SVANTEK

USER MANUAL

SV 971A

POCKET-SIZE SOUND LEVEL METER & ANALYSER

Warsaw, 2021-09-23

Rev. 1.00

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 **1.05**.*

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

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

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1 INTRODUCTION

SV 971A is an extremely small Class 1 IEC 61672-1:2013 Sound Level Meter (SLM) with the optional real time 1/1 & 1/3 octave analyser and Sound Exposure Meter (SEM) conforming to international standards ISO 9612 and OSHA (IEC 61252; ANSI S1.25).

The new user interface of this instrument makes measurement configuration as easy as possible. This all makes SV 971A an ideal choice for industrial hygiene noise measurements, short period environmental noise measurements, acoustics consultancy surveys, technical engineers dealing with noise issues and general acoustics noise measurements.

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 a micro SD memory card and can be easily downloaded to a PC over the USB-C or optional RS 232 interface. 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 a sound calibrator. The calibration process can be automatically activated whenever a sound calibrator with the auto run function is installed on the microphone.

SV 971A comes with Svantek dedicated 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++* that enables advanced data processing and analysis, visualization and automated reporting.

SV 971A is equipped with the Bluetooth®[1] module and can be remotely control by the *BA Assistant* smartphone application smartphone application dedicated for building acoustics and speech intelligibility measurements.

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

1.1 SV 971A AS SOUND LEVEL METER & ANALYSER

- SLM mode: **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, Leq statistics (**Ln**), expected Leq value (**EX**), standard Leq deviation (**SD**), measurement time and overload time % (**OVL**) and two rolling Leq (**LR1** and **LR2**) with Class 1 IEC 61672-1:2013 accuracy in the frequency range 5 Hz ÷ 20 kHz
- SEM mode: **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **LEPd**, **Ltm3**, **Ltm5**, Leq statistics (**Ln**), expected Leq value (**EX**), standard Leq deviation (**SD**), **Lc-a**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, SEL8(**LAE8**), PSEL(**PLAE**), **E**, **E_8h**, peak counter (**PTC**), peak threshold (**PTP**), upper limit time (**ULT**), **TWA**, **PrTWA**, measurement time and overload time % (**OVL**) with Class 1 IEC 61672-1:2013 accuracy in the frequency range 5 Hz ÷ 20 kHz

[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** frequency filters
- Two measurement ranges 25 dBA LEQ ÷ 123 dB Peak (**Low**) and 30 dBA LEQ ÷ 140 dB Peak (**High**).
- **1/1 Octave** real-time analysis (option). Eleven 1/1-octave filters with center frequencies from 16.0 Hz to 16 kHz (meeting Class 1 requirements of IEC 61260-1:2014) available simultaneously with three user definable profiles for broadband measurements (SLM and SEM), time history logging and audio recording
- **1/3 Octave** real-time analysis (option). Thirty-five 1/3-octave filters with center frequencies from 8 Hz to 20 kHz (meeting Class 1 requirements of IEC 61260-1:2014) available simultaneously with three user definable profiles for broadband measurements (SLM and SEM), time history logging and audio recording
- **Audio signal** recording (option), trigger and continuous mode, 12 kHz and 24 kHz sampling rate, WAV format
- Reverberation time **RT60** analysis function (option) for 1/1 octave bands or 1/3 octave bands and three total RMS levels (**A**, **C** and **Z** weighted) in accordance with the ISO 3382 standard.
- **STIPA** (speech transmission index for public address systems) measurements of electro-acoustic and acoustic environments effects that affect the speech intelligibility in the room acoustics and/or public address systems.

1.2 GENERAL FEATURES OF SV 971A

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

1.3 ACCESSORIES INCLUDED

- **ACO 7152** prepolarised ½" condenser microphone with nominal sensitivity 32 mV/Pa
- **SV 18A** microphone preamplifier
- **SC 158** USB type C to USB type A cable
- **SA 22** foam windscreen
- **batteries** four AAA type

1.4 ACCESSORIES AVAILABLE

- **SV 36** Class 1 sound calibrator: 94dB/114 dB/1000 Hz
- **SP 75** RS232 interface option with external power supply plug
- **SC 91A/05** extension cable for SV 18A, 5 meters (for laboratory purposes)
- **SA 72** carrying case for SV 971A and accessories (waterproof)
- **SA 80** pocket soft bag
- **SA 271A** outdoor microphone kit
- **SA 270D** desiccator for the SA 271A outdoor microphone kit
- **SvanPC++_EM** environmental monitoring module for SvanPC++ (hardware key, single license)

1.5 FIRMWARE OPTIONS AVAILABLE

- **SF 971A_P1** Package SF 971A_1 1/1 & 1/3 octave and audio recording
- **SF 971A_P2** Package SF 971A_5 RT60, SF 971A_20 STIPA, BA_Assistant APP, SvanPC++_BA (not included SF971A_3 1/1 & 1/3 octave)
- **SF 971A_P3** Package including P1, P2 packages
- **SF 971A_1** 1/1 octave analysis option
- **SF 971A_5** Reverberation time analysis (RT60) option, SvanPC++_BA and BA_Assistant APP option
- **SF 971A_10** Noise dosimetry option
- **SF 971A_15** Audio events recording option
- **SF 971A_20** STIPA function with mobile APP 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 MEASUREMENT CONFIGURATIONS

The instrument's normal operating mode as SLM assumes operating with the preamplifier and microphone attached to the instrument and without a windscreen. Optionally the instrument can be operated with the windscreen attached to the microphone or with the preamplifier and microphone fitted in the outdoor microphone kit and connected with the instrument by the extension cable (see Appendix C for specification).

In the case of significant differences between the instrument's temperature and the ambient temperature at the measuring point, long enough acclimatization of the instrument is recommended so that its temperature is as close to the ambient temperature as possible.

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

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).

When measuring in the diffusion field (in small spaces) it is recommended to switch on the filter for the diffusion field.

Chapter 16.3 presents the way the microphone should be attached to the preamplifier and the preamplifier to the instrument.

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

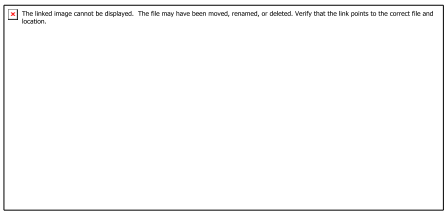
2.2 INPUT AND OUTPUT SOCKETS OF THE INSTRUMENT

Top cover of the instrument

The measurement **Input** is placed in the centre of the instrument's top cover. The **SV 18A** microphone preamplifier has a specially designed matching plug with a locking screw to secure the preamplifier to the meter body. After plugging in the preamplifier to the measurement input, the screw should be tightened to light resistance only. Do not over tighten this connector. It is not necessary to remove this preamplifier from the top of the instrument unless the meter is in a calibration laboratory as it is always used close coupled to the meter body. The full description of the signals connected to the sockets is given in Appendix C.

Bottom cover of the instrument

In the bottom cover, there is only one socket – **USB** (C type).



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. The USB-C 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.*

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

You can access the card and batteries by unscrewing the coin slot screw and removing the bottom cover – see Chapter 16.1.

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

2.3 INSTRUMENT POWER

SV 971A 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 12 h (6.0 V / 1.6 Ah). Instead of the ordinary alkaline cells, four AAA rechargeable batteries can be used (a separate external charger is required for charging them). In this case, using the best NiMH type, the operation time can be increased up to 16 h (4.8 V / 2.6 Ah)
- **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 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 power to the internal batteries.

Note: *When the instrument is powered via USB, the internal batteries slightly discharge. 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 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 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.)*.

2.4 CONTROL KEYS ON THE FRONT PANEL

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

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

- **<ESC>**, **(<P/S>)**
- **<Enter>**, **(<Menu>)**
- ▲,◄, ►, ▼
- **<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 (**<P/S>**, **<Menu>**) can be used when the **<Shift>** key is pressed with **<Enter>**, **<ESC>** or some other keys. This key can be used in two different modes, which can be configured in the **Keyboard** list (*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 opens the selected position in the menu and confirms selected settings. In the Measurement mode, it switches sub-views. 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 list of parameters is closed after pressing the **<ESC>** key, any changes of settings just made are ignored. In the Measurement mode, it switches views of results presentation.

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

- change viewed result in the measurement mode,
- select column in a multi-column parameter list,
- select a parameter value in an active position (e.g. filter **Z**, **A**, **C** etc., **Start Delay** period: **1s**, **2s**, **3s**, … etc.). In case of numerical values, it speeds up selection after pressing and holding,
- control cursor in the graph views (Logger, Spectrum etc.),
- select position of a character in the text editor screen.

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

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

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

- select position in the list,
- select character in the text editor screen,
- change profile in the measurement mode.

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

- change view in the measurement mode,
- change relationship between Y-axis and X-axis in the Logger and Spectrum views,
- program the Real Time Clock (**RTC**) and delayed run **Timer**.

(<Menu>) This key (**<Shift> + <Enter>**) opens the main **Menu** in the configuration mode. Double press of the **<Menu>** key opens the list containing last opened configuration screens. It gives faster access to the frequently used screens for easy navigation.

(<P/S>) This key (**<Shift> + <ESC>**) 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.

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

2.5 WORKING WITH THE INSTRUMENT

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.

Turning on the instrument

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 the Running SPL view mode, if it was enabled, if not - to the One profile view.

2.5.1 *Measurement mode*

The measurement results can be viewed in different views or display modes, the set of which depend on the selected **Measurement Function**, which you can change with the **<ESC>** key or the ▲ / ▼ keys pressed together with **<Shift>**.

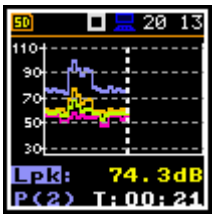
Measurement views

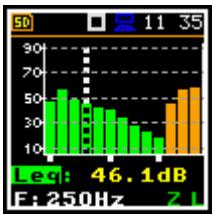
Views present some measurement results as well as additional information by means of icons regarding:

- 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.

Some views are always available, and some can be activated or deactivated using the Configuration mode.

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

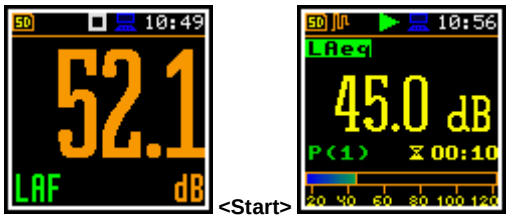




In some views you can toggle sub-views by pressing the **<Enter>** key.

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

Starting measurements



To start a measurement, press the **<Start>** key. The ▶ icon will appear, and the measurement will be performed with the current instrument settings, which are stored in the instrument's internal memory. During the measurement the shape of the ▶ icon will be changing from self to contoured.

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

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 **Pause** screen.

The Pause mode allows you to erase up to 30 last seconds of the measurement with the ◀ key. One press deletes one second of the measurement and this reduces also the elapsed time.

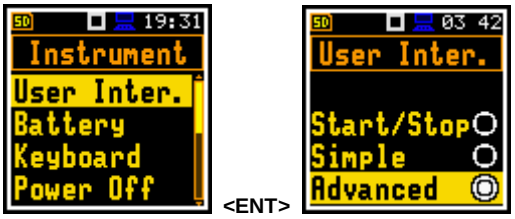
It may be useful if, for example, the measurement is temporarily disturbed by some event that should not normally occur.

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

2.5.2 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.

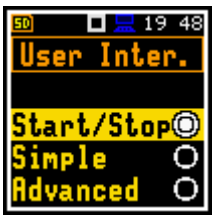
User interface mode



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.

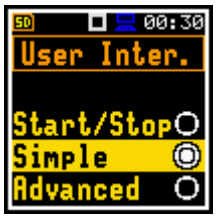
The **Start/Stop** mode limits the menu to only one **User Interface** position in the main menu and measurement screens.

<Menu>



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

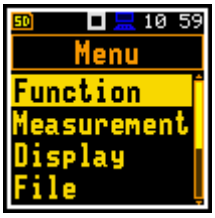
When the **Simple** interface mode is being selected after the **Advanced** mode the instrument proposes to restore the default settings by asking the question: **Do you restore the default value of the advanced settings?** In case of **No**, all hidden in the **Simple** mode parameters will have settings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



<ENT>

Note: *The screens in this manual are mainly presented in the* ***Advanced*** *interface mode*.

Main menu



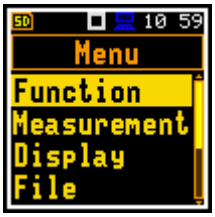
The main **Menu** contains the headers of six sections (submenu), which group configuration settings by feature. The main **Menu** is opened after pressing the **<Menu>** (**<Shift>** + **<Enter>**) key. The main **Menu** list contains the following sections: **Function**, **Measurement**, **Display**, **File**, **Instrument**, **Auxiliary Setup** and **Report**.

Recent Items list

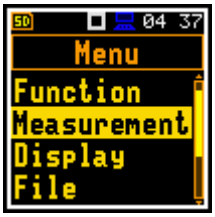
Double-pressing of the **<Menu>** key opens the list of recently used menu items. This enables accessing most frequently used lists of parameters and lists of options quickly, without the necessity of passing through the whole menu.

Selecting position

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

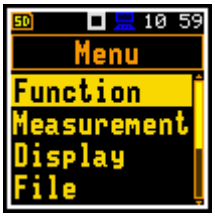


▼



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.



<ENT>

List of parameters

List of parameters contains parameters for which you may select the value from the available range or 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.

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 changing automatically until you release the pressed button.

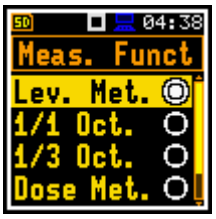
You may change the numerical parameter value with a larger step (usually 10) with the ◄ / ► key pressed with **<Shift>**.

Matrix of parameters

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

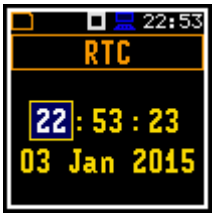
- column with the ◄ / ► key
- line with the ▲ / ▼ key
- value in a selected position with the ◄ / ► key pressed with **<Shift>**
- all values in a line with the ▲ / ▼ key pressed with **<Shift>**
- all values in a column, if the cursor is on one of Profile positions, with the ◄ / ► key pressed with **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

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.

Complex parameters



For complex parameters, consisted of more than one value field like **RTC**, 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 list. The list is closed, ignoring any made changes with the **<ESC>** key.

Text editor screen

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

- 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 a screen, press **<ESC>** or **<Enter>**.

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 will be not active!

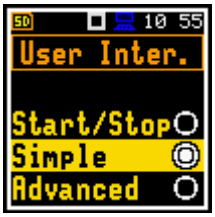
2.6 DEFAULT SETTINGS

Factory settings

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



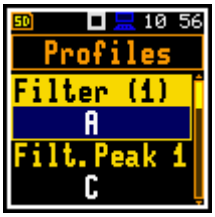
With default settings, the instrument has the **Simple** user interface and is configured as the Sound Level Meter (**Measurement Function: Level Meter**) to measure sound pressure level by three virtual meters, so called profiles, with 1 second delay from the **<Start>** key pressure, infinite integration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

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

Other functions 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**). The logger results will be logged with 1 s step (**Logger Step: 1s**). Logger splitting is **Off**.

Default Profile settings:



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

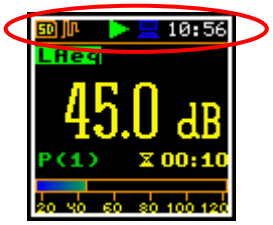
Profile 2 - **C** weighting filter for Peak results (**Filt.Peak(2)=C**), **C** weighting filter for other results (**Filter(2)=C**), **Fast** for the LEQ detector (**Detector(2)=Fast**);

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

You can change all 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.

2.7 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:

	"**measurement**" 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.
	"**waiting**" 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 is not inserted.
	"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%).		**"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.
	"Level+" icon is displayed when the trigger condition is set „**Level+**". The icon appears alternately with the „wait", "logger" or "wave" icons.		**"Level–"** icon is displayed when the trigger condition is set „**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.
	"RS232" icon is displayed when the RS232 port is activated.	Sh	**"Shift"** icon is displayed when the **<Shift>** key is pressed.

	"**vibration**" icon is displayed when high self-vibration level is registered		"**USB**" icon is displayed when there is USB connection with the PC.
	"**plug**" icon is displayed when the instrument is powered through the USB socket without using USB interface.		**"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.

2.8 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.

2.9 SAVING DATA

The instrument creates files of 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.

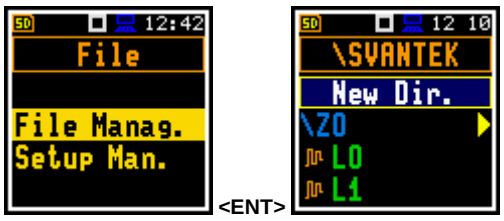
The **SD Card** memory is activated automatically after insertion of the card. The presence of the SD-card is indicated by the icon with SD letters at the top left-hand corner of the display.

- SD-card is inserted

- no SD-card

File manager

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 **SD Card** 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 of logger and wave files

Logger files are created and saved automatically to the SD-card. To enable automatic saving several conditions should be fulfilled:

1. SD-card should be inserted and there should be enough free space on it.
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. When the signal is recorded to the wave file, the "signal" 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**.

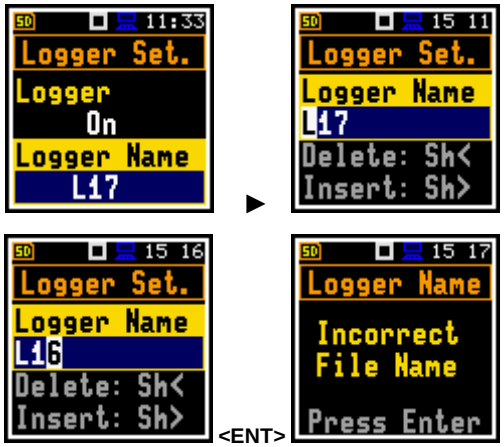
The instrument assigns an individual counter to each prefix of files the user has created and saved in the working directory. The counter value is equal to the maximum number in the set of files with the same prefix. For example, if there are files with names: **L0**, **L15** and **L16**, the counter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

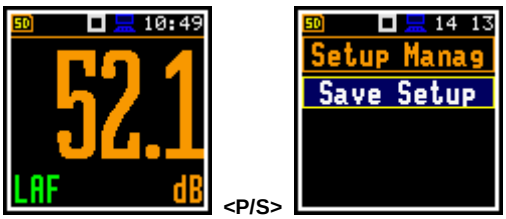
The instrument accepts only that name which number is higher than the counter of the prefix.



Saving setup files

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

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



2.10 DOWNLOADING AND UPLOADING FILES

Downloading files

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

Since the file structure of the SD-card is the same as on most PC, the user may extract the micro SD-card and use it directly in the PC. But it is not recommended.

We recommend using *SvanPC++* or *Supervisor* software, which enables the user download and upload functions as well as data viewing and data processing options. In this case, the instrument should be connected to the PC via SC 158 USB cable.

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

Uploading files

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

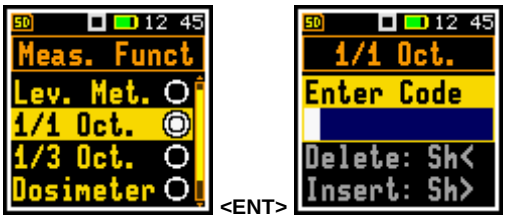
Files can be upload via micro SD-card or via *SvanPC++* or *Supervisor* software.

2.11 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 and event recording.

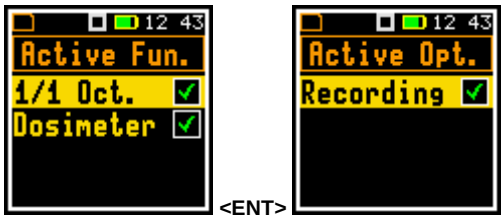
If additional functions were not included in the instrument kit and were not unlocked by the supplier, such a task is in responsibility of the user who decides to buy additional functions later.

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.



You can check and lock early unlocked options in the special **Active Functions** and **Active Options** screen which is opened if you press the **<Shift>** and ◄ keys right after turning on the instrument. You should keep these keys pressed during the first half of the system initialization until the **Active Fun.** screen opens.

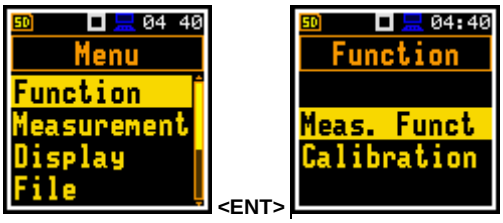
To open the **Active Opt.** screen, press the **<Enter>** key.



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>**.

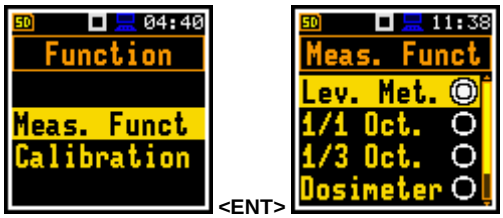


3.1 ACTIVATING MEASUREMENT FUNCTIONS – MEASUREMENT FUNCTION

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 1 accuracy. The instrument can also be used for medium to long-term acoustic monitoring using the huge capacity data logger in which all measurement results can be stored.

You may also use 1/1- and 1/3-octave band real time analysis (**1/1 Oct.**, **1/3 Oct.**) and dose meter (**Dosimeter**) 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. **1/1.&Dose** and **1/3.&Dose** functions enable 1/1- and 1/3-octave analysis along with dose calculations.

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



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

Note: *The 1/1- and 1/3-octave analysis,* ***Dosimeter****,* ***RT60*** *and* ***STIPA*** *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 ready to use 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 CALIBRATION OF THE INSTRUMENT – 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 measurement cannot be in progress while the automatic calibration is being performed.

Note: *SV 971A has two different dynamic ranges – **Normal** and **Low**. In the SLM functions (**Level Meter**, **1/1 Octave**, **1/3 Octave**, **RT60** and **STIPA**) both ranges can be used for measurement, but in the SEM functions (**Dosimeter**, **1/1.&Dose**, **1/3.&Dose**) – only **Normal** (see Chapter 4.6 and 11.4). But in case of calibration, it does not matter which function and which range is selected.*

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

<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 all measurement 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. Attach the sound calibrator (SV 36 or equivalent 114 dB/1000 Hz) carefully over the microphone of the instrument.

Note: *It is also possible to use an electro-mechanical pistonphone, which generates a signal (ca 124 dB) or different type of acoustic calibrator dedicated for ½" microphones. It is also necessary to switch the instrument **Range** to the **Normal** level.*

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 **<Enter>** or **<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.

During the calibration measurement, the level of the measured calibration signal is displayed. If the maximal difference between three consecutive 1-second LCeq results is less than **0.05dB**, the calibration measurement will be stopped, and the calibration factor will be calculated. The measurement can be always stopped by the **<Stop>** key.

After calibration measurement stop, the **Calibration drift** (change of calibration factor since last calibration, calculated in dB) is displayed and it will be proposed to save the new calibration factor by pressing **<Enter>**, or reject it by pressing **<Esc>**. In both cases the instrument exits the **Calibration** screen.

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 (microphone, preamplifier or instrument itself) is damaged.

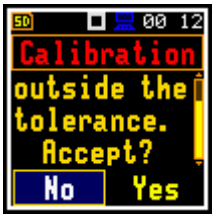
Note: *During the calibration measurement, external disturbances (acoustic noise or vibrations) should not exceed a value of 100 dB (when using a calibrator that generates 114 dB).*

5. Press **<Enter>** to accept and save the new calibration factor.

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

<ENT>

Note: If calculated calibration drift 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**.



6. Detach the calibrator from the microphone.

3.2.2 Last calibration record – Last Calibration

The **Last Cal.** screen displays the information regarding recent calibration record for the current measurement function: type of calibration (*Factory Calibration*, *By Sensitivity* or *By Measurement*), date of calibration and calibration factor.

<ENT>

3.2.3 History of calibrations – Calibration History

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

<ENT>

Note: *Every time you return to 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.*

3.2.4 Erasing calibration records – Clear History

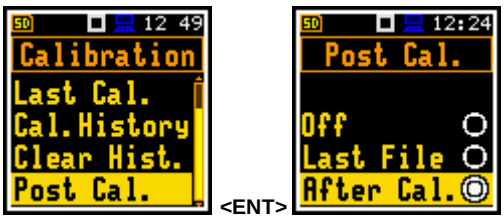
To erase all calibration records in the history, choose the position **Clear Hist.** and press **<Enter>**.

The instrument requests confirmation of the selected operation.

3.2.5 Post measurement calibration – Post Calibration

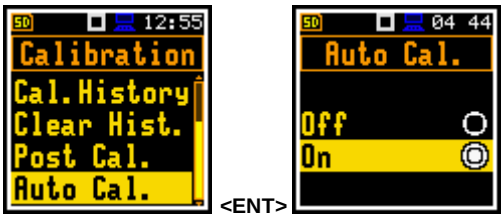
Some regulations require post-measurement calibration information to be added to measurement files created before such calibration. The last calibration factor is for informational purposes only, as it was not considered during the measurement.

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.**).



3.2.6 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 the instrument 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 36 (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.*

Generated by the calibrator sound pressure level starts the Automatic Calibration process if the difference between the **Calibration Level** value set up in the **Calibration** screen and the measured SPL level generated by the calibrator is in the range **±5 dB**.

During the calibration measurement, the level of the measured calibration signal will be displayed. If the maximal difference between three consecutive 1-second LCeq results is less than **0.05dB**, the calibration measurement will be finished. The measurement can be always stopped by the **<Stop>** key.

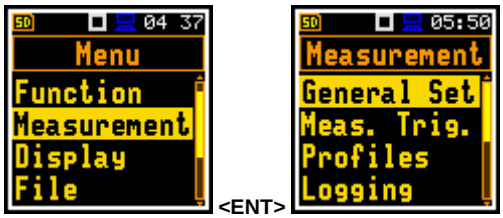
After calibration measurement stop, the **Calibration drift** (change of the calibration factor since the last calibration, calculated in dB) is displayed.

3. Press **<Enter>** to save the new calibration factor or press **<Esc>** to reject it. In both cases the instrument exits the **Calibration** screen.
4. Detach the calibrator from the microphone.

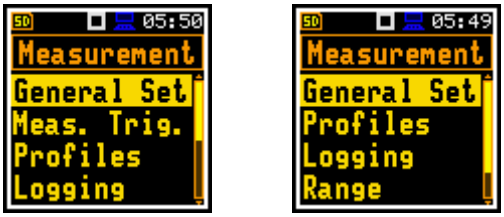
4 CONFIGURING MEASUREMENT PARAMETERS – Measurement

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 the **Advanced** interface mode;
Logging	allowing you to configure the logging function;
Spectrum	allowing you to set spectrum parameters. This position becomes available only in the 1/1- and 1/3-octave analysis functions;
Range	allowing you to set the required 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**), LEQ detector type (**LEQ Integr.**) and duration of day periods (**Day Time L.**).

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 cycles

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>** 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 cycles

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>** 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 the infinite repetition cycles the measurement should be stopped manually with the* ***<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****)*.

Rolling Leq

In the two **LRx Time** positions, you can define integration periods for calculating the **LR1** and **LR2** results (see Appendix D). Default values respectively: **30 m** and **60 m**.

4.2 SETTING MEASUREMENT TRIGGER – MEASUREMENT TRIGGER

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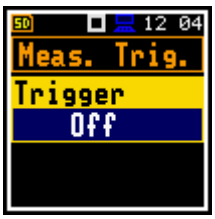
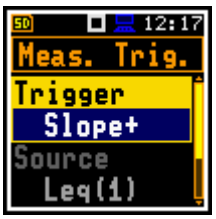


The **Meas. Trig.** position appears only in the **Advanced** interface mode and enables setting parameters of the measurement trigger. The **Meas. Trig.** is a contexts list of parameters in which the trigger (**Trigger**) can be switched **Off** or On by selecting the trigger type (**Slope+**, **Slope–**, **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.

Slope trigger

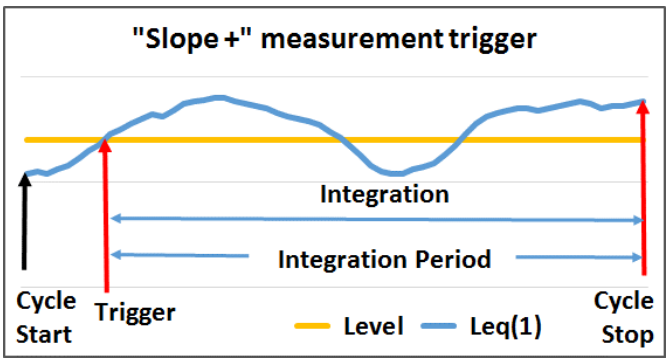


The **Slope+ / Slope–** trigger starts the measurement/integration with the duration of the **Integration Period** on condition: rising value of the measured result (**Source**) integrated during 0.5 ms passes above/below the threshold value (**Level**).

When a new measurement cycle begins (after pressing the **<Start>** key or automatically after previous measurement cycle stop) the instrument checks a trigger condition every 0.5 ms and if condition is met the instrument starts a continuous series of 1-second integrations, the number of which is equal to the number of seconds in the **Integration Period**.

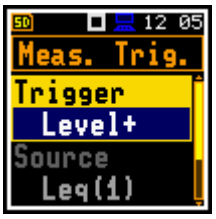
After ending the **Integration Period**, the new measurement cycle can start with above logic.

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



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

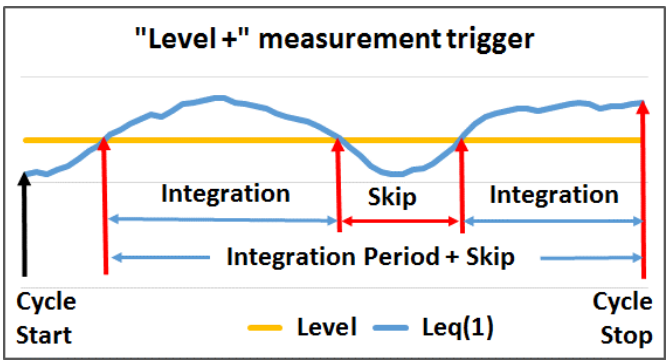
Level trigger



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

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

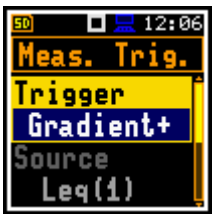
After 1-second integration, the instrument repeats trigger condition checking every 0.5 ms and starts next 1-second integration if condition is met. The instrument does it as many times as many seconds are within the Integration Period and stops the measurement cycle. Therefore, the series of 1-second 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.

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

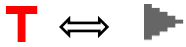
Gradient trigger



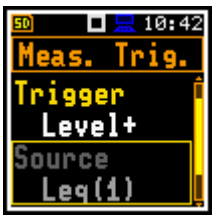
The **Gradient+** trigger starts the 1-second measurement/integration under the condition: value of the RMS result (**Source**) integrated during 0,5 ms is greater than the threshold (**Level**) and the gradient of the Source value is greater than the gradient threshold (**Gradient**). In other cases,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

This type of trigger has the same logic as the **Level+** trigger, but the trigger condition requires also gradient 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

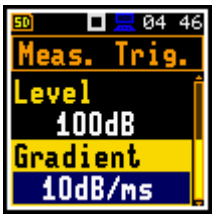


Only one measured result (**Source**) can be used for checking trigger condition in the **Level Meter** mode, namely the instantaneous LEQ from the first profile (with appropriate filter and detector), which is denoted here as **Leq(1)**. This position cannot be changed.

Threshold level

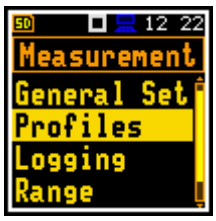
The threshold (**Level**) can be set in the range from **24 dB** to **136 dB**. The **Source** value compares with the **Level** value every 0.5 milliseconds.

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



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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).

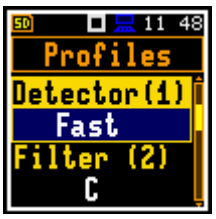
Following parameters can be programmed independently for each profile: weighting filters for other than peak results (**Filter**), weighting filters for peak results (**Filter Peak**) and LEQ detectors type (**Detector**).

Weighting filter

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

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

LEQ detector selection

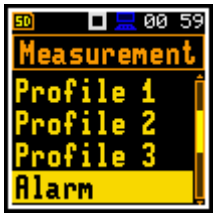


Available LEQ detectors (time constants): **Impulse**, **Fast** and **Slow**.

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

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



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4.5 CONFIGURING DATA LOGGING – LOGGING

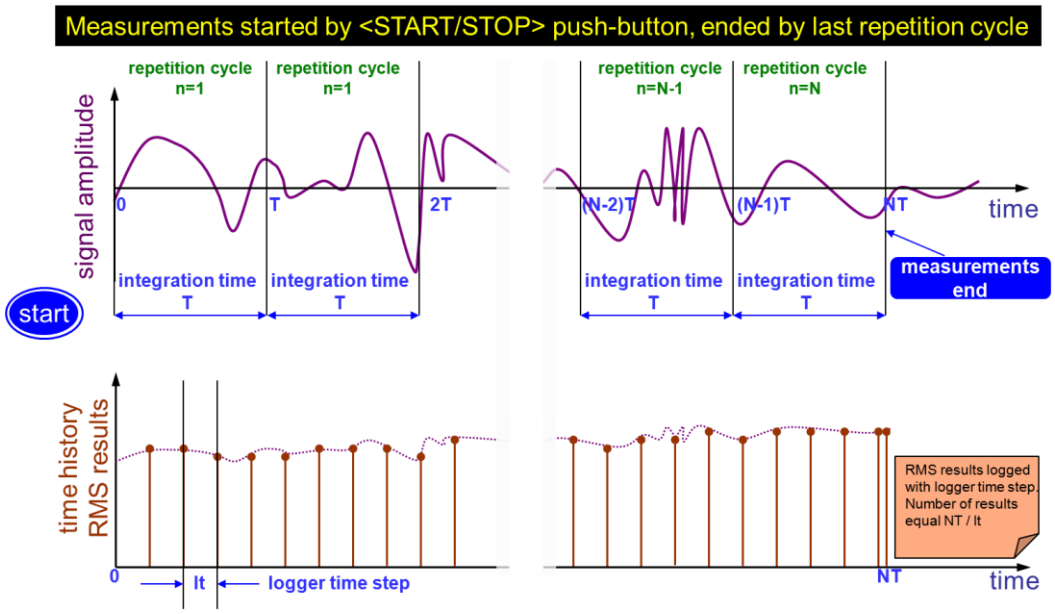
Summary results (**L**(SPL), **Leq**, **LE**(SEL), **Lden**, **LEPd**, **Ltm3**, **Ltm5**, 10 x **Ln**, **OVL**, **Lpeak**, **Lmax**, **Lmin**, **EX**, **SD**) and spectra are measured and saved in the file with the step defined by the **Integration Period** parameter as many times as defined by the **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 saving

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.**

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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 saving selected results from the three profiles and spectra (**Logger Results**) with the step defined by the **Logger Step** parameter and programming 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 files

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. Default value: **Off**.

In other cases, the 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 the 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.

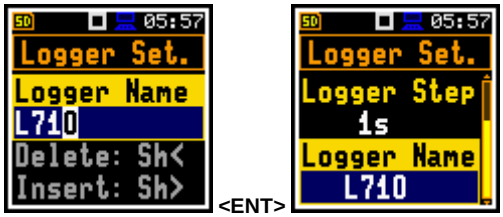
The **Logger Step** defines the step for logger results logging in a file. It can be set from **100ms** to **1h**. Its value by default is set to **1s**.

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

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

Logger file name

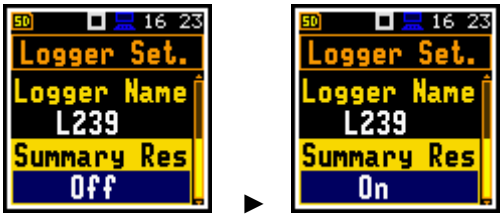
The **Logger Name** position enables defining the logger file name, which consists of a prefix and a number. The default logger file prefix is **L**. The name can be of up to eight characters long. After pressing the ◄ / ► key, the text editor screen is opened.



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.

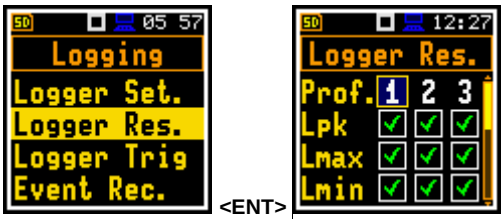
Logging Summary Results



The **Summary Results** parameter switches on or off logging 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**, **Leq**, **LR1** and **LR2**.

Activation / deactivation can be done with the ◄ / ► key pressed with **<Shift>**. The position is changed with the ◄ / ► or ▲ / ▼ 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 are selected).*

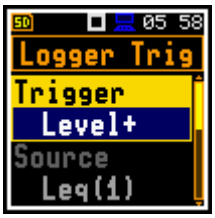
4.5.3 Configuring Logger trigger – Logger Trigger

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 switched **Off** or On by selecting its type (**Level+** or **Level–**) in the **Trigger** position.

When the trigger is selected, 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**).*

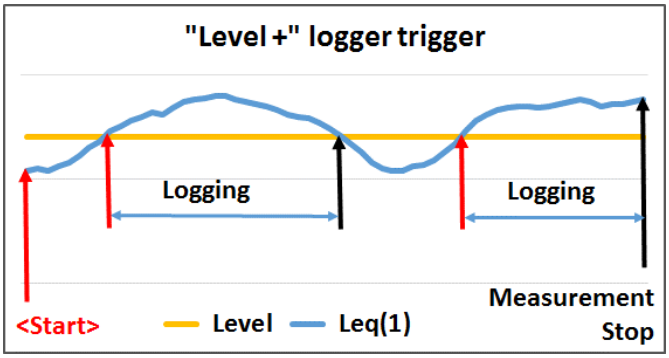
Level trigger



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.*

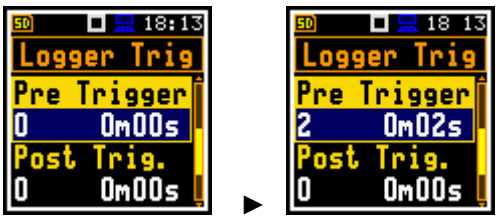
Source result

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 logger results which will be registered in the file before fulfilment of the first trigger condition. This number can be set in the range 0..10.

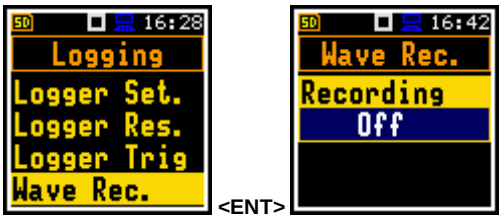
In the **Post Trigger** position, you can define the number of logger results which will be registered in the file after fulfilment of the last trigger condition. This number can be set in the range 0..200.

Periods of logging the logger results before and after fulfilment of the trigger condition can be calculated by multiplying the value set up in the **Pre** or **Post** positions by the value set up in the **Logger Step** position (*path: <Menu> / Measurement / Logging / Logger Setup*). The result of this calculation is presented in the same line for the **Pre** and **Post** parameters in the format **0m00s**.

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.

4.5.4 Configuring signal recording – Wave Recording

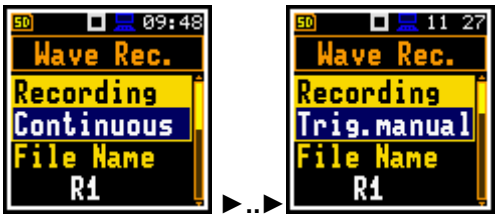
The **Wave Recording** position enables activating and configuring a waveform signal recording in the separate file with the extension **WAV**. WAV files are saved automatically in the working directory of the instrument's memory (SD-card).



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**.



Note: *The **Wave Recording** function is optional and should be unlocked by entering the activation code in the text editor screen, during the first attempt to switch it on with the ► key. Once unlocked this option will be available permanently.*

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

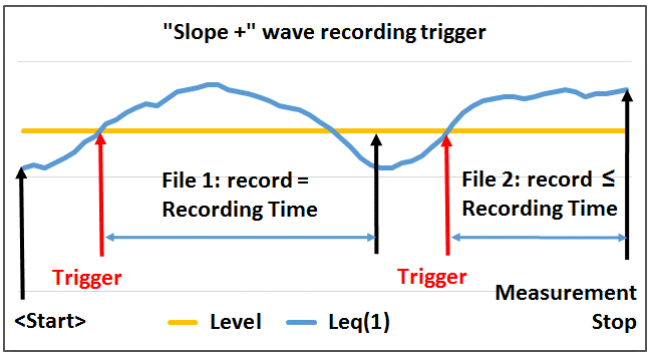
In the **Format** position, you can select the format of the signal recording: **PCM** or **Extensible**.

Slope trigger

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

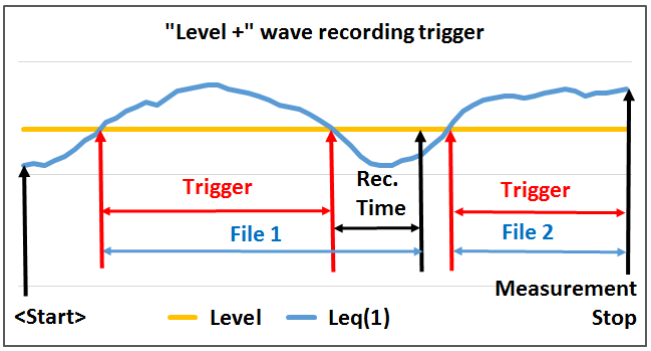


Note: *When a signal recording is waiting for the slope trigger the "slope" icon superimposes on the grey „signal" icon.*

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**.

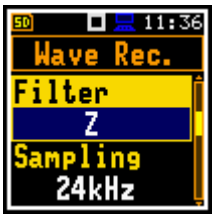
Integration period trigger

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**.

.

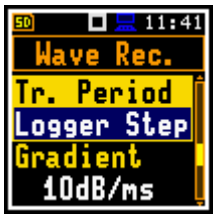
Source result

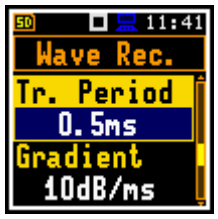
Only one measured result can be used as a trigger source (**Source**) for checking the trigger condition in the **Level Meter** mode, namely the instantaneous LEQ from the first profile averaged for the **Trigger Period** with appropriate filter and detector, which is denoted here as **Leq(1)**. This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

Threshold level

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

Checking the trigger condition

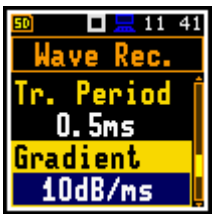




The **Source** value compares with the **Level** value with the step defined by the **Tr. Period** parameter which may be set as: **Logger Step**, **0.5ms**, **100ms** and **1s**.

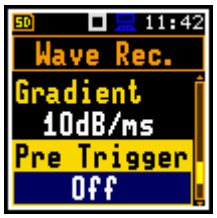
Speed of source value changing

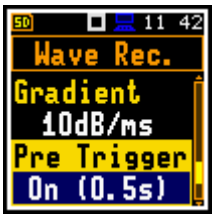
Speed of triggering signal changing (**Gradient**) can be set in the range from **1 dB/ms** to **100 dB/ms**.



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).





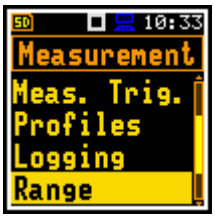
Signal recording time

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 SELECTING MEASUREMENT RANGE – RANGE

The **Range** position is used for setting one of the available measurement ranges in the instrument.

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



<ENT>

There are two ranges available: **Normal** and **Low**.

The detailed description of the measurement ranges parameters is given in Appendix C.

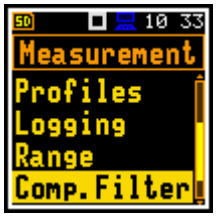
..

Note: *The ranges at the above screens correspond to the microphone with the sensitivity within the declared range 25 ÷ 37 mV/Pa (see Appendix C). If microphone sensitivity is other than 25 ÷ 37 mV/Pa, the range will be automatically changed.*

4.7 SELECTING MICROPHONE COMPENSATION – 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 switch off (Off) the compensation filter or to select the compensation filter for sound measurements in the free-field (**Free Field**), diffuse field (**Dif. Field**) conditions or for the permanent outdoor monitoring application as a part of the **SV 271** monitoring station: **Environment** (when the acoustic signal is parallel to the microphone's grid) or **Airport** (when the acoustic signal is perpendicular to the microphone's grid).. 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.

<ENT>

4.9 PROGRAMMING INSTRUMENT'S INTERNAL TIMER – TIMER

The **Timer** function is used to programme the automatic start-up of the measurement at a given time and day of a week and with the parameters set in the **Measurement** section.

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).

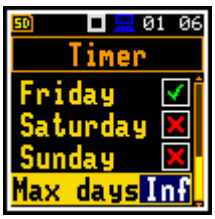
<ENT>

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**). The measurement series stops when the day-counter number will be equal to **Max days**. If **Inf** value is selected the measurement series can be stopped only manually (if the power is assured). If more than one day in a week is selected, every performed measurement will increase the day-counter.

After programming the Timer, you can turn off the instrument and it will turn itself on before each measurement. However, there is a minimum time between turning off the instrument and the set time in the Timer, which is 10 minutes. If you try to turn off the instrument during this time, a question will appear whether you really want to turn off the instrument, because it will also turn off the set Timer.

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 14:54, 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 14:54 on the nearest Monday.

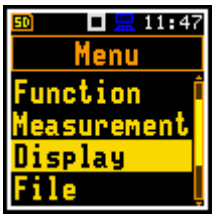
The measurement will be performed by a period of ten minutes. Then, the results will be saved in the file with the name R1 automatically and the instrument will be waiting for the next Monday to start measurement at 14:54. Next file will be automatically named R2 and so on. Such measurement will be repeated so many times as was defined by the **Max days** parameter.

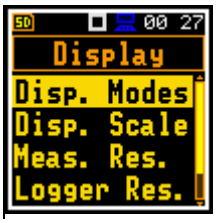
5 CONFIGURING DATA VIEWING – Display

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>**.



<ENT>


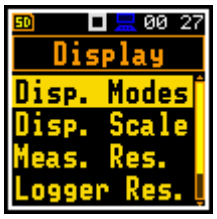
The **Display** section contains following items:

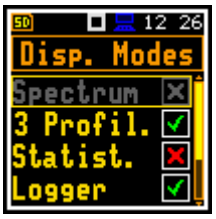
Disp. Modes	allowing you to enable modes of the measurement results presentation (views);
Disp. Scale	allowing you to adjust the **Logger** and **Spectrum** views;
Spect. View	allowing you to select spectra to be viewed. This position becomes available only in the 1/1- and 1/3-octave analysis functions;
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.

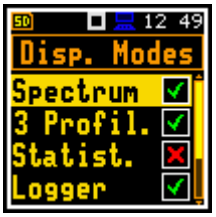
You may switch in the measurement mode between those views, that were enabled in the **Disp. Modes** screen.



<ENT>


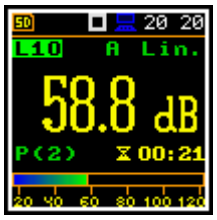
In the **Level Meter** function, following views are available: **3 Profiles**, **Statistics**, **Logger**, **Running SPL** and **File Info**.

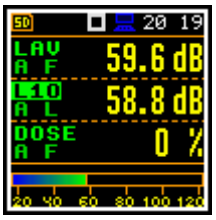
In the analyser functions, additional view (**Spectrum**) becomes available.



Changing views

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

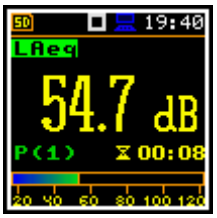


<Sh>/▲


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. You may change the sub-view of the One Result view by pressing **<Enter>**.

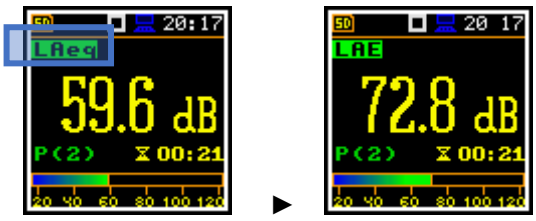


<ENT>


<ENT>

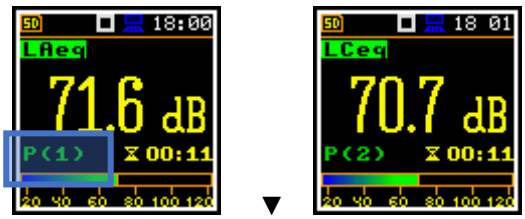

Changing measurement results

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

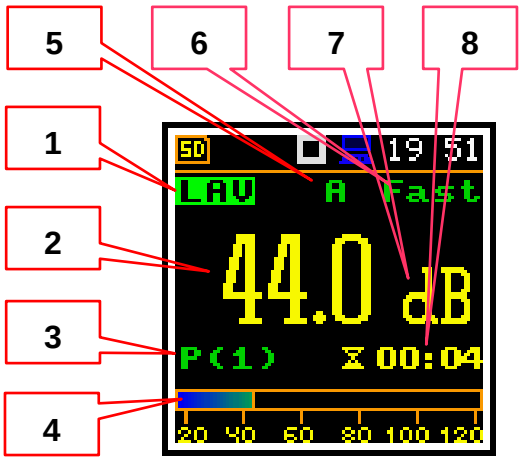


Changing viewed profile

The profile results displayed in this view can be changed with the ▲ / ▼ key.



Field description of the One Result mode



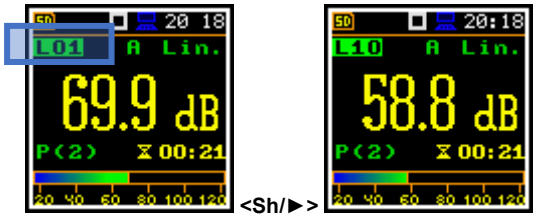
1. Result name for:
   - **Level Meter**, **1/1 Oct.** and **1/3 Oct.** functions: **OVL**, **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln**, **EX**, **SD**, **LR1**, **LR2**
   - **Dosimeter** function: **OVL**, **Lpeak**, **Lmax**, **Lmin**, **L**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **Leq**, **LE**, **SEL8**, **E**, **E_8h**, **LEPd**, **PSEL**, **Ltm3**, **Ltm5**, **Ln**, **PTC**, **PTP**, **ULT**, **TWA**, **PrTWA**, **Lc-a**, **EX**, **SD**, **LR1**, **LR2**
2. Value of the measured result
3. 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,* ***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.*

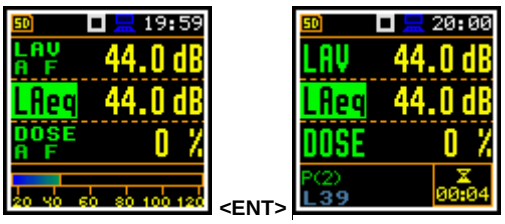
Changing statistical levels (Ln)

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>**.



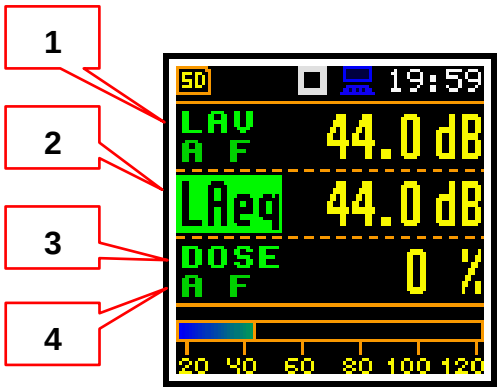
5.1.2 Three profiles view

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



3 Profiles view fields

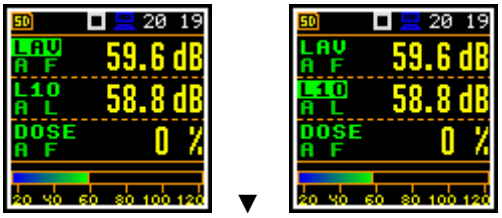
1. Result for the first profile
2. Result for the second profile
3. Result for the third profile
4. Implemented weighting filter: **A**, **C**, **Z** or **B** and detector time constant: **I** (Impulse), **F** (Fast), **S** (Slow) when the detector is exponential or **L** when the detector is linear



Changing measurement results

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

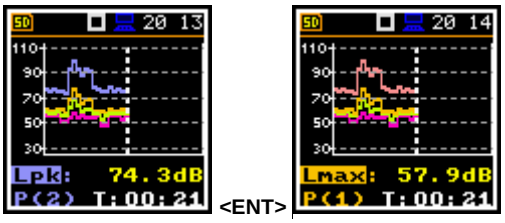
The statistical levels can be changed with the ◄ / ► key pressed with **<Shift>**.



5.1.3 Logger view

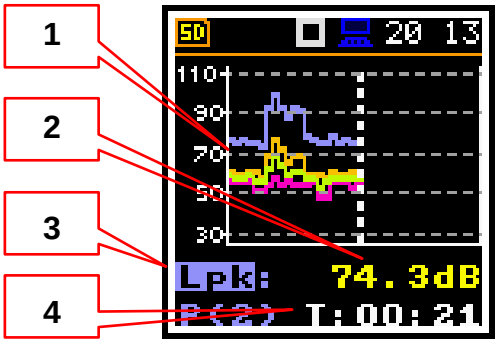
In the **Logger** mode, the history results, selected in the **Logger View** list, are displayed as a plot. You may change the active history plot with the **<Enter>** key.

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!*

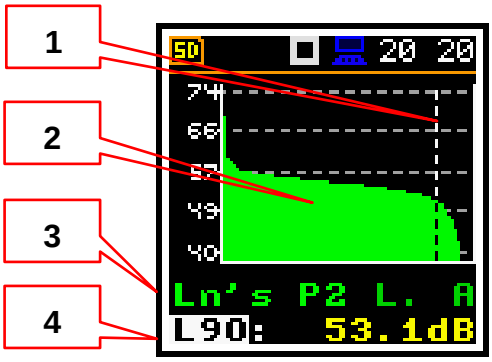
Note: *When **Logger** is switched on, but results were not selected for logging the **Logger** presentation mode is disabled!*

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.

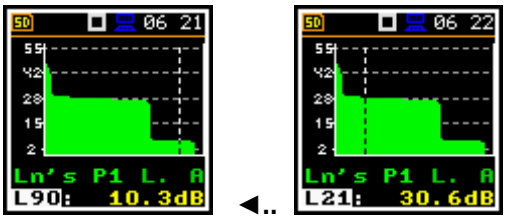
Statistics view fields

1. Cursor position
2. Statistics plot
3. Type of the plot (**Ln's**), active profile, LEQ detector (**L**inear, Fast, **S**low or **I**mpulse), used weighting filter name (**A**, **C**, **Z** or **B**)
4. Value (in dB) of the selected statistical level **Ln** for the cursor position
5.



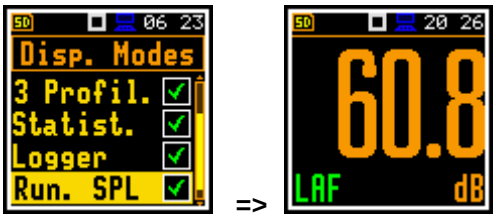
The cursor position can be changed with the ◄ / ► key.

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



5.1.5 Running SPL view

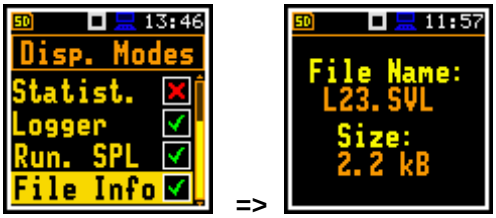
The **Run. SPL** view shows the **SPL** result when measurement is not currently running. In this mode, the SPL result is calculated and displayed, but not stored in the file. The purpose of this view is to give the user a first indication about the signal to be measured and for the correct selection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



5.1.6 File information view

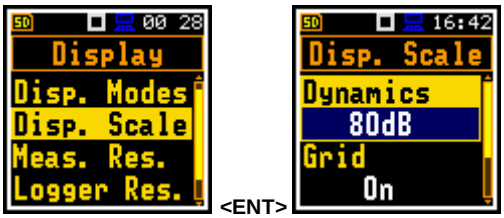
The **File Info** position enables additional view with information about the last saved logger file.

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 <u>disabled</u>.



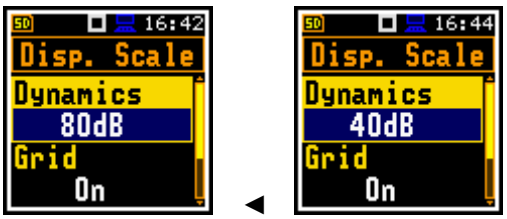
5.2 ADJUSTING PLOT SCALE – DISPLAY SCALE

The **Disp. Scale** list of parameters enables adjusting the scale of the plot and switching a grid on/off in the **Logger** and **Spectrum** views.



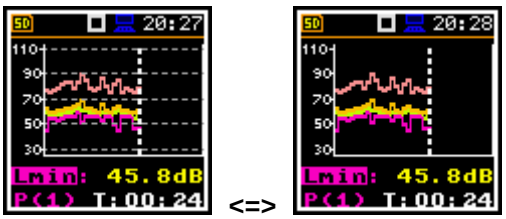
Scaling the vertical axis

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**.



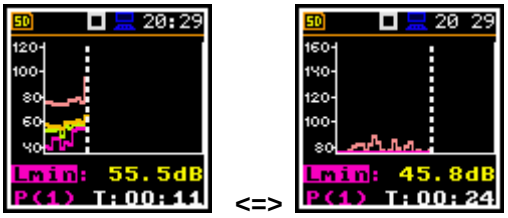
Switching grid on/off

The **Grid** position enables switching **On** or **Off** the horizontal grid lines of the plot.



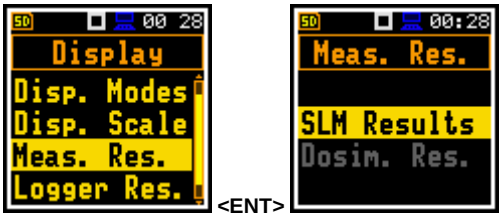
Switching automatic Y-scale adjustment on/off

The **Autoscale** position switches **On** or **Off** the automatic scale adjustment of the Y-axis. Adjustment is made automatically as soon as the measurement is started to match the scale to the microphone input level.



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 different views.



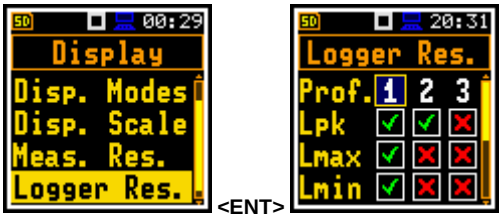
The result can be selected from:

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

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

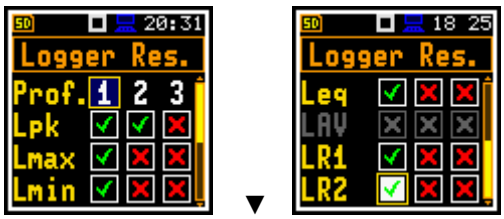
5.4 Choosing Logger Results for presentation – Logger Results

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



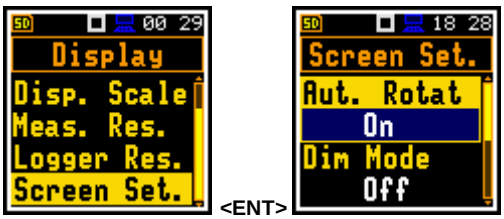
Logger results to be viewed:

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



5.5 CONFIGURING POWER SAVER – SCREEN SETUP

The **Screen Set.** position enables switching on the screen auto-rotation and configuring the power saver function (**Dim Mode**).



Screen auto rotation

The **Aut. Rota** position enables switching **On** or **Off** the adjustment of the screen image on the display according to the instrument's physical orientation in space. If the unit is rotated upside down then the display also changes its image orientation accordingly, so you can always see it in normal upright view. The screen rotation also works if the meter is in the horizontal position.

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.

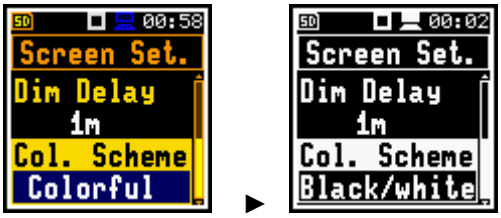
By default, **Dim Mode** is of **Level 2** (medium dim).

Setting the power saver delay

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

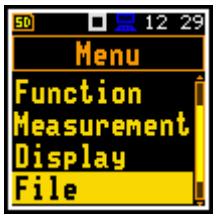
The **Col. Scheme** position enables changing of the colour scheme of the screen from **Colourful** to **Black/white**.



6 MANAGING FILES – File

The **File** section enables managing data files saved in the instrument's memory. The memory structure and files saving methods are described in Chapter 2.9.

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



<ENT>

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.

Note: *Positions in the **File** list are active only when an SD-card is inserted into the card slot behind the bottom cover of the instrument.*

Note: *Data files can be saved only on the SD-card. So, if there is no SD-card in the instrument no file can be created. Therefore, among other things, **Logging** position in the **Measurement** list is not available.*

The instrument creates files of the next types:

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

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**, **STIPA**) and may include:

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

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

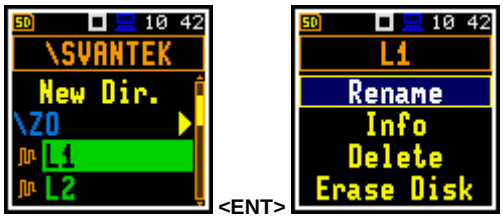
6.1 MANAGING FILES – FILE MANAGER

Files are stored in directories, which are organised hierarchically. The **File Manager** enables access to files and directories on the SD-card.

In the **File Manager**, 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 appropriate 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.

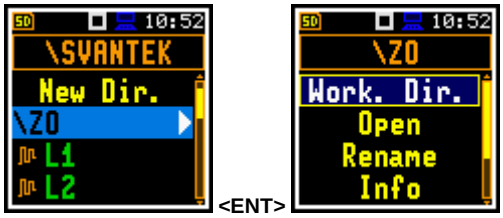
SD-card properties

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

6.1.1 Assigning the directory for saving data files – 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 files/directories – 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 Viewing information about files/directories – 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 files/directories – 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

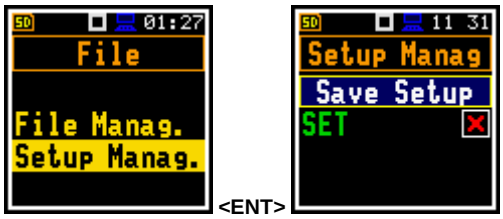
To delete all files and directories from the memory card, select any file in the directory and press **<Enter>**. Select the **Erase Disk** position in the command list and press **<Enter>**. The instrument will ask for confirmation of this action since it cannot be undone.

After erasing the SD disk, the default directories will be recreated.

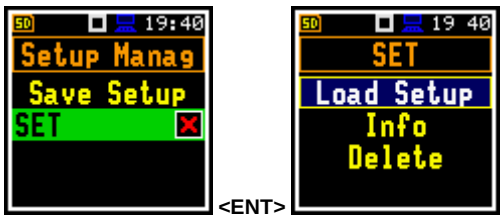
6.2 MANAGING SETUP FILES – SETUP MANAGER

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 the instrument start-up.

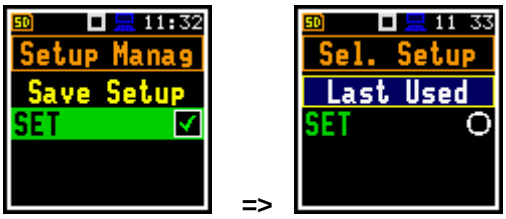
All setup files are stored in the default directory **SETUP**on the SD-card.



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>**.

<ENT>

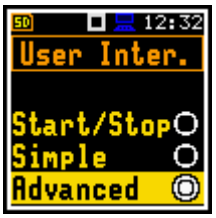
The **Instrument** section contains following items:

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;
Self Vibr.	allowing you to set the threshold for marker registration of instrument self-vibration. This position is available only in the **Advanced** user interface mode;
RTC	allowing you to set the Real Time Clock;
Unit Label	allowing you to display instrument properties.

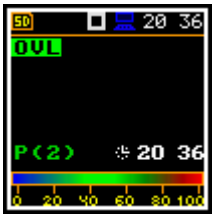
7.1 CHOOSING USER INTERFACE MODE – USER INTERFACE

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.

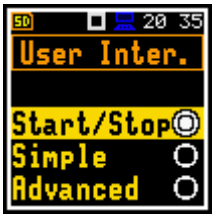
<ENT>



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



<Menu>

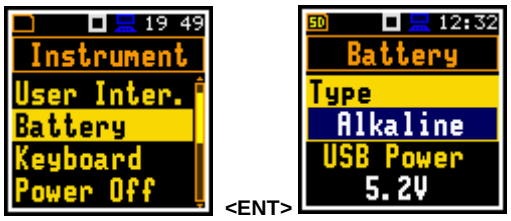


Note: *When you switch the interface mode from* ***Advanced*** *to another there always appears the request "Do you restore the default value of the advanced settings?" If the answer is "No", then all settings of parameters not active in the* ***Simple*** *mode will stay unchanged. If answer is "Yes",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

7.2 CHECKING POWER – BATTERY

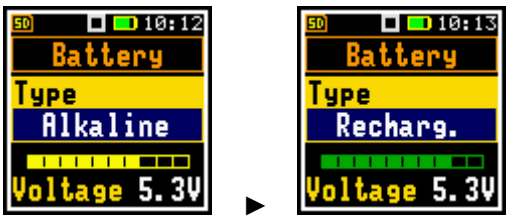
The **Battery** position enables checking the power source condition. The instrument can be powered from four AAA rechargeable or standard alkaline batteries or from the USB-C interface.

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 indication.

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

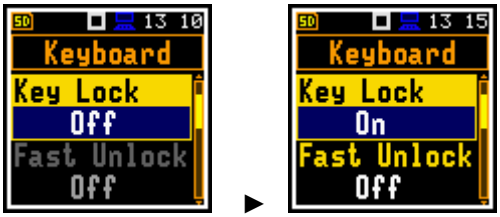
The **Keyboard** position enables programming the operation mode of the **<Shift>** key, to switch on the key lock and the fast unlock of the keyboard with four keys.

<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.

Keyboard 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.



Keyboard unlocking

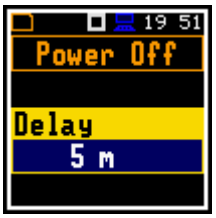
The unlocking code can be programmed with next four positions: **First Key**, **Second Key**, **Third Key** and **Fourth Key**. In every position, the user may choose one of four arrow keys: **Left Key**, **Right Key**, **Up Key** or **Down Key**, the sequence of which creates unlocking code.

7.4 AUTOMATIC POWER OFF – 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.

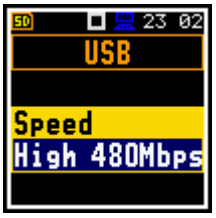
<ENT>



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**.

<ENT>

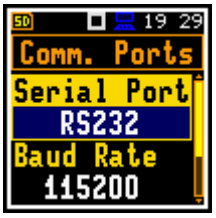


Note: *For effective operation with the USB, the* ***High 480Mbps*** *speed mode should be used, however when the interference RF field strength may exceed the value of 3V/m, then it is recommended to switch to the* ***Full 12Mbps*** *speed mode.*

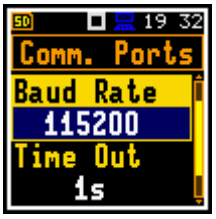
7.6 SETTING INTERFACE PARAMETERS – COMMUNICATION PORTS

The **Communication Ports** position enables selecting and programming the serial port of the instrument – **Serial Port** (**RS232** or **Bluetooth**).

<ENT>



In case of the **RS232** serial port, two parameters should be defined: transmission speed (**Baud Rate: 1200**, **2400**, **4800**, **9600**, **19200**, **38000**, **57600** or **115200** bits/s) and the time limit during which the data transfer should be performed (**Time Out**). Other RS 232 transmission parameters are fixed to **8 bits for data**, **No parity** & **1 Stop bit**.



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

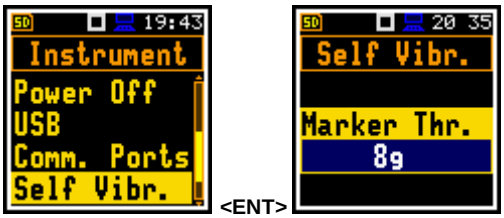
In case of Bluetooth, you can set the PIN with the ◄ / ► keys. Default value is **1234**.

►

7.7 SELF-VIBRATION MARKER – SELF VIBRATION

The **Self Vibr.** position enables defining the threshold for self-vibration of the instrument for marker registration. The special marker will be written to the file when self-vibration of the instrument is higher than defined in the **Marker Thr.** position.

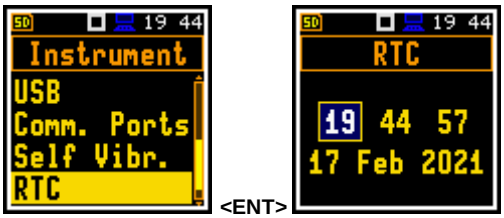
This position is available only in the **Advanced** user interface mode.



7.8 PROGRAMMING INTERNAL REAL TIME CLOCK – RTC

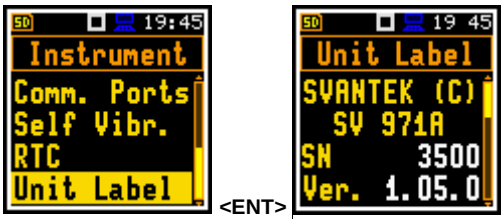
The **RTC** position enables programming the internal Real Time Clock of the instrument. This clock is displayed in the top right corner of the display.

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



7.9 CHECKING INSTRUMENT PROPERTIES – UNIT LABEL

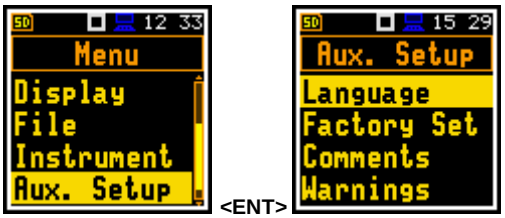
The **Unit Label** position enables checking the model of the instrument, it's serial number, the current software version installed and the appropriate standards, which the instrument fulfils.



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.



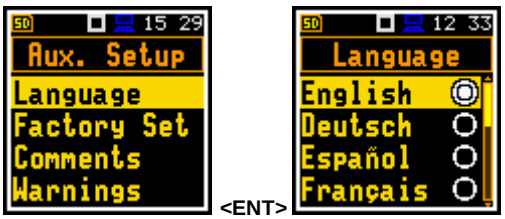
To open the **Auxiliary Setup** section, press the **<Menu>** key, select the **Auxiliary Setup** position and press **<Enter>**.

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

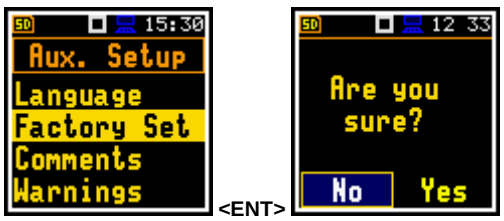
The **Language** position enables selecting the language of the user interface.



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.



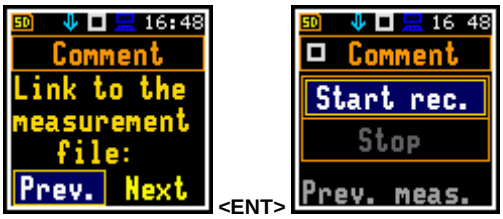
Factory settings can be restored also with three **<Shift/Enter/Start>** keys pressed together.

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 with a name starting with @ and icon .

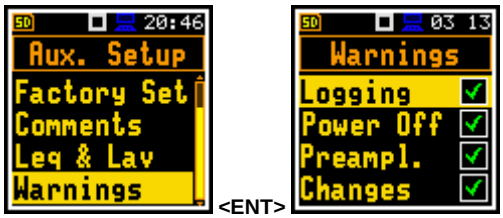
8.4 DISPLAYING LEQ & LAV RESULTS – LEQ & LAV

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 Chapter 11.7.1.

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 **Preampl.** is active, there will be warning if the instrument detects that there is no preamplifier 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 and printing measurement reports in the predefined format.

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

<ENT>

The **Report** section contains following positions:

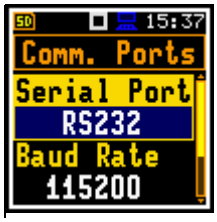
Print	allowing you to print measurement results on the default printer;
Options	allowing you to set report options;
Results	allowing you to select measurement results to be included in the report;
Statistics	allowing you to select statistics to be included in the report;
Spectrum	allowing you to select 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 a report, connect the instrument to the printer's RS 232 port using the **SV 76** interface. This hardware interface is hidden in the Cannon type, 9-pin RS 232 plug-in. On the other end of the **SV 76** interface, which itself looks like a cable, there is the micro 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.

For this, in the **Communication Ports** screen (*path: <Menu> / Instrument*) set **RS232** in the **Serial Port** position and select the transmission speed (**Baud Rate**) and the time limit during which the data transmission should be performed (**Time Out**).

<ENT>



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.

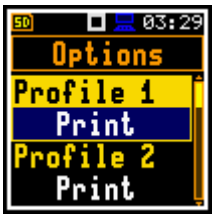
Below is an example printout of the report.

```
SVANTEK (C)   SV 971A   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 specifying the report content, selecting profiles, results for these profiles, statistics and spectra which will be included in the report.

<ENT>



You may include (**Print**) or exclude (**Off**) results for each profile (**Profile x**) 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**). In the last case the **Results** position appears in 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**). In the last case the **Statistics** position appears in the **Report** menu.

In case of 1/1-octave or 1/3-octave analysis functions, you may also exclude all Leq, Lmax, Lmin and Lpeak spectra (positions: **Leq Spect.**, **Lmax Spect.**, **Lmin Spect.**, **Lpeak Spect.**) from the report (**Off**), include to the report all bands of 1/1 or 1/3 spectra (**Print All**) or selected bands (**Pr.Selected**). In the last case the **Specrtum** position appears in the **Report** menu.

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

9.3 SELECTING RESULTS FOR THE REPORT – RESULTS

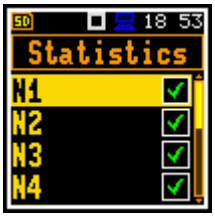
The **Results** position allows you to select results to be included in the report for the selected profiles: **Lpeak**, **Lmax**, **Lmin**, **L**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **Leq**, **LE**, **SEL8**, **E**, **E_8h**, **Lden**, **LEPd**, **PSEL**, **Ltm3**, **Ltm5**, **PTC**, **PTP**,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

<ENT>

9.4 SELECTING STATISTICS FOR THE REPORT – STATISTICS

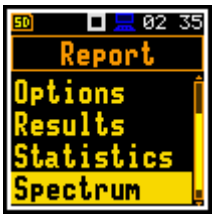
The **Statistics** position allows you to select statistic levels from **N1** to **N10** to be included in the report.

<ENT>

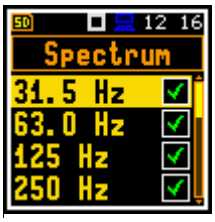


9.5 SELECTING SPECTRA FOR THE REPORT – SPECTRUM

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



<ENT>



9.6 PRINTER SETTINGS – PRINTER

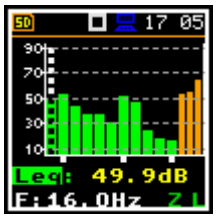
The **Printer** position enables setting the number of characters in the report lines – from 20 to 500. Default value: 32.

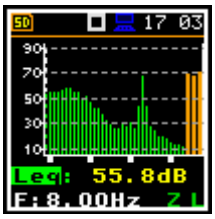
10 1/1- AND 1/3-OCTAVE ANALYSER

The real-time 1/1-octave or 1/3-octave analysis is performed in parallel with the SLM or SEM measurements. All digital pass-band filters (eleven 1/1-octave with centre frequencies from 16 kHz down to 16.0 Hz and thirty five 1/3-octave with central frequencies from 20 kHz down to 8 Hz; in the "base ten" system) are working in real-time with the weighting filters (**Z**, **A**, **B** or **C**) and the LEQ detector (**Linear**, **Fast** or **Slow**). 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.

For each octave or one-third octave band, the Leq, Peak, Min or Max result is calculated and presented as a bar on the spectrum graph. Spectra can be examined on a display in the **Spectrum** view.

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



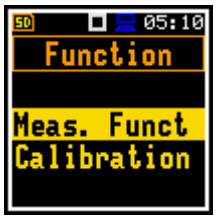


Besides results for bands three **Total** values are measured and displayed as additional three bars on the spectrum graph. Parameters for Total values (e.g. filters) are set by default and cannot be changed.

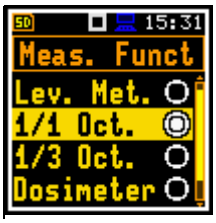
Note: *Total values for 1/1- or 1/3-octave analysis can be different from those obtained for profiles (if the* ***LEQ Integration*** *was set as* ***Exponential****).*

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** (**1/1.&Dose**) or **1/3 Octave** (**1/3.&Dose**) position and press **<Enter>**.



<ENT>



Note: *The 1/1-octave and 1/3-octave analysis functions are optional and should be unlocked by entering the activation code in the text editor screen, which is opened after first attempt to select them. Once unlocked these options will be ready to use permanently.*

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

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

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

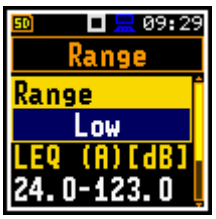
Averaging of results for each spectrum band is performed during the **Integration Period** and is repeated the **Repetition Cycles** times. 1/1-octave and 1/3-octave spectra are always saved as Summary Results.

The **Integration Period** and **Repetition Cycles** parameters are defined in the **General Settings** list.

10.2.2 Selecting measurement range for 1/1- and 1/3-octave analysis – Range

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

The selection of the input range is made in the **Range** screen of the **Measurement** list.



For the **1/1.&Dose** or **1/3.&Dose** functions the input range is set to **Normal** and you cannot change it.

Note: *The ranges at the above screens correspond to the microphone with the sensitivity within the declared range 25 ÷ 37 mV/Pa (see Appendix C). If microphone sensitivity is other than 25 ÷ 37 mV/Pa, the range will be automatically changed*.

10.2.3 Logging of 1/1- and 1/3-octave spectra – Logging

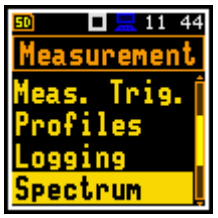
Spectra are always logged together with the Summary results in a logger file with the **Integration Period** step. The first condition should be fulfilled, namely the **Logger** must be switched on (*path: <Menu> / Measurement / Logging / Logger Setup / Logger: On).*

The **Leq** and **Lpeak** results from the 1/1-octave or 1/3-octave analysis can also be logged in the logger file with the step defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup*). To enable spectrum saving in the logger file, check the **Peak Spectrum** or **Leq Spectrum** position in the **Logger Results** list (*path: <Menu> / Measurement / Logging / Logger Res.*) with the ◄ / ► key.

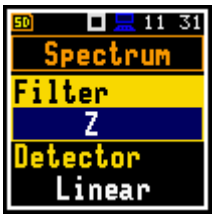
10.2.4 Setting parameters of 1/1- and 1/3-octave analysis – Spectrum

For the 1/1-octave or 1/3-octave analysis functions, the additional position (**Spectrum**) appears in 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.



<ENT>

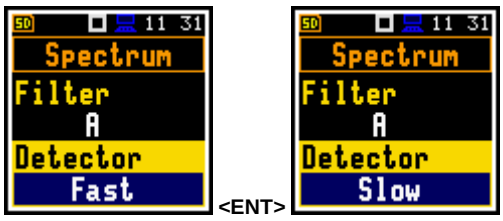


Following weighting filters are available for the 1/1 and 1/3-octave analysis:

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

Filter characteristics are given in Appendix C.

The **Detector** parameter defines the LEQ detector for the 1/1-octave or 1/3-octave analysis: **Linear**, **Fast** or **Slow**.



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

The **Display** section is used for setting various parameters, which are mainly intended for spectrum view control. The following positions are used to customize the 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 graph and switch on/off the grid;

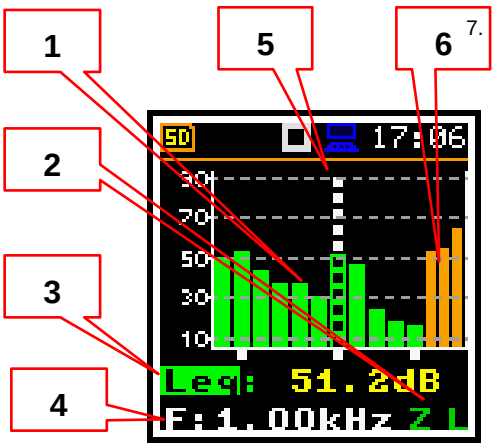
Spect. View allowing you to select spectra to be viewed: instantaneous, averaged, maximum or minimum.

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

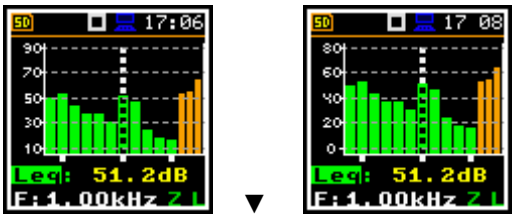
The **Spectrum** position in the **Display Modes** list becomes available for the **1/1 Octave** and **1/3 Octave** functions and enables/disables the spectrum view (**Spectrum**).

Spectrum view fields

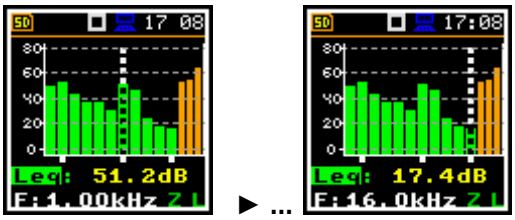
1. Spectrum graph
2. Type of filter and RMS detector
3. Type of result and its value for the cursor position
4. Central frequency for the cursor position
5. Cursor position
6. Total values



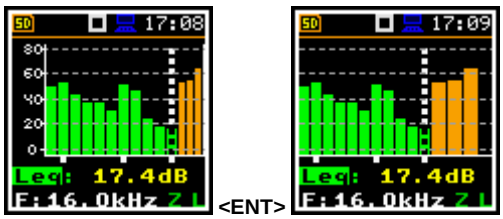
You can shift the Y-axis up or down during the spectrum presentation with the ▲ / ▼ key.



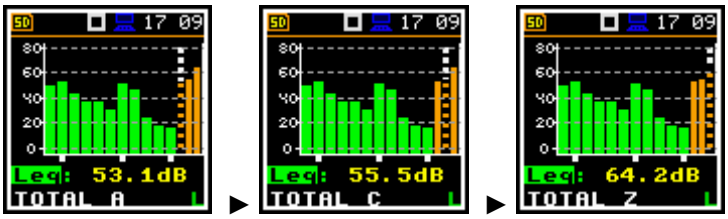
You can change the cursor position with the ◄ / ► key. The frequency and appropriate dB value are presented in the line below the graph.



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

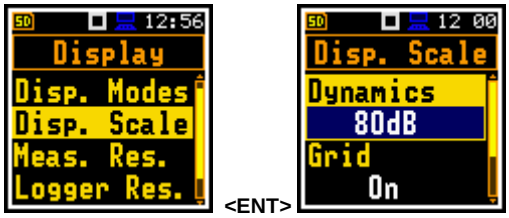


Total values are calculated with the filters **A**, **C** and **Z**, and are displayed at the bottom line of the screen when the cursor is placed on the one of the orange bars.



10.3.2 Adjusting spectrum graph scale – Display Scale

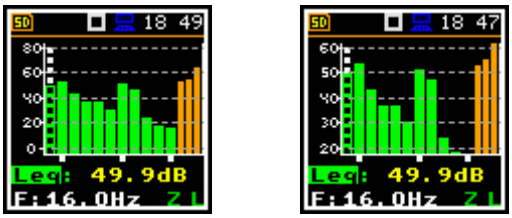
The **Disp. Scale** position allows you to change the scale of the spectrum graph and switch the grid and automatic scale adjustment on/off.



Scaling the vertical axis

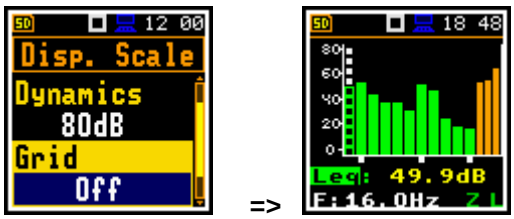
The **Dynamics** position enables selecting the required scale dynamic range of the spectrum graph. It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB** and **120dB**.

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



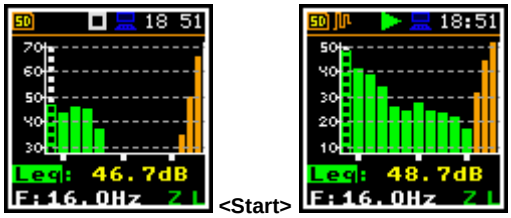
Switching the grid on/off

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



Automatic Y-scale adjustment

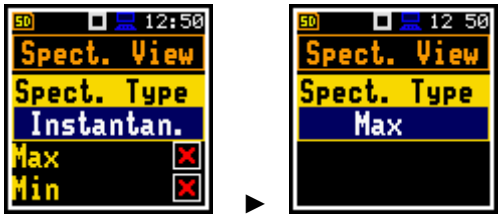
The **Autoscale** position switches on or off the automatic adjustment of the Y-axis scale dynamic range to the current spread between lowest and highest measured octave or third octave results.

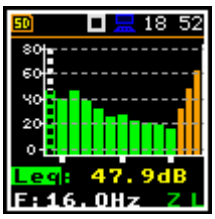


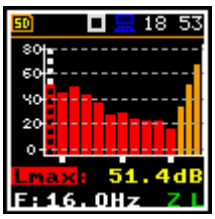
10.3.3 Selecting spectra to be viewed – Spectrum View

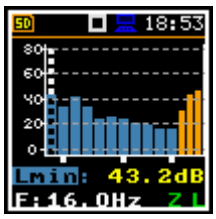
In the **Spectrum View** screen, which appears in the **1/1 Octave** or **1/3 Octave** functions, you can select different spectra to be visible on the display (**Spect. Type**): **Averaged**, **Instantaneous**, **Max**, **Min** and **Peak**.

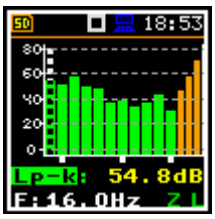
Below are the views of different spectra.



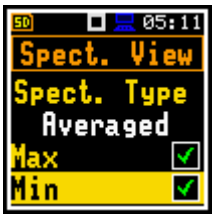




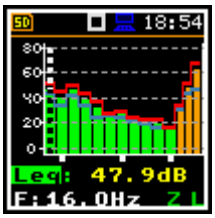




Minimum and maximum spectra can be presented at the same view with the **Averaged** and **Instantaneous** spectrum when the **Max** or/and **Min** parameter is switched on.



=>

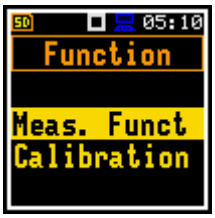


11 SOUND EXPOSURE METER – DOSIMETER

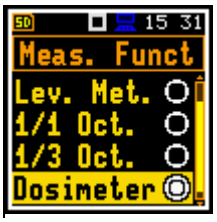
The instrument operates as a Sound Exposure Meter (SEM) or Dosimeter in a very similar way to the Sound Level Meter (SLM) and, in addition to the SLM results, measures also basic dose parameters. This chapter describes settings specific for the SEM.

11.1 SELECTING DOSIMETER FUNCTION

To select 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.

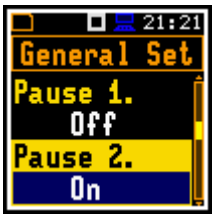


<ENT>



11.2 SETTING GENERAL PARAMETERS – GENERAL SETTINGS

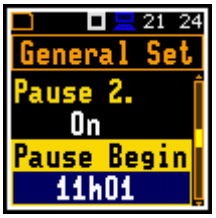
Most general settings of the **Dosimeter** function are similar to the **Level Meter** function (see Chapter 4.1). Additionally, **Dosimeter** has a programmable five automatic pauses.



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**).



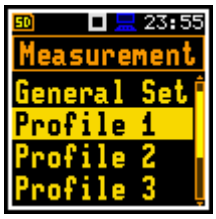
▼

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**).*

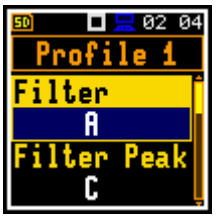
11.3 SETTING PROFILE PARAMETERS – PROFILE X

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.**.

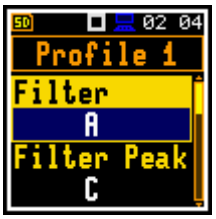


<ENT>



Weighting filter selection

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



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.

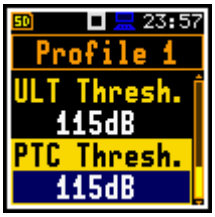
Criterion Level is a steady noise level permitted for a full eight-hour work shift: **60dB**, **65dB**, **70dB**, **75dB**, **80dB**, **84dB**, **85dB**, **87dB**, **90dB**;

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**;

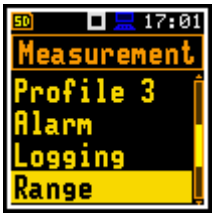
ULT Threshold Level (Upper Level Time) is a threshold level for calculation of the ULT results: **70dB ÷ 140dB**;

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 set to **Normal** and you cannot change it. The detailed description of the measurement range parameters is given in Appendix C.



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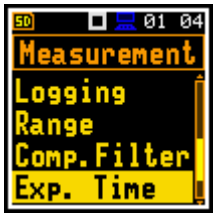
11.5 SETTING EXPOSURE TIME – EXPOSURE TIME

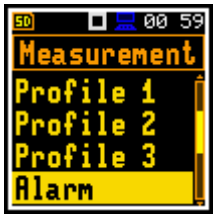
The **Exp. Time** position enables setting the desired value of the workday exposure time which is used for calculation of the **LEPd** results (see Appendix D).



<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)**).



<ENT>

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.

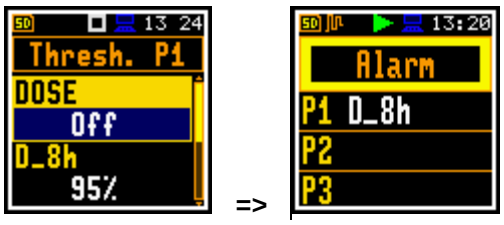
If **Off** is selected, the alarm for the measurement result is switched off.

<ENT>

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.

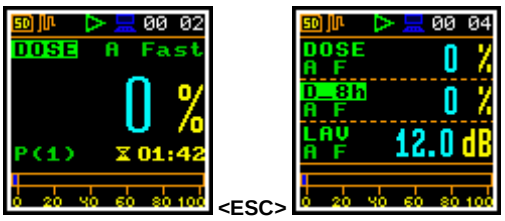
To exit the alarm screen, press any key.



11.7 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.*).



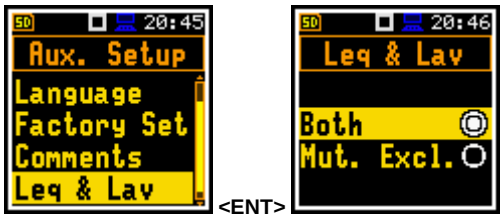
11.7.1 Displaying of Leq & Lav results – Leq & Lav

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 971A, 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 971A fulfil the ISO 3382 standard.

The reverberation time of the room can be obtained with the use of SV 971A 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.

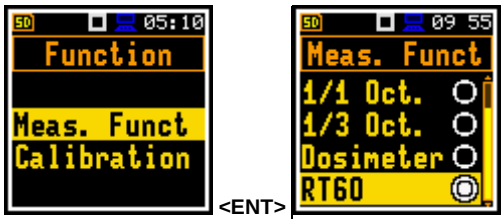
The reverberation time analysis applied in the instrument consists of two parts:

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.

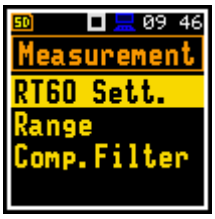


Note: *The **RT60** function is optional and should be unlocked by entering the activation code in the text editor screen, which is opened after first attempt to select this function. Once unlocked this option will be available permanently.*

12.2 SETTING RT60 PARAMETERS – RT60 SETTINGS

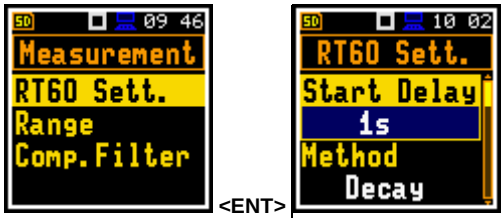
Execution of the **RT60** analysis depends on a certain number of the parameters, which can be set in the different screens of the **Measurement** section: **RT60 Settings**, **Compensation Filter** and **Range**.

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>** 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 value is 2ms.

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.

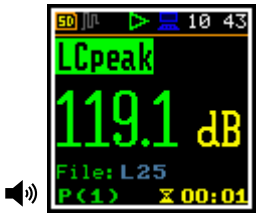
▶

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

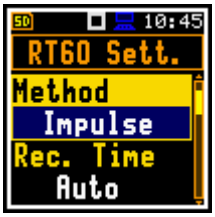
Measurements using Decay method

1. Set parameters for **Decay** RT60 measurements. Most used setup is as presented below.
   - **Method:** **Decay**
   - **Recording Time:** **Auto**
   - **Time Step:** **2ms**
   - **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>** 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 as presented below.
   - **Method:** **Impulse**
   - **Recording Time:** **Auto**
   - **Time Step:** **2ms**
   - **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>** 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.*

12.4 VIEWING RT60 RESULTS

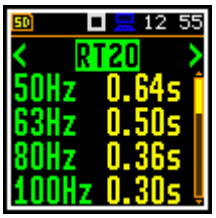
The **RT60** measurement results for all 1/1 or 1/3-octave bands and three Total values are presented in a table form.

▼

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).*

12.5 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.

<ENT>

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.

<ENT>

13 STI CALCULATIONS – STIPA

The Speech Transmission Index (STI) is applied in the deterioration of the speech intelligibility induced by the transmission channel. The STI method involves the use of a test signal applied to the transmission channel, and an analysis of the received test signal. The speech transmission quality of the channel is determined and expressed in values from 0 to 1 in the form of STI. Using the obtained STI value, it is possible to determine the potential speech intelligibility.

The applications of STI include evaluation of sound reinforcement and emergency systems, communication channels, speech intelligibility, communication in rooms and auditoria, etc.

STIPA (speech transmission index for public address systems) is a STI derivative approach that was developed for fast measurements of electro-acoustic and acoustic environments effects that affect the speech intelligibility in the room acoustics and/or public address systems.

STIPA calculations are realized in SV 971A in accordance with IEC 60268-16:2011.

Note: *In addition to the fact that measurements can be made using only SV 971A, Svantek also provides an application (**BA Assistant**) for mobile devices (smartphone, tablet) with Android 7.0 platform or higher, which performs STIPA measurements using SV 971A but has a more convenient user interface (see BA Assistant User Manual).*

13.1 STI METHOD BACKGROUND

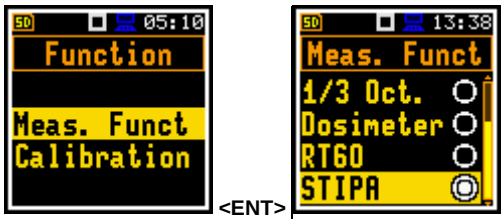
The STI method is based on measurements of the STI test signal comprising seven octave band noise signals corresponding with the octave bands from 125 Hz up to 8 kHz. Each noise carrier is modulated with one or more modulation frequencies at one-third octave intervals ranging from 0,63 Hz up to and including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

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

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

13.2 SELECTING STIPA FUNCTION

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



Note: *The **STIPA** 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.*

13.3 STIPA MEASUREMENT AND CALCULATION PROCESS

STI measurements usually relate to objects (buildings), which may consist of several areas (rooms) in which measurements are made in a given number of points (in practice, from 1 up to several dozen). In addition, especially in case of assessing speech intelligibility in a room on the directly, i.e. without an amplification system, tests are performed for a given number of source positions (in practice from one to several). It may happen that a given area is examined in several configurations - e.g. a theatre hall with a raised and lowered curtain, or a rail vehicle at a standstill and while moving. The result for a given point is obtained on the basis of several measurements (in practice from 1 to 6) - most often as an average value. Analyses are performed independently for areas in a given configuration.

13.3.1 Measured results

The **STIPA** function enables measuring and calculating the next results:

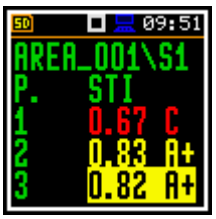
- **STI** - Speech Transmission Index representing the transmission quality of speech with respect to intelligibility by a speech transmission channel, ranging between 0 and 1. STI is calculated for individual measurements and averaged for the measurement point and for the area.
- **Avg.** – averaged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

There are some additional indications:

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

These results are displayed in different views:

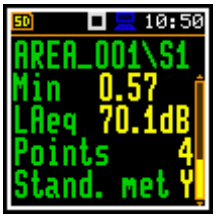
- *Area* view is a main STIPA view that allows you to create new measurement points, delete measurement points or exclude them from the calculation of averaged indexes for the Area as well as to go to the selected *Point* view. This view presents a list of measurement points and next results:



  - Averaged **STI** or **CIS** indexes with consideration of the Ambient noise distortions for measurement points.
  - The STI qualification band (**A+** through **U**) is displayed for each measurement point.

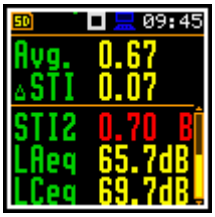
  Red colour of the STI/CIS result indicates errors or disruptions detected during measurements in this point.

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



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

- *Point* view is a main STIPA view. The *Point* view allows you to see the modulation function, to delete measurements (only for the last measurement point) and exclude measurement results from the calculation of the averaged STI index. It always appears after *Measurement* view for the last measurement point or when you select the measurement point in the *Area* view and choose the **Point view** command in the command list (see Chapter 13.3.6). This view presents a list of measurements for the measurement point with following results:



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

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

- *Measurement* view appears when you start a new measurement (manually or automatically). This view presents measured results which are updated every second and a progress bar of the measurement that lasts 15 seconds:

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

After completion of the measurement, the instrument will automatically switch to the *Point* view and the measurement results will be placed in the measurement list. If you stop the measurement manually, the instrument switches to the *Point* view, but the measurement result will not be included in the measurement list (see Chapter 13.3.6).

- *Modulation function* view is available when you select the measurement in the *Point* view and choose the **Modulation** command in the command list - see Chapter 13.3.6. This view presents LZeq and modulation transfer ratios (*m(f1), m(f2)*) for seven octave bands with central frequency from 125 Hz up to 8 kHz:

To change columns, use the ◄ / ► key.

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

To return to the *Point* view press **<Enter>** or **<ESC>**.

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

13.3.2 Project structure

Speech intelligibility measurements are organized in the structure of projects. The name of the project is equal to the name of the directory in the instrument's memory. Its subdirectories have names of tested areas. Next down level directories have names of test signal (source) position. The source position directories include measurement point directory with predefined names (**P1**, **P2** etc.) and the measurement files are saved in these directories. File contains measured results for the single measurement.

For example, in the below screens the project directory (**PROJ_001**) contains one area directory (**AREA_001**), which contains one source position directory (**S1**), which contains two points directories (**P1** and **P2**).

Directory **P1** contains files with measurement results (**M1.SVL**, **M2.SVL …**) and one file with the Ambient noise table (**NOISE.SVL**).

First three directories are created by the user during configuration of the **STIPA Settings** in the **Project**, **Area** and **Source** positions.

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

Point directories are created automatically after creating the **Next** measurement point for the Area during the measurement process. Measurement files are created automatically every time the measurement starts (see Chapter 13.3.6).

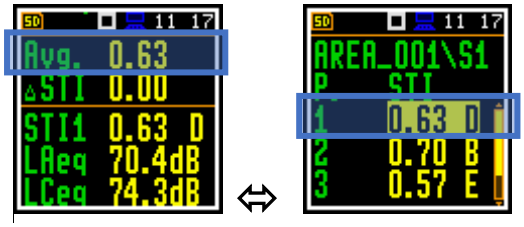
Note: *You cannot delete or rename point directories and measurement file via the **File Manager**. You can delete point directory and measurement file using the mechanism described in Chapter 13.3.6.*

13.3.3 Results averaging

STIPA measurements require averaging of STI/CIS indexes. This averaging concern two aspects:

1) averaging of results for a measurement point.

Averaged **STI/CIS** for the measurement point is displayed in the first line of the *Point* view and in the measurement points list of the *Area* view.



2) averaging of results for a tested area.

Averaged **STI/CIS** for the tested area is displayed in the second line of the *Area summary* view.

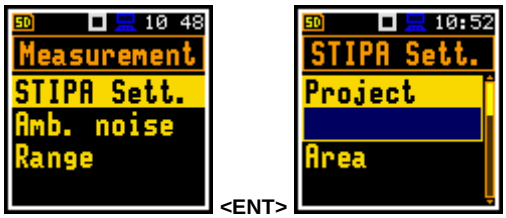
According to most standards, it is good practice to average the results for measuring points from two or three measurements. In case of fluctuating noise occurring during measurements, it is recommended to make not less than three measurements and check whether the spread of the obtained STI results does not exceed 0.03.

The standard deviation is determined with the calculation of the mean STI (or CIS) for the area.

13.3.4 STIPA settings

STIPA measurements are configured in the **STIPA Settings** and **Ambient noise** screens. To configure a STIPA project follow these steps:

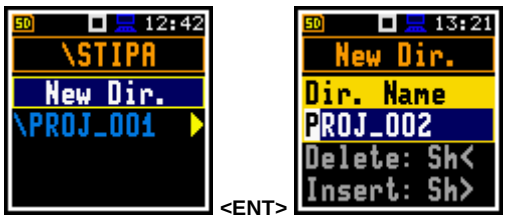
1. Select the **STIPA Sett.** position in the **Measurement** section and open it with the **<Enter>** key.



2. Being at the **Project** position, press the ► key and, in the **File Manager** screen, select **<New Dir.>** to create a new project directory or select the directory of the previously created Project and press **<Enter>**.

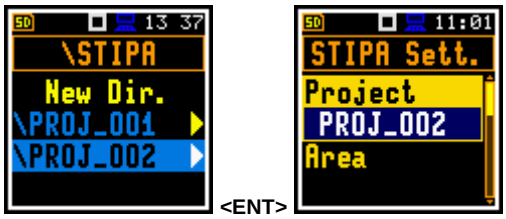
In case of **<New Dir.>** the instrument will propose a default name for the new Project directory which can be modified in the editor screen opened after pressing the **<Enter>** key.

After edition of the directory name it should be confirmed by the **<Enter>** key.



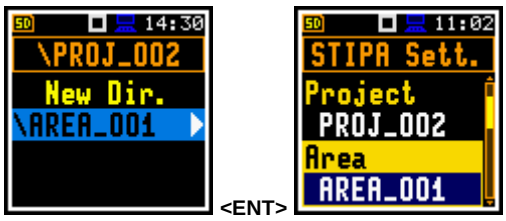
Being at the new created directory line in the **File Manger** screen press **<Enter>** to return to the **STIPA Sett.** screen.

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



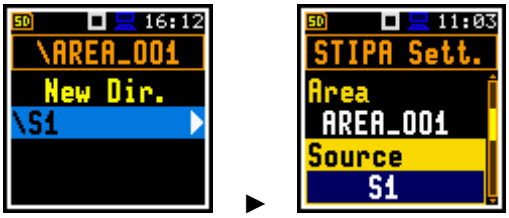
3. Go to the **Area** position and press the ► key. In the **File Manager** screen create a new area directory **<New Dir.>** or select the directory of the previously created Area in the selected Project.

After creation of a new area directory or selection of the existed one press **<Enter>** and the selected area name will be displayed in the **Area** position of the **STIPA Sett.** screen.



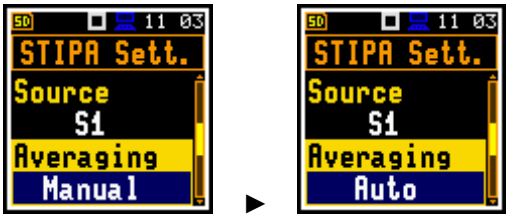
4. Go to the **Source** position and press the ► key. In the **File Manager** screen create a new source directory **<New Dir.>** or select the directory of the previously created Source in the selected Area.

After creation of a new source directory or selection of the existed one press **<Enter>** and the selected source name will be displayed in the **Source** position of the **STIPA Sett.** screen.



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

Manual averaging means that you may perform as many measurements for the measurement point as you heed, and you will decide when to stop series of measurements by using the **Complete** command – see Chapter 13.3.6.



Automatic averaging assumes that the measurements will be averaged according to IEC 60268-16:2011 which assumes two types of averaging – for standard measurements (**60268-16x2**) and for measurements with fluctuating noise (**60268-16x3**). In the standard abbreviation **x2** means that no less than two measurements should be made, and **x3** means that no less than three measurements should be made. When the automatic averaging is selected, additional position **Standard** appears in the **STIPA Settings** screen.

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

In the automatic averaging mode, you make measurements the same way as in the manual mode. The difference is that in automatic mode, the instrument decides when to end the series of measurements and ends it automatically when the appropriate condition is met.

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

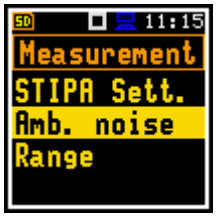
8. In the **Source Calibration** position, set the adjustment of the reference STIPA signal level to the level of a real voice signal in the tested area.

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

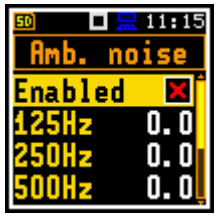
13.3.5 Considering ambient noise distortions

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

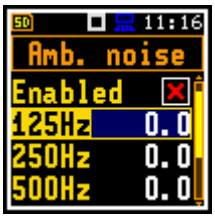
In the **Ambient noise** screen, you can set noise levels for octave bands that will be considered in STIPA calculations.



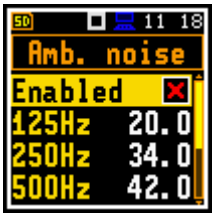
<ENT>

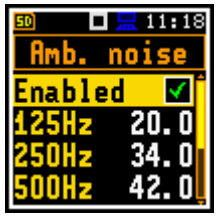


To set the ambient noise, select the 1/1-octave band and with the ◄/► key set the required value in dB.



In the **Enable** position, you can enable or disable the consideration of ambient noise for subsequent measurements.





13.3.6 STIPA measurements

When STIPA settings are complete, you can start measuring.

1. To perform measurements, go to the measurement mode (escape from the configuration menu).

   If you begin measurements, the *Area* view will show the first measurement point with zero STI value.

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

2. To start measurement, press the **<Start>** key. The *Measurement* view appears, showing the measurement progress bar and STI index calculated with considered ambient noise (**STI**), measured STI index (**Meas.**), STI qualification band next to the index, **LAeq** and **LAS** results.

   The measurement lasts 15 seconds during which the displayed results are updated every 1 second.

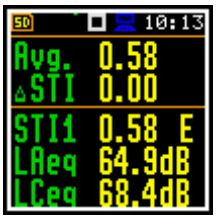
<Start>

Note: *Ambient noise distortions will be considered in accordance with the values set in the* ***Ambient noise*** *table – see Chapter 13.3.5.*

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

After completing the measurement, the instrument shows the *Point* view with current measurement results. You can scroll measurement results with the ▲ / ▼ key.

3. Press the **<Start>** key if you wish to perform another measurement.

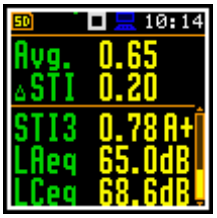


or

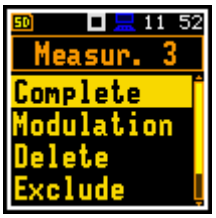
4. To finish measurement series for the measurement point, you should complete them.

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

   The instrument closes the series of measurements in the current measurement point and switches to the *Area* view.



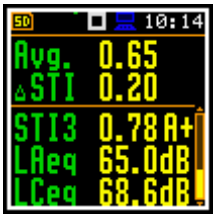
<ENT>



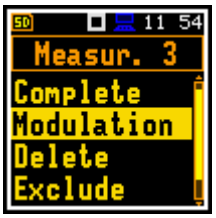
<ENT>

Note: *In case of automatic averaging the series of measurements will be completed automatically after meeting the conditions specified in the selected standard.*

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



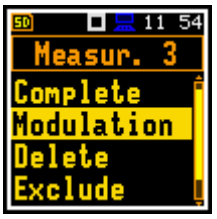
<ENT>



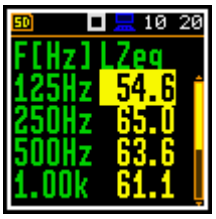
If you choose **Modulation** and press **<Enter>** the instrument will go to the *Modulation function* view.

To change columns in this view, use the ◄ / ► key.

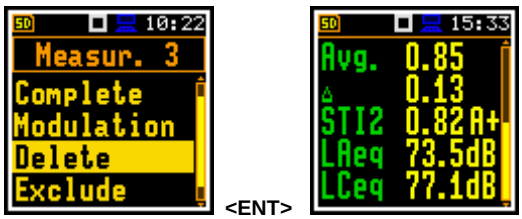
To return to the *Point* view press **<Enter>** or **<ESC>**.



<ENT>

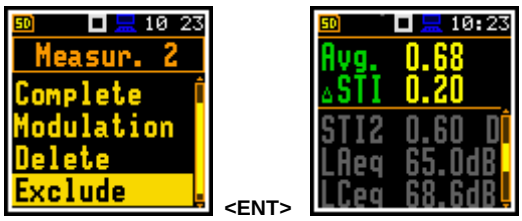


If you choose **Delete** and press **<Enter>** the instrument will delete the selected measurement from the measurement list and change the numeration in the *Point* view. At the same time the file with the measurement results will be deleted from the Point directory.



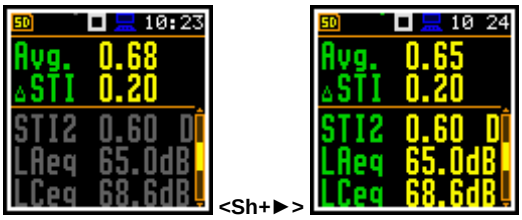
If you choose **Exclude** and press **<Enter>** the instrument will exclude the selected measurement from averaging and in the *Point* view the excluded measurement results will be shown in grey.

If you select the excluded measurement and open the command list the last command will be named **Include**.



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

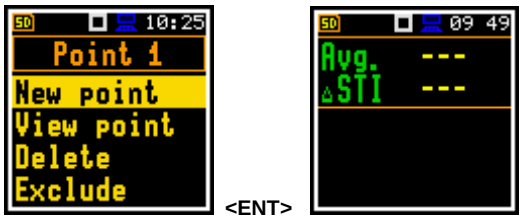
The file with the excluded measurement results will have the "_" character instead of "M".



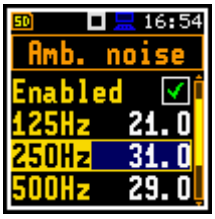
5. After completion of the measurement series for the measurement point, you can create a new measurement point.

   For this press **<Enter>** in the *Area* view and in the command list, select the **New point** position and press **<Enter>**. The instrument will create a new point directory.

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



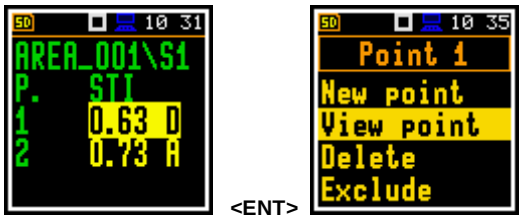
In some cases, it may be necessary to change ambient noise levels for a new measurement point. In such a case you should open the **Ambient noise** screen of the **Measurement** section and make necessary adjustments of the noise levels for octaves. After confirmation of the changes with the **<Enter>** key you can return to the measurement mode with new ambient noise distortion parameters.



Note: *Any confirmed changes in the* ***Ambient noise*** *table will replace the previous ones!*

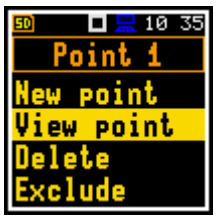
The summary results for the Area are presented in the *Area summary* view, which is accessible from the *Area* view if you press the ▼/▲ key together with **<Shift>**.

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



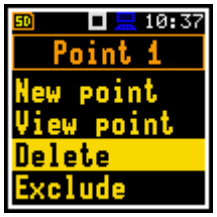
If you choose **View point** and press **<Enter>** the instrument will open the *Point* view for the selected measurement point.

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



<ENT>

If you choose **Delete** and press **<Enter>** the instrument will delete the selected measurement point and return to the *Area* view with a new points numeration. The point directory with all measurement files will be deleted from the Source directory.



<ENT>

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

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

<ENT>

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

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

<Sh+►>

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

13.4 FILES DOWNLOADING AND DATA PROCESSING

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

The SvanPC++ software can use also work with projects created by the BA Assistant application for smartphones.

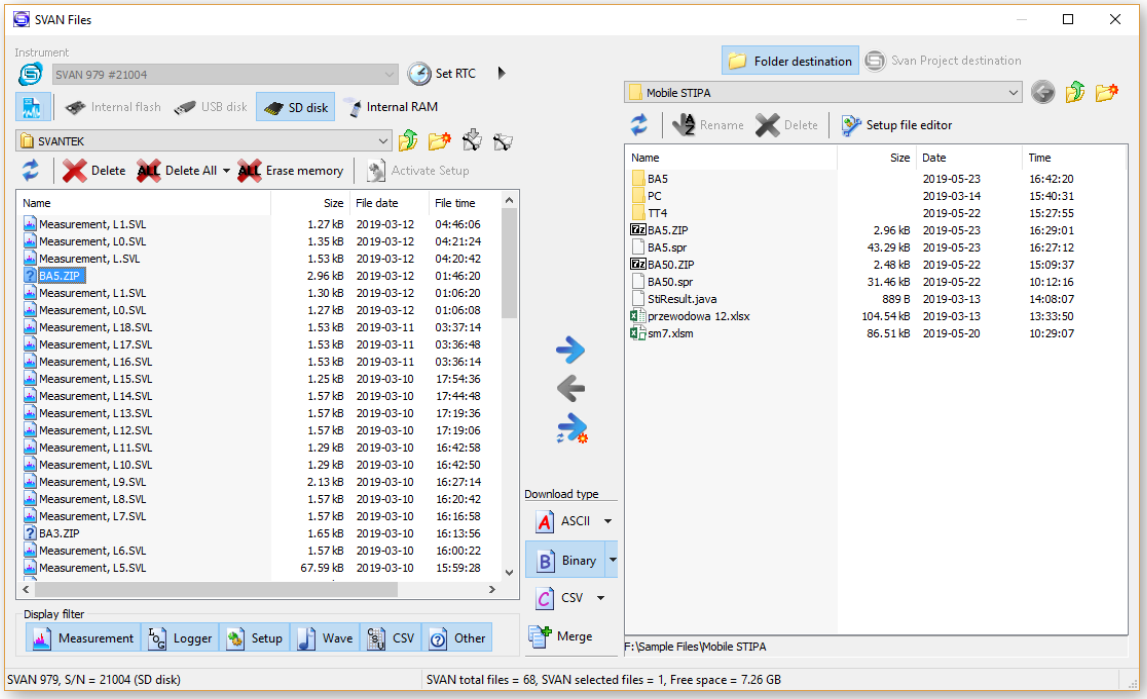
13.4.1 Measurement with BA Assistant

BA Assistant is an application for mobile devices (smartphone, tablet) with Android 7.0 or higher which allows using SV 971A to perform building acoustics measurements, among others speech intelligibility using the STIPA method.

After taking measurements using the BA Assistant application and generating a report, the project file containing all the results obtained during the measurements will be automatically copied to the SV 971A instrument. Application project files are named BAxxx.ZIP and after launching the SvanPC++ program you can download them using the "SVAN Files" option (available in the menu "SVAN -> SVAN Files" or using the meter icon on the toolbar) or open them directly.

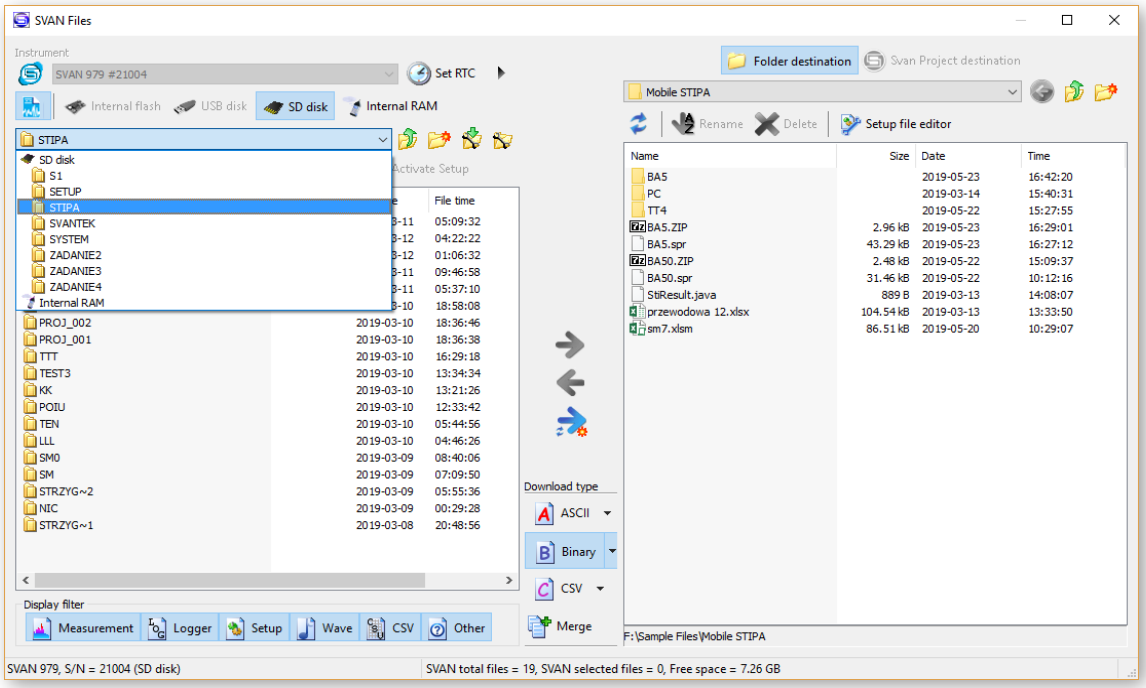
Select the project file in the list on the left side of the window and then use the right arrow button. As a result, the file will be downloaded to the folder on the right side of the window. Then just double click on the downloaded file and it will be automatically opened in the SvanPC++ program - the STIPA results

window will appear. You can skip downloading the file and double-click on the file in the list on the left panel - the file will be downloaded to the temporary folder and opened.



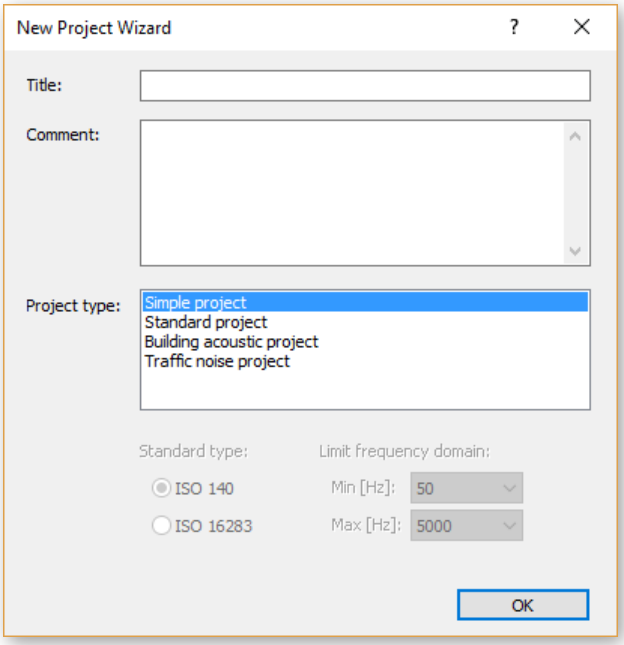
13.4.2 Measurement with SV 971A without BA Assistant

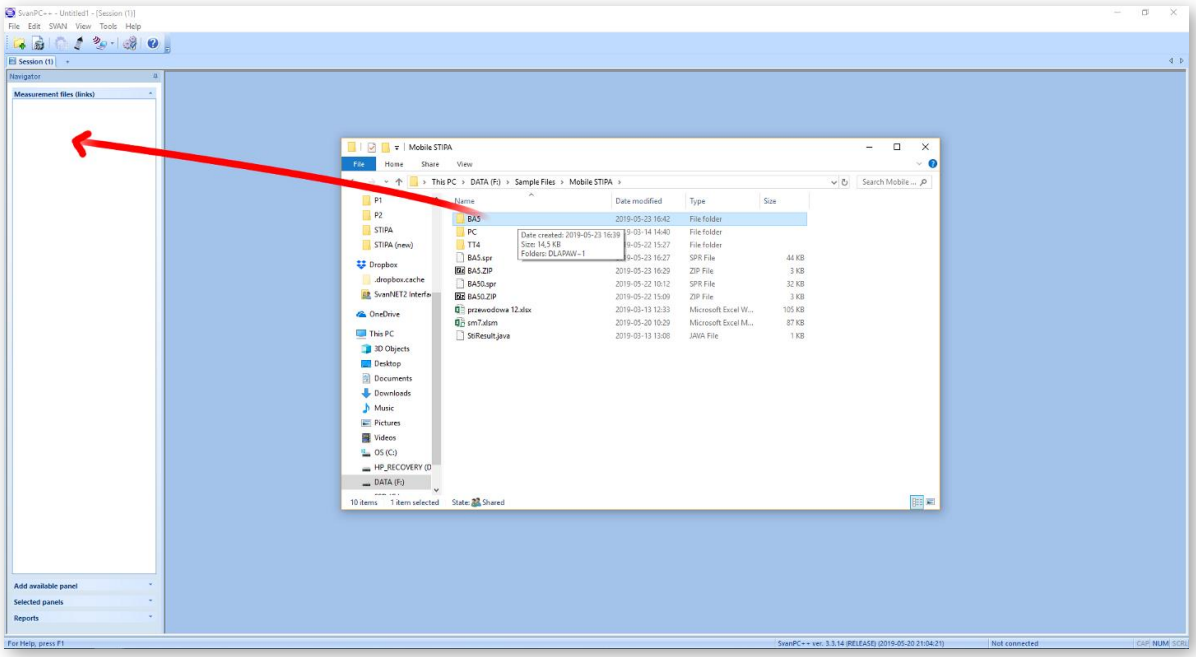
During the STIPA measurement SV 971A generates files in the SVL format which are grouped in the *Point* directories belonged to the project "*Project/Area/Source*". To download files, use the "SVAN Files" window and select the appropriate folder with required data. You can select the entire project folder or only a subfolder for the area or source (and even point directory or a single SVL file) and then click the right arrow to download the folder or file.



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

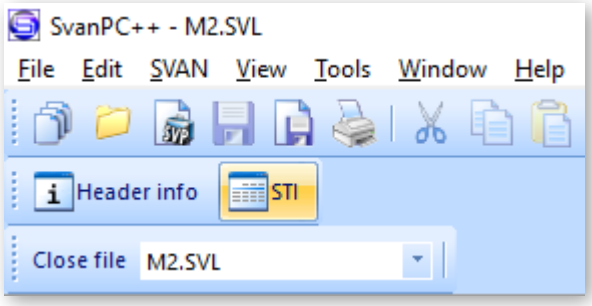
A window on the left side with a list of project files (empty for now) will appear. Add folders / files to the project that you wish to combine. The easiest way to do this is through drag & drop operations from the file explorer by selecting the folder / files and dragging it to the SvanPC++ window.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



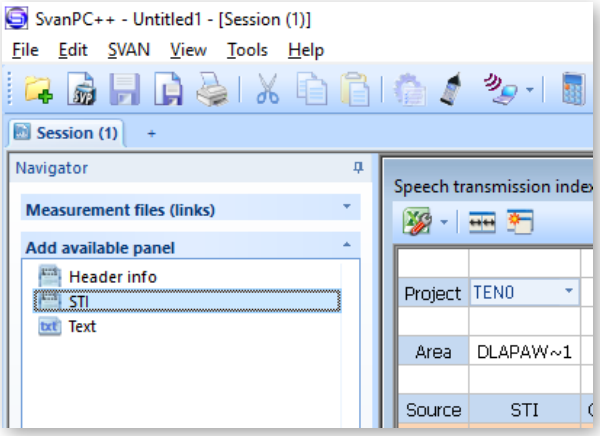


13.4.3 Presentation of STIPA results

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



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



STIPA results by default appear for areas, sources and points. Each point on the view is a button which, when pressed, shows measurement results for a given point.

Each measurement has additionally a "checkbox" type which can be used to enable / disable a given measurement - in this situation the STIPA results for the point and higher groups will be automatically recalculated after the measurement is turned on / off.

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

Speech transmission index

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

13.4.4 Changing background noise values

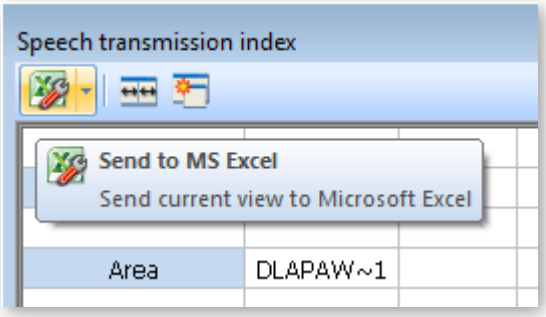
The cells with the background noise results are editable, i.e. you can manually enter values for individual octaves (just double click on the selected background noise value). Such a change will automatically convert the results for a point and above.

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

13.4.5 Generating reports

There are two ways to generate a report:

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



14 ASSISTANT MOBILE APPLICATION

Assistant is an application for mobile devices (smartphones and tablets) running on the Android platform that extends functionalities of SV 971A. The application uses the Bluetooth® interface enabling current results to be previewed on a mobile device as well as controlling the measurement Start / Stop.

Assistant also signals alarms when the certain limits are exceeded. The unique feature of the application is functionality of sending an email or SMS on pre-programmed alarm conditions.

The *Assistant* application supports also other Svantek instruments (e.g. SV 100A vibration whole-body dosimeters, SV 104B/BIS sound exposure meters and SV 973 sound level meters).

14.1 INSTALLING ASSISTANT ON A MOBILE DEVICE

To install *Assistant* on your mobile device:

1. Download the Assistant installation file from the svantek.com website to your mobile device - smartphone / tablet with Android 5.0+ or iOS 9.0+ systems.

   You can also download *Assistant* from the *Play Store* application.

2. Go to the folder on your mobile device with the downloaded installation file *assistant_x.x.x.apk*, tap it and follow installation procedure.

To start working with *Assistant*, select its icon in your device and tap it.

Assistant may ask you to enable Bluetooth® and Localization services on your smartphone or tablet.

Assistant will detect visible instruments automatically.

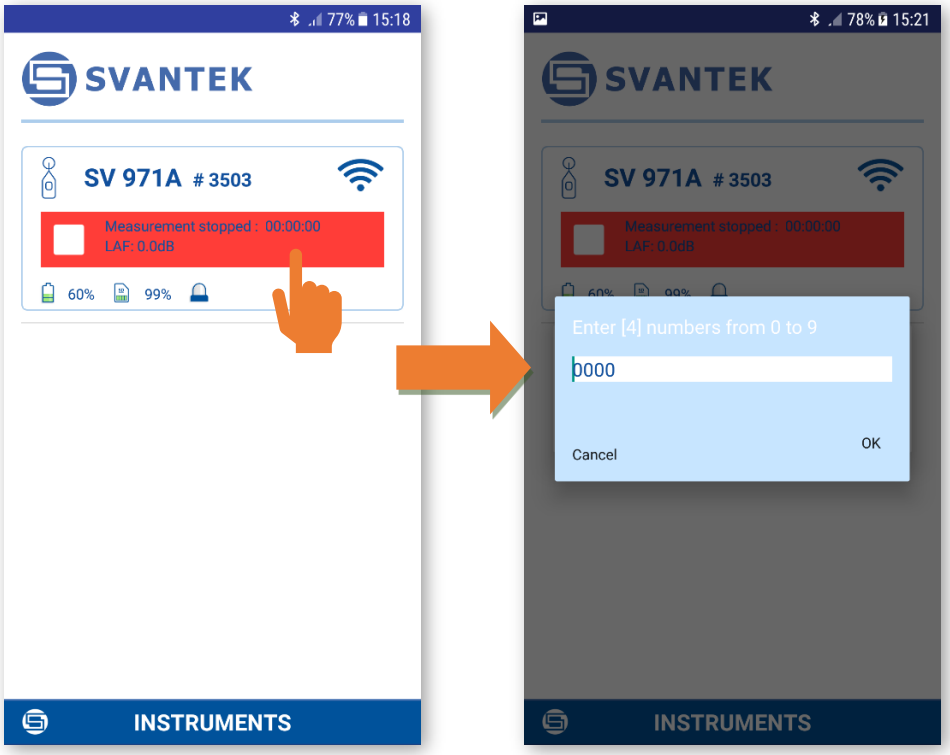
14.2 CONNECTION VIA BLUETOOTH®

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

If some type of instruments (e.g. SV 104) are switched off, they appear on the instrument list with the comment “Turned off”. You may switch them on by clicking on the instrument’s bar.

If an instrument is protected by the PIN code you will be asked to enter this code in a special screen, otherwise *Assistant* will not be able to download data from the instrument.

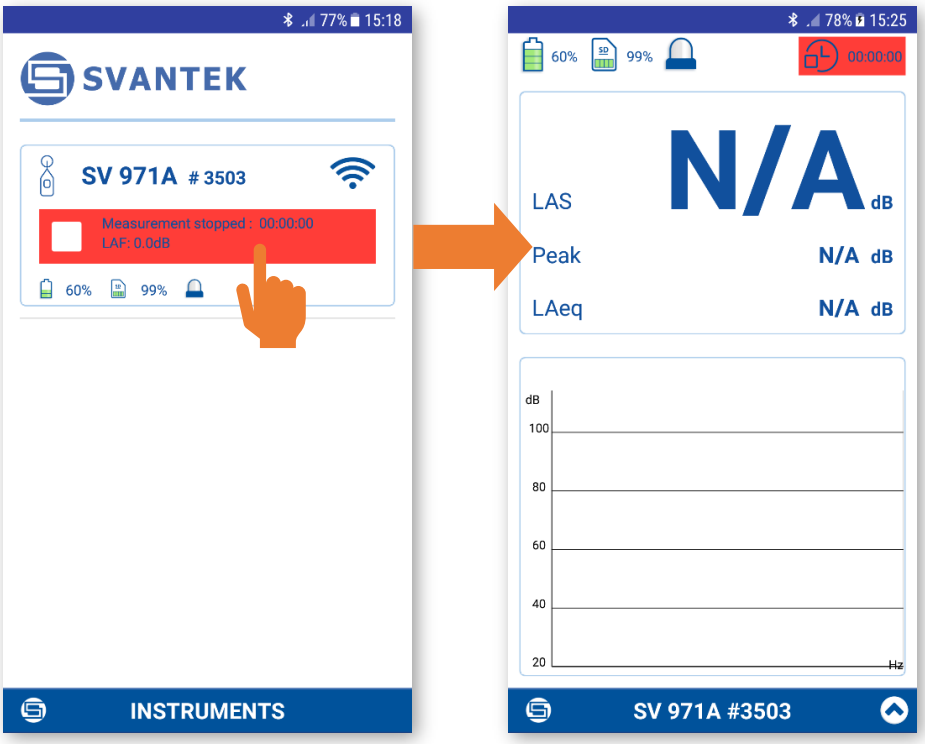
Note: *You will not get access to the instruments that are under control of other simultaneously running Assistant applications on another mobile devices.*



14.3 Control via Bluetooth®

The *Assistant* application has two main screens: scanning/status screen and result view/control screen.

Tapping the fields inside the instrument frame you can go to the instrument's results view and measurement control screen.



If you wish to come back to the scanning/status screen just press the BACK button on your mobile device.

14.3.1 Instruments' status screen

In the scanning/status screen you may observe the state of a set of instruments.

Each instrument status is displayed in the frame that contain up to tree fields. First field displays the instrument name and serial number. Second field shows the instrument status (**Turned off**) or if it is turned on – the measurement status. If the measurement is stopped the field is red, if in progress it is green, if in pause – yellow.

The third field contains several icons that inform you about:

Internal **battery** status of the selected instrument. Battery capacity is displayed as a percentage. When the battery is low, the icon turns red.

Internal **memory** status of the selected instrument. The green area and the percentage display the empty memory capacity.

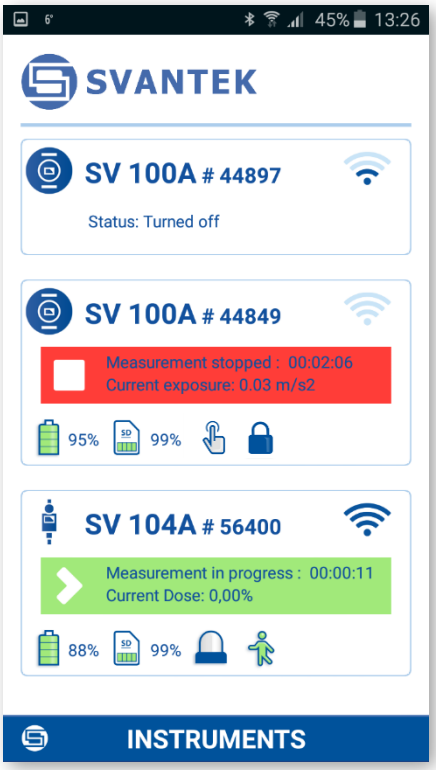
Dose **alarm**. If the dose exceeds the threshold level, the icon is red, and the mobile device vibrates.

Movement of a controlled person. If the controlled person is moving, the icon is green, otherwise the icon is red (not used in SV971A instruments).

Someone is using the instrument's **keyboard** (not used in SV971A instruments).

Lockout status due to different current device control over this instrument.

As an example:



- The instrument SV 100A #44897 is switched off.

- The instrument SV 100A #44897 is switched on and measurement is stopped. Battery charging is 95%, free memory is 99%, no alarm, the controlled person in not driving a vehicle.

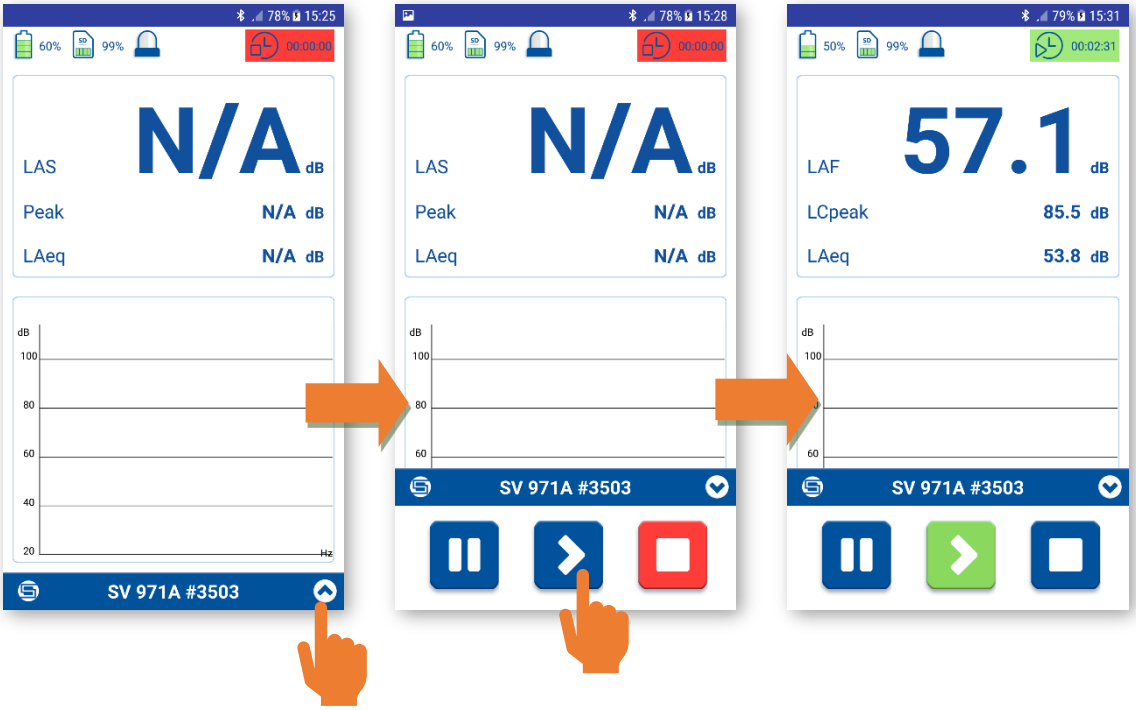
- The instrument SV 104A #56400 is switched on and measurement is running. Current Dose value is displayed. The controlled person presses the instrument's button and this instrument is already controlled by another mobile device. Note, that since scanning there may be a few seconds' delay.

14.3.2 Results view / control screen

The result view/control screen enables you viewing measured results of the particular instrument and controlling the measurement.

As in the scanning/status screen the same icons in the upper screen line describe the instrument status. In addition to them, the integration time is displayed.

From this screen, you can **Pause, Start** or **Stop** a measurement run tapping the appropriate icon on the measurement control bar. Stopping the measurement run requires confirmation.



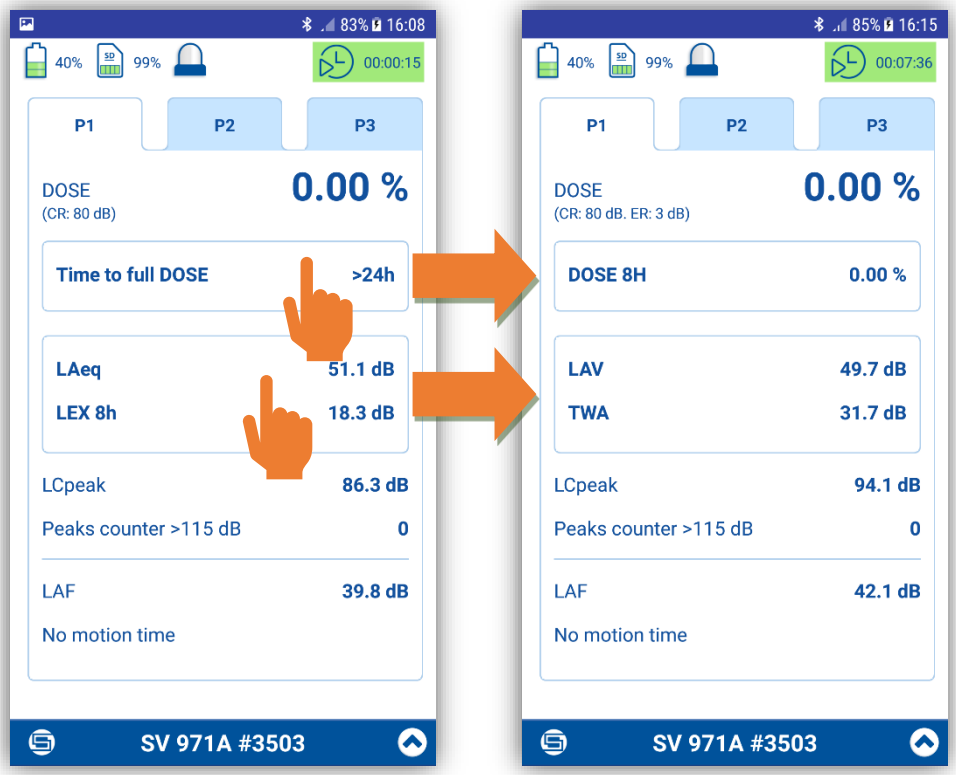
Integration time. If the measurement is in progress, the field turns green and time shows the elapsed measurement time. If the measurement is stopped or paused, the field turns red or yellow, and the time change will be stopped.

Depending on the selected measurement function the view / control screen will have different view.

If the **Level Meter** function is selected, the results view / control screen presents three results: LAF, LCpeal and LAeq measured for the integration time. If the **1/1 Octave** or **1/3 Octave** function is selected, also 1/1 or 1/3 octave spectrum with three TOTAL results is displayed. To see the spectrum, you should hide the measurement control bar.

Note: *In the* ***Sound Level*** *and* ***1/1 Octave*** *or* ***1/3 Octave*** *functions, Assistant adds a GPS point marker every second to the instrument file. This function can be switched off After pressing the*  *button and selecting the* ***Disable GPS marker*** *command.*

In case of the **Dosimeter** function the view / control screen presents measurement results for three profiles. You can switch profiles by tapping the profile tab. You can change the results in the frames by tapping on them.

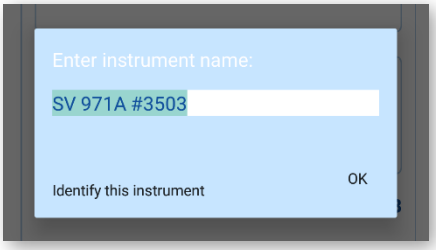


After pressing the button, the pop-up menu appears in which you can:

- Identify corresponded instrument.
- Disable the GPS marker (only for the **Sound Level** and **1/1 Octave** / **1/3 Octave** functions).
- Turn the instrument off.
- Exit the application.

After tapping the **Identity this instrument** position, the pop-up box with the current name of the corresponded instrument will appear. If you tap “Identify this instrument”, the instrument shows its name which will blink for 5 seconds then the instrument returns to the previous screen.

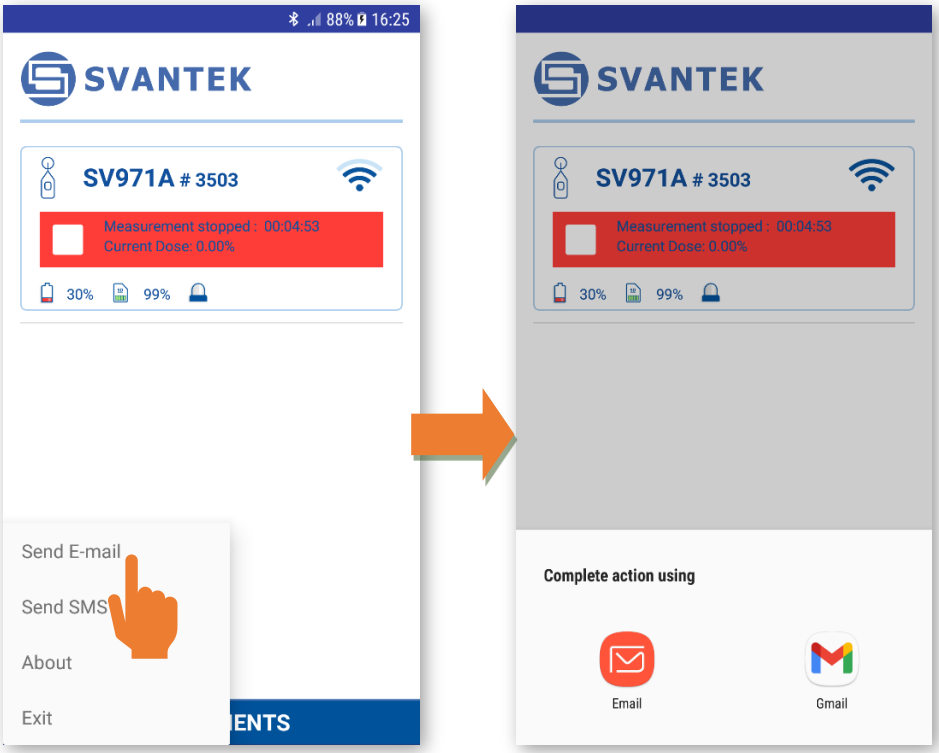
At the same time, you can change the name of this instrument.

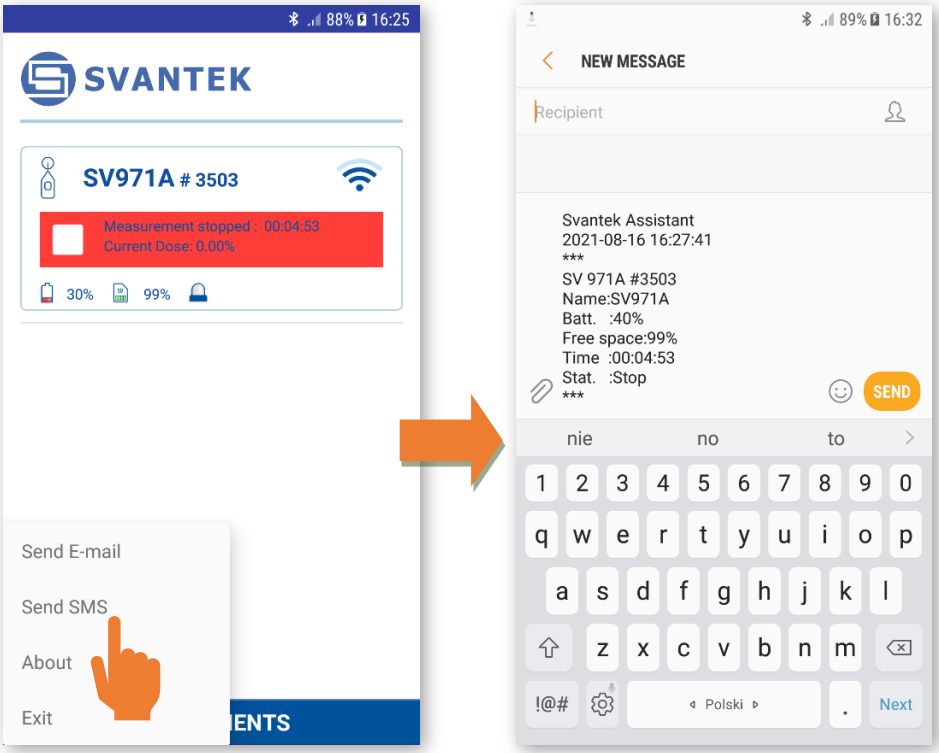


14.3.3 SMS and e-mail notifications

Assistant can also send e-mail / SMS messages directly from the application based on pre-programmed alarm conditions. Notifications are sent when the certain thresholds are exceeded – see Chapter 11.6.

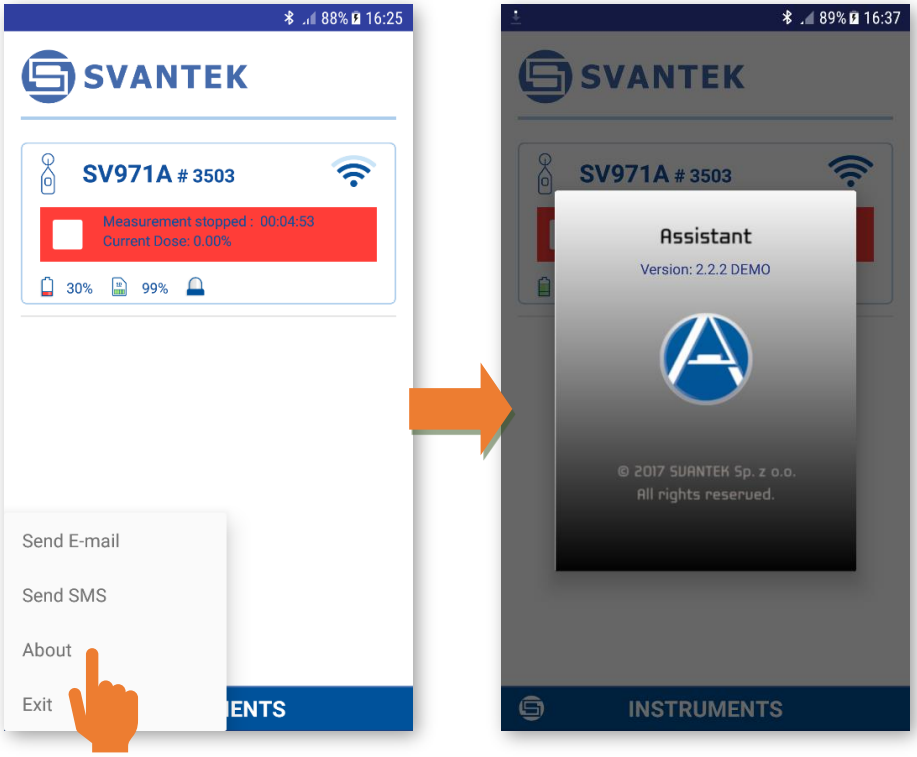
The recipient and contents of the E-mail or SMS is defined by tapping the button, and then selecting the appropriate command from the pop-up menu.





14.1 CHECKING THE SOFTWARE VERSION AND EXITING THE APPLICATION

To check the software version, tap the  icon in the lower left corner and select the **About** command.



To exit the application, tap the  icon in the lower left corner and select the **Exit** command or press the BACK button on your device.

15 GENERAL PURPOSE AND SPECIAL SOFTWARE

SVANTEK offers few software solutions for data downloading and processing as well as remote control and communication with SV 971A depending on the user's needs and capabilities:

- *SvanPC++* - data downloading and uploading, data post-processing, reporting and remote control via the USB or RS232 connection with a PC,
- *Supervisor* - data downloading and uploading, reporting via the USB or RS232 connection with a PC,
- *BA Assistant* – building acoustics and speech intelligibility measurements via the Bluetooth® connection with a smartphone/tablet.

The *SvanPC++* and *Supervisor* installation packages can be downloaded from the Svantek official web-side. *BA Assistant* can be installed via the *Play Store* application.

All software functionalities are described in the User Manuals, which can be downloaded from the Svantek official web-side:

1. SvanPC++ User Manual
2. Supervisor User Manual
3. BA Assistant User Manual.

15.1 SVANPC++

SvanPC++ is an advanced PC software supporting SVANTEK measuring instruments. The basic software offers functions of editing instrument settings, downloading data files from the instrument as well as data preview and basic recalculations of Leq and RMS.

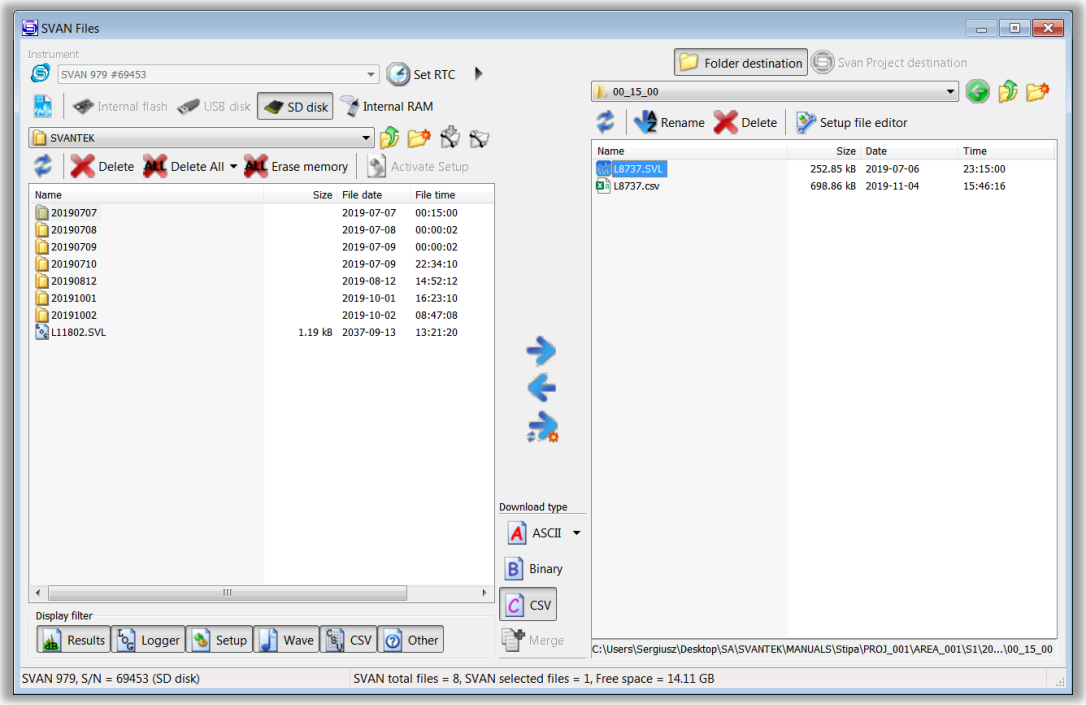
SvanPC++ is enriched with the Projects functionality that allows to combine numerous data files into Sessions. The main advantage of using Projects is possibility to compare data from different measurements as well as an easy report management. Reports are prepared in a form of panels (text, photos, tables, graphs, plots) and can be exported to the Excel spread sheet or Word text editor applications.

Main features of *SvanPC++:*

- Support for all Svantek instruments
- USB interfaces compatible
- Downloading measurement results from instruments to PC
- Data files storage and management in project documents
- Configuration of instrument settings
- Easy direct data export to commonly used applications
- Generation of reports
- Data post-processing (e.g. spectra comparison, time-history and wave recalculation)
- Wave files playback Remote communication with instruments equipped with 3G/4G/LAN modems (optional)

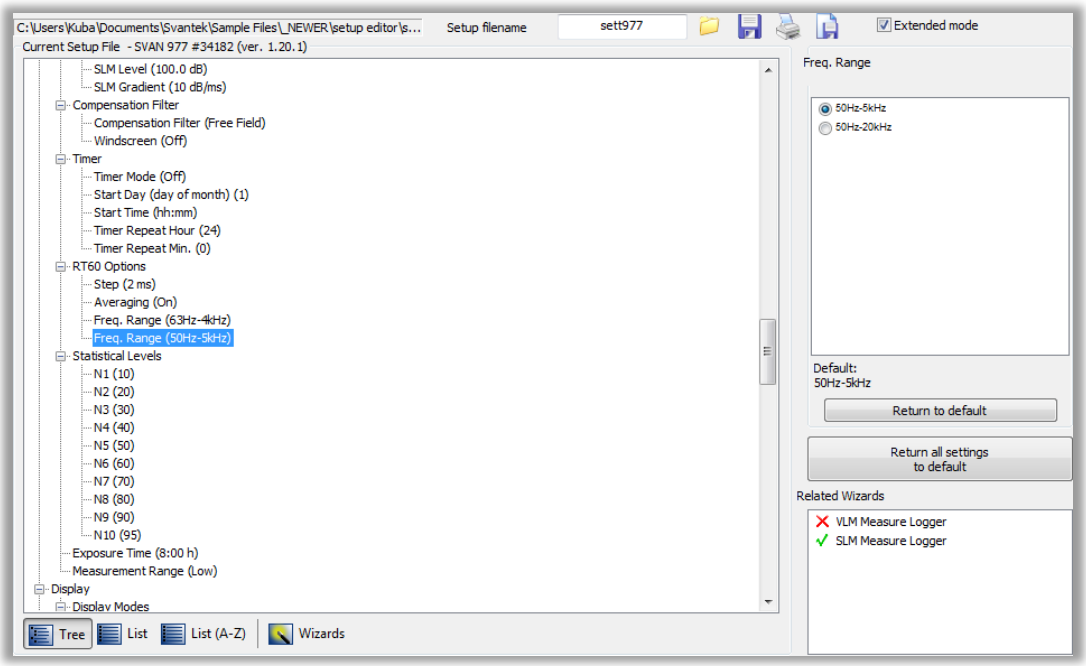
Downloading measurement results

If your Svantek instrument is connected to a PC (via USB, RS232 interface or wireless connection) *SvanPC++* offers simple tool for files downloading, files uploading and configuring settings of the instrument – *SVAN Files*.



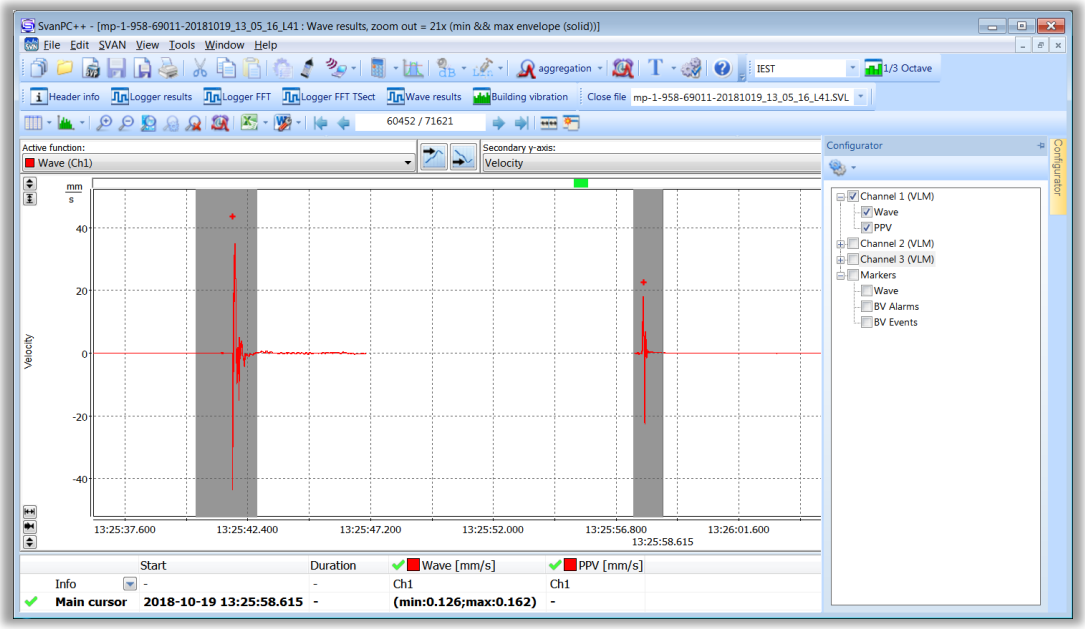
Configuring instrument settings

The *Setup file editor* is a function that gives you an easy access to Svantek instruments' current settings, allows to configure instrument settings and upload them to the instrument.



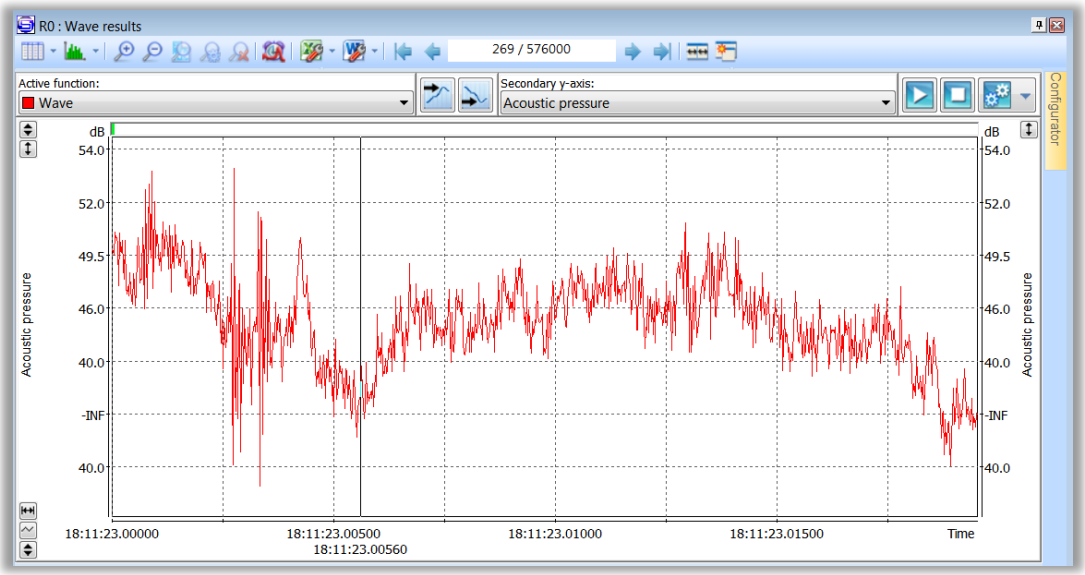
Markers & Block Generator

The Marker Block Generator browses through the long logger files in search of events defined by the user. It can find data in the given time range and cross check it with thresholds. Search results can be also filtered by the event duration or time of the day etc.



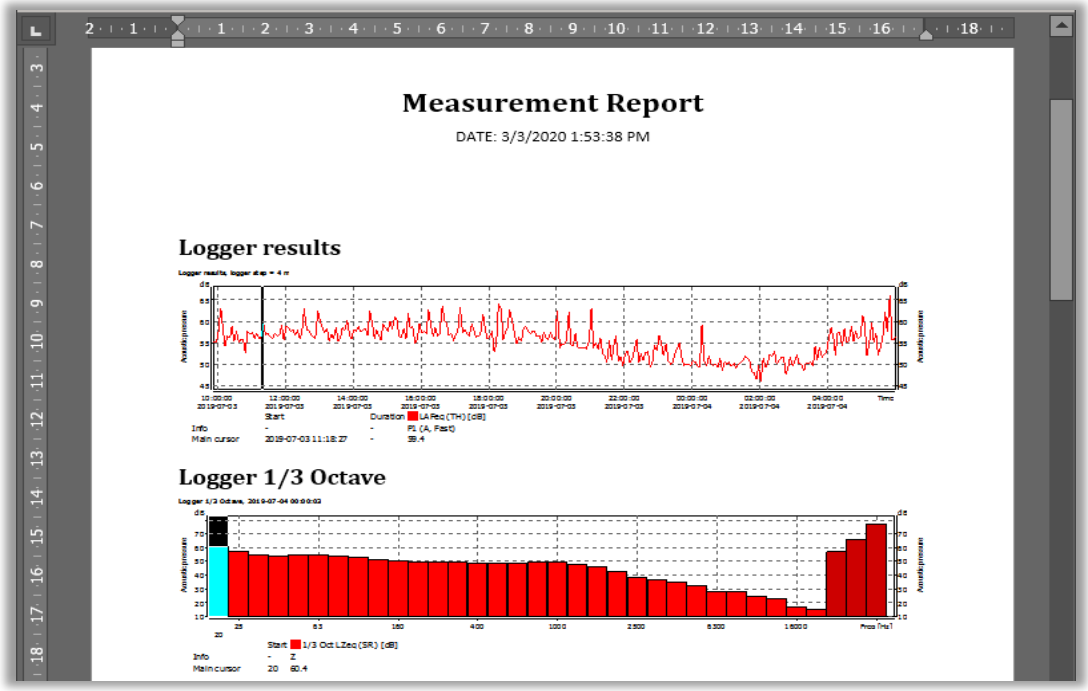
Wave Analyser

Wave analyser is used for analysis of wave files. The module provides calculation of overall results such as Leq, Lmax, Lmin, Lpeak, noise statistics as well as 1/1-, 1/3-, 1/6 and 1/12-octave and FFT spectra or perform tonality analysis from 24 wave files in a single operation.



Reporting

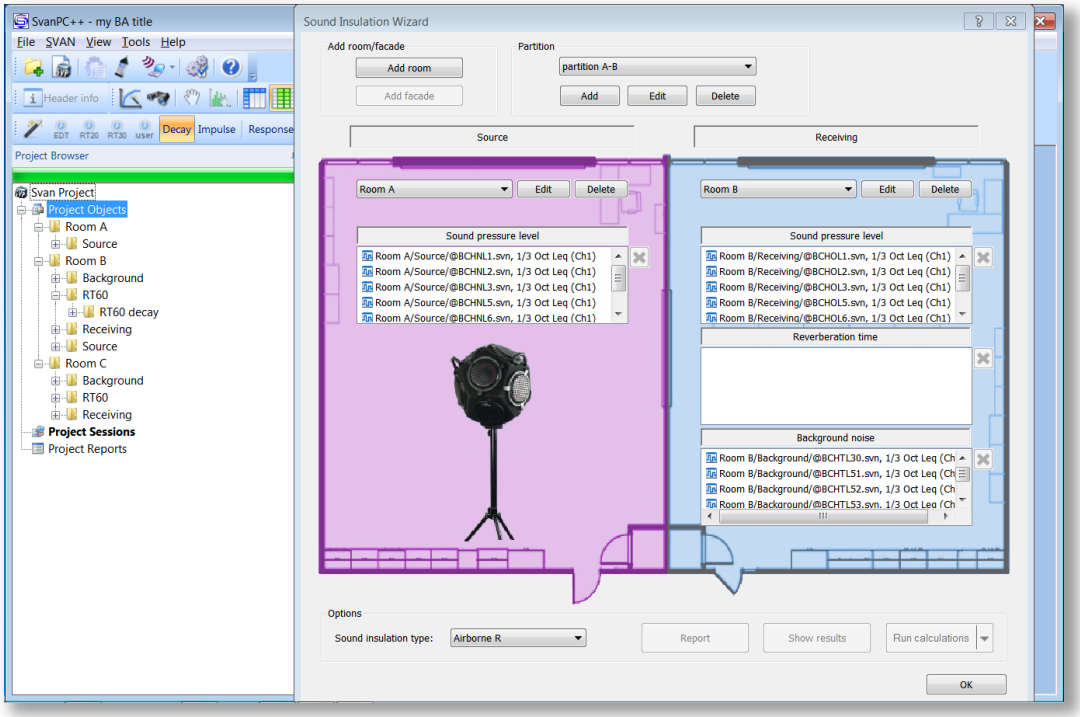
Reporting is based on MS Word™ and it allows to export tables or graphs to a printable text document. Any created report can be saved as a template and used with other data files. Reports and templates are saved together with the Project so they can be recalled whenever necessary.



Projects

The *Projects* feature is a useful tool allowing for managing multiple files of various types and grouping them in a project file, modifying and saving data views, as well as creating reports using the measurement data contained in a project.

The project functionality uses Building Acoustic module (BA) which extends basic *SvanPC++* functionality offering easy to use environment and tools for reverberation time and insulation calculation and reporting. It offers also tools for implementing calculation made with the use of *BA Assistant* application for Android based mobile devices including STIPA calculations.



15.2 SUPERVISOR

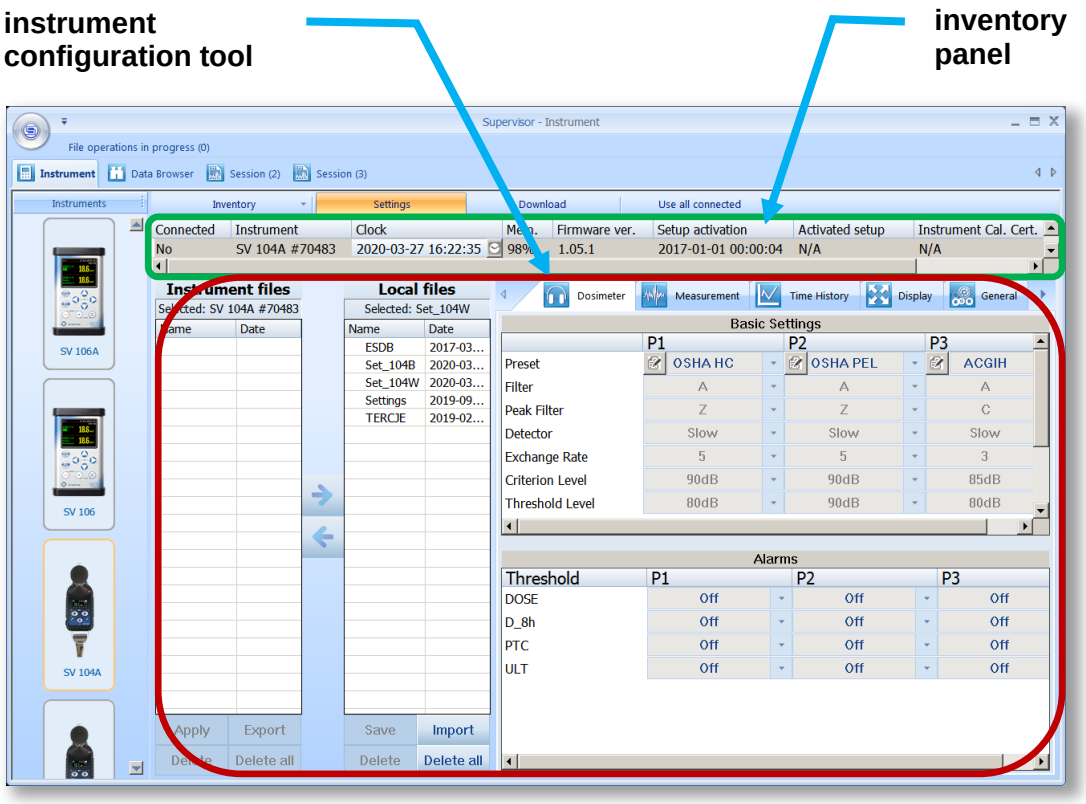
The *Supervisor* software is designed to extend the functionality of some Svantek instruments dedicated for Health and Safety professionals.

Main features of *Supervisor*:

- Easy to use, intuitive interface
- Managing multiple instruments via the inventory panel tool
- Downloading measurement results from instruments connected to a PC
- Sessions tool for displaying the measurement results, analyzing data and performing calculations, generating reports
- Clear setup editor with pre-sets for compliance with health & safety legislation
- Easy data export to commonly used applications
- Fast and convinient way of reports generation with the use of templates
- Powerful tools for data analysis
- Audio events, voice comments and WAVE files support
- Noise exposure recalculations in accordance with ISO 9612
- Hearing protection adjustment in accordance with ISO 4869-2
- Hand-Arm dose recalculations in accordance with ISO 5349-2
- Whole-Body dose recalculations in accordance with ISO 2631-1

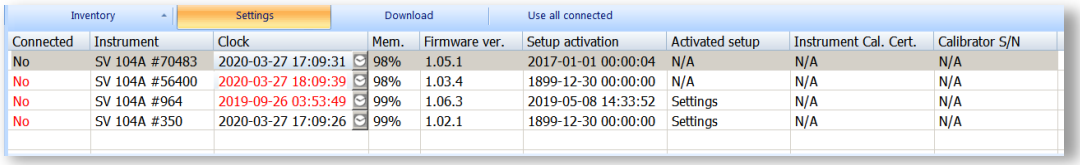
Easy to use, intuitive interface

The main screen of *Supervisor* is divided into few panels. Panels expose areas of interest of professional users and satisfy user's needs to find, configure, download, review and assess stored data in a very simple but still professional way.



Instrument inventory

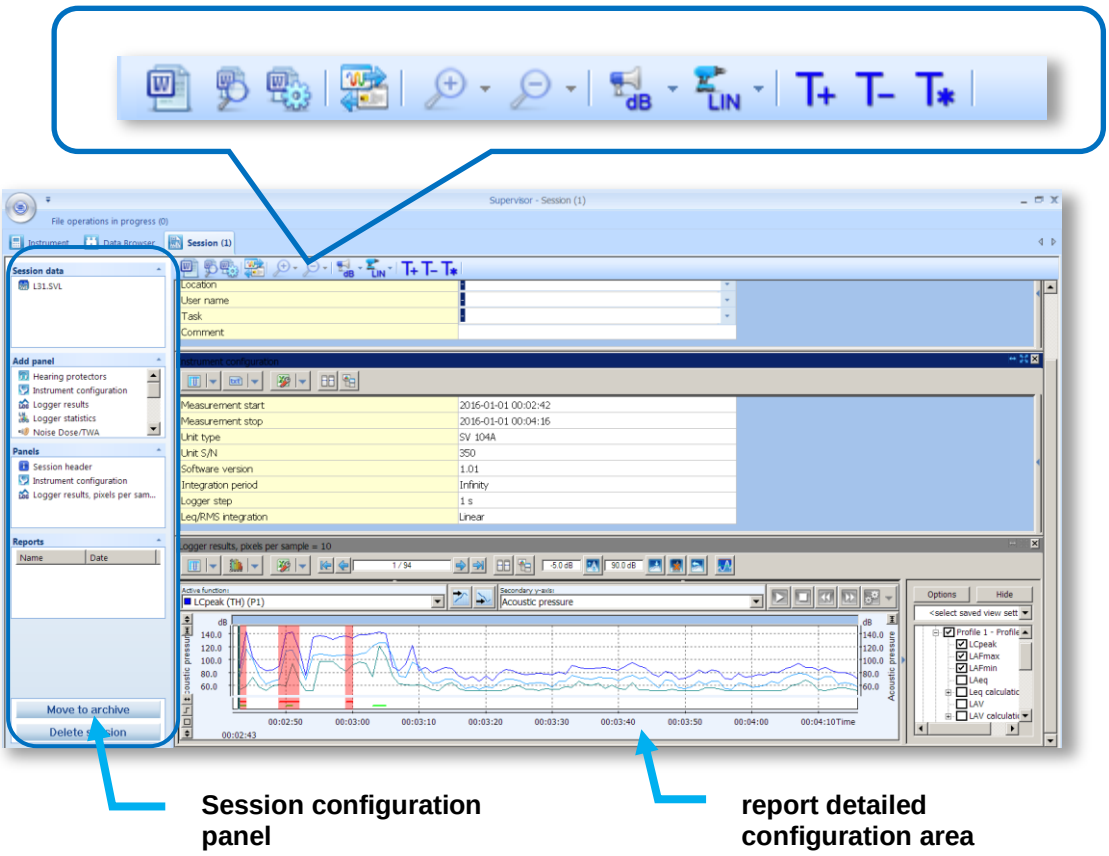
When a connected Svantek instrument is detected by Supervisor, it is added to the *Inventory* - a database of all Svantek instruments you used with Supervisor. This tool allows you to see group of selected instruments type. The columns of the Inventory table contain information about the multiple instruments: name, internal clock, free memory, firmware version, calibration details, etc. The Inventory panel gives you more capabilities to manage the selected instrument, like: Refresh Catalogue, Set Clock, Edit Name, etc.; if you click right mouse button on the instrument's row.



Connected	Instrument	Clock	Mem.	Firmware ver.	Setup activation	Activated setup	Instrument Cal. Cert.	Calibrator S/N
No	SV 104A #70483	2020-03-27 17:09:31	98%	1.05.1	2017-01-01 00:00:04	N/A	N/A	N/A
No	SV 104A #56400	2020-03-27 18:09:39	98%	1.03.4	1899-12-30 00:00:00	N/A	N/A	N/A
No	SV 104A #964	2019-09-26 03:53:49	99%	1.06.3	2019-05-08 14:33:52	Settings	N/A	N/A
No	SV 104A #350	2020-03-27 17:09:26	99%	1.02.1	1899-12-30 00:00:00	Settings	N/A	N/A

Sessions and reporting

Sessions is the most advanced charting, tables, and reporting capability in its class. Each Session is highly configurable, and the *template* of a document once created can be saved for future use with other measurement data. That gives the operator quick solutions at the fingertip. The information is divided into panels and viewable in customizable graphs and/or with selected measurement data/parameters.



15.3 BA ASSISTANT

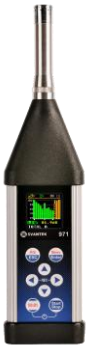
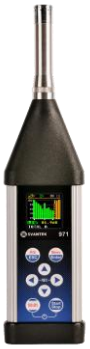
Building Acoustics Assistant (*BA Assistant*) is an application for smartphones and tablets with the Android operating system, dedicated to assessments of airborne or impact sound insulation in buildings and of building elements in accordance with the next standards:

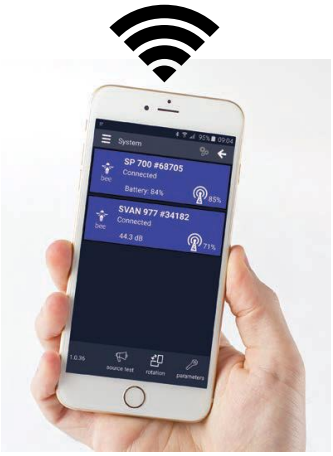
- ISO 16283-1:2014 Acoustics -- Field measurement of sound insulation in buildings and of building elements -- Part 1: Airborne sound insulation,
- ISO 16283-2:2018 Acoustics -- Field measurement of sound insulation in buildings and of building elements -- Part 2: Impact sound insulation,
- ISO 16283-3:2016 Acoustics -- Field measurement of sound insulation in buildings and of building elements -- Part 3: Façade sound insulation,
- ISO 140-4:1998 Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 4: Field measurements of airborne sound insulation between rooms,
- ISO 140-5:1998 Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 5: Field measurements of airborne sound insulation of façade elements and façades,
- ISO 140-7:1998 Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 7: Field measurements of impact sound insulation of floors.

BA Assistant is dedicated as well to assessments of speech intelligibility (STI) induced by the transmission channel in accordance with the standards: IEC 60268-16:2011, DIN VDE 0833-4 and AS 1670.4. The applications of STI include evaluation of sound reinforcement and emergency systems, communication channels, speech intelligibility, communication in rooms and auditoria, etc.

Building Acoustics

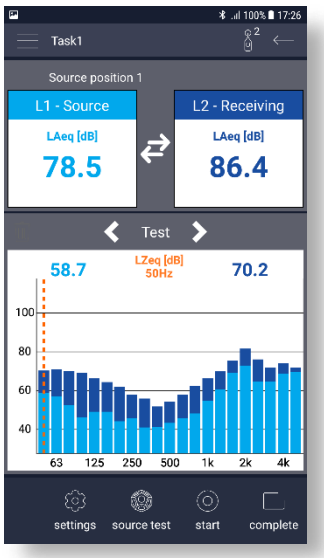
With *BA Assistant* you may simultaneously start measurement by two instruments connected with your smartphone via Bluetooth®, one located in the source room, another – in the receiving room.

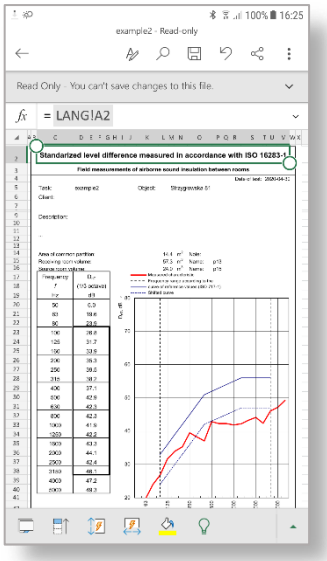
Source room	Receiving room
 	



Note: *For the Building acoustics measurements, the measuring instrument should have active* ***1/3 Octave*** *and* ***RT60*** *options.*

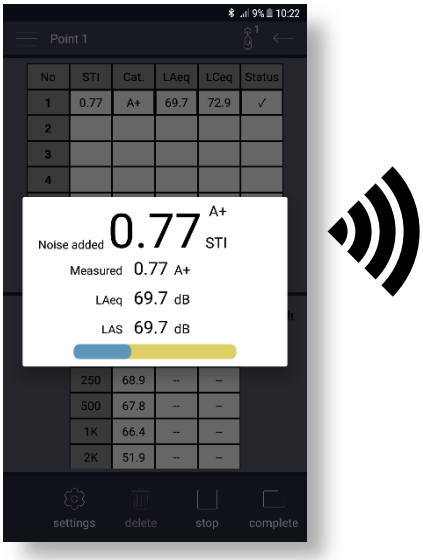
BA Assistant allows you to install connection with one or two instruments, create measurement project in accordance with the required standard, configure building properties, perform measurements remotely and send the report to any address from your smartphone.

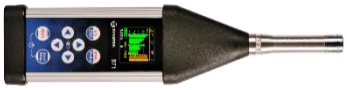




STIPA measurements

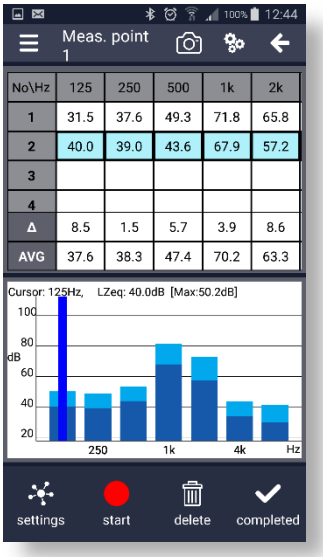
The STIPA project of *BA Assistant* allows you to perform speech transmission index (STI) assessment for estimation the speech intelligibility in the room acoustics and/or public address systems. Thanks to *BA Assistant* these measurements becomes easy and fast. To perform such measurements the user should have a Svantek measuring instrument (for example, SV 971A), test signal source (for example, Audio TalkBox) and a smartphone with the *BA Assistant* application.

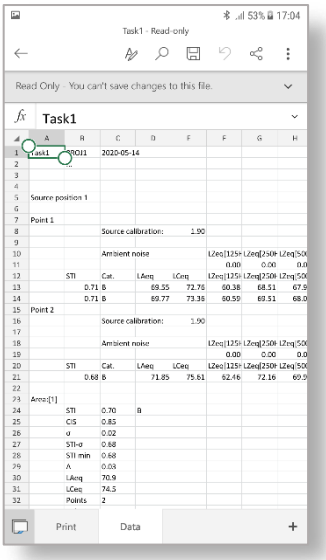




Note: *For STIPA measurements, the measuring instrument should have active* ***1/1 Octave****,* ***1/3 Octave*** *and* ***STIPA*** *options.*

BA Assistant allows you to install connection with the measuring instruments, create measurement project in accordance with the required standard, configure measurement points in the assessed area, perform measurements remotely and send the report to any address from your smartphone.





16 MAINTENANCE

16.1 REPLACING BATTERIES

SV 971A 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.*

16.2 EXTRACTING AND INSERTING THE MEMORY CARD

SV 971A is delivered with 16 GB micro SD-card - Kingston Industrial (SDCIT/8GBSP).

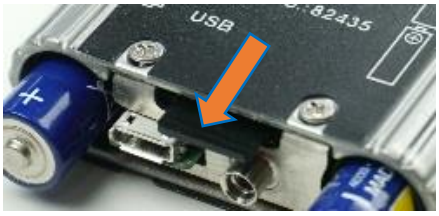
You may exchange it with the high capacity card (up to 128GB), but before insertion the card must be formatted as FAT32.

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

***Note:** If you would like to use the card with higher capacity, consult this with the local distributer.*

To extract the memory card from the card-slot, switch off the instrument, unscrew the bolt and remove the black bottom cover of the instrument.

The card is installed in the slot. To extract the card, push on the card and then pull it out of the slot.



A click should appear after inserting the SD card, indicating that the card has been inserted correctly. If necessary, use a tool (such as a Pen) to push the card into the slot.

16.3 REPLACING THE MICROPHONE AND MICROPHONE PREAMPLIFIER

SV 971A is equipped with the special connector for the input of the measured signal taken from the microphone preamplifier.

The SV 971A set includes prepolarised ½" microphone (ACO 7152) and microphone preamplifier (SV 18A).

***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.*

You can replace the microphone cartridge just unscrewing the previous microphone and screwing the new one. When unscrewing the microphone, care must be taken not to drop the microphone. To avoid this, unscrew the microphone so that it ended up in the user's palm.

Note: *After replacing the microphone you must calibrate the instrument! Due to the significant difference in the sensitivity of the microphones, the calibration drift may also be significant, which in this case will not mean a malfunction.*

The instrument is delivered with the attached preamplifier. Nevertheless, sometimes it is necessary to disconnect the preamplifier (for example, in the case SV 971A should be used with the SV 271 monitoring station).

To disconnect the preamplifier from the instrument, unscrew the screw threaded ring of the preamplifier and pull the preamplifier out of the instrument.

To connect the preamplifier (with the microphone) to the instrument, position the instrument socket and the preamplifier plug in the way that the red point on the instrument socket is in line with the pilot slot on the preamplifier plug. Then insert the preamplifier plug into the socket and tighten the screw threaded ring.

16.4 RESETTING THE INSTRUMENT

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

- **HARDWARE RESET:** internal hardware reset 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 10 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!

16.5 UPGRADING THE FIRMWARE

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 instrument is turned off.
- Connect the SC 158 cable to the instrument and then to the PC.
- Keeping pressed the **<Enter>** and **<ESC>** keys switch on the instrument - the following message should appear on the instrument's screen: Bootstrap ver: 2.01 (or higher).
- Wait for the "<USB>" message on the instrument's screen and run the *go-usb.bat* file in the PC.
- The changing number and final message "..... o.k." should appear on the PC 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.*

16.6 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 rechargeable cells every few months if it is not going to be used regularly.

16.7 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 advisable to use the carrying case provided by the manufacturer such as waterproof case (SA 72) or pocket soft bag (SA 80), which ensure excellent mechanical and environmental protection and long-term storage conditions.

16.8 CLEANING

Clean the surface of the instrument with damp soft cloth.

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

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

16.9 TROUBLESHOOTING

- In the case the instrument is not able to turn on connect the unit via USB to the power supply. Then perform the hardware reset.
- In the case your instrument is switched on but does not respond to any key perform the hardware reset.
- In the 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.

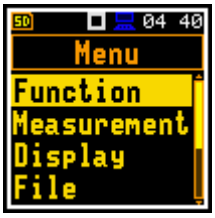
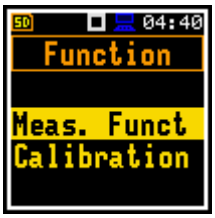
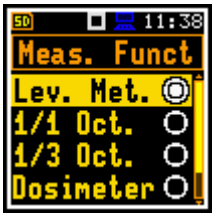
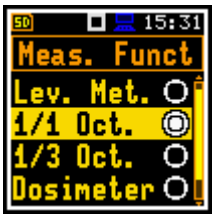
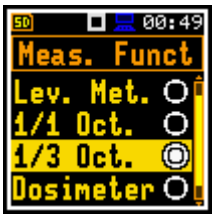
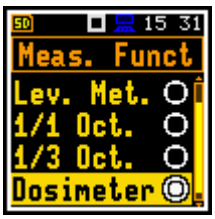
E-mail: support@svantek.com.pl
office@svantek.com.pl

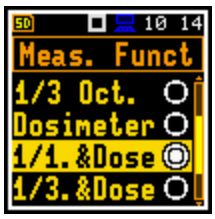
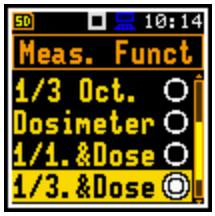
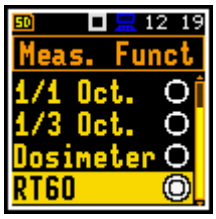
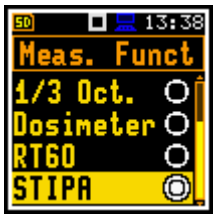
Internet: www.svantek.com

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

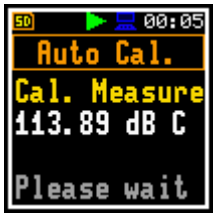
17 GLOSSARY

17.1 MODES AND MEASUREMENT FUNCTIONS

Position	Description	Screen	Reference
Function	The menu section that enables selecting the *Measurement Function* and performing *Calibration* of the instrument.		Chapter 3
Measurement Function	Type of calculations the instrument currently performs: - *Level Meter*, - *1/1 Octave*, - *1/3 Octave*, - *Dosimeter,* - *RT60,* - *STIPA*.		Chapter 3.1
Level Meter	*Measurement Function* enabling calculation of broad band results (*Summary Results*) and time-history for sound measurements in accordance with Class 1 IEC 61672-1:2013 accuracy. All results can be calculated in parallel by three virtual meters (so called profiles) using different weighting filters and LEQ detectors.		Chapter 3.1
1/1 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/1-octave sound results in accordance with Class 1 IEC 61260-1:2014. 1/1-octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/1-octave results can be saved as a time-history.		Chapter 3.1, 10
1/3 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/3-octave sound results in accordance with Class 1 IEC 61260-1:2014. 1/3-octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/3-octave results can be saved as a time-history.		Chapter 3.1, 10
Dosimeter	*Measurement Function* enabling calculation of broad band (*Level Meter*) and sound exposure results.		Chapter 3.1, 11

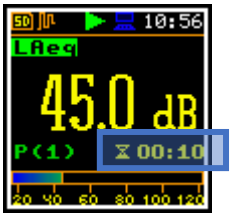
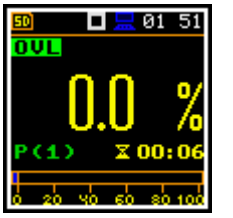
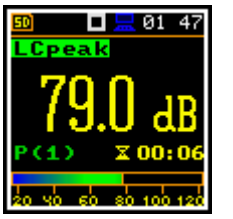
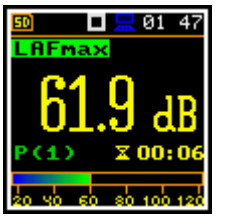
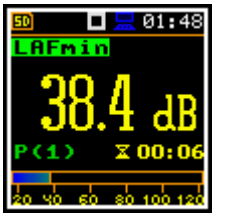
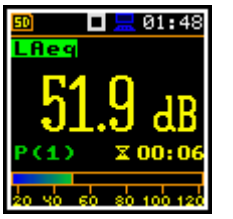
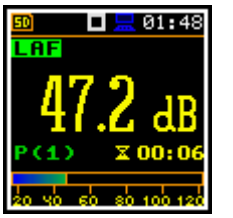
1/1.&Dose	*Measurement Function* enabling calculation of *Dose Meter* results and 1/1-octave sound results in accordance with Class 1 IEC 61260-1:2014. 1/1-octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/1-octave results can be saved as a time-history.		Chapter 3.1, 10
1/3.&Dose	*Measurement Function* enabling calculation of *Dose Meter* results and 1/3-octave sound results in accordance with Class 1 IEC 61260-1:2014. 1/3-octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/3-octave results can be saved as a time-history.		Chapter 3.1, 10
RT60	*Measurement Function* enabling calculation of reverberation time in 1/1-octave bands or 1/3-octave bands including three total RMS levels (A, C and Z weighted). Two methods can be applied: Impulse Response Method and Interrupted Noise Method. Results are presented for 1/1 or 1/3 octave bands.		Chapter 3.1, 12
STIPA	*Measurement Function* enabling analysis of the speech intelligibility with the STIPA method.		Chapter 3.1, 13

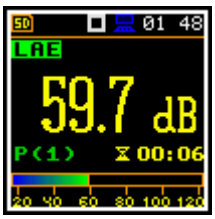
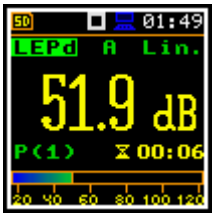
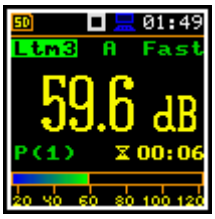
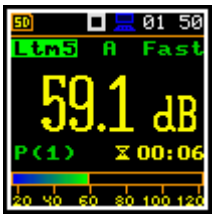
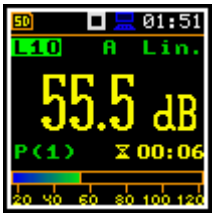
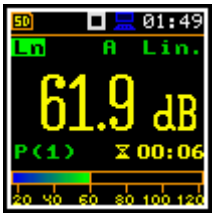
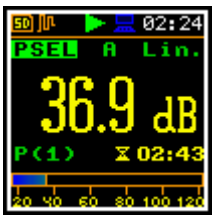
17.2 CALIBRATION

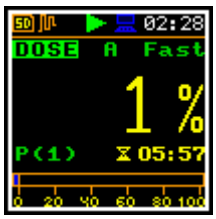
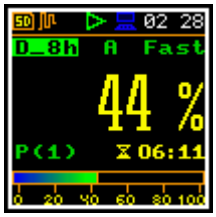
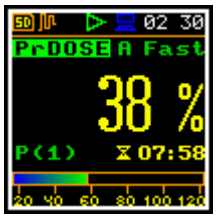
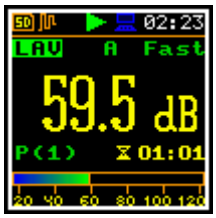
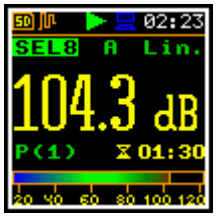
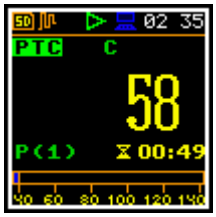
Position	Description	Screen	Reference
Calibration	Position on the *Function* screen that opens a screen with positions allowing you to perform calibration of the instrument: *By Measurement, Last Calibration, Calibration History, Clear History, Post Calibration* and *Auto Calibration*.		Chapter 3.2
By Measurement	Type of calibration based on the reference signal measurement with the use of a sound calibrator.		Chapter 3.2.1
Calibration Measure	Measured by the instrument reference signal level without calibration factor correction.		Chapter 3.2.1, 3.2.6

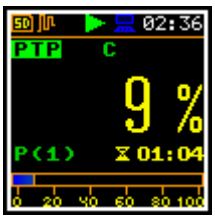
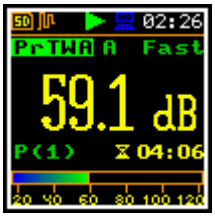
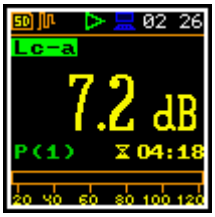
Calibration Level	Level of the reference signal generated by used calibrator.		Chapter 3.2.1
Calibration drift	Difference between the new calibration factor and the previous one.		Chapter 3.2.1, 3.2.6
Last Calibration	Recent calibration record: measurement function for which calibration was performed (*Level Meter* or *Dosimeter*), type of calibration (*Factory Calibration*, *By Sensitivity* or *By Measurement*), date of calibration and calibration factor.		Chapter 3.2.2
Calibration History	List of calibration records which you can view by pressing the **<Enter>** key.		Chapter 3.2.3
Clear History	Operation that clears all calibration records.		Chapter 3.2.4
Post Calibration	Feature that enables adding the new calibration factor to some files already saved in the instrument's memory or to the files that will be created in the future.		Chapter 3.2.5
Auto Calibration	Feature that enables automatic calibration when the reference sound signal is detected by the instrument.		Chapter 3.2.6

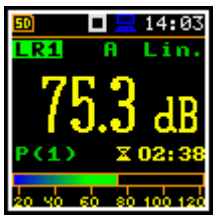
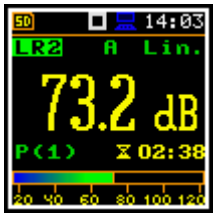
17.3 MEASURED RESULTS

Position	Description	Screen	Reference
Elapsed time	Time from the measurement start, that is displayed under the result in the format ⌛mm:ss in the range from 00:00 to 59:59, or in the format ⌛hh:mm:ss in the range from 01:00:00 to 99:59:59, or in format ⌛xxxh from 100h to 999h, and ⌛>999h if the elapsed time exceeds 999 hours. Its maximum value is equal to the *Integration Period* and the elapsed time is zeroed when new measurement cycle starts.		Chapter 5.1.1
OVL	Percentage of the overloaded input signal, which occurred within the elapsed measurement time.		Appendix D
Lpeak	Peak Sound Level, the greatest instantaneous value of a standard frequency weighted sound pressure level within the elapsed measurement time. It is measured with frequency weighting A, C or Z and accordingly displayed as LApeak, LCpeak or LZpeak.		Appendix D
Lmax	Maximal value of the time-weighted sound pressure level at the exponential RMS detector output within the elapsed measurement time. The *Max* result for the 1 second period is equal to the Spl result. It is measured with frequency weighting A, C or Z and time weighting F, S, I and displayed as LAFmax, LASmax, LCFmax, LCSmax etc.		Appendix D
Lmin	Minimal value of the time-weighted sound pressure level at the exponential RMS detector output within the elapsed measurement time. It is measured with frequency weighting A, C or Z and time weighting F, S, I and displayed as LAFmax, LASmax, LCFmax, LCSmax etc.		Appendix D
Leq	Equivalent continuous sound level, time-averaged sound level for the elapsed measurement time (equivalent sound level). It is measured with frequency weighting A, C or Z and accordingly displayed as LAeq, LCeq or LZeq.		Appendix D
L	Time weighted sound level expressed at observation time, expressed in dB. It is measured with frequency weighting A, C or Z and time weighting F, S, I and displayed as LAF, LAS, LCF, LCS etc.		Appendix D

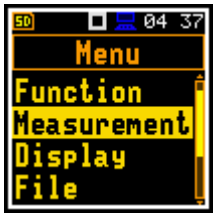
LE	Sound Exposure Level (SEL), the constant sound level that has the same amount of energy in one second as the original noise event and is the subset of the *Leq* result so, for the integration time equal to 1 s, *SEL* is always equal to *Leq*. It is measured with frequency weighting A, C or Z and accordingly displayed as LAE, LCE or LZE.		Appendix D
LEPd	Daily Personal Noise Exposure, the noise exposure level for a nominal 8-hour working day, used for assessing the noise exposure of a worker during a working day. The *LEPd* result is calculated on the base of the *Leq*.		Appendix D
Ltm3	Takt-Maximal Level calculated according to the German standard TA Lärm.		Appendix D
Ltm5	Takt-Maximal Level calculated according to the German standard TA Lärm.		Appendix D
Ln	Statistical Noise Levels, the certain boundary level surpassed by the temporary noise level values in not more than n% 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

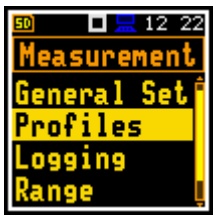
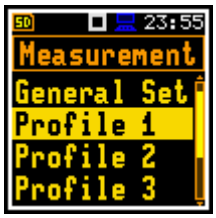
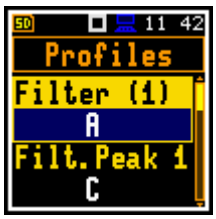
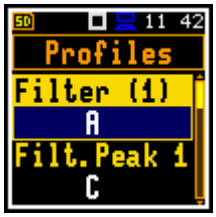
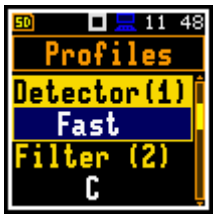
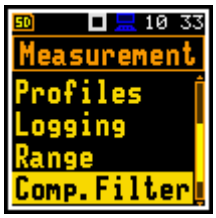
PTP	PTC result expressed in percent.		Appendix D
TWA	Time Weighted Average - average A-weighted sound level for a nominal 8-hour workday with Time Weighting S and Exchange Rate 5. TWA is usually measured with A-weighting and Slow response detector type. TWA is calculated from the measured LAV (taking 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
ULT	Upper Limit Time - time that SPL exceeded the “ULT Threshold Level” set during configuration.		Appendix D
PrTWA	Projected Time Weighted Average is calculated from the measured LAV (taking THRESHOLD LEVEL into account) and the exposure time.		Appendix D
Lc-a	*Leq* that enhances the low-frequency components of the sound signal. It is the result of subtracting an A-weighted LAeq from a simultaneously collected C-weighted Leq.		Appendix D
EX	Expected value. Calculated on the basis of 100ms Leq results.		Appendix D
SD	Standard deviation. Calculated on the basis of 100ms Leq results.		Appendix D

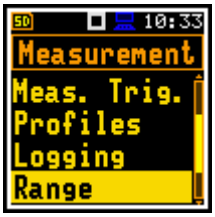
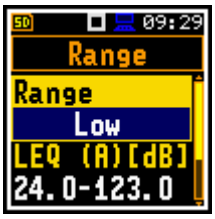
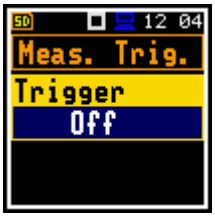
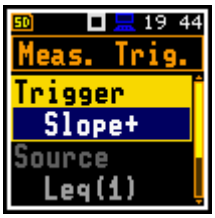
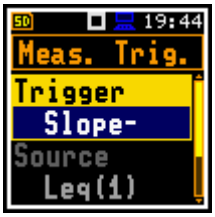
LR1	First rolling *Leq* - Leq for the window of the last xx seconds/minutes of the measurement moving with 1 second step.		Appendix D
LR2	Second rolling *Leq* - Leq for the window of the last yy seconds/minutes of the measurement moving with 1 second step.		Appendix D

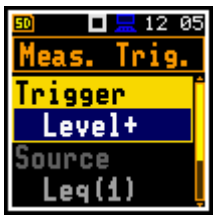
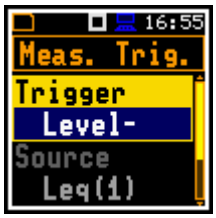
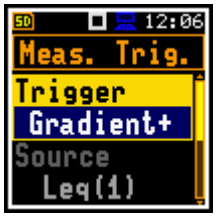
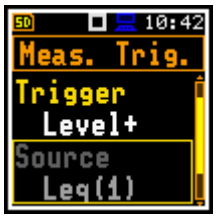
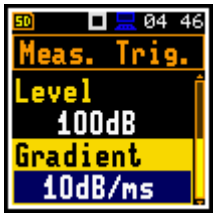
17.4 MEASUREMENT PARAMETERS

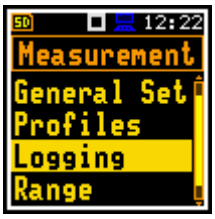
Position	Description	Screen	Reference
Measurement	Section of the Main Menu that enables selecting the measurement parameters in the screens: *General Settings, Measurement Trigger, Profiles, Logging, Spectrum, Range, Compensation Filter, Statistical Levels, Exposure Time, Timer* and *Alarm*.		Chapter 4
General Settings	General measurement settings: *Start Delay*, *Start Sync.*, *Integration Period*, *Repetition Cycles*, *RMS Integration* and *Day Time Limits*.		Chapter 4.1
Start Delay	Delay between pressing the <Start> key and the start of measurement integration.		Chapter 4.1
Start Synch.	Synchronization of the measurement/integration start to the nearest full minute or hour of the instrument real-time clock. It helps to measure in full cycles.		Chapter 4.1
Integration Period	Time of averaging of *Summary Results*: from 1 second to Infinitive. For example, with 8 hours integration period the LEQ result will be averaged for 8 hours. In case of Infinitive, the measurement will last until the user presses the <Stop> key.		Chapter 4.1

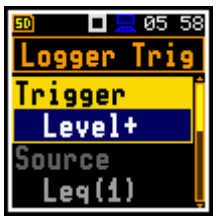
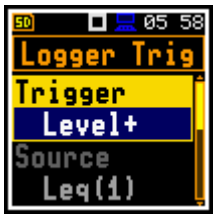
Repetition Cycles	Number of measurement/integration repetitions after the <Start> key pressure. This enables to make a series of measurements without pressing the <Start> key and save this series in the results file.		Chapter 4.1
LEQ Integration	Type of integration of RMS based results (RMS detector): *Linear* or *Exponential*. The IEC 61672-1:2013 standard requires Linear integration, without time weighting, however in some countries old regulation refers to the Exponential RMS integration with standard time weighting: Fast or Slow.		Chapter 4.1
Linear	Linear type of integration of RMS based results (RMS detector), without time weighting according to the IEC 61672-1:2013 standard.		Chapter 4.1
Exponential	Exponential type of integration of RMS based results (RMS detector), where averaging is a continuous averaging process that weighs current and past data differently. The amount of weight given to past data as compared to current data depends on the exponential time constant. In exponential averaging, the averaging process continues indefinitely.		Chapter 4.1
Day Time Limits	Definition of the day and night periods required by local standards: 6–18h and 7–19h. These limits are used for the calculation of the L(den) function.		Chapter 4.1
LRx Time	Definition of the integration periods for calculating the LR1 and LR2 results.		Chapter 4.1

Profiles	Virtual broadband level meters, which calculate the set of results with own weighting filter (*Filter*) and exponential detector time constant (*Detector*). Profiles can be programmed together in the *Profile* screen if the instrument works in the *Level Meter*, *1/1 Octave* or *1/3 Octave* modes, or individually if the instrument works in the *Dosimeter* mode.	 	Chapter 4.3, 11.3
Filter	Weighting filter applied in the profile for all results except *Lpeak* in accordance with most applicable world standards: Z, A, C, B, LF.		Chapter 4.3 Appendix C Appendix D
Filter Peak	Weighting filter applied in the profile for *Lpeak* results calculation in accordance with most applicable world standards: Z, A, C, B, LF.		Chapter 4.3 Appendix C Appendix D
Detector	Exponential RMS detector time constant applied in the profile: *Impulse*, *Fast* or *Slow* for such results like *Leq, Lmax, Lmin, LE, LEPd, Lden, L, Ltm3 and Ltm5*.		Chapter 4.3 Appendix D
Compensation Filter	Digital filter that compensates some effect: *Microphone*, *Diffuse Field, Windscreen, Outdoor Environment and Outdoor Airport*.		Chapter 4.7
Microphone	Digital filter that compensates the microphone inner noise. It is switched On by default, however it should be switched Off for electrical measurements (e.g. for laboratory calibration measurements).		Chapter 4.7
Field Compensation	Digital filter that compensates the free-field (**Free Field**) or diffuse field (**Dif. Field**) effects as well as compensation of the outdoor microphone kit SA 271A (**Environmental** and **Airport**). The user may switch off (**Off**) all compensations for laboratory purposes.		Chapter 4.7

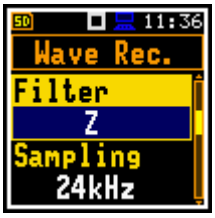
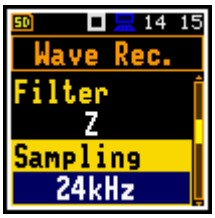
Windscreen	Digital filter that compensates the effect of the SA 22 windscreen.		Chapter 4.7
Range	Position that enables selecting the linear operating range for the sinusoidal signal selection: *Low* or *Normal.* The calibration factor is always added to the range limits. The ranges depend on the selected *Compensation Filter*.		Chapter 4.6
Low	Low linear operating range for the sinusoidal signal. The calibration factor is always added to the range limits. The range depends on the selected *Compensation Filter.*		Chapter 4.6 Appendix C
Normal	Normal linear operating range for the sinusoidal signal. The calibration factor is always added to the range limits. The range depends on the selected *Compensation Filter.*		Chapter 4.6 Appendix C
Measurement Trigger	Screen that enables configuring triggering of the measurement/integration process with parameters: *Trigger, Source, Level* and *Gradient*.		Chapter 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.		Chapter 4.2
Slope+	Type of trigger that starts the measurement/ integration by the duration of the *Integration Period* on condition: rising value of the RMS result (*Source*) integrated during 0,5 ms passes above the threshold value (Level).		Chapter 4.2
Slope -	Type of trigger that starts the measurement/ integration by the duration of the *Integration Period* on condition: falling value of the RMS result (*Source*) integrated during 0,5 ms passes below the threshold value (Level).		Chapter 4.2

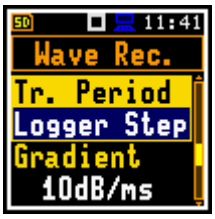
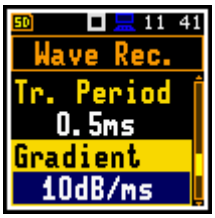
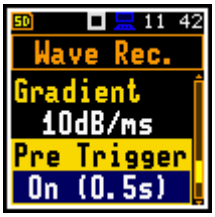
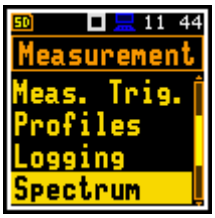
Level+	Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0.5 ms. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.		Chapter 4.2
Level–	Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0.5 ms is lower than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0.5 ms. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.		Chapter 4.2
Gradient+	Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold level (*Level*) and the gradient of this Source is greater than the threshold level (*Gradient*). In other cases, the instrument continues checking the trigger condition every 0.5 ms. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle. This type of trigger has the same logic as Level+ trigger, but the trigger condition requires also gradient level to be exceeded.		Chapter 4.2
Source	Measured result that is compared with the threshold level (*Level*) for triggering – RMS measured in the first profile: Leq(1).		Chapter 4.2
Level	Threshold level of the *Source* for triggering condition fulfilment.		Chapter 4.2
Gradient	Threshold level of the source signal value speed of changing (Gradient) for trigger condition fulfilment.		Chapter 4.2

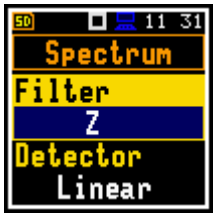
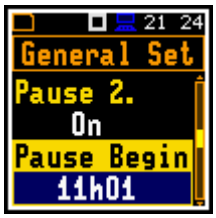
Statistical Levels	Screen that enables setting a boundary level (*Ln*) surpassed by the temporary noise level values in not more than nn**%** of the observation period. The user can define ten statistical levels, named from N1 to N10, to be calculated, displayed and saved in the files together with the main results.		Chapter 4.8 Appendix D
Timer	Screen that enables configuring automatic switching *On* the instrument and performing the measurement on the programmed time with defined setup. Timer can be *Single* or repeatable (*Multiple*). After every timer cycle, the instrument automatically switches itself off.		Chapter 4.9
Logging	Screen that enables configuring saving of the *Summary Results*, *Logger Results* and a waveform signal in files with the use of the next screens: *Logger Setup, Logger Results, Logger Trigger* and *Event Recording.*		Chapter 4.5
Logger Setup	Screen that enables switching the logger function on and setting the main logging parameters: *Logger*, *Split*, *Logger Step* and *Logger Name*.		Chapter 4.5.1
Logger	Position in the *Logger Setup* list that switches On or Off the *Logging* functionality. If *Logger* is Off no data recording is available.		Chapter 4.5.1
Logger Split	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.		Chapter 4.5.1
Logger Step	Time of measuring/integrating *Logger Results* and recording them to the logger file (same meaning as *Integration Period* for *Summary Results*). *Logger Step* can be selected from the set: 100 ms, 200 ms, 500 ms or from 1 second to 59 seconds with 1-second step or from 1 minute to 59 minutes with 1-minute step and up to 1 hour.		Chapter 4.5.1
Logger Name	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.		Chapter 4.5.1

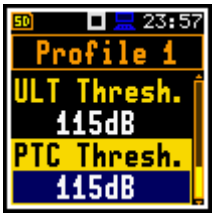
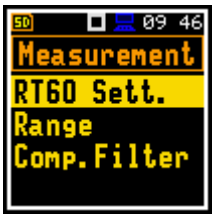
Summary Results	Main measurement results: *Leq*, *Lpeak*, *Lmax*, *Lmin*, *L*, *LE*, *Lden*, *LEPd*, *Ltm3*, *Ltm5, LR1*, *LR2* statistics *Ln, EX, SD* and *OVL*; that are measured, displayed and saved in the file with the *Integration Period* step as many times as defined by the *Repetition Cycles* parameter. They are renewed and displayed every second when the measurement is running. The saving of the *Summary Results* can be switched on or off in the *Logger Setup* screen.		Chapter 4.5.1
Logger Results	Screen in the *Logging* list enabling selecting results that will be logged to the logger file as a time-history with the *Logger Step*: *Lpeak, Lmax, Lmin, Leq, LR1*, *LR2*. For the *1/1 Octave* and *1/3 Octave* functions also spectra can be saved.		Chapter 4.5.2
Logger Trigger	Screen that enables configuring parameters for triggering of *Logger Results* recording to the logger file: *Trigger, Source, Level, Pre Trigger* and *Post Trigger*.		Chapter 4.5.3
Trigger	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.		Chapter 4.5.3
Level+	Type of trigger, that starts logging of *Logger Results* under the condition: value of the Leq result (*Source*) integrated by the *Logger Step* period is greater than the threshold level (*Level*). In other cases, the logging is skipped.		Chapter 4.5.3
Level–	Type of trigger, that starts logging of *Logger Results* under the condition: value of the Leq result (*Source*) integrated by the *Logger Step* period is lower than the threshold level (*Level*). In other cases, the logging is skipped.		Chapter 4.5.3
Source	Measured result that is compared with the threshold level (*Level*) for triggering – LEQ measured in the first profile (Leq(1)).		Chapter 4.5.3

Level	Threshold level of *Source* for triggering condition fulfilment.		Chapter 4.5.3
Pre Trigger	Period of additional logging before triggering condition fulfilment.		Chapter 4.5.3
Post Trigger	Period of additional logging after triggering condition fulfilment.		Chapter 4.5.3
Wave Recording	Recording of the waveform signal in the wave file.		Chapter 4.5.4
Recording	Switching on the signal recording: *Continuous* or on trigger: *Slope+*, *Slope -*, *Level+*, *Level–*, *Gradient+*, *Trigger Chapter* or *Integr. Period*. Continuous means that the waveform signal will be recorded continuously from the start of the measurement till its end. On trigger recording put additional conditions for triggering and ending of the recording. If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „signal" icon.		Chapter 4.5.4
Slope+	Type of trigger that starts the signal recording for *Recording Time* under the condition: rising value of the LEQ result (*Source*) integrated during 0,5 ms passes above the threshold level (*Level*).		Chapter 4.5.4
Slope -	Type of trigger that starts the signal recording for *Recording Time* under the condition: falling value of the LEQ result (*Source*) integrated during 0,5 ms passes below the threshold level (*Level*).		Chapter 4.5.4

Level+	Type of trigger that starts the signal recording for *Recording Time* under the condition: value of the LEQ result (*Source*) integrated by the 0,5 ms period is greater than the threshold level (*Level*).		Chapter 4.5.4
Level–	Type of trigger that starts the signal recording to start for *Recording Time* under the condition: value of the LEQ result (*Source*) integrated by the 0,5 ms period is lower than the threshold level (*Level*).		Chapter 4.5.4
Gradient+	Type of trigger that starts the signal recording for *Recording Time* under the condition: value of the LEQ result (*Source*) integrated by the 0,5 ms period is greater than the threshold level (*Level*) and the gradient of this Source is greater than the threshold level (*Gradient*).		Chapter 4.5.4
Trigger manual	Type of trigger that starts manual triggering of the signal recording start after pressing simultaneously ◄ and ► keys during the measurement.		Chapter 4.5.4
Integr. Period	Type of trigger that starts the signal recording for *Recording Time* every time the measurement starts. If *Integration Period* is shorter than *Recording Time,* the event recording will be continued for additional *Recording Time*.		Chapter 4.5.4
Filter	Weighting filter used during signal recording: Z, A, C, B or LF.		Chapter 4.5.4
Sampling	Sampling frequency of the event recording: 24 kHz or 12 kHz.		Chapter 4.5.4
Signal Gain	Gain of the recorded signal: *0 dB … 40 dB*.		Chapter 4.5.4

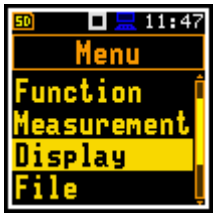
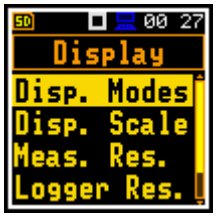
Source	Measured result that is compared with the threshold level for triggering (*Level*) – LEQ measured in the first profile: Leq(1).		Chapter 4.5.4
Level	Threshold level of the *Source* for the trigger condition fulfilment.		Chapter 4.5.4
Trigger Period	Time interval of checking the triggering conditions. This parameter can be set as: Logger Step, 0.5 ms, 100.0 ms and 1 s.		Chapter 4.5.4
Gradient	Threshold level of the source signal value speed of changing (Gradient) for trigger condition fulfilment.		Chapter 4.5.4
Pre Trigger	Period of signal recording before the first trigger condition moment: Off or 1 s.		Chapter 4.5.4
Recording Time	Time of the signal recording after meeting every trigger condition. The available values can be selected from 1 s to 8 h. Recording stops after *Recording Time* or earlier if the measurement is stopped manually.		Chapter 4.5.4
Spectrum	Screen that enables setting the *1/1 Octave* or *1/3 Octave* spectrum parameters setup: *Filter* and *Detector*.		Chapter 10.2.4
Peak Sp.	Position in the *Logger Results* screen that switches on/off the Lpeak spectra saving as a time-history in a logger file.		Chapter 10.2.3

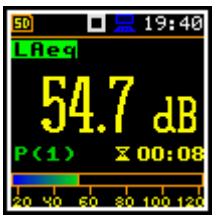
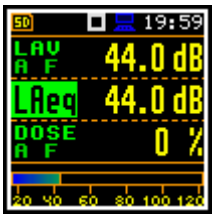
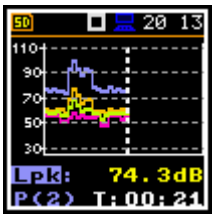
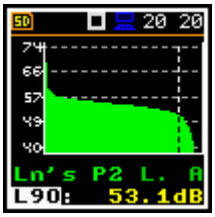
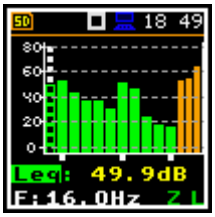
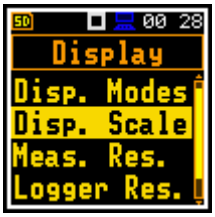
Leq Sp.	Position in the *Logger Results* screen that switches on/off the Leq spectra saving as a time-history in a logger file.		Chapter 10.2.3
Filter	Weighting filters for the *1/1 Octave* and *1/3 Octave* analysis: A, B, C, Z.		Chapter 10.2.4
Detector	Type of integration of RMS based results for *1/1 Octave* and *1/3 Octave* analysis: Linear, Fast or Slow.		Chapter 10.2.4
Pause	Automatic pause(s) in the *Dosimeter* mode, that can be programmed based on absolute time.		Chapter 11.2
Exposure Time	Total time during working day in which the worker is exposed to the noise. This time is considered for the LEPd result calculation.		Chapter 11.5 Appendix D
Criterion Level	Steady noise level permitted for a full eight-hour work shift.		Chapter 11.3
Threshold Level	Noise level limit below which the dosimeter does not accumulate noise dose data.		Chapter 11.3
Exchange Rate	Amount by which the permitted sound level may increase if the exposure time is halved.		Chapter 11.3

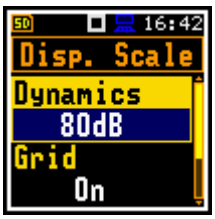
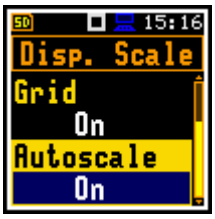
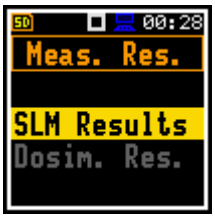
ULT Threshold Level	Threshold level for calculation of ULT results.		Chapter 11.3
PTC Threshold Level	Threshold level for calculation of PTC results.		Chapter 11.3
RT60 Settings	Screen that enables setting the reverberation time measurement parameters: *Start Delay*, *Method*, *Recording Time*, *Time Step*, *Averaging*, *Noise Mar.*, *Octave*, *Freq. Range*, *Logger Name* and *Level*.		Chapter 12.2
Start Delay	Delay between pressing the <Start> key and the start of the RT60 measurement.		Chapter 12.2
Method	Method of the RT60 calculation: *Decay* (Interrupted Noise Method) or *Impulse* (Impulse Response Method). The selection of the method depends on the used type of the sound source.		Chapter 12.2
Recording Time	Time of measurement data (sound pressure level decay curve) registration during RT60 calculations: *1s .. 30 s* or *Auto*.		Chapter 12.2
Time Step	Time-step of data registration (sound pressure level) in the file during RT60 calculations: *2, 5, 10, 20, 50 ms*.		Chapter 12.2
Averaging	Averaging of the reverberation time results from several measurements during RT60 calculations.		Chapter 12.2

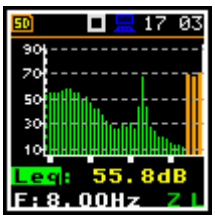
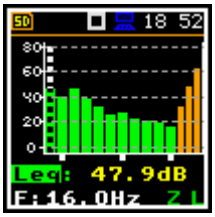
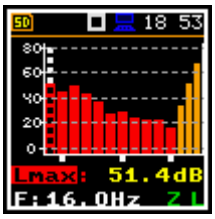
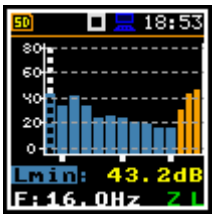
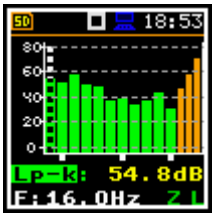
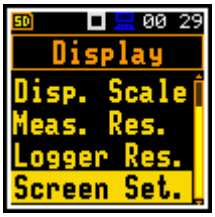
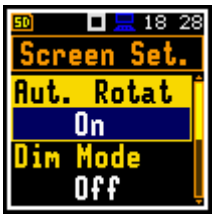
Noise Mar.	Margin value to the calculated noise level for RT60 calculations: *0 ÷ 20 dB*.		Chapter 12.2
Octave	Type of spectrum (1/1-octave or 1/3-octave) based on which the RT60 analysis is performed.		Chapter 12.2
Freq. Range	Frequency range for RT60 calculations: *63Hz-4kHz* (7 bands) and *63Hz-8kHz* (8 bands) for 1/1-octave; *50Hz-5kHz* (21 bands) and *50Hz-10kHz* (24 bands) for 1/3 octave.		Chapter 12.2
Logger Name	Name of the Logger file in which data of the RT60 analysis will be recorded.		Chapter 12.2
Level	Threshold level of the sound source for triggering the RT60 measurement. If the measured sound is below the *Level* value, the RT60 measurement will not start.		Chapter 12.2

17.5 DISPLAY PARAMETERS

Name	Description	Screen	Reference
Display	Section of the Main Menu that enables setting of the measurement views.		Chapter 5
Display Mode	Mode of measurement results presentation - view. Views can be activated in the *Display Modes* screen.		Chapter 5.1

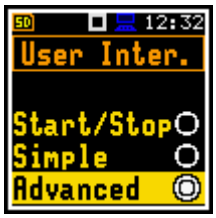
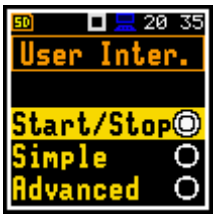
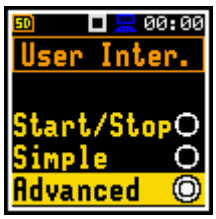
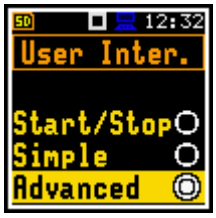
One Result view	View of the one result. This view is always available and cannot be disabled.		Chapter 5.1.1
Running SPL view	View of the running SLP result. This view is used before the measurement start for the noise level estimation.		Chapter 2.5, 5.1.5
3 Profiles view	View of three results on the display at the same time.		Chapter 5.1.2
Logger view	View of time-history (logger) results.		Chapter 5.1.3
Statistics view	View of statistics of sound results.		Chapter 5.1.4
Spectrum view	View spectra: *1/1 Octave* and *1/3 Octave*.		Chapter 5.1, 10.3
RT60 results view	View of RT60 results calculated for octave or third-octave bands: EDT, RT20, RT30; and averaged results: AEDT, ART20, ART30.		Chapter 12.4
Display Scale	Screen that enables setting parameters of the results presentation: *Dynamics*, *Grid* and *Autoscale*.		Chapter 5.2

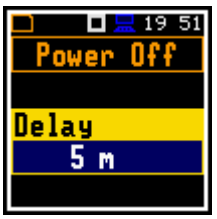
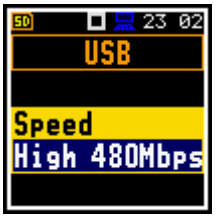
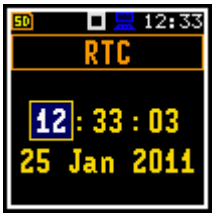
Dynamics	Range of the plot scale: 10 dB, 20 dB, 40 dB, 80 dB, 100 dB and 120 dB.		Chapter 5.2
Grid	Toggle of the grid on the graph views.		Chapter 5.2
Autoscale	Switching automatic scale adjustment of the Y axis.		Chapter 5.2
Measurement Results	Screen that enables selecting the Sound Level Meter and/or Dose Meter results, which will be presented on the display.		Chapter 5.3
SLM Results	Screen that enables selecting the Sound Level Meter results, which will be presented on the display.		Chapter 5.3
Dosimeter Results	Screen that enables selecting the Dose Meter results, which will be presented on the display.		Chapter 5.3
Logger Results	Screen that enables selecting time-history results, which will be presented on the display.		Chapter 5.4
Spectrum View	Screen that enables selecting types of spectra for displaying: *Averaged*, *Instantaneous*, *Max*, *Min* and *Peak*.		Chapter 10.3.3

Instantaneous	Spectrum of instantaneous *Leq* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Averaged	Spectrum of averaged *Leq* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Max	Spectrum of *Lmax* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Min	Spectrum of *Lmin* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Peak	Spectrum of *Lpeak* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Screen Setup	Screen that enables setting the screen brightness and power saving.		Chapter 5.5
Auto Rotation	Switching on the adjustment of the screen image on the display according to the instrument's physical orientation in space.		Chapter 5.5
Dim Mode	Screen dimming in no activity after delay. The screen may be switch off (*Screen Off*) or dimmed with different levels (*Level 1, 2* or *3*).		Chapter 5.5

Dim Delay	Screen dimming time delay in no activity after last key pressing.		Chapter 5.5
Col. Scheme	Colour scheme of the screen.		Chapter 5.5

17.6 INSTRUMENT PARAMETERS

Name	Description	Screen	Reference
Instrument	Section in the Main Menu that enables setting the hardware components of the instrument in the screens: *User Interface, Battery, Keyboard, Power Off, USB, Communication Ports, Self Vibration, RTC* and *Unit Label.*		Chapter 7
User Interface	Screen that allows to select the user interface - a set of functions that are available for the user. Instrument offers three types of user interface: limited to start and stop of the measurement (*Start/Stop*), narrow set of functions for novice users (*Simple*) and full set of functions (*Advanced*).		Chapter 7.1
Start/Stop	User interface mode that limits the menu to only one *User Interface* position in the main *Menu* and measurement screens		Chapter 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.		Chapter 7.1
Advanced	User interface that enables full scope of instrument settings.		Chapter 7.1

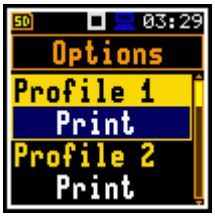
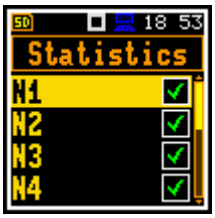
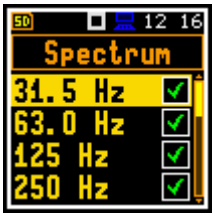
Battery	Position in the *Instrument* list that enables checking of the instrument power source status.		Chapter 7.2
Keyboard	Position in the *Instrument* list that enables setting of the Shift, Alt, Start/Stop keys functionality and programming of locking/unlocking the keyboard.		Chapter 7.3
Power Off	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.		Chapter 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*.		Chapter 7.5
Communication Ports	Position in the *Instrument* list that enables selecting and programming the serial port of the instrument (*Serial Port*).		Chapter 7.6
Serial Port	Position in the *Communication Ports* list which enables selecting the serial port of the instrument – *RS232* or *Bluetooth*. In case of the *RS232* serial port, you can set the transmission speed (*Baud Rate*) and the time limit during for the data transfer (*Time Out*). In case of *Bluetooth*, you can set the PIN.		Chapter 7.6
Self Vibration	Position in the *Instrument* list that enables defining the threshold level for the self-vibration of the instrument for marker registration. The special marker will be written to the file when the self-vibration of the instrument is higher than defined in the *Marker Thr.* position.		Chapter 7.7
RTC	Instrument's Real Time Clock. This clock is displayed in the upper right corner places of the display.		Chapter 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.		Chapter 7.9

17.7 AUXILIARY PARAMETERS

Name	Description	Screen	Reference
Auxiliary Setup	Section in the Main Menu that enables customizing the instrument interface to specific user requirements in the screens: *Language, Factory Settings, Comments, Leq & Lav* and *Warnings*.		Chapter 8
Language	Screen that enables selecting the user interface language.		Chapter 8.1
Factory Settings	Restoration of the default settings of the instrument.		Chapter 8.2
Comments	Definition of the file name for recording of voice comments.		Chapter 8.3
Leq & Lav	Position in the *Auxiliary Setup* screen that enables to control displaying of Leq and Lav results: *Both* or *Mutually Exclusive*.		Chapter 8.4
Warnings	Activation of the warning messages, which are to be displayed during the normal operation of the instrument.		Chapter 8.5

17.8 REPORT

Name	Description	Screen	Reference
Report	Section in the Main Menu that enables configuring and printing measurement reports in the predefined format and includes positions: *Print, Options, Results, Statistics*, *Spectrum* and *Printer*.		Chapter 9
Print	Position in the *Report* screen that enables printing of the report.		Chapter 9.1
Options	Position in the *Report* screen that enables specifying the report content, selecting profiles, results for these profiles, statistics and spectra which will be included in the report.		Chapter 9.2
Results	Position in the *Report* screen that allows you to select results to be included in the report for the selected profiles.		Chapter 9.3
Statistics	Position in the *Report* screen that allows you to select statistic levels from *N1* to *N10* to be included in the report.		Chapter 9.4
Spectrum	Position in the *Report* screen that allows you to select based on their central frequencies the 1/1 or 1/3 octave bands which will be included in the report for the *Leq*, *Lmax*, *Lmin* and *Lpeak* spectra.		Chapter 9.5
Printer	Position in the *Report* screen that enables setting the number of characters in the report lines – from 20 to 500.		Chapter 9.6

APPENDIX A. REMOTE CONTROL

The **USB 2.0 interface** is the Type C serial interface working with 480 MHz clock which enables one to control remotely the unit. Its speed is relatively high, and it ensures the common usage of USB-C in most produced nowadays Personal Computers.

Alternatively, all commands described in this appendix are valid for any other kinds of interfaces (if present) like **Bluetooth** communication **or RS232**.

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

In order to program the serial interface, the user has to:
1. send a "function code",
2. get a response to the “function code”
3. send/receive a data file (optionally)

A.1 INPUT/OUTPUT TRANSMISSION TYPES

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

#1 – general control functions,

#2 – read out of the measurement results in the **SLM** mode,

#3 – read out of the measurement results in the **1/1-** or **1/3 Octave** analysis mode,

#4 – read out data from the setup file,

#5 – read out of the statistical analysis results,

#7 – special control functions,

#9 – writing data to the setup file,

#D – data files access,

#S – direct setup access.

A.2 FUNCTION #1 – GENERAL CONTROL FUNCTIONS

#1 function enables the user to send the control setting codes to the instrument and read out a file containing the current control state. A list of the control setting codes is given in A.3 ***Control setting codes***. The format of #1 function is defined as follows:

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

or

#1,Xccc,X?,Xccc,(...),X?,Xccc; **(2)**

or

#1,X?,X?,(...),X?; **(3)**

where:

X - group code, **ccc** – new code value,

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

In the first case (1) the instrument does not respond to a command, even if an error occurs.

In the second and third cases (2), (3) the instrument outputs control settings for all requests X? in the following format:

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

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

Note: *Changing settings using #1 functions during measurements running state (#1,S1;) is blocked. Stop the measurements (#1,S0;) before changing the settings.*

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

#1;

In this case the instrument outputs all control settings given in A.3 ***Control setting codes*** in the format:

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

Example: The instrument sends the following sequence of characters as an answer for the mentioned above request:

#1,U971,N1234,W1.05.1,Q0.01,M1,R1,F2:1,F3:2,F1:3,F2:4,F3:5,F1:6,J2:1,J3:2,J1:3,J3:4,J3:5,J1:6,f1,C1:1,C0:2,C2:3,C1:4,C0:5,C2:6,B0:1,B3:2,B15:3,b0,d1s,D10s,K5,L0,Y3,y0,XT0,XL100,XQ0,Xq0,XC115:1,XC115:2,XC115:3,XI115:1,XI115:2,XI115:3,XA0,XD-1:1,XD-1:2,XD-1:3,XD-1:4,XD-1:5,XD-1:6,S0,T1,e480,c1:1,c1:2,c1:3,h0:1,h0:2,h0:3,x3:1,x3:2,x5:3,m0,s0,l100,O10,o0,t0;

means that:

- SV 971A is investigated (**U971**); see #7,US; command for unit subtype information;
- its number is 1234 (N1234);
- software version number is 1.05.1 (W1.05.1);
- calibration factor is equal to 0.01 dB (Q0.01);
- **Level Meter** is selected as the measurement function (M1);
- range is **Low** (R1);
- **A** filter is selected in profile 1, SLM function (F2:1);
- **C** filter is selected in profile 2, SLM function (F3:2);
- **Z** filter is chosen in profile 3, SLM function (F1:3);
- **A** filter is selected in profile 1, SEM function (F2:4);
- **C** filter is selected in profile 2, SEM function (F3:5);
- **Z** filter is chosen in profile 3, SEM function (F1:6);
- **A** Peak filter is selected in profile 1, left channel, SLM function (J2:1);
- **C** Peak filter is selected in profile 2, left channel, SLM function (J3:2);
- **Z** Peak filter is selected in profile 3, left channel, SLM function (J1:3);
- **C** Peak filter is selected in profile 1, both channels, SEM function (J3:4);
- **C** Peak filter is selected in profile 2, both channels, SEM function (J3:5);
- **Z** Peak filter is selected in profile 3, both channels, SEM function (J1:6);
- **Z** filter is selected for **1/1 Octave** or **1/3 Octave** analysis (f1)
- **Fast** detector is selected in profile 1, SLM function (C1:1);
- **Impulse** detector is chosen in profile 2, SLM function (C0:2);
- **Slow** detector is selected in profile 3, SLM function (C2:3);
- **Fast** detector is selected in profile 1, SEM function (C1:4);
- **Impulse** detector is chosen in profile 2, SEM function (C0:5);
- **Slow** detector is selected in profile 3, SEM function (C2:6);
- logger's buffer is not filled by the results from profile 1 (B0:1);
- **Lpeak** and **Lmax** values are stored in the files of the logger from profile 2 (B3:2);
- **Lpeak**, **Lmax**, **Lmin** and **Leq** values are stored in the files of the logger from profile 3 (B15:3);
- results of **1/1 Octave** or **1/3 Octave** analysis are not stored in the files of the logger (b0);

- results are stored in a logger's file every 1 second (d1s);
- integration period is equal to 10 seconds (D10s);
- the measurement has to be repeated 5 times (K5);
- linear detector is selected to the **Leq** calculations (L0);
- .. and so on.

See A.3 ***Control setting codes*** for more details.

Note: *Control settings presented in the instrument's response and not described in* A.3 ***Control setting codes*** *considered as reserved. Do not change these settings!*

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

#2 function enables one to read out the current measurement results from the selected profile.

#2 function has the format defined as follows:

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

where:

<aver> – type of results:

i – instantaneous results, i.e. results from the current cycle (default),

a – averaged results, i.e. results from the previous cycle,

<profile>– profile number:

1, 2 or 3 – one of the profile, i.e. only results from the given profile will be sent;

X – code of the specified result (see below); if no codes are specified all results will be sent;

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

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

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

If no results are available, the instrument returns:

#2,?;

The **X** codes of the results from the **SLM** mode are defined as follows:

v under-range flag (ccc equals to 0 when the overload did not occur, 2 when the under-range took place during the last measurement period but did not occur in the last second of the measurement and 3 when the under-range took place during the last measurement period and it lasted in the last second of the measurement);

V overload flag (ccc equals to 0 or 1);

T time of the measurement (ccc – value in seconds);

x start date of the measurement in format ***dd/mm/yyyy*** (***dd*** – day, ***mm*** – month, ***yyyy*** - year)

t start time of the measurement in format ***hh/mm/ss*** (***hh*** – hour, ***mm*** – minute, ***ss*** - second)

P **Lpeak** value (ccc – the value in dB);

M **Lmax** value (ccc – the value in dB);

N **Lmin** value (ccc – the value in dB);

S **L** result (ccc – the value in dB);

R **Leq** result (ccc – the value in dB).

U **LE** result (ccc – the value in dB);

B(k) **Lden** result (ccc – the value in dB; k – flag determining the kind of the result);

I(nn) **LEPd** result (ccc – the value in dB, nn – the value of Exposure Time in minutes);
Y **Ltm3** result (ccc – the value in dB);
Z **Ltm5** result (ccc – the value in dB);
L(nn) **L** result of the nn statistics (ccc – the value in dB).
g **LR1** result (ccc – the value in dB);
G **LR2** result (ccc – the value in dB);
s **SD** result (ccc – the value in dB);
k **EX** result (ccc – the value in dB);

Note: *In the case of **Lden**, the value k placed in the parenthesis after the code **B**, denotes the kind of the currently measured result. The kind of the **Lden** result depends on the time during which the measurements were performed (**d** denotes day, **e** denotes evening and **n** denotes night). The corresponding values of k parameter and the kind of the measured **Lden** result are presented below:*

k = 1 ***Ld*** *result,*

k = 2 ***Le*** *result,*

k = 3 ***Lde*** *result,*

k = 4 ***Ln*** *result,*

k = 5 ***Lnd*** *result,*

k = 6 ***Len*** *result,*

k = 7 ***Lden*** *result.*

The codes of the results from the **DOSE METER** mode are defined as follows:

v under-range flag (ccc equals to 0 when the overload did not occur, 2 when the under-range took place during the last measurement period but did not occur in the last second of the measurement and 3 when the under-range took place during the last measurement period and it lasted in the last second of the measurement);
V overload flag (ccc equals to 0 or 1);
T time of the measurement (ccc – value in seconds);
x start date of the measurement in format ***dd/mm/yyyy*** (***dd*** – day, ***mm*** – month, ***yyyy*** - year)
t start time of the measurement in format ***hh/mm/ss*** (***hh*** – hour, ***mm*** – minute, ***ss*** - second)
P **Lpeak** value (ccc – the value in dB);
M **Lmax** value (ccc – the value in dB);
N **Lmin** value (ccc – the value in dB);
S **L** result (ccc – the value in dB);
D **DOSE** result (ccc – the value in %);
d **D_8h** result (ccc – the value in %);
p **PrDOSE** result (ccc – the value in %);
A **LAV** result (ccc – the value in dB);
R **Leq** result (ccc – the value in dB);
U **LE** result (ccc – the value in dB);
u **SEL8** result (ccc – the value in dB);
E **E** result (ccc – the value in Pa^2h);
e **E_8h** result (ccc – the value in Pa^2h);
I(nn) **LEPd** result (ccc – the value in dB, nn – the value of Exposure Time in minutes);
J **PSEL** result (ccc – the value in dB);
Y **Ltm3** result (ccc – the value in dB);
Z **Ltm5** result (ccc – the value in dB);

L(nn) value L of the nn statistics (ccc – the value in dB);
C **PTC** result (ccc – the counter value);
c **PTP** result (ccc – the value in %);
l **ULT** result (ccc – value in seconds);
W **TWA** result (ccc – the value in dB);
w **PrTWA** result (ccc – the value in dB);
a **Lc-a** result (ccc – the value in dB);

The exemplary results of the instrument's response after sending to it the following sequence of characters: **#2,1;** coming from the first profile are given below:

a) for the case of the **SLM** mode:

#2,1,x17/03/2014,t13:44:28,v0,V0,T10,P79.97,M52.92,N38.50,S46.35,R43.91,U53.91,B(1)43.91,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,g?,G?,k?,s?;

b) and for the case of the **SEM** mode:

#2,1,x17/03/2014,t13:48:36,v0,V0,T7,P124.39,M99.26,N41.54,S42.05,D0,d389,p389,A85.86,R85.86,U94.31,u130.45,E0.00,e1.23,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,T1,P65.80,R43.99,L(01)52.00,L(10)51.10,L(20)46.10,L(30)44.10,L(40)38.60,L(50)38.10,L(60)37.60,L(70)37.10,L(80)36.60,L(90)36.10;

Read-out the RT60 results

In the case of RT60 function there are additional codes:
#2,EDT; this function allows you to read the current EDT results.
#2,T20; this function allows you to read the current RT20 results.
#2,T30; this function allows you to read the current RT30 results.

The function's answer is in the one of the following format:
#2,<type>,0,<status>; when results are not available
#2,<type>,1,<results>; when results are available.
<type> accepts the following values: EDT/T20/T30
<status> is the status of device
0 – no results,
1 – waiting for trigger,
2 – measurement in progress,
3 – calculations
<results> is the full list of frequencies with corresponding results in the format:
freq1:value1,freq2:value2,…,freqN:valueN

The exemplary answer:

#2,T30,1,50.0Hz:0.36s,63.0Hz:0.41s,80.0Hz:0.20s,100Hz:---,125Hz:0.07s,160Hz:0.09s,200Hz:0.32s,250Hz:0.33s,315Hz:0.44s,400Hz:0.29s,500Hz:0.39s,630Hz:0.49s,800Hz:0.44s,1.00k:0.47s,1.25k:0.46s,1.60k:0.34s,2.00k:0.42s,2.50k:0.40s,3.15k:0.42s,4.00k:0.42s,5.00k:0.41s,TOT.A:0.42s,TOT.C:0.42s,TOT.Z:0.42s;

A.2.3. Read-out the STIPA results

#2,STI,CP; this command creates new project and returns new project name.
#2,STI,CA; this command creates new area and returns new area name.
#2,STI,CS; this command creates new source and returns new source name. e.g. **#2,STI,CS,"S2"**;

#2,STI,PL; this command returns the project list. e.g. **#2,STI,PL,2,"PROJ0001","PROJ0002"**;
#2,STI,AL; this command returns the area list. e.g. **#2,STI,AL,2,"AREA1","AREA2"**;
#2,STI,SL; this command returns the source list. e.g. **#2,STI,SL,2,"S1","S2"**;

The following list of commands require prior setting of the project, area and source.
#2,STI,NP; this command adds the new point and returns the new point ID.
#2,STI,PC; this command returns the count of the measurement points and list of point IDs. e.g.
#2,STI,PC,n,1,2,3;
#2,STI,MC,p; this command returns the count of the measurements at the point **p**.
#2,STI,AP,p; this command allows you to read and set average flag at the point **p**.
#2,STI,AM,p,m; this command allows you to read and set average flag for the m measurement at the point **p**.
#2,STI,DP,p; this command deletes the point **p**.
#2,STI,DM,p,m; this command deleted the measurement m at the point **p**.
#2,STI,MR,p,m,mrn; this command allows you to read the results of the m measurement at the point **p**.
#2,STI,FR,p,m,frn; this command allows you to read the modulation results of the m measurement at the point **p**.
#2,STI,SN; this command allows you to read and write Ambient Noise parameters. e.g.
#2,STI,SN,enabled,90.0,91.0,...,95.0;

p: 0..PointCount-1
m: 0..MeasurementCount-1
mrn: STI,LAQ,LCQ,LAS,STM,FLG
frn: LZQ,MF1,MF2,ERR
enabled: 0/1
flags: UNDERRANGE = 1, OVERLOAD = 2

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

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

#3 function enables one to read out the current measurement results in **1/1 Octave** or **1/3 Octave** modes, depends on device function selected.

#3 function format is defined as follows:

#3;	- displayed spectrum
#3,A;	- averaged spectrum
#3,I;	- instantaneous spectrum
#3,M;	- max spectrum
#3,N;	- min spectrum

#3,P; - peak spectrum

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

#3[,T<time>];<Status Byte> <LSB of the transmission counter> <MSB of the transmission counter> <data byte> (...) <data byte>

<time> is the measurement time given in seconds

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

D7	D6	D5	D4	D3	D2	D1	D0

where:

D7 = 0 means that "overload does not happen",
= 1 means that “overload appeared”,
D6 = 0 means that "spectrum is not averaged ",
= 1 means that "spectrum is averaged ",
D4 = 0 the instantaneous current result (RUN State),
= 1 the final result (STOP State),
D3 = 1 results in **1/3 Octave** mode,
D2 = 1 results in **1/1 Octave** mode,
D5, D1, D0 reserved bits.

Note: *ASCII part of the response ends with semicolon “;”. Status byte, transmission counter and data bytes are coded in binary form.*

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

A.5. FUNCTION #4 – SETUP FILE READ-OUT

#4 function enables the user to read-out a file from the internal Flash-disk or RAM memory. The data file formats are given in Appendix B.

#4 function formats are defined as follows:

#4,0,\; file containing the catalogue,
#4,0,?; count of the files,
#4,0,index,count; part of the file containing the catalogue,
where:
index - first record,
count - number of records in the catalogue.

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

words 0 - 3 8 characters of the file name,
word 4 type (binary number),
word 5 reserved,
word 6 least significant word of the file size,
word 7 most significant word of the file size,
words 8 - 15 reserved.

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

#4,4,offset,length; part of current setup file,

where:

offset - offset from the beginning of the current setup file,

length - number of bytes to read,

Note: *The "\" character is treated as the file name of the catalogue and must be sent to the instrument.*

All data words are sent **<LSB>** (least significant byte) first.

When an error is detected in the file specification or data, the instrument responds with:

#4,?;

Note: *Current setup file placed in RAM is serviced by this command in SV 971A only. For data files access see* A.1 **Function #D – data files access***.*

A.6. FUNCTION #5 – STATISTICAL ANALYSIS RESULTS READ-OUT

#5 function enables one to read out the statistical analysis results.

#5 function format is defined as follows:

#5,p;

where:

p - the number of the profile (1, 2 or 3)

The device responds, sending the current classes of the statistics in the following format:

#5,p;<Status Byte> <LSB of the transmission counter> <MSB of the transmission counter> <NofClasses><BottomClass><ClassWidth><Counter of the class> (...) <Counter of the class>

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

D7	D6	D5	D4	D3	D2	D1	D0

where:

D7 = 0 means "overload does not happen",
= 1 means "overload appeared",

D5 = 0 instantaneous current result (RUN State),
= 1 final result (STOP State),

D6, D0 to D4 reserved bits.

Note: *There is no any succeeding transmission in the case when the* ***Status Byte*** *is equal to zero.*

The **transmission counter** is a two-byte word denoting the number of the remaining bytes to be transmitted. Its value is calculated from the formulae:

Transmission counter = 6+n * (4 * the number of the classes in the statistics)

where:

n is a number of the transmitted statistics. For p = 1, 2 or 3 only one statistic is transmitted (n = 1).

NofClasses is a two-byte word denoting the number of classes in the statistic.

BottomClass is a two-byte word denoting the lower limit of the first class (*10 dB).

ClassWidth is a two-byte word denoting the width of the class (*10 dB).

Counter of the class is a four-byte word containing the number of the measurements belonging to the current class.

Note: *The bytes in the words are sent* ***<LSB>*** *(least significant byte) first.*

Note: *ASCII part of the response ends with semicolon ";". Status byte, transmission counter and data bytes are coded in binary form.*

A.7. FUNCTION #7 – SPECIAL CONTROL FUNCTIONS

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

#7 function format is defined as follows.

To read settings a query should be send to the device:

#7,<code>;

where **<code>** is a two ASCII letter code.

The device responds with a control settings:

#7,<code>,set1[,set2[,set3[,...[,setN]]]];

where **<code>** is the same code sent in the query and **set1, set2,... setN** are settings.

To write settings to the device follow the opposite procedure. Send to the device:

#7,<code>,set1[,set2[,set3[,...[,setN]]]];

In case of success the device responds with:

#7,<code>;

In case of an unknown function or error the device returns:

#7,?;

Codes and settings for #7 function are described in the A.3 ***Control setting codes***.

Note: *#7 function protocol consist of ASCII characters only.*

Note: *Some of the #7 functions are blocked during measurements running state (#1,S1;). Stop the measurements (#1,S0;) before changing these settings.*

A.8. FUNCTION #9 – SETUP FILE WRITE-IN

#9 function enables the user to write a configuration file into the instrument's storage or non-volatile memory. The data file formats are given in Appendix B.

#9 function formats are defined as follows:

#9,<FILE_TYPE>,<FILE_LENGTH>,<DATA>

where:

<FILE_TYPE>	type of the file
	2 - setup file (file is saved on SD card; does not change current setup),
	4 - current setup file,
<FILE_LENGTH>	length of the file in bytes,
<DATA>	binary content of the file.

Note: *#9 function is blocked during measurements running state (#1,S1;). Stop the measurements (#1,S0;) before using the function.*

A.1 FUNCTION #D – DATA FILES ACCESS

#D functions are used to access data files in the instrument's storage like microSD card or USB Flash Disc with FAT file system. A basic knowledge of FAT file system is necessary to use these functions.

#D functions take the following parameters:

<disk>	logical disk number: 0 – SD-card, 1 – USB Disk (not implemented), 2 – Internal Memory (not implemented)
<address>	directory address (cluster number),
<offsetB>	offset of the first byte to read (an even number),
<nB>	number of bytes to read (an even number),
<data>	binary data,
<count>	directory size in bytes,
<name>	filename in the format XXXXXXXX.YYY (XXXXXXXX – filename, YYY- filename extension),
<dirName>	directory name,
<nBwr>	number of bytes to write.

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

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

2) **#D,d,?;** this function returns parameters of the working directory in format:

#D,d,<disk>,<address>,<count>;

3) **#D,d,<disk>,<address>;** this function enables to change the working directory.

Response:

#D,d; - command was executed

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

4) **#D,r,<disk>,<address>,<offsetB>,<nB>;** the function enables to read a file from the working directory.

Response:

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

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

Response:

#D,w; - command was executed

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

6) **#D,e,<name>;** function enables to delete a file in working directory.

Response:

#D,e; - command was executed

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

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

Response:

#D,e; - command was executed

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

8) **#D,m,<address>,<dirName>;** function enables to create a subdirectory in the directory defined by <address>.

Response:

#D,m; - command was executed

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

9) **#D,f,<address>;** function enables to delete directory and its contents (files and subdirectories).

Response:

#D,f; - command was executed

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

10) **#D,s,?;** this function returns parameters of the setup directory in format:

#D,s,<disk>,<address>;

11) **#D,i,?;** this function returns parameters of the STIPA function directory in format:

#D,i,<disk>,<address>;

Note: *Only read functions are available during measurements running state (#1,S1;). Stop the measurements (#1,S0;) to unlock all the functions.*

A.2 FUNCTION #S – DIRECT SETUP ACCESS

#S function enables to read/write instrument's settings in a direct manner. Any settings changed by this command affect current setup, are written into non-volatile memory and are available on the next power up.

#S function format is defined as follows.

To read settings a query should be send to the device:

#S[,<code1>[,<code2>[,code3[,...]]]];

where **<codeN>** is a two to four ASCII letter setting code.

The device responds with the control settings:

#S[,<code1>:<set1>[,<code2>:<set2>[,<code3>:<set3>[,...]]]];

where **<codeN>** is the same settings code sent in the query and <**setN>** is a settings value.

To return all settings available send:

#S;

To write settings to the device follow the opposite procedure. Send to the device:

#S,<code1>:<set1>[,<code2>:<set2>[,<code3>:<set3>[,...]]];

In case of success the device responds with the same ASCII string:

#S,<code1>:<set1>[,<code2>:<set2>[,<code3>:<set3>[,...]]];

In case of an error (e.g. settings code does not exist or parameter value is out of range) the device respond with "?" instead of **<setN>** value:

#S,<codeN>:?;

For example if three parameters are set and <set2> is out of range the device response is:

#S,<code1>:<set1>,<code2>:?,<code3>:<set3>;

Codes and settings for #S function are described in the A.3 ***Control setting codes***.

Note: *#S function protocol consist of ASCII characters only.*

Note: *Some of the #S functions are blocked during measurements running state (#1,S1;). Stop the measurements (#1,S0;) before changing these settings.*

A.3 CONTROL SETTING CODES

The control setting codes used in the SV 971A instrument are given in the below tables:

Table A.1 Unit information
Table A.2 Measurements settings and control
Table A.3 Calibration and microphone settings
Table A.4 Profile settings
Table A.5 Spectrum settings
Table A.6 Dosimeter settings
Table A.7 RT60 settings
Table A.8 STIPA settings
Table A.9 Statistical settings
Table A.7 Audio settings
Table A.8 Logger settings
Table A.9 CSV export settings
Table A.10 Programmable pauses (valid only in Dosimeter function)
Table A.11 Audio settings
Table A.12 Logger settings
Table A.13 Display and keyboard settings
Table A.14 Setup settings
Table A.15 Alarms settings (valid only in the Dosimeter function)
Table A.16 General settings
Table A.17 Power settings
Table A.18 Position and time settings
Table A.19 Report printing settings

Notes:

*- function codes marked in green are **read only**!*

*- function codes marked in red are **locked during measurements run state**! Stop measurements before changing these settings.*

*- values in square brackets are **[optional]**!*

- values are written in the form of numbers or in the form of a bit number (prefix 'b') or hexadecimal (prefix '0x') e.g. the b5 is equal to the number 32 = 2^5 or hexadecimal 0x20.

Table A.1 Unit information

Group name	#1 code	#7 code	#S code	Code description
Unit type	U			971
Unit subtype		US		Returns unit subtype. 2 – SV 971A
Serial number	N			xxxxxx
Software version	W			a.bb.c – firmware version a.bb.**0**c – beta firmware version
			AA	abbc - firmware version in hex format
Files system version		FS		a.bb - file system version
PIC version		PI		x.xx - version of auxiliary microcontroller
Hardboot version		VH		x.xx - version of hardboot program
Bootstrap version		VB		x.xx - version of bootstrap program

Table A.2 Measurements settings and control

Group name	#1 code	#7 code	#S code	Code description
Measurement function	M		BB	1 - **Level Meter** 2 - **1/1 Octave** 3 - **1/3 Octave** 4 - **Dosimeter** 102 - **1/1 Octave** & **Dosimeter** 103 - **1/3 Octave** & **Dosimeter** 8 - **RT60** 19 - **STIPA**
Measurement Range	R		BC	1 - **Low** 2 - **Normal**
Measurement state	S			0 - **Stop** 1 - **Start** 2 - **Pause** 4 - **Delay before START** (read only)
Start delay	Y		BD	nn - nn delay given in seconds ∈ (0 ÷ 59) and (60 ÷ 3600) with step 60s
Start synchronization	y		BN	0 - switched off (**OFF**) -1 - synchronization to full second 1 - synchronization to 1 min. 15 - synchronization to 15 min. 30 - synchronization to 30 min. 60 - synchronization to 1 hour.
Integration period	D			0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) nns - nn number in seconds nnm - nn number in minutes

Group name	#1 code	#7 code	#S code	Code description
				nnh - nn number in hours
			BE	0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) 1 - 24 hours 2 - 8 hours 3 - 1 hour 4 - 15 minutes 5 - 5 minutes 6 - 1 minute x ∈ (7 ÷ 65) - (x-6) seconds x ∈ (66 ÷ 124)- (x-65) minutes x ∈ (125÷148)- (x-124) hours 149 - infinity
Repetition number	K		BF	Repetition number of the measurement cycles. 0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) nnnn - nnnn number of repetitions ∈ (1 ÷ 1000)
Detector type in the **LEQ** function	L		BG	0 - **Linear** 1 - **Exponential**
Day time limits		DL	BH	0 - 6h-18h 1 - 7h-19h
Rolling time (1)			BU	nn- nn time in seconds ∈(1 ÷60) nn- nn time in minutes multiplied by 60 ∈(60 ÷3600)
Rolling time (2)			BW	nn- nn time in seconds ∈(1 ÷60) nn- nn time in minutes multiplied by 60 ∈(60 ÷3600)
Exposure Time	e		EA	x - time in minutes ∈ (1 ÷ 720)
Microphone compensation		MC	JD	0 - Off 1 - On
Free field compensation		FF	BT	Free Field compensation. 0 - **Off** 1 - **Free Field** 2 - **Diffuse Field** 3 - **Outdoor Environmental** 4 - **Outdoor Airport**
Windscreen compensation		WD	BP	0 - Off 1 - On
Measure trigger mode	m		FA	0 - **Off** 2 - **Slope+** 3 - **Slope–** 4 - **Level+** 5 - **Level–** 6 - **Gradient+**
Measure trigger level	l		FI	x - level [dB] ∈(24 ÷ 136); default 100dB

Group name	#1 code	#7 code	#S code	Code description
Measure trigger gradient	O		FK	x - gradient [dB] ∈(1 ÷ 100); default 10dB/(trigger period)
Auto-Run		AS		#7,AS,<e>,<HH>,<MM>,<hh>,<mm>,<dW>,<mR>; where: <e> - On (e=1), Off (e=0), <HH> - hour of the measurement start, <MM> -minutes of the measurement start, <hh> - hour of the measurement stop, <mm> -minutes of the measurement stop, <dW> - day of week in which the measurement will be done defined as a sum of flags: b0 - Monday b1 - Tuesday b2 - Wednesday b3 - Thursday b4 - Friday b5 - Saturday b6 - Sunday <mR> - maximum number of the measurement days,
			MR	<e> - On (e=1), Off (e=0)
			MJ	<HH> - hour of the measurement start
			MK	<MM> -minutes of the measurement start
			ML	<hh> - hour of the measurement stop
			MM	<mm> -minutes of the measurement stop
			MN	<dW> - day of week
			MO	<mR> - maximum number of the measurement days

Table A.3 Calibration and microphone settings

Group name	#1 code	#7 code	#S code	Code description
Calibration factor	Q		AJ	nn.nn - calibration factor [dB] represented as real number ∈(-10.00 ÷ 10.00)
Calibration history		CH		#7,CH; Get number of records calibration history. Response format: #7,CH,n; n – number of records calibration history, #7,CH,n; Get n record from calibration history. Response format: #7,CH,n,cT,hh,mm,ss,DD,MM,YYYY,cF,cL; n – record number in the history of calibration,

Group name	#1 code	#7 code	#S code	Code description
				cT – type of calibration: 0 - none, 1 - by measurement, 2 - by sensitivity, 3 - factory calibration, hh:mm:ss – time of calibration, DD/MM/YYYY – date of calibration, cF – calibration factor in dB. cL – calibration level in dB. Response #7,CH,-1; denotes incorrect data in the selected record
Last calibration type			**AF**	Previously performed calibration type 0 - none 1 - By Measurement (manual) 2 - Remote 3 - Factory Calibration 4 - Auto Calibration
Last calibration date and time		**CT**		Function returns calibration date and time in the format: **#7,CT,DD-MM-YYYY,hh:mm:ss;** where **hh:mm:ss** denotes the time and **DD/MM/YYYY** gives the date

			AG	Last calibration date
				d - coded data ∈(0 ÷ 65535)
				Date decoding in C language:
				day = (d & 0x1F);
				month = ((d>>5) & 0x0F);
				year = ((d>>9) & 0x7F) + 2000;

			AH	Last calibration time
				t - t coded time ∈(0 ÷ 65535)
				Time decoding in C language:
				sec = (t%30);
				min = ((t/30)%60);
				hour = (t/1800);
				Note: time resolution is 2 seconds!

Calibration level			**AI**	nnnn - calibration reference level [dB] multiplied by 100
Auto calibration settings		**AC**	**JF**	0 - **Off** 1 - **On**
Post calibration settings			**JA**	0 - **Off** 1 - **Last file** 2 - **Files after last calibration**
Preamplifier TEDs type		**TT**		Returns type of the preamplifier saved in TEDS memory. Where -1 - unknown, 18 - SV18
Preamplifier TEDs serial number		**TS**		Returns serial number of the preamplifier saved in TEDS memory in format.

Group name	#1 code	#7 code	#S code	Code description
				#7,TS,<sn>; Where <sn> - microphone serial number,
Load TEDs		LF		Load TEDS memory.

Table A.4 Profile settings

Group name	#1 code	#7 code	#S code	Code description
Filter type in profile n	F			Fk:n - k filter in profile n k: 1 - **Z** filter, 2 – **A** filter, 3 – **C** filter, 5 – **B**, 6 – **LF** filter n: 1, 2, 3 – profile number: 1, 2 or 3 for function other than Dosimeter n: 4, 5, 6 – profile number: 1, 2 or 3 for Dosimeter function.
			BIn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for function other than Dosimeter.
			EGn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for Dosimeter function.
Peak Filter type in profile n	J			Fk:n - k filter in profile n k: 1 - **Z** filter, 2 – **A** filter, 3 – **C** filter, 5 – **B**, 6 – **LF** filter n: 1, 2, 3 – profile number: 1, 2 or 3 for function other than Dosimeter n: 4, 5, 6 – profile number: 1, 2 or 3 for Dosimeter function.
			BJn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for function other than Dosimeter.
			EHn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for Dosimeter function.
Detector type in profile n	C			Ck:n - k detector in profile n k: 0 - **Impulse**, 1 – **Fast**, 2 – **Slow** n: 1, 2, 3 – profile number: 1, 2 or 3 for function other than Dosimeter n: 4, 5, 6 – profile number: 1, 2 or 3 for Dosimeter function.
			BKn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for function other than Dosimeter.
			EIn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for Dosimeter function.

Table A.5 Spectrum settings

Group name	#1 code	#7 code	#S code	Code description
Filter type in **1/x OCTAVE** analysis	**f**		**BL**	1 - **Z** filter 2 - **A** filter 3 - **C** filter 5 - **B** filter
Detector type in **1/x OCTAVE** analysis	**XB**		**BS**	0 - **Linear** 1 - **Fast** 2 - **Slow**

Table A.6 Dosimeter settings

Group name	#1 code	#7 code	#S code	Code description
Criterion Level	**c**			c1:p - 80 dB c2:p - 84 dB c3:p - 85 dB c4:p - 90 dB c5:p - 60 dB c6:p - 65 dB c7:p - 70 dB c8:p - 75 dB c9:p - 87 dB p: 1, 2, 3 - profile number
			EBn	criterion level in profile n+1, n ∈(0 ÷ 2) 0 - 80 dB 1 - 84 dB 2 - 85 dB 3 - 90 dB 4 - 60 dB 5 - 65 dB 6 - 70 dB 7 - 75 dB 8 - 87 dB
Threshold Level	**h**			h0:p - None h1:p - 70 dB h2:p - 75 dB h3:p - 80 dB h4:p - 85 dB h5:p - 90 dB h6:p - 60 dB h7:p - 65 dB p: 1, 2, 3 - profile number
			ECn	threshold level in profile n+1, n ∈(0 ÷ 2) 0 - None 1 - 70 dB 2 - 75 dB 3 - 80 dB 4 - 85 dB 5 - 90 dB 6 - 60 dB 7 - 65 dB
Exchange Rate	**x**			xk:n - k exchange rate in profile n, k ∈(2 ÷ 6) n: 1, 2, 3 – profile number

Group name	#1 code	#7 code	#S code	Code description
			EDn	k - k exchange rate in profile n+1, n ∈(0 ÷ 2), k ∈(2 ÷ 6)
Threshold level for ULT calculation	XI			xk:n - k threshold level in profile n, k ∈(70 ÷ 140) dB n: 1, 2, 3 – profile number
			EEn	k - k threshold level in profile n+1, n ∈(0 ÷ 2), k ∈(70 ÷ 140) dB
Threshold level for PCT calculation	XC			xk:n - k threshold level in profile n, k ∈(70 ÷ 140) dB n: 1, 2, 3 – profile number
			EFn	k - k threshold level in profile n+1, n ∈(0 ÷ 2), k ∈(70 ÷ 140) dB

Table A.7 RT60 settings

Group name	#1 code	#7 code	#S code	Code description
RT60 Method			VA	1 - **Decay** 2 - **Impulse**
Octave			VG	1 - **1/1 octave** 2 - **1/3 octave**
Frequency Range in 1/1 mode			VH	1 - 63Hz÷4kHz 2 - 63Hz÷16kHz
Frequency Range in 1/3 mode			VI	1 - 50Hz÷5kHz 2 - 50Hz÷20kHz
Recording Time			VB	0 - Auto n - n = time in seconds ∈(1 ÷ 30)
Time Step			VC	0 - **2ms** 1 - **5ms** 2 - **10ms** 3 - **20ms** 4 - **25ms** 5 - **50ms**
Averaging			VD	0 - **Off** 1 - **On**
Smoothing			VE	n - n = graph smoothing factor ∈(1 ÷ 15)
Noise Margin			VF	n - n = Value in dB multiplied by 10 ∈ (0 ÷ 200)

Table A.8 STIPA settings

Group name	#1 code	#7 code	#S code	Code description
Project Name			QR	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')

Group name	#1 code	#7 code	#S code	Code description
Area Name			QS	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Source Name			QX	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Source Level			QZ	x - source calibration level in dB multiple by 10 ∈ (-300 ÷ 300)
Averaging			QT	0 - Manual 1 - Auto
Standard			QU	0 - **60268x2** 1 - **60268x3**
Index			QV	0 - **STI** 1 - **CIS**
Ambient noise			QY	0 - **Off** 1 - **On**

Table A.9 Statistical settings

Group name	#1 code	#7 code	#S code	Code description
Statistical levels		SL		Reading (response from the instrument): #7,SL,<sl1>,<sl2>,<sl3>,<sl4>,<sl5>,<sl6>,<sl7>,<sl8>,<sl9>,<sl10>; Writing: #7,SL,<sl_index>,<sl_level>; This function sets statistical levels where <sl_index> is the statistical index ∈(1 ÷ 10), <sl_level> is the statistical level [%] ∈(1 ÷ 99)
			RA	<sl1> - statistical level 1
			RB	<sl2> - statistical level 2
			RC	<sl3> - statistical level 3
			RD	<sl4> - statistical level 4
			RE	<sl5> - statistical level 5
			RF	<sl6> - statistical level 6
			RG	<sl7> - statistical level 7
			RH	<sl8> - statistical level 8
			RI	<sl9> - statistical level 9
			RJ	<sl10> - statistical level 10

Table A.10 Programmable pauses (valid only in Dosimeter function)

Group name	#1 code	#7 code	#S code	Code description
Pause 1			CA	0 - **Off** 1 - **On**

Group name	#1 code	#7 code	#S code	Code description
Pause 1 - start hour			CB	hour ∈(0 ÷ 23)
Pause 1 - start minute			CC	minute ∈(0 ÷ 59)
Pause 1 - stop hour			CD	hour ∈(0 ÷ 23)
Pause 1 - stop minute			CE	minute ∈(0 ÷ 59)
Pause 2			CF	0 - **Off** 1 - **On**
Pause 2 - start hour			CG	hour ∈(0 ÷ 23)
Pause 2 - start minute			CH	minute ∈(0 ÷ 59)
Pause 2 - stop hour			CI	hour ∈(0 ÷ 23)
Pause 2 - stop minute			CJ	minute ∈(0 ÷ 59)
Pause 3			CK	0 - **Off** 1 - **On**
Pause 3 - start hour			CL	hour ∈(0 ÷ 23)
Pause 3 - start minute			CM	minute ∈(0 ÷ 59)
Pause 3 - stop hour			CN	hour ∈(0 ÷ 23)
Pause 3 - stop minute			CO	minute ∈(0 ÷ 59)
Pause 4			CP	0 - **Off** 1 - **On**
Pause 4 - start hour			CR	hour ∈(0 ÷ 23)
Pause 4 - start minute			CS	minute ∈(0 ÷ 59)
Pause 4 - stop hour			CT	hour ∈(0 ÷ 23)
Pause 4 - stop minute			CU	minute ∈(0 ÷ 59)
Pause 5			CW	0 - **Off** 1 - **On**
Pause 5 - start hour			CV	hour ∈(0 ÷ 23)
Pause 5 - start minute			CX	minute ∈(0 ÷ 59)
Pause 5 - stop hour			CY	hour ∈(0 ÷ 23)
Pause 5 - stop minute			CZ	minute ∈(0 ÷ 59)

Table A.11 Audio settings

Group name	#1 code	#7 code	#S code	Code description
Wave file name			IB	xxxxxxxx – up to 8 characters (permitted characters: 0:9, A:Z, and '_'). Default name "R1"
Last wave file name		LW		a name of a previous wave file
Wave recording mode			IA	0 - Off 1 - continuous 2 - slope+ 3 - Slope– 4 - level+

Group name	#1 code	#7 code	#S code	Code description
				5 - Level– 6 - gradient+ 7 - manual 8 - integration period
Format			IC	0 - PCM 1 - Extensible
Sampling			IE	0 - 48 kHz 1 - 24 kHz 2 - 12 kHz
Filter			ID	1 - **Z** filter 2 - **A** filter 3 - **C** filter 5 - **B** filter
Gain			IO	x - x gain [dB] used in 16 bit mode ∈(0 ÷ 40)
Trigger level			II	x - x level [dB] ∈(24 ÷ 136); default 100dB
Trigger period			IJ	0 - logger step 5 - 0.5 ms 1000 - 100 ms 10000 - 1 s
Trigger gradient			IK	x - x gradient [dB] ∈(1 ÷ 100); default 10dB/(trigger period)
Pre trigger			IL	x - x pre trigger time [s] (default 1s) ∈ (0 ÷ 30) - for 12 kHz sampling (0 ÷ 15) - for 24 kHz sampling (0 ÷ 8) - for 48 kHz sampling
Recording time			IN	x - x recording time [s]; ∈ (1 ÷ 59), (60 ÷ 3600) with 60s steps and (3600 ÷ 28800) with 3600s steps

Table A.12 Logger settings

Group name	#1 code	#7 code	#S code	Code description
Logger file name			DC	xxxxxxxx – up to 8 characters (permitted characters: 0:9, A:Z, and '_'). Default name "L1"
Last logger file name		LB		a name of a previous logger file
Next logger file name		NB		a name of a next logger file
Logger step	d			nn - nn number of milliseconds ∈ (100,200,500) nns - nn number of seconds ∈ (1 ÷ 60) nnm - nn number of minutes ∈ (1 ÷ 60)
			DB	nn - nn number of milliseconds ∈ (100,200,500), (1000 ÷ 60000) with 1000ms steps and (60000 ÷ 3600000) with 60000ms steps
Logger	T		DA	0 - Off 1 - On

Group name	#1 code	#7 code	#S code	Code description
				Note: this setting must be on in order to create a logger data file!
Logger results in profile n	**B**			Bx:n - x – sum of the following flags: b0 - logger with **Lpeak** values in profile n b1 - logger with **Lmax** values in profile n b2 - logger with **Lmin** values in profile n b3 - logger with **Leq** values in profile n b4 - logger with **Lav** values in profile n b5 - logger with **LR1** values in profile n b6 - logger with **LR2** values in profile n n – profile ∈ (1 ÷ 3)
			DDn	x - x logger results in profile n+1, n ∈(0 ÷ 2)
Summary results	**XXE**		**DG**	0 - Off 1 - On *Note: this is a main switch for all summary results.*
1/x Octave analysis results	**b**		**DE**	x - x – sum of the following flags: b0 - logger with **Lpeak** spectrum b3 - logger with **Leq** spectrum
Logger File Splitting Mode	**XA**		**DH**	0 switched off (**OFF**) -1 - file is created for each measurement cycle. 15 - file is created every 15 min, synchronized to RTC. 30 - file is created every 30 min, synchronized to RTC. 60 - file is created every 1 hour, synchronized to RTC. 1440 - file is created on the specified times, see next parameter *Note: for "-1" – integration period must be at least 60s*
Specified Time for Logger File Splitting	**XD**			XDx:n – x = -1 (switched off) x = 0 ÷ 1439 (time in minutes) n = 1 ÷ 6 (specified time number) *Note: valid only if Split Mode is equal to 1440*
			DI	Active split time number x - x – sum of the following flags b0 - split on time number 1 b1 - split on time number 2 b2 - split on time number 3 b3 - split on time number 4 b4 - split on time number 5 b5 - split on time number 6
			DJn	Split hour (0 ÷ 23) for time number n-1, n ∈(0 ÷ 5)

Group name	#1 code	#7 code	#S code	Code description
			DKn	Split minute (0 ÷ 59) for time number n-1, n ∈(0 ÷ 5)
User text			UB	text – to up to 128 characters of user text added each data file. Default text " ". Permitted characters: 0-9, a-z, A-Z, space and the following characters !"#$%&')(*+-./:<=>?@[\]^}_{`|~
Logger trigger mode	XT		GA	0 - Off 4 - level+ 5 - Level–
Logger trigger level	XL		GI	x - level [dB] ∈(24 ÷ 136); default 100dB
Logger pre-trigger	XQ		GL	x - number of the records taken into account before the fulfilment of the triggering condition ∈(0 ÷ 10); default 0
Logger post-trigger	Xq		GM	x - number of the records taken into account after the fulfilment of the triggering condition ∈(0 ÷ 200); default 0

Table A.13 Display and keyboard settings

Group name	#1 code	#7 code	#S code	Code description
Key shift mode			NA	0 - **2nd function** 1 - **Direct**
Make Key Lock			NB	0 - **Off** 1 - **On**
Fast Unlock			NC	0 - **Off** 1 - **On**
Unlock 1st key			ND	1 - **Esc** 2 - **Left** 4 - **Enter** 8 - **Right** 16 - **Down** 32 - **Up**
Unlock 2nd key			NE	1 - **Esc** 2 - **Left** 4 - **Enter** 8 - **Right** 16 - **Down** 32 - **Up**
Unlock 3rd key			NF	1 - **Esc** 2 - **Left** 4 - **Enter** 8 - **Right** 16 - **Down** 32 - **Up**
Unlock 4th key			NG	1 - **Esc** 2 - **Left** 4 - **Enter** 8 - **Right** 16 - **Down**

Group name	#1 code	#7 code	#S code	Code description
				32 - **Up**
Keyboard lock		**KL**		0 - **Unlock** 1 - **Lock**
Files lock		**FL**	**XE**	0 - **Unlock** 1 - **Lock**
Main View Mode			**SG**	0 - **Normal** 1 - **Full** 2 - **Large**
Spectrum View			**SA**	0 - **Off** 1 - **On**
Spectrum View Mode			**SI**	0 - **Normal** 1 - **Full**
3-profiles View			**SB**	0 - **Off** 1 - **On**
3-profiles View Mode			**SH**	0 - **Normal** 1 - **Full**
Statistics View			**SC**	0 - **Off** 1 - **On**
Statistics View Mode			**SJ**	0 - **Normal** 1 - **Full**
Time History View			**SD**	0 - **Off** 1 - **On**
Time History View Mode			**SK**	0 - **Normal** 1 - **Full**
Running SPL View			**SE**	0 - **Off** 1 - **On**
File Info View			**SF**	0 - **Off** 1 - **On**
Display **Time** result in the main and 3-profile views			**OA**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Lpeak** result in the main and 3-profile views			**OB**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Lmax** result in the main and 3-profile views			**OC**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Lmin** result in the main and 3-profile views			**OD**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **L** result in the main and 3-profile views			**OE**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Leq** result in the main and 3-profile views			**OF**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LE** result in the main and 3-profile views			**OG**	0 - Off 1 - On Valid for function other than Dosimeter.

Group name	#1 code	#7 code	#S code	Code description
Display **Lden** result in the main and 3-profile views			**OH**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LEPd** result in the main and 3-profile views			**OI**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Ltm3** result in the main and 3-profile views			**OJ**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Ltm5** result in the main and 3-profile views			**OK**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Ln** result in the main and 3-profile views			**OL**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LR1** result in the main and 3-profile views			**OM**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LR2** result in the main and 3-profile views			**ON**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **EX** result in the main and 3-profile views			**OR**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **SD** result in the main and 3-profile views			**OS**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **OVL** result in the main and 3-profile views			**OO**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Time** result in the main and 3-profile views			**PA**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lpeak** result in the main and 3-profile views			**PB**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lmax** result in the main and 3-profile views			**PC**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lmin** result in the main and 3-profile views			**PD**	0 - Off 1 - On Valid for Dosimeter function.
Display **L** result in the main and 3-profile views			**PE**	0 - Off 1 - On Valid for Dosimeter function.
Display **Dose** result in the main and 3-profile views			**PF**	0 - Off 1 - On Valid for Dosimeter function.

Group name	#1 code	#7 code	#S code	Code description
Display **D_8h** result in the main and 3-profile views			**PG**	0 - Off 1 - On Valid for Dosimeter function.
Display **PrDose** result in the main and 3-profile views			**PQ**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lav** result in the main and 3-profile views			**PH**	0 - Off 1 - On Valid for Dosimeter function.
Display **Leq** result in the main and 3-profile views			**PI**	0 - Off 1 - On Valid for Dosimeter function.
Display **LE** result in the main and 3-profile views			**PJ**	0 - Off 1 - On Valid for Dosimeter function.
Display **SEL8** result in the main and 3-profile views			**PK**	0 - Off 1 - On Valid for Dosimeter function.
Display **E** result in the main and 3-profile views			**PL**	0 - Off 1 - On Valid for Dosimeter function.
Display **E_8h** result in the main and 3-profile views			**PM**	0 - Off 1 - On Valid for Dosimeter function.
Display **LEPd** result in the main and 3-profile views			**PN**	0 - Off 1 - On Valid for Dosimeter function.
Display **PSEL** result in the main and 3-profile views			**PO**	0 - Off 1 - On Valid for Dosimeter function.
Display **Ltm3** result in the main and 3-profile views			**PP**	0 - Off 1 - On Valid for Dosimeter function.
Display **Ltm5** result in the main and 3-profile views			**PR**	0 - Off 1 - On Valid for Dosimeter function.
Display **Ln** result in the main and 3-profile views			**PS**	0 - Off 1 - On Valid for Dosimeter function.
Display **PTC** result in the main and 3-profile views			**PT**	0 - Off 1 - On Valid for Dosimeter function.
Display **PTP** result in the main and 3-profile views			**PU**	0 - Off 1 - On Valid for Dosimeter function.
Display **ULT** result in the main and 3-profile views			**PW**	0 - Off 1 - On Valid for Dosimeter function.

Group name	#1 code	#7 code	#S code	Code description
Display **TWA** result in the main and 3-profile views			**PV**	0 - Off 1 - On Valid for Dosimeter function.
Display **PrTWA** result in the main and 3-profile views			**PY**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lc-a** result in the main and 3-profile views			**PZ**	0 - Off 1 - On Valid for Dosimeter function.
Display **EX** result in the main and 3-profile views			**OT**	0 - Off 1 - On Valid for Dosimeter function.
Display **SD** result in the main and 3-profile views			**OW**	0 - Off 1 - On Valid for Dosimeter function.
Display **OVL** result in the main and 3-profile views			**PX**	0 - Off 1 - On Valid for Dosimeter function.
Graph Y axis for 1/x OCTAVE			**SM**	0 - **10dB** 1 - **20dB** 2 - **40dB** **3 - 80dB** (default) 4 - **120dB**
Graph grid for 1/x OCTAVE			**SN**	0 - **Off** **1 - On** (default)
Spectrum type for 1/x OCTAVE			**SP**	0 - **Averaged** 1 - **Instantaneous** 2 - **Max** **3 - Min** 4 - **Peak**
Spectrum view Min. for 1/x OCTAVE			**SR**	0 - Off 1 - On
Spectrum view Max. for 1/x OCTAVE			**SS**	0 - Off 1 - On
Chart auto-scale			**SO**	0 - Off **1 - On (default)**
Displayed result in the main and 3-profile views (function other then Dosimeter)			**LDn**	x - x result in profile n+1, n ∈(0 ÷ 2) 1 - Time 2 - Lpeak 3 - Lmax 4 - Lmin 5 - LF 6 - Leq 7 - LAE 8 - Lden 9 - LEPd 10 - Ltm3 11 - Ltm5 12 - Ln 13 - LR1 14 - LR2

Group name	#1 code	#7 code	#S code	Code description
				15 - EX 16 - SD 17 - OVL
Displayed result in the main and 3-profile views (Dosimeter function)			**LEn**	x - x result in profile n+1, n ∈(0 ÷ 2) 1 - Time 2 - Lpeak 3 - Lmax 4 - Lmin 5 - LF 6 - Dose 7 - D_8h 8 - PrDOSE 9 - Lav 10 - Leq 11 - LE 12 - SEL8 13 - E 14 - E_8h 15 - LEPd 16 - PSEL 17 - Ltm3 18 - Ltm5 19 - Ln 20 - PTC 21 - PTP 22 - ULT 23 - TWA 24 - PrTWA 25 - Lc-a 26 - EX 27 - SD 28 - SD
Results displayed on the Time history view			**STn**	x - x logger results in profile n+1, n ∈(0 ÷ 2) x – sum of the following flags: b0 - logger with Lpeak values in profile n b1 - logger with Lmax values in profile n b2 - logger with Lmin values in profile n b3 - logger with Leq values in profile n b4 - logger with L values in profile n b5 - logger with LR1 values in profile n b6 - logger with LR2 values in profile n
Display dim mode			**SU**	0 - Off 1 - Level 1 2 - Level 2 (default) **3** - Level 3 4 - Screen Off
Display dim timeout			**SW**	0 - disabled, display stays on all the time nn - timeout [s] for display dim; nn delay given in seconds ∈ (5 ÷ 59) with 1s step and ∈ (60 ÷ 3600) with 60s step; default is 60s *Note: it is not recommended to disable this feature!*

Group name	#1 code	#7 code	#S code	Code description
Display auto rotate			**SV**	0 - Off 1 - On
Colour Scheme			**SX**	0 - Colourful 1 - Black/White
Warning: Logger Off			**TA**	0 - Off 1 - On (default)
Warning: Power Off			**TB**	0 - Off 1 - On (default)
Warning: Preamplifier disconnected			**TC**	0 - Off 1 - On (default)
Warning: Save changes			**TD**	0 - Off 1 - On (default)

Table A.14 Setup settings

Group name	#1 code	#7 code	#S code	Code description
Load setup		**LS**		name - a name of a setup file to be loaded (activated) *Notes:* *- name is given without "svt" extension* *- a setup file must be placed into the SETUP directory of the instrument's SD card prior using this command; see* 0 *or* A.1 *on file upload*
Save setup		**SS**		name - a current instrument setup will be saved as a "name.svt" file in the SETUP directory of the instrument's SD card; 8 characters is a maximum name length *Notes:* *- name is given without "svt" extension*
Clear setup		**CS**		This command restores factory defaults of the instrument. To execute command send #7,CS[,<sel>]; where <sel> is settings selector: 0 - inquiry, clear and ask to save the calibration 1 - TEDS, clear and read TEDs 2 - Memory, 3 - Factory (set factory calibration)
Delete setup		**DS**		name - a name of a setup file to be deleted from the SETUP directory of the instrument's SD card *Notes:* *- name is given without "svt" extension*

Table A.15 Alarms settings (valid only in the Dosimeter function)

Group name	#1 code	#7 code	#S code	Code description
Alarm Dose threshold			**WAn**	threshold in dB for profile n+1, n ∈(0 ÷ 2)
Alarm D_8h threshold			**WDn**	threshold in dB for profile n+1, n ∈(0 ÷ 2)
Alarm PTC threshold			**WBn**	threshold for profile n+1, n ∈(0 ÷ 2)
Alarm ULT threshold			**WCn**	threshold in seconds for profile n+1, n ∈(0 ÷ 2)

Table A.16 General settings

Group name	#1 code	#7 code	#S code	Code description
Interface mode		**IM**	**AE**	0 - **Start/Stop** 1 - **Simple** (default) 2 - **Advanced**
Language		**LA**	**JC**	0 - **English** (default) 1 - **German** 2 - **Spanish** 3 - **French** 4 - **Hungarian** 5 - **Italian** 6 - **Dutch** 7 - **Polish** 8 - **Portuguese** 9 - **Russian** 10 - **Turkish**
Leq & Lav			**JE**	0 - **Both** 1 - **Mutual exclusive**
USB		**UF**	**JG**	0 - USB High Speed (480 MHz) 1 - USB Full Speed (12 MHz) (default)
Serial interface mode		**BT**	**JN**	0 - **RS232** 1 - **Bluetooth**
Bluetooth PIN		**BP**	**JL**	0 - PIN off PIN ∈(1 ÷ 9999)
RS232 Baud Rate			**JH**	7 - 115200 6 - 57600 5 - 38400 4 - 19200 3 - 9600 2 - 4800 1 - 2400 0 - 1200
RS232 Time Out			**JI**	n - n = time in seconds ∈(1 ÷ 60)
Unit Name		**UN**		Up to 12 characters (permitted characters: 0:9, a:z, A:Z, space, and '_').
Display Unit Name		**DN**		k - display unit name on the instruments screen for k seconds
Comment file name			**UA**	Qxxxxxxx – up to 7 characters (permitted characters: 0:9, A:Z, and '_'). Default name "@C1"
SD card: erase disk		**ED**		Erase all files from SD card.

Group name	#1 code	#7 code	#S code	Code description
SD card: version of Fat file system		FT		-1 - SD disk not ready 1 - FAT16 2 – FAT32
SD card: number of sectors		NS		n - number of sectors. *Sector is 512 bytes in size*
SD card: number of free sectors		NF		n - number of free sectors. *Sector is 512 bytes in size*
Measurement files number		BN		n - number of "*.svl" files in the instrument's working directory
Instrument temperature		TP		xx.x - temperature of the instrument [°C]
Microphone temperature		TM		xx.x - temperature of the microphone [°C]
Vibration threshold			JJ	x - vibration threshold in [g]
Instrument orientation		OR		Returns orientation of the device in the format: **#7,OR,x<a.aa>,y<b.bb>,z<c.cc>;** where a.aa - gravitational acceleration in [g] for axes x b.bb - gravitational acceleration in [g] for axes y c.cc - gravitational acceleration in [g] for axes z
SPL on stop		LL		Reading (response from the instrument): #7,LL,<L1>; where <L1> - L value from profile 1 in [dB] *Notes: function is not available during measurements.*
Station status		II		This function provides cumulative station status. Reading (response from the instrument): #7,II,[L1],Fx<flags>,B<bat>,D<disk>; where <L1> - L value from profile 1 in [dB] (on STOP only) <flags> - station status flags defined in hexadecimal format as a sum of the following flags: b0 - measurements are running, b1 - pause is active, b2 - programed pause id active, b5 - USB power supply is present, <bat> - battery relative state of charge [%] <disk> - SD card occupation [%]

Table A.17 Power settings

Group name	#1 code	#7 code	#S code	Code description
Battery type			JB	0 - **Alkaline** 1 - **Rechargeable**
Power status		BS		To read settings send #7,BS;. Response: #7,BS,<bat>;

Group name	#1 code	#7 code	#S code	Code description
				where <bat>: 1 ÷ 100 – battery state in [%] -1 - external USB power supply
Battery voltage		**BV**		volt - battery voltage [mV] multiplied by 10;
USB voltage		**UV**		volt - USB voltage [mV] multiplied by 10;
Power off		**PO**		Power off the instrument.
Reset		**XR**		Hardware reset of the instrument (power off and on).
Automatic power off			**JK**	0 - disabled, display stays on all the time nn - timeout [s] for instrument power off; nn delay given in seconds ∈ (300 ÷ 3600) with 60s step and ∈ (3600 ÷ 14400) with 3600s step; **default is 14400s** *Note: instrument automatically power off only if doesn't measurement!* *Automatic power off is blocked when instrument is powered from USB supply*

Table A.18 Position and time settings

Group name	#1 code	#7 code	#S code	Code description
Set GPS marker		**MG**		#7,MG,p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12,p13,p14,p15,p16,p17,p18,p19,p20; All parameters are optional. where: p1 – signal quality, p1 = 0 - no signal, p1 = 1 - GPS fix, p2 – Seconds part of time, p3 – Minutes part of time, p4 – Hours part of time, p5 – Day, p6 – Month, p7 – Year, p8 – Degree part of latitude, p9 – Minutes part of latitude, p10 – Seconds part of latitude, p11 – Milliseconds part of latitude, p12 – Latitude direction: N, S, p13 – Degree part of longitude, p14 – Minutes part of longitude, p15 – Seconds part of longitude, p16 – Milliseconds part of longitude, p17 – Longitude direction: E, W, p18 – Altitude in meters, p19 – Decimal part of altitude, p20 – Speed * 100 (km/h),
Real Time Clock (RTC)		**RT**		Current instrument's date/time settings.

Group name	#1 code	#7 code	#S code	Code description
				Reading (response from the instrument): #7,RT,<hour>,<min>,<sec>,<day>,<month>,<year>; Writing: #7,RT,<hour>,<min>,<sec>,<day>,<month>,<year>; where <hour> - hour ∈ (0 ÷ 23) <min> - min ∈ (0 ÷ 59) <sec> - sec ∈ (0 ÷ 59) <day> - day ∈ (1 ÷ 31) <month> - hour ∈ (1 ÷ 12) <year> - hour ∈ (2000 ÷ 2099)

Table A.19 Report printing settings

Group name	#1 code	#7 code	#S code	Code description
Print data from profiles			**QAn**	k - k print in profile n+1, n ∈(0 ÷ 2), 0 - Off 1 - On
Print profile results			**QB**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print statistics			**QC**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Aver spectrum			**DD**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Max spectrum			**QE**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Min spectrum			**QF**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Peak spectrum			**QG**	0 - **Off** 1 - **All results** 2 - **Selected results**
Printer chars per line			**QH**	n ∈(20 ÷ 500)
Units			**QJ**	0 - **Off** 1 - **Print**
Print **Lpeak** profiles result			**QK1**	0 - Off 1 - On
Print **Lmax** profiles result			**QK2**	0 - Off 1 - On
Print **Lmin** profiles result			**QK3**	0 - Off 1 - On

Group name	#1 code	#7 code	#S code	Code description
Print **L** profiles result			**QK4**	0 - Off 1 - On
Print **Dose** profiles result			**QK5**	0 - Off 1 - On
Print **D_h8** profiles result			**QK6**	0 - Off 1 - On
Print **PrDose** profiles result			**QK7**	0 - Off 1 - On
Print **Lav** profiles result			**QK8**	0 - Off 1 - On
Print **Leq** profiles result			**QK9**	0 - Off 1 - On
Print **LE** profiles result			**QL1**	0 - Off 1 - On
Print **SEL8** profiles result			**QL2**	0 - Off 1 - On
Print **E** profiles result			**QL3**	0 - Off 1 - On
Print **E_8h** profiles result			**QL4**	0 - Off 1 - On
Print **Lden** profiles result			**QL5**	0 - Off 1 - On
Print **LEPd** profiles result			**QL6**	0 - Off 1 - On
Print **PSEL** profiles result			**QL7**	0 - Off 1 - On
Print **Ltm3** profiles result			**QL8**	0 - Off 1 - On
Print **Ltm5** profiles result			**QL9**	0 - Off 1 - On
Print **PTC** profiles result			**QM1**	0 - Off 1 - On
Print **PTP** profiles result			**QM2**	0 - Off 1 - On
Print **ULT** profiles result			**QM3**	0 - Off 1 - On
Print **TWA** profiles result			**QM4**	0 - Off 1 - On
Print **PrTWA** profiles result			**QM5**	0 - Off 1 - On
Print **Lc-a**profiles result			**QM6**	0 - Off 1 - On
Print **LR1** profiles result			**QM7**	0 - Off 1 - On
Print **LR2** profiles result			**QM8**	0 - Off 1 - On
Print **OVL** profiles result			**QN1**	0 - Off 1 - On
Print **EX** profiles result			**QN2**	0 - Off 1 - On

Group name	#1 code	#7 code	#S code	Code description
Print **SD** profiles result			**QN3**	0 - Off 1 - On
Print statistics			**QOn**	k - print statistic for statistical level n, 0 - Off 1 - On n ∈(0 ÷ 9),
Print **20Hz** octave result			**QP1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **25Hz** octave result			**QP2**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **31.5Hz** octave result			**QP3**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **40Hz** octave result			**QP4**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **50Hz** octave result			**QP5**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **63Hz** octave result			**QP6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **80Hz** octave result			**QP7**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **100Hz** octave result			**QP8**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **125Hz** octave result			**QP9**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **160Hz** octave result			**QR1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **200Hz** octave result			**QR2**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **250Hz** octave result			**QR3**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **315Hz** octave result			**QR4**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **400Hz** octave result			**QR5**	0 - Off 1 - On Valid for 1/3 Octave function.

Group name	#1 code	#7 code	#S code	Code description
Print **500Hz** octave result			**QR6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **630Hz** octave result			**QR7**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **800Hz** octave result			**QR8**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **1kHz** octave result			**QR9**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **1.25kHz** octave result			**QS1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **1.6kHz** octave result			**QS2**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **2kHz** octave result			**QS3**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **2.5kHz** octave result			**QS4**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **3.15kHz** octave result			**QS5**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **4kHz** octave result			**QS6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **5kHz** octave result			**QS7**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **6.3kHz** octave result			**QS8**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **8kHz** octave result			**QS9**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **10kHz** octave result			**QT1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **12.5kHz** octave result			**QT2**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **16kHz** octave result			**QT3**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.

Group name	#1 code	#7 code	#S code	Code description
Print **20kHz** octave result			**QT4**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **total A** result			**QT5**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **total C** result			**QT6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **total Z** result			**QT7**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.

APPENDIX B. DATA FILE STRUCTURES

B.1 GENERAL STRUCTURE OF THE SV 971A FILES

Each file containing data from the SV 971A instrument consists of several groups of words. In the case of SV 971A (the internal file system rev. **1.05**), there are two different types of files containing:

- the results stored in the file in the instrument's logger (cf. App. B.2);
- setup data (cf. App. B.3).

Each file has the following elements:

- SvanPC file header (cf. Tab. B.1.1);
- file header (cf. Tab. B.1.2);
- unit and internal software specification (cf. Tab. B.1.3);
- calibration settings (cf. Tab. B.1.4);
- user's text (a header) stored together with the measurement data (cf. Tab. B.1.5);
- parameters and global settings, common for all profiles (cf. Tab. B.1.6);
- parameters for measurement trigger (cf. Tab. B.1.7);
- parameters for logger trigger (cf. Tab. B.1.8);
- parameters for Wave-file recording (cf. Tab. B.1.9);
- special settings for profiles (cf. Tab. B.1.10);
- display settings of the main results (cf. Tab. B.1.11);
- header of the statistical analysis (cf. Tab. B.1.12);
- header of the file from the logger (cf. Tab. B.1.13);
- contents of the file from the logger (cf. Tab. B.1.14);
- parameters for RT60 analysis (cf. Tab. B.1.22);
- parameters for STIPA analysis (cf. Tab. B.1.25).

Other elements of the file structure are not obligatory for each file type stated above. They depend on the file type (**SLM**, **Dosimeter**, file from the logger) and on the setting of the **FULL STAT.** These elements are as follows:

- Header of the Summary Results Record (saved in Summary Results Record) (cf. Table B.1.15);
- main results (saved in Summary Results Record) (cf. Tab. B.1.16_SLM, B.1.16_DM);
- statistical levels (saved in Summary Results Record) (cf. Tab. B.1.17);
- 1/1 Octave analysis results (saved in Summary Results Record) (cf. Tab. B.1.18);
- 1/3 Octave analysis results (saved in Summary Results Record) (cf. Tab. B.1.19);
- results of the statistical analysis (saved in Summary Results Record) (cf. Tab. B.1.20);
- settings of the instrument saved in the setup file (cf. Tab. B.1.21);
- results of the RT60 analysis (cf. Tab. B.1.23, B.1.24);
- results of the STIPA analysis (cf. Tab. B.1.26, B.1.27);
- file-end-marker (cf. Tab. B.1.30).

Below, all file structure groups are described separately in Tab. B.1.1 – Tab. B.1.23. The format used in the columns, named **Comment** with the square parenthesis ([xx, yy]), means the contents of the word with; **xx** is the most significant byte (MSB) and **yy** the lowest significant byte (LSB) of the word. The format 0xnnnn means that the nnnn is four-digit number in hexadecimal form.

Table B.1.1. SvanPC file header

Word number	Name	Comment
0..2	“SvanPC”	reserved
3	26	reserved
4	32	reserved
5	73	reserved
6..15	reserved	reserved
…	…	…

Table B.1.2. File header

Word number	Name	Comment
0	0xnn01	[01, nn=header’s length]
1..4	FileName	name of the file (8 characters)
5	reserved	reserved
6	CurrentDate	file creation date (cf. App. B.4)
7	CurrentTime	file creation time (cf. App. B.4)
8..13	reserved	reserved
…		…

Table B.1.3. Unit and software specification

Word number	Name	Comment
0	0xnn02	[02, nn=specification’s length]
1	UnitNumberL	unit number (LSB word)
2	UnitType	type of the unit: 971 – **SV 971A**
3	SoftwareVersion	software version: 105
4	SoftwareIssueDate	software issue date
5	DeviceMode	mode of the instrument
6	UnitSubtype	subtype of the unit: 2 – **SV 971A**
7	FileSysVersion	file system version: 105
8	reserved	reserved
9	SoftwareSubversion	software subversion: 01
10	UnitNumberH	unit number (MSB word)
11	PreNumberL	preamplifier number (LSB word)
12	PreNumberH	preamplifier number (MSB word)
…		…

Table B.1.4. Calibration settings

Word number	Name	Comment
0	0xnn47	[47, nn=header's length]
1	PreCalibrType	type of calibration performed prior to measurement: 0 - none 1 - **By Measurement** (manual) 2 - **Remote** 3 - **Factory Calibration** 4 - **Auto Calibration**
2	PreCalibrDate	date of calibration performed prior to measurement (cf. App. B.4)
3	PreCalibrTime	time of calibration performed prior to measurement (cf. App. B.4)
4	PreCalibrFactor	factor (*100 dB) of calibration performed prior to measurement
5	PreCalibrLevel	level (*100 dB) of calibration performed prior to measurement
6	PostCalibrType	type of calibration performed prior to measurement: 0 - none 1 - **By Measurement** (manual) 2 - **Remote** 3 - **Factory Calibration** 4 - **Auto Calibration** 0xFFFF - **Calibration not performed**
7	PostCalibrDate	date of calibration performed after the measurement (cf. App. B.4)
8	PostCalibrTime	time of calibration performed after the measurement (cf. App. B.4)
9	PostCalibrFactor	factor (*100 dB) of calibration performed after the measurement
10	PostCalibrLevel	level (*100 dB) of calibration performed after the measurement
…	…	…

Table B.1.5. USER's text

Word number	Name	Comment
0	0xnn03	[03, nn=specification's length]
1…	title text	user's text (two characters in a word) finished with one or two null bytes

Table B.1.6. Parameters and global settings

Word number	Name	Comment
0	0xnn04	[04, nn=block's length]
1	MeasureStartDate	measure start date (cf. App. B.4)
2	MeasureStartTime	measure start time (cf. App. B.4)
3	DeviceFunction	device function: 1 - **Sound Level Meter**, 2 - **1/1 Octave**, 3 - **1/3 Octave**,

		4 - **Dosimeter** 102 - **1/1 Octave** & **Dosimeter**, 103 - **1/3 Octave** & **Dosimeter**, 8 - **RT60** 19 - **STIPA**
4	MeasureInput	measurement input type: 2 - **Microphone**
5	Range	measurement range: 1 - **Low** 2 - **Normal**
6	UnitFlags	calibration flags: b0 - if set to 1: calibration coefficient is used b3 - if set to 1: overload occurred b7,b6,b5: type of the result **Lden** 000 – **Lden** result is not available 001 – **Ld** result 010 – **Le** result 011 – **Lde** result 100 – **Ln** result 101 – **Lnd** result 110 – **Len** result 111 – **Lden** result B9 - if set to 1: preamplifier disconnected
7	RepCycle	repetition cycle: 0 - infinity nnnn - number of repetitions $\in(1 \div 1000)$
8	NofChannel	number of channels (1)
8	NofProf	number of profiles (3)
10	StartDelay	start delay time
11..12	IntTimeSec	integration time specified in seconds
13	InterfaceMode	user interface mode: 0 - **Start/Stop**, 1 - **Simple**, 2 - **Advanced**
14	LeqInt	detector's type in the **Leq** function: **0 - Linear,** 1 - **Exponential**
15	SpectrumFilter	1/1 or 1/3 Octave analysis filter: 1 - **Z**, 2 - **A**, 3 - **C** 5 - **B** in other cases: Reserved
16	SpectrumBuff	1/1 or 1/3 Octave logger: sum of the following flags: 1 - logger with **Lpeak** values 8 - logger with **Leq** values in other cases: reserved
17	ExposureTime	exposure time: 1..720 (min)

18	Leq & Lav	method of viewing results Leq and Lav 0 - **Both** 1 - **Mutually exclusive (**visibility depends of the EXCHANGE RATE parameter**)**
19	MicComp	compensating filter for microphones: 0 - switched off, 1 - switched on
20	SpectrumRMSDetector	spectrum RMS detector type: 0 - **LINEAR**, 1 - **Fast**, 2 - **Slow**
21	Reserved	reserved
22	CriterionLevel[0]	1st profile criterion level (only **Dosimeter**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
23	ThresholdLevel[0]	1st profile threshold level (only **Dosimeter**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
24	ExchangeRate[0]	1st profile exchange rate (only **Dosimeter**): 2, 3, 4, 5, 6
25	CriterionLevel[1]	2nd profile criterion level (only **Dosimeter**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
26	ThresholdLevel[1]	2nd profile threshold level (only **Dosimeter)**: 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
27	ExchangeRate[1]	2nd profile exchange rate (only **Dosimeter**): 2, 3, 4, 5, 6
23	CriterionLevel[2]	3rd profile criterion level (only **Dosimeter**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
29	ThresholdLevel[2]	3rd profile threshold level (only **Dosimeter**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
30	ExchangeRate[2]	3rd profile exchange rate (only **Dosimeter**): 2, 3, 4, 5, 6
31	MainResBuff	Summary results. Contents defined as a sum of: 0 - none 1 - **Main Results** 2 - **Spectrum** 4 - **Spectrum MAX** 8 - **Spectrum MIN** 16 - **Spectrum PEAK** 32 - **Statistical levels** 64 - **Statistical analysis in profiles** 128 - **Statistical analysis in 1/1 or 1/3 Octave mode**
32	StartSync	synchronization the start of measurement with RTC 0 - switched off -1 - synchronization to **1 sec** 1 - synchronization to **1 min** 15 - synchronization to **15 min** 30 - synchronization to **30 min** 60 - synchronization to **1 hour**.
33	reserved	reserved
34	Windscreen	Windscreen compensation:

		0 - off. 1 - on.
35	FieldCompensation	Field Compensation: 0 – Off 1 – Free Field 2 – Diffuse Field 3 – Outdoor Environmental 4 – Outdoor Airport
36	UL Th. Level[0]	1st profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
37	UL Th. Level[1]	2nd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
38	UL Th. Level[2]	3rd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
39	PEAK Th. Level[0]	1st profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
40	PEAK Th. Level[1]	2nd profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
41	PEAK Th. Level[2]	3rd profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
42	SplitMode	logger files splitting mode: 0 - off. -1 - The file is created for each measurement cycle. 15 - The file is created every 15 min synchronized to RTC. 30 - The file is created every 30 min synchronized to RTC. 60 - The file is created every 1 hour synchronized to RTC. 1440 - The file is created on the specified times.
43	SplitTime[1]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
44	SplitTime[2]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
45	SplitTime[3]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
46	SplitTime[4]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
47	SplitTime[5]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
48	SplitTime[6]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
49	Pause[1]	programmable pause no. 1.
50	PauseBegin[1]	start time of the pause no. 1 in format 0xhhmm hh – hour mm – minute
51	PauseEnd[1]	end time of the pause no. 1 in format 0xhhmm: hh – hour

		mm – minute
52	Pause[2]	programmable pause no. 2.
53	PauseBegin[2]	start time of the pause no. 2 in format 0xhhmm hh – hour mm – minute
54	PauseEnd[2]	end time of the pause no. 2 in format 0xhhmm: hh – hour mm – minute
55	Pause[3]	programmable pause no. 3.
56	PauseBegin[3]	start time of the pause no. 3 in format 0xhhmm hh – hour mm – minute
57	PauseEnd[3]	end time of the pause no. 3 in format 0xhhmm: hh – hour mm – minute
58	Pause[4]	programmable pause no. 4.
59	PauseBegin[4]	start time of the pause no. 4 in format 0xhhmm hh – hour mm – minute
60	PauseEnd[4]	end time of the pause no. 4 in format 0xhhmm: hh – hour mm – minute
61	Pause[5]	programmable pause no. 5.
62	PauseBegin[5]	start time of the pause no. 5 in format 0xhhmm hh – hour mm – minute
63	PauseEnd[5]	end time of the pause no. 5 in format 0xhhmm: hh – hour mm – minute
64..65	MeasureStartTimeMS	measure start time in ms (cf. App. B.4)
66	RollLeq1	Rolling time (1) in seconds
67	RollLeq2	Rolling time (2) in seconds
…		

Table B.1.7. Measurement trigger parameters

Word number	Name	Comment
0	0xnn2B	[2B, nn=block's length]
1	TriggerMode	trigger mode: 0 - **Off**, 2 - measurement on trigger **Slope+** 3 - measurement on trigger **Slope–** 4 - measurement on trigger **Level+** 5 - measurement on trigger **Level–** 6 - measurement on trigger **Gradient+**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLevel	level of triggering: 24 ÷ 136 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms (*10)

5	TriggerPre	reserved
6	TriggerPost	reserved
7	TriggerSampling	reserved
8	TriggerRecTime	reserved
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	reserved
11	BitsPerSample	reserved
12	Range	reserved
13	Gain	reserved
14	LengthLimit	reserved
…		

Table B.1.8. Logger trigger parameters

Word number	Name	Comment
0	0xnn2C	[2C, nn=block's length]
1	TriggerMode	trigger mode: 0 - **Off**, 4 - measurement on trigger **Level+**, 5 - measurement on trigger **Level–**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLev	level of triggering: 24 ÷ 136 dB (*10)
4	TriggerGrad	reserved
5	TriggerPre	number of the records taken into account before the fulfilment of the triggering condition ∈(1 ÷ 10)
6	TriggerPost	number of the records taken into account after the fulfilment of the triggering condition ∈(1 ÷ 200)
7	TriggerSampling	reserved
8	TriggerRecTime	reserved
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	reserved
11	BitsPerSample	reserved
12	Range	reserved
13	Gain	reserved
14	LengthLimit	reserved
…		

Table B.1.9. Wave-file recording parameters

Word number	Name	Comment
0	0xnn2D	[2D, nn=block's length]
1	TriggerMode	trigger mode: 0 - **Off**, 1 - recording whole measurement 2 - recording on trigger **Slope+** 3 - recording on trigger **Slope–** 4 - recording on trigger **Level+** 5 - recording on trigger **Level–** 6 - recording on trigger **Gradient+** 7 - recording on trigger **Manual**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLevel	level of triggering: 24 ÷ 136 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms (*10)
5	TriggerPre	pretrigger time given in 10ms
6	TriggerPost	reserved
7	TriggerSampling	sampling frequency given in 10Hz
8	TriggerRecTime	recording time of single data block: 0 - recording to the end of measurement 1..28800 (sec)
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	filter type: 1 - **Z**, 2 - **A**, 3 - **C** 5 - **B**
11	BitsPerSample	bits/sample: 16
12	Range	full scale signal range in 0.01dB
13	Gain	signal gain in dB
14	LengthLimit	wave file length limit in minutes
…		

Table B.1.10. Special settings for profiles

Word number	Name	Comment
0	0xnn05	[05, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm06	[06, mm=sub-block's length]

3	DetectorP[1]	detector type in the 1st profile: 0 - **Imp.**, 1 - **Fast**, 2 - **Slow**
4	FilterP[1]	filter type in the 1st profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
5	BufferP[1]	logger contents in the 1st profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxvmax[2] 4 - Lxvmin[2] 8 - Lxveq[23] 16 - **LAV** 32 - **LR1** 64 – **LR2**
6	FilterPeakP[1]	filter type for Peak result calculation in the 1st profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
7	reserved	reserved
8	0xmm06	[06, mm=sub-block's length]
9	DetectorP[2]	detector type in the 2nd profile: 0 - **Imp.**, 1 - **Fast**, 2 - **Slow**
10	FilterP[2]	filter type in the 2nd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
11	BufferP[2]	logger contents in the 2nd profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxvmax[2] 4 - Lxvmin[2] 8 - Lxveq[23] 16 - **LAV** 32 – **LR1** 64 – **LR2**

12	FilterPeakP[2]	filter type for Peak result calculation in the 2nd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
13	reserved	reserved
14	0xmm06	[06, mm=sub-block's length]
15	DetectorP[3]	detector type in the 3rd profile: 0 - **Imp.**, 1 - **Fast**, 2 - **Slow**
16	FilterP[3]	filter type in the 3rd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
17	BufferP[3]	logger contents in the 3rd profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxymax[2] 4 - Lxymin[2] 8 - Lxyeq[23] 16 - **LAV** 32 – **LR1** 64 – **LR2**
18	FilterPeakP[3]	filter type for Peak result calculation in the 3rd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
19	reserved	reserved
…		

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.11. Display settings of the main results

Word number	Name	Comment
0	0xnn48	[48, nn=header's length]
1	TIME	0 – TIME result not displayed, 1 - TIME result displayed
2	Lpeak	0 – Lxpeak[1] result not displayed, 1 – Lxpeak[1] result displayed
3	Lmax	0 – Lxymax[2] result not displayed, 1 – Lxymax[2] result displayed
4	Lmin	0 – Lxymin[2] result not displayed, 1 – Lxymin[2] result displayed
5	L	0 – Lxy[2] result not displayed, 1 – Lxy[2] result displayed
6	DOSE	0 – DOSE result not displayed, 1 - DOSE result displayed
7	D_8h	0 – D_8h result not displayed, 1 - D_8h result displayed
8	LAV	0 – LAV result not displayed, 1 - LAV result displayed
9	Leq	0 – Lxyeq[23] result not displayed, 1 – Lxyeq[23] result displayed
10	LE	0 – LxyE[23] result not displayed, 1 - LxyE[23] result displayed
11	SEL8	0 – SEL8 result not displayed, 1 - SEL8 result displayed
12	E	0 – E result not displayed, 1 – E result displayed
13	E_8h	0 – E_8h result not displayed, E_8h 1 - result displayed
14	Lden	0 – Lden result not displayed, 1 - Lden result displayed
15	LEPd	0 – LEPd result not displayed, 1 - LEPd result displayed
16	PSEL	0 – PSEL result not displayed, 1 - PSEL result displayed
17	Ltm3	0 – Ltm3 result not displayed, 1 - Ltm3 result displayed
18	Ltm5	0 – Ltm5 result not displayed, 1 - Ltm5 result displayed
19	Ln	0 – Ln result not displayed, 1 - Ln result displayed
20	PTC	0 – PTC result not displayed, 1 - PTC result displayed
21	PTP	0 – PTP result not displayed, 1 - PTP result displayed
22	ULT	0 – ULT result not displayed, 1 - ULT result displayed
23	TWA	0 – TWA result not displayed, 1 - TWA result displayed
24	PrDOSE	0 – PrDOSE result not displayed, 1 - PrDOSE result displayed
25	PrTWA	0 – PrTWA result not displayed, 1 - PrTWA result displayed
26	LR1	0 – LR1 result not displayed, 1 - LR1 result displayed
27	LR2	0 – LR2 result not displayed, 1 – LR2 result displayed
28	LCA	0 – Lc-a result not displayed, 1 – Lc-a result displayed
29	OVL	0 – OVL result not displayed, 1 - OVL result displayed
30	LeqLF	0 – LeqLF result not displayed, 1 - LeqLF result displayed
…	…	…

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.12. Header of the statistical analysis

Word number	Name	Comment
0	0xnn09	[09, nn=block's length]
1	0x0307	[03=number of profiles, 07=active profiles mask]
2	0xmm0A	[0A, mm=sub-block's length]

3	NofClasses[1]	number of classes in the first profile (120)
4	BottomClass[1]	bottom class boundary (*10 dB) in the first profile
5	ClassWidth[1]	class width (*10 dB) in the first profile
6	0xmm0A	[0A, mm=sub-block's length]
7	NofClasses[2]	number of classes in the second profile (120)
8	BottomClass[2]	bottom class boundary (*10 dB) in the second profile
9	ClassWidth[2]	class width (*10 dB) in the second profile
10	0xmm0A	[0A, mm=sub-block's length]
11	NofClasses[3]	number of classes in the third profile (120)
12	BottomClass[3]	bottom class boundary (*10 dB) in the third profile
13	ClassWidth[3]	class width (*10 dB) in the third profile
…	…	…

Table B.1.13. Header of the file from the logger

Word number	Name	Comment
0	0xnn0F	[0F, nn=header's length]
1	BuffTSec	logger time step - full seconds part
2	BuffTMilisec	logger time step - milliseconds part
3	LowestFreq	lowest 1/1 Octave or 1/3 Octave frequency (*100 Hz)
4	NOctTer	number of 1/1 Octave or 1/3 Octave results
5	NOctTerTot	number of TOTAL values
6..7	BuffLength	logger length (bytes)
8..9	RecsInBuff	number of records in the logger
10..11	RecsInObserv	number of records in the observation period equal to: number of records in the logger + number of records not saved
12..13	AudioRecords	number of audio records in the logger
…	…	…

Note: *The current logger time step in seconds can be obtained from the formulae:*

T = BuffTSec + BuffTMillisec / 1000

Table B.1.14. Contents of the file from the logger

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

Table B.1.15. Header of the Summary Results Record (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn59	[59, nn=header's length]
1..2	RecNumber	Summary Results Record number: 1..
…	…	…

Table B.1.16_SLM. Main results in the SLM mode (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	L_{xpeak}^{1} value in the 1st profile (*100 dB)
6	Result[1][2]	L_{xyE}^{23} value in the 1st profile (*100 dB)
7	Result[1][3]	maximal value (L_{xymax}^{2}) in the 1st profile (*100 dB)
8	Result[1][4]	minimal value (L_{xymin}^{2}) in the 1st profile (*100 dB)
9	Result[1][5]	L_{xy}^{2} value in the 1st profile (*100 dB)
10	Result[1][6]	L_{xyeq}^{23} value in the 1st profile (*100 dB)
11	Result[1][7]	**Lden** value in the 1st profile (*100 dB)
12	Result[1][8]	**Ltm3** value in the 1st profile (*100 dB)
13	Result[1][9]	**Ltm5** value in the 1st profile (*100 dB)
14	Result[1][10]	**LR1** value in the 1st profile (*100 dB)
15	Result[1][11]	**LR2** value in the 1st profile (*100 dB)
16	UnderRes[1]	under-range value in the 1st profile
17..18	ULTime[1]	reserved
19..20	PTC[1]	reserved
21	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
22	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
23	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
24	0xmm08	[08, mm=sub-block's length]
25..26	OVL	overload time
27	Result[2][1]	L_{xpeak}^{1} value in the 2nd profile (*100 dB)
28	Result[2][2]	L_{xyE}^{23} value in the 2nd profile (*100 dB)
29	Result[2][3]	maximal value (L_{xymax}^{2}) in the 2nd profile (*100 dB)
30	Result[2][4]	minimal value (L_{xymin}^{2}) in the 2nd profile (*100 dB)
31	Result[2][5]	L_{xy}^{2} value in the 2nd profile (*100 dB)

32	Result[2][6]	Lxveq[23] value in the 2nd profile (*100 dB)
33	Result[2][7]	**Lden** value in the 2nd profile (*100 dB)
34	Result[2][8]	**Ltm3** value in the 2nd profile (*100 dB)
35	Result[2][9]	**Ltm5** value in the 2nd profile (*100 dB)
36	Result[2][10]	**LR1** value in the 2nd profile (*100 dB)
37	Result[2][11]	**LR2** value in the 2nd profile (*100 dB)
38	UnderRes[2]	under-range value in the 2nd profile
39..40	ULTime[2]	reserved
41..42	PTC[2]	reserved
43	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
44	EX[2]	**EX** (Expected Value) in the 2nd profile (*100 dB)
45	SD[2]	**SD** (Standard Deviation) in the 2nd profile (*100 dB)
46	0xmm08	[08, mm=sub-block's length]
47..48	Reserved	reserved
49	Result[3][1]	Lxpeak[1] value in the 3rd profile (*100 dB)
50	Result[3][2]	LxyE[23] value in the 3rd profile (*100 dB)
51	Result[3][3]	maximal value (Lxymax[2]) in the 3rd profile (*100 dB)
52	Result[3][4]	minimal value (Lxymin[2]) in the 3rd profile (*100 dB)
53	Result[3][5]	Lxy[2] value in the 3rd profile (*100 dB)
54	Result[3][6]	Lxveq[23] value in the 3rd profile (*100 dB)
55	Result[3][7]	**Lden** value in the 3rd profile (*100 dB)
56	Result[3][8]	**Ltm3** value in the 3rd profile (*100 dB)
57	Result[3][9]	**Ltm5** value in the 3rd profile (*100 dB)
58	Result[3][10]	**LR1** value in the 2nd profile (*100 dB)
59	Result[3][11]	**LR2** value in the 2nd profile (*100 dB)
60	UnderRes[3]	under-range value in the 3rd profile
61..62	ULTime[3]	reserved
63..64	PTC[3]	reserved
65	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
66	EX[3]	**EX** (Expected Value) in the 3rd profile (*100 dB)
67	SD[3]	**SD** (Standard Deviation) in the 3rd profile (*100 dB)
…	…	…

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)

[2] x - depends of the filter type in selected profile: A, C, Z, B (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)

[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.16_DM. Main results in Dosimeter mode (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	Lxpeak[1] value in the 1st profile (*100 dB)
6	Result[1][2]	LxvE[23] value in the 1st profile (*100 dB)
7	Result[1][3]	maximal value (Lxvmax[2]) in the 1st profile (*100 dB)
8	Result[1][4]	minimal value (Lxvmin[2]) in the 1st profile (*100 dB)
9	Result[1][5]	Lxv[2] value in the 1st profile (*100 dB)
10	Result[1][6]	Lxveq[23] value in the 1st profile (*100 dB)
11	Result[1][7]	Lc-a (LCeq-LAeq) value (*100 dB)
12	Result[1][8]	**Ltm3** value in the 1st profile (*100 dB)
13	Result[1][9]	**Ltm5** value in the 1st profile (*100 dB)
14	Result[1][10]	**LAV** value in the 1st profile (*100 dB)
15	Result[1][11]	**TLAV** value in the 1st profile (*100 dB)
16	UnderRes[1]	under-range value in the 1st profile
17..18	ULTime[1]	**ULT** value in the 1st profile (sec.)
19..20	PTC[1]	**PTC** value in the 1st profile
21	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
22	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
23	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
24	0xmm08	[08, mm=sub-block's length]
25..26	OVL	overload time
27	Result[2][1]	Lxpeak[1] value in the 2nd profile (*100 dB)
28	Result[2][2]	LxvE[23] value in the 2nd profile (*100 dB)
29	Result[2][3]	maximal value (Lxvmax[2]) in the 2nd profile (*100 dB)
30	Result[2][4]	minimal value (Lxvmin[2]) in the 2nd profile (*100 dB)
31	Result[2][5]	Lxv[2] value in the 2nd profile (*100 dB)
32	Result[2][6]	Lxveq[23] value in the 2nd profile (*100 dB)
33	Result[2][7]	reserved
34	Result[2][8]	**Ltm3** value in the 2nd profile (*100 dB)
35	Result[2][9]	**Ltm5** value in the 2nd profile (*100 dB)
36	Result[2][10]	**LAV** value in the 2nd profile (*100 dB)
37	Result[2][11]	**TLAV** value in the 2nd profile (*100 dB)

38	UnderRes[2]	under-range value in the 2nd profile
39..40	ULTime[2]	**ULT** value in the 2nd profile (sec.)
41..42	PTC[2]	**PTC** value in the 2nd profile
43	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
44	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
45	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
46	0xmm08	[08, mm=sub-block's length]
47..48	Reserved	reserved
49	Result[3][1]	Lxpeak[1] value in the 3rd profile (*100 dB)
50	Result[3][2]	LxvE[23] value in the 3rd profile (*100 dB)
51	Result[3][3]	maximal value (Lxvmax[2]) in the 3rd profile (*100 dB)
52	Result[3][4]	minimal value (Lxvmin[2]) in the 3rd profile (*100 dB)
53	Result[3][5]	Lxv[2] value in the 3rd profile (*100 dB)
54	Result[3][6]	Lxveq[23] value in the 3rd profile (*100 dB)
55	Result[3][7]	reserved
56	Result[3][8]	**Ltm3** value in the 3rd profile (*100 dB)
57	Result[3][9]	**Ltm5** value in the 3rd profile (*100 dB)
58	Result[3][10]	**LAV** value in the 3rd profile (*100 dB)
59	Result[3][11]	**TLAV** value in the 3rd profile (*100 dB)
60	UnderRes[3]	under-range value in the 3rd profile
61..62	ULTime[3]	**ULT** value in the 3rd profile (sec.)
63..64	PTC[3]	**PTC** value in the 3rd profile
65	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
66	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
67	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
…	…	…

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.17. Statistical levels (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn17	[17, nn=block's length]
1	0xpprr	[pp=used_profile, rr=profile's mask]
2	N_stat_level	number of statistical levels = N

3+i*(pp+1)	nn[i]	number of the **Ln** statistics; i=0..N-1
3+i*(pp+1)+p	**Lnn**[i,p]	value of the **Ln** statistics for profile p (p=1..pp) (*100 dB)
…	…	…

Table B.1.18. 1/1 Octave analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn0E, 0xnn26, 0xnn27, 0xnn30	[block_id, nn=block_length] 0xnn0E - averaged spectrum results, 0xnn26 - min. spectrum results, 0xnn27 - max. spectrum results 0xnn30 - peak spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	lowest 1/1 Octave frequency (*100 Hz): 3150
3	NOct	number of 1/1 Octave values: 10
4	NOctTot	number of **TOTAL** values: 3
5÷20	Octave[i]	1/1 Octave[i] value (*100 dB); i=1÷NOct+NoctTot (1÷13)
…	…	…

Table B.1.19. 1/3 Octave analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn10, 0xnn28, 0xnn29, 0xnn32	[block_id, nn=block_length] 0xnn10 - averaged spectrum results, 0xnn28 - min. spectrum results, 0xnn29 - max. spectrum results 0xnn32 - peak spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	lowest 1/3 Octave frequency (*100 Hz): 2000
3	NTer	number of 1/3 Octave values: 31
4	NTerTot	number of TOTAL values: 3
5÷50	Tercje[i]	1/3 octave[i] value (*100 dB); i=1÷NTer+NTerTot (1÷34)
…	…	…

Table B.1.20. Results of the statistical analysis in profiles (saved in Summary Results Record)

Word number	Name	Comment
0	0x010B	[0B, prof_mask#1]
1	SubblockLength	2 * number of classes in the first profile + 2
2..3	Histogram[1][1]	first counter in the first profile
4..5	Histogram[1][2]	second counter in the first profile
.....	.....	.....
0	0x020B	[0B, prof_mask#2]
1	SubblockLength	2 * number of classes in the second profile + 2
2..3	Histogram[2][1]	first counter in the second profile
4..5	Histogram[2][2]	second counter in the second profile
.....	.....	.....
0	0x040B	[0B, prof_mask#3]
1	SubblockLength	2 * number of classes in the third profile + 2
2..3	Histogram[3][1]	first counter in the third profile
4..5	Histogram[3][2]	second counter in the third profile
.....	.....	.....

Table B.1.21. Setup file

Word number	Name	Comment
0	0x0020	[20, 00=block's length in the second word]
1	BlockLength	length of the block
2..BlockLength-1	SetupTextData	saved setup values

Table B.1.22. RT60 parameters

Word number	Name	Comment
0	0xnn1A	[1A, nn=block's length]
1	ResultsType	type of results in block 1B: 1 - results, 2 - averaged results
2	Method	calculation method: 1 - **Decay**, 2 - **Impulse**
3	Spectrum	type of spectrum: 1 - **1/1 Octave**, 2 - **1/3 Octave**
4	TimeStep	logger time step in milliseconds

5	MeasureTime	measure time in seconds
6		reserved
7	DispSmooth	smoothing parameter (0 means no smoothing)
8	NoiseMargin	noise margin level (*10 dB)
9	Reserved	reserved
10	AverNo	number of averaged results
...		

Table B.1.23. RT60 results

Word number	Name	Comment
0	0x001B	[1B, 00= block's length in the second word]
1	BlockLength	length of the block
2	LowestFreq	lowest **1/3 Octave** frequency (*100 Hz)
3	NTer	Number of **1/3 Octave** values
4	NTotal	Number of **TOTAL** values
5	N1_rt60_freq	first frequency
6	N2_rt60_freq	last frequency
7+i	calculated[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
8+i	EDT[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
9+i	RT20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
10+i	RT30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
11+i	RT_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
12+i	Cor_EDT[i]	reserved
13+i	Cor_RT20[i]	reserved
14+i	Cor_RT30[i]	reserved
15+i	Cor_RT_user[i]	reserved
...		reserved

Table B.1.24. RT60 averaged results

Word number	Name	Comment
0	0x001C	[1C, 00= block's length in the second word]
1	BlockLength	length of the block
2	LowestFreq	lowest 1/3 Octave frequency (*100 Hz)
3	NTer	number of 1/3 Octave values
4	NTotal	number of TOTAL values
5	N1_rt60_freq	first frequency
6	N2_rt60_freq	last frequency
7+i	calculated[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
8+i	EDT[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
9+i	RT20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
10+i	RT30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
11+i	RT_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
12+i	N_EDT[i]	number of averaging for the EDT[i]
13+i	N_RT20[i]	number of averaging for the RT20[i]
14+i	N_RT30[i]	number of averaging for the RT30[i]
15+i	N_RT_user[i]	number of averaging for the RT_user[i]
...		reserved

Table B.1.25. STIPA parameters

Word number	Name	Comment
0	0x0063	[63, 00= block's length in the second word]
1	BlockLength	length of the block
2	Standard	standard: 0 – IEC 60268-16x2, 1 – IEC 60268-16x3
3	Averaging	averaging type: 0 – Manual, 1 – Auto
4	N	project name length
5..	ProjectName[N]	project name

5+N	M	area name length
6+N..	AreaName[M]	area name
6+N+M	PointId	point Id
7+N+M	K	source name length
8+N+M..	SourceName[K]	source name
8+N+M+K	CalibrLevel	Calibration factor level (*10 dB)
…		reserved

Table B.1.26. STIPA results

Word number	Name	Comment
0	0x0061	[61, 00= block's length in the second word]
1	BlockLength	length of the block
2	STI	STI result (*100)
3	LAeq	LAeq result (*100 dB)
4	LCeq	LCeq result (*100 dB)
5	N	STIPA analysis frequency count
6	LZeq[1]	LZeq result for the first frequency (*100 dB)
7	Err1[1]	error flag of m(f1) for the first frequency (0,1)
8	Mf1[1]	result of m(f1) for the first frequency (*100 dB)
9	Err2[1]	error flag of m(f2) for the first frequency (0,1)
10	Mf2[1]	result of m(f2) for the first frequency (*100 dB)
i*5+1	LZeq[i]	LZeq result for the next frequency (*100 dB)
i*5+2	Err1[i]	error flag of m(f1) for the next frequency (0,1)
i*5+3	Mf1[i]	result of m(f1) for the next frequency (*100 dB)
i*5+4	Err2[i]	error flag of m(f2) for the next frequency (0,1)
i*5+5	Mf2[i]	result of m(f2) for the next frequency (*100 dB)
N*5+6	Flags	bit 0 – underrange flag bit 1 – overload flag
N*5+7	STI-Measured	STI result not including Ambient Noise
…		reserved

Table B.1.27. STIPA noise results

Word number	Name	Comment
0	0x0062	[62, 00= block's length in the second word]
1	BlockLength	length of the block
2	N	STIPA analysis frequency count
3..	Distortion[N]	STIPA distortion table (*100 dB)
…		reserved

Table B.1.24. File-end-marker

Word number	Name	Comment
0	0xFFFF	file end marker

B.2 STRUCTURE OF THE FILE CONTAINING RESULTS FROM LOGGER'S FILE

SvanPC file header - cf. Tab. B.1.1.
File header - cf. Tab. B.1.2.
Unit and software specification - cf. Tab. B.1.3.
Calibration settings - cf. Tab. B.1.4.
User's text - cf. Tab. B.1.5.
Parameters and global settings - cf. Tab. B.1.6.
Measurement trigger settings - cf. Tab. B.1.7.
Logger trigger settings - cf. Tab. B.1.8.
Wave-file recording parameters - cf. Tab. B.1.9.
Special settings for profiles - cf. Tab. B.1.10.
Display settings of the main results - cf. Tab. B.1.11.
Header of the statistical analysis - cf. Tab. B.1.12.
Header of the file from the logger - cf. Tab. B.1.13.
Contents of the file from the logger - cf. Tab. B.1.14. and the description in B.2.1.
RT60 parameters – cf. Tab. B.1.22
STIPA parameters – cf. Tab. B.1.25

B.2.1. The contents of the files in the logger

The records with the results and the records with the state of the markers as well as the records with the breaks in the results registration are saved in the files in the logger. All results are written in dB*100.

B.2.1.1. Record with the results

The contents of the record with the results depends on the selected measurement function and the value set in the **Logger** position of the **Profile x** and **Spectrum** sub-lists. The following elements can be present (in the given sequence):

(1) flag record

< flags > :

b0: 1- the overload detected, 0 - the overload not detected
b1: 1- the excessive self-vibration detected, 0 - the excessive self-vibration overload not detected

(2) results of the measurement from the first profile if the corresponding **LOGGER** position was active *(paths: Measurement / Logging / Logger Res. / Prof. 1*); up to seven words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result2> - Lxymax[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result3> - Lxymin[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result4> - Lxyeq[2,3] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result5> - **LAV** result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result6> - **LR1** result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result7> - **LR2** result, depending on the value of BufferP[1] (cf. Tab. B.1.10)

(3) results of the measurement from the second profile if the corresponding **LOGGER** position was active *(paths: Measurement / Logging / Logger Res. / Prof. 2*); up to five words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result2> - Lxymax[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result3> - Lxymin[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result4> - Lxyeq[2,3] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result5> - **LAV** result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result6> - **LR1** result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result7> - **LR2** result, depending on the value of BufferP[2] (cf. Tab. B.1.10)

(4) results of the measurement from the third profile if the corresponding **LOGGER** position was active *(paths: Measurement / Logging / Logger Res. / Prof. 3*); up to five words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result2> - Lxymax[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result3> - Lxymin[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result4> - Lxyeq[2,3] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result5> - **LAV** result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result6> - **LR1** result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result7> - **LR2** result, depending on the value of BufferP[3] (cf. Tab. B.1.10)

1	x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
2	x - depends of the filter type in selected profile: A, C, Z, B (cf. Tab. B.1.10) y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
3	y - only for exponential detector's type (cf. Tab. B.1.6)

(5) results of **1/1 Octave** analysis or **1/3 Octave** analysis if **1/1 Octave** analysis or **1/3 Octave** analysis was selected as the measurement function and the **Logger** was active *(paths: Measurement / Logging / Logger Res. / Peak Sp. [√] and Leq Sp. [√]*); the sequence of words is written:

<Octave Peak[1]> <Octave Peak [2]> ... <Octave Peak [Noct+NOctTot]> <Octave Leq[1]> <Octave Leq[2]> ... <Octave Leq[NOct+NOctTot]>

where:

Octave Peak[i] - the result of **1/1 Octave** or **1/3 Octave** Peak analysis (*100 dB); i = 1..NOct+NOctTot

Octave Leq[i] - the result of **1/1 Octave** or **1/3 Octave** Leq analysis (*100 dB); i = 1..NOct+NOctTot

B.2.1.2. Record with the state of the markers

The record with the state of the markers consists of one word:

<0x8nnn>

in which 12 bits nnn denote the state of the markers:

b11 = state of #12 marker

b10 = state of #11 marker

...

b1 = state of #2 marker

b0 = state of #1 marker

B.2.1.3. Record with the breaks in the results registration

The record with the breaks in the results registration consists of four words:

<0xB0ii> <0xB1jj> <0xB2kk> <0xB3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter of left or skipped records: nnkkjjii (ii is the least significant byte, nn – the most significant byte).

B.2.1.4. Record with the breaks account PAUSE in the results registration

The record with the breaks in the results registration consists of four words:

<0xA0ii> <0xA1jj> <0xA2kk> <0xA3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter duration of PAUSE in milliseconds:

nnkkjjii (ii is the least significant byte, nn - the most significant byte).

B.2.1.5. Record with the wave file name

The record with the wave file name consists of six words:

<0xC2aa>

<0xccbb>

<0xeedd>

<0xggff>

<0xiihh>

<0xCAaa>

in which:

aa - size of records,

bb cc dd ee ff gg hh ii - 8-bytes name of wave file name

B.2.1.6. Record with Summary Results

The format of the data frame is as follows:

HS	L (optional)	D	L (optional)	HE

where:

HS starting header (1 word)
L length of the block (field is optional and occurs only when b7..b0 in header are set to zero)
D Summary Data:
- Main results (cf. Tab. B.1.17_SLM, B.1.17_DM)
- Statistical levels (optional, cf. Tab. B.1.18)
- 1/1 Octave analysis results (optional, cf. Tab. B.1.19)
- 1/3 Octave analysis results (optional, cf. Tab. B.1.20)
- The results of the statistical analysis in profiles (optional, cf. Tab. B.1.21)

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

The HEADER format is as follows:

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

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:

0 - HS

1 - HE

b10 - 0

b9 - 1

b8 - 1

b15÷b8 – HS (0xC3), HE (0xCB)
b7÷b0 – length of the block (if zero length of the block is saved in additional word L)

B.2.1.8. Record with name of the comment file

The format of the data frame is as follows:

HS	D	HE

where:

HS starting header (1 word)
D The full name of the comment file (e.g. “REC62.WAV”).
HE ending header (1 word), which differs from the HS only on b11 bit (thanks to it, it is possible to analyse the recorded file starting from its end)

The HEADER format is as follows:

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

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:
0 - HS
1 - HE
b10 - 1
b9 - 0
b8 - 0
b15÷b8 – HS (0xC4), HE (0xCC)
b7÷b0 – length of the block

B.2.1.9. Record with GPS data

The value equal to -12288 (0xd000) denotes the undefined value.

Word number	Name
0	0xC703
1	Length
2	Quality
3	Time.Sec
4	Time.Min
5	Time.Hour
6	Date.Day
7	Date.Month
8	Date.Year
9	Latitude.Deg
10	Latitude.Min
11	Latitude.Sec
12	Latitude.MiliSec
13	Latitude.Dir
14	Longitude.Deg
15	Longitude.Min
16	Longitude.Sec
17	Longitude.MiliSec
18	Longitude.Dir
19	Altitude
20	Altitude.10
21	Speed
22	Length
23	0xCF03
…	…

B.3 STRUCTURE OF THE SETUP FILE

SvanPC file header - cf. Tab. B.1.1.
File header - cf. Tab. B.1.2.
Unit and software specification - cf. Tab. B.1.3.
Setup data - cf. Tab. B.1.23.
File-end-marker - cf. Tab. B.1.24.

B.4 DATE AND TIME

Following function written in C explain how the date and time are coded:

```
void ExtractDateTime(int date, unsigned int time, int dt[])
{
      dt[0] = time % 30;                  /* sec */
      dt[1] = (time/30) % 60;             /* min */
      dt[2] = time/1800;                  /* hour */

      dt[3] = date & 0x001F;              /* day */
      dt[4] = (date>>5) & 0x000F;         /* month */
      dt[5] = ((date>>9) & 0x007F) + 2000;      /* year */
}
```

APPENDIX C. TECHNICAL SPECIFICATIONS

C.1 SPECIFICATION OF SV 971A AS SOUND LEVEL METER (SLM)

C.1.1 Specification of SV 971A as SLM in the standard configuration

Statement of performance

SV 971A working as SLM with all listed below accessories meets requirements of IEC 61672-1:2013 for the Class 1 Group X instruments.

Configuration of the complete SLM

SV 971A	sound level meter and analyser comprising:
SV 18A	microphone preamplifier
ACO 7152	prepolarised free-field microphone (1/2", typical sensitivity 32 mV/Pa, polarization 0 V)

Recommended calibrator:

SV 36	Class 1 sound calibrator 94/114 dB@1000 Hz or equivalent (not included in the standard set)

Accessories included in the SV 971A instrument set

SC 158	USB-C cable
SA 22	windscreen

Accessories available

SV 36	Class 1 sound calibrator: 94/114 dB@1000 Hz
SP 75	RS232 interface option
SA 271A	outdoor microphone kit

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 %), two rolling Leq (**LR1** and **LR2**). Definitions for above mentioned parameters are given in Appendix D.

Additional functions

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

Normal operating mode

SV 971A in configuration with the **SV 18A** microphone preamplifier and **ACO 7152** microphone with following settings: measurement range **- Normal** or **Low** (path: <Menu> / Measurement / Range – see Chapter 4.6), **Microphone** compensation - **On**, **Field Compensation** - **Free Field**, **Windscreen** compensation - **Off** (path: <Menu> / Measurement / Compensation Filter – see Chapter 4.7).

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 preamplifier.

Electrical substitute for the microphone To obtain an electrical input, the microphone must be replaced by an microphone electrical equivalent impedance ST 03 with 18 pF@100kOhm ± 10%.

Note: *For acoustic conformance tests with the installed SA 22 windscreen, the* ***Windscreen*** *compensation must be* ***On****.*

Periodical test upper frequency 8 kHz

Linear operating ranges

Two measuring ranges are available: **Normal** and **Low**.

The starting point at which tests of level linearity shall begin is 94.0 dB for the frequencies specifies below. For the **Low** measurement range and A weighting linearity test at 31.5 Hz, the starting point is 79 dB.

Table C.1.1. Linear operating ranges for the **Normal** measurement range (for the sinusoidal signal and microphone sensitivity 32 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	27	97	27	120	27	134	34	137	27	97	27	120	27	134	30	100	53	137
500 Hz	27	133	27	136	27	137	34	137	27	133	27	136	27	137	30	136	53	140
1 kHz	27	137	27	137	27	137	34	137	27	137	27	137	27	137	30	140	53	140
4 kHz	27	138	27	136	27	136	34	137	27	138	27	136	27	136	30	141	53	139
8 kHz	27	136	27	134	27	134	34	137	27	136	27	134	27	134	30	139	53	137
12.5 kHz	27	132	27	131	27	131	34	137	27	132	27	131	27	131	30	135	53	134

Table C.1.2. Linear operating ranges for the **Low** measurement range (for the sinusoidal signal and microphone sensitivity 32 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	24	83	24	106	24	120	32	123	24	83	24	106	24	120	27	86	50	123
500 Hz	24	119	24	122	24	123	32	123	24	119	24	122	24	123	27	122	50	126
1 kHz	24	123	24	123	24	123	32	123	24	123	24	123	24	123	27	126	50	126
4 kHz	24	124	24	122	24	122	32	123	24	124	24	122	24	122	27	127	50	126
8 kHz	24	122	24	120	24	120	32	123	24	122	24	120	24	120	27	125	50	123
12.5 kHz	24	118	24	117	24	117	32	123	24	118	24	117	24	117	27	121	50	120

Note: *For the 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:* $A_n = 137 - 20\log\left(n/\sqrt{2}\right)$, *where A is the upper limit for the sinusoidal signal*

Example: For the crest factor n = 10 the upper limit is A10 = 120 dB

Measuring ranges

Reference measuring range of the acoustic pressure — **Normal**

Measuring frequency range of the acoustic pressure (-3 dB) — 5 Hz ÷ 20 000 Hz.

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

Weighting filters (see Chapter C.3)

Z meeting requirements of the IEC 61672-1:2013 standard for the Class 1 "**Z**" filter
A meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 "**A**" filter
B meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 "**B**" filter
C meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 "**C**" filter

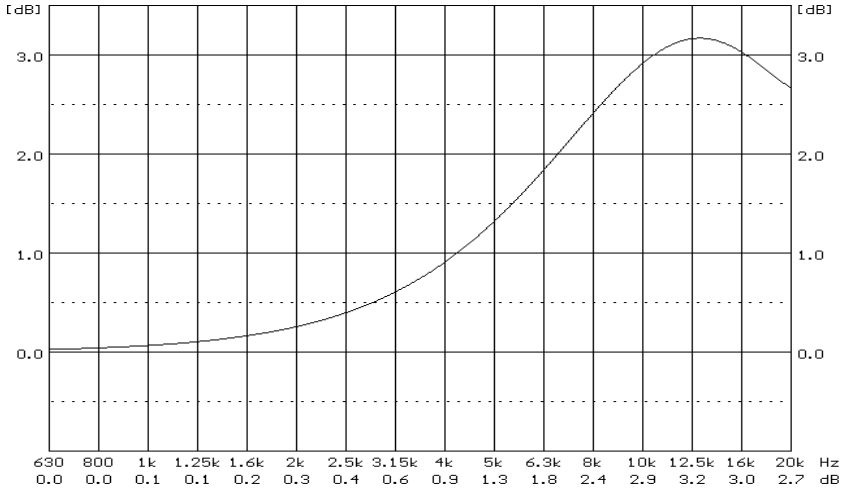
Table C.1.3. Self-generated noise for different weighting filters

	Electrical *)			Acoustical compensated		
Weighting filter / Range	A	C	Z	A	C	Z
Low	< 12 dB	< 12 dB	< 20 dB	< 17 dB	< 17 dB	< 23 dB
Normal	< 16 dB	< 16 dB	< 23 dB	< 20 dB	< 20 dB	< 27 dB

*) measured with the **ST 03** microphone equivalent impedance **18 pF@100kOhm ± 10%**

Special filters

- **Diffuse Field** — compensation filter that improves the complete instrument frequency response in the diffuse acoustic field (see below)
- **Windscreen** — compensation filter that improves the instrument frequency response in the free acoustic field when windscreen SA 22 is mounted on the microphone (see Chapter C.1.2)



SV 971A Diffuse Field compensation filter

Note: *Using special filters might change the frequency response and measuring ranges of SV 971A. Please check the below given specification.*

Linear operating ranges for LEQ measurements with the **Diffuse Field** filter

The starting point at which tests of level linearity shall begin is 94.0 dB for the frequencies specifies below. For the **Low** measurement range and A weighting linearity test at 31.5 Hz, the starting point is 79 dB.

Table C.1.4. Linear operating ranges for the **Normal** measurement range for the **Diffuse Field** filter (for the sinusoidal signal and microphone sensitivity in the range 32 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	28	97	28	120	28	134	35	137	28	97	28	120	28	134	31	100	53	137
500 Hz	28	133	28	136	28	137	35	137	28	133	28	136	28	137	31	136	53	140
1 kHz	28	137	28	137	28	137	35	137	28	137	28	137	28	137	31	140	53	140
4 kHz	28	138	28	136	28	136	35	137	28	138	28	136	28	136	31	141	53	139
8 kHz	28	136	28	134	28	134	35	137	28	136	28	134	28	134	31	139	53	137
12.5 kHz	28	132	28	131	28	131	35	137	28	132	28	131	28	131	31	135	53	134

Table C.1.5. Linear operating ranges for the **Low** measurement range for the **Diffuse Field** filter (for the sinusoidal signal and microphone sensitivity in the range 32 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	25	83	25	106	25	120	33	123	25	83	25	106	25	120	28	86	50	123
500 Hz	25	119	25	122	25	123	33	123	25	119	25	122	25	123	28	122	50	126
1 kHz	25	123	25	123	25	123	33	123	25	123	25	123	25	123	28	126	50	126
4 kHz	25	124	25	122	25	122	33	123	25	124	25	122	25	122	28	127	50	126
8 kHz	25	122	25	120	25	120	33	123	25	122	25	120	25	120	28	125	50	123
12.5 kHz	25	118	25	117	25	117	33	123	25	118	25	117	25	117	28	121	50	120

RMS detector

- Digital — "True RMS" with Peak detection,
- Resolution — 0.1 dB
- Range — 327.7 dB
- Crest Factor — unlimited (for signals in 20 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 Class 1, Equivalent Time Constant 1000 ms
Fast	"**F**" according to IEC 61672 Class 1, Equivalent Time Constant 125 ms
Impulse	"**I**" according to IEC 60804 Class 1, 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 hPa
- Reference incidence direction — perpendicular to the microphone diaphragm.

Calibration

Acoustical **-** with the SV 36 sound calibrator (or equivalent):

- Calibration level for the pressure field — 114.0 dB (equal to the calibrator pressure Level – see calibration chart of the used calibrator)
- Calibration level for the free field and 0 deg incidence angle — 114.0 dB (equal to the calibration level for the pressure field minus free field correction of ACO 7152 at 1000 Hz – see Table C.1.6)

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	20 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
Nominal delay between operating of the **<Start>** (Reset) key and beginning of a new measurement	≥ 1 sec
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 instruments. 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.

The instrument produces greatest radio-frequency emission when an extension cable is connected. The cable placed as a solenoid may produce unexpected emission depending on its physical dimensions. Any configuration w/o extension cable reduces emission below 30 dBuV/m.

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

ACO 7152	1/2" prepolarised free-field microphone
Typical sensitivity	32 mV/Pa (corresponding to -30 dBV/Pa re 1 V/Pa)
Capacitance	18 pF
Reference point	geometric centre of the microphone diaphragm

Note: *Maximum level of sound pressure level, which can be affect the microphone without destruction the microphone: 155 dB.*

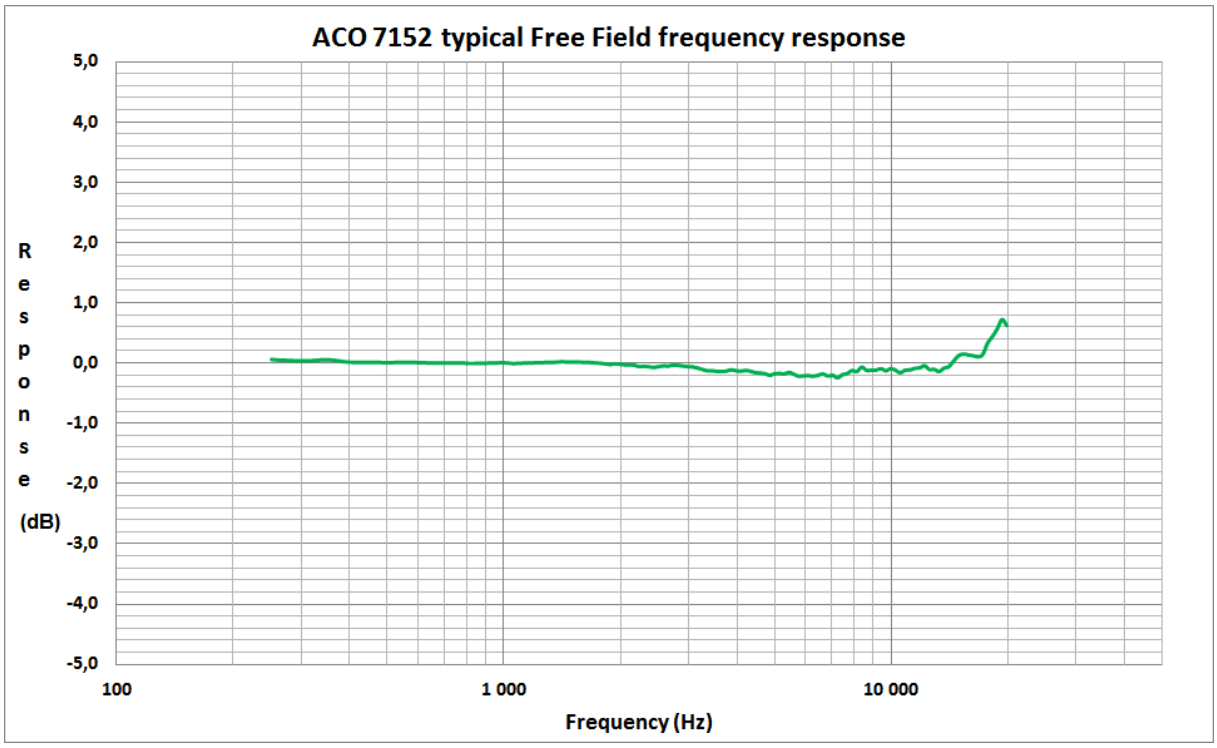


Table C.1.6. ACO 7152 Free Field correction for the electrostatic actuator and 0 deg incidence angle

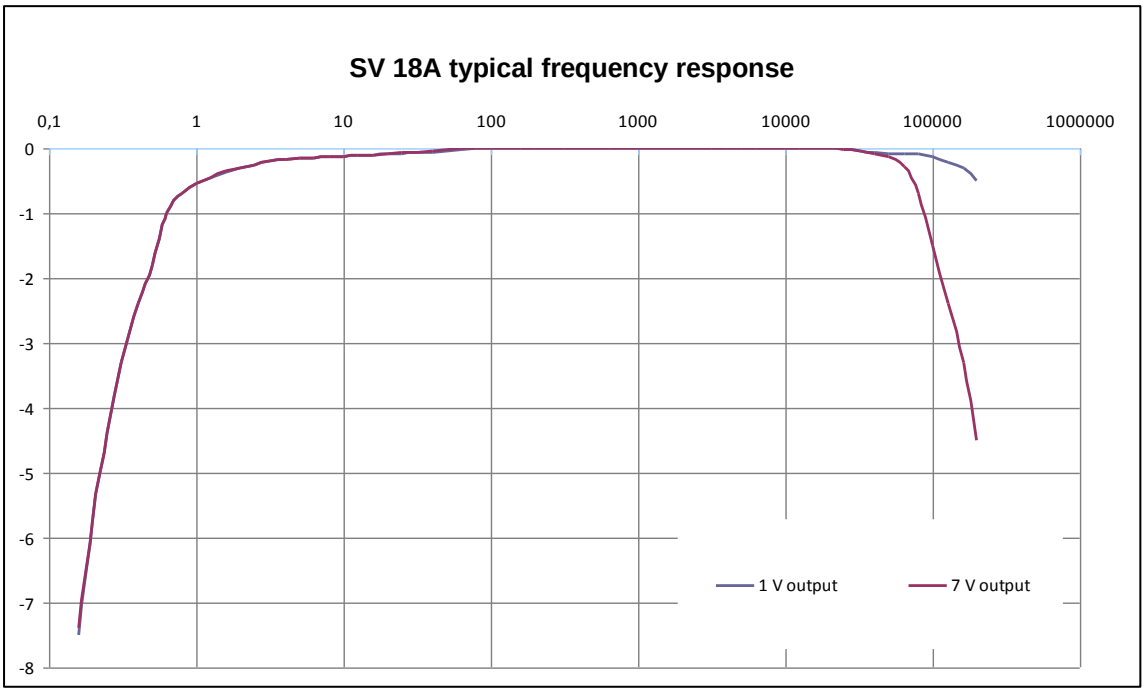
[dB]	Frequency [Hz]																
	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800
Correction factors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.05	0.04	0.04	0.04	0.06
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

[dB]	Frequency [Hz]													
	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
Correction factors	0.11	0.16	0.23	0.28	0.44	0.63	0.91	1.35	1.96	2.95	4.22	5.87	8.38	11.60
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.35	0.35	0.35	0.35	0.50	0.50	0.50

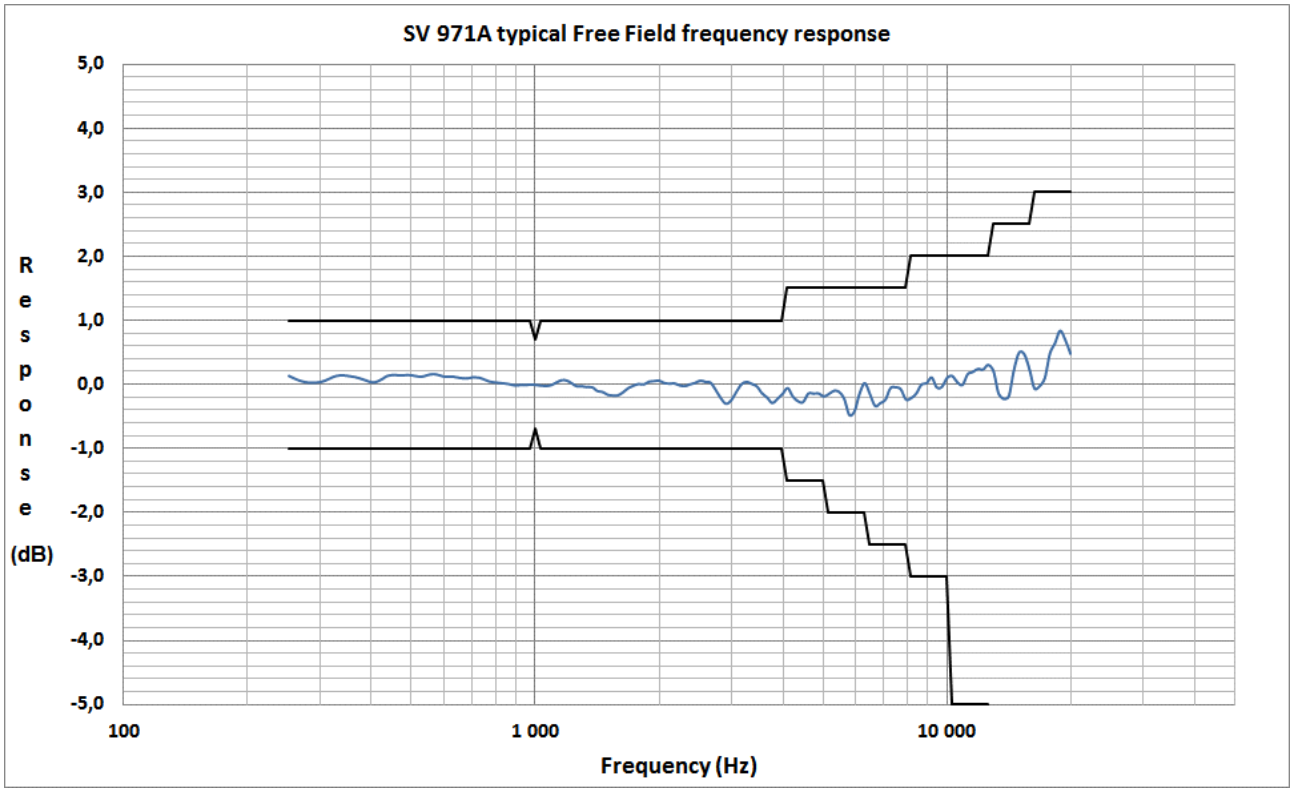
Preamplifier

SV 18A nominal preamplifier attenuation: 1.0 dB;

Power supply 2.5 mA@ 11 V /-7.5V



SV 971A frequency characteristics for 0 deg incidence angle



Effect of reflections and diffraction of the acoustic plane wave from the case of SV 971A (“Case Effect”)

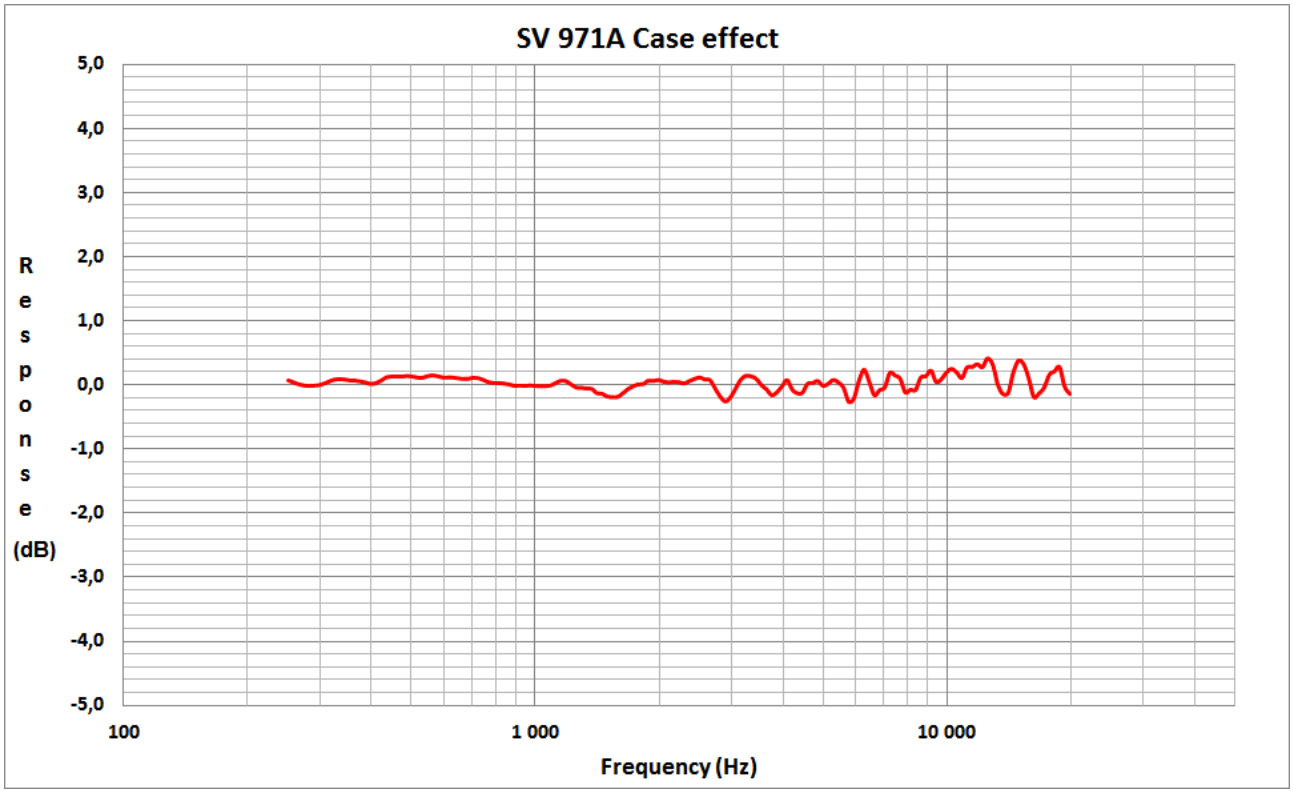


Table C.1.7. ACO 7152 and SV 971A typical frequency characteristics

Frequency [Hz]	ACO 7152 typical Free Field response [dB]	SV 971A typical Free Field response [dB]	SV 971A Case Effect [dB]	Uncertainty (IEC 62585:2012) [dB]
251	0.06	0.13	0.07	0.25
259	0.05	0.09	0.04	0.25
266	0.05	0.06	0.01	0.25
274	0.04	0.04	0.00	0.25
282	0.04	0.03	-0.01	0.25
290	0.04	0.03	-0.01	0.25
299	0.03	0.04	0.00	0.25
307	0.03	0.06	0.03	0.25
316	0.04	0.10	0.06	0.25
325	0.04	0.13	0.09	0.25
335	0.05	0.14	0.09	0.25
345	0.05	0.14	0.09	0.25
355	0.05	0.13	0.07	0.25
365	0.04	0.11	0.07	0.25
376	0.03	0.09	0.06	0.25
387	0.02	0.06	0.04	0.25
398	0.02	0.04	0.02	0.25
410	0.01	0.04	0.03	0.25
422	0.01	0.08	0.07	0.25
434	0.01	0.13	0.12	0.25
447	0.01	0.15	0.13	0.25
460	0.01	0.14	0.13	0.25
473	0.01	0.14	0.13	0.25

Frequency [Hz]	ACO 7152 typical Free Field response [dB]	SV 971A typical Free Field response [dB]	SV 971A Case Effect [dB]	Uncertainty (IEC 62585:2012) [dB]
487	0.01	0.15	0.14	0.25
501	0.00	0.14	0.14	0.25
516	0.01	0.12	0.12	0.25
531	0.01	0.12	0.11	0.25
546	0.01	0.15	0.14	0.25
562	0.01	0.16	0.15	0.25
579	0.01	0.15	0.14	0.25
596	0.01	0.13	0.12	0.25
613	0.00	0.12	0.12	0.25
631	0.00	0.12	0.12	0.25
649	0.00	0.11	0.11	0.25
668	0.00	0.09	0.10	0.25
688	0.00	0.10	0.10	0.25
708	0.00	0.11	0.11	0.25
729	0.00	0.11	0.11	0.25
750	0.00	0.08	0.08	0.25
772	0.00	0.04	0.04	0.25
794	0.00	0.03	0.04	0.25
818	-0.01	0.02	0.03	0.25
841	-0.01	0.02	0.02	0.25
866	-0.01	0.00	0.01	0.25
891	-0.01	-0.01	-0.01	0.25
917	0.00	-0.01	-0.01	0.25
944	0.00	-0.01	-0.01	0.25
972	0.00	0.00	0.00	0.25
1 000	0.00	-0.01	-0.01	0.25
1 029	0.00	-0.02	-0.02	0.25
1 059	-0.01	-0.02	-0.01	0.25
1 090	-0.01	-0.01	-0.01	0.25
1 122	0.00	0.03	0.03	0.25
1 155	0.00	0.07	0.07	0.25
1 189	0.00	0.06	0.06	0.25
1 223	0.01	0.02	0.01	0.25
1 259	0.01	-0.03	-0.04	0.25
1 296	0.01	-0.03	-0.04	0.25
1 334	0.01	-0.04	-0.05	0.25
1 372	0.01	-0.04	-0.06	0.25
1 413	0.02	-0.10	-0.12	0.25
1 454	0.02	-0.12	-0.13	0.25
1 496	0.01	-0.16	-0.17	0.25
1 540	0.01	-0.17	-0.18	0.25
1 585	0.01	-0.17	-0.18	0.25
1 631	0.01	-0.12	-0.13	0.25
1 679	0.01	-0.06	-0.06	0.25
1 728	0.00	-0.02	-0.02	0.25
1 778	0.00	0.01	0.01	0.25
1 830	-0.01	0.00	0.02	0.25
1 884	-0.02	0.04	0.07	0.25
1 939	-0.01	0.05	0.06	0.25
1 995	-0.02	0.06	0.08	0.25
2 054	-0.03	0.02	0.05	0.25
2 113	-0.03	0.01	0.04	0.25
2 175	-0.04	0.02	0.05	0.25

Frequency [Hz]	ACO 7152 typical Free Field response [dB]	SV 971A typical Free Field response [dB]	SV 971A Case Effect [dB]	Uncertainty (IEC 62585:2012) [dB]
2 239	-0.06	-0.01	0.05	0.25
2 304	-0.05	-0.03	0.03	0.25
2 371	-0.06	0.00	0.06	0.25
2 441	-0.07	0.02	0.10	0.25
2 512	-0.06	0.06	0.12	0.25
2 585	-0.05	0.04	0.09	0.25
2 661	-0.05	0.03	0.08	0.25
2 738	-0.04	-0.08	-0.05	0.25
2 818	-0.04	-0.21	-0.18	0.25
2 901	-0.05	-0.30	-0.25	0.25
2 985	-0.06	-0.25	-0.19	0.25
3 073	-0.06	-0.12	-0.05	0.25
3 162	-0.08	0.00	0.08	0.25
3 255	-0.10	0.04	0.15	0.25
3 350	-0.13	0.01	0.13	0.25
3 447	-0.13	-0.03	0.10	0.25
3 548	-0.14	-0.14	0.00	0.25
3 652	-0.14	-0.20	-0.06	0.25
3 758	-0.13	-0.29	-0.15	0.25
3 868	-0.11	-0.22	-0.11	0.25
3 981	-0.13	-0.15	-0.02	0.25
4 097	-0.14	-0.06	0.08	0.35
4 217	-0.12	-0.19	-0.07	0.35
4 340	-0.13	-0.26	-0.12	0.35
4 467	-0.16	-0.27	-0.12	0.35
4 597	-0.16	-0.14	0.02	0.35
4 732	-0.17	-0.14	0.03	0.35
4 870	-0.20	-0.14	0.06	0.35
5 012	-0.17	-0.18	-0.01	0.35
5 158	-0.17	-0.15	0.02	0.35
5 309	-0.18	-0.10	0.08	0.35
5 464	-0.15	-0.11	0.04	0.35
5 623	-0.18	-0.23	-0.04	0.35
5 788	-0.22	-0.48	-0.26	0.35
5 957	-0.21	-0.41	-0.20	0.35
6 131	-0.21	-0.14	0.07	0.35
6 310	-0.22	0.02	0.24	0.35
6 494	-0.20	-0.15	0.05	0.35
6 683	-0.18	-0.33	-0.15	0.35
6 879	-0.21	-0.29	-0.08	0.35
7 079	-0.20	-0.24	-0.03	0.35
7 286	-0.24	-0.06	0.19	0.35
7 499	-0.19	-0.04	0.15	0.35
7 718	-0.17	-0.07	0.10	0.35
7 943	-0.12	-0.23	-0.11	0.35
8 175	-0.14	-0.21	-0.07	0.35
8 414	-0.07	-0.14	-0.07	0.35
8 660	-0.12	0.00	0.12	0.35
8 913	-0.12	0.02	0.14	0.35
9 173	-0.12	0.11	0.22	0.35
9 441	-0.09	-0.04	0.05	0.35
9 716	-0.13	-0.04	0.09	0.35
10 000	-0.09	0.10	0.20	0.35

Frequency [Hz]	ACO 7152 typical Free Field response [dB]	SV 971A typical Free Field response [dB]	SV 971A Case Effect [dB]	Uncertainty (IEC 62585:2012) [dB]
10 292	-0.12	0.13	0.25	0.35
10 593	-0.16	0.04	0.20	0.35
10 902	-0.12	-0.01	0.11	0.35
11 220	-0.11	0.16	0.27	0.35
11 548	-0.09	0.19	0.28	0.35
11 885	-0.08	0.24	0.32	0.35
12 232	-0.04	0.23	0.28	0.35
12 589	-0.11	0.30	0.41	0.35
12 957	-0.10	0.21	0.32	0.35
13 335	-0.14	-0.13	0.01	0.35
13 725	-0.08	-0.22	-0.14	0.35
14 125	-0.06	-0.18	-0.12	0.35
14 538	0.03	0.22	0.19	0.35
14 962	0.12	0.50	0.38	0.35
15 399	0.15	0.47	0.33	0.35
15 849	0.13	0.24	0.11	0.35
16 312	0.12	-0.06	-0.18	0.35
16 788	0.10	-0.02	-0.13	0.35
17 278	0.14	0.10	-0.04	0.35
17 783	0.32	0.48	0.16	0.35
18 302	0.43	0.64	0.21	0.35
18 836	0.56	0.83	0.28	0.35
19 387	0.71	0.69	-0.02	0.35
19 953	0.61	0.48	-0.13	0.35

Table C.1.8. SV 971A Free Field corrections (combined: Microphone plus Case Effect) for electrostatic actuator and 0 deg incidence angle

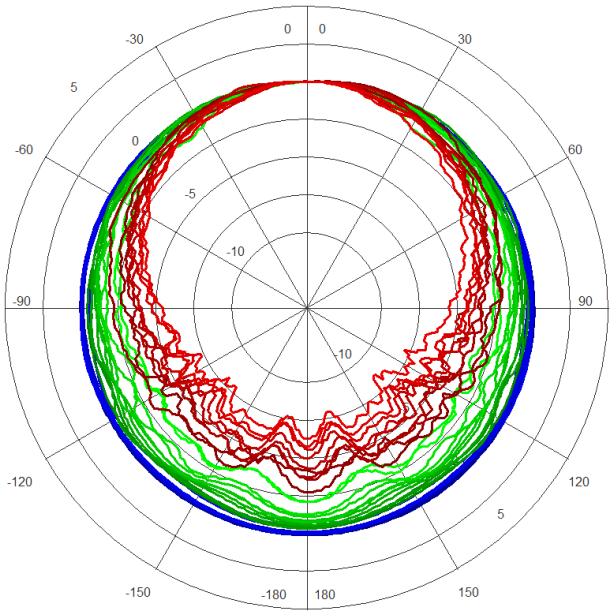
[dB]	Frequency [Hz]																
	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800
Correction factors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0,28	-0,35	-0,14	-0,18	-0,04	0,01
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

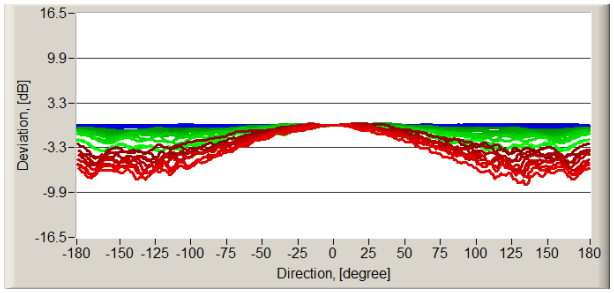
[dB]	Frequency [Hz]													
	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
Correction factors	0,05	0,10	0,50	0,65	1,08	1,17	2,27	3,37	4,58	5,54	7,95	9,90	11,18	-6,96
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.35	0.35	0.35	0.35	0.50	0.50	0.50

SV 971A directional characteristics

Directional response of SV 971A with the ACO 7152 microphone and SV 18A preamplifier for specified frequencies.

Typical total directional characteristics

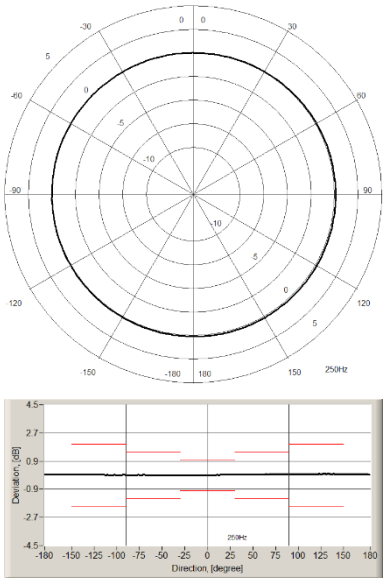
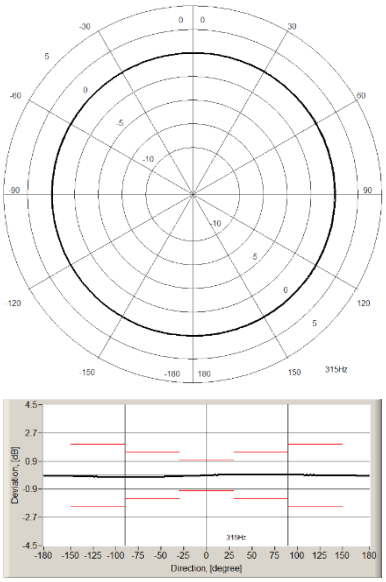
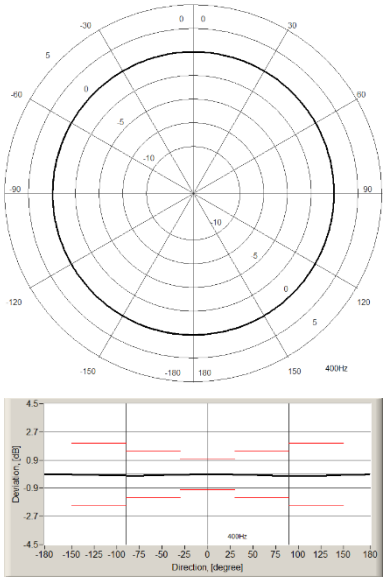
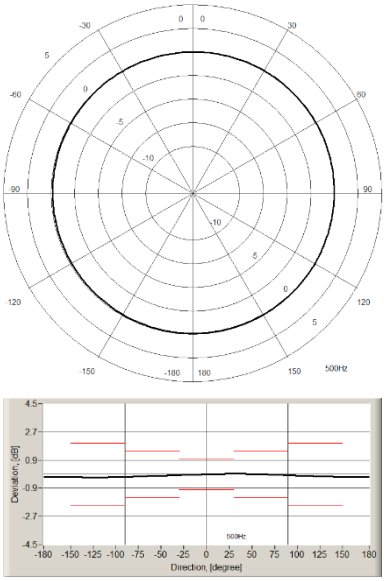
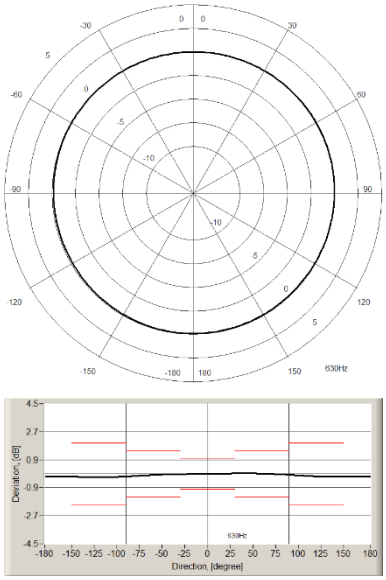
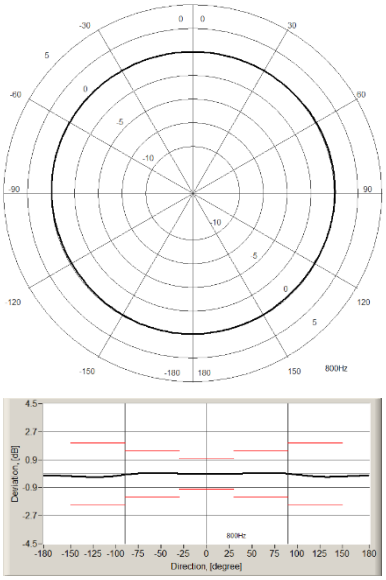




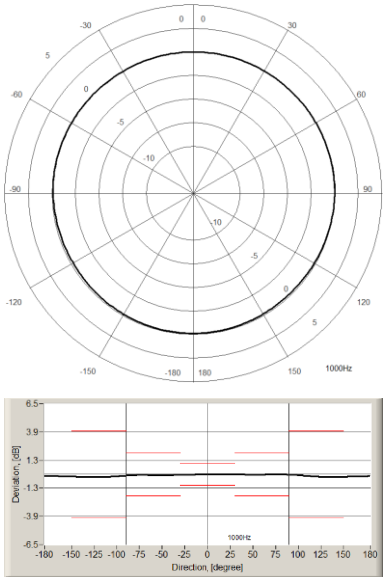
LEGEND

Fmin (250Hz) **Fmax (12,5kHz)**

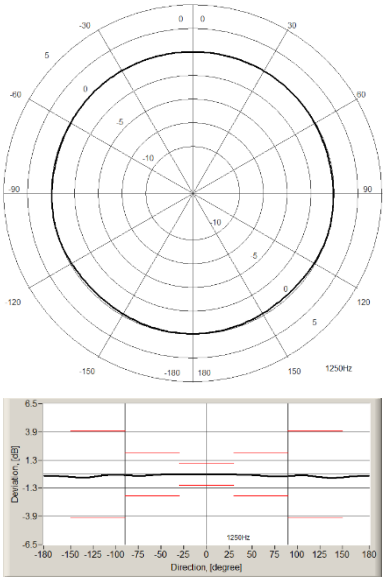
The round charts show the typical directional characteristic and the charts below shows the errors for angles.

250 Hz		**315 Hz**	
400 Hz		**500 Hz**	
630 Hz		**800 Hz**	

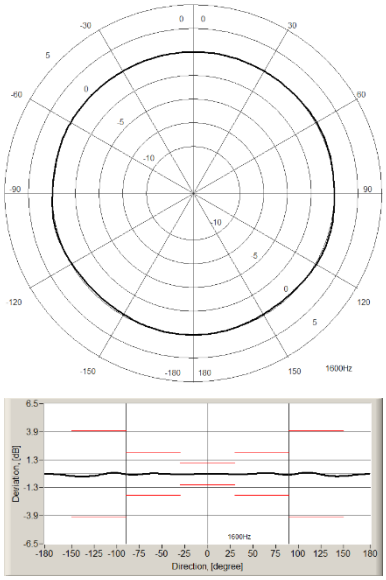
1000 Hz



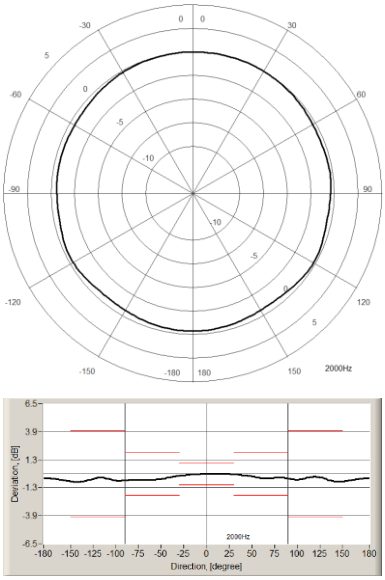
1250 Hz



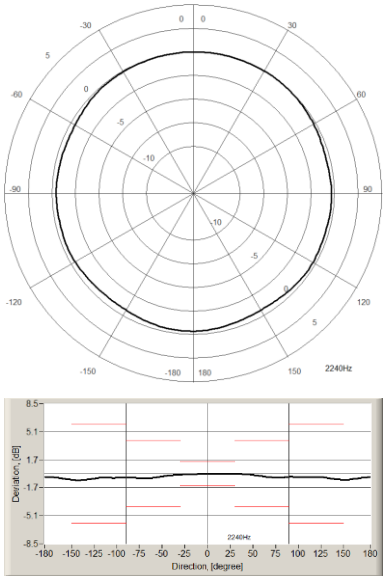
1600 Hz



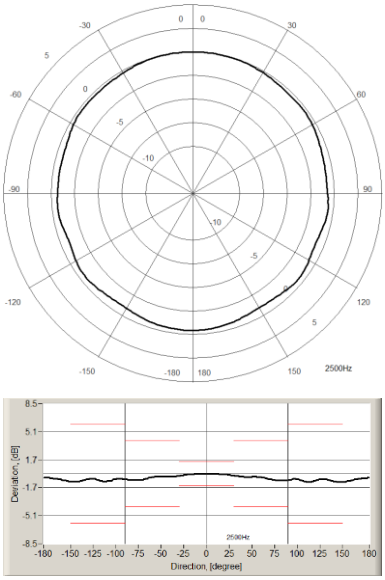
2000 Hz

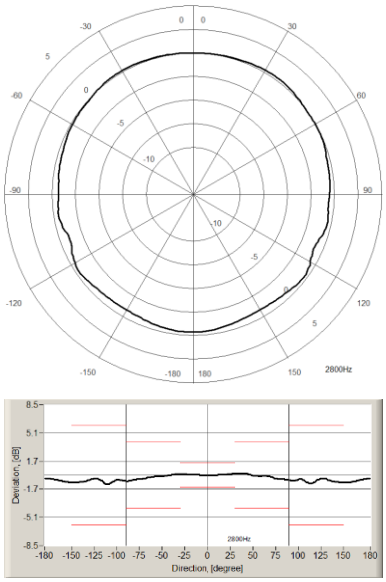
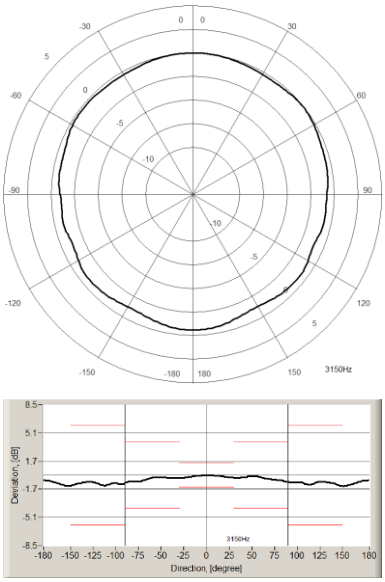
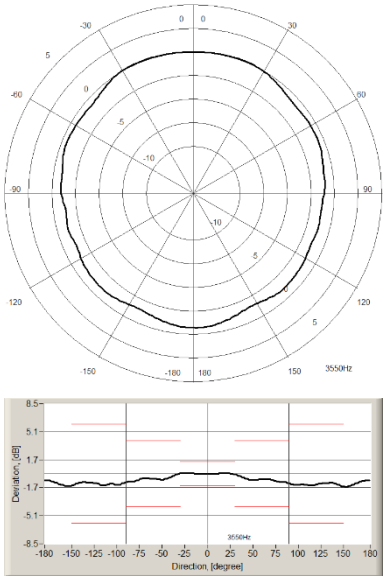
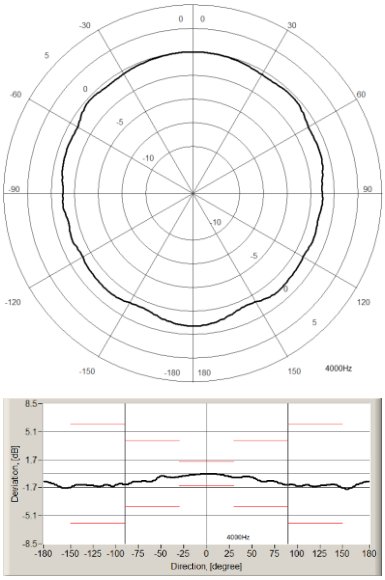
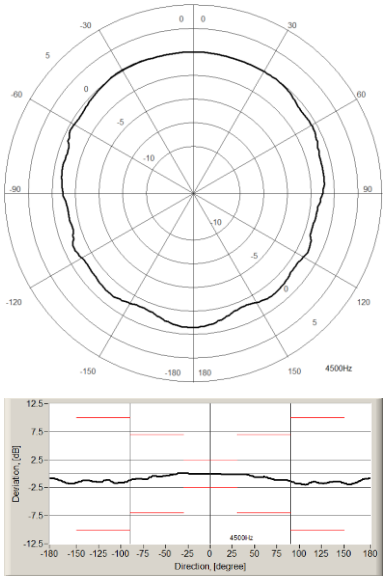
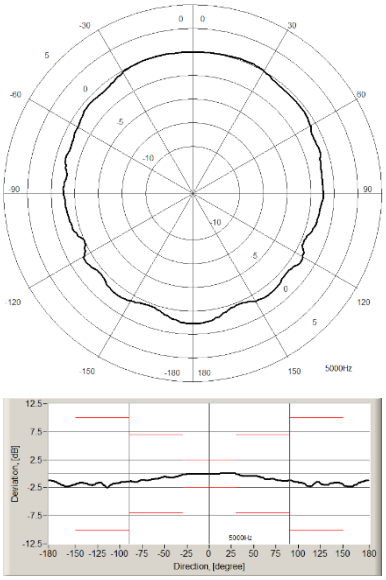


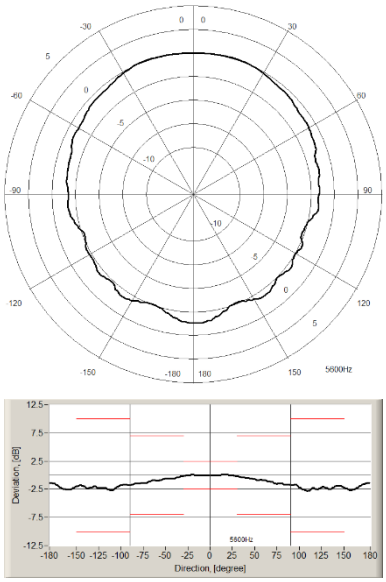
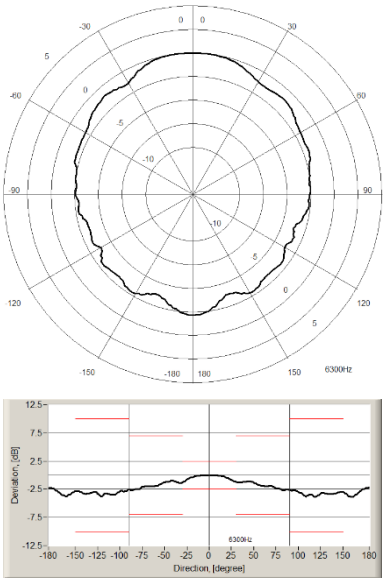
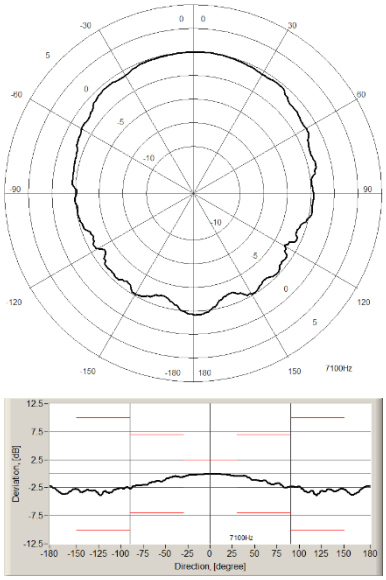
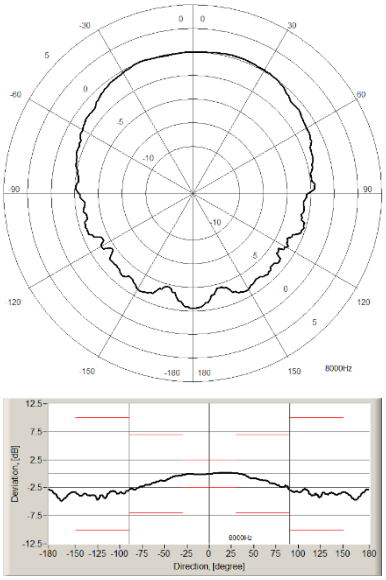
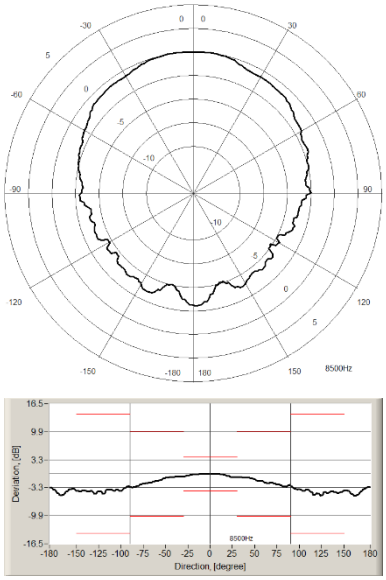
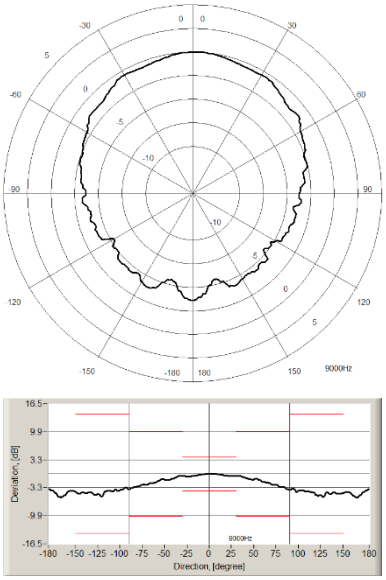
2240 Hz



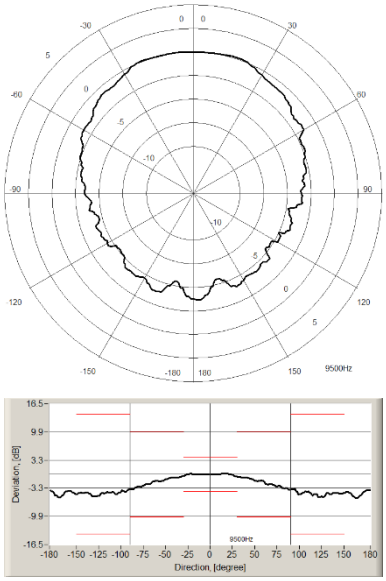
2500 Hz



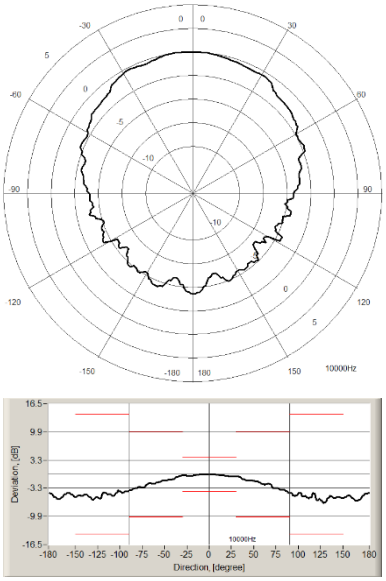
2800 Hz		**3150 Hz**	
3550 Hz		**4000 Hz**	
4500 Hz		**5000 Hz**	

5600 Hz		**6300 Hz**	
7100 Hz		**8000 Hz**	
8500 Hz		**9000 Hz**	

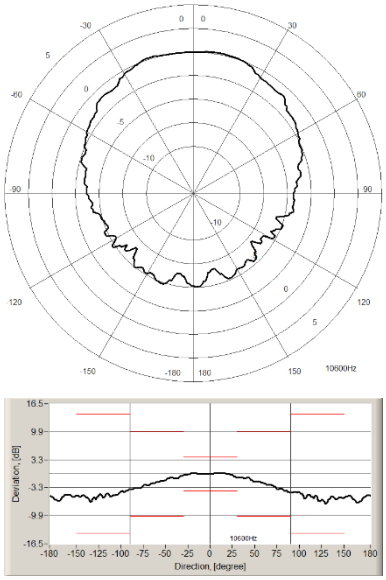
9500 Hz



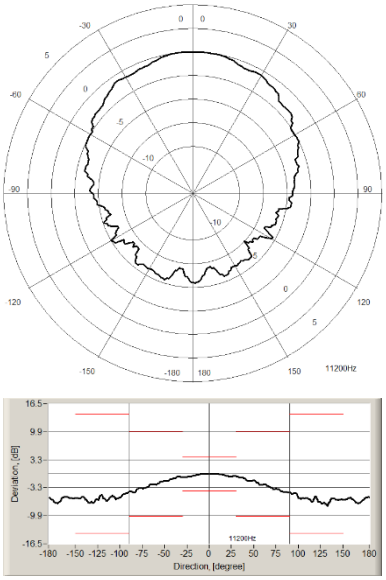
10000 Hz



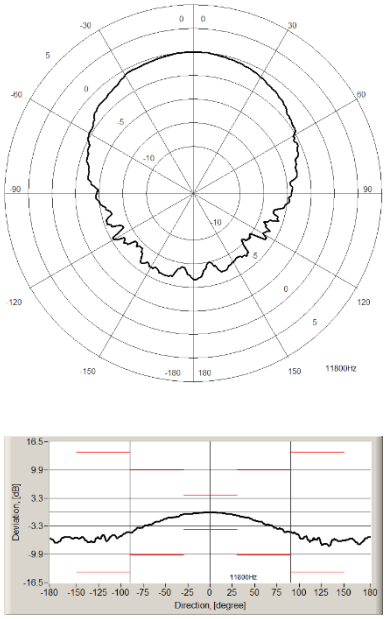
10600 Hz



11200 Hz



11800 Hz



12500 Hz

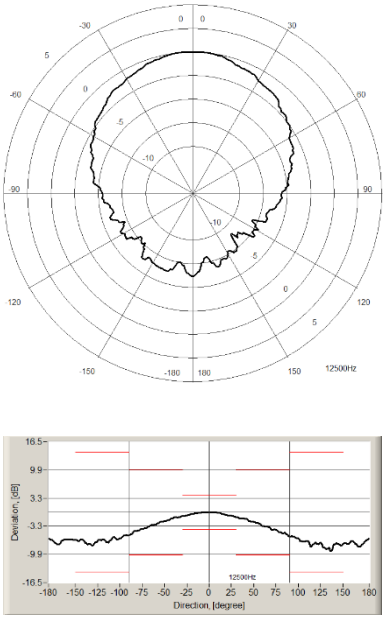


Table C.1.9. SV 971A typical directional response

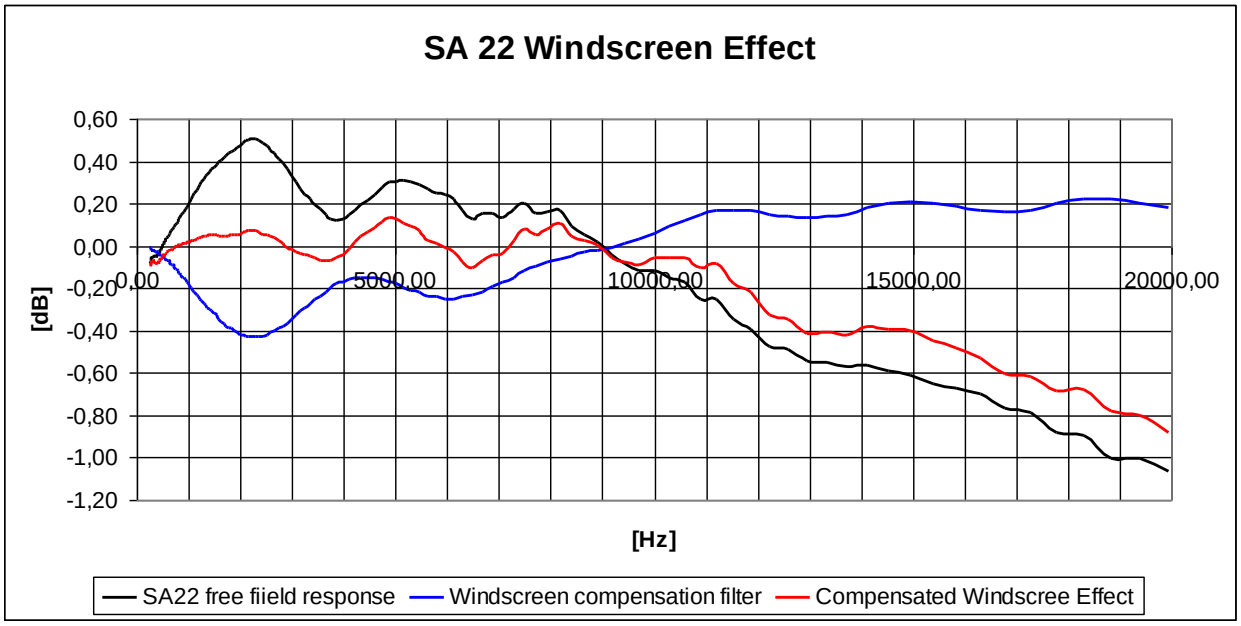
	Angle [°]									
f [Hz]	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**	**80-90**	**90-100**
250	0.03	0.03	0.03	0.04	0.04	0.05	0.06	0.06	0.07	0.08
315	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.03
400	-0.01	-0.01	-0.02	-0.04	-0.06	-0.08	-0.09	-0.11	-0.12	-0.12
500	0.01	0.02	0.03	0.03	0.03	0.02	-0.01	-0.03	-0.06	-0.09
630	0.01	0.01	0.02	0.02	0.02	0.02	0.00	-0.04	-0.07	-0.10
800	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.05	0.04	-0.06
1 000	-0.01	-0.02	-0.04	-0.05	-0.06	-0.06	-0.06	-0.07	-0.09	-0.16
1 250	0.00	-0.01	-0.02	-0.04	-0.08	-0.13	-0.19	-0.21	-0.21	-0.17
1 600	0.00	-0.02	-0.04	-0.04	-0.03	0.06	0.08	0.00	-0.08	-0.07
2 000	0.01	0.01	-0.05	-0.12	-0.25	-0.39	-0.42	-0.40	-0.45	-0.53
2 240	0.01	0.01	-0.01	-0.05	-0.16	-0.33	-0.43	-0.47	-0.44	-0.39
2 500	-0.02	-0.10	-0.25	-0.36	-0.38	-0.48	-0.68	-0.82	-0.83	-0.70
2 800	0.03	0.10	0.22	0.24	0.17	-0.10	-0.22	-0.45	-0.62	-0.66
3 150	-0.05	-0.18	-0.31	-0.32	-0.23	-0.26	-0.48	-0.60	-0.82	-0.87
3 550	0.03	0.06	-0.02	-0.48	-0.75	-0.76	-0.69	-0.99	-1.12	-1.35
4 000	-0.03	-0.24	-0.44	-0.47	-0.36	-0.86	-0.90	-1.05	-1.32	-1.44
4 500	-0.04	-0.08	-0.08	-0.13	-0.60	-0.62	-0.96	-1.09	-1.34	-1.81
5 000	0.05	0.15	0.15	-0.37	-0.38	-0.72	-0.94	-1.20	-1.24	-1.48
5 600	0.04	0.08	-0.13	-0.46	-0.73	-0.85	-1.20	-1.52	-1.65	-1.93
6 300	-0.06	-0.47	-1.23	-1.30	-1.31	-1.89	-1.95	-2.47	-2.68	-3.07
7 100	0.02	-0.15	-0.39	-0.41	-1.00	-1.26	-1.79	-1.90	-2.38	-2.28
8 000	0.15	0.24	0.19	-0.21	-0.70	-1.11	-1.71	-2.35	-2.91	-3.31
8 500	-0.01	-0.29	-0.59	-0.80	-1.07	-1.51	-1.94	-2.44	-2.67	-3.23
9 000	-0.17	-0.47	-0.53	-0.95	-1.32	-1.91	-2.51	-3.08	-3.72	-4.13
9 500	0.01	0.14	-0.59	-0.80	-1.54	-1.83	-2.42	-3.05	-3.55	-4.55
10 000	-0.14	-0.39	-0.50	-1.32	-1.51	-2.41	-2.98	-3.56	-4.34	-5.16
10 600	0.11	0.13	-0.68	-1.03	-1.74	-2.12	-2.65	-3.49	-4.16	-4.39
11 200	-0.05	-0.57	-0.71	-1.09	-1.68	-2.63	-3.16	-4.14	-4.40	-5.73
11 800	-0.12	-0.38	-0.69	-1.18	-1.83	-2.60	-3.13	-3.82	-4.63	-5.45
12 500	-0.15	-0.73	-1.28	-1.54	-2.37	-3.31	-4.12	-4.81	-5.65	-6.24
f [Hz]	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**	**170-180**	**180-190**	**190-200**
250	0.08	0.08	0.09	0.09	0.08	0.08	0.08	0.07	0.05	0.04
315	0.02	0.02	0.01	0.01	-0.01	-0.02	-0.02	-0.03	-0.03	-0.04
400	-0.12	-0.11	-0.10	-0.08	-0.06	-0.04	-0.03	-0.02	-0.01	-0.02
500	-0.11	-0.13	-0.15	-0.16	-0.16	-0.17	-0.17	-0.17	-0.17	-0.18
630	-0.14	-0.16	-0.18	-0.18	-0.18	-0.18	-0.17	-0.16	-0.16	-0.17
800	-0.12	-0.17	-0.19	-0.20	-0.19	-0.16	-0.14	-0.12	-0.11	-0.13
1 000	-0.22	-0.25	-0.28	-0.28	-0.27	-0.25	-0.21	-0.17	-0.13	-0.13
1 250	-0.12	-0.21	-0.32	-0.34	-0.34	-0.29	-0.20	-0.15	-0.15	-0.19
1 600	0.11	0.11	-0.14	-0.23	-0.23	-0.20	-0.11	-0.03	-0.03	-0.10
2 000	-0.53	-0.37	-0.45	-0.68	-0.72	-0.69	-0.54	-0.45	-0.45	-0.57
2 240	-0.42	-0.40	-0.46	-0.66	-0.72	-0.71	-0.58	-0.46	-0.45	-0.60
2 500	-0.98	-0.99	-0.71	-0.94	-1.02	-0.96	-0.72	-0.54	-0.57	-0.76
2 800	-0.86	-1.01	-0.54	-0.78	-0.88	-0.88	-0.76	-0.51	-0.51	-0.72
3 150	-1.09	-1.15	-0.84	-1.03	-1.30	-1.30	-1.03	-0.68	-0.79	-1.15
3 550	-1.37	-1.42	-1.25	-1.16	-1.54	-1.58	-1.32	-0.87	-0.99	-1.41
4 000	-1.47	-1.51	-1.50	-1.37	-1.76	-1.84	-1.51	-1.10	-1.20	-1.71
4 500	-1.91	-1.58	-1.72	-1.56	-1.75	-1.91	-1.67	-0.98	-1.16	-1.72
5 000	-2.13	-2.24	-1.97	-1.92	-1.94	-2.28	-2.13	-1.39	-1.63	-2.27
5 600	-2.77	-2.71	-2.41	-2.41	-2.09	-2.66	-2.58	-1.58	-1.94	-2.59
6 300	-3.72	-3.76	-3.48	-3.34	-3.19	-3.80	-3.72	-2.47	-3.00	-3.74
7 100	-3.32	-3.75	-3.67	-3.09	-3.13	-3.64	-3.61	-2.57	-3.27	-3.71
8 000	-3.16	-3.92	-4.31	-3.73	-3.74	-4.56	-4.66	-3.34	-4.46	-4.79
8 500	-3.69	-4.38	-4.68	-4.32	-4.72	-5.06	-5.00	-4.03	-4.76	-5.04
9 000	-4.16	-5.05	-5.39	-4.69	-4.63	-5.08	-5.58	-4.50	-5.39	-5.62
9 500	-4.71	-5.17	-5.33	-4.66	-4.58	-4.85	-5.53	-4.43	-5.37	-5.58
10 000	-5.49	-6.05	-6.61	-6.26	-5.47	-5.46	-6.21	-5.12	-5.88	-5.90
10 600	-5.79	-5.91	-6.76	-6.67	-5.83	-5.74	-6.67	-5.89	-6.48	-6.46
11 200	-5.95	-6.49	-7.02	-7.53	-6.24	-6.14	-7.06	-6.53	-7.12	-6.84
11 800	-6.32	-6.83	-7.50	-7.76	-6.70	-6.47	-7.39	-6.90	-7.23	-7.07
12 500	-7.04	-8.04	-8.57	-8.89	-7.68	-7.22	-8.04	-7.41	-7.68	-7.50

f [Hz]	200-210	210-220	220-230	230-240	240-250	250-260	260-270	270-280	280-290	290-300
250	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
315	-0.05	-0.07	-0.08	-0.09	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11
400	-0.03	-0.04	-0.05	-0.07	-0.08	-0.09	-0.09	-0.10	-0.09	-0.08
500	-0.18	-0.19	-0.20	-0.20	-0.20	-0.19	-0.18	-0.17	-0.15	-0.13
630	-0.18	-0.20	-0.21	-0.22	-0.22	-0.21	-0.19	-0.17	-0.13	-0.10
800	-0.15	-0.18	-0.21	-0.21	-0.21	-0.18	-0.12	-0.05	0.04	0.05
1 000	-0.15	-0.17	-0.18	-0.18	-0.17	-0.13	-0.09	-0.06	-0.03	-0.05
1 250	-0.26	-0.31	-0.32	-0.28	-0.19	-0.07	-0.09	-0.14	-0.15	-0.13
1 600	-0.20	-0.26	-0.27	-0.21	-0.09	0.09	0.01	-0.09	-0.08	0.03
2 000	-0.71	-0.76	-0.73	-0.56	-0.44	-0.63	-0.64	-0.60	-0.55	-0.55
2 240	-0.75	-0.77	-0.74	-0.61	-0.50	-0.51	-0.48	-0.51	-0.56	-0.56
2 500	-0.96	-0.98	-0.86	-0.76	-0.96	-0.88	-0.70	-0.74	-0.75	-0.64
2 800	-0.87	-0.87	-0.81	-0.54	-1.07	-1.03	-0.73	-0.72	-0.51	-0.37
3 150	-1.28	-1.21	-0.94	-1.02	-1.26	-1.14	-1.08	-0.92	-0.75	-0.62
3 550	-1.50	-1.36	-1.09	-1.31	-1.45	-1.37	-1.36	-0.98	-0.83	-0.63
4 000	-1.76	-1.50	-1.39	-1.56	-1.57	-1.52	-1.27	-1.27	-0.95	-0.97
4 500	-1.78	-1.49	-1.43	-1.49	-1.54	-1.72	-1.61	-1.10	-1.05	-0.73
5 000	-2.25	-1.74	-2.06	-1.89	-2.49	-1.84	-1.54	-1.55	-1.27	-1.22
5 600	-2.58	-2.11	-2.36	-2.35	-2.73	-2.66	-1.82	-1.75	-1.46	-1.17
6 300	-3.61	-3.32	-3.34	-3.81	-3.53	-3.52	-2.96	-2.69	-2.27	-2.01
7 100	-3.44	-3.39	-3.10	-3.89	-3.53	-3.04	-2.66	-2.64	-2.04	-1.75
8 000	-3.65	-3.96	-3.98	-4.69	-4.43	-3.58	-3.59	-2.83	-2.41	-1.96
8 500	-4.53	-4.15	-4.40	-4.17	-4.01	-3.46	-3.20	-2.69	-2.09	-1.53
9 000	-4.52	-4.78	-4.89	-5.42	-4.52	-4.18	-3.77	-3.60	-2.91	-2.42
9 500	-4.74	-4.65	-5.21	-5.37	-4.57	-4.67	-4.14	-3.52	-3.05	-2.37
10 000	-5.36	-5.18	-6.08	-5.84	-4.81	-5.11	-4.37	-3.82	-3.11	-2.24
10 600	-5.52	-5.49	-6.65	-6.10	-5.45	-5.20	-4.32	-3.78	-3.39	-2.75
11 200	-5.94	-5.95	-7.08	-6.60	-6.41	-6.08	-5.40	-4.57	-3.53	-3.17
11 800	-6.27	-6.65	-7.22	-6.79	-6.82	-6.10	-5.50	-4.84	-3.76	-2.97
12 500	-6.79	-7.29	-7.97	-7.24	-7.26	-6.35	-6.05	-5.11	-4.35	-3.42

f [Hz]	300-310	310-320	320-330	330-340	340-350	350-360
250	0.01	0.01	0.00	0.00	-0.01	0.01
315	-0.10	-0.09	-0.07	-0.06	-0.04	-0.02
400	-0.07	-0.05	-0.04	-0.02	-0.01	0.00
500	-0.11	-0.09	-0.08	-0.06	-0.04	-0.02
630	-0.07	-0.05	-0.03	-0.02	-0.01	0.00
800	0.05	0.04	0.03	0.01	0.01	0.00
1 000	-0.06	-0.06	-0.05	-0.03	-0.02	0.00
1 250	-0.07	-0.03	0.02	0.02	0.02	0.01
1 600	0.03	-0.03	-0.04	-0.04	-0.03	-0.01
2 000	-0.55	-0.46	-0.31	-0.16	-0.08	-0.03
2 240	-0.47	-0.27	-0.15	-0.11	-0.06	-0.02
2 500	-0.39	-0.36	-0.34	-0.21	-0.08	-0.01
2 800	-0.16	-0.10	0.13	0.13	0.08	0.03
3 150	-0.28	-0.35	-0.36	-0.34	-0.21	-0.06
3 550	-0.73	-0.71	-0.25	0.07	0.05	0.01
4 000	-0.78	-0.47	-0.48	-0.32	-0.16	-0.04
4 500	-0.52	-0.28	0.10	0.08	-0.03	-0.02
5 000	-0.88	-0.68	-0.61	-0.12	0.01	-0.01
5 600	-0.97	-0.59	-0.52	-0.09	0.06	0.00
6 300	-1.75	-1.23	-1.41	-0.93	-0.24	-0.03
7 100	-1.37	-0.91	-0.61	-0.57	-0.18	-0.10
8 000	-1.39	-1.11	-0.40	-0.16	-0.11	-0.10
8 500	-1.25	-0.79	-0.58	-0.38	-0.08	0.01
9 000	-1.84	-1.40	-0.88	-0.60	-0.52	-0.11
9 500	-1.77	-1.22	-0.86	-0.31	-0.03	-0.02
10 000	-1.96	-1.40	-0.89	-0.44	-0.40	0.03
10 600	-1.88	-1.45	-1.06	-0.35	0.18	0.01
11 200	-2.46	-1.76	-1.05	-0.82	-0.57	-0.07
11 800	-2.26	-1.50	-1.12	-0.43	-0.34	-0.10
12 500	-2.56	-2.06	-1.25	-0.90	-0.43	-0.04

C.1.2 Effect of the SA 22 windscreen

Note: *When using the SA22 windscreen the* ***Windscreen*** *compensation filter must be* ***On*** *to ensure good tolerances margin of the SV 971A frequency response.*



Windscreen SA22 Free Field typical response and compensated effect

Table C.1.10. Effect of the SA 22 windscreen

Frequency [Hz]	SA 22 typical Free Field effect [dB]	Compensation filter [dB]	Compensated SA 22 Free Field effect [dB]	Uncertainty (IEC 62585:2012) [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

Frequency [Hz]	SA 22 typical Free Field effect [dB]	Compensation filter [dB]	Compensated SA 22 Free Field effect [dB]	Uncertainty (IEC 62585:2012) [dB]
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
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	-0.1	-0.02	0.20
729	0.09	-0.1	-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
1 000	0.19	-0.18	0.01	0.20
1 029	0.21	-0.19	0.02	0.20
1 059	0.22	-0.2	0.02	0.20
1 090	0.23	-0.21	0.02	0.20
1 122	0.25	-0.22	0.03	0.20
1 155	0.26	-0.23	0.03	0.20
1 189	0.28	-0.24	0.04	0.20
1 223	0.29	-0.25	0.04	0.20
1 259	0.30	-0.26	0.04	0.20
1 296	0.31	-0.27	0.04	0.20
1 334	0.33	-0.28	0.05	0.20
1 372	0.34	-0.29	0.05	0.20
1 413	0.35	-0.3	0.05	0.20
1 454	0.36	-0.31	0.05	0.20
1 496	0.37	-0.32	0.05	0.20
1 540	0.38	-0.33	0.05	0.20
1 585	0.39	-0.35	0.04	0.20
1 631	0.40	-0.36	0.04	0.20
1 679	0.41	-0.37	0.04	0.20
1 728	0.42	-0.38	0.04	0.20
1 778	0.43	-0.38	0.05	0.20
1 830	0.44	-0.39	0.05	0.20
1 884	0.45	-0.40	0.05	0.20
1 939	0.46	-0.40	0.06	0.20

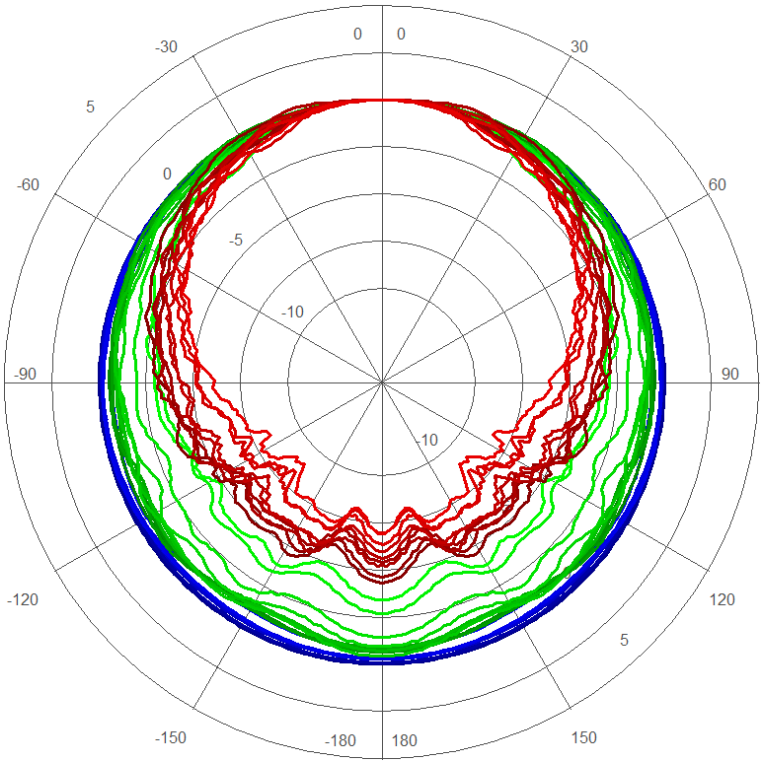
Frequency [Hz]	SA 22 typical Free Field effect [dB]	Compensation filter [dB]	Compensated SA 22 Free Field effect [dB]	Uncertainty (IEC 62585:2012) [dB]
1 995	0.47	-0.41	0.06	0.20
2 054	0.48	-0.42	0.06	0.20
2 113	0.50	-0.43	0.07	0.20
2 175	0.50	-0.43	0.07	0.20
2 239	0.50	-0.43	0.07	0.20
2 304	0.50	-0.43	0.07	0.20
2 371	0.50	-0.43	0.07	0.20
2 441	0.48	-0.43	0.05	0.20
2 512	0.47	-0.42	0.05	0.20
2 585	0.45	-0.41	0.04	0.20
2 661	0.44	-0.4	0.04	0.20
2 738	0.41	-0.39	0.02	0.20
2 818	0.39	-0.38	0.01	0.20
2 901	0.36	-0.37	-0.01	0.20
2 985	0.33	-0.35	-0.02	0.20
3 073	0.30	-0.33	-0.03	0.20
3 162	0.27	-0.31	-0.04	0.20
3 255	0.24	-0.29	-0.05	0.20
3 350	0.22	-0.27	-0.05	0.20
3 447	0.20	-0.25	-0.05	0.20
3 548	0.17	-0.24	-0.07	0.20
3 652	0.15	-0.22	-0.07	0.20
3 758	0.13	-0.2	-0.07	0.20
3 868	0.12	-0.18	-0.06	0.20
3 981	0.13	-0.17	-0.04	0.20
4 097	0.15	-0.16	-0.01	0.30
4 217	0.17	-0.15	0.02	0.30
4 340	0.19	-0.15	0.04	0.30
4 467	0.21	-0.15	0.06	0.30
4 597	0.24	-0.15	0.09	0.30
4 732	0.27	-0.16	0.11	0.30
4 870	0.30	-0.17	0.13	0.30
5 012	0.31	-0.18	0.13	0.30
5 158	0.31	-0.2	0.11	0.30
5 309	0.30	-0.21	0.09	0.30
5 464	0.29	-0.22	0.07	0.30
5 623	0.27	-0.24	0.03	0.30
5 788	0.25	-0.24	0.01	0.30
5 957	0.24	-0.25	-0.01	0.30
6 131	0.22	-0.25	-0.03	0.30
6 310	0.17	-0.24	-0.07	0.30
6 494	0.12	-0.23	-0.11	0.30
6 683	0.15	-0.22	-0.07	0.30
6 879	0.15	-0.19	-0.04	0.30
7 079	0.14	-0.17	-0.03	0.30
7 286	0.17	-0.15	0.02	0.30
7 499	0.20	-0.12	0.08	0.30
7 718	0.15	-0.1	0.05	0.30
7 943	0.16	-0.08	0.08	0.30
8 175	0.17	-0.06	0.11	0.30
8 414	0.09	-0.05	0.04	0.30
8 660	0.05	-0.03	0.02	0.30
8 913	0.02	-0.02	0.00	0.30

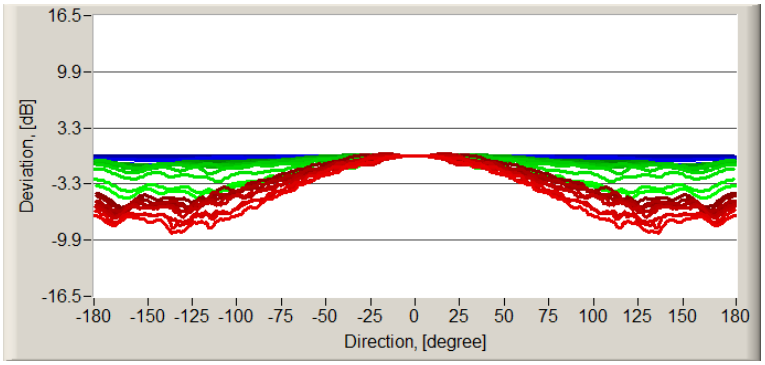
Frequency [Hz]	SA 22 typical Free Field effect [dB]	Compensation filter [dB]	Compensated SA 22 Free Field effect [dB]	Uncertainty (IEC 62585:2012) [dB]
9 173	-0.04	-0.01	-0.05	0.30
9 441	-0.09	0.01	-0.08	0.30
9 716	-0.12	0.03	-0.09	0.30
10 000	-0.12	0.06	-0.06	0.30
10 292	-0.15	0.09	-0.06	0.30
10 593	-0.17	0.12	-0.05	0.30
10 902	-0.25	0.15	-0.10	0.30
11 220	-0.25	0.17	-0.08	0.30
11 548	-0.35	0.17	-0.18	0.30
11 885	-0.39	0.17	-0.22	0.30
12 232	-0.47	0.15	-0.32	0.30
12 589	-0.49	0.14	-0.35	0.30
12 957	-0.54	0.13	-0.41	0.30
13 335	-0.55	0.14	-0.41	0.30
13 725	-0.57	0.15	-0.42	0.30
14 125	-0.56	0.18	-0.38	0.30
14 538	-0.59	0.2	-0.39	0.30
14 962	-0.61	0.21	-0.40	0.30
15 399	-0.65	0.2	-0.45	0.30
15 849	-0.67	0.19	-0.48	0.30
16 312	-0.70	0.17	-0.53	0.30
16 788	-0.77	0.16	-0.61	0.30
17 278	-0.79	0.17	-0.62	0.30
17 783	-0.88	0.2	-0.68	0.30
18 302	-0.90	0.22	-0.68	0.30
18 836	-1.00	0.22	-0.78	0.30
19 387	-1.00	0.2	-0.80	0.30
19 953	-1.06	0.18	-0.88	0.30

Directional characteristics of SV 971A with SA 22

Directional response of SV 971A with the ACO 7152 microphone, SV 18A preamplifier and SA 22 windscreen for specified frequencies.

Combined typical directional characteristics

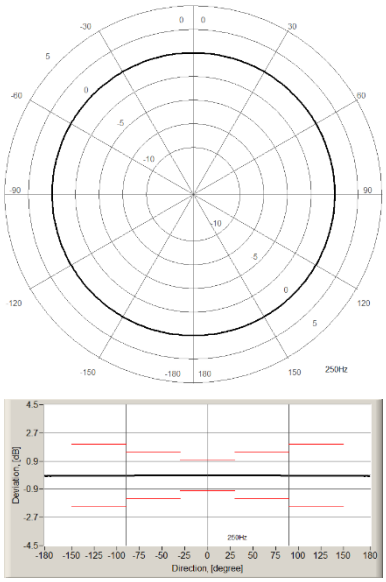
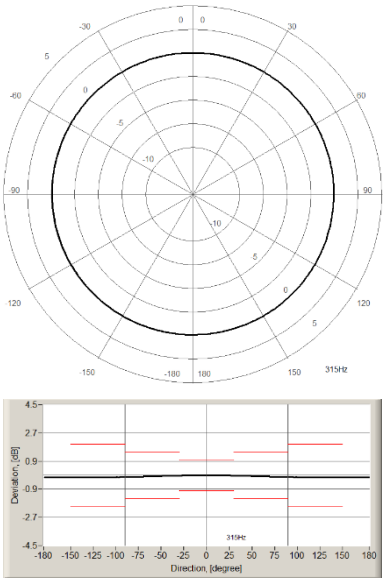
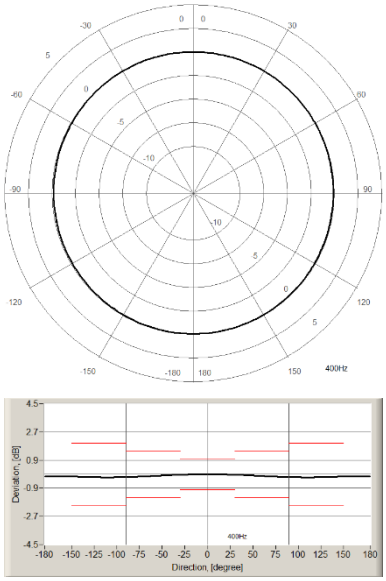
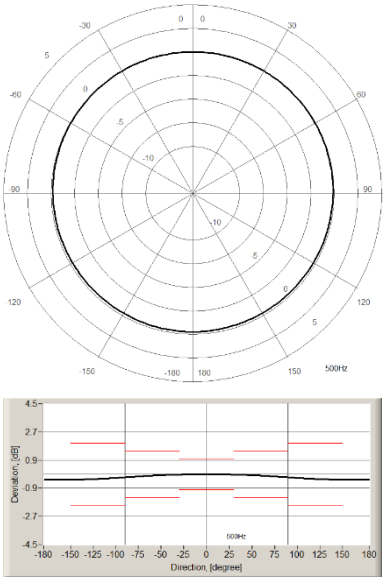
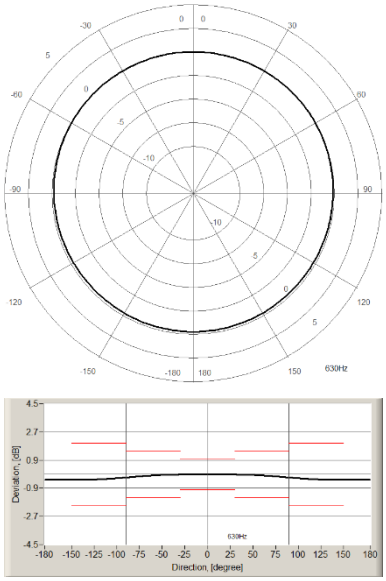
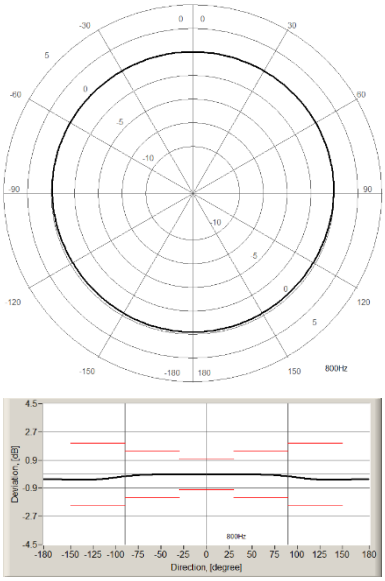


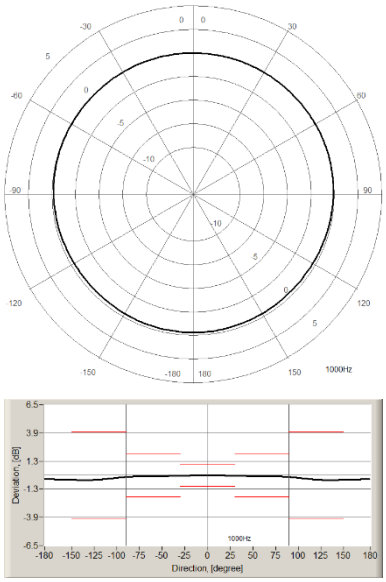
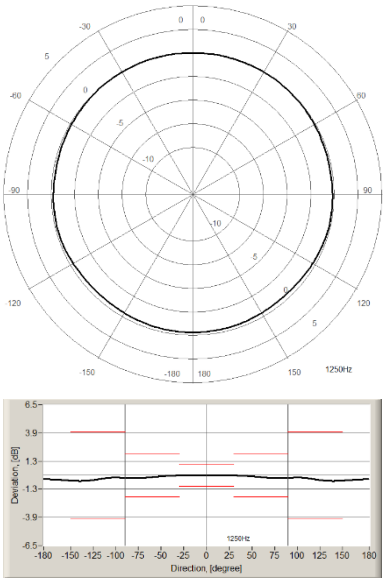
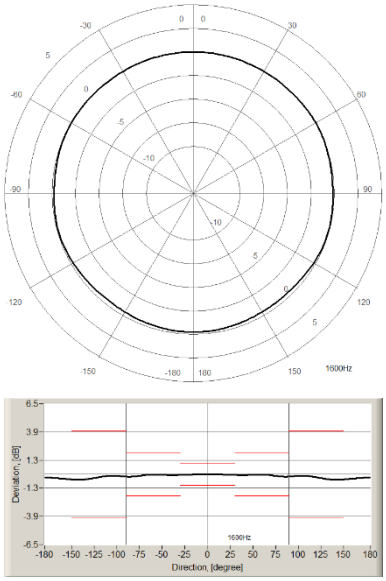
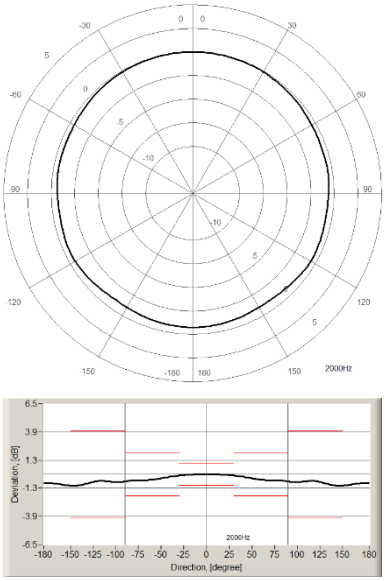
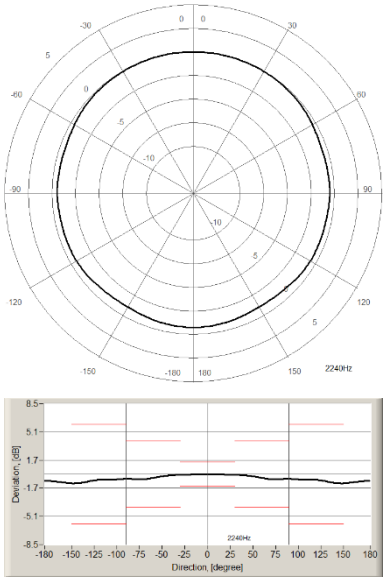
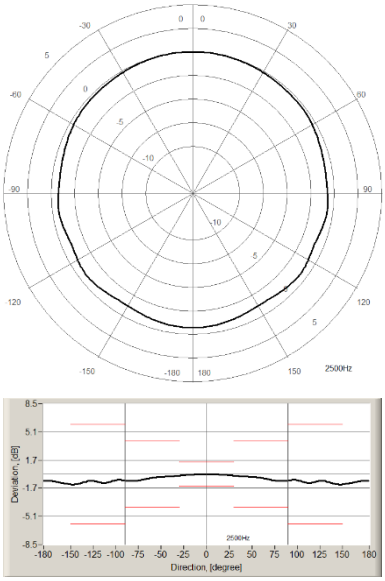


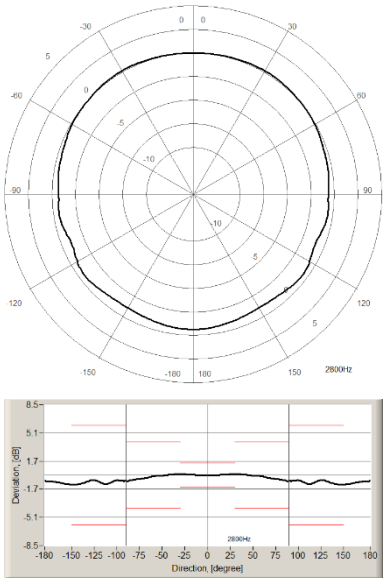
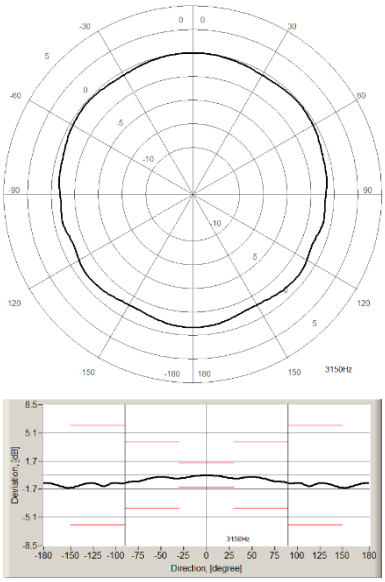
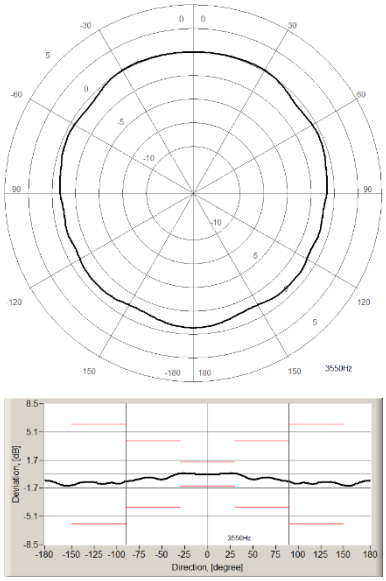
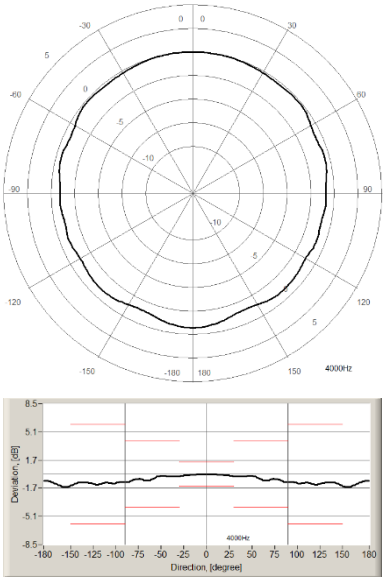
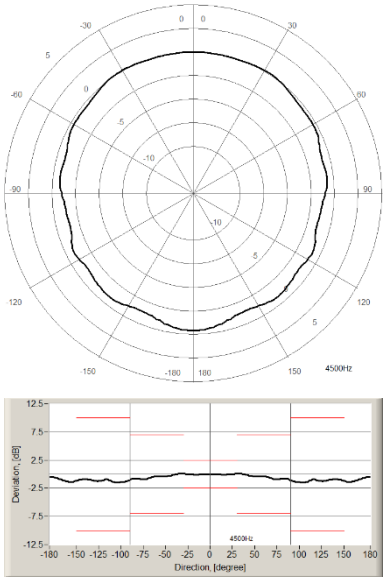
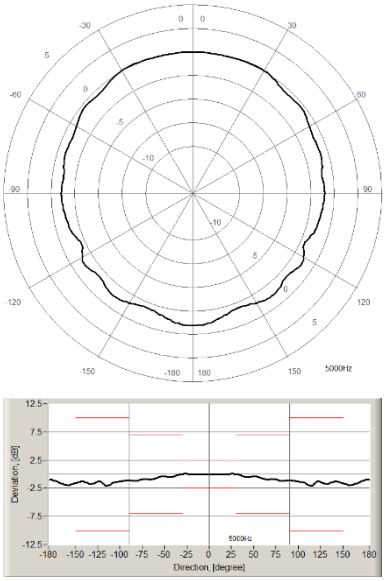
LEGEND

Fmin (250Hz) **Fmax (12,5kHz)**

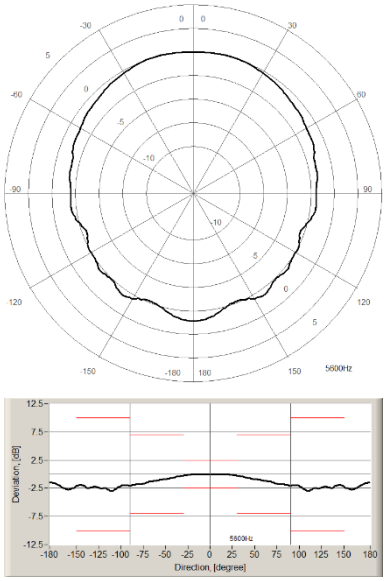
The round charts show the typical directional characteristic and the charts below shows the errors for angles.

250 Hz		**315 Hz**	
400 Hz		**500 Hz**	
630 Hz		**800 Hz**	

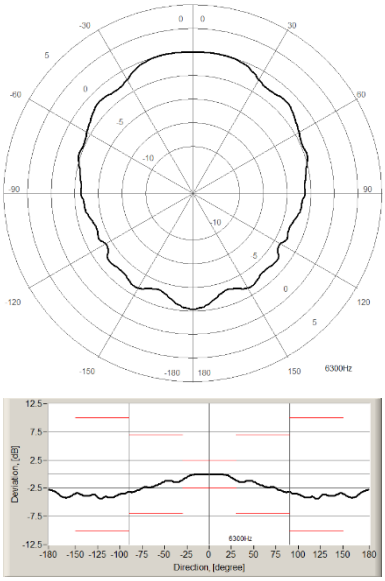
1000 Hz		**1250 Hz**	
1600 Hz		**2000 Hz**	
2240 Hz		**2500 Hz**	

2800 Hz		**3150 Hz**	
3550 Hz		**4000 Hz**	
4500 Hz		**5000 Hz**	

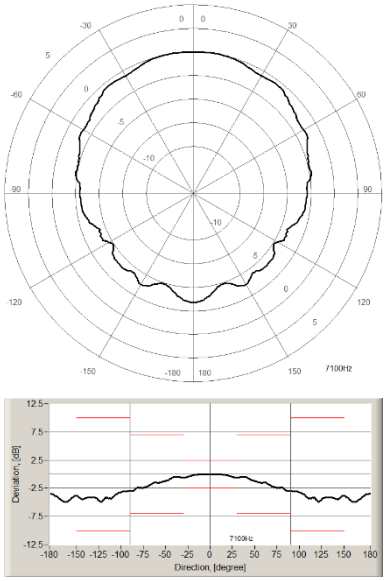
5600 Hz



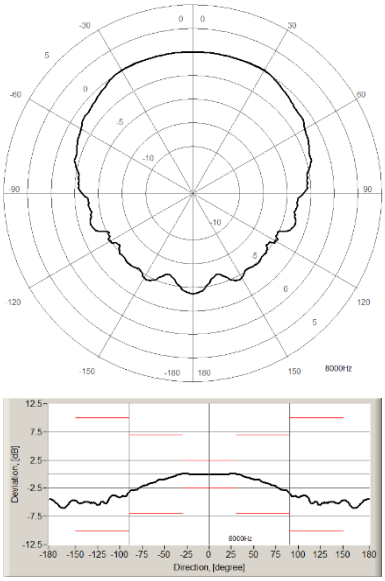
6300 Hz



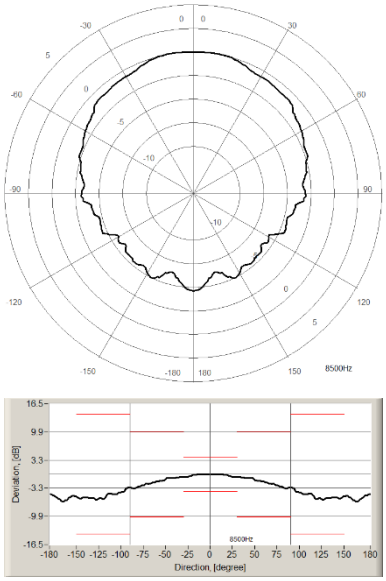
7100 Hz



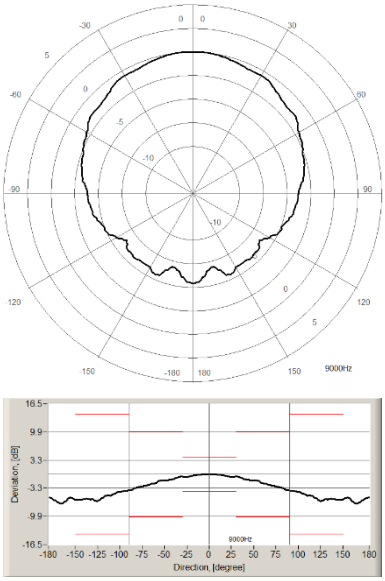
8000 Hz



8500 Hz



9000 Hz



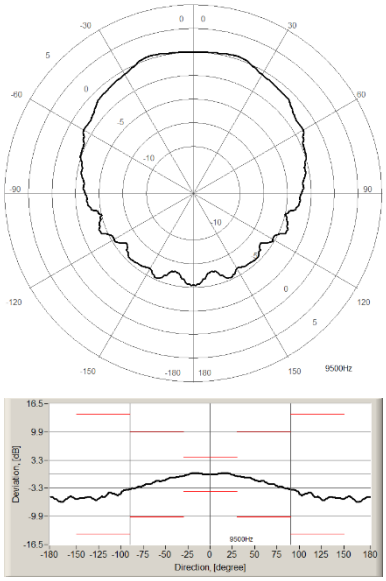
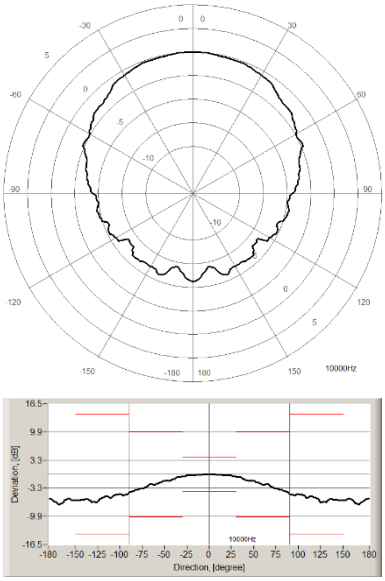
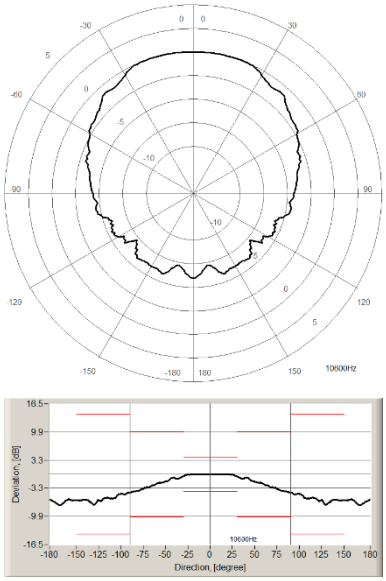
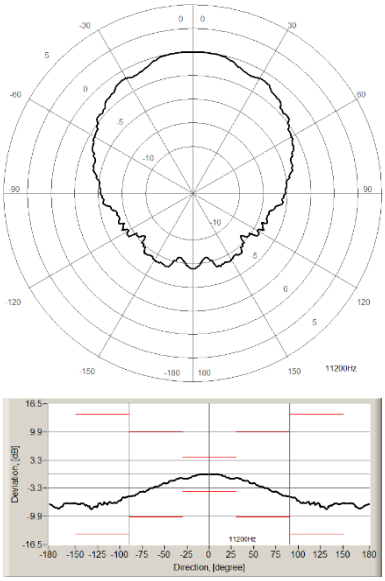
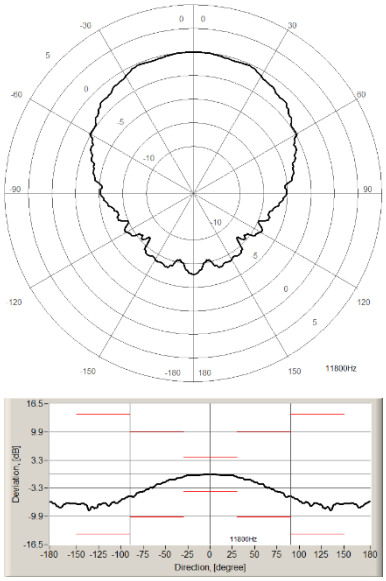
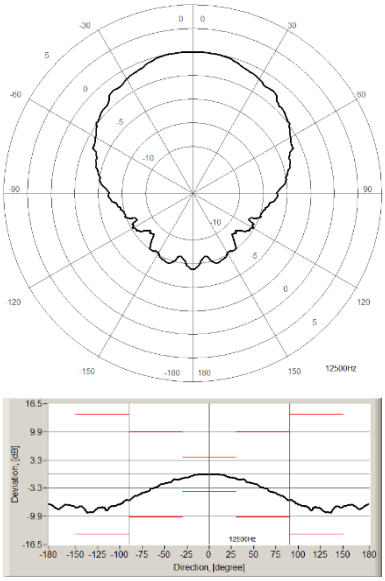
9500 Hz		**10000 Hz**	
10600 Hz		**11200 Hz**	
11800 Hz		**12500 Hz**	

Table C.1.11. Typical directional response of SV 971A with the SA 22 windscreen

	Angle [°]									
f [Hz]	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**	**80-90**	**90-100**
250	0.01	0.02	0.02	0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.02
315	0.02	0.02	0.03	0.02	0.02	0.01	-0.03	-0.05	-0.06	-0.08
400	-0.01	-0.01	-0.03	-0.04	-0.07	-0.10	-0.13	-0.16	-0.18	-0.19
500	0.01	0.02	0.02	0.02	-0.01	-0.04	-0.07	-0.11	-0.15	-0.20
630	0.01	0.00	0.01	0.00	-0.01	-0.03	-0.06	-0.09	-0.15	-0.19
800	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.03	-0.05	-0.09	-0.17
1 000	-0.01	-0.02	-0.03	-0.06	-0.07	-0.07	-0.08	-0.10	-0.14	-0.23
1 250	0.00	-0.01	-0.04	-0.07	-0.14	-0.21	-0.28	-0.30	-0.30	-0.27
1 600	-0.01	-0.03	-0.06	-0.08	-0.08	-0.06	-0.07	-0.18	-0.23	-0.23
2 000	0.01	0.01	-0.04	-0.10	-0.26	-0.42	-0.49	-0.49	-0.58	-0.70
2 240	0.00	-0.01	-0.04	-0.09	-0.17	-0.34	-0.55	-0.56	-0.53	-0.61
2 500	-0.01	-0.07	-0.19	-0.26	-0.32	-0.46	-0.68	-0.83	-0.85	-0.78
2 800	0.03	0.10	0.17	0.17	0.13	0.04	-0.34	-0.39	-0.70	-0.73
3 150	-0.04	-0.20	-0.35	-0.35	-0.19	-0.23	-0.55	-0.66	-0.86	-0.97
3 550	0.02	0.09	0.14	-0.20	-0.62	-0.61	-0.42	-0.66	-0.84	-1.14
4 000	0.01	-0.06	-0.19	-0.26	-0.25	-0.65	-0.70	-0.62	-0.87	-0.99
4 500	-0.04	-0.05	0.08	-0.11	-0.35	-0.41	-0.72	-0.91	-1.01	-1.40
5 000	0.01	0.09	0.17	-0.32	-0.37	-0.67	-0.83	-1.10	-1.10	-1.17
5 600	0.03	-0.06	-0.22	-0.59	-0.80	-1.13	-1.51	-1.76	-1.94	-2.29
6 300	0.03	-0.30	-1.08	-1.33	-1.36	-2.08	-2.33	-2.86	-3.17	-3.66
7 100	-0.01	-0.28	-0.50	-0.47	-1.30	-1.49	-2.23	-2.37	-2.96	-3.13
8 000	0.10	0.23	0.24	-0.31	-0.65	-1.12	-1.84	-2.58	-3.31	-4.10
8 500	-0.01	-0.39	-0.75	-0.86	-1.42	-1.85	-2.22	-2.87	-3.28	-4.09
9 000	-0.11	-0.50	-0.55	-1.14	-1.44	-2.04	-2.69	-3.13	-3.87	-4.43
9 500	0.11	0.34	-0.45	-0.74	-1.36	-1.64	-2.39	-2.91	-3.50	-4.75
10 000	-0.14	-0.22	-0.66	-1.48	-1.61	-2.61	-3.34	-4.05	-5.11	-5.28
10 600	0.03	0.04	-0.71	-0.98	-1.89	-2.49	-2.99	-3.88	-4.76	-4.96
11 200	-0.04	-0.84	-0.99	-1.56	-2.09	-3.05	-3.97	-4.96	-5.35	-6.39
11 800	-0.08	-0.28	-0.57	-1.08	-1.93	-2.47	-3.46	-4.34	-5.08	-6.25
12 500	-0.07	-0.55	-1.03	-1.55	-2.35	-3.35	-4.27	-5.03	-6.18	-7.48
f [Hz]	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**	**170-180**	**180-190**	**190-200**
250	-0.02	-0.02	-0.01	-0.01	-0.02	-0.03	-0.04	-0.05	-0.07	-0.06
315	-0.09	-0.10	-0.11	-0.12	-0.12	-0.12	-0.13	-0.13	-0.14	-0.15
400	-0.20	-0.20	-0.19	-0.18	-0.17	-0.15	-0.14	-0.13	-0.13	-0.13
500	-0.24	-0.28	-0.31	-0.33	-0.34	-0.35	-0.35	-0.35	-0.35	-0.35
630	-0.25	-0.29	-0.33	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.36
800	-0.23	-0.31	-0.35	-0.37	-0.37	-0.36	-0.34	-0.32	-0.32	-0.33
1 000	-0.32	-0.40	-0.45	-0.46	-0.46	-0.43	-0.41	-0.38	-0.37	-0.39
1 250	-0.30	-0.42	-0.52	-0.55	-0.54	-0.49	-0.43	-0.38	-0.39	-0.44
1 600	-0.16	-0.23	-0.36	-0.50	-0.51	-0.50	-0.42	-0.34	-0.34	-0.40
2 000	-0.73	-0.67	-0.73	-1.01	-1.10	-1.09	-0.97	-0.87	-0.82	-0.91
2 240	-0.65	-0.64	-0.81	-1.02	-1.09	-1.09	-0.99	-0.86	-0.86	-1.00
2 500	-1.04	-1.08	-0.88	-1.17	-1.26	-1.24	-1.03	-0.82	-0.85	-1.05
2 800	-0.94	-1.12	-0.75	-0.99	-1.16	-1.15	-1.01	-0.79	-0.75	-0.94
3 150	-1.14	-1.25	-1.00	-1.23	-1.51	-1.55	-1.36	-0.98	-1.05	-1.38
3 550	-1.11	-1.17	-1.03	-1.01	-1.38	-1.47	-1.29	-0.89	-0.97	-1.27
4 000	-1.07	-1.19	-1.19	-1.01	-1.46	-1.58	-1.36	-0.96	-1.01	-1.45
4 500	-1.44	-1.16	-1.31	-1.16	-1.22	-1.46	-1.29	-0.68	-0.80	-1.26
5 000	-1.86	-1.99	-1.66	-1.70	-1.64	-1.99	-1.94	-1.17	-1.40	-1.93
5 600	-2.95	-2.85	-2.53	-2.45	-2.20	-2.71	-2.65	-1.68	-2.05	-2.73
6 300	-4.10	-4.38	-4.19	-3.81	-3.62	-4.22	-4.22	-3.07	-3.43	-4.16
7 100	-4.42	-4.93	-4.67	-4.28	-4.26	-4.80	-4.80	-3.72	-4.41	-5.02
8 000	-3.90	-5.23	-5.58	-5.18	-5.28	-5.80	-6.03	-4.92	-5.43	-6.05
8 500	-4.86	-5.94	-6.26	-5.72	-5.81	-6.13	-6.34	-5.52	-5.93	-6.33
9 000	-5.09	-6.09	-6.38	-6.05	-6.08	-6.84	-7.05	-5.82	-6.88	-6.96
9 500	-4.96	-5.40	-6.05	-5.57	-5.66	-5.85	-6.51	-5.77	-6.47	-6.57
10 000	-5.95	-6.39	-7.01	-6.17	-6.17	-6.23	-7.28	-6.50	-6.97	-6.97
10 600	-6.29	-5.87	-7.44	-6.65	-6.27	-6.59	-7.31	-6.76	-7.15	-7.15
11 200	-6.98	-7.34	-8.40	-8.40	-7.06	-7.10	-8.09	-7.47	-8.12	-8.12
11 800	-7.25	-7.62	-8.28	-8.34	-7.00	-6.91	-7.62	-7.37	-8.03	-7.92
12 500	-8.14	-8.74	-9.25	-9.31	-7.71	-7.29	-8.09	-7.73	-8.34	-8.24

f [Hz]	200-210	210-220	220-230	230-240	240-250	250-260	260-270	270-280	280-290	290-300
250	-0.07	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.02	-0.01
315	-0.15	-0.16	-0.16	-0.16	-0.17	-0.17	-0.16	-0.16	-0.15	-0.14
400	-0.14	-0.16	-0.17	-0.18	-0.19	-0.19	-0.19	-0.18	-0.17	-0.15
500	-0.35	-0.35	-0.35	-0.34	-0.33	-0.31	-0.28	-0.24	-0.21	-0.17
630	-0.37	-0.37	-0.38	-0.38	-0.37	-0.35	-0.30	-0.27	-0.21	-0.16
800	-0.35	-0.36	-0.37	-0.37	-0.36	-0.31	-0.24	-0.16	-0.08	-0.05
1 000	-0.41	-0.44	-0.44	-0.44	-0.41	-0.35	-0.25	-0.19	-0.13	-0.11
1 250	-0.50	-0.53	-0.52	-0.46	-0.34	-0.23	-0.22	-0.25	-0.25	-0.21
1 600	-0.49	-0.54	-0.54	-0.47	-0.34	-0.15	-0.23	-0.25	-0.24	-0.11
2 000	-1.03	-1.08	-1.06	-0.92	-0.64	-0.79	-0.81	-0.75	-0.64	-0.63
2 240	-1.12	-1.13	-1.09	-0.90	-0.72	-0.72	-0.68	-0.63	-0.65	-0.65
2 500	-1.22	-1.23	-1.04	-0.95	-1.06	-0.94	-0.77	-0.81	-0.79	-0.64
2 800	-1.11	-1.13	-1.08	-0.70	-1.22	-1.20	-0.77	-0.80	-0.61	-0.45
3 150	-1.49	-1.43	-1.19	-1.18	-1.37	-1.18	-1.08	-0.99	-0.83	-0.71
3 550	-1.39	-1.29	-0.98	-1.20	-1.25	-1.13	-1.16	-0.89	-0.79	-0.52
4 000	-1.50	-1.29	-1.08	-1.29	-1.24	-1.20	-1.07	-1.03	-0.78	-0.81
4 500	-1.37	-1.16	-1.09	-1.20	-1.40	-1.53	-1.39	-0.94	-0.92	-0.77
5 000	-1.94	-1.50	-1.86	-1.94	-2.19	-1.61	-1.40	-1.35	-1.24	-1.14
5 600	-2.72	-2.32	-2.44	-2.51	-3.01	-2.83	-2.10	-2.12	-1.84	-1.35
6 300	-4.10	-3.90	-3.93	-4.46	-4.27	-4.10	-3.56	-3.27	-2.76	-2.44
7 100	-4.69	-4.70	-4.25	-5.16	-4.50	-3.76	-3.20	-3.00	-2.65	-2.13
8 000	-5.31	-5.17	-5.13	-5.56	-5.30	-4.21	-4.00	-3.14	-2.55	-1.96
8 500	-5.29	-5.59	-5.81	-5.79	-5.31	-4.72	-4.33	-3.47	-2.98	-2.33
9 000	-6.08	-5.96	-6.06	-6.46	-5.13	-4.56	-3.93	-3.59	-2.87	-2.44
9 500	-5.99	-5.79	-6.01	-6.24	-5.18	-5.12	-4.09	-3.44	-3.07	-2.32
10 000	-6.18	-6.19	-7.03	-6.59	-5.68	-5.43	-4.82	-3.80	-3.24	-2.36
10 600	-6.30	-6.32	-7.34	-6.99	-6.40	-5.79	-4.57	-4.12	-3.82	-3.24
11 200	-7.14	-7.23	-8.27	-7.62	-7.08	-6.66	-5.74	-5.30	-4.34	-3.58
11 800	-7.14	-7.41	-8.50	-7.50	-7.64	-6.71	-5.86	-5.47	-4.28	-3.35
12 500	-7.79	-8.37	-9.09	-8.34	-8.26	-7.25	-6.71	-5.81	-4.67	-3.79

f [Hz]	300-310	310-320	320-330	330-340	340-350	350-360
250	-0.01	0.01	0.01	0.00	0.01	0.01
315	-0.12	-0.10	-0.08	-0.05	-0.02	-0.01
400	-0.12	-0.09	-0.06	-0.04	-0.02	0.00
500	-0.14	-0.11	-0.08	-0.06	-0.04	-0.01
630	-0.12	-0.07	-0.05	-0.03	-0.02	0.00
800	-0.02	-0.01	-0.01	-0.01	-0.01	0.00
1 000	-0.11	-0.10	-0.08	-0.06	-0.03	-0.01
1 250	-0.14	-0.07	-0.02	0.01	0.01	0.00
1 600	-0.06	-0.09	-0.09	-0.08	-0.05	-0.01
2 000	-0.61	-0.49	-0.33	-0.19	-0.10	-0.04
2 240	-0.50	-0.30	-0.16	-0.09	-0.05	-0.01
2 500	-0.41	-0.32	-0.28	-0.17	-0.07	-0.01
2 800	-0.26	-0.12	0.08	0.09	0.04	-0.01
3 150	-0.38	-0.43	-0.45	-0.40	-0.22	-0.05
3 550	-0.68	-0.62	-0.18	0.07	0.04	-0.01
4 000	-0.59	-0.34	-0.35	-0.29	-0.13	-0.03
4 500	-0.44	-0.42	0.06	-0.06	-0.06	-0.03
5 000	-0.83	-0.67	-0.47	-0.06	-0.06	-0.03
5 600	-1.12	-0.90	-0.50	-0.27	0.05	0.02
6 300	-1.90	-1.42	-1.50	-0.65	-0.10	-0.01
7 100	-1.68	-1.04	-0.75	-0.72	-0.15	0.00
8 000	-1.31	-1.03	-0.53	-0.16	-0.15	-0.06
8 500	-1.67	-1.02	-0.86	-0.65	-0.14	0.02
9 000	-1.75	-1.51	-0.87	-0.66	-0.37	-0.04
9 500	-1.66	-1.25	-0.69	-0.34	0.21	0.04
10 000	-1.98	-1.53	-0.67	-0.30	-0.23	-0.08
10 600	-2.05	-1.50	-1.04	-0.05	-0.05	0.01
11 200	-2.71	-2.32	-1.42	-1.25	-0.49	-0.06
11 800	-2.51	-1.61	-1.10	-0.55	-0.32	-0.12
12 500	-2.92	-1.98	-1.31	-0.79	-0.35	-0.01

C.1.3 Effect of the SA 271A outdoor microphone kit

See Chapter C.5 for the details related to using of the SA 271A outdoor microphone kit.

C.1.4 Effect of Vibration

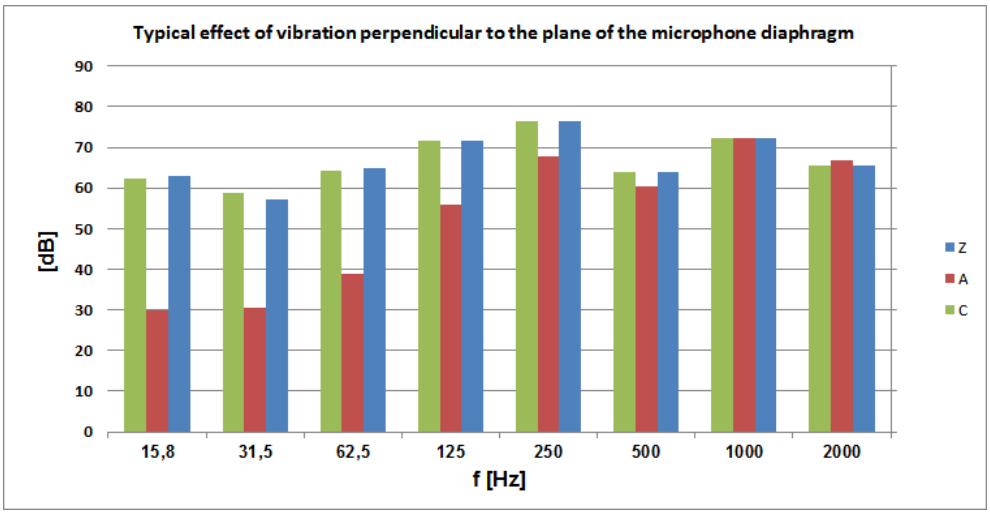
1. Mechanical vibration with an acceleration of 1 m/s² perpendicular to the membrane of the microphone for the frequencies 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz and 1000 Hz increases the low level of the linear operation range according to the Table C.1.12.
2. Mechanical vibration with an acceleration of 1 m/s² parallel to the membrane of the microphone for the frequencies 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz and 1000 Hz increases the low level of the linear operation range according to the Table C.1.13.

Test conditions:

SV 971A with microphone and preamplifier is mounted on the shaker.

Ref 1. Vibration is applied in a direction perpendicular to the plane of the microphone diaphragm.

Ref 2. Vibration is applied in a direction parallel to the plane of the microphone diaphragm.



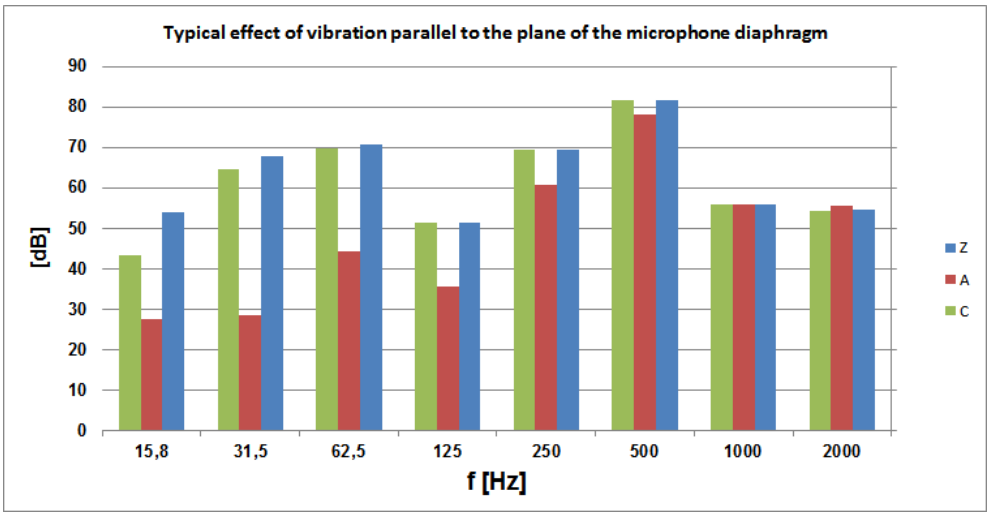


Table C.1.12. Typical effect of vibration perpendicular to the plane of the microphone diaphragm

f (Hz) / [dB]	15.6	31.25	62.5	125	250	500	1000	2000
Z filter	62.8	57.3	65.0	71.7	76.4	63.8	72.2	65.5
A filter	29.9	30.4	38.8	67.9	64.2	60.5	72.2	66.7
C filter	62.2	58.8	64.3	76.4	72.9	63.8	72.2	65.4

Table C.1.13. Typical effect of vibration parallel to the plane of the microphone diaphragm

f (Hz) / [dB]	15.6	31.25	62.5	125	250	500	1000	2000
Z filter	54.1	67.8	70.7	51.4	69.4	81.5	56.0	54.5
A filter	27.5	28.5	44.4	35.5	60.7	78.2	55.9	55.6
C filter	43.4	64.7	69.9	51.3	69.4	81.5	55.8	54.2

C.2 SPECIFICATION OF SV 971A AS 1/1 OCTAVE AND 1/3 OCTAVE ANALYSER

C.2.1 Specification of SVAN 971A as 1/1- and 1/3-octave analyser in the standard configuration

Statement of performance

SV 971A can operate as 1/1-octave or 1/3-octave analyser with all listed below accessories meeting requirements of the international IEC 61260-1:2014 standard for the pass band filters for the Class 1 Group X instruments.

Note: *Simultaneously to the frequency analysis SV 971A operates as a Sound Level Meter - see Chapters C.1 for specification.*

Configuration of the complete analyser

SV 971A	sound analyser
SV 18A	microphone preamplifier
ST 03	adapter (input impedance)

Normal operating mode

SV 971A in configuration with the **SV 18A** microphone preamplifier and **ST 03** adapter with following settings: measurement range – **Normal** or **Low** (path: *<Menu> / Measurement / Range* – see Chapter 4.6), **Microphone** compensation – **Off**, **Field Compensation** – **Free Field**, **Windscreen** compensation – **Off** (path: *<Menu> / Measurement / Compensation Filter* – see Chapter 4.7).

Note: *For the conformance electrical tests with the ST03 impedance, the* ***Microphone*** *compensation must be set to* ***Off*** *(path: <Menu> / Measurement / Compensation Filter) – see Chapter 4.7.*

Note: *When the 1/1- or 1/3-octave analyser is used with the microphone installed (for acoustic signals), the* ***Microphone*** *compensation must be set to* ***On*** *(path: <Menu> / Measurement / Compensation Filter) – see Chapter 4.7.*

Signal input

- SV 18A preamplifier throughout the ST 03 adapter
- Maximum input voltage: SV 971A meets the requirements of IEC 348 for the class 2 devices. The input voltage shall not exceed the limits between -10 V and +10 V.
- Impedance: 10 GΩ / 2 pF.

Linear operating ranges

Two measurement ranges are available: **Normal** and **Low**

Table C.2.1. Linear operating range (with SV 18A preamplifier, ST 03 adapter)

Range	**Linear operating range** (with 10 dB margin from noise) (**RMS** for the sinusoidal signal at reference conditions @ 1 kHz, 0.0 dB calibration factor)	
Low	from 10 μV_{RMS} “A”-weighting	to 0.891 V_{RMS} “A”-weighting
	from 10 μV_{RMS} “B”-weighting	to 0.891 V_{RMS} “B”-weighting
	from 10 μV_{RMS} “C”-weighting	to 0.891 V_{RMS} “C”-weighting
	from 20 μV_{RMS} “Z”-weighting	to 0.891 V_{RMS} “Z”-weighting
Normal	from 14.1 μV_{RMS} “A”-weighting	to 4.467 V_{RMS} “A”-weighting
	from 14.1 μV_{RMS} “B”-weighting	to 4. 467 V_{RMS} “B”-weighting
	from 14.1 μV_{RMS} “C”-weighting	to 4. 467 V_{RMS} “C”-weighting
	from 31.6 μV_{RMS} “Z”-weighting	to 4. 467 V_{RMS} “Z”-weighting

Table C.2.2. Peak for the sinusoidal signal 1 kHz, at reference conditions (with SV 1A8 preamplifier, ST 03 adapter)

Peak for the sinusoidal signal **1 kHz**, at reference conditions @ 1 kHz (0.0 dB calibration factor)	
Range	**Max Peak value**
Low	1.260 V “A”–weighting
	1. 260 V “B”–weighting
	1. 260 V “C”-weighting
	1. 260 V “Z”-weighting
Normal	6.317 V “A”-weighting
	6.317 V “B”–weighting
	6.317 V “C”-weighting
	6.317 V “Z”-weighting

Measuring frequency range 5 Hz ÷ 22.4 kHz with the **Z** filter (-3 dB)

Maximum peak voltage 20 V Peak-Peak (Maximum peak voltage of input sinusoidal signal, which can be lead to the SLM without destruction the meter)

RMS detector

- Digital “True RMS“ with Peak detection
- Resolution 0.1 dB
- Range 327.7 dB
- Crest Factor unlimited (for signals in 20 kHz band)

Reference conditions as per IEC 61260-1:2014

- Reference temperature +23°C
- Reference relative humidity 50%
- Static pressure 101.325 kPa

Calibration (electrical)

Calibration level 0.5 V_{RMS}

Basic accuracy < ± 0.2 dB (for the temperature T=+23°C ± 5°C for sinusoidal signal 120 dB_{RMS} in the band 5 Hz ÷ 20 kHz with filter **Z**)

Measurement error in the full temperature range

< ± 0.1 dB (when the temperature is from -10°C to +50°C for the sinusoidal signal 120 dB_{RMS} in the band 5 Hz ÷ 20 kHz with filter **Z**)

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 1 min. (for 0.1 dB accuracy).

Effect of humidity < 0.5 dB (for 30%<RH<90% at 40°C re Reference conditions).

Effect of magnetic field < 15 dB (A) or < 25 dB (Z) (for 80 A/m and 50 Hz).

Effect of Vibration < 0.1 dB (from 20 Hz to 1000 Hz at 1 m/s^2).

Antialiasing filter

Built-in antialiasing filter. Second-order analogue filter, passive Class, combined with on-chip FIR digital filter of the analog-to-digital converter, ensuring correct sampling of the measured signal.

Pass band (-1 dB) 22.200 kHz

Pass band (-3 dB) 23.520 kHz

Stop band 26.256 kHz

Attenuation in the stop band > 80 dB

Sampling frequency 48 kHz (internal only)

Analogue to digital converter 1 x 24 bit

Reference range **Normal**

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 IEC 61672-1:2013 for the Class 1 “A” filters
- **C** meeting requirements of IEC 61672-1:2013 for the Class 1 “C” filters
- **Z** meeting requirements of IEC 61672-1:2013 for the Class 1 “Z“ filters
- **B** meeting IEC651 for the Class 1 filters

See Chapter C.3 for the A, C, B and Z filters characteristics.

Noise levels (measured with SV 18A preamplifier, equivalent impedance ST 03 and 50 Ω BNC terminal, **Microphone** compensation switched off).

Range Low

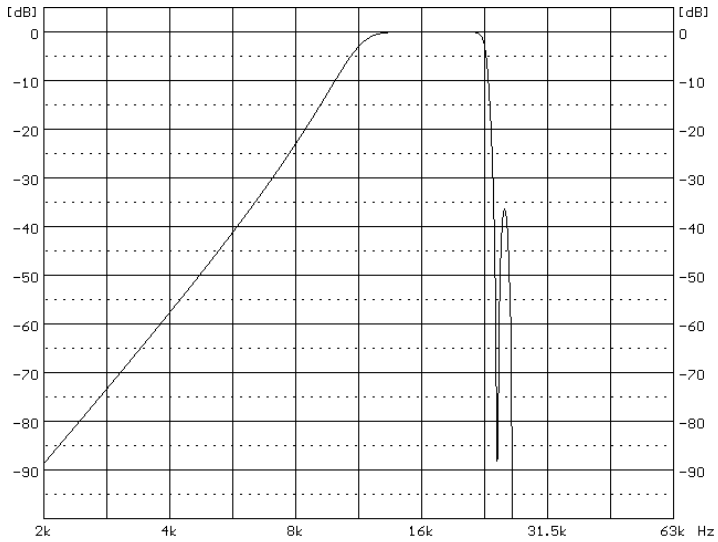
A weighting	< 3.0 μV_{RMS}
B weighting	< 3.0 μV_{RMS}
C weighting	< 3.0 μV_{RMS}
Z weighting	< 4.5 μV_{RMS}.

Range Normal

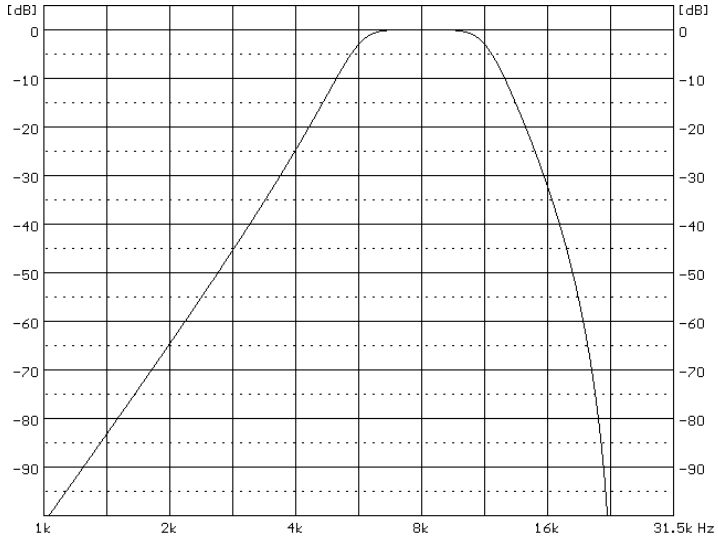
A weighting	< 12.0 μV_{RMS}
B weighting	< 12.0 μV_{RMS}
C weighting	< 12.0 μV_{RMS}.
Z weighting	< 16.0 μV_{RMS}

C.2.2 1/1 and 1/3 octave filters

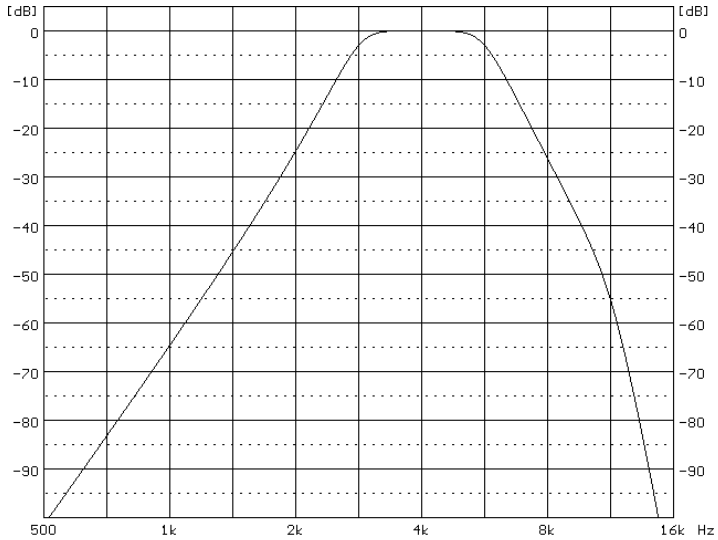
1/1 Octave filters 11 filters with centre frequencies from 16.0 Hz to 16 kHz (base 10), meeting IEC 61260-1:2014 standard for Class 1



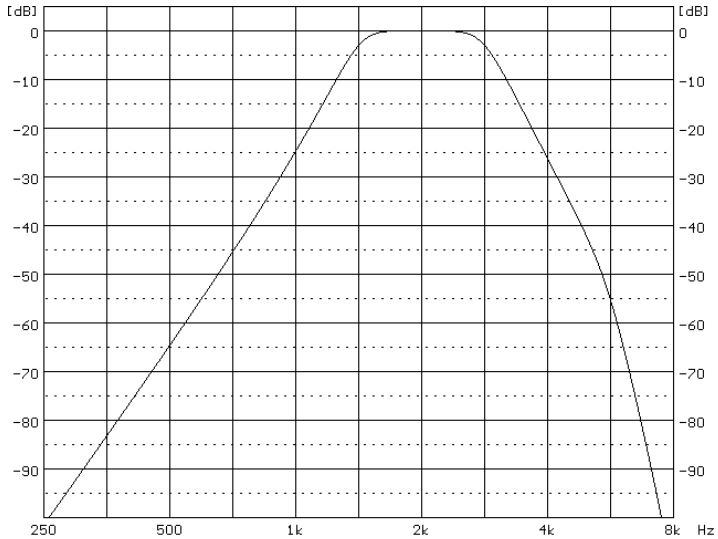
16.0 kHz 1/1 Octave filter (Audio/Full band)



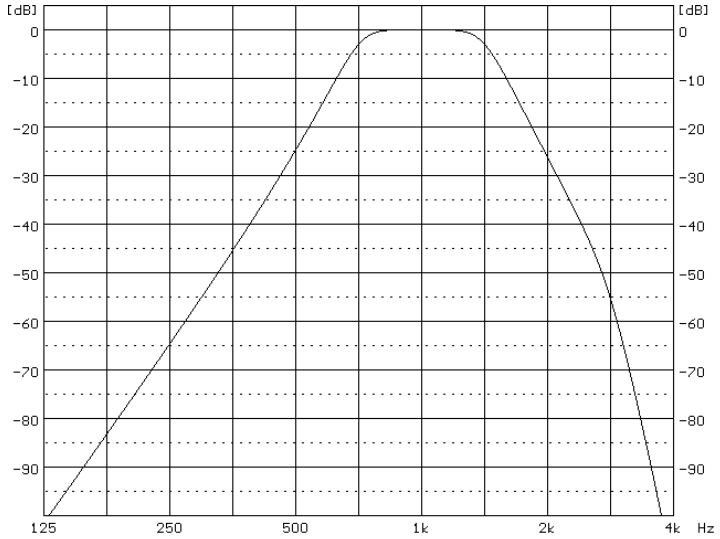
8.0 kHz 1/1 octave filter



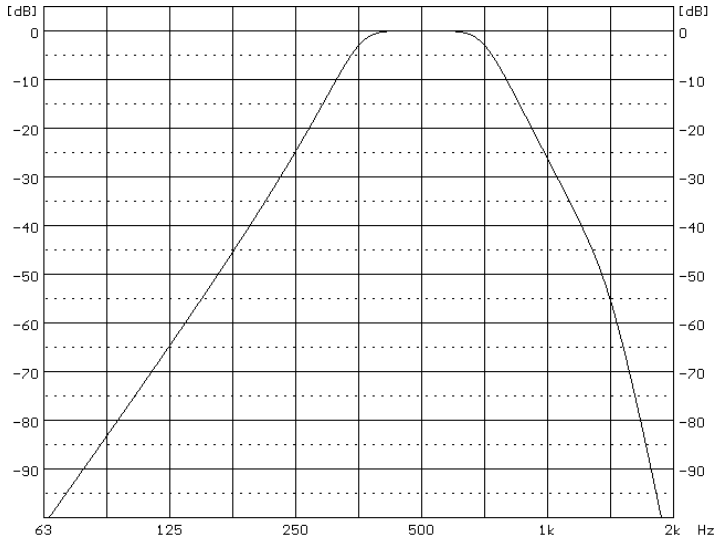
4.0 kHz 1/1 octave filter



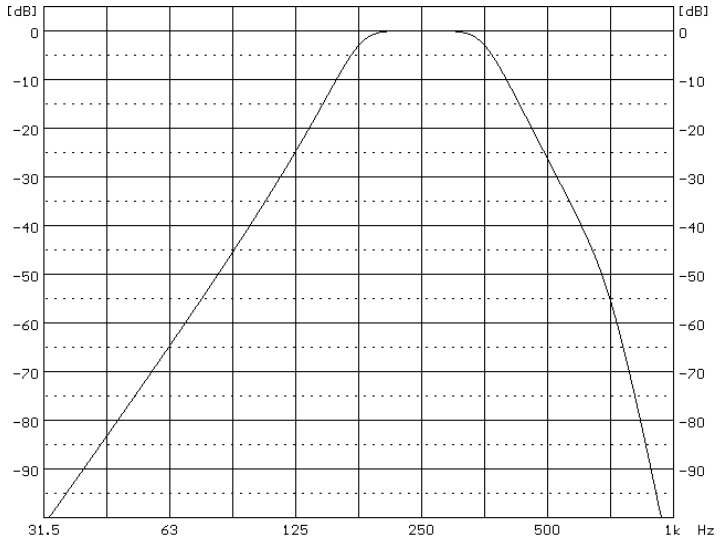
2.0 kHz 1/1 octave filter



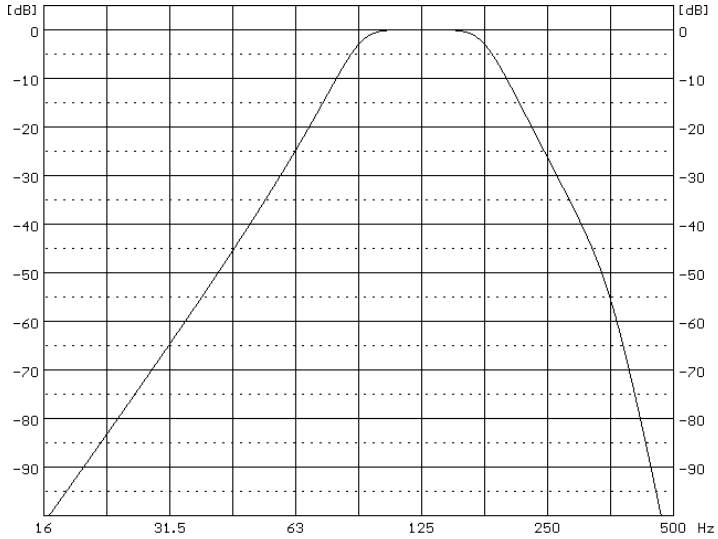
1.0 kHz 1/1 octave filter



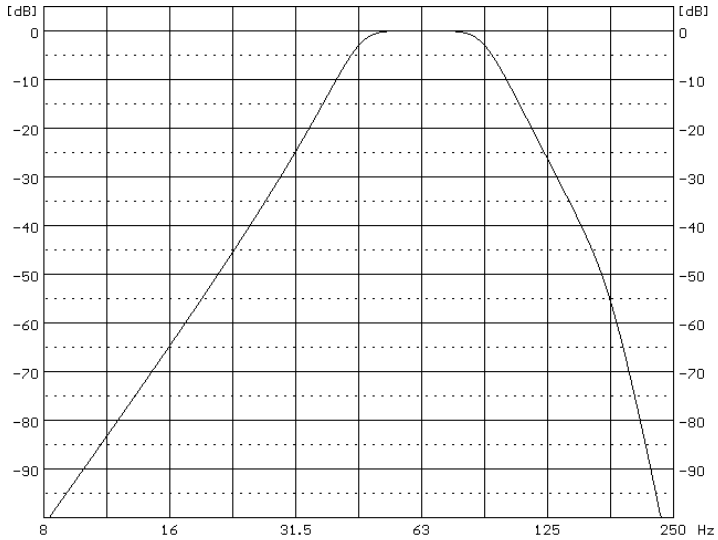
500 Hz 1/1 octave filter



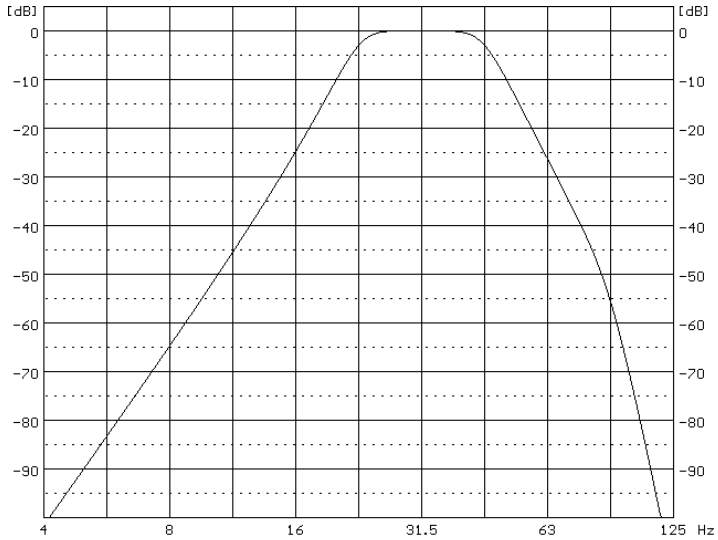
250 Hz 1/1 octave filter



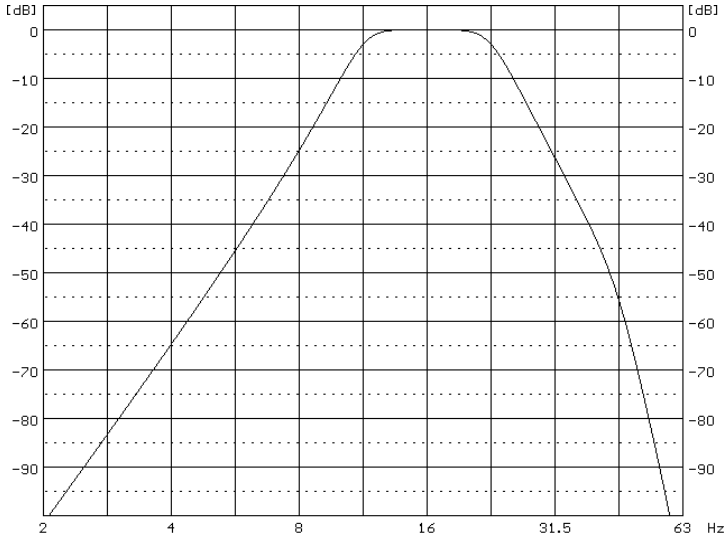
125 Hz 1/1 octave filter



63.0 Hz 1/1 octave filter



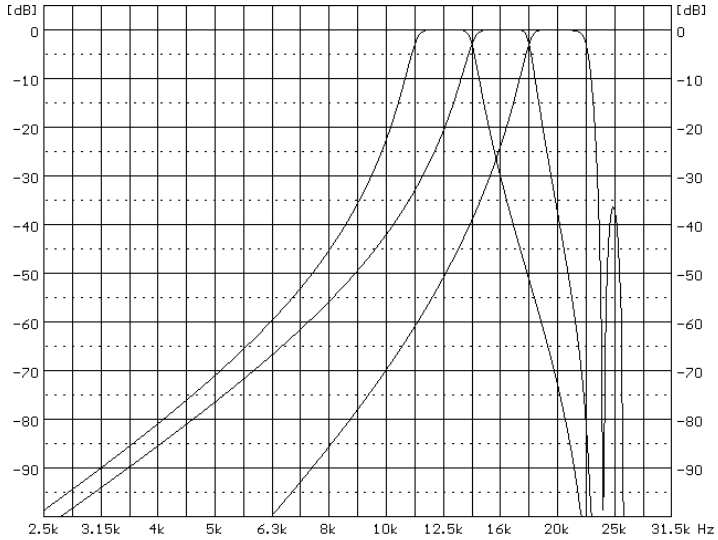
31.5 Hz 1/1 octave filter



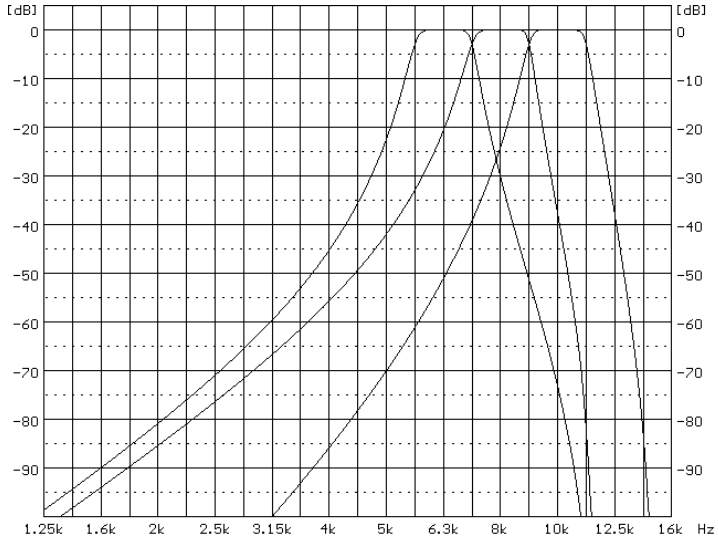
16.0 Hz 1/1 octave filter

1/3 Octave filters

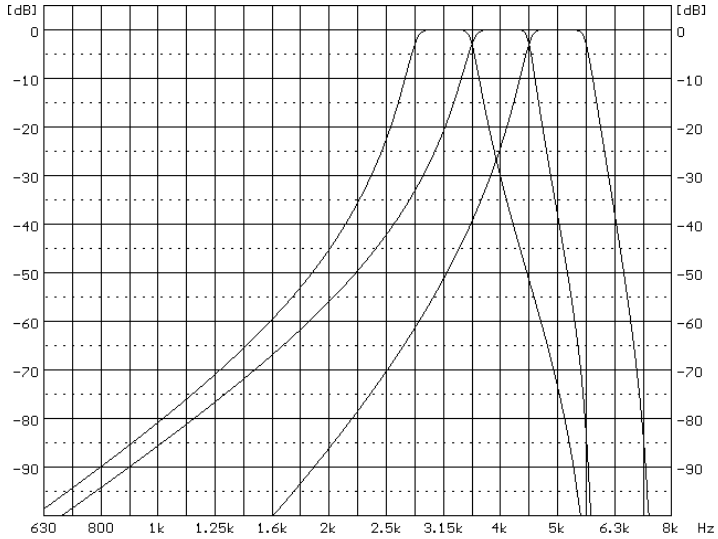
35 filters with centre frequencies from 8 Hz to 20 kHz (base 10), meeting IEC 61260-1:2014 standard for Class 1



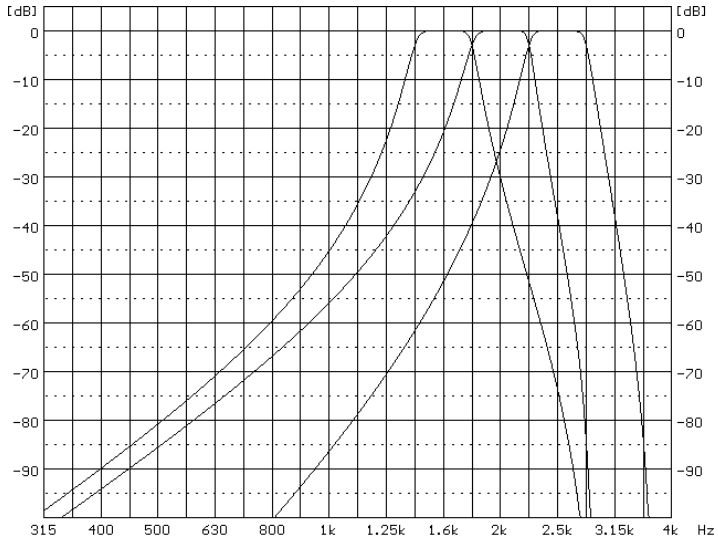
1/3 octave filters for 16.0 kHz 1/1 octave filter



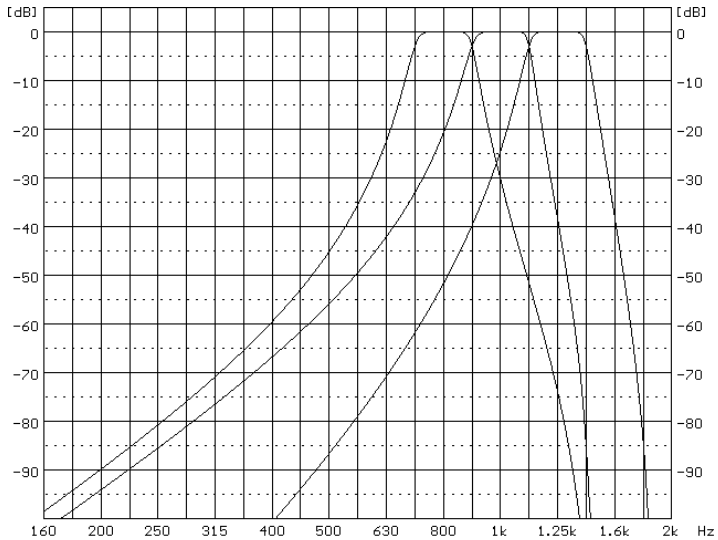
1/3 octave filters for 8.0 kHz 1/1 octave filter



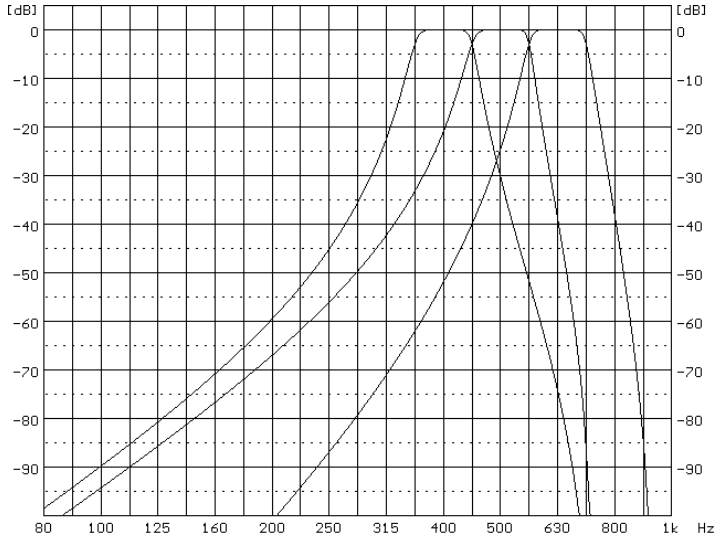
1/3 octave filters for 4.0 kHz 1/1 octave filter



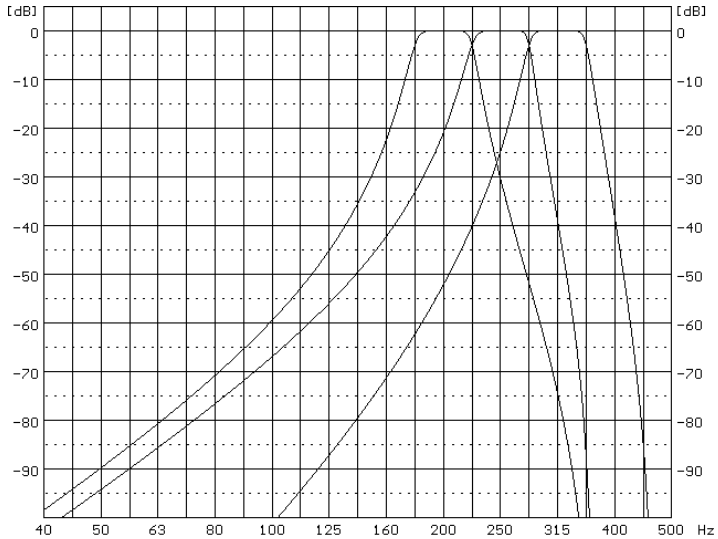
1/3 octave filters for 2.0 kHz 1/1 octave filter



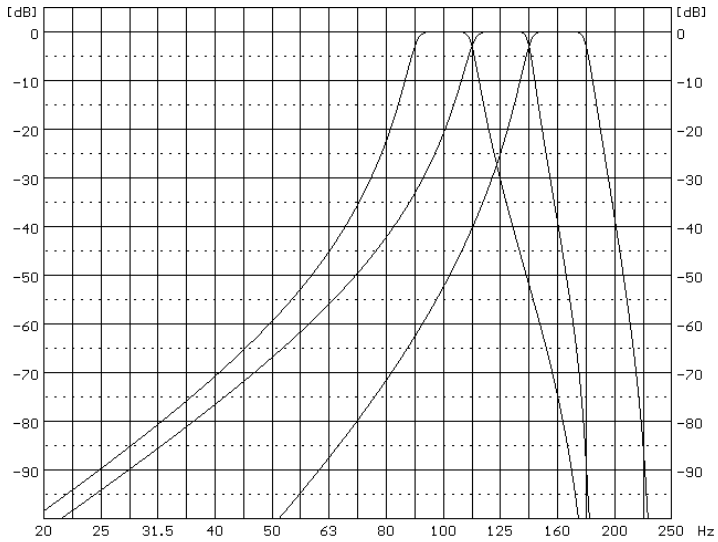
1/3 octave filters for 1.00 kHz 1/1 octave filter



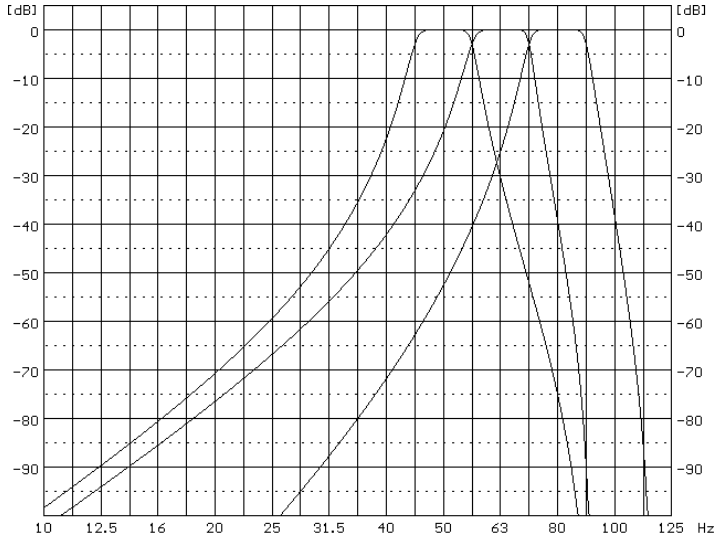
1/3 octave filters for 500 Hz 1/1 octave filter



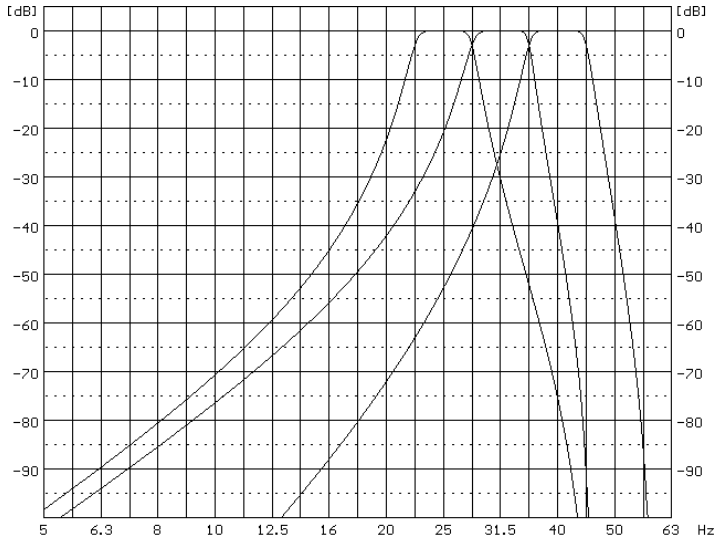
1/3 octave filters for 250 Hz 1/1 octave filter



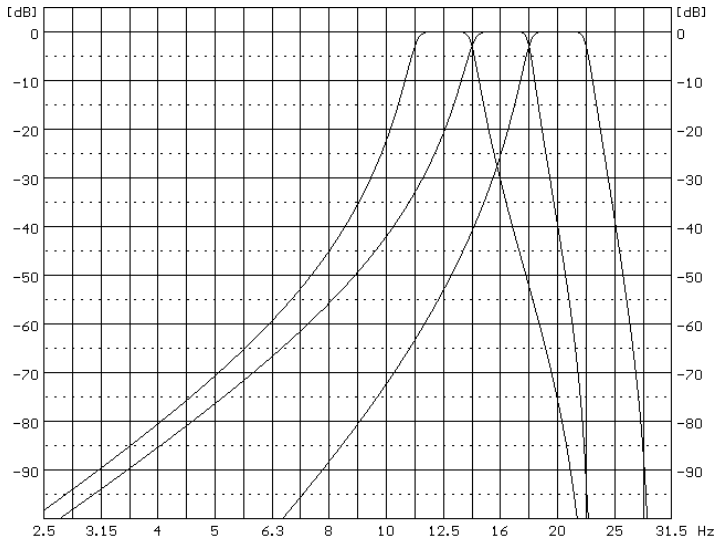
1/3 octave filters for 125 Hz 1/1 octave filter



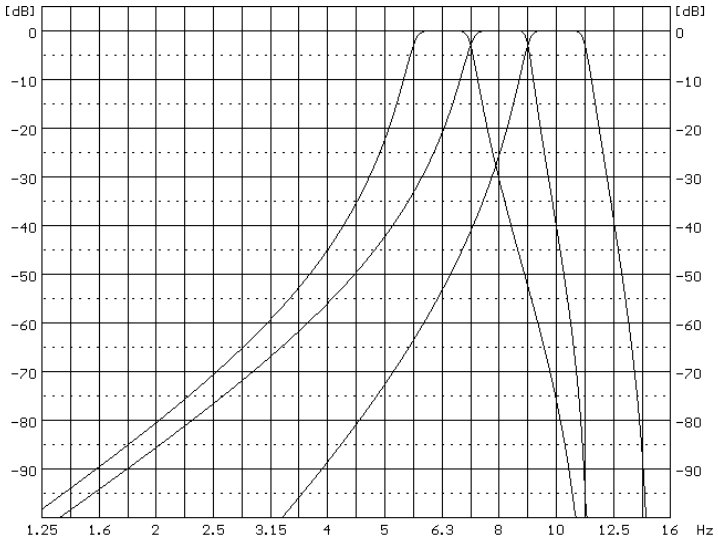
1/3 octave filters for 63.0 Hz 1/1 octave filter



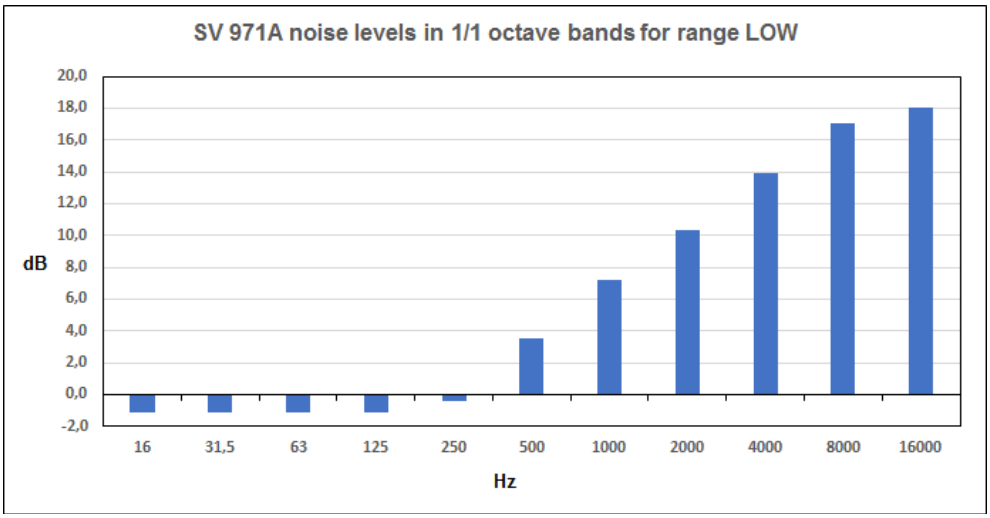
1/3 octave filters for 31.5 Hz 1/1 octave filter

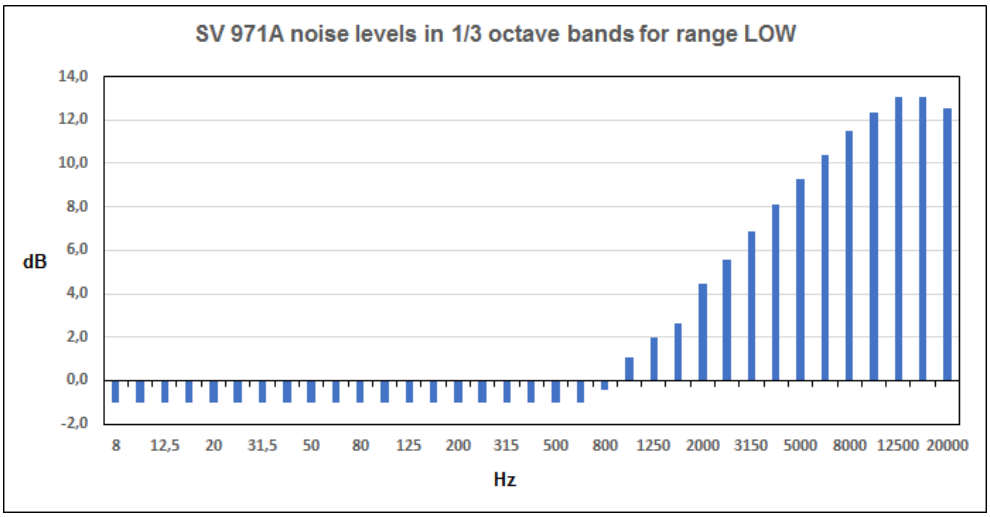


1/3 octave filters for 16.0 Hz 1/1 octave filter



1/3 octave filters for 8.00 Hz 1/1 octave filter

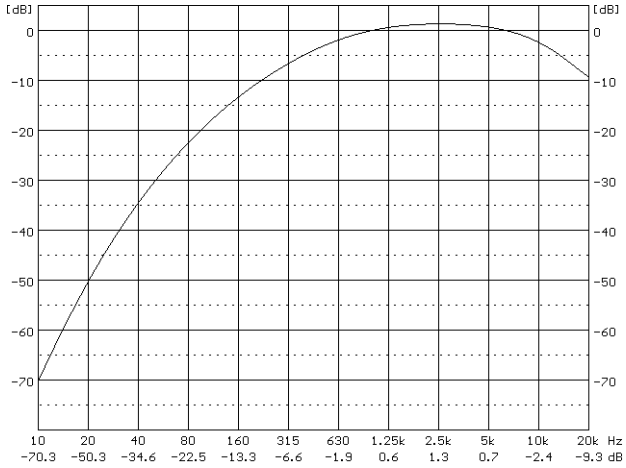




Typical electrical noise floor for the 1/1 and 1/3 octave filters in the SV 971A instrument

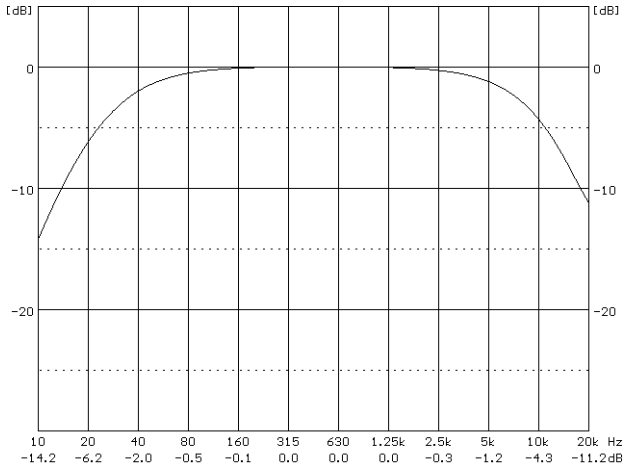
C.3 FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED DIGITAL FILTERS

“A” filter Class 1 according to IEC 651& and IEC 61672-1:2013



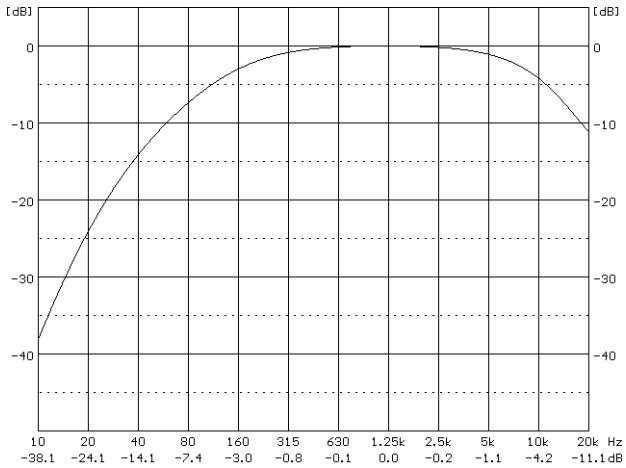
“A” filter characteristics

“C” filter Class 1 according to IEC 651 and IEC 61672-1:2013



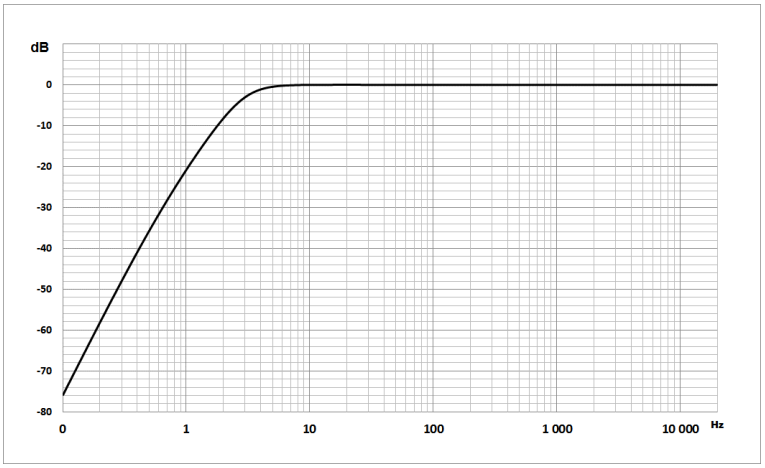
“C” filter characteristics

“B” filter Class 1 according to IEC 651



“B” filter characteristics

“Z” filter Class 1 according to IEC 61672-1:2013



“Z” filter characteristics

C.4 MISCELLANEOUS SPECIFICATION OF SV 971A

Display

Super contrast OLED colour display (96 x 96 pixels).

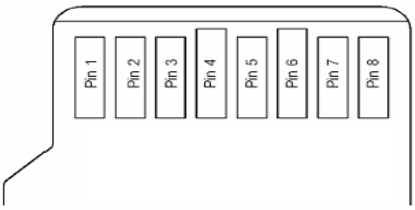
Memory

4 MB flash memory and 320 kB RAM memory.

Memory card

Can be used typical Micro SD or Micro SDHC cards. Supported for up to 128 GB (provided that card was formatted as FAT32).

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



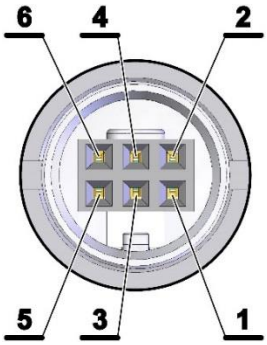
MicroSD contact pad assignment - outer view

Table C.4.1. Pin out of the MicroSD contact

Pin No.	Name	Description
1	DAT2	Data Line [Bit 2]
2	CD/DAT3	Card Detect / Data Line [Bit 3]
3	CMD	Command / Response
4	V_{DD}	Supply voltage
5	CLK	Clock
6	V_{SS}	Supply voltage ground
7	DAT0	Data Line [Bit 0]
8	DAT1	Data Line [Bit 1]

Input (Preamplifier) Connector

The input of the measured signal is taken form the microphone preamplifier:



Connector view (external), contact assignment

Table C.4.2. Pin out of the TNC connector

Contact number	Signal name
1	+4V /+10 V power supply
2	-2.1V /-7.3 V power supply
3	GND
4	Pramp DC bias
5	Signal
6	Temperature sensor / TEDS
Preamplifier body	Shield / Cable Screen

Power Supply

Instrument is dedicated for the operation from the internal replaceable AAA batteries. Power consumption from the 6V source is approx. 60 mA (at + 20°C). So, typical operating time from 4 x AAA alkaline batteries will be about **16 hours**.

SV 971A can be also powered from the AAA Class rechargeable batteries.

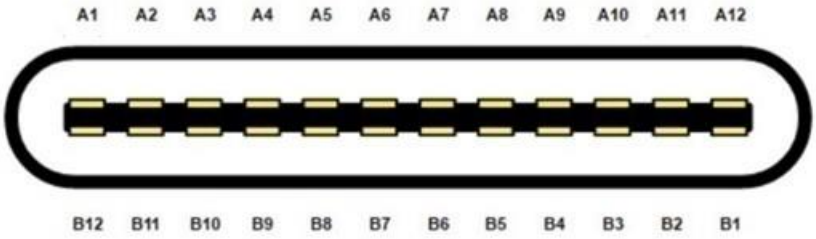
Note: *For the temperatures below 0℃ operating time can decrees (depending on the batteries)!*

Interface USB Type C

The SV 971A 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.

Note: *For effective operation with the USB, the **High 480Mbps** speed mode should be used, however when the interference RF field strength may exceed the value of 3V/m, then it is recommended to switch to the **Full 12Mbps** speed mode.*

The USB-C interface can work as external power source for the meter.



USB-C socket (external view)

Table C.4.3. 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 971A 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 300 bit/s to 115200 bit/s.

Note: *The SP 75 interface must be connected to the SV 971A 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.4.4. SP 75 interface description

PC RS 232, 9 - pin connector Signal name	SV 56 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)

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.

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)
- Ingress Protection Code IP 54

Weight with batteries 225 g (including microphone and preamplifier).

Dimensions 20 x 56 x 232 mm .

Compliance with EU Directives (see Chapter C.6)

CE mark indicates compliance with RED Directive 2014/53/EU:

- 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.5 USING THE SA 271A OUTDOOR MICROPHONE KIT

The **SA 271A** outdoor microphone kit protects the instrument's preamplifier and microphone from weather conditions. Using an outdoor microphone kit requires an extension cable between the instrument and its preamplifier (**SC 91A**).

SA 271A is made of lightweight materials and is easy to install on a tripod. This solution is recommended for short term outdoor noise measurements.

The outdoor microphone kit has ¾" screw on its bottom which allows the use of standard tripods or other user specific mounts.

As an option the user may use desiccator – Silica gel. Desiccator absorbs moisture normally contained in the air.

***Note**: Desiccator should be regenerated after some period of use, when it changes colour to light grey, by drying it for 3 hours in a temperature of 150°C. Desiccator should be inspected at least every 2 weeks, and more often when used in conditions of high air humidity.*

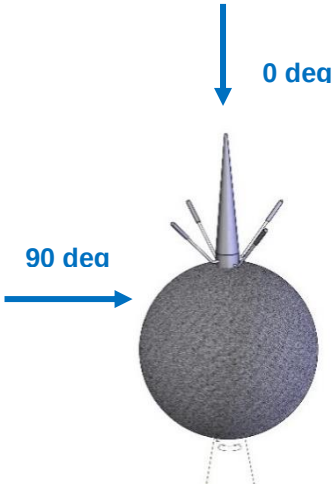
***Note**: See also Appendix F to learn how to assemble and disassemble the outdoor microphone kit.*

***Note:** Using SA 271A changes the frequency response and measuring ranges of SV 971A. Please check the below given specification.*

Depending on the measurement task SA 271A can be used in two operational modes:

1. With reference incidence angle 90 deg – so called "Environment" mode.
2. With reference incidence angle 0 deg – so called "Airport" mode.

The wave incidence angle is oriented to the microphone membrane surface. 0 deg means direction orthogonal to the membrane surface. 90 deg means direction parallel to the membrane surface.



Frequency response of SV 971A with the SA 271A outdoor microphone kit is compensated by means of two digital filters which can be set in the **Field Comp.** position (*path: <Menu> / Measurement / Comp. Filter*):

- **Environment** — compensation filter that improves the complete instrument frequency response in the free field for the reference acoustic wave incidence angle 90 deg
- **Airport** — compensation filter that improves the complete instrument frequency response in the free field for the reference acoustic wave incidence angle 0 deg

Note: *For the conformance acoustical tests with SA 271A, the* ***Microphone*** *compensation must be switched* ***On*** *and the* ***Field Compensation*** *must be set to* ***Environment*** *or* ***Airport*** *(path: <Menu> / Measurement / Comp. Filter).*

Statement of performance

SV 971A working as the SLM with SA 271A meets requirements of IEC 61672:2013 for the Class 1 Group X instruments.

Linear operating ranges with the **Environment** filter

The starting point at which tests of level linearity shall begin is 94.0 dB for the frequencies specifies below. For the **Low** measurement range and A weighting linearity test at 31.5 Hz, the starting point is 79 dB.

Table C.5.1. Linear operating ranges for the **Normal** measurement range and the **Environment** filter (for the sinusoidal signal and microphone sensitivity in the range 32 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	29	97	29	120	29	134	36	137	29	97	29	120	29	134	32	100	55	137
500 Hz	29	133	29	136	29	137	36	137	29	133	29	136	29	137	32	136	55	140
1 kHz	29	137	29	137	29	137	36	137	29	137	29	137	29	137	32	140	55	140
4 kHz	29	138	29	136	29	136	36	137	29	138	29	136	29	136	32	141	55	139
8 kHz	29	136	29	134	29	134	36	137	29	136	29	134	29	134	32	139	55	137
12.5 kHz	29	132	29	131	29	131	36	137	29	132	29	131	29	131	32	135	55	134

Table C.5.2. Linear operating ranges for the **Low** measurement range and the **Environment** filter (for the sinusoidal signal and microphone sensitivity in the range 32 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	26	80	26	103	26	117	31	120	26	80	26	103	26	117	29	83	51	120
500 Hz	26	116	26	119	26	120	31	120	26	116	26	119	26	120	29	119	50	123
1 kHz	26	120	26	120	26	120	31	120	26	120	26	120	26	120	29	123	50	123
4 kHz	26	121	26	119	26	119	31	120	26	121	26	119	26	119	29	124	50	123
8 kHz	26	119	26	117	26	117	31	120	26	119	26	117	26	117	29	122	50	120
12.5 kHz	26	115	26	114	26	114	31	120	26	115	26	114	26	114	29	118	50	117

Table C.5.3. Self-generated noise for different weighting filters

	Electrical *)			**Acoustical compensated**		
Weighting filter / Range	**A**	**C**	**Z**	**A**	**C**	**Z**
Low	< 15 dB	< 15 dB	< 20 dB	< 16 dB	< 16 dB	< 21 dB
Normal	< 26 dB	< 26 dB	< 31 dB	< 27 dB	< 27 dB	< 31 dB

*) measured with the **ST 03** microphone equivalent impedance 18 pF ± 10%

Linear operating ranges with Airport filter

The starting point at which tests of level linearity shall begin is 94.0 dB for the frequencies specifies below. For the **Low** measurement range and A weighting linearity test at 31.5 Hz, the starting point is 79 dB.

Table C.5.4. Linear operating ranges for the **Normal** measurement range and the **Airport** filter (for the sinusoidal signal and microphone sensitivity 32 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	29	97	29	120	29	134	36	137	29	97	29	120	29	134	32	100	55	137
500 Hz	29	133	29	136	29	137	36	137	29	133	29	136	29	137	32	136	55	140
1 kHz	29	137	29	137	29	137	36	137	29	137	29	137	29	137	32	140	55	140
4 kHz	29	138	29	136	29	136	36	137	29	138	29	136	29	136	32	141	55	139
8 kHz	29	136	29	134	29	134	36	137	29	136	29	134	29	134	32	139	55	137
12.5 kHz	29	132	29	131	29	131	36	137	29	132	29	131	29	131	32	135	55	134

Table C.5.5. Linear operating ranges for the **Low** measurement range and the **Airport** filter (for the sinusoidal signal and microphone sensitivity in the range 32 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	26	80	26	103	26	117	32	120	26	80	26	103	26	117	29	83	50	120
500 Hz	26	116	26	119	26	120	32	120	26	116	26	119	26	120	29	119	50	123
1 kHz	26	120	26	120	26	120	32	120	26	120	26	120	26	120	29	123	50	123
4 kHz	26	121	26	119	26	119	32	120	26	121	26	119	26	119	29	124	50	123
8 kHz	26	119	26	117	26	117	32	120	26	119	26	117	26	117	29	123	50	120
12.5 kHz	26	115	26	114	26	114	32	120	26	115	26	114	26	114	29	118	50	117

Table C.5.6. Self-generated noise for different weighting filters

	Electrical *)			**Acoustical compensated**		
Weighting filter / **Range**	**A**	**C**	**Z**	**A**	**C**	**Z**
Low	< 15 dB	< 14 dB	< 20 dB	< 16 dB	< 16 dB	< 22 dB
Normal	< 26 dB	< 25 dB	< 32 dB	< 26 dB	< 26 dB	< 32 dB

*) measured with the **ST 03** microphone equivalent impedance 18 pF +/-10%

ACO 7152 Free Field frequency response for 90 deg incidence angle

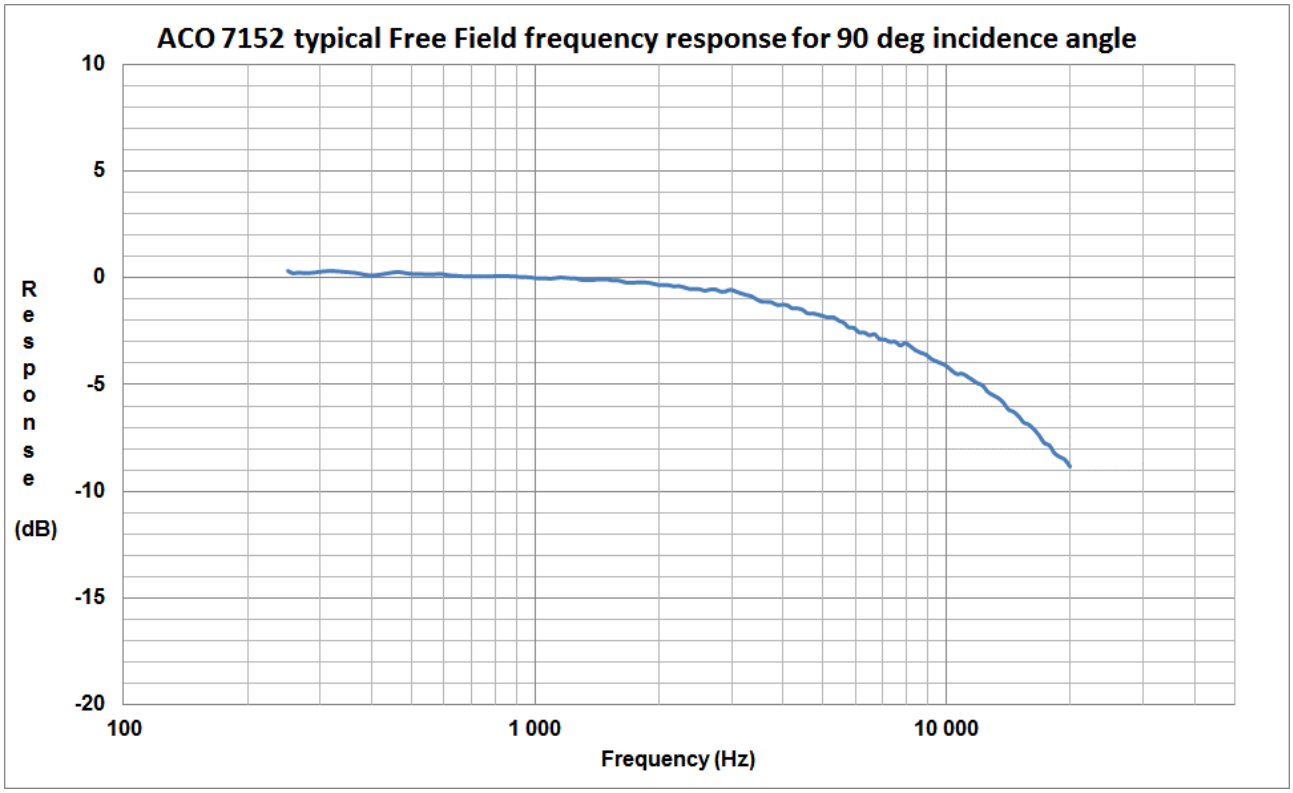


Table C.5.7. ACO 7152 Free Field corrections for the electrostatic actuator for 90 deg incidence angle

[dB]	Frequency [Hz]																
	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800
Correction factors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.31	0.31	0.12	0.19	0.12	0.12
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

[dB]	Frequency [Hz]													
	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
Correction factors	0.09	0.11	0.09	-0.05	-0.05	-0.03	-0.23	-0.28	-0.39	0.01	0.17	0.64	1.38	2.16
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.35	0.35	0.35	0.35	0.50	0.50	0.50

Free Field frequency characteristics of SV 971A with SA 271A for 90 deg incidence angle

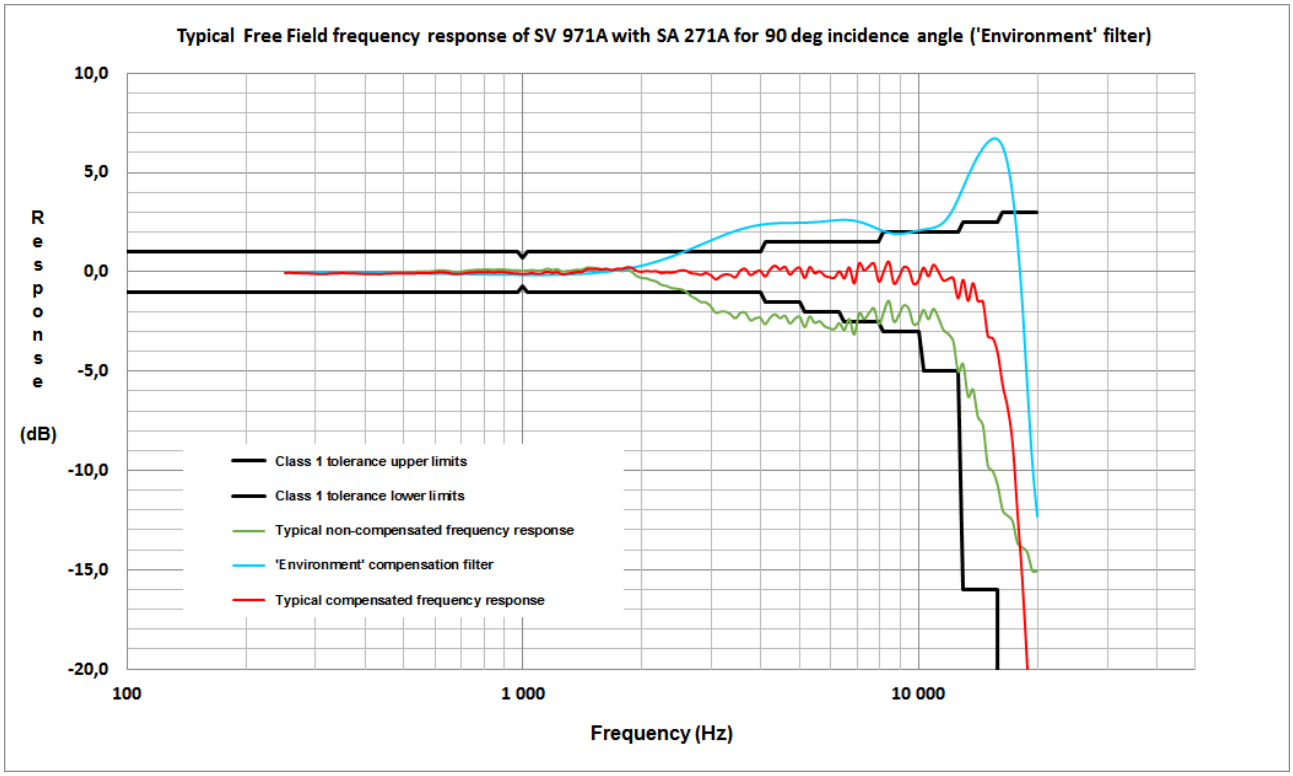


Table C.5.8. Typical Free Field frequency characteristics of SV 971A with SA 271A for 90 deg incidence angle

Frequency	Compensation filter for 90 deg incidence angle "Environment"	Typical compensated response of SV 971A with SA 271A for 90 deg incidence angle	Compensated Case Effect of SA 271A for 90 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
251	-0.01	-0.03	-0.34	0.25
259	-0.02	-0.03	-0.22	0.25
266	-0.02	-0.04	-0.27	0.25
274	-0.02	-0.05	-0.26	0.25
282	-0.02	-0.05	-0.26	0.25
290	-0.02	-0.06	-0.29	0.25
299	-0.02	-0.07	-0.34	0.25
307	-0.02	-0.09	-0.38	0.25
316	-0.02	-0.10	-0.40	0.25
325	-0.02	-0.07	-0.37	0.25
335	-0.03	-0.06	-0.34	0.25
345	-0.03	-0.05	-0.31	0.25
355	-0.03	-0.05	-0.29	0.25
365	-0.03	-0.06	-0.28	0.25
376	-0.03	-0.06	-0.24	0.25
387	-0.03	-0.08	-0.20	0.25
398	-0.04	-0.08	-0.18	0.25
410	-0.04	-0.09	-0.19	0.25
422	-0.04	-0.09	-0.23	0.25

Frequency	Compensation filter for 90 deg incidence angle "Environment"	Typical compensated response of SV 971A with SA 271A for 90 deg incidence angle	Compensated Case Effect of SA 271A for 90 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
434	-0.04	-0.10	-0.28	0.25
447	-0.04	-0.08	-0.30	0.25
460	-0.05	-0.07	-0.33	0.25
473	-0.05	-0.05	-0.30	0.25
487	-0.05	-0.05	-0.25	0.25
501	-0.05	-0.05	-0.22	0.25
516	-0.06	-0.06	-0.22	0.25
531	-0.06	-0.05	-0.21	0.25
546	-0.06	-0.05	-0.19	0.25
562	-0.07	-0.04	-0.19	0.25
579	-0.07	-0.04	-0.21	0.25
596	-0.07	-0.03	-0.18	0.25
613	-0.08	0.01	-0.11	0.25
631	-0.08	0.00	-0.08	0.25
649	-0.08	-0.03	-0.10	0.25
668	-0.09	-0.08	-0.14	0.25
688	-0.09	-0.08	-0.13	0.25
708	-0.09	-0.05	-0.10	0.25
729	-0.10	-0.02	-0.08	0.25
750	-0.10	-0.01	-0.05	0.25
772	-0.11	0.01	-0.04	0.25
794	-0.11	0.01	-0.05	0.25
818	-0.11	0.02	-0.04	0.25
841	-0.12	-0.01	-0.07	0.25
866	-0.12	0.00	-0.06	0.25
891	-0.12	0.01	-0.04	0.25
917	-0.13	-0.02	-0.05	0.25
944	-0.13	-0.04	-0.06	0.25
972	-0.13	-0.05	-0.06	0.25
1 000	-0.13	-0.08	-0.06	0.25
1 029	-0.14	-0.06	-0.01	0.25
1 059	-0.14	-0.04	0.01	0.25
1 090	-0.14	-0.07	-0.02	0.25
1 122	-0.14	-0.05	-0.03	0.25
1 155	-0.14	0.03	0.03	0.25
1 189	-0.13	-0.04	-0.02	0.25
1 223	-0.13	0.01	0.05	0.25
1 259	-0.12	-0.10	-0.06	0.25
1 296	-0.12	-0.06	0.05	0.25
1 334	-0.11	-0.03	0.08	0.25
1 372	-0.10	0.02	0.15	0.25
1 413	-0.09	0.02	0.11	0.25
1 454	-0.07	0.16	0.25	0.25
1 496	-0.05	0.16	0.24	0.25
1 540	-0.03	0.16	0.30	0.25
1 585	-0.01	0.14	0.27	0.25

Frequency	Compensation filter for 90 deg incidence angle "Environment"	Typical compensated response of SV 971A with SA 271A for 90 deg incidence angle	Compensated Case Effect of SA 271A for 90 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
1 631	0.02	0.17	0.36	0.25
1 679	0.05	0.11	0.35	0.25
1 728	0.09	0.18	0.42	0.25
1 778	0.13	0.17	0.40	0.25
1 830	0.17	0.25	0.47	0.25
1 884	0.22	0.23	0.47	0.25
1 939	0.27	0.07	0.36	0.25
1 995	0.33	0.02	0.37	0.25
2 054	0.39	0.07	0.42	0.25
2 113	0.46	0.04	0.40	0.25
2 175	0.53	0.05	0.46	0.25
2 239	0.61	-0.03	0.37	0.25
2 304	0.69	-0.01	0.45	0.25
2 371	0.78	-0.02	0.51	0.25
2 441	0.88	0.04	0.58	0.25
2 512	0.97	0.09	0.64	0.25
2 585	1.07	0.08	0.70	0.25
2 661	1.17	-0.04	0.52	0.25
2 738	1.28	-0.07	0.48	0.25
2 818	1.39	-0.13	0.52	0.25
2 901	1.49	-0.04	0.62	0.25
2 985	1.60	-0.14	0.43	0.25
3 073	1.70	-0.35	0.30	0.25
3 162	1.80	-0.20	0.54	0.25
3 255	1.90	-0.10	0.71	0.25
3 350	1.99	-0.14	0.73	0.25
3 447	2.08	-0.25	0.76	0.25
3 548	2.16	0.10	1.22	0.25
3 652	2.23	0.17	1.31	0.25
3 758	2.29	-0.14	1.01	0.25
3 868	2.34	0.00	1.27	0.25
3 981	2.39	0.08	1.36	0.25
4 097	2.42	-0.21	1.08	0.35
4 217	2.45	0.14	1.58	0.35
4 340	2.47	0.33	1.77	0.35
4 467	2.48	0.14	1.65	0.35
4 597	2.48	0.28	1.95	0.35
4 732	2.49	-0.11	1.57	0.35
4 870	2.49	0.13	1.87	0.35
5 012	2.49	0.22	2.02	0.35
5 158	2.50	-0.28	1.58	0.35
5 309	2.51	0.26	2.12	0.35
5 464	2.52	-0.04	1.96	0.35
5 623	2.54	0.06	2.17	0.35
5 788	2.56	-0.17	2.16	0.35
5 957	2.59	-0.25	2.11	0.35

Frequency	Compensation filter for 90 deg incidence angle "Environment"	Typical compensated response of SV 971A with SA 271A for 90 deg incidence angle	Compensated Case Effect of SA 271A for 90 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
6 131	2.61	-0.27	2.29	0.35
6 310	2.63	0.05	2.62	0.35
6 494	2.63	-0.30	2.40	0.35
6 683	2.62	0.25	2.90	0.35
6 879	2.59	-0.56	2.31	0.35
7 079	2.54	0.46	3.36	0.35
7 286	2.47	0.09	3.10	0.35
7 499	2.38	0.31	3.30	0.35
7 718	2.27	0.43	3.60	0.35
7 943	2.16	-0.47	2.59	0.35
8 175	2.07	0.07	3.29	0.35
8 414	1.99	0.53	3.93	0.35
8 660	1.94	-0.56	2.96	0.35
8 913	1.93	-0.26	3.35	0.35
9 173	1.95	0.26	4.06	0.35
9 441	1.99	0.15	4.07	0.35
9 716	2.05	-0.58	3.43	0.35
10 000	2.11	-0.41	3.73	0.35
10 292	2.15	0.23	4.58	0.35
10 593	2.19	-0.19	4.32	0.35
10 902	2.24	0.38	4.87	0.35
11 220	2.33	0.03	4.66	0.35
11 548	2.50	-0.41	4.37	0.35
11 885	2.79	-0.34	4.60	0.35
12 232	3.19	-0.29	4.75	0.35
12 589	3.70	-1.32	4.03	0.35
12 957	4.27	-0.38	5.12	0.35
13 335	4.84	-1.44	4.19	0.35
13 725	5.38	-0.55	5.29	0.35
14 125	5.85	-1.46	4.70	0.35
14 538	6.25	-1.48	4.80	0.35
14 962	6.55	-3.21	3.28	0.35
15 399	6.73	-3.32	3.46	0.35
15 849	6.69	-4.07	2.80	0.35
16 312	6.32	-5.70	1.40	0.35
16 788	5.46	-6.82	0.56	0.35
17 278	3.92	-8.64	-0.91	0.35
17 783	1.55	-12.12	-4.27	0.35
18 302	-1.76	-15.64	-7.43	0.35
18 836	-5.78	-19.92	-11.54	0.35
19 387	-9.68	-24.74	-16.23	0.35
19 953	-12.32	-27.39	-18.56	0.35

Free Field frequency characteristics of SV 971A with SA 271A for 0 deg incidence angle

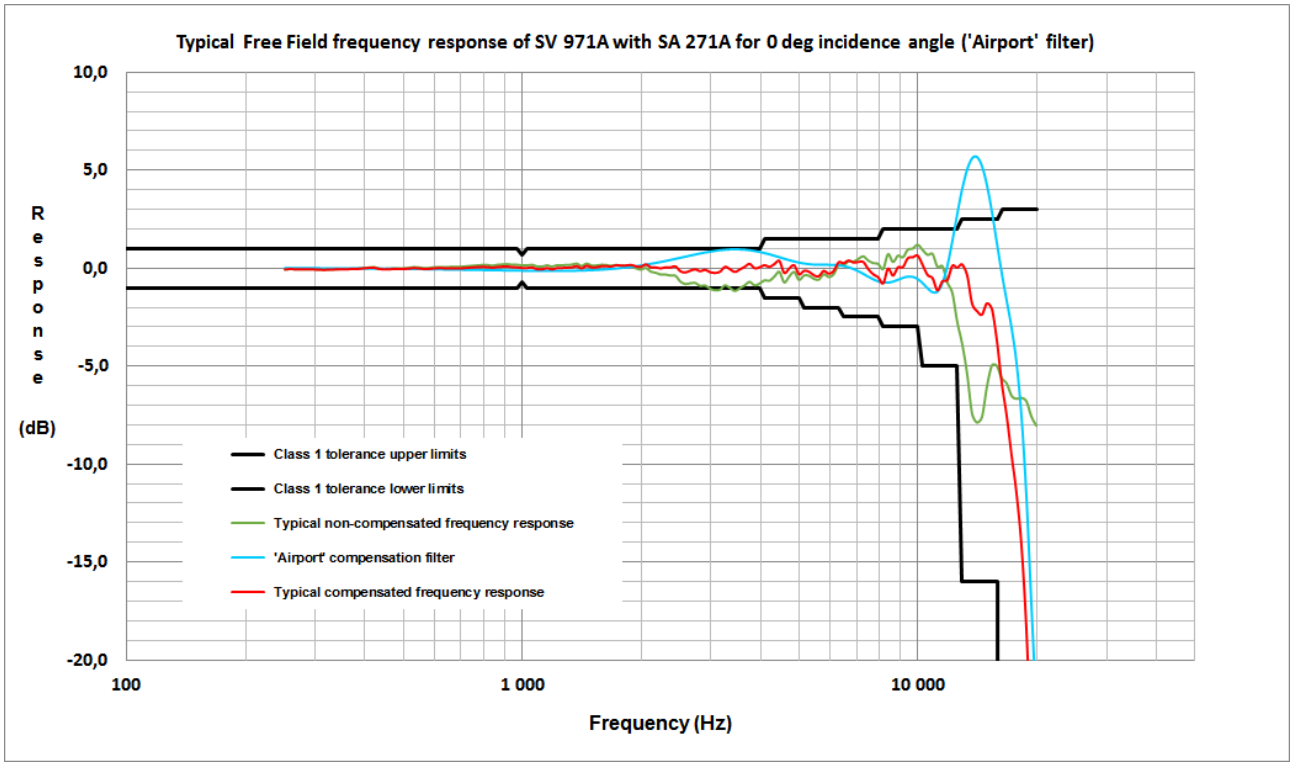


Table C.5.9. Typical Free Field frequency characteristics of SV 971A with SA 271A for 0 deg incidence angle

Frequency	Compensation filter for 0 deg incidence angle "Airport"	SA 271A typical compensated response for 0 deg incidence angle	Compensated Case Effect for 0 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
251	-0.02	-0.08	-0.14	0.25
259	-0.02	-0.06	-0.11	0.25
266	-0.02	-0.07	-0.12	0.25
274	-0.02	-0.07	-0.11	0.25
282	-0.02	-0.07	-0.11	0.25
290	-0.02	-0.07	-0.11	0.25
299	-0.02	-0.08	-0.11	0.25
307	-0.02	-0.09	-0.13	0.25
316	-0.03	-0.10	-0.14	0.25
325	-0.03	-0.09	-0.13	0.25
335	-0.03	-0.08	-0.13	0.25
345	-0.03	-0.08	-0.13	0.25
355	-0.03	-0.07	-0.12	0.25
365	-0.03	-0.07	-0.11	0.25
376	-0.03	-0.06	-0.09	0.25
387	-0.04	-0.05	-0.07	0.25
398	-0.04	-0.02	-0.04	0.25
410	-0.04	0.00	-0.01	0.25
422	-0.04	0.01	0.00	0.25
434	-0.04	-0.05	-0.06	0.25
447	-0.05	-0.08	-0.10	0.25
460	-0.05	-0.07	-0.08	0.25

Frequency	Compensation filter for 0 deg incidence angle "Airport"	SA 271A typical compensated response for 0 deg incidence angle	Compensated Case Effect for 0 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
473	-0.05	-0.06	-0.07	0.25
487	-0.05	-0.06	-0.07	0.25
501	-0.06	-0.06	-0.06	0.25
516	-0.06	-0.04	-0.05	0.25
531	-0.06	-0.01	-0.02	0.25
546	-0.07	-0.03	-0.04	0.25
562	-0.07	-0.05	-0.06	0.25
579	-0.07	-0.06	-0.07	0.25
596	-0.08	-0.03	-0.04	0.25
613	-0.08	-0.01	-0.02	0.25
631	-0.08	-0.02	-0.02	0.25
649	-0.09	-0.03	-0.03	0.25
668	-0.09	-0.02	-0.02	0.25
688	-0.10	-0.03	-0.03	0.25
708	-0.10	-0.02	-0.02	0.25
729	-0.10	0.01	0.01	0.25
750	-0.11	0.02	0.02	0.25
772	-0.11	0.04	0.04	0.25
794	-0.12	0.05	0.05	0.25
818	-0.12	0.04	0.05	0.25
841	-0.13	0.01	0.02	0.25
866	-0.13	0.05	0.05	0.25
891	-0.13	0.06	0.07	0.25
917	-0.14	0.07	0.07	0.25
944	-0.14	0.04	0.04	0.25
972	-0.15	0.03	0.02	0.25
1 000	-0.15	-0.01	-0.01	0.25
1 029	-0.15	-0.01	-0.01	0.25
1 059	-0.16	0.02	0.03	0.25
1 090	-0.16	-0.07	-0.07	0.25
1 122	-0.16	-0.08	-0.08	0.25
1 155	-0.16	-0.01	-0.01	0.25
1 189	-0.16	-0.08	-0.08	0.25
1 223	-0.16	-0.01	-0.02	0.25
1 259	-0.16	-0.01	-0.01	0.25
1 296	-0.16	0.00	-0.01	0.25
1 334	-0.15	0.03	0.02	0.25
1 372	-0.15	0.09	0.07	0.25
1 413	-0.14	-0.02	-0.04	0.25
1 454	-0.13	0.10	0.09	0.25
1 496	-0.12	0.02	0.01	0.25
1 540	-0.11	0.03	0.02	0.25
1 585	-0.10	0.08	0.07	0.25
1 631	-0.08	0.09	0.08	0.25
1 679	-0.06	0.07	0.06	0.25
1 728	-0.04	0.13	0.13	0.25
1 778	-0.01	0.11	0.12	0.25
1 830	0.02	0.12	0.14	0.25
1 884	0.05	0.15	0.17	0.25
1 939	0.08	0.08	0.09	0.25
1 995	0.12	0.05	0.07	0.25

Frequency	Compensation filter for 0 deg incidence angle "Airport"	SA 271A typical compensated response for 0 deg incidence angle	Compensated Case Effect for 0 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
2 054	0.16	0.17	0.20	0.25
2 113	0.20	0.03	0.06	0.25
2 175	0.25	0.02	0.06	0.25
2 239	0.30	-0.02	0.04	0.25
2 304	0.35	0.03	0.08	0.25
2 371	0.40	0.02	0.09	0.25
2 441	0.46	0.07	0.15	0.25
2 512	0.51	-0.17	-0.11	0.25
2 585	0.57	-0.24	-0.19	0.25
2 661	0.63	-0.14	-0.09	0.25
2 738	0.68	-0.07	-0.04	0.25
2 818	0.73	-0.17	-0.13	0.25
2 901	0.78	-0.10	-0.05	0.25
2 985	0.83	-0.22	-0.16	0.25
3 073	0.87	-0.26	-0.20	0.25
3 162	0.90	-0.20	-0.12	0.25
3 255	0.92	0.05	0.15	0.25
3 350	0.94	-0.06	0.06	0.25
3 447	0.94	-0.21	-0.08	0.25
3 548	0.94	-0.08	0.05	0.25
3 652	0.93	0.05	0.19	0.25
3 758	0.90	0.21	0.34	0.25
3 868	0.86	-0.02	0.09	0.25
3 981	0.81	0.03	0.15	0.25
4 097	0.76	0.14	0.27	0.35
4 217	0.69	0.05	0.17	0.35
4 340	0.62	0.19	0.33	0.35
4 467	0.54	0.36	0.51	0.35
4 597	0.46	-0.26	-0.09	0.35
4 732	0.39	-0.03	0.14	0.35
4 870	0.32	0.13	0.33	0.35
5 012	0.27	-0.33	-0.16	0.35
5 158	0.22	-0.15	0.02	0.35
5 309	0.19	-0.20	-0.02	0.35
5 464	0.17	-0.38	-0.22	0.35
5 623	0.16	-0.42	-0.24	0.35
5 788	0.15	-0.15	0.07	0.35
5 957	0.15	-0.30	-0.09	0.35
6 131	0.15	-0.16	0.05	0.35
6 310	0.13	0.28	0.50	0.35
6 494	0.09	0.24	0.44	0.35
6 683	0.03	0.37	0.55	0.35
6 879	-0.06	0.28	0.49	0.35
7 079	-0.17	0.30	0.50	0.35
7 286	-0.31	0.30	0.54	0.35
7 499	-0.45	-0.07	0.13	0.35
7 718	-0.59	-0.33	-0.16	0.35
7 943	-0.70	-0.48	-0.36	0.35
8 175	-0.76	-0.79	-0.65	0.35
8 414	-0.76	-0.04	0.02	0.35
8 660	-0.71	-0.39	-0.27	0.35

Frequency	Compensation filter for 0 deg incidence angle "Airport"	SA 271A typical compensated response for 0 deg incidence angle	Compensated Case Effect for 0 deg incidence angle	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
8 913	-0.61	0.03	0.15	0.35
9 173	-0.51	0.04	0.15	0.35
9 441	-0.45	0.49	0.59	0.35
9 716	-0.46	0.54	0.67	0.35
10 000	-0.57	0.62	0.71	0.35
10 292	-0.79	0.14	0.26	0.35
10 593	-1.05	-0.37	-0.21	0.35
10 902	-1.25	-0.52	-0.41	0.35
11 220	-1.21	-1.15	-1.03	0.35
11 548	-0.78	-0.68	-0.60	0.35
11 885	0.11	-0.62	-0.54	0.35
12 232	1.36	0.10	0.15	0.35
12 589	2.75	0.01	0.12	0.35
12 957	4.03	0.17	0.27	0.35
13 335	5.02	-0.39	-0.25	0.35
13 725	5.59	-1.84	-1.75	0.35
14 125	5.66	-2.21	-2.15	0.35
14 538	5.19	-2.39	-2.42	0.35
14 962	4.23	-1.81	-1.92	0.35
15 399	2.86	-2.10	-2.24	0.35
15 849	1.28	-3.70	-3.83	0.35
16 312	-0.28	-5.88	-6.00	0.35
16 788	-1.68	-7.55	-7.65	0.35
17 278	-3.09	-9.58	-9.72	0.35
17 783	-4.90	-11.56	-11.88	0.35
18 302	-7.64	-14.24	-14.67	0.35
18 836	-11.71	-18.49	-19.05	0.35
19 387	-17.18	-24.74	-25.45	0.35
19 953	-22.54	-30.56	-31.17	0.35

Table C.5.10. Free Field corrections for SV 971A with SA 271A (combined: Microphone plus Case Effect) for the electrostatic actuator

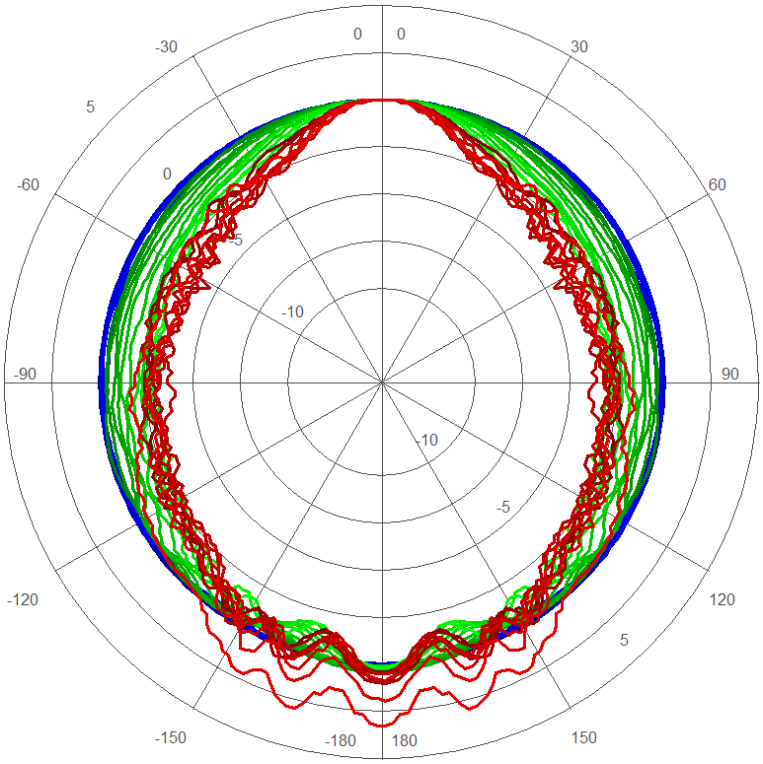
Correction factors [dB]	Frequency [Hz]																
	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800
0 deg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.28	-0.35	-0.14	-0.18	-0.04	0.01
90 deg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.17	0.2	0.08	0.13	0.1	0.17
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

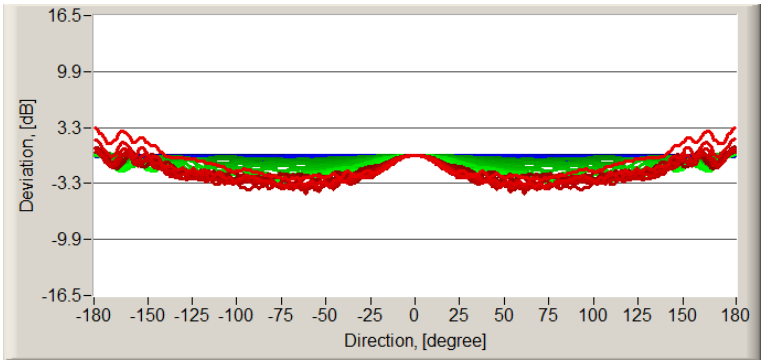
Correction factors [dB]	Frequency [Hz]													
	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
0 deg	0.05	0.1	0.50	0.65	1.08	1.17	2.27	3.37	4.58	5.54	7.95	9.9	11.18	-6.96
90 deg	0.08	0.1	0.16	0.02	-0.16	-0.15	-0.08	-0.44	0.11	-0.35	0.88	0.76	-2.45	-29.01
Uncertainty (IEC 62585)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.35	0.35	0.35	0.35	0.50	0.50	0.50

Free Field directional characteristics of SV 971A with SA 271A

Directional response of SV 971A with the ACO 7152 microphone, SV 18A preamplifier and SA 271A outdoor microphone kit for specified frequencies.

Combined typical directional characteristics



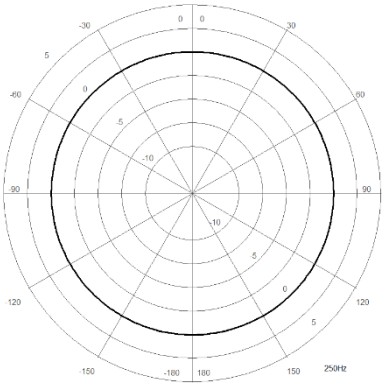


LEGEND

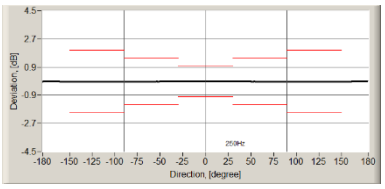
Fmin (250Hz) **Fmax (12,5kHz)**

The round charts show the typical directional characteristics and the charts below shows the errors for 0 deg and 90 deg incidence angles.

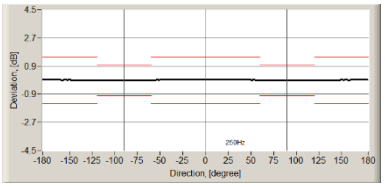
250 Hz



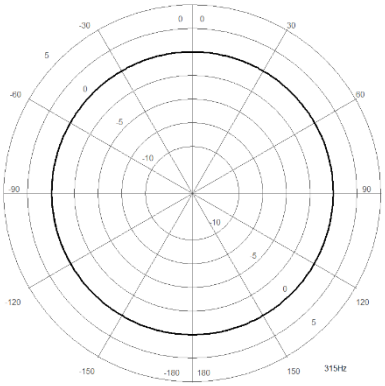
0 deg



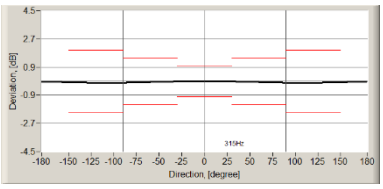
90 deg



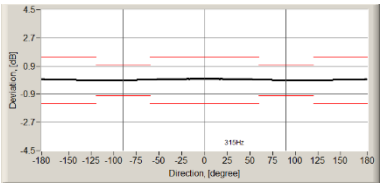
315 Hz



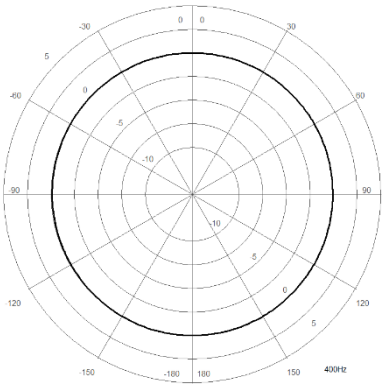
0 deg



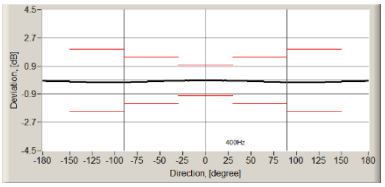
90 deg



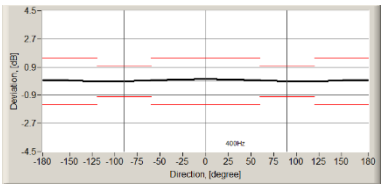
400 Hz



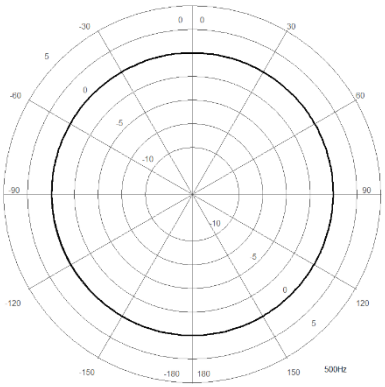
0 deg



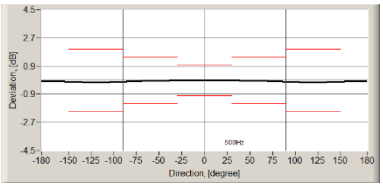
90 deg



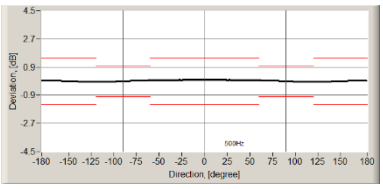
500 Hz



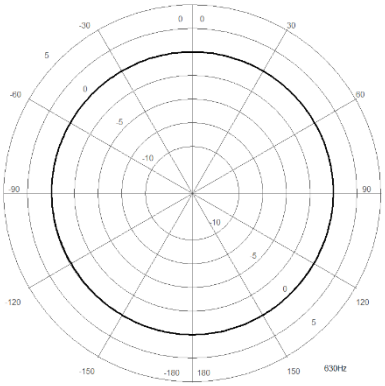
0 deg



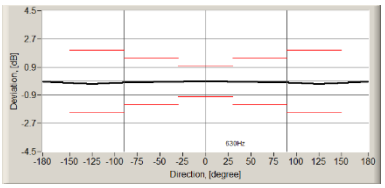
90 deg



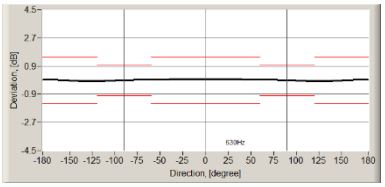
630 Hz



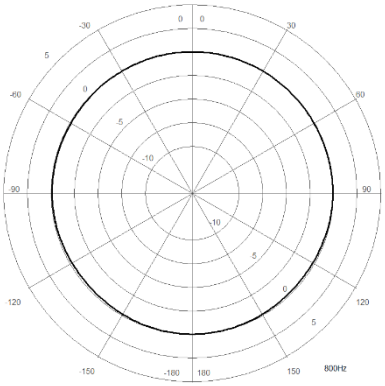
0 deg



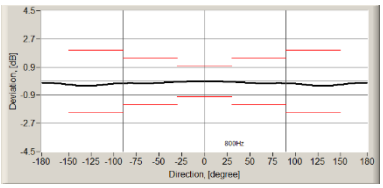
90 deg



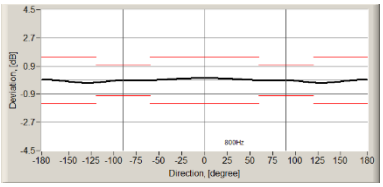
800 Hz



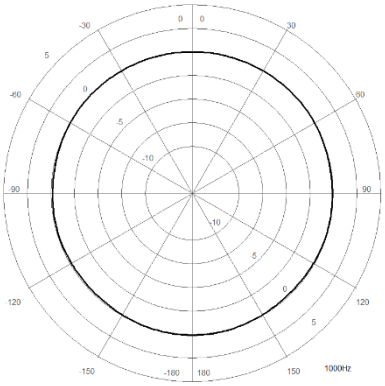
0 deg



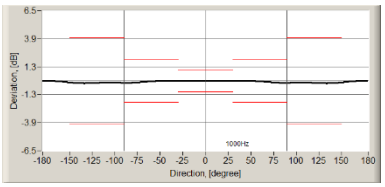
90 deg



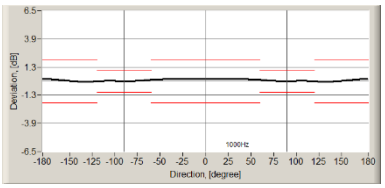
1000 Hz



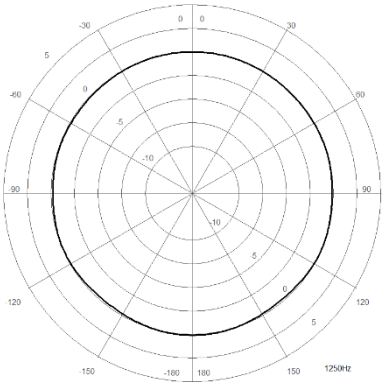
0 deg



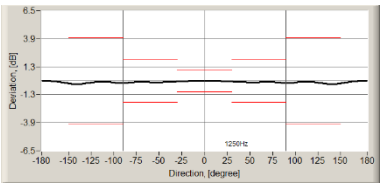
90 deg



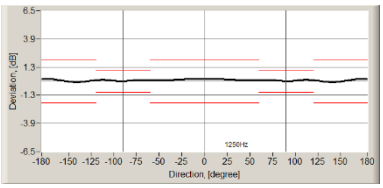
1250 Hz



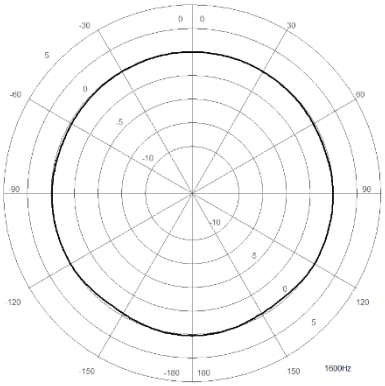
0 deg



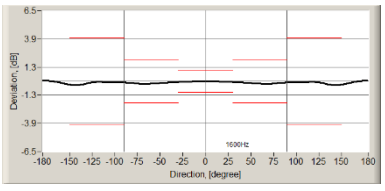
90 deg



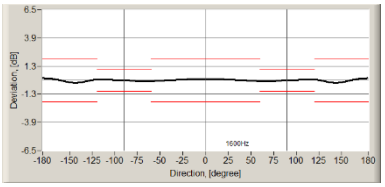
1600 Hz



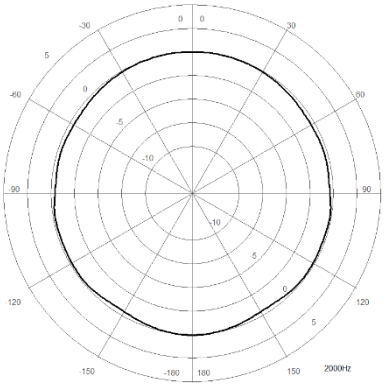
0 deg



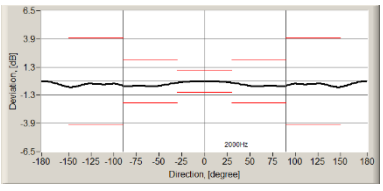
90 deg



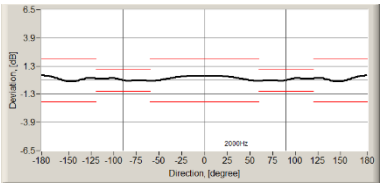
2000 Hz



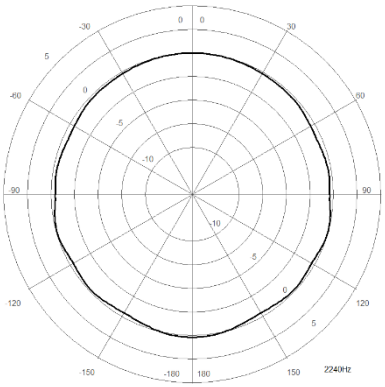
0 deg



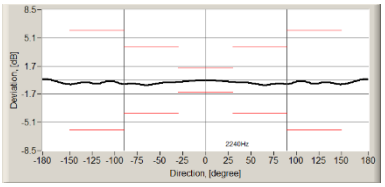
90 deg



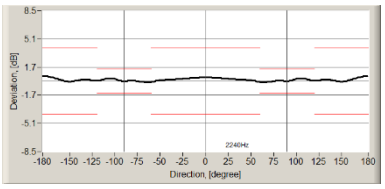
2240 Hz



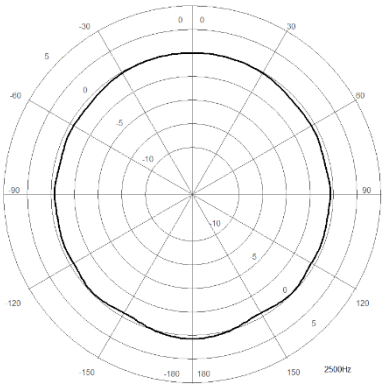
0 deg



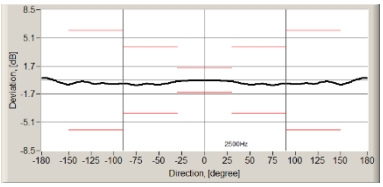
90 deg



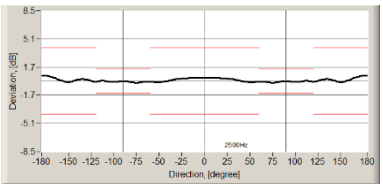
2500 Hz



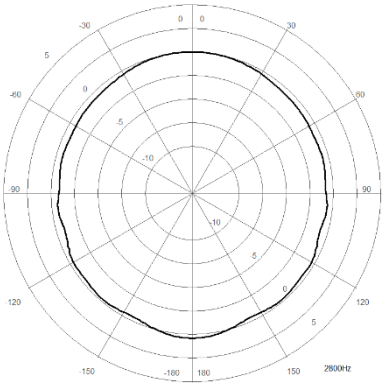
0 deg



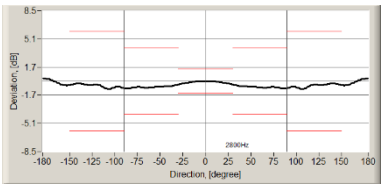
90 deg



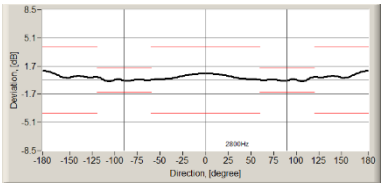
2800 Hz



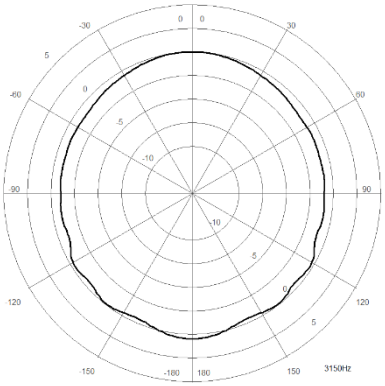
0 deg



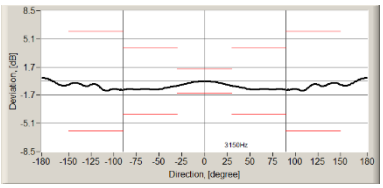
90 deg



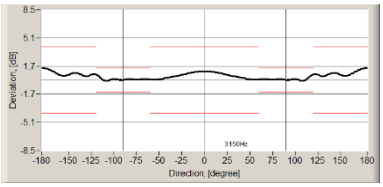
3150 Hz



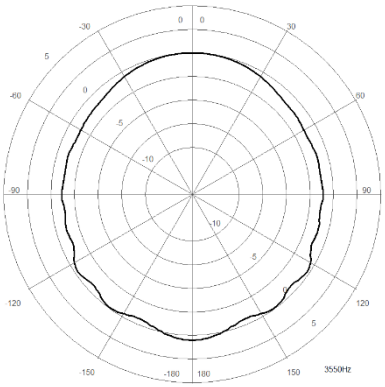
0 deg



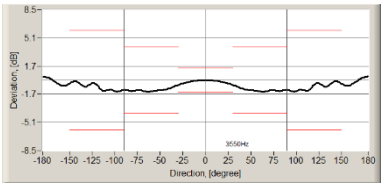
90 deg



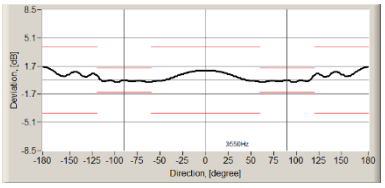
3550 Hz



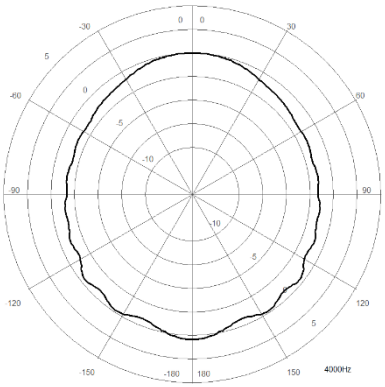
0 deg



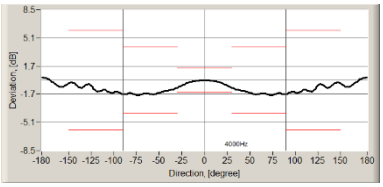
90 deg



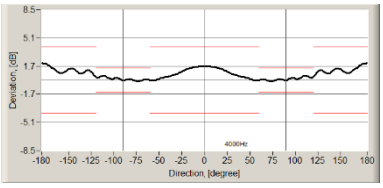
4000 Hz



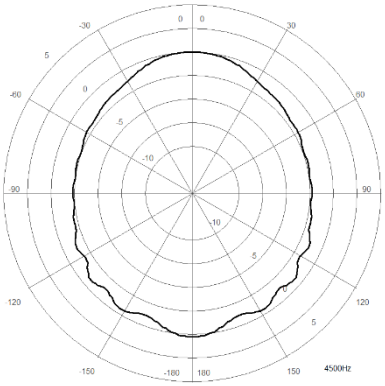
0 deg



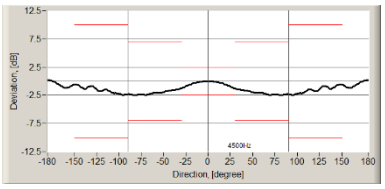
90 deg



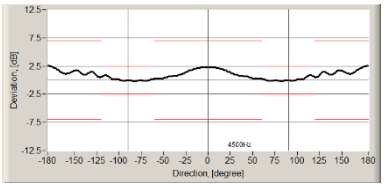
4500 Hz



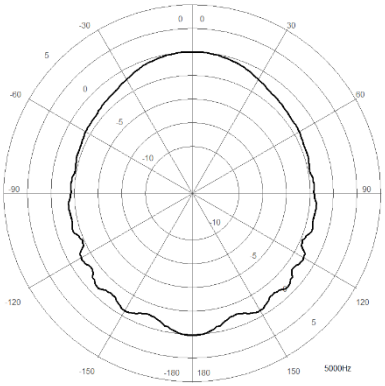
0 deg



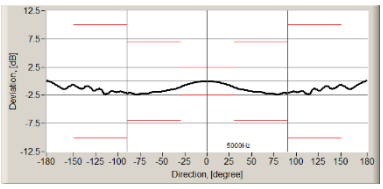
90 deg



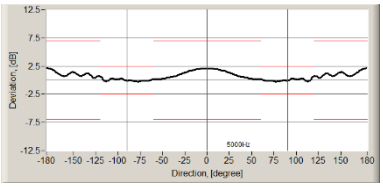
5000 Hz



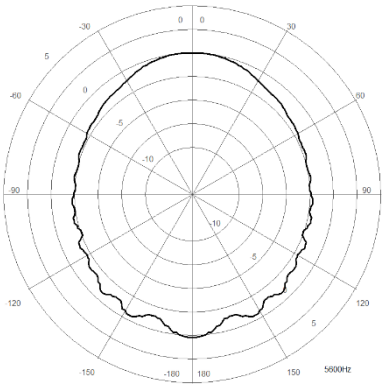
0 deg



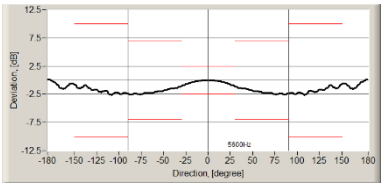
90 deg



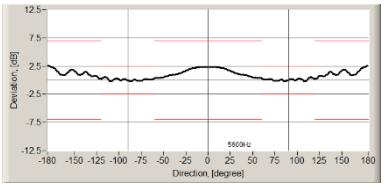
5600 Hz



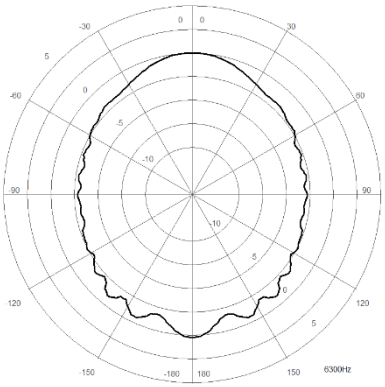
0 deg



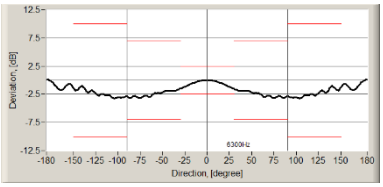
90 deg



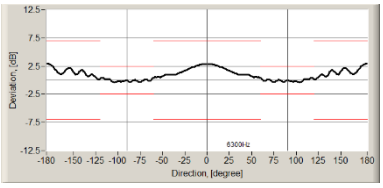
6300 Hz



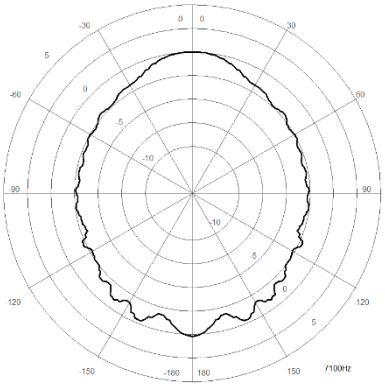
0 deg



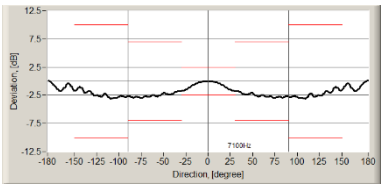
90 deg



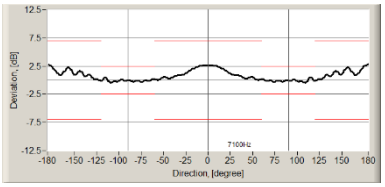
7100 Hz



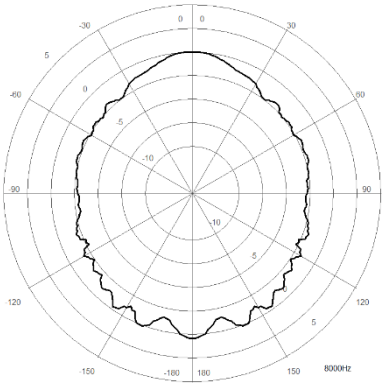
0 deg



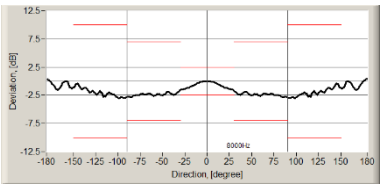
90 deg



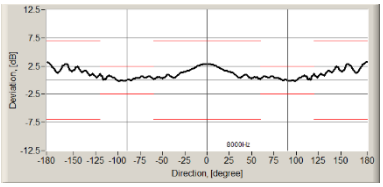
8000 Hz



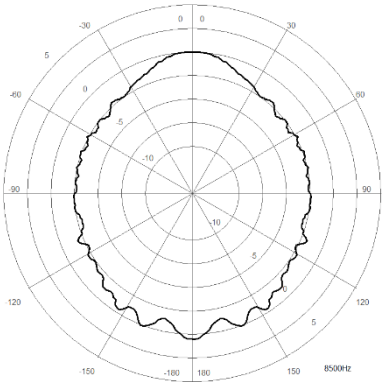
0 deg



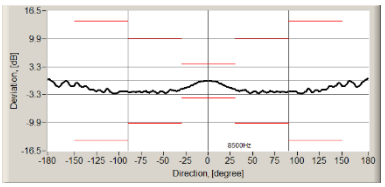
90 deg



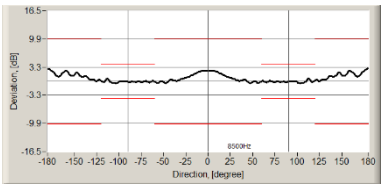
8500 Hz



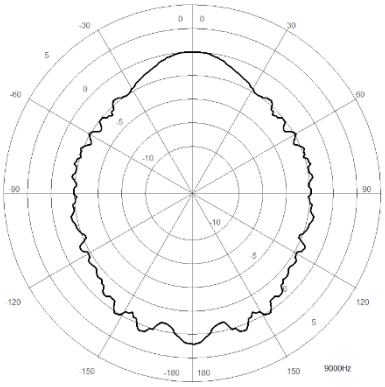
0 deg



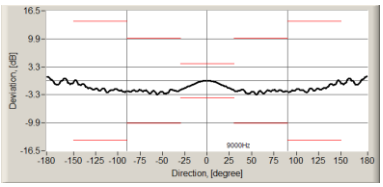
90 deg



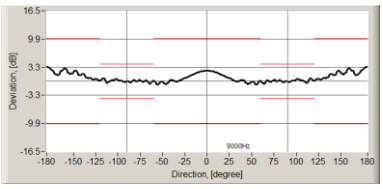
9000 Hz



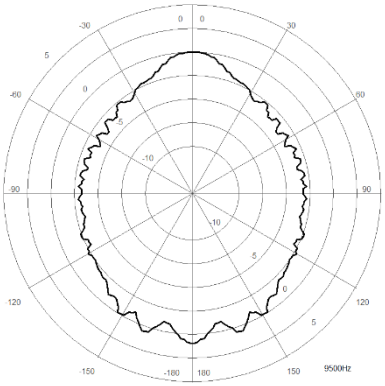
0 deg



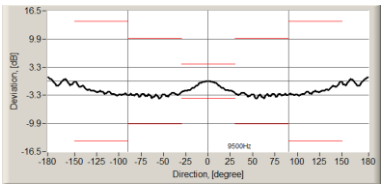
90 deg



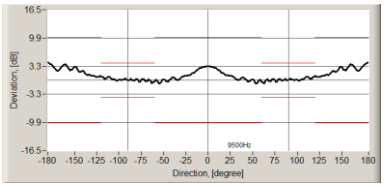
9500 Hz



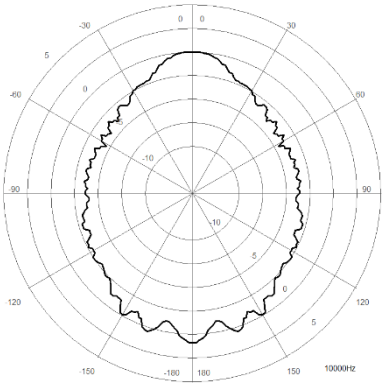
0 deg



90 deg



10000 Hz



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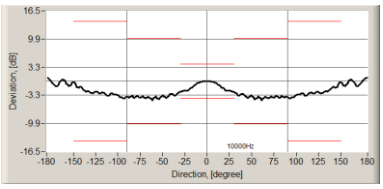

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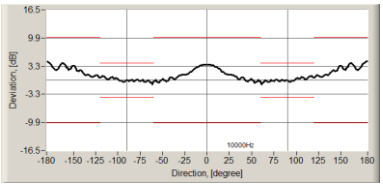
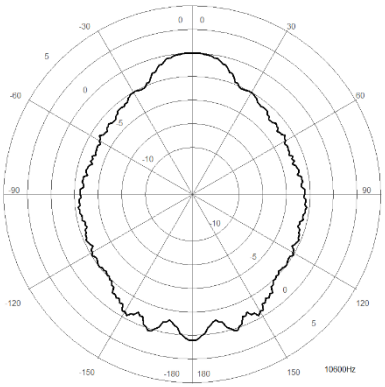
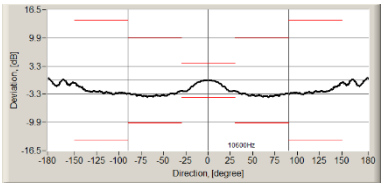


10600 Hz



0 deg



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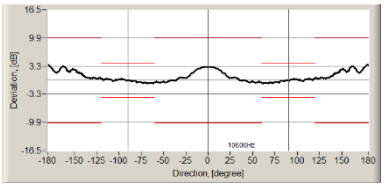
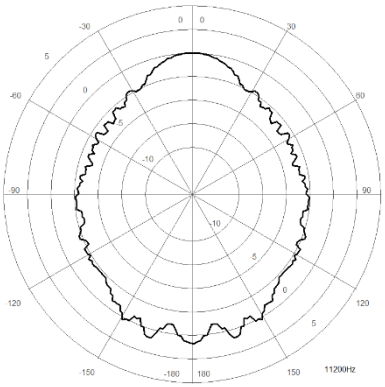
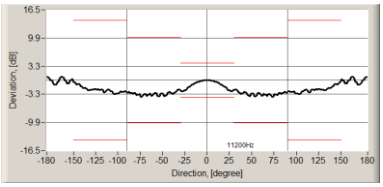


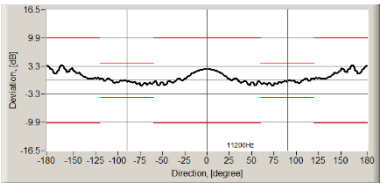
11200 Hz



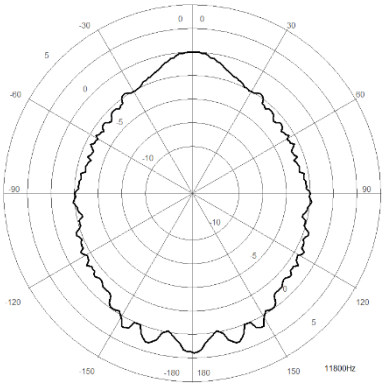
0 deg

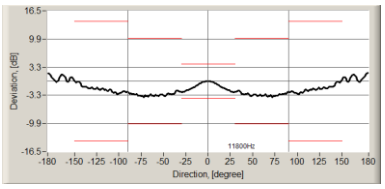


90 deg



11800 Hz





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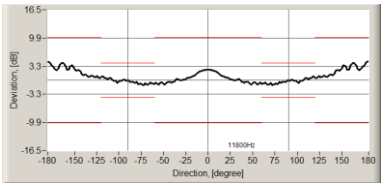
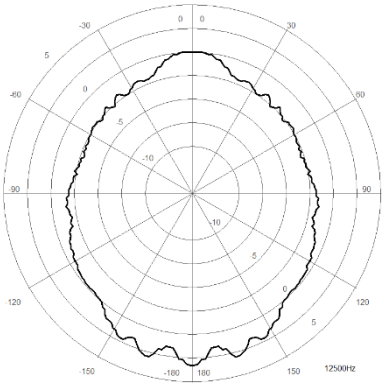
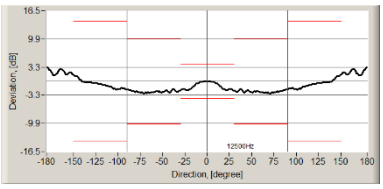


90 deg

12500 Hz





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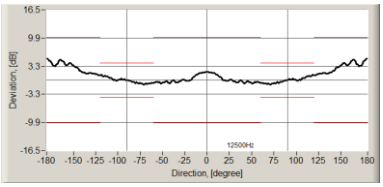


90 deg

Table C.5.11. Typical directional response of SV 971A with SA 271A for 0 deg incidence angle

f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
250	0.01	0.00	-0.01	-0.02	-0.03	-0.03	-0.04	-0.05	-0.05	-0.06
315	-0.01	-0.02	-0.03	-0.04	-0.06	-0.08	-0.09	-0.11	-0.12	-0.13
400	-0.01	-0.01	-0.01	-0.02	-0.03	-0.05	-0.07	-0.09	-0.11	-0.13
500	0.00	0.00	-0.01	-0.02	-0.03	-0.04	-0.06	-0.08	-0.10	-0.12
630	-0.01	-0.01	-0.02	-0.03	-0.05	-0.06	-0.06	-0.07	-0.09	-0.11
800	0.00	-0.01	-0.03	-0.06	-0.10	-0.13	-0.13	-0.13	-0.12	-0.14
1 000	0.00	0.00	0.01	0.00	-0.02	-0.06	-0.13	-0.18	-0.19	-0.18
1 250	0.01	-0.02	-0.06	-0.10	-0.12	-0.12	-0.11	-0.13	-0.20	-0.20
1 600	-0.01	-0.04	-0.08	-0.12	-0.17	-0.21	-0.25	-0.25	-0.17	-0.14
2 000	-0.01	-0.06	-0.16	-0.33	-0.47	-0.49	-0.45	-0.48	-0.50	-0.35
2 240	-0.04	-0.13	-0.24	-0.27	-0.37	-0.60	-0.61	-0.47	-0.52	-0.48
2 500	-0.01	-0.05	-0.16	-0.39	-0.54	-0.53	-0.56	-0.61	-0.48	-0.50
2 800	-0.03	-0.19	-0.47	-0.63	-0.68	-0.77	-0.78	-0.80	-0.89	-0.77
3 150	-0.10	-0.40	-0.62	-0.77	-1.05	-1.07	-0.99	-1.00	-1.10	-1.02
3 550	-0.07	-0.28	-0.62	-1.05	-1.24	-1.39	-1.42	-1.30	-1.31	-1.39
4 000	-0.13	-0.47	-0.95	-1.30	-1.55	-1.67	-1.71	-1.76	-1.64	-1.54
4 500	-0.17	-0.67	-1.36	-1.61	-2.00	-2.04	-2.43	-2.45	-2.47	-2.45
5 000	-0.10	-0.51	-1.04	-1.50	-1.81	-1.87	-2.12	-2.25	-2.20	-1.97
5 600	-0.14	-0.54	-1.17	-1.54	-2.00	-2.10	-2.31	-2.44	-2.51	-2.35
6 300	-0.31	-1.09	-1.56	-1.96	-2.09	-2.66	-2.93	-3.01	-2.99	-3.04
7 100	-0.32	-1.14	-1.83	-2.32	-2.42	-2.60	-2.71	-2.92	-2.92	-2.81
8 000	-0.33	-1.22	-1.90	-2.25	-2.39	-2.56	-2.33	-2.58	-2.96	-3.02
8 500	-0.33	-1.63	-1.98	-2.52	-2.93	-2.88	-2.91	-2.72	-2.75	-2.94
9 000	-0.32	-1.40	-2.19	-2.43	-2.98	-2.99	-2.97	-2.55	-2.61	-2.73
9 500	-0.64	-2.02	-2.71	-3.12	-3.50	-3.86	-3.99	-3.45	-3.32	-3.25
10 000	-0.43	-2.15	-2.77	-3.20	-3.88	-4.43	-4.05	-3.78	-4.01	-4.00
10 600	-0.54	-2.33	-2.86	-3.13	-3.77	-3.95	-3.92	-3.82	-3.34	-3.21

11 200	-0.51	-1.69	-2.62	-3.13	-3.68	-3.71	-3.66	-3.81	-3.32	-3.17
11 800	-0.68	-2.16	-2.53	-3.00	-3.32	-3.59	-3.70	-3.84	-3.27	-3.14
12 500	-0.85	-1.97	-2.38	-2.47	-2.69	-2.91	-3.13	-3.13	-2.39	-2.03
f [Hz]	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**	**170-180**	**180-190**	**190-200**
250	-0.06	-0.06	-0.06	-0.05	-0.04	-0.03	-0.02	-0.02	-0.01	-0.02
315	-0.13	-0.13	-0.12	-0.11	-0.09	-0.07	-0.06	-0.05	-0.04	-0.04
400	-0.14	-0.14	-0.14	-0.13	-0.12	-0.09	-0.07	-0.06	-0.05	-0.06
500	-0.14	-0.15	-0.15	-0.15	-0.13	-0.11	-0.09	-0.07	-0.06	-0.06
630	-0.14	-0.17	-0.18	-0.17	-0.15	-0.11	-0.08	-0.05	-0.05	-0.07
800	-0.20	-0.28	-0.31	-0.31	-0.29	-0.23	-0.15	-0.11	-0.10	-0.14
1 000	-0.15	-0.21	-0.24	-0.24	-0.21	-0.12	-0.06	0.02	0.02	-0.08
1 250	-0.13	-0.10	-0.22	-0.30	-0.30	-0.22	-0.09	0.02	-0.03	-0.11
1 600	-0.11	-0.10	-0.21	-0.34	-0.37	-0.32	-0.14	0.06	0.06	-0.15
2 000	-0.31	-0.31	-0.28	-0.54	-0.58	-0.50	-0.22	0.02	-0.10	-0.34
2 240	-0.19	-0.44	-0.43	-0.41	-0.53	-0.51	-0.22	0.14	0.13	-0.35
2 500	-0.50	-0.44	-0.44	-0.24	-0.53	-0.52	-0.18	0.30	0.29	-0.25
2 800	-0.94	-0.71	-0.48	-0.41	-0.52	-0.52	0.14	0.33	0.33	-0.39
3 150	-1.16	-1.00	-0.63	-0.61	-0.49	-0.55	0.23	0.40	0.39	-0.50
3 550	-1.26	-1.26	-0.76	-0.77	-0.49	-0.68	-0.36	0.45	0.44	-0.67
4 000	-1.48	-1.36	-0.95	-0.87	-0.42	-0.83	-0.67	0.37	0.35	-0.80
4 500	-2.13	-1.86	-1.72	-1.39	-1.12	-1.22	-1.13	0.21	-0.45	-1.16
5 000	-2.27	-2.36	-1.77	-1.48	-1.34	-1.46	-1.35	-0.21	-0.71	-1.30
5 600	-2.63	-2.27	-2.06	-1.67	-1.52	-1.57	-1.57	-0.19	-0.93	-1.52
6 300	-3.14	-2.67	-2.67	-2.13	-1.79	-1.65	-1.81	-0.67	-1.20	-1.78
7 100	-3.24	-2.85	-2.59	-2.01	-1.63	-1.34	-1.81	-0.82	-1.53	-1.76
8 000	-2.68	-2.91	-2.54	-2.14	-1.35	-0.95	-1.61	-0.40	-1.40	-1.50
8 500	-2.94	-2.80	-2.50	-2.06	-1.48	-1.42	-1.45	-0.73	-1.41	-1.38
9 000	-2.75	-2.75	-2.09	-1.82	-1.11	-0.97	-1.04	0.98	0.95	-0.85
9 500	-3.37	-3.08	-2.58	-2.27	-1.39	-1.11	-1.18	0.85	-0.86	-1.03
10 000	-3.57	-3.35	-3.18	-2.59	-1.74	-1.32	-1.30	-0.91	-1.14	-1.14
10 600	-3.46	-3.29	-3.17	-2.91	-1.80	-1.52	-1.69	-0.61	-1.37	-0.67
11 200	-3.18	-2.81	-2.50	-2.65	-1.24	-1.15	-1.34	-1.21	-0.89	0.84
11 800	-3.14	-2.35	-1.94	-1.86	-0.99	1.36	1.46	1.91	1.79	1.62
12 500	-2.03	-1.03	-0.62	-0.45	1.86	2.66	3.14	3.30	2.87	3.16
f [Hz]	**200-210**	**210-220**	**220-230**	**230-240**	**240-250**	**250-260**	**260-270**	**270-280**	**280-290**	**290-300**
250	-0.02	-0.02	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03
315	-0.06	-0.07	-0.08	-0.08	-0.09	-0.08	-0.08	-0.07	-0.06	-0.05
400	-0.08	-0.10	-0.12	-0.15	-0.16	-0.16	-0.16	-0.16	-0.14	-0.13
500	-0.08	-0.10	-0.11	-0.12	-0.12	-0.12	-0.11	-0.09	-0.07	-0.05
630	-0.10	-0.13	-0.15	-0.15	-0.14	-0.12	-0.10	-0.08	-0.06	-0.06
800	-0.20	-0.26	-0.29	-0.30	-0.28	-0.23	-0.17	-0.13	-0.13	-0.13
1 000	-0.16	-0.22	-0.23	-0.22	-0.18	-0.17	-0.19	-0.19	-0.16	-0.10
1 250	-0.26	-0.30	-0.30	-0.21	-0.11	-0.16	-0.22	-0.22	-0.14	-0.13
1 600	-0.29	-0.36	-0.35	-0.18	-0.07	-0.08	-0.10	-0.16	-0.24	-0.24
2 000	-0.53	-0.53	-0.33	-0.26	-0.27	-0.25	-0.44	-0.45	-0.39	-0.47
2 240	-0.49	-0.45	-0.29	-0.40	-0.32	-0.24	-0.45	-0.40	-0.56	-0.57
2 500	-0.50	-0.47	-0.23	-0.46	-0.44	-0.45	-0.45	-0.55	-0.57	-0.48
2 800	-0.49	-0.35	-0.45	-0.45	-0.88	-0.91	-0.85	-0.87	-0.73	-0.77
3 150	-0.53	-0.33	-0.60	-0.54	-1.15	-1.05	-1.06	-0.97	-1.00	-0.97
3 550	-0.70	-0.32	-0.79	-0.59	-1.34	-1.37	-1.38	-1.30	-1.28	-1.35
4 000	-0.82	-0.78	-0.94	-1.38	-1.44	-1.57	-1.75	-1.75	-1.86	-1.72
4 500	-1.16	-1.25	-1.28	-1.78	-1.87	-2.20	-2.39	-2.48	-2.45	-2.40
5 000	-1.03	-1.26	-1.54	-1.63	-2.33	-1.98	-2.25	-2.38	-2.44	-2.17
5 600	-0.93	-1.49	-1.73	-2.09	-2.74	-2.60	-2.51	-2.67	-2.63	-2.33
6 300	-1.60	-1.89	-2.36	-2.88	-2.87	-3.39	-3.27	-3.30	-3.36	-3.04
7 100	-1.79	-1.88	-2.34	-2.70	-3.34	-2.99	-3.07	-3.21	-3.17	-2.93

8 000	-1.41	-1.45	-2.02	-2.39	-2.98	-3.03	-3.00	-2.83	-2.54	-2.73
8 500	-1.41	-1.44	-2.20	-2.78	-2.86	-3.05	-2.89	-2.94	-2.86	-2.83
9 000	-0.84	-1.02	-1.80	-2.32	-2.81	-2.43	-2.71	-2.69	-2.70	-3.09
9 500	-0.98	-1.20	-2.08	-2.52	-2.96	-3.37	-3.40	-3.56	-3.74	-4.14
10 000	-1.12	-1.72	-2.64	-2.91	-3.43	-3.53	-4.03	-3.92	-4.11	-4.71
10 600	-1.21	-2.19	-2.73	-2.98	-3.38	-3.31	-3.38	-3.77	-4.06	-4.01
11 200	-0.61	-1.55	-2.32	-2.52	-2.81	-3.26	-3.05	-3.57	-4.01	-3.80
11 800	1.13	-1.27	-1.60	-2.16	-2.23	-3.09	-2.79	-2.97	-3.58	-3.53
12 500	2.47	1.53	-0.17	-0.81	-1.32	-2.00	-1.95	-2.32	-2.73	-2.73
f [Hz]	**300-310**	**310-320**	**320-330**	**330-340**	**340-350**	**350-360**				
250	-0.02	-0.01	-0.01	0.00	0.00	0.01				
315	-0.03	-0.02	-0.01	0.00	0.00	-0.01				
400	-0.11	-0.08	-0.06	-0.05	-0.02	-0.01				
500	-0.03	-0.02	-0.01	-0.01	0.00	0.00				
630	-0.05	-0.04	-0.03	-0.02	-0.01	0.00				
800	-0.13	-0.11	-0.08	-0.05	-0.02	-0.01				
1 000	-0.04	-0.01	0.00	0.00	0.01	0.01				
1 250	-0.14	-0.14	-0.11	-0.07	-0.02	0.01				
1 600	-0.22	-0.16	-0.12	-0.07	-0.04	-0.01				
2 000	-0.47	-0.37	-0.19	-0.10	-0.03	0.00				
2 240	-0.45	-0.29	-0.25	-0.17	-0.08	-0.02				
2 500	-0.51	-0.48	-0.29	-0.11	-0.04	0.00				
2 800	-0.69	-0.60	-0.53	-0.31	-0.12	-0.01				
3 150	-0.99	-0.86	-0.65	-0.43	-0.17	-0.01				
3 550	-1.29	-1.14	-0.84	-0.45	-0.17	-0.01				
4 000	-1.75	-1.33	-1.16	-0.72	-0.32	-0.04				
4 500	-2.11	-1.84	-1.56	-1.13	-0.46	-0.09				
5 000	-1.95	-1.85	-1.45	-0.91	-0.38	-0.06				
5 600	-2.03	-1.79	-1.37	-0.80	-0.32	-0.03				
6 300	-2.38	-1.97	-1.89	-1.30	-0.58	-0.10				
7 100	-2.81	-2.41	-1.89	-1.68	-0.72	-0.09				
8 000	-2.75	-2.45	-2.58	-1.31	-0.99	-0.16				
8 500	-3.03	-2.99	-2.41	-1.71	-0.88	-0.13				
9 000	-3.39	-3.30	-2.58	-1.83	-1.07	-0.23				
9 500	-4.18	-3.82	-3.34	-2.45	-1.91	-0.46				
10 000	-4.48	-4.19	-3.50	-2.12	-1.67	-0.22				
10 600	-3.91	-3.75	-3.34	-2.64	-1.30	-0.09				
11 200	-3.89	-3.83	-3.39	-2.66	-0.98	-0.12				
11 800	-3.65	-3.65	-3.05	-2.35	-1.57	-0.54				
12 500	-3.10	-2.83	-2.61	-2.02	-1.72	0.09				

C.6 DECLARATION OF CONFORMITY

Manufacturer:	**SVANTEK Sp. z o. o**
Address:	Strzyglowska 81 04-872 Warszawa Poland
Kind of product:	SOUND LEVEL METER – ANALYZER, Class 1
Type:	**SV 971A**
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 V2.2.3. Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised standard for Electromagnetic Compatibility. ETSI EN 301 489-17 V3.2.4. Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised standard for Electromagnetic Compatibility. EN 61000-4-2:2009. Electromagnetic compatibility (EMC). Testing and measurement techniques. Part 4-2; Electrostatic discharge immunity test. EN 61000-4-3:2006 + A1:2008 + A2:2010 + ISI:2009. Electromagnetic compatibility (EMC). Testing and measurement techniques. Part 4-3; Radiated, radio-frequency, electromagnetic field 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 V2.2.2. Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised standard for access to radio spectrum.
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:

$$r(t) = \begin{cases} p_w(t) & \text{RMS Integration} = \text{Lin} \\ p_{w\tau}(t) & \text{RMS Integration} = \text{Exp} \end{cases}$$

p_o — 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 from **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

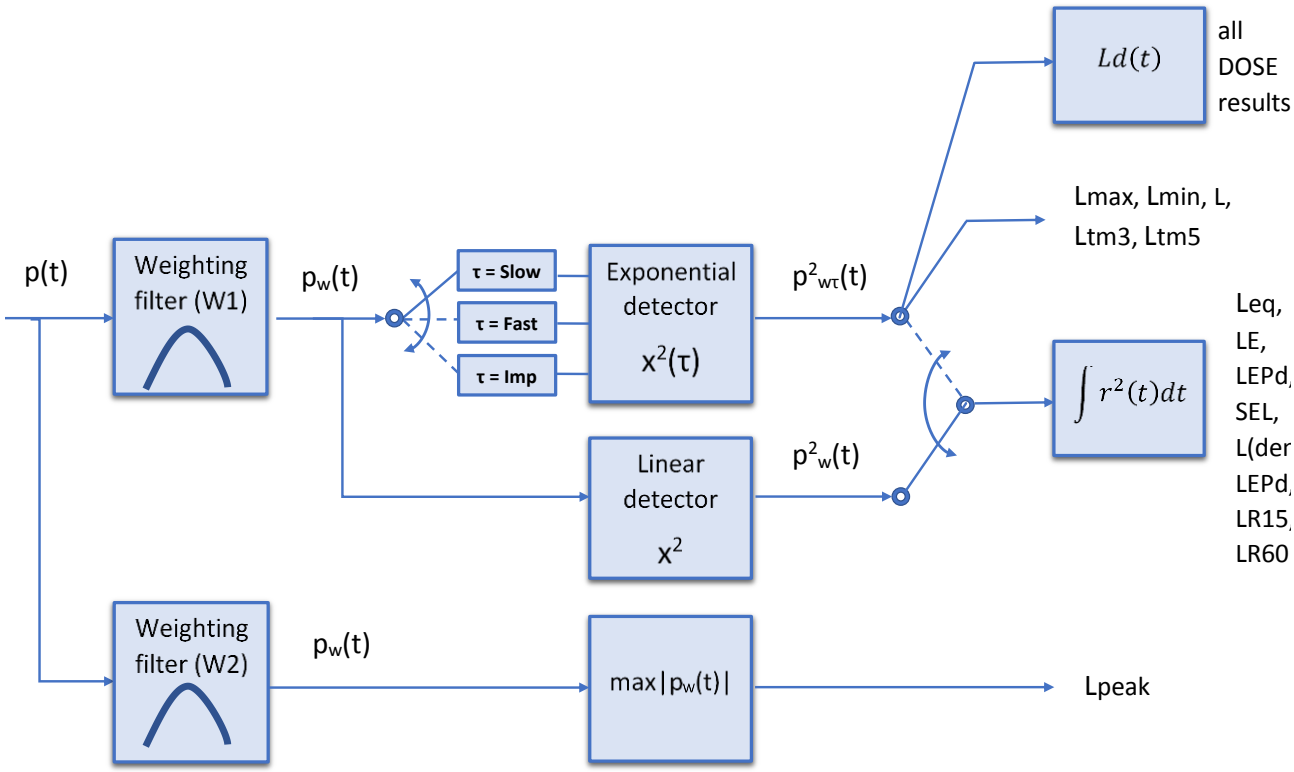
$$L_d(t) = L(t)$$

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 RESULT

The instrument calculates the sound measurement results for three profiles. The calculation flow diagram for one profile is presented below:



OVL Percentage of the overloaded input signal, which occurred during the current time period of the measurement (**T**)

L(A/C/Z)peak

Peak sound level expressed in dB, for frequency weightings A, C, Z, symbols are **LApeak**, **LCpeak** and **LZpeak**. Peak sound level is calculated for the given **T**.

$$\mathbf{Peak = 10\,log\left(max_T \frac{p_W^2(t)}{p_0^2}\right)}$$

L(A/C/Z)(S/F/I) max

The highest time weighted sound level (**Max**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are LAFmax, LASmax, LCFmax, LCSmax etc.

$$\mathbf{Max = 10\,log\left(max_T \frac{p_{W\tau}^2(t)}{p_0^2}\right)}$$

L(A/C/Z)(S/F/I) min

The lowest time weighted sound level (**Min**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are LAFmin, LASmin, LCFmin, LCSmin etc.

$$\mathbf{Min = 10\,log\left(min_T \frac{p_{W\tau}^2(t)}{p_0^2}\right)}$$

L(A/C/Z)(S/F/I)

Time weighted sound level expressed at observation time, expressed in dB, for frequency weightings A, C, Z and time weightings F, S, I symbols are LAF, LAS, LCF, LCS etc.

$$\mathbf{L = 10\,log\left(\frac{p_{W\tau}^2(t)}{p_0^2}\right)}$$

L(A/C/Z)eq

Time averaged equivalent continuous sound level (**Leq**) expressed in dB, for frequency weightings A, C, Z symbols are LAeq, LCeq and LZeq. In principle time weighting is not involved in a determination of time averaged sound level. Time-averaged sound level is calculated for current time period of the measurement (**T**).

$$\mathbf{Leq = 10\,log\left(\frac{1}{T}\int_0^T \left(r(t)/p_0\right)^2 dt\right)}$$

L(A/C/Z)E

Sound Exposure Level (**SEL**) expressed in dB, for frequency weightings A, C, Z, symbols are LAE, LCE and LZE. **SEL** is essentially the subset of the **Leq** result. Its value is equal to the **Leq** result referred to the integration time equal to one second (so, for the Integration time equal to 1 s, **SEL** is always equal to **Leq**).

$$\mathbf{SEL = 10\,log\left(\int_0^T \left(r(t)/p_0\right)^2 dt\right) = Leq + 10\,log\frac{T}{1s}}$$

L(den)

Only one result from: **Lday**, **Leve**, **Lnight**, **Lde**, **Len**, **Lnd**, and **Lden** is available in the instrument. It depends on the day and night time in which the measurement was performed. Day and night time depend on the **<Day Time Limits>** option (**6h-18h** or **7h-19h**).

If **<6h-18h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 6 am and ends at 6 pm,
T_e (evening-time) starts from 6 pm and ends at 10 pm,
T_n (night-time) starts at 10 pm and ends at 6 am.

If **<7h-19h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 7 am and ends at 7 pm,
T_e (evening-time) starts from 7 pm and ends at 11 pm,
T_n (night-time) starts at 11 pm and ends at 7 am.

Lday

Lday is calculated for: $T_d \neq 0$, $T_e = 0$, $T_n = 0$.

$$Ld = 10 \log \left(\frac{1}{T_d} \int_{T_d} (r_w(t)/p_0)^2 dt \right)$$

Leve

Leve is calculated for: $T_d = 0$, $T_e \neq 0$, $T_n = 0$.

$$Le = 5\ dB + 10 \log \left(\frac{1}{T_e} \int_{T_e} (r_w(t)/p_0)^2 dt \right)$$

Lnight

Lnight is calculated for: $T_d = 0$, $T_e = 0$, $T_n \neq 0$.

$$Ln = 10\ dB + 10 \log \left(\frac{1}{T_n} \int_{T_n} (r_w(t)/p_0)^2 dt \right)$$

Lde

Lde is calculated for: $T_d \neq 0$, $T_e \neq 0$, $T_n = 0$.

$$Lde = 10 \log \left[\frac{1}{12+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} \right) \right]$$

Len

Len is calculated for: $T_d = 0$, $T_e \neq 0$, $T_n \neq 0$.

$$Len = 10 \log \left[\frac{1}{4+8} \left(4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

Lnd

Lnd is calculated for: $T_d \neq 0$, $T_e = 0$, $T_n \neq 0$.

$$Lnd = 10 \log \left[\frac{1}{8+12} \left(8 \cdot 10^{Ln/10} + 12 \cdot 10^{Ld/10} \right) \right]$$

Lden

Lden is calculated for: $T_d \neq 0$, $T_e \neq 0$, $T_n \neq 0$.

$$Lden = 10 \log \left[\frac{1}{12+8+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

LEPd

Daily Personal Noise Exposure is the noise exposure level for a nominal 8-hour working day. The **LEPd** result is calculated on the base of the **LEQ**

$$LEPd = Leq + 10 \log \frac{T_e}{T_{8h}}$$

Ltm3 and **Ltm5**

The **Ltm3** and **Ltm5** results (Takt-Maximal Levels) are calculated according to the German standard TA Lärm.

Ln Statistical level is the certain boundary level surpassed by the temporary noise level values in not more than **n%** of the observation period

see Chapter D.4

EX Expected value. Calculated on the basis of 100ms Leq results.

SD Standard deviation. Calculated on the basis of 100ms Leq results.

LR Rolling Leq measured in the time window for the last **Tw** seconds of the measurement. LR window is moving with 1 second step.

$$LR(Tw) = 10\log\left(\frac{1}{Tw}\int_{T-Tw}^{T}(r(t)/p_0)^2 dt\right)$$

Note: *If the current measurement time **T** is less than the time window **Tw** the **LR** result is undefined.*

D.3 DEFINITIONS AND FORMULAS OF THE ADDITIONAL DOSIMETER FUNCTION RESULTS

DOSE Quantity of noise received by the worker, expressed as the percentage of the whole day acceptable value.

$$DOSE = \frac{100\%}{T_{8h}}\int_0^T 10^{\frac{L_d(t)-L_c}{q}} dt$$

D_8h 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 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 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 **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

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

Peak Threshold Counter – the number of the overpasses of the Threshold Level by Lpeak result. This result is incremented in 100 ms intervals.

PTP

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

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

Projected Time Weighted Average is calculated from the measured **LAV** (taking **THRESHOLD LEVEL** into account) and the exposure time.

Lc-a

The C-A measurement is an Leq that enhances the low-frequency components of the sound signal. It is the result of subtracting an A-weighted LAeq from a simultaneously collected C-weighted Leq

Lc-a = LCeq - LAeq

D.4 STATISTICAL LEVELS – LN DEFINITION

The noise level **L(t)** is the continuous random variable. The probability that the temporary noise level **L(t)** belongs to the interval $\langle L_k, L_k + \Delta L \rangle$ is called the class density and it can be expressed by the equation:

$$P_k[L_k \le L(t) \le L_k + \Delta L] = \sum_{i=1}^{n} \Delta t_i \Big/ P$$

where: Δt_i - time intervals, in which the noise level $L(t) \in \langle L_k, L_k + \Delta L \rangle$ occurs,

ΔL - so-called class interval or distribution class of the series,

P - total observation period.

In case when the class interval approaches infinity, the probability of **L(t)** tends to the probability of L_k. In practice, ΔL value is strictly determined for the measuring instrument. For SV 971A, there are 240 classes and the width of each class is 0.5 dB. The histogram is the set of the class density values calculated for all classes.

The statistical distribution function, which determines the probability (expressed in %) of the noise occurrence on the level equal or less than $L_k + \Delta L$ is given by the formulae:

$$P\left[L(t) \le L_j\right] = \sum_{k=1}^{j} P_k(L)$$

The cumulative density function expressed by the equation:

$$P\left[L(t) > L_j\right] = 1 - P\left[L(t) \le L_j\right]$$

is directly used to determine so-called statistical levels **Ln** or position parameters of the distribution.

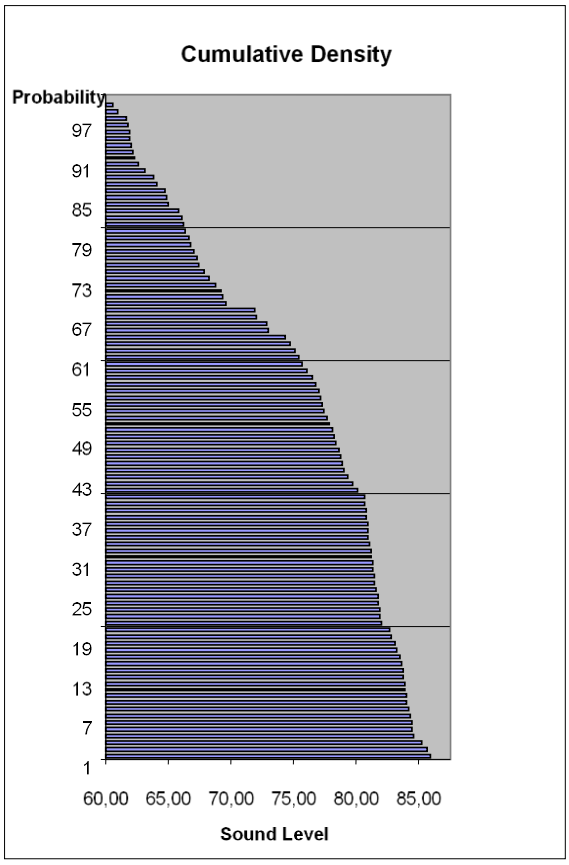
The **Ln** is the certain boundary level surpassed by the temporary noise level values in not more than **n%** of the observation period.

Example:

Let us assume that **L35** is equal to 76.8 dB. It means that during the measurements the noise level 76.8 dB was exceeded in not more than 35% of the observation period.

The cumulative density function for the exemplary data is presented in Figure on the right side. In order to determine the **Ln** level, one must draw the horizontal cursor and find out the crossing point between the cumulative density function and the cursor. In the instrument the user can determine 10 statistical levels - from **L01** to **L99** (1% step of observation period).

The statistical level **Ln** value, the profile's number the statistics are taken from, the RMS detector (**Lin.**, or **Exp.**: **Fast**, **Slow** or **Imp**.), the filter's name (**A**, **C** or **Z**) and real time are displayed in the top-right side of the display in one-result view mode.



Exemplary cumulative density

APPENDIX E. REVERBERATION TIME CALCULATIONS

E.1 INTRODUCTION

If an impulsive sound is generated in a room with reflecting boundaries, repeated reflections at the boundaries result in the rapid establishment of a more or less uniform sound field. This field then decays as the sound energy is absorbed by the bounding materials. The rate at which the sound energy decays is determined by the absorptive properties of the reflecting surfaces and the distances between them. The time taken for the sound intensity or the sound pressure level to decay by 60 dB is called the **reverberation time** (RT). 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):

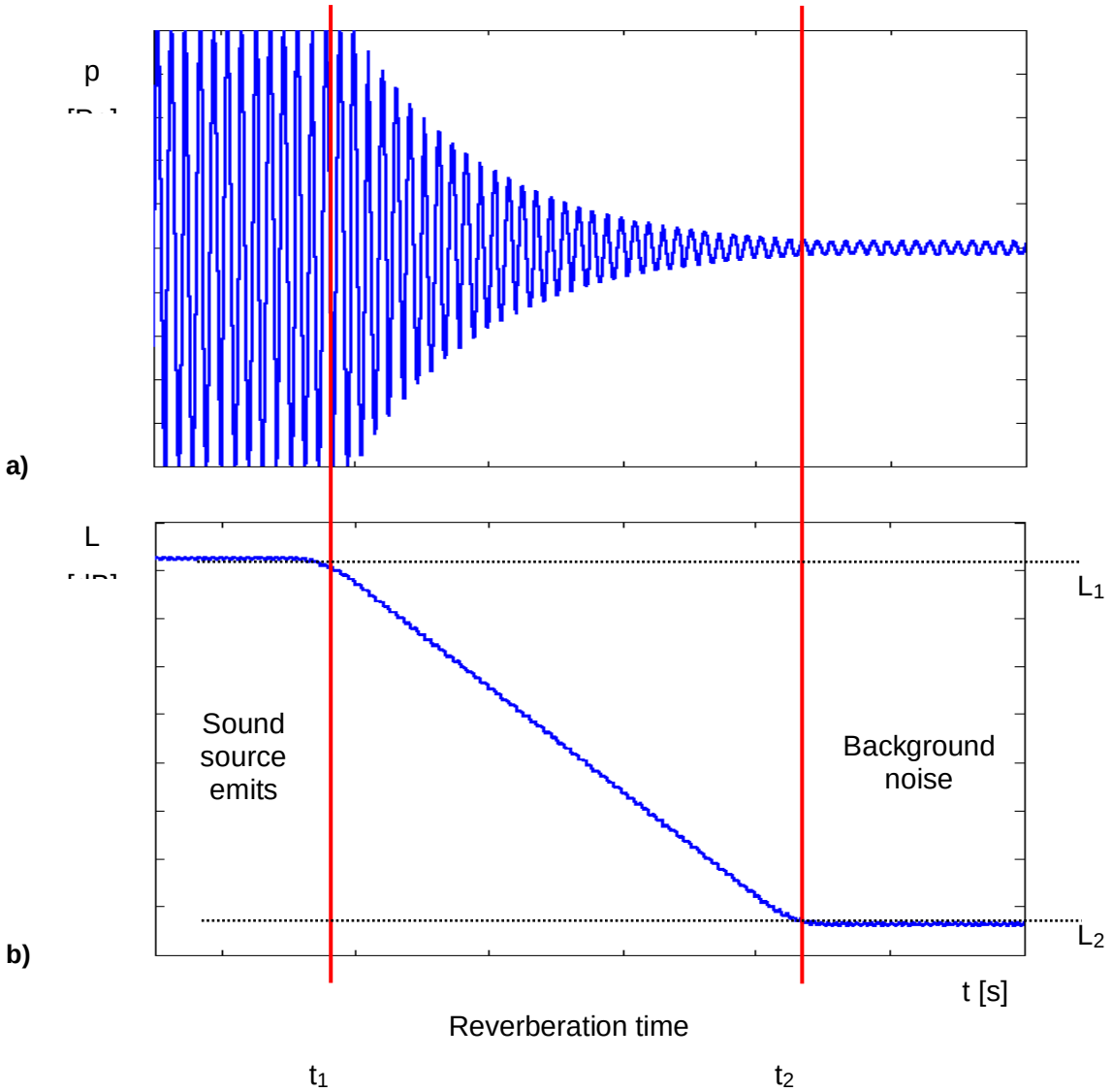


Fig 1. The acoustic pressure versus time (a) and the value of the sound pressure level versus time, so-called decay curve (b)

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:

$$L_1 - L_2 >= 10 \text{ dB}$$

$$L_2 - L_3 >= \text{noise margin}$$

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:

$$EDT = -60.0 / a$$

In case of the **decay method**, the EDT value is calculated according to the formula:

$$EDT = 6 \cdot (t_2 - t_1)$$

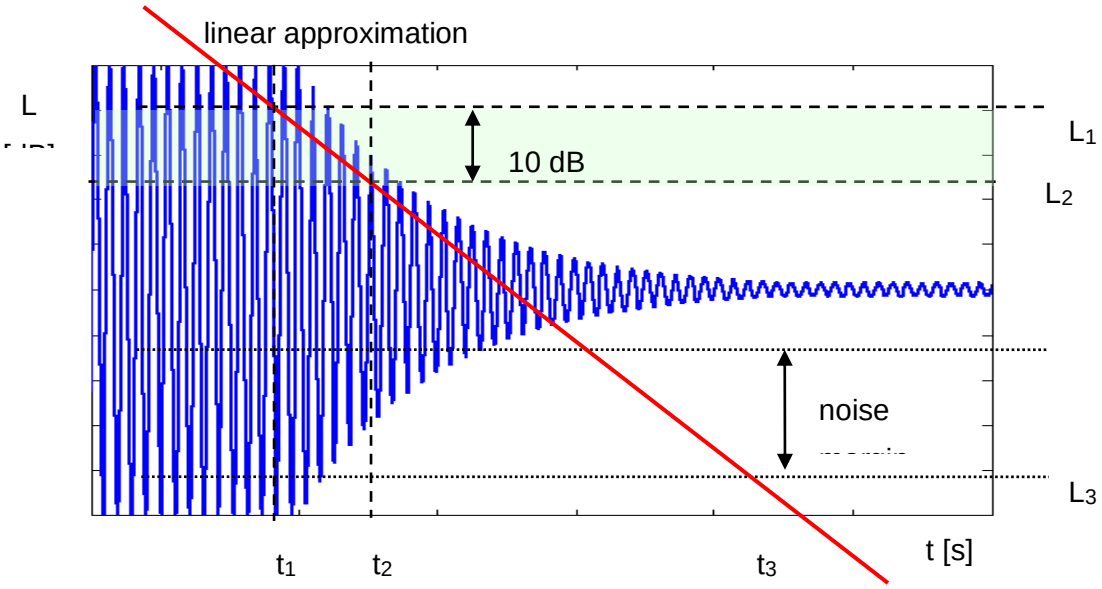


Fig 2. The EDT evaluation

➢ **RT 20 (reverberation time calculated with 20 dB dynamics):**

The RT 20 decay curve region is 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:

$$L_1 - L_4 > 5 \text{ dB} + 20 \text{ dB} + \text{noise margin}$$

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 · 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:

$$\mathbf{RT\ 20 = 3 \cdot (t_3 - t_2)}$$

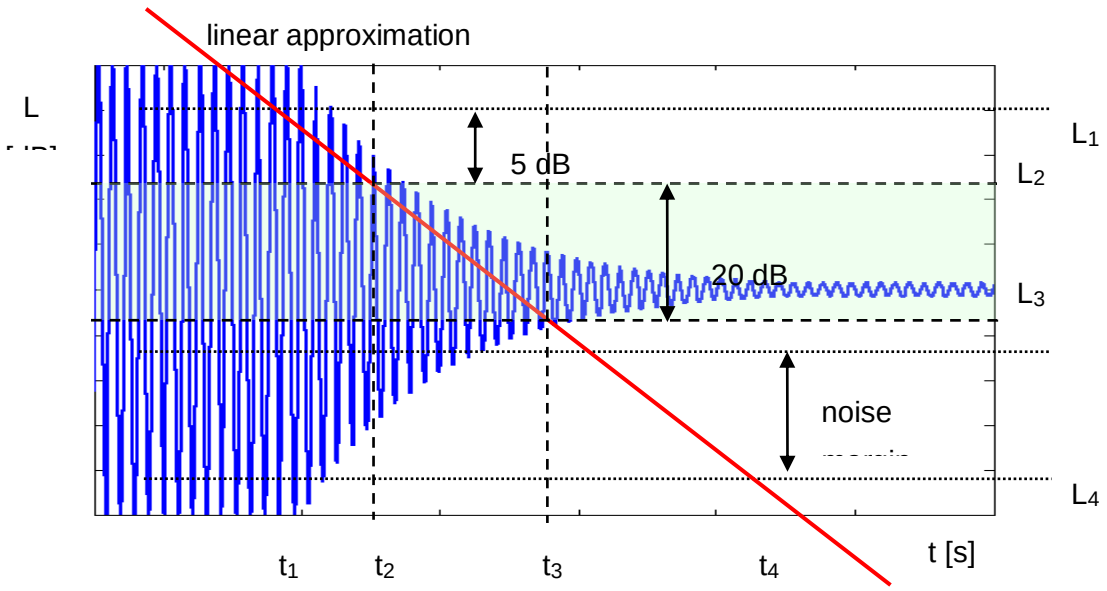


Fig 3. The RT 20 evaluation

➢ **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 · 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

$$\mathbf{RT\ 30 = 2 \cdot (t_3 - t_2)}$$

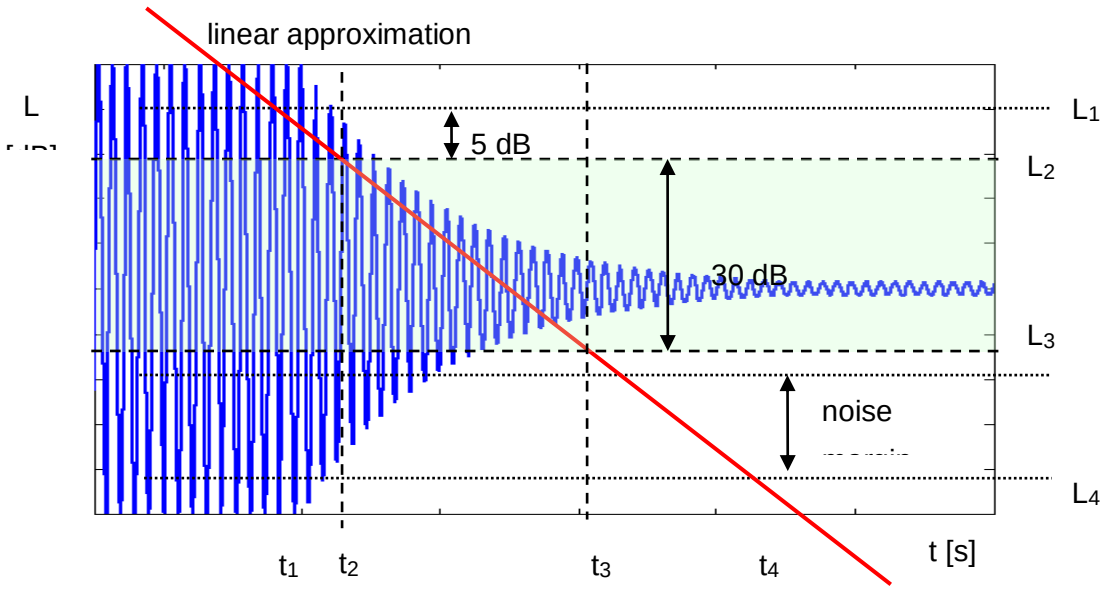


Fig 4. The RT 30 evaluation

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.

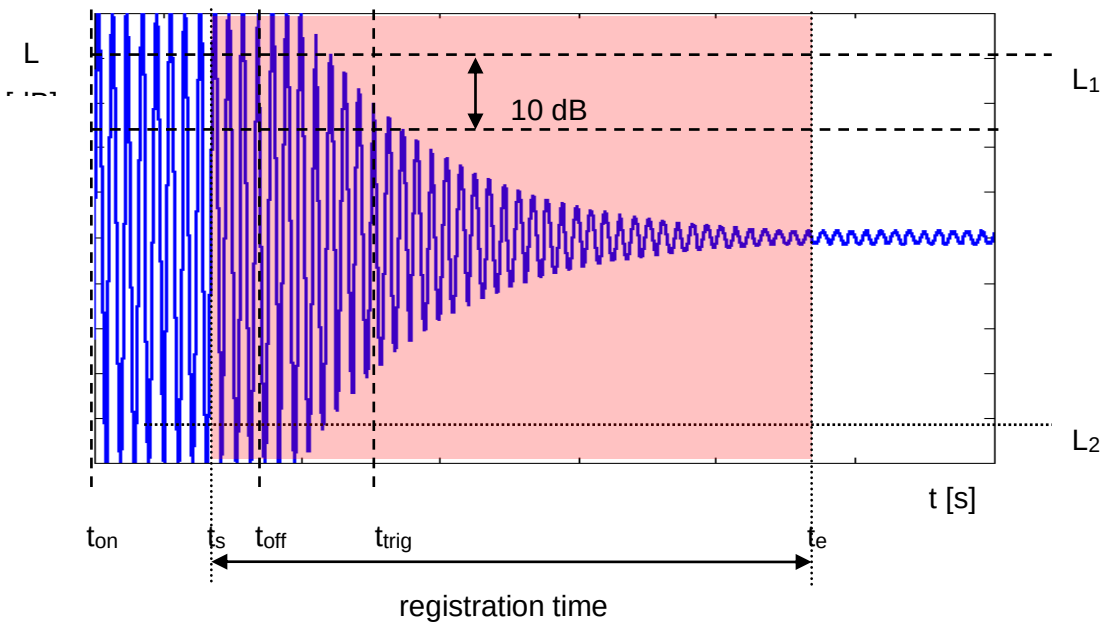


Fig 5. Data recording in the decay method of the reverberation time evaluation

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*

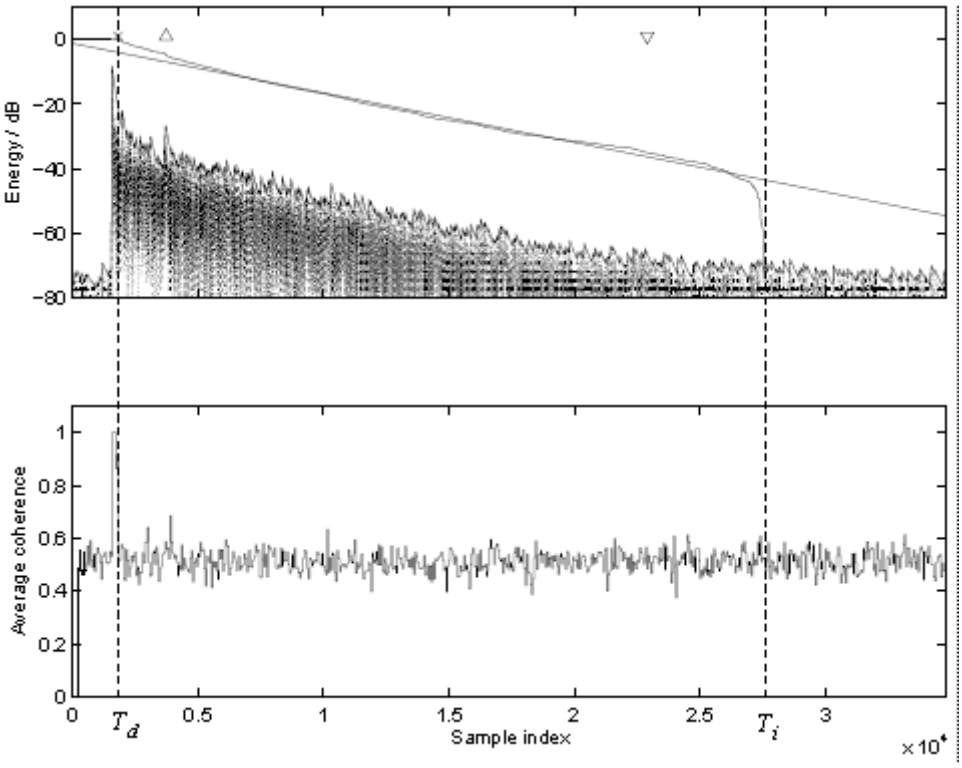


Fig. 6 An example of Schroeder integration with the limits Ti and Td

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.

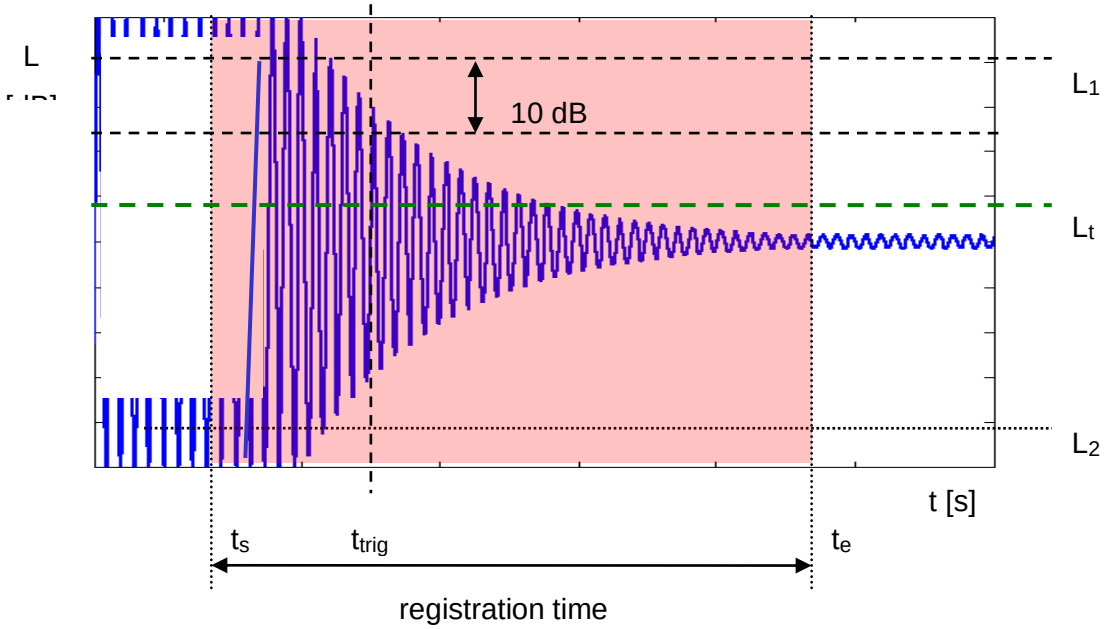


Fig 7. Data recording in the impulse method of the reverberation time evaluation

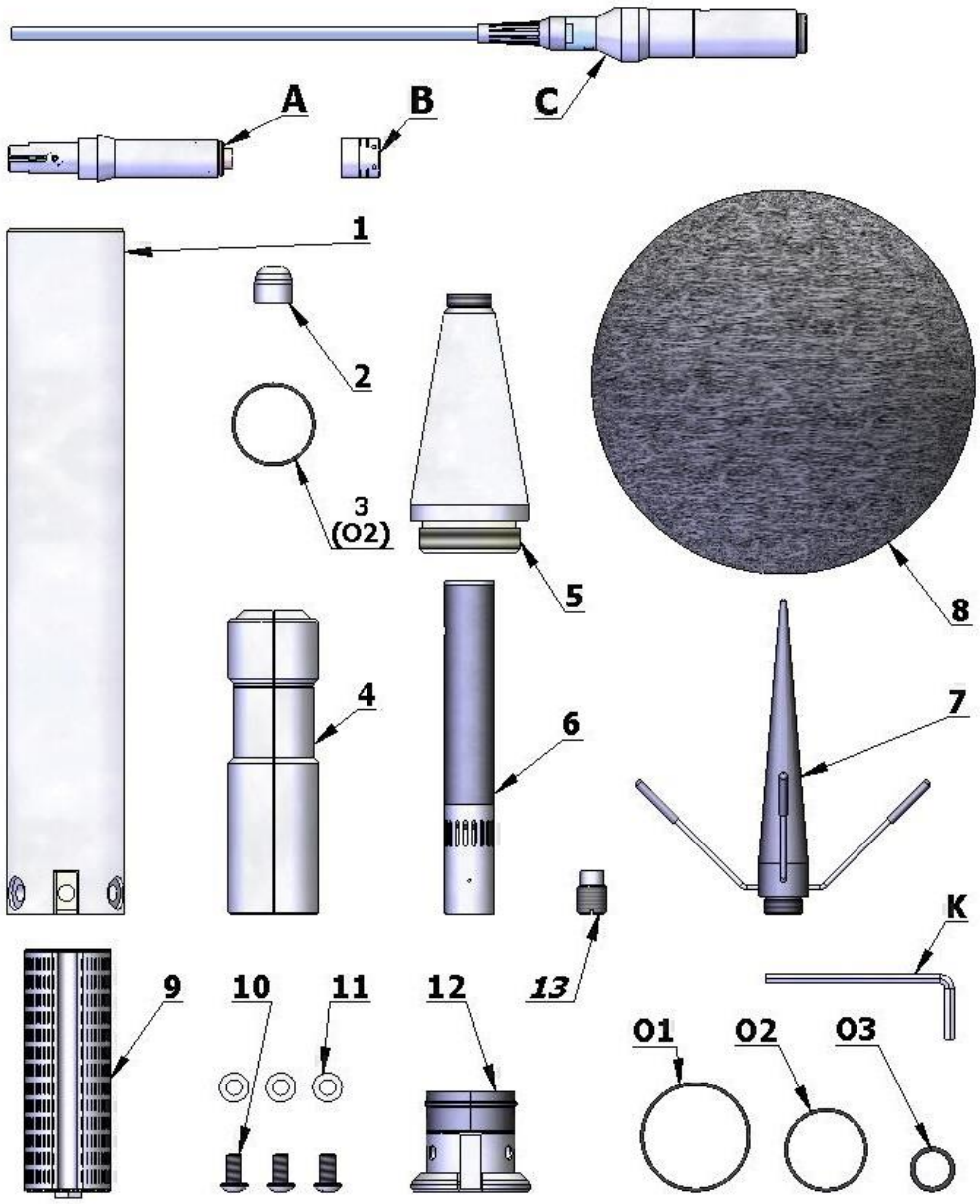
The measurement time in this method consists of:

- 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.

APPENDIX F. SA 271A OUTDOOR MICROPHONE KIT ASSEMBLY GUIDE

F.1 PART SET

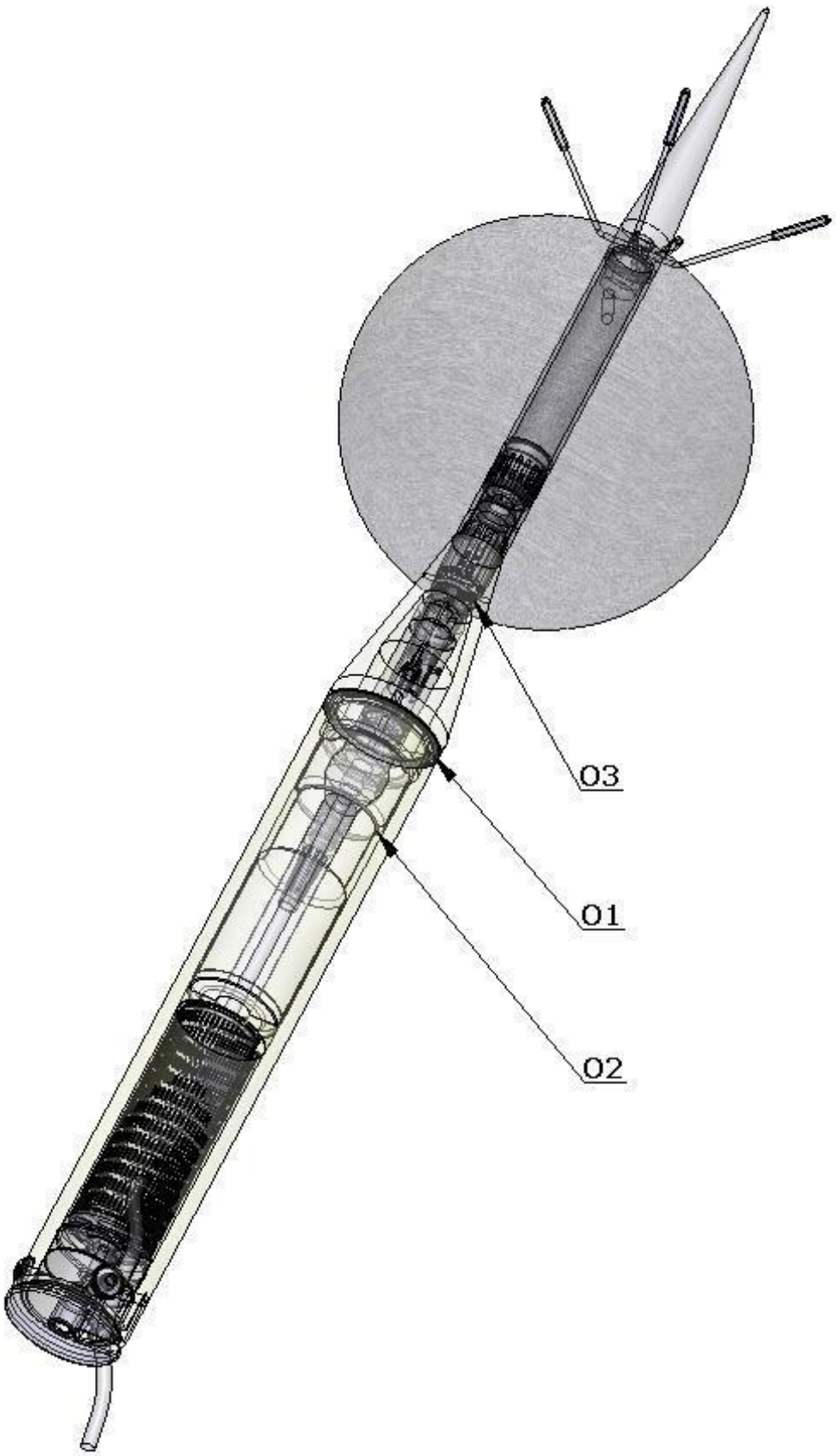


SA 271A kit:
1 - tube
2 - dummy microphone
3 - O-ring type gasket
4 - clamp (2 halves)
5 - upper cone
6 - microphone protecting tube
7 - anti-bird spikes
8 - windscreen (SA 209)
9 - desiccator (not included)
10 - M5x10 hex socket raised screw
11 - washer
12 - bottom
13 - ¼" thread adapter (not included)

Tools:
K - 3mm Allen key

Spare parts:
O1 - O-ring type gasket Ø35x1
O2 - O-ring type gasket Ø26x1
O3 - O-ring type gasket Ø12x1.5

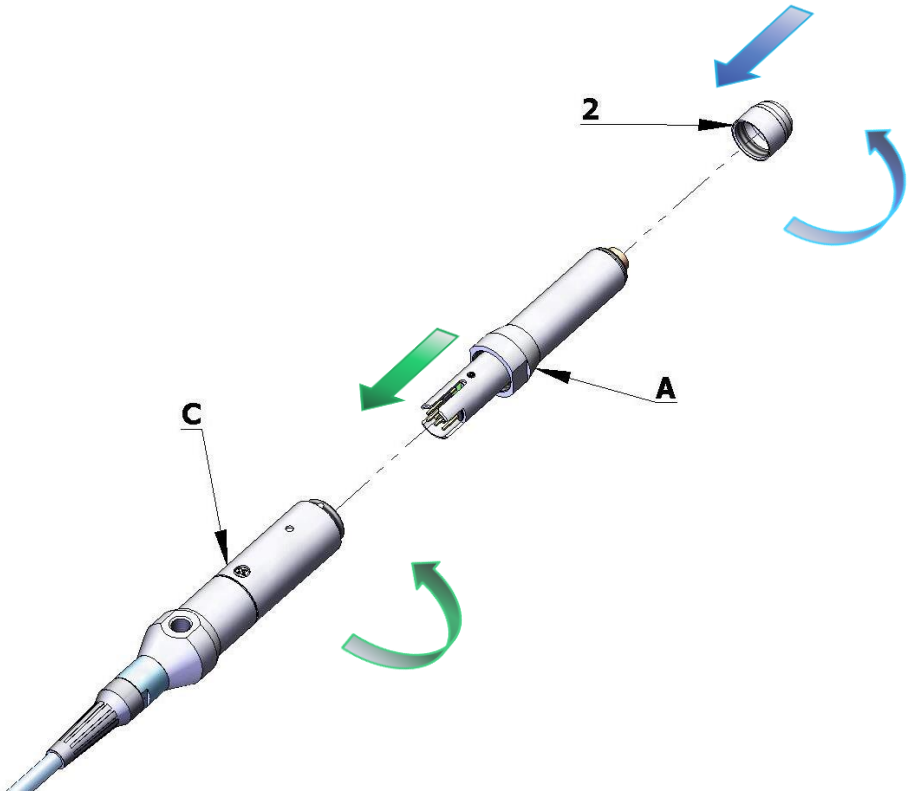
Parts not included:
A – SV 18A preamplifier
B – ACO 7152 microphone
C – SC 91A cable



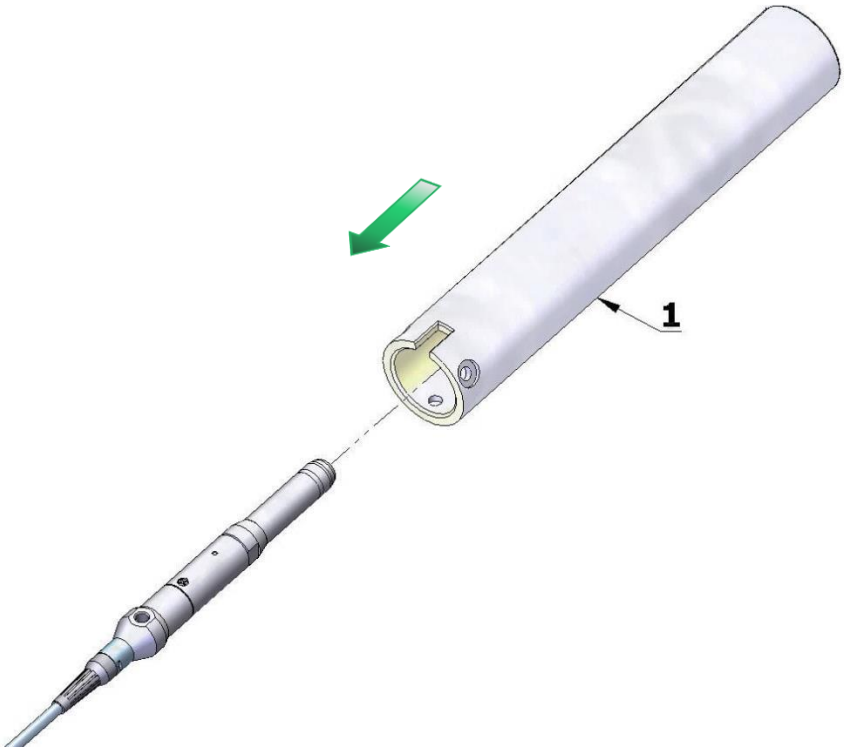
O-ring gasket locations inside

F.2 ASSEMBLY OF SA 271A

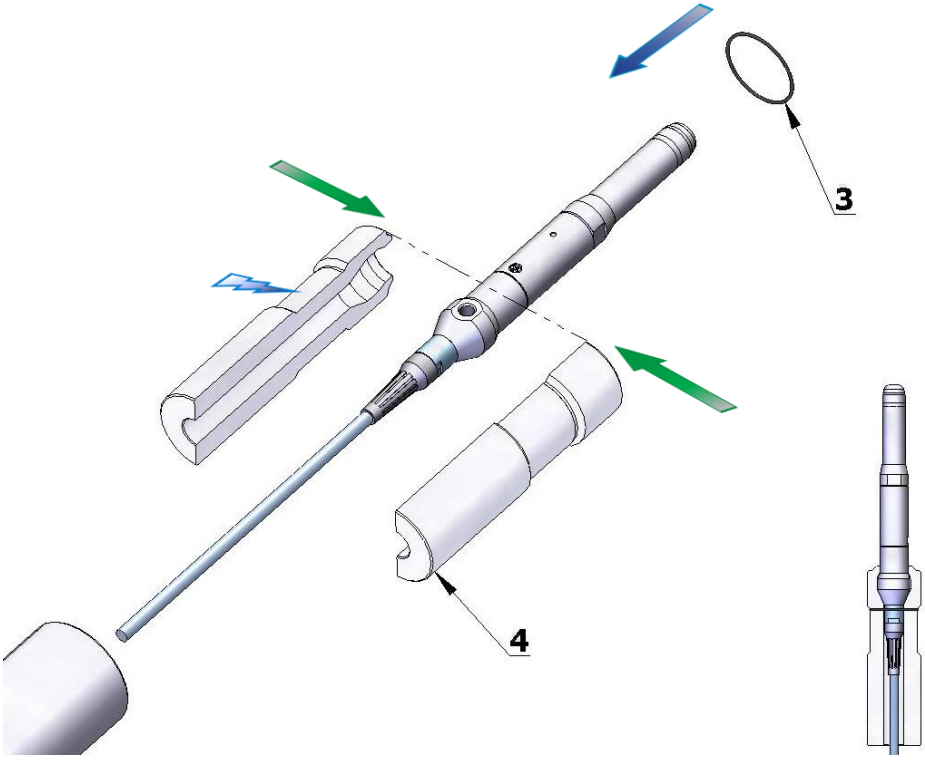
1. Secure preamplifier (**A**) with the dummy microphone (**2**) and connect the cable (**C**).



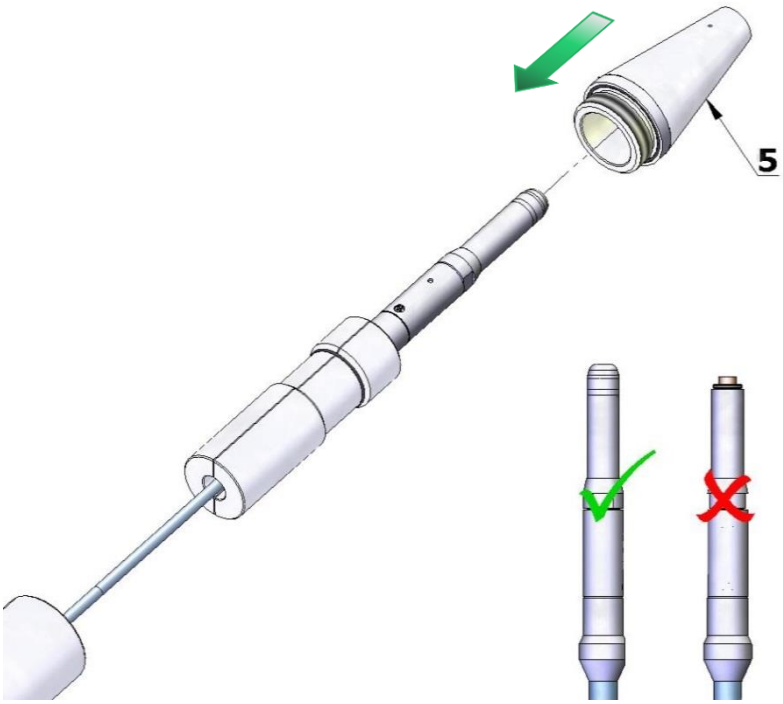
2. Pull tube (**1**) over the cable.



3. Connect the clamp halves (**4**) to the connector and insert O-ring gasket (**3**) on the lightning signed place.

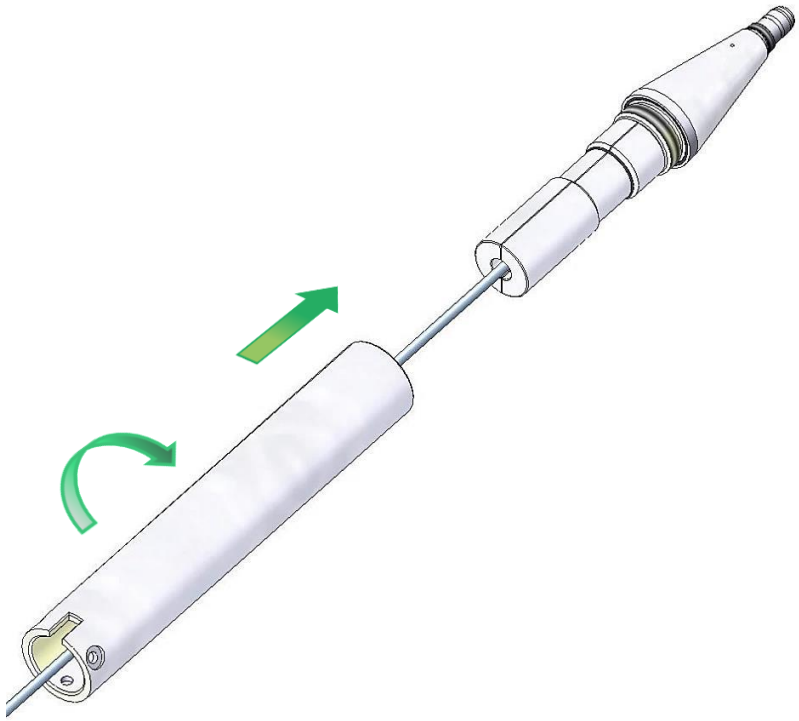


4. Apply the upper, conical part (**5**) on the preamplifier.

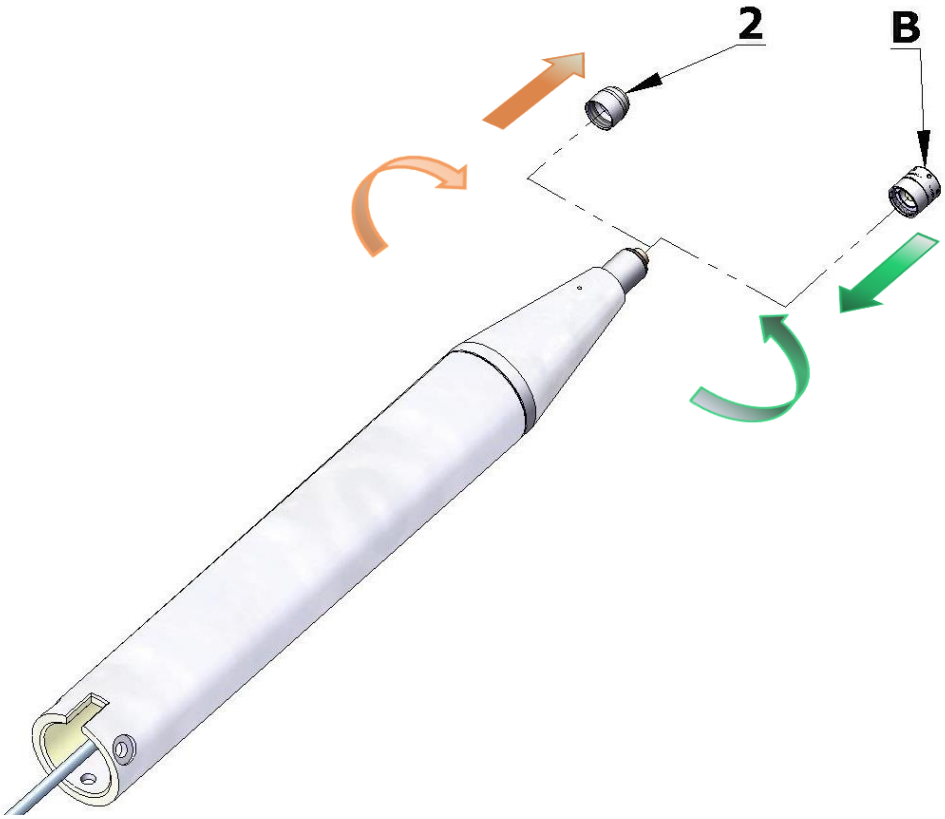


Note: *Do not use preamplifier without the dummy microphone. It can cause damage of the O-ring gasket inside the cone.*

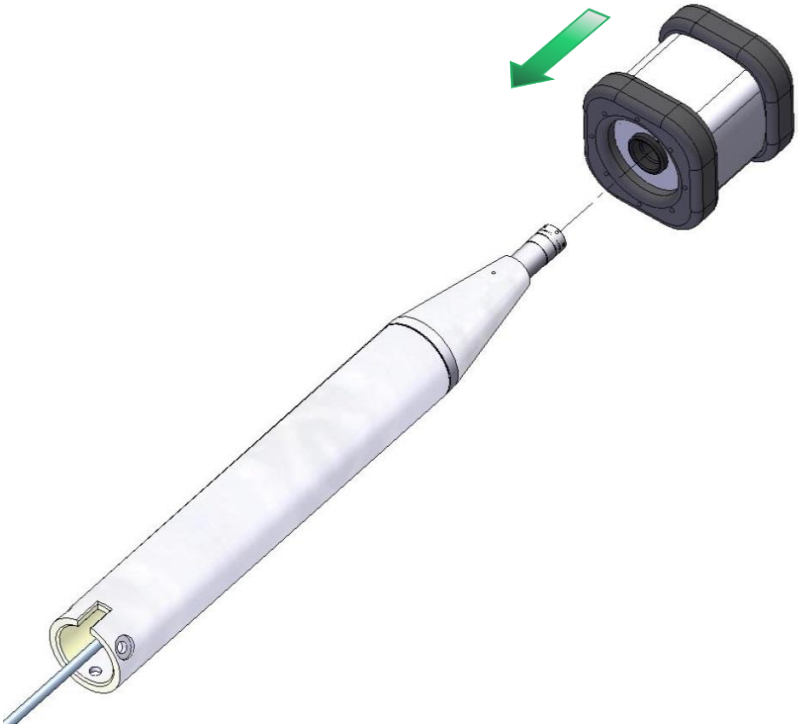
5. Screw the tube on the cone by rotating the tube – so as to not twist the cable.



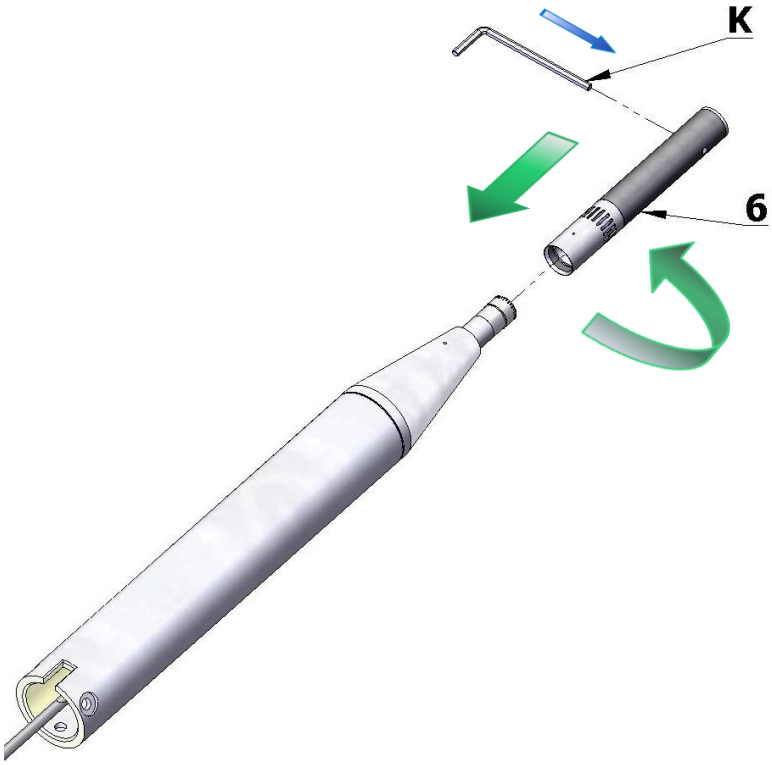
6. Replace the dummy microphone (**2**) with the ½" microphone cartridge (**B**).



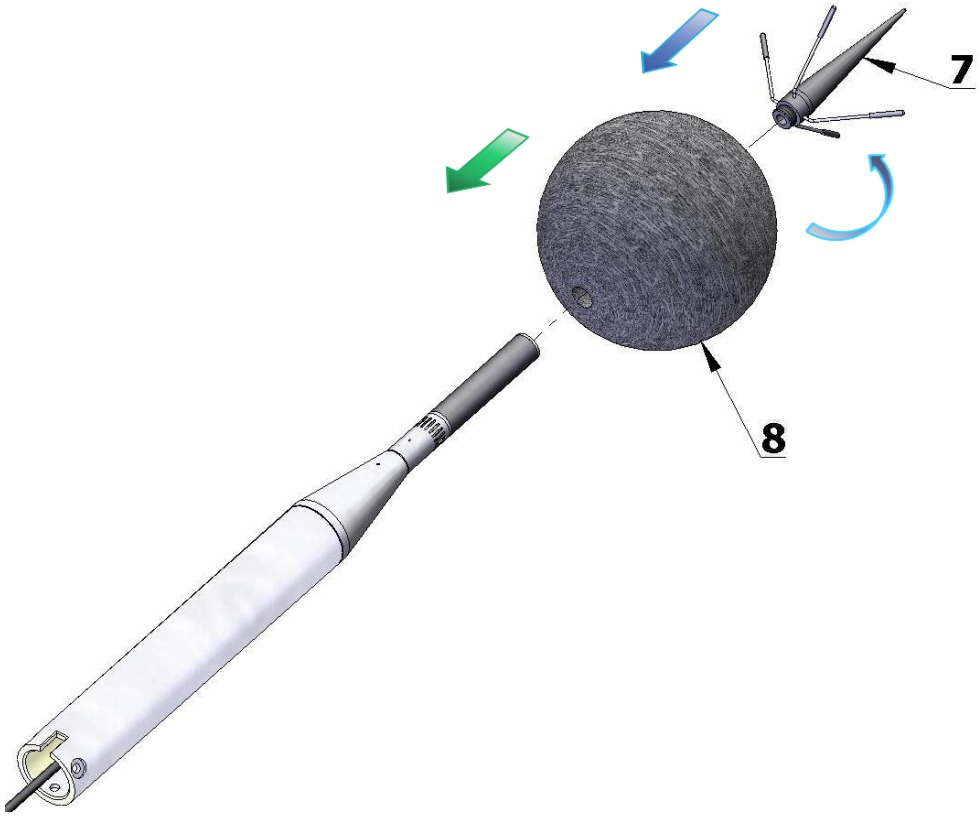
7. Calibrate the complete system using SVANTEK acoustic calibrator.



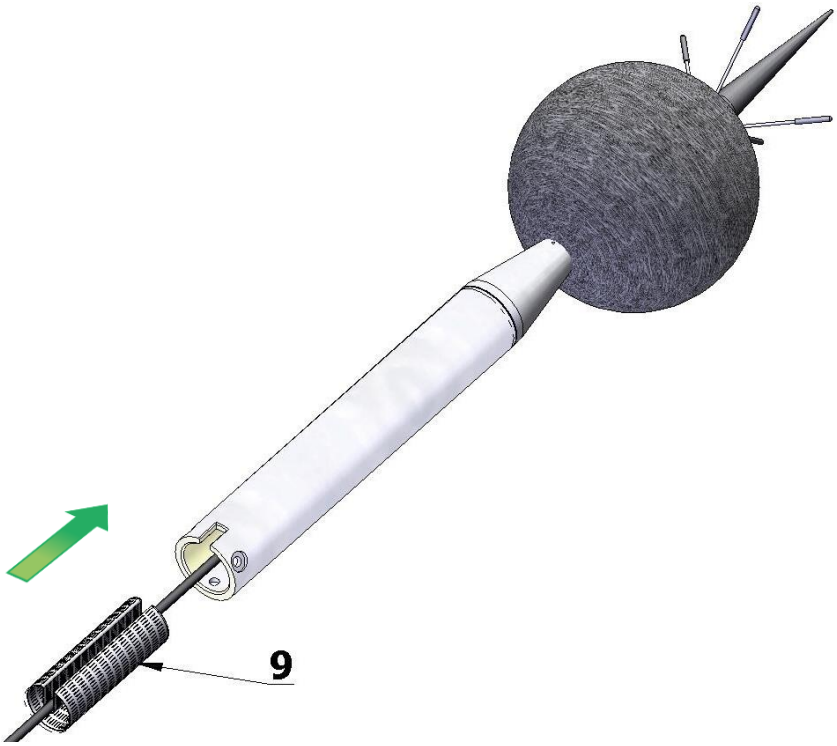
8. Install the microphone protection tube (**6**). Use the Allen key (**K**) as a pin at protecting tube orifice.



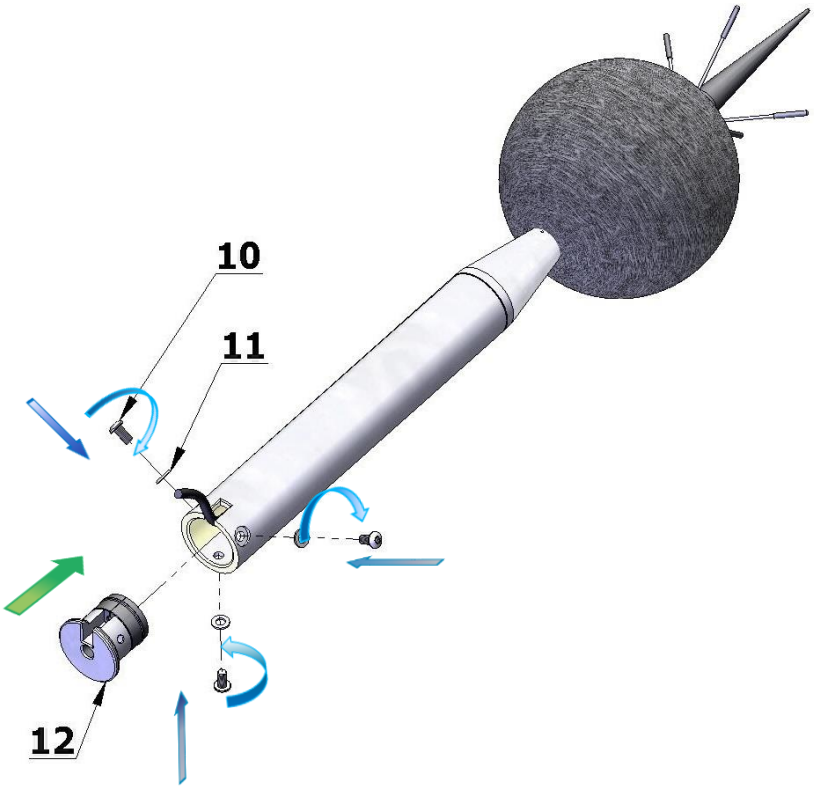
9. Mount windscreen (**8**) and the anti-bird spikes (**7**).



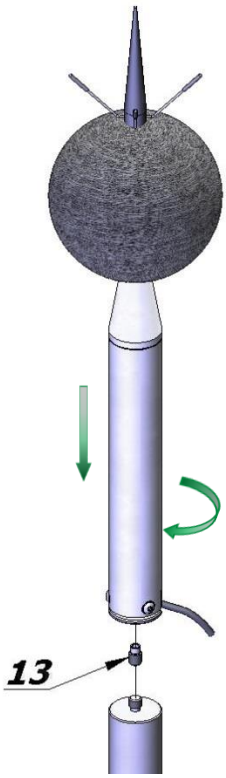
10. Slide the desiccator (**9**) inside the tube.



11. Place the cable in the slot and connect the bottom part (**12**) by three screws (**10**) with washers (**11**). Use the Allen key (**K**).



12. Mount the completed system on the dedicated tripod or pole. Use ¼" thread adapter (**13**) (if necessary) (see last note on next page).

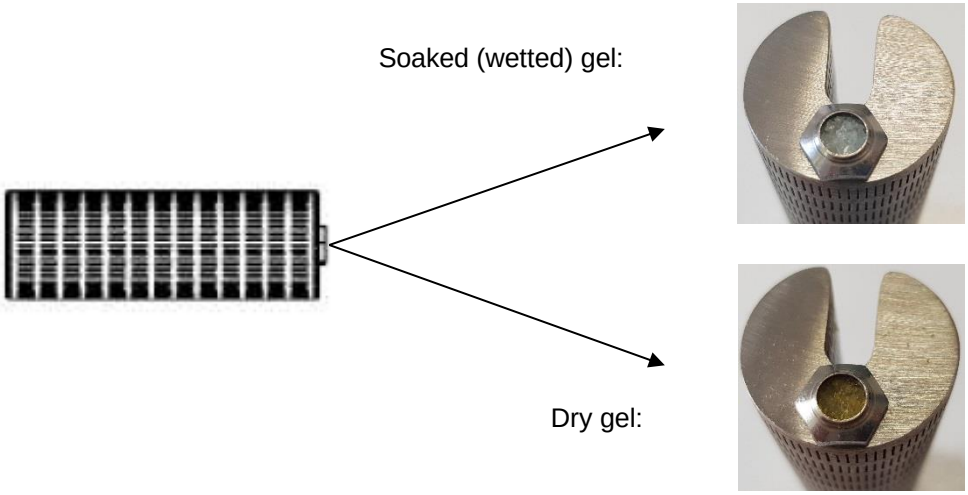


F.3 IMPORTANT NOTES

Note: *The SA 209 (**8**) at the part set picture) foam windscreen protects microphone from wind and rain. If the SA 209 windscreen is used continuously for a long period of time it is recommended to replace it at least once a year.*

Note: *During continuous usage the SA 209 windscreen is exposed to different weather conditions with possibility of causing physical damage to the foam's structure. Therefore, it is recommended, at least once a quarter (3 months), to check the condition of the windscreen by examining the surface for cracks by squeezing the foam. If cracks or holes are observed, the SA 209 windscreen must be replaced. Take care when examining the foam, as squeezing it too aggressively can damage the surface.*

Colour of the silica gel used in the desiccator (part 9) when it is dry is amber. If colour of the silica gel turns light grey it means that the gel is soaked (wetted) and the desiccator is not able to absorb more moisture. Colour of the silica gel is visible through the window of the desiccator. If colour of the gel becomes light grey, the desiccator should be regenerated by drying it for 3 hours in temperature of 150°C.



Note*: Desiccator should be inspected at least every 2 weeks, and more often when used in conditions of high air humidity.*

Note: *Desiccator must be stored in a hermetic container when is not installed in SA 271A to prevent absorbing moisture unnecessarily.*

Note: *Tripod or pole with ¼" thread is not recommended for stormy weather.*