SVANTEK

USER MANUAL

SV 104A

(microphone ST 104A)

ACOUSTIC
DOSIMETER

Warsaw, 2024-10-10
Rev. 2.01

Note: *Due to continuous product improvement SVANTEK reserves the right to make changes to product specifications without notice. To download the most up to date User Manual please visit our website at www.svantek.com.*

*This User Manual presents the firmware revision **1.09**.*

The succeeding software revisions (marked with the higher numbers) can change the view of some displays presented in the text of this 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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GENERAL WARNINGS, SAFETY CLAUSES, AND STANDARD INFORMATION

Note: *If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

Note: *The* ***SV 104A*** *dosimeter contains no user serviceable parts. Opening product case invalidates the warranty.*

Note: *When in normal use, always fit the* ***SA 122A*** *windscreen provided and make sure there is no display shipping protection foil in place. See Chapters 3.3 and 4.3.*

Note: *Under no circumstances should this equipment be cleaned using a solvent based cleaner (it can affect the case polymeric materials). Clean it with water dampened cloth only.*

Note: *Battery power indicator - To improve accuracy of remaining battery life indicator, run the dosimeter until it is fully discharged; then proceed with a full charge. The procedure is recommended before first use. Repeat this procedure every year of use to maintain more accurate current battery condition indication.*

Note: *If the dosimeter is flooded / falls into water - the device loses the intrinsically safe guarantee and cannot be used in potentially explosive atmospheres.*

Note: *The dosimeter should be periodically checked that it does not become unsealed, e.g., as a result of a fall, because then it loses IP65 (Ingres Protection) rating.*

Note: *Dosimeter incorporates Bluetooth®[1] wireless communication operating in 2.4GHz RF band and transmit power up to +9 dBm.*

Note: *For air-transport turn off* ***Bluetooth interface*** (*Chapters 3.8.3, 5.2.9.4 and 7.8).*

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SPECIAL PRECAUTIONS WHEN USING AND CHARGING LITHIUM BATTERIES

SV 104A contains extremely high energy density lithium-ion cell. Use special caution when working with lithium-ion cells. They are very sensitive to charging conditions and may explode or burn if mishandled.

- Do not replace the battery yourself. The battery is only manufacturer replaceable.
- Do not charge the instrument underground (mining) or in other hazardous locations.
- Always charge lithium batteries on a fire-proof surface.
- Do not charge the instrument near flammable materials such as boxes, paper and furniture.
- Immediately discontinue use of the instrument, while using, charging, or storing the instrument, if the instrument emits an unusual smell, feels hot, changes colour, changes shape, swells, or appears abnormal in any other way. Contact your sales location or **SVANTEK** if any of these problems are observed.
- Be careful not to puncture or break the instrument and cell within. Do not penetrate the instrument with nails, strike the instrument with a hammer, step on the instrument, or otherwise subject it to strong impacts or shocks.
- Do not place the instrument on or near fires, stoves, or other high-temperature locations. Do not use or store the battery inside cars in hot weather. Do not place the instrument in direct sunlight or use or store the instrument near a source of heat. Doing so may cause the battery contained inside to generate heat, explode, or ignite. Using the instrument in this manner may also result in a loss of performance and a shortened life expectancy.
- Do not place the instrument in microwave ovens, high-pressure containers, or on induction cooktop.
- Although the instrument is IP65 protected do not expose it extensively to water conditions which could cause the contained battery to get wet.
- The temperature range over which the instrument can be charged is **0°C** to **40°C**. Charging the instrument at temperatures outside of this range may cause the battery to become hot or to break. Charging the instrument outside of this temperature range may also harm the performance of the battery or reduce the battery's expectancy.

Assure that all of these precautions are observed before leaving the instrument charging unattended.

- The temperature range over which the battery can be stored is -20°C to +50°C and the temperature range over which the battery can be discharged is -10°C to +50°C. Use of the battery outside of this temperature range may damage the performance of the battery or may reduce its life expectancy.
- If you notice a performance decrease of greater than 20% in instrument, the battery is at the end of its life cycle. Do not continue to use, and ensure the battery is disposed of properly. Contact your sales location or **SVANTEK**.

ENVIRONMENTAL PROTECTION MARKING OF THE UNIT

Marking on the Unit	Explanation
IP65	Dust-tight. Protected against water jets
	ATTENTION, CONSULT ACCOMPANYING DOCUMENTS
	Do not throw into standard municipal waste containers. The user is obliged to deliver used equipment to the manufacturer or to the recycling collection point
	This product meets EU consumer safety, health or environmental requirements
	This product can be recycled (sign is placed on the battery)

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1 INTRODUCTION

The **SV 104A** instrument is a revolutionary new approach to occupational health and safety noise monitoring offering **voice comments**, **signal recording** and **vibration shock detection** functions which are new and useful concepts in an instrument of this size. It is a cable-free dosimeter and is typically attached to the user's shoulder, close to the ear using the mounting clips supplied.

This personal dosimeter has an **incredibly robust** 1/2" MEMS microphone (part number **ST 104A**) enabling easy and automatic calibration using most commonly available acoustic calibrators.

The class beating, high resolution, **amazing colour OLED** screen displays information in both text and graphical form and offers excellent visibility in dark sites as well as in full daylight conditions. This makes taking noise measurement a real pleasure.

Three independent acoustic profiles allow parallel measurements with separately defined filters and RMS detector time constants. Each profile provides an extensive number of results (like **Leq**, **Lmax**, **Lmin**, **Lpeak**, **L**, **LE**,…). All required weighting filters (**A**, **C, Z**) can be calculated in parallel.

For instance, it is trivial to set one profile to monitor noise parameters using the ACGIH (American Conference of Governmental Industrial Hygienists) preset, second profile set to OSHA HC (Occupational Safety and Health Administration - Hearing Conversation) preset and simultaneously monitor noise with the OSHA PEL (Occupational Safety and Health Administration – Permissible Exposure Level) settings.

Using the computational power of its digital signal processor the SV 104A instrument can simultaneously measure the dosimeter results and perform real time **1/1 Octave** & **1/3 Octave** analysis including calculations of statistical levels.

An inbuilt tri-axial accelerometer for **vibration shock detection** firmly places SV 104A as both the most technically advanced and the most robust personal dosimeter out there providing also information on the time when dosimeter is not used by the worker.

Advanced **time history logging** for each profile provides safe and complete information about measured signal in the internal **large 8GB memory**.

The instrument is powered from internal new generation Li-ion **rechargeable batteries** offering circa **48 hours**[2] of continuous operation. Ultra-low battery self-discharge is about 1% per year. The **powering and charging of the instrument from the USB** interface is provided which also enables easy data exchange connection between the SV 104A and a PC without the requirement of a special dock station. Alternatively, powering and charging of the instrument is possible with one of **SB 104B** series **dock station** with the USB interface which also enables easy data exchange with a PC.

The instrument works with Svantek dedicated health and safety software packages – **Supervisor**, mobile **Assistant**, as well as full analysis package **SvanPC++**.

Robust and lightweight design and Low Energy **Long Range Bluetooth® Smart** wireless interface enhances the exceptional features of this new generation instrument. Add to it the **automatic calibration** feature and one can say: "Never before has a noise dosimeter been so accomplished yet so affordable, making your measurements more **accurate and reliable than ever before**".

To get started quickly with SV 104A, the first part of the manual describes basic noise dosimetry information followed by a guide to setting up the dosimeter and running measurements.

[2] Depending on configuration.

1.1 SOUND PRESSURE

The human ear responds to audible sound pressure levels in the range from 20 µPa (hearing threshold) to 20 Pa (pain threshold), resulting in the enormous scale 1:1 000 000. Since using such a large arithmetic scale is not practical, a logarithmic scale in decibels (dB) was introduced which is also in agreement with physiological and psychological hearing sensations. Therefore, it is common that sound pressure is measured in decibels. Below there is sample information about expected sound levels for different sources.

Sound source	Sound level [dB]
Jet aircraft, 50 m away, or gunshot at close range	**140**
Threshold of pain	**130**
Threshold of discomfort	**120**
Chainsaw, 1 m distance	**110**
Disco, 1 m from speaker	**100**
Vacuum cleaner, distance 1 m	**70**
Conversational speech, 1 m	**60**
Quiet library	**40**
Rustling leaves	**10**
Hearing threshold	**0**

Table 1-1 Example sound source levels

1.2 DOSIMETRY

Noise is definitely a serious hazard in many workplaces. In case exposure to noise from machinery processes and equipment is not correctly eliminated or controlled, it may cause permanent hearing loss in workers. The, so called, inner ear is very fragile part of our hearing sense, which with current knowledge in medicine, cannot be truly repaired. Therefore, it is of great importance to protect our senses from excessive noise. Exposure to high levels of noise may also create physical and psychological stress, reduce productivity and interfere with normal communications. This may lead to accidents and injuries by making it difficult to hear moving equipment, other workers, and warning signals. Undoubtedly hearing loss has a very significant impact on the quality of life for many workers and their families.

Therefore, measuring noise exposure in the workplace is fundamental part of all good hearing conservation and noise reduction programs. The aim of taking a measurement with a noise dosimeter is to evaluate the average exposure of employees to noise during a normal shift. Wherever the worker goes the noise dosimeter goes too so that it captures all of the harmful noise during the typical day.

The dosimeter may be worn for the complete shift if the work pattern is so variable that it is difficult to predict exactly what will occur or it may be worn for a shorter but representative period and then the full day's dose extrapolated from that sample.

1.3 STANDARDS

The effects of high sound exposure on hearing have been studied for many years. As far back in 1954 AIHA (American Industrial Hygiene Association) – Rosenwinkel & Stewart – described a "new device which integrates sound energy over finite time periods." In 1956 – von Witternand & von Gierke obtained a patent for a noise exposure meter for "indicating the total time that noise exceeded a certain predetermined level". Since

then, measurements could be conducted over long periods of time and the instrument was worn by personnel under normal work conditions.

Finally, organizations developed standards to regulate personal noise exposure. International standards are specified by health and safety regulations such as the European Union Parliament and Council Directive 2003/10/EC of February 6, 2003 on minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise) or International Electrotechnical Commission IEC-61252 guidelines. The EU directive links to the ISO 9612-2009 Acoustics – Determination of occupational noise exposure – Engineering method.

In the United States, the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910 General Industry Regulations: Standard No. 1910.95 Occupational noise exposure, the Mine Safety and Health Administration (MSHA), and the American Conference of Governmental Industrial Hygienists (ACGIH) have created slightly different regulations and limitations on tolerable noise exposure. Noise requirements are to ensure that the hazards associated with the exposure of workers to noise are eliminated or properly controlled.

Organization	Website address
ISO	http://www.iso.org
IEC	http://www.iec.ch
OSHA	http://www.osha.gov
MSHA	http://www.msha.gov
NIOSH	http://www.cdc.gov/niosh
ACGIH	http://www.acgih.org
CCOHS	http://www.ccohs.ca
…	

Table 1-2 Standardization organizations' websites

Additionally, at present dosimeters should meet relevant accuracy and performance requirements defined by:

- **IEC 61252** Personal Sound Exposure Meters
- **ANSI S1.25** Personal Noise Dosimeters

1.4 APPLICATIONS

The SV 104A noise dosimeter is extremely well suited to ISO, OSHA, ACGIH, MSHA, NIOSH, CFR 1910.95, HSE L108 workplace noise measurements in noise exposure assessments. NIHL: Noise Induced Hearing Loss remains noticeably significant occupational disease It is notably severe in the mining, construction, oil & gas industry but also in a wide variety of manufacturing sectors and other commercial operations. The dosimeter comes with pre-defined setups that suit different measurement requirements and offer versatile possibilities to be specifically configured by the user for special requirements if needed:

- measurement and control of the industrial noise
- work site assessments
- sites/plants/facilities survey monitoring systems
- hearing conservation compliance, noise induced hearing loss (NIHL)
- transportation noise studies
- personal noise verifications
- peak dosimeter for example in military applications.

One of the most desirable SV 104A features is the unique data logging function that stores significant number of noise parameters at regular intervals and superimposed random vibration shock or audio events during a measurement run.

Due to the unattended nature of noise dosimetry it is important for workers to be fully engaged with the risk assessment process. Motion sensing (No Motion Time) is particularly useful in cases of cheating to tamper with the instrument or try to impact on the results, by for example instrument being taken off for the majority of the time.

The addition of Bluetooth® wireless connectivity and the supporting mobile devices **Assistant** application enables remote control and monitoring of the instrument's status such as battery usage, memory capacity and measurement progress without having to disturb the worker.

Noise profiled results can be easily transferred to the **Supervisor** or **SvanPC++** software packages. The noisiest times can be immediately seen in the graphical report and actions directed to the appropriate area. This makes checking for different regulatory bodies' compliance and ensuring if hearing conservation programs are needed definitely easier than ever before. SV 104A answers all the important questions such as WHEN and HOW did the noise exposure appear? The data logging measurements can be started immediately, or they can be pre-programmed in advance so that measurement run can begin and end automatically at a pre-set start and end time without the need for any onsite supervision.

Additionally, SV 104A allows for custom **voice note comments** to be added before or after the measurement run, and therefore this is the ideal instrument for the professional occupational hygienist to use for all noise exposure studies.

1.5 MEASUREMENT PROCEDURES

Preferably, when taking measurements, the noise dosimeter should be attached to the employee at the start of a shift and collected at the end of the whole shift. In case a shorter period is sampled then care should be taken to ensure that the result is representative of the full shift exposure. Shorter sampled periods require that the sampler has a deep and full understanding of the expected working tasks during the shift and the duration cycles of those tasks.

Before performing any noise measurements, ensure that employees selected for evaluation are operating equipment or performing tasks under normal (representative) conditions, and emphasise the importance of continuing to work in their usual manner (wearing the dosimeter should not interfere with normal duties). Explain the purpose and procedures of sampling to the employee who will be wearing the dosimeter and the importance of not touching, tapping or interfering with the microphone. Instruct the employee not to remove the dosimeter unless absolutely necessary.

The general procedure for taking measurements could be as follows:

1. Check that the indicated instrument battery life is at least twice the time required for the measuring period.
2. Check the instrument setup mode is appropriate and change if necessary.
3. Check the calibration of the instrument and adjust the settings if required.
4. Secure the instrument onto the shoulder of the employee selected for sampling. Refer to the chapter with specific requirements regarding orientation of the microphone.
5. Start the recording session manually if it is not programmed for an automatic timed start.
6. At the end of the measurement period, stop the recording session, and remove the dosimeter from the employee.
7. Recheck the dosimeter's calibration. If the instrument is not within the calibration limits, then the results are invalid (usually if a discrepancy is found between two successive checks of more than ± 0.5dB in the reference level, then the results of the measurements taken between the two checks should be considered invalid and the cause investigated, and the measurement repeated).
8. Follow your organisation's specific procedure for personal noise exposure recordings analysis
9. Ensure the report is submitted to the appropriate person.
10. Distribute copies of noise exposure recordings to test participants, explain the results and ensure that their hearing protection adequately protects against the recorded noise exposure levels.

2 KIT COMPONENTS

2.1 SV 104A DOSIMETER SHORT FORM SPECIFICATION

- The SV 104A dosimeter with all listed below accessories meets requirements of the IEC 61252 ed1.2 (2017) and ANSI/ASA S1.25-1991 (R2020) standards for personal noise dosimeters and the IEC 61672-1:2013 standard for sound level meters of Class 2 Group X instruments
- **ST 104A** MEMS microphone, 1/2" housing, patented
- **OLED colour display** (128 x 64 pixels) with super brightness and contrast
- Large **8 GB memory**
- Wireless connectivity with low energy **Long Range Bluetooth® Smart** (4.0) interface
- **USB 2.0** high speed interface (available also through the dock stations)
- Parallel **Slow, Fast**, **Impulse** detectors for the measurements with **A**, **C**, **Z** filters
- Frequency Range **20 Hz ÷ 10 kHz**
- Measurement range better than **53 dBA RMS ÷ 141 dBA Peak**
- Dynamic Range better than **98 dB**
- Exchange rates **2, 3, 4, 5, 6**
- Measurement results: **Run Time (TIME), Lpeak, Lmax, Lmin, L, DOSE (%), D_8h, PrDOSE, Leq, LAV, LE, SEL8, E, E_8h, LEPd, PSEL, Ltm3, Ltm5, Lstat, PTC, PTP, ULT, TWA, PrTWA, Lc-a, OVL, No Motion Time**
- **Three** independent user configurable acoustic measurement profiles
- Easy in use **predefined setups**
- **Time-history data logging** of Leq/Lav/Lmax/Lmin/Lpeak with variable 0.1 s to 1 hr logger step and separate summary results intervals with statistical levels
- **1/1 Octave** real time analysis - 9 filters with centre frequencies from 31 Hz to 8 kHz (meeting Class 1 requirements of IEC 61260-1:2014) presented as a bar graph with Leq and Lmax band levels plus overall A, C and Z broadband weightings (as option called SF 104A-OCT)
- **1/3 Octave** real time analysis - 28 filters with centre frequencies from 20 Hz to 10 kHz (meeting Class 1 requirements of IEC 61260-1:2014) presented as a bar graph with Leq and Lmax band levels plus overall A, C and Z broadband weightings (as option called SF 104A-3OCT)
- **Wave recording**, triggered and continuous mode, 12/24 kHz sampling rate, WAV format (as option called SF 104A-WAV)
- **Voice Comments** records audio on demand, created before or after measurement, added to measurement file
- **Vibration shock detector** with user selectable variable threshold: 1g-15g
- **Automatic acoustic field calibration** with one touch activation before and after measurement
- Operational time **> 48 hours** *(display off, Bluetooth® off, octave analysis off)*
- Extremely **compact, lightweight and robust case with IP65 ingress protection**

2.2 ACCESSORIES INCLUDED

- **ST 104A** ½" MEMS microphone, nominal sensitivity 2.5 mV/Pa
- **SA 122A** foam windscreen
- **SC 156** micro-USB to USB type A cable

2.3 ACCESSORIES AVAILABLE

- **ST 104A** ½" MEMS microphone, nominal sensitivity 2.5 mV/Pa
- **SA 122A_3** Windscreens for the SV 104A dosimeter 3 pcs per pack
- **SV 34B** Class 2 acoustic calibrator: 114dB@1000Hz
- **SA 54** Charger/power supply for 1 x SV 104A
- **SB 104B-1** 1-bay dock station (including **SC 16** – USB type A to USB type B cable)
- **SB 104B-5** 5-bay dock station with **SB 33** power supply (including **SC 16** – USB type A to USB type B cable)
- **SA 144** Carrying Case for five dosimeters and 5-bay dock station
- **SA 147** Waterproof Carrying Case for one dosimeter and 1-bay dock station
- **SL 104CA_A** Equivalent Impedance for electrical calibration
- **NM104I1Z** Technological wrench to unscrew the microphone

2.4 FIRMWARE OPTIONS AVAILABLE

- **SF 104A OCT** real time 9 band 1/1 octave analysis option
- **SF 104A 3OCT** real time 9 band 1/1 octave and 28 band 1/3 octave analysis option
- **SF 104A WAV** wave recording option

Note: *Software options can be purchased in any time as only the introduction of a special code is required for their activation. The activation of the optional functions can be made with the use of the Supervisor software – see Chapter 0.*

3 GETTING STARTED

3.1 SYSTEM DESCRIPTION

The following figure shows the SV 104A controls and ports:

Figure 3-1 SV 104A at a glance

3.2 INPUT / OUTPUT INTERFACES

SV 104A is equipped with a set of useful interfaces:

- microphone connector (essential for measuring)
- micro-USB connector (charging, and data download)
- charging connector and fast communication port (reserved for dock stations)
- Bluetooth® 4.0 wireless connectivity and the supporting mobile devices **Assistant** application enables remote control and monitoring of the instrument's results and status

Figure 3-2 SV 104A side view – microphone connector

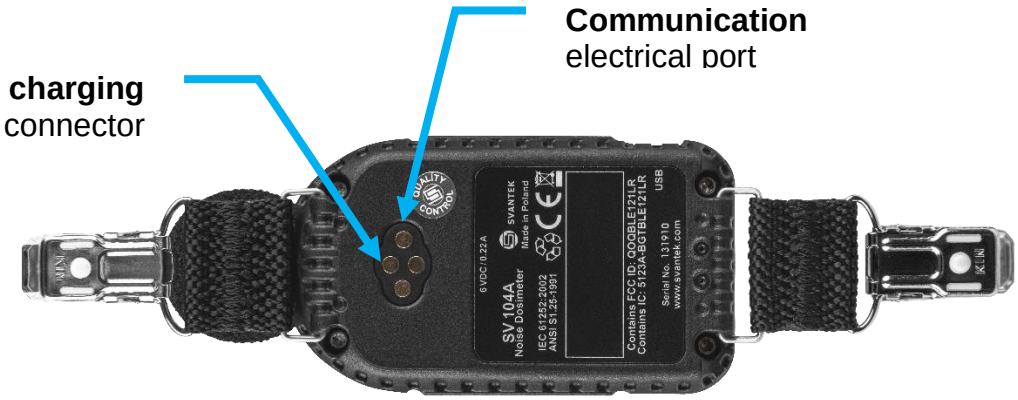


Figure 3-3 SV 104A back view - charging and communication port (reserved for dock stations)

Note: *Full description of the connectors is given in Appendix C.*

3.3 WINDSCREEN

When in use, it is strongly recommended that the SV 104A is fitted with the supplied **SA 122A** anti-static windscreen. To calibrate the dosimeter, it is necessary to remove the windscreen to gain access to the microphone. It is not necessary to remove the windscreen to record voice annotations.

The SV 104A uses a counter-clockwise threading technique to fit tightly onto the microphone body. To remove the windscreen, unscrew it, holding the lower half of the foam, and lift the windscreen off the microphone housing. Once the SV 104A has been calibrated, place the windscreen by carefully screwing it back over the microphone.

Figure 3-4 SA 122A windscreen

3.4 MOUNTING CLIPS

SV 104A is supplied with standard natural leather mounting clips. The clips can be replaced with a pair of pliers.

Figure 3-5 SV 104A standard mounting clips

3.5 MOUNTING AND POSITIONING SV 104A

Unless required by local legislation, personal noise dosimeters should always be mounted on the shoulder, approximately 10 cm from the most exposed ear, with the microphone a few cm above the shoulder. The shape of the SV 104A and the height of the microphone ensure correct positioning of the instrument, see figure below.

Figure 3-6 SV 104A positioning

3.6 LED STATUS INDICATOR

There is a three-colour instrument LED status indicator, located to the right of the microphone mounting head and above the display. The table below explains the conditions under which each LED colour will appear.

LED status indication	Description
GREEN flashing once per second	Indicates that the **measurement is running** and the dose alarm level has not been exceeded.
AMBER flashing once per over a dozen seconds	Indicates that the **measurement has stopped** and the dose alarm level has not been exceeded.
RED single isolated flashes with a duration of nominally one second	Indicates that a **vibration shock threshold has been detected**. This goes out when the high vibration shock has stopped.
RED flashing quickly, four times per second	Indicates the **alarm conditions**: For example: the dose has exceeded the alarm level.

Table 3-1 LED status description

3.7 STATUS BAR ICONS

The upper part of the display is designed to provide basic status information. See the description below.

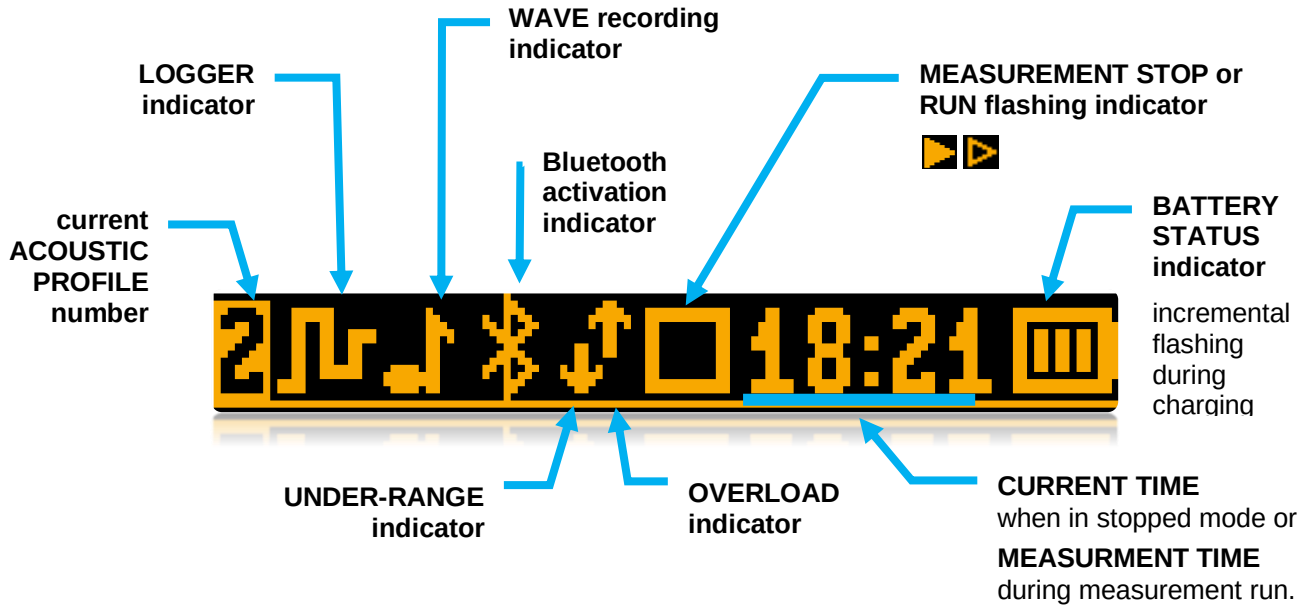


Figure 3-7 SV 104A display icons description

Note: *If the Bluetooth icon is inverted , this means that the dosimeter is connected to a remote application such as Assistant (see Chapter 6).*

Overload detector

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

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

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

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

Underrange detector

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

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

3.8 MANUAL CONTROL OF THE INSTRUMENT

Although the Instrument is small, the keypad has been designed to be minimal, yet highly ergonomic and easy to use, offering effective operating possibilities. As a result, the number of control buttons on the instrument has been reduced to just three.

In general, the user can operate the instrument by:

- changing the **VIEW** mode with the key
- selecting the desired **ACOUSTIC PROFILE** with the key
- scrolling through the results with the key.

Note: *To conserve power and prolong battery life, the SV 104A will automatically turn off the display after 30 seconds if no key is pressed on the keypad. The LED display will continue to inform the user of the current operating status and any alarm conditions. Press any key to reactivate the display.*

3.8.1 Primary key functions

On the front panel of the instrument the following control keys are located. See below for primary (short press) key functions description:

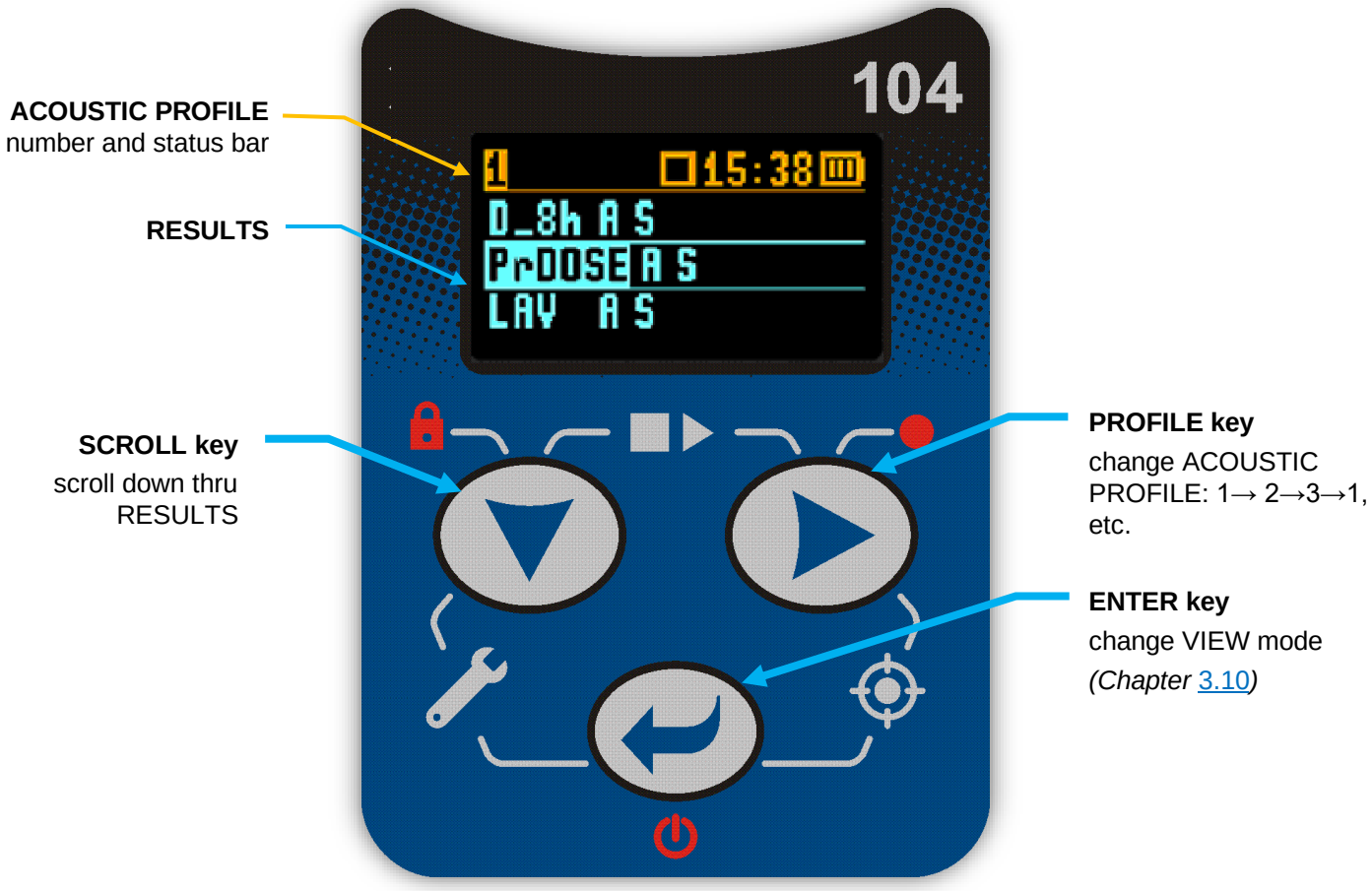


Figure 3-8 Control keypad on the front panel – primary key functions

3.8.2 Alternate key functions

Alternative **long press of a single key** (keypad icons highlighted in red) allows quick access to special functions:

- **POWER ON/OFF** of the unit by holding down the key
- Record the **VOICE COMMENT** by holding down the key
- **LOCK** the keypad and screen by holding down the key.

Figure 3-9 Control keypad on the front panel – alternate key functions

If you press and hold a key for a few seconds, during which a countdown is displayed, the instrument gives you time to decide whether you really want to access the function to be performed:

- Shutting down 3… 2… 1… for the key
- Keyboard lock 3… 2… 1… for the key
- Voice comment 3… 2… 1… for the key.

If you release the key too early, the instrument will return to the last used **VIEW** mode and the selected control will not be executed.

3.8.3 Alternate combined keys functions

In addition, you can quickly access even more functions by briefly pressing two keys together (keypad icons highlighted in white.

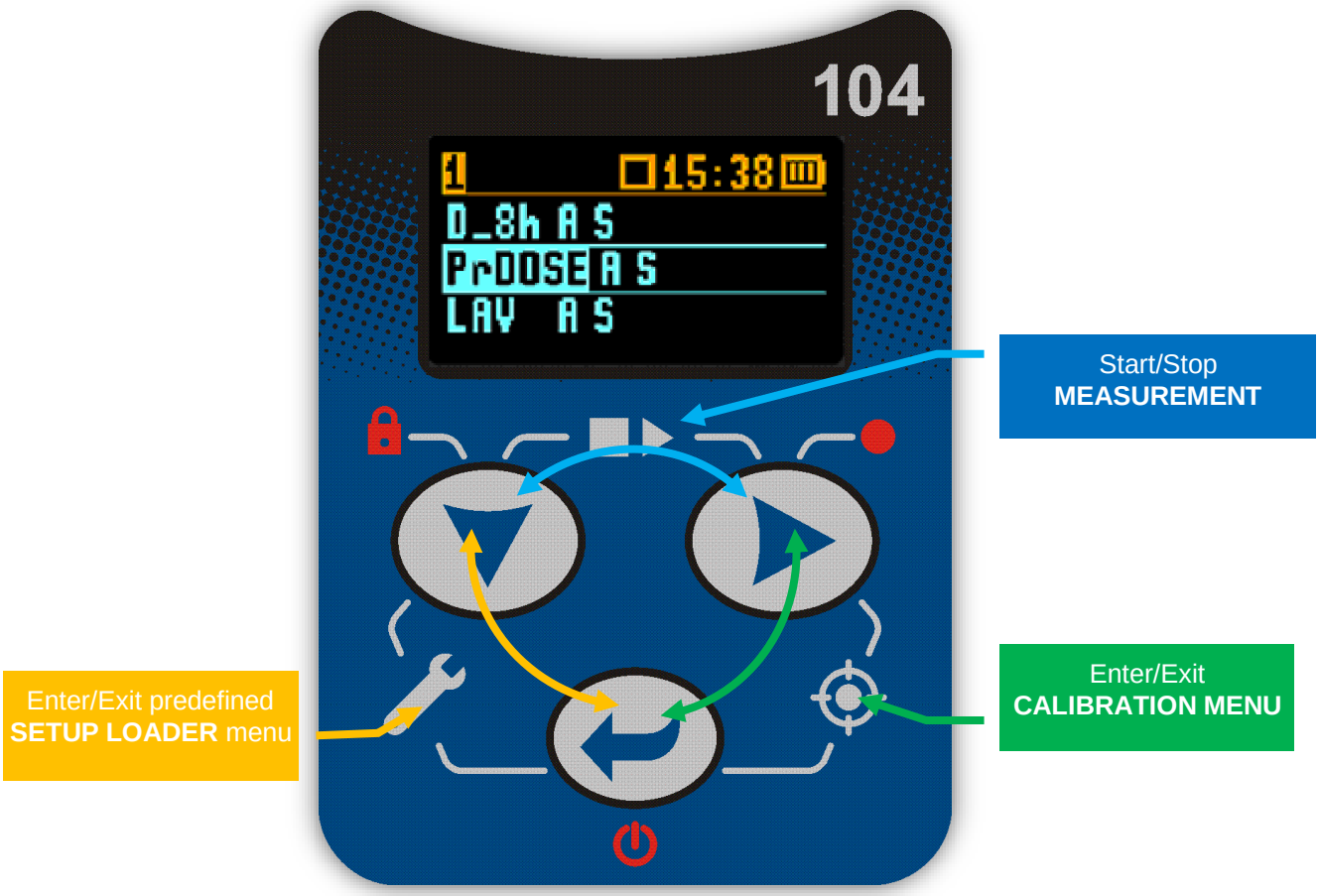


Figure 3-10 Control keypad on the front panel – alternate combined keys function

Note: *Extra additional keypad functionality is also available to display the instrument's* ***Unit Label*** *screen, which shows the current firmware revision number. This is accessed by briefly pressing* ***all three keys*** *simultaneously.*

Note: *To access Bluetooth menu, press the ▼ and ↵ keys simultaneously* ***twice****.*

Note: *Microphone compensation settings can be accessed by pressing and holding the ▼ and ↵ keys simultaneously for three seconds.*

Warning: *Changing the microphone compensation filter setting is not recommended for purposes other than laboratory calibration!*

3.9 THREE INSTRUMENTS IN ONE – ACOUSTIC PROFILE CONCEPT

SV 104A is able to monitor and record noise by allowing up to three different parameter configuration settings, also known as "**ACOUSTIC PROFILES**". Profile 1 can be set to perform measurements using OSHA HC (Occupational Safety and Health Administration - Hearing Conversation) parameters, while Profile 2 is set to monitor noise using OSHA PEL (Occupational Safety and Health Administration – Permissible Exposure Level) parameters, and Profile 3 is set to ACGIH parameters. This is a true triple instrument in one.

3.10 THE VIEW MODE PRESENTATION CONCEPT

SV 104A offers a large number of measurement results for the operator to check. For this reason, all information is clearly organised as **VIEW** modes for each PROFILE.

The **VIEW** mode is a way of presenting the measurement results to the operator. In other words, when you change the VIEW mode, certain measurement results and status information are presented in a different way as different screen content.

SV 104A has the following VIEW modes, most of which can be individually disabled with the Supervisor PC software or Assistant Pro mobile application:

- Running instantaneous SPL view mode (Chapter 3.10.1).
- Primary "one-result" view mode (Chapter 3.10.2) - *cannot be disabled!*
- Results list view mode (Chapter 3.10.3).
- 1/1 octave analysis spectrum LEQ view mode (Chapter 3.10.4).
- 1/1 octave analysis spectrum MAX view mode (Chapter 3.10.4).
- 1/3 octave analysis spectrum LEQ view mode (Chapter 3.10.5).
- 1/3 octave analysis spectrum MAX view mode (Chapter 3.10.5).
- Instrument Status view mode (Chapter 3.10.6).

3.10.1 Running SPL view mode

The Running SPL view mode is used when the measurement run is not actually running, i.e. when the instrument is in standby mode before or after a measurement. In this mode the current SPL result is calculated and displayed, but not stored in the instrument's memory. The purpose of this information is to give the user an initial indication of the sound levels to be measured. In this view mode the instrument behaves as a simple general purpose sound level meter.

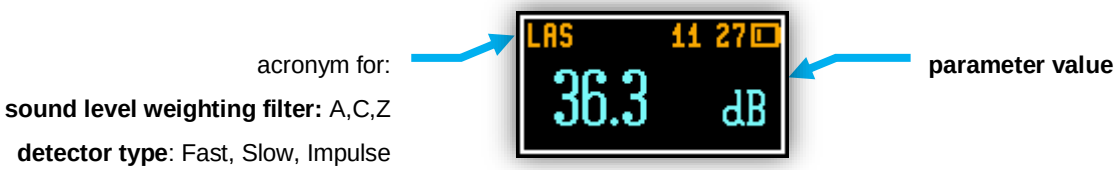


Figure 3-11 Running SPL view mode screen

3.10.2 Primary "ONE RESULT" view mode

The One Result view mode is always available in all measurement modes and cannot be disabled. In One Result mode, any measurement result selected with the ▼ key can be displayed. The user can change the current profile view by pressing the ▶ key. This view mode is useful if in poor visibility conditions or for operators with some visual impairment.

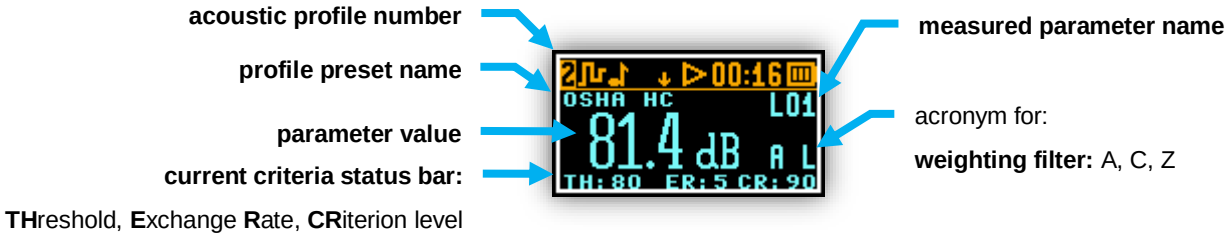


Figure 3-12 Primary ONE RESULT view

3.10.3 RESULTS LIST view mode

To obtain information on a number of results at once, it is convenient to switch to the Results List view mode.

Up to three results are accessible for the operator at any one time. In this view, the user can use the key to scroll through the list of results, starting with the profile name and configuration with.

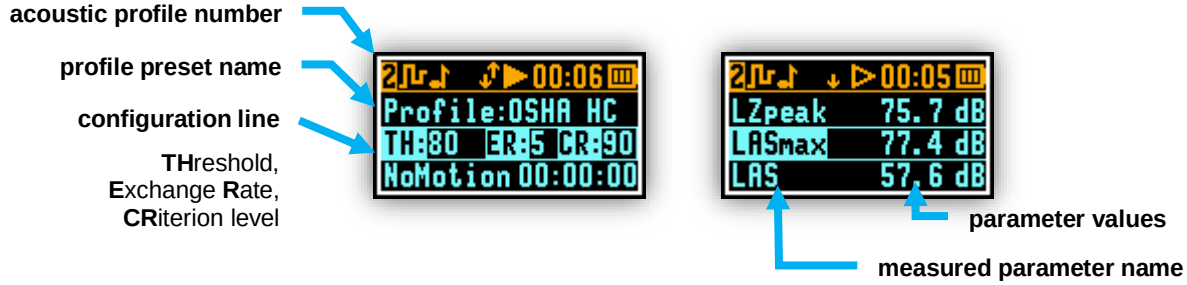


Figure 3-13 RESULTS LIST view

3.10.4 1/1 octave analysis spectrum view mode

Note: *The 1/1 octave analysis is switched on with the use of the dedicated software, see Appendix E.*

Note: *The 1/1 octave analysis is an optional function and should be activated before use. Activation of the optional functions can be made with the use of the Supervisor software, see Appendix E.*

The instrument operates as a real-time 1/1 octave band analyser (RTA). In addition, and if enabled, 1/1 octave analysis is performed in parallel with the dosimeter operations. All 1/1 octave digital passband filters (with 9 centre frequencies from 8 kHz down to 31.5 Hz; in the base two system) work in real time with the broadband frequency weighting filters (A, C or Z) and the linear LEQ detector. This allows the user to pre-weight a spectrum with one of the selected broadband frequency curves, if required for a particular application such as the provision of hearing protectors in the control of high workplace noise levels.

Note: *The three overall TOTAL LEQ results are measured with the weighting filters (A, C, Z) without taking into account the settings of the level meters for profiles. The spectra are always linearly averaged. Thus, the TOTAL values from 1/1 octave band analysis can be different from those obtained for the profiles (if the LEQ Integration was set as Exponential).*

The results of 1/1 octave analysis (so-called spectrum) can be examined by the user on a display in the **Spectrum** VIEW presentation mode. 1/1 octave spectra for all 9 centre frequencies of passband filters together with the 3 TOTAL overall values measured with the user selected frequency weighting filters are presented in the Spectrum mode, if enabled in the configuration setup. Spectrum cursor can be moved left and right with the and keys respectively.

With the Supervisor PC software or Assistant Pro mobile application, the user can select which spectrum (**LEQ**, **MAX** or both) will be available for view (Chapter 5.2.7).

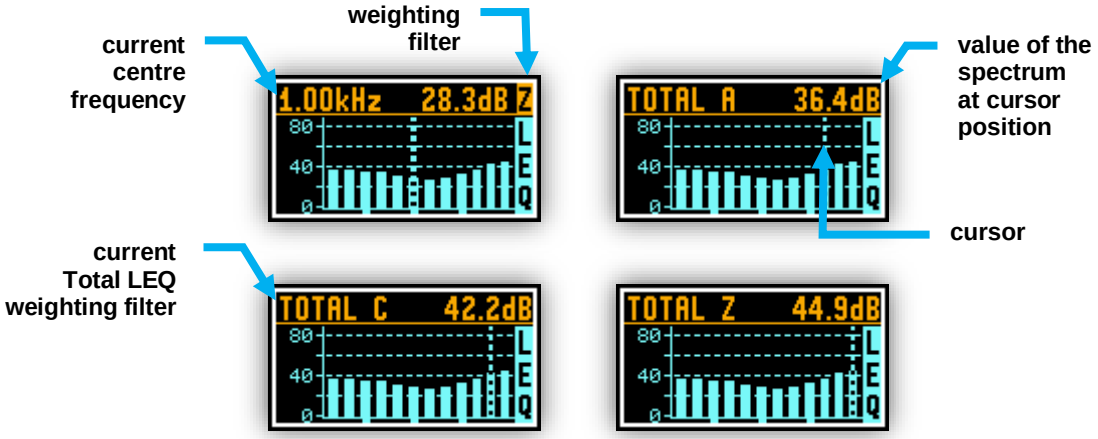


Figure 3-14 1/1 octave analysis LEQ spectrum graph view

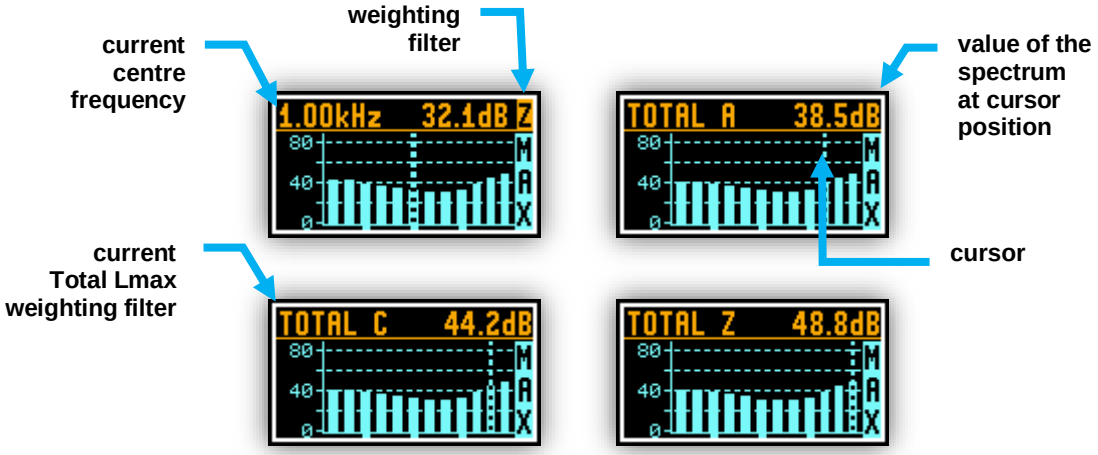


Figure 3-15 1/1 octave analysis MAX spectrum plot view

3.10.5 1/3 octave analysis spectrum view mode

Note: *The 1/3 octave analysis is switched on with the use of the Supervisor software – see Chapter 5.2.5.*

Note: *The 1/3 octave analysis is an optional function and should be activated before use. Activation of the optional functions can be made with the use of the Supervisor software – see Chapter 0.*

The instrument can also operate as a real time 1/3 octave band analyser (RTA). In addition, and if enabled, 1/3 octave analysis is performed in parallel with the dosimeter operations. All 1/3 octave digital passband filters (with 28 centre frequencies from 10 kHz down to 20 Hz; in base 10 system) are working in real-time with the broadband frequency weighting filters (Z, A or C) and the linear LEQ detector. This enables the user to pre-weight a spectrum with one of the selected broadband frequency curves if required for a particular application such as the provision of hearing protectors in the control of high workplace noise levels.

Note: *The three overall TOTAL LEQ results are measured with the weighting filters (A, C, Z) without taking into account the settings of the level meters for profiles. The spectra are always linearly averaged. Thus, the TOTAL values from 1/3 octave band analysis can be different from those obtained for the profiles (if the LEQ Integration was set as Exponential).*

The results of 1/3 octave analysis (so-called spectrum) can be examined by the user on a display in **Spectrum** VIEW presentation mode. 1/3 octave spectra for all 28 centre frequencies of passband filters together with the 3 TOTAL overall values measured with the user selected frequency weighting filters are presented in the Spectrum mode, if enabled in the configuration setup. Spectrum cursor can be moved left and right with the and keys respectively.

With the Supervisor PC software or Assistant Pro mobile application, the user can select which spectrum (**LEQ**, **MAX** or both) will be available for view (Chapter 5.2.7).

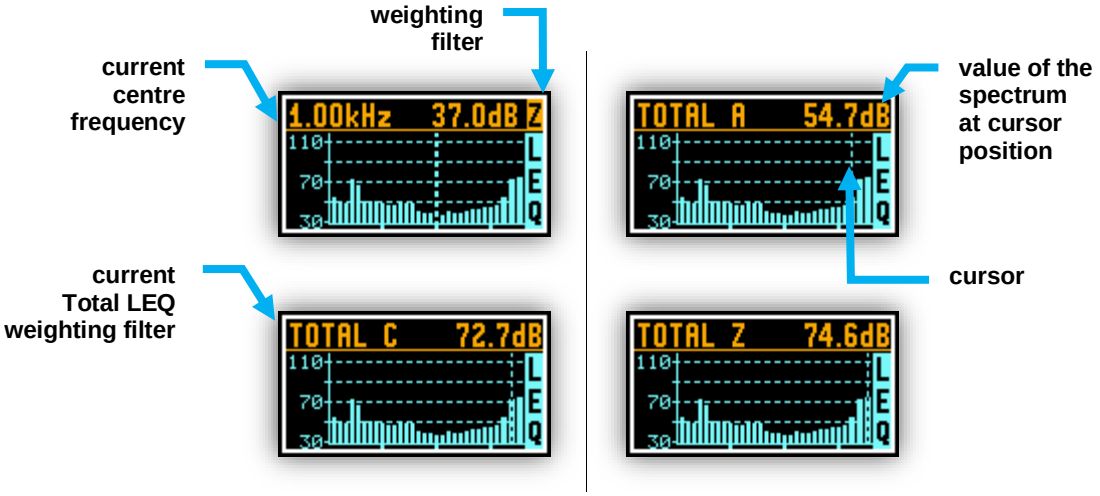


Figure 3-16 1/3 octave analysis LEQ spectrum plot view

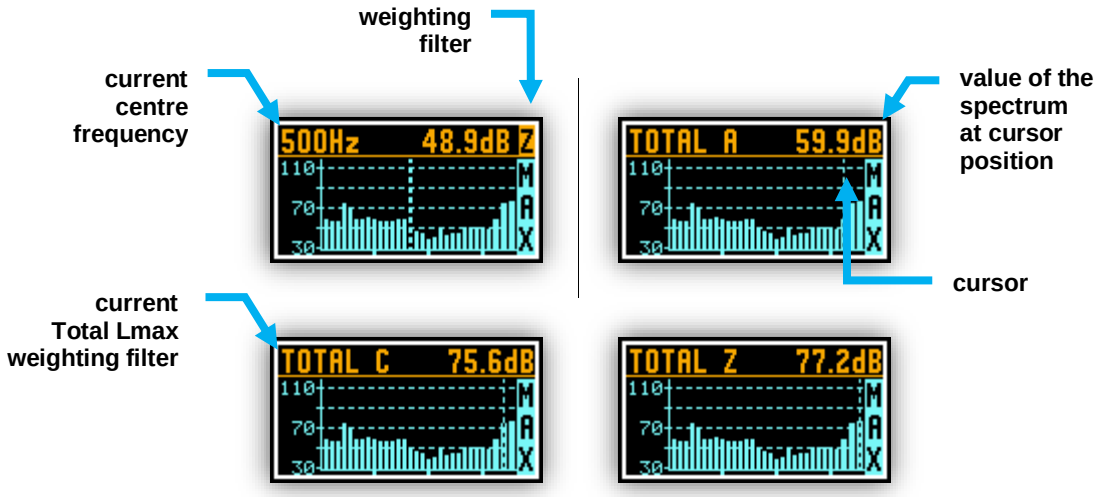


Figure 3-17 1/3 octave analysis MAX spectrum plot view

3.10.6 INSTRUMENT STATUS view mode and Bluetooth security PIN code

The Instrument Status view presents:

- the battery charge status (**Bat.Charge**) along with estimated working time which is left until the battery is expected to be completely drained (**Bat.Left**)
- current configuration information (**Setup**),
- Bluetooth status (**On** or **Off**) and PIN code,
- Timer status (**On** or **Off**) and time left to start.

The Instrument Status screen is moved down and up with the  and  keys respectively.

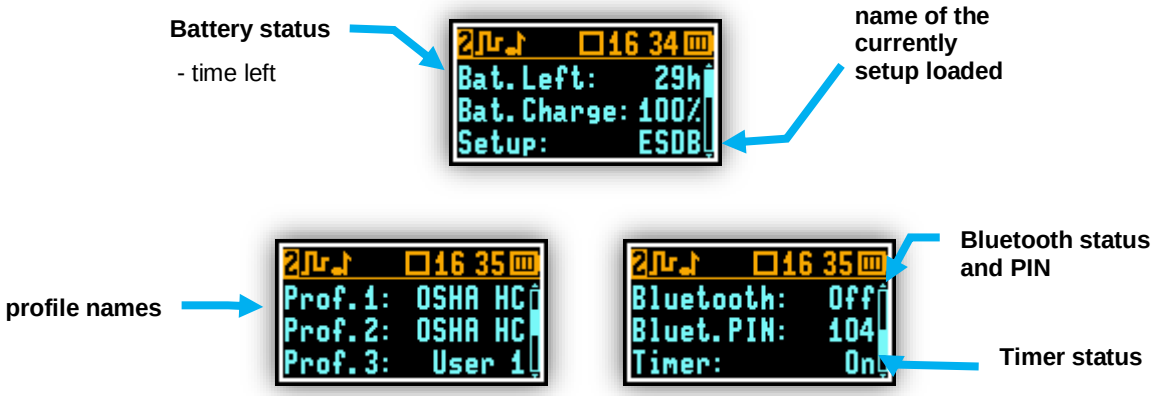


Figure 3-18 INSTRUMENT STATUS view mode screens

The Bluetooth security PIN allows the user to protect access to the instrument via Bluetooth® by the Assistant mobile application. The PIN is defined using the Supervisor PC software (Chapter 5.2.9.4).

When the **Timer** is **On**, there are additional items in the Status list with time left to start.

Figure 3-19 Timer information

3.11 ALARM SCREEN REVIEW

Apart from simple LED alarm indications (Chapter 3.6), there are a number of alarm conditions where ALARM view will appear. During a measurement run SV 104A will immediately switch on the display when the programmable alarm condition is exceeded. The detailed alarm state condition for each profile is presented to the user. Press any key to confirm the information.

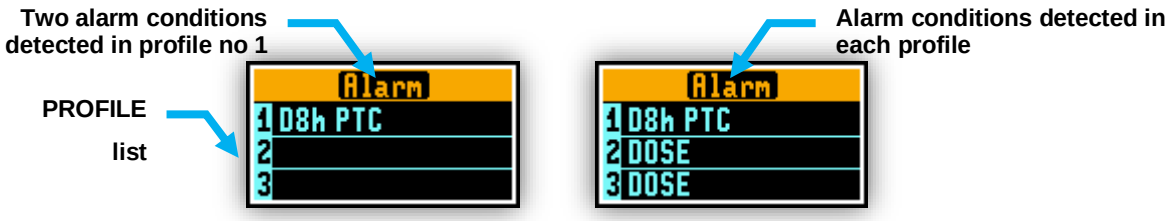


Figure 3-20 ALARM view screens

Note: *At any time when the battery is low, the "low battery" alarm screen may alert you to the need for immediate recharging.*

4 RUNNING AND OPERATING BASIC PROCEDURES

4.1 USB CHARGING

Note: *The battery inside SV 104A uses lithium-ion technology which requires special consideration and handling techniques due to the extremely high energy density (see "SPECIAL PRECAUTIONS WHEN USING AND CHARGING LITHIUM BATTERIES" clause on page 4). Ensure the SV 104A is fully charged prior to use by installing it(them) at the Dock Station.*

Note: *Charging is allowed only in safe area. See the SPECIAL PRECAUTIONS WHEN USING AND CHARGING LITHIUM BATTERIES clause on page 4.*

Note: *To charge a fully discharged battery, it would take approximately 8 hours.*

The SV 104A dosimeter can be charged directly from the computer's USB port or from the optional charger (SA 54 universal USB charger).

To charge SV 104A using the USB cable, connect it to the USB power source. SV 104A will automatically switch on the display during charging and show the amount of charge in the instrument. SV 104A will display 'Fully charged' when charging is complete. This should take approximately 2 hours from a fully discharged state. A charging time of approximately 30 minutes is sufficient for more than 8 hours of measurement.

Note that the dosimeter automatically turns off when it is removed from the dock station. When it is placed back on the dock station, the internal battery will be float charged. This will maintain the battery in a stable condition. If the battery is fully discharged before it is placed on a charger, it will trickle charge for a maximum of 1 hour before the fast charge cycle. This prevents damage to the batteries.

4.2 DOCK STATION CHARGING

SV 104A can be charged using a dock station for a single unit (1-bay dock station **SB 104B-1**) or for five units (5-bays dock station **SB 104B-5**).

Both dock stations are equipped with the USB type B connector and can be connected to a PC for data transfer using the **SC 16** cable. SB 104B-1 is also powered via the USB port, while SB 104B-5 is powered by the **SB 33** power supply (9V AC/DC).

Figure 4-1 1-bay and 5-bay dock station (SB 104B-1 and SB 104B-5)

To charge SV 104A, place it on the dock station charger and ensure that the power cable is connected. SV 104A will automatically switch on the display during charging and show the amount of charge in the instrument. SV 104A will display 'Charging completed' when charging is complete. This should take approximately 7 hours from a fully discharged state. A charging time of approximately 2 hours is sufficient for more than 10 hours of measurement. A fully charged instrument will hold enough charge to operate for approximately 45 hours.

Note that the dosimeter automatically turns off when it is removed from the dock station. When it is placed back on the dock station, the internal battery will be float charged. This will maintain the battery in a stable condition. If the battery is fully discharged before it is placed on a charger, it will trickle charge for a maximum of 1 hour before the fast charge cycle. This prevents damage to the batteries.

Dock stations have LEDs. The table below describes the LED status of the Dock station.

Charger LED status indication		Description
SB 104B-1	**OFF**	Dock station is not powered on
	GREEN	Dock station is powered on and fully operational
	RED	Dock station is powered on, but not fully operational
	RED flashing quickly, 2 times per second	Charging error – ambient air temperature limit exceeded
SB 104B-5 *LED on the top*	**OFF**	Dock station is not powered on
	GREEN	Dock station is powered on and fully operational
	RED	Dock station is powered on, but not fully operational
SB 104B-5 *LED on the side*	**RED flashing quickly,** 2 times per second	Charging error – ambient air temperature limit exceeded

Table 4-1 SB 104B-1 dock station LED indicator status description

When the dosimeter is in the dock station, its LED indicates the charging status.

LED status indication	Description
GREEN continuous	Dosimeter has charged
RED continuous	Dosimeter is charging
RED flashing quickly, 2 times per second	Charging error - temperature limits inside the dosimeter exceeded
Not lit	Not charging but has not been charged (communication is on) *In this case, the battery may be damaged or unusable because the charger IC in the dosimeter has a time limiter and will turn off the LED off if charging is impossible.*

Table 4-2 LED status description of the SV 104A when dosimeter is placed on the Dock station

***Note: To charge dosimeters using the SB 104B-5**, it is necessary to use 9V AC/DC power supply such as the **SB 33** to provide sufficient power. USB connection doesn't provide enough power to charge dosimeter(s) using SB 104B-5.*

4.3 BEFORE YOU TURN THE INSTRUMENT ON

There are only a few things to remember:

- Ensure that the microphone is properly attached to the mounting head before switching on the instrument.
- Always use the supplied **SA 122A** windscreen when measuring.

Note: *On new products there is a display shipping protection film which is used on new products being shipped to protect against accidental scratches. It is a ~25x15mm rectangle of film.*

Remove and discard the protective film

4.4 TURNING ON/OFF

TURNING ON: To switch on the instrument, the operator should keep the key pressed for a few seconds. The instrument will switch on and run a self-test routine (during which the manufacturer's logo, instrument name and firmware version will be displayed).

If the test is successful, the instrument will run through a short start-up sequence showing the currently loaded configuration setup and the names of all of three profiles, followed by a battery status screen. The instrument will then enter the stopped (ready to measure) mode and the running SPL mode if it has been enabled.

Note: *Warm up time - After switching on, the instrument should warm up for at least 30 seconds before taking a measurement.*

Note: *If you leave the instrument in Stop (Ready to measure) mode, the display will turn off after 30 seconds and the instrument will turn off after approximately 5 minutes of inactivity to conserve the batteries.*

Note: *The instrument will display a warning screen when the battery capacity is less than 2 hours of potential measurement time.*

TURNING OFF: To turn off the instrument, the operator should keep the key pressed for a few seconds, during which a countdown is displayed ("Shutting down" 3… 2… 1…). In this way, the instrument gives you time to decide if you really want to switch it off. If the key is released too early, the instrument will return to the last **VIEW** mode displayed.

If enabled in the configuration setup, an additional double check, warning screen may be displayed. This is so that the operator is aware and sure that the instrument is to be switched off. See figure below:

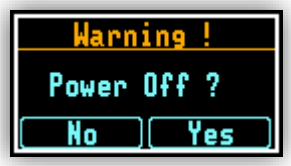


Figure 4-2 Power-off warning screen

Note: *SV 104A will automatically shut down after 5 minutes in stopped mode.*

Note: *If the **auto-run** (timer) mode is active, SV 104A will automatically stop measuring when the set time has elapsed and then switch off. If the **auto-run** mode is not used and no specific time has been set, the instrument will continue to measure until the battery is exhausted. Just before switching off, the measurement run will be stopped and all data up to that point will be safely stored for later download to a PC.*

4.5 BATTERY CHECK

Observe the battery icon in the instrument's icon status bar or press the key until the Instrument Status view mode is displayed and check the battery level. If it is low, recharge the batteries.

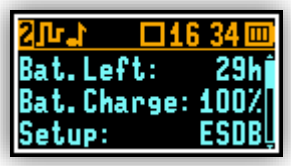


Figure 4-3 Instrument Status - battery status

The Instrument Status screen is scrolled up and down using the and keys.

Press to switch to the next VIEW mode.

Note: *The calculation of the battery level is based on an internal charge counter and should only be considered as a rough estimate. The remaining time may therefore vary considerably. Although the latest technology cells are used, some degradation over time is inevitable and ageing will require occasional replacement of the battery cells by the factory (or authorised service centre).*

Note: *Battery life indicator - To improve the accuracy of the remaining battery life indicator, operate the dosimeter until it is fully discharged, then proceed with a full charge via the docking station. This procedure is recommended before first use. Repeat this procedure after every few months of use to maintain a more accurate indication of battery life.*

4.6 REVIEWING UNIT LABEL

The **Unit label** screen provides information on basic dosimeter properties, such as:

- Copyrighted manufacturer name: **SVANTEK (C)**
- Instrument name: **SV 104A**
- Unit serial number: **SN XXXXX**
- ST 104A microphone serial number: **SN ST104A XXXXX**
- Unit name: **XXXXXXX** *[user programmable name]*
- Firmware version: **Version X.XX.X**
- File system version: **FS Version X.XX**
- CRC value: **CRC(OK) XXXX**
- List of standards, that the dosimeter conforms to

To access the **Unit Label** screen, briefly press the ▼, ▶ and ↵ keys simultaneously.

The following screen will be displayed:

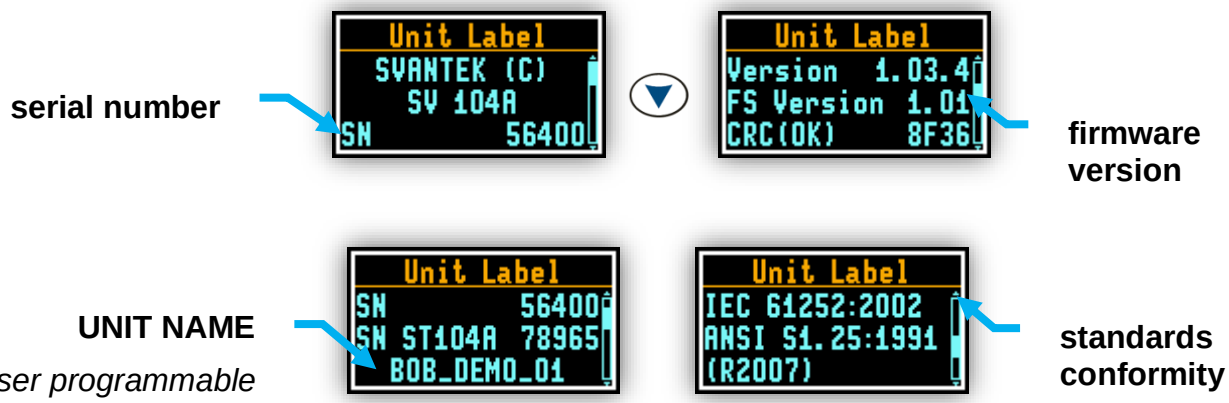


Figure 4-4 Unit Label screens

Use the ▼ or ▶ keys to scroll through the **Unit Label** screen.

To exit the Unit Label screen, press the ↵ key briefly. The instrument will then return to the last **VIEW** mode displayed.

Note: *The personalised **Unit Name** can be set to any name using the Supervisor software.*

4.7 MEASUREMENT SETUP - BASIC CONFIGURATION

Press two keys and simultaneously. The **Load Setup** menu appears with the list of loaded configuration setups for selection.

Figure 4-5 Load setup menu

To cancel the setup selection, press and simultaneously again. Otherwise, select the desired configuration setup with the key scrolling through the list with the or key.

The following screen will appear, allowing you to confirm that you really want to load the selected setup, or to cancel the selection and return to the list of configuration setups.

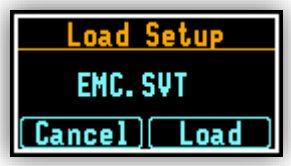


Figure 4-6 Load setup confirmation

Press the key to cancel the loading of the setup, or the key to confirm the loading of the selected setup configuration. Confirming the loading of the configuration setup will take you to the loading status screen:

Figure 4-7 Status of setup loading

Once the setup has been loaded successfully, it is possible to return to the list of predefined setups by pressing the key or to proceed to the measurement screen by pressing the key.

Note: *A detailed description of how to upload setup files to the instrument can be found in Chapter 7.6 of this manual.*

4.8 CALIBRATION

The SV 104A dosimeter is offered with the dedicated **ST 104A** MEMS microphone in a ½" housing. The instrument is factory calibrated with the supplied microphone for standard ambient conditions. As the microphone sensitivity is a function of the temperature, ambient pressure and humidity, the absolute calibration of the measurement channel should be performed locally.

Svantek offers the **SV 34B** sound calibrator 114dB@1000Hz for the SV 104A instruments.

The instrument has an automatic calibration function that can be enabled or disabled using the Supervisor software (see Chapter 5.2.9.1) or the Assistant Pro mobile application (see 6.2.7). One of the important instrument settings is the sound pressure level generated by the calibrator. By default, the automatic calibration is enabled, and the calibrator signal level is set to 114 dB.

If automatic calibration is enabled, the instrument will automatically perform calibration when the calibrator is placed over the microphone (remove the windscreen first!). The calibrator level is automatically detected, and the calibration procedure is started.

The user only needs to press the key to confirm the calibration results. Calibration is only allowed in stopped mode. No sound measurement can take place during calibration.

Note: *During the calibration measurement, the instrument automatically changes the setting to filter C, switches Microphone compensation on and switches Free Field compensation off (see Chapter 4.16). When the calibration measurement is completed, the previous settings are restored.*

Note: *It is recommended that the instrument is acoustically calibrated before and after each measurement run. A single calibration at the start of each day of use is usually sufficient for most regulations.*

Note: *The calibration factor is always added to the results in the Dosimeter or 1/1 octave or 1/3 octave analysis modes.*

Note: *The manufacturer's recommended factory calibration interval is every 12 months to ensure continued accuracy and compliance with the international specifications. Please contact your local SVANTEK representative for further details.*

To calibrate the instrument manually, the user must enter the **Calibration** menu.

1. Use the and keys to set the calibration **Level** of the calibrator to be used which is specified in the calibration certificate of the calibrator (the default expected value of the calibration level set by the manufacturer is equal to 114 dB).

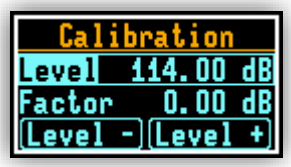


Figure 4-8 Calibration menu

2. Place the **SV 34B** sound calibrator (or equivalent 114dB@1000Hz) carefully but firmly over the microphone of the instrument.

Note: *It is also possible to use an electromechanical pistonphone that generates the signal (ca 124 dB), or another type of acoustic calibrator designed for ½" microphones with an alternative output level, such as 94 dB @ 1 kHz.*

3. Switch on the calibrator and wait about 30 seconds for the tone to stabilise before starting the calibration measurement.
4. Start the calibration measurement by pressing the key.
5. The calibration measurement time is set to 1 second with 3 second delay. Calibration stops when either 5 consecutive results do not differ from each other by more than 0.02 dB or 10 consecutive results do not differ from each other by more than 0.05 dB. It is possible to stop the calibration measurement by pressing the and keys simultaneously.

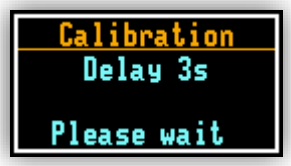


Figure 4-9 Calibration - initial delay screen

6. The delay before the start of the calibration measurement is counted down on the display. After the measurement, the result is sown on the display.

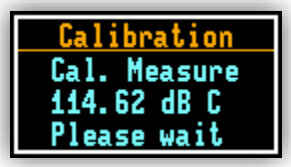


Figure 4-10 Calibration in progress screen

Note: *To exit the calibration procedure without saving the calibration factor, press the and keys simultaneously.*

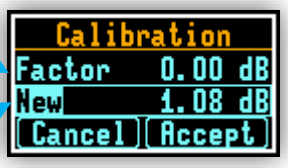
7. It is recommended to repeat the calibration measurement several times. The results obtained should be almost the same (with a difference of ±0.1 dB). The reasons for the unstable results are as follows:
   - the calibrator is not properly attached to the instrument
   - there are external acoustic disturbances such as high noise levels in the vicinity
   - the calibrator or the measurement channel (e.g. microphone) is damaged.

Note: *During the calibration measurement, the external disturbances (noise or vibration) should not exceed 100 dB (using a calibrator that produces a level of 114 dB).*

8. Press to accept the measurement result.

previous

new calibration factor



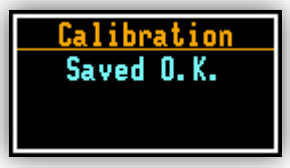


Figure 4-11 Calibration confirmation screen

Note: *If a calibration factor does not meet the tolerance criteria of ±2 dB, you can still accept the microphone manually, but the results may be affected (see Figure 4-12).*

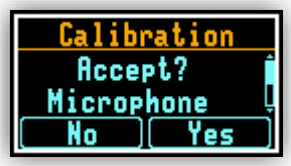


Figure 4-12 Calibration - microphone not in tolerance screen

9. Post calibration. If enabled (using Supervisor or Assistant Pro), the post-processing is performed automatically after the calibration measurement has been accepted. SV 104A automatically adds the results to the previously stored files. Before saving the calibration factor, the text "**Post Calibration**" is displayed.

4.9 VOICE COMMENTS RECORDING

To record a comment, the user should press the key for a few seconds during which a countdown ("Voice comment" 3… 2… 1…) is displayed. The SV 104A gives you time to decide if you really want to record a voice comment. If you release the key too early, SV 104A will return to the last used VIEW mode.

When entering the voice comment recording, a screen will normally appear asking which logger file the voice comment should be linked to - the previous or to the next. NOTE: This screen will be skipped if there are no previous logger files or if the unit has just been switched on.

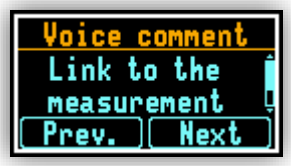


Figure 4-13 Voice comment linking screen

After selecting an answer by pressing or , the record command screen will open.

Figure 4-14 Voice comment recording command screen

When recording is started with the key, a blinking circle appears on the screen to indicate that recording is in progress.

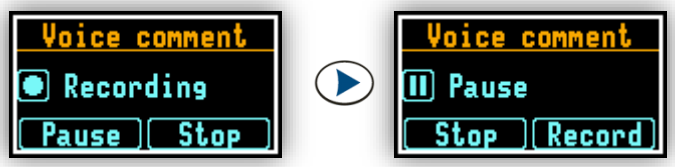


Figure 4-15 Voice comment recording in progress screens

You can also continue to record a comment on the measurement and press the key to end the recording. The end of the recording is confirmed with the on-screen comment "Saved O.K.".

Figure 4-16 Voice comment record confirmation screen

Note: *The voice comment can be recorded before or after the measurement run and can be linked to the previous or the next measurement run. Note that it is not possible to link to the previous measurement if the unit is switched off and on again or if there are no previous logger files. In this case, the recording screen will be displayed (with the comment linked to the next logger file by default).*

4.10 BEFORE AND AFTER MEASUREMENT RUN

Before starting a measurement, ensure that:

1 the instrument is switched on (Chapter 4.4)
2 there is sufficient battery life and free memory by checking the status screen (Chapter 3.10.6)
3 the required configuration setup is selected (Chapter 4.7)
4 SV 104A is calibrated because it affects the results (Chapter 4.8)
5 the windscreen is fitted, as it protects the microphone from the industrial environments such as dust and moisture or from the effects of shocks (Chapter 3.3).

After stopping the measurement run, check that:

1 the calibration is still valid (Chapter 4.8)
2 the data are correctly downloaded to the PC for further analysis (Chapter 4.17)
3 the instrument is switched off (Chapter 4.4).

4.11 START AND STOP THE MEASUREMENTS

START:

To start the measurement, the user must press the and keys simultaneously. The results of the measurement are displayed in the view mode last used. The ONE RESULT view mode is shown as an example. The ONE RESULT view mode is always available for most functions of the instrument. Measurement results can also be displayed in other view modes, which can be enabled or disabled to suit the user's needs.

Figure 4-17 ONE RESULT mode view

STOP:

The same keys combination and allows the user to stop the measurement run. All the results are always saved automatically, there is no need to save them manually.

Note: *The instrument can be started or stopped remotely via the Bluetooth® interface using the mobile applications (see Chapter 6).*

4.12 AUTO-RUN MODE INFORMATION

Note that when the auto-run mode (timer and/or pause) is configured, information available to the user on the display. There is no need to switch on the instrument manually. All timer procedures can be easily pre-programmed using the Supervisor PC software or the Assistant Pro mobile application.

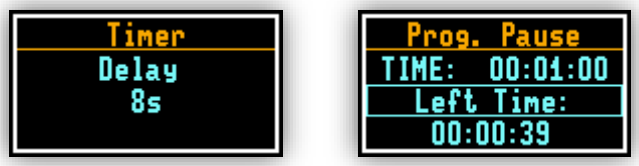


Figure 4-18 Auto-run mode – timer and programmable pause screen

4.13 SECURITY LOCK

The purpose of locking the keypad and display during a measurement is to prevent the wearer or anyone else from tampering with the measurement. The SV 104A can be set to automatically enter the locked mode when it is started (Chapter 5.2.9.3). This automatically prevents tampering, but the unit can still be unlocked, if necessary, by pressing the correct sequence of keys.

Locking SV 104A: To lock the instrument, the operator must keep the key pressed for a few seconds, during which a countdown (“Keyboard lock” 3… 2… 1…) is displayed, giving you time to decide if you really want to activate the security lock. If you release the key too early, SV 104A will return to the last VIEW mode displayed.

Unlocking SV 104A: To unlock the instrument, the operator must press the keys in the correct sequence. The sequence is pre-programmed in the configuration setup (Chapter 5.2.9.3).

Figure 4-19 Unlocking the unit sequence screens

Note: *The instrument is automatically unlocked when placed on the dock station.*

4.14 REVIEWING MEASUREMENTS

Most parameters can be viewed in real time either during a measurement or when the instrument is stopped. If the display screen is switched off, simply press any key (but see note below).

The keys on the instrument keypad allow you to navigate through most of the parameters. For specific information on the **VIEW** modes, see Chapter 3.10.

- Use the key to scroll the list of different measurement results.
- Use the key to change the ACOUSTIC PROFILE you wish to view.
- Use the key to change the VIEW mode.

Note: *In most cases the keypad is likely to be locked. To access the results and unlock the keypad, see Chapter 4.13.*

Note: *After reviewing the results, remember to lock the keypad again to maintain the integrity of the measurement run by preventing uncontrolled access to the instrument.*

4.15 CONTROLLING THE INSTRUMENT VIA BLUETOOTH®

Long-range Bluetooth® Low Energy wireless connectivity and the supporting **Assistant** mobile application allow you to remotely control and monitor the status of the instrument, such as battery usage, memory capacity and measurement progress and results without disturbing the worker. You can be assured that confidence in the measurement minimises the likelihood of having to repeat an examination due to potentially corrupted data, maximising your performance. For more detailed description of the remote control, see Chapter 6.

The Bluetooth connection between the instrument and the Assistant mobile application can be established after the PIN code has been set. The PIN code is set using the Supervisor PC software (see Chapter 5.2.9.4) or the Assistant Pro mobile application (see Chapter 6.2).

By pressing the and keys simultaneously twice, the user can access the **Bluetooth** menu. Pressing the key allows the user to turn Bluetooth® on or off. Press and **Accept** to confirm the selection.

Figure 4-20 Switching the Bluetooth® on

***Note: Bluetooth**® is disabled by default. For air transport, **Bluetooth**® **should be disabled**. Make sure that the correct settings file is applied or switch it off manually (see Chapter 3.8.3).*

4.16 SWITCHING OFF MICROPHONE COMPENSATION

The ST 104A microphone is digitally compensated. In addition, the free filed and SA 122A windscreen effects are compensated by the Free Field compensation filter. Both compensations are active by default.

For laboratory approval testis or calibration measurements it is necessary to disable one or both compensation filters (see Appendix C).

To access the **Microphone** menu, press and hold for 3 seconds the ▼ and ↵ keys simultaneously.

To switch the compensation on or off, press the ▶ key. Press ↵ and **Accept** to confirm the selection.

Figure 4-21 Disabling the Free Field filter

4.17 DATA DOWNLOAD AND UPLOAD

Data can be downloaded and uploaded using the Assistant Pro mobile application (see Chapter 6.2.6) or the Supervisor PC software (see Chapter 0). In the latter case, it can be done directly via the SC 156 USB cable or by using dock stations.

The dock stations exchange data with a PC using the USB protocol.

Both dock stations have a USB-B connector and require the **SC 16** cable.

Figure 4-22 USB connections of the SB 104B-1 and SB 104B-5 dock station

If data transfer fails, the dock stations should be reset. To reset the dock station, disconnect all cables from the dock station to remove power.

4.18 RESETTING THE DOSIMETER

- **FACTORY SETTINGS:** clears any setup configuration and restores the factory default settings. You can reset the factory settings using the **Send 'clear setup' command** by right-clicking on the instrument row in the Supervisor's Inventory panel (Chapter 0) or using the Assistant Pro application (Chapter 6.2.8).
- **HARDWARE RESET:** internal hardware reset; the setup configuration is not changed. Press and hold the  key for about 30 seconds, then release. If the instrument was switched on, the screen will turn off after about 20 seconds. Switch on the instrument in the usual way (Chapter 4.4).

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

- stops any pre-programmed auto-run modes
- stops measurement run
- works even if the keyboard is locked!

5 SUPERVISOR PC SOFTWARE

This chapter explains how to download data and configure dosimeter settings as well as analyse data and generate reports using the **Supervisor** software.

Supervisor can be used in two modes - *Advanced* or *Lite*. *Supervisor Lite* is recommended for health and safety professionals who are just starting work with the software. This manual provides an overview of the basic features of the Lite option. Both options are widely described in detail in the Supervisor User Manual.

5.1 INSTALLING AND CONNECTING TO PC

Download the **Supervisor** installation file to your PC and run the installer. The USB drivers are included in the installation file, and you do not need to download them yourself from the website.

After installation, you are ready to connect the dosimeter.

- Connect your SV 104A to the computer using the dock station.
- Turn on the dosimeter − long press the key.
- Run the *Supervisor* software and select its mode – *Advanced* or *Lite*.

Figure 5-1 Choosing the Supervisor mode

When Supervisor is running, you can switch between modes by clicking on the Svantek icon and selecting **Run as Supervisor Advanced** or **Run as Supervisor Lite** from the menu.

Note: *This user manual describes the basic features of the* ***Supervisor Lite*** *mode and the main operations with the SV 104A instruments, such as: instrument configuration, data download and report generation. For a full description of the Supervisor software, please refer to the Supervisor User Manual.*

Note: *This*
important
and report
Manual.

5.2 SUPERVISOR MAIN WINDOW

The **Supervisor** main window is divided into a number of panels. Panels expose areas of interest to professional users and satisfy the user's need to find, configure, download, review and evaluate stored data in a very simple but professional way.

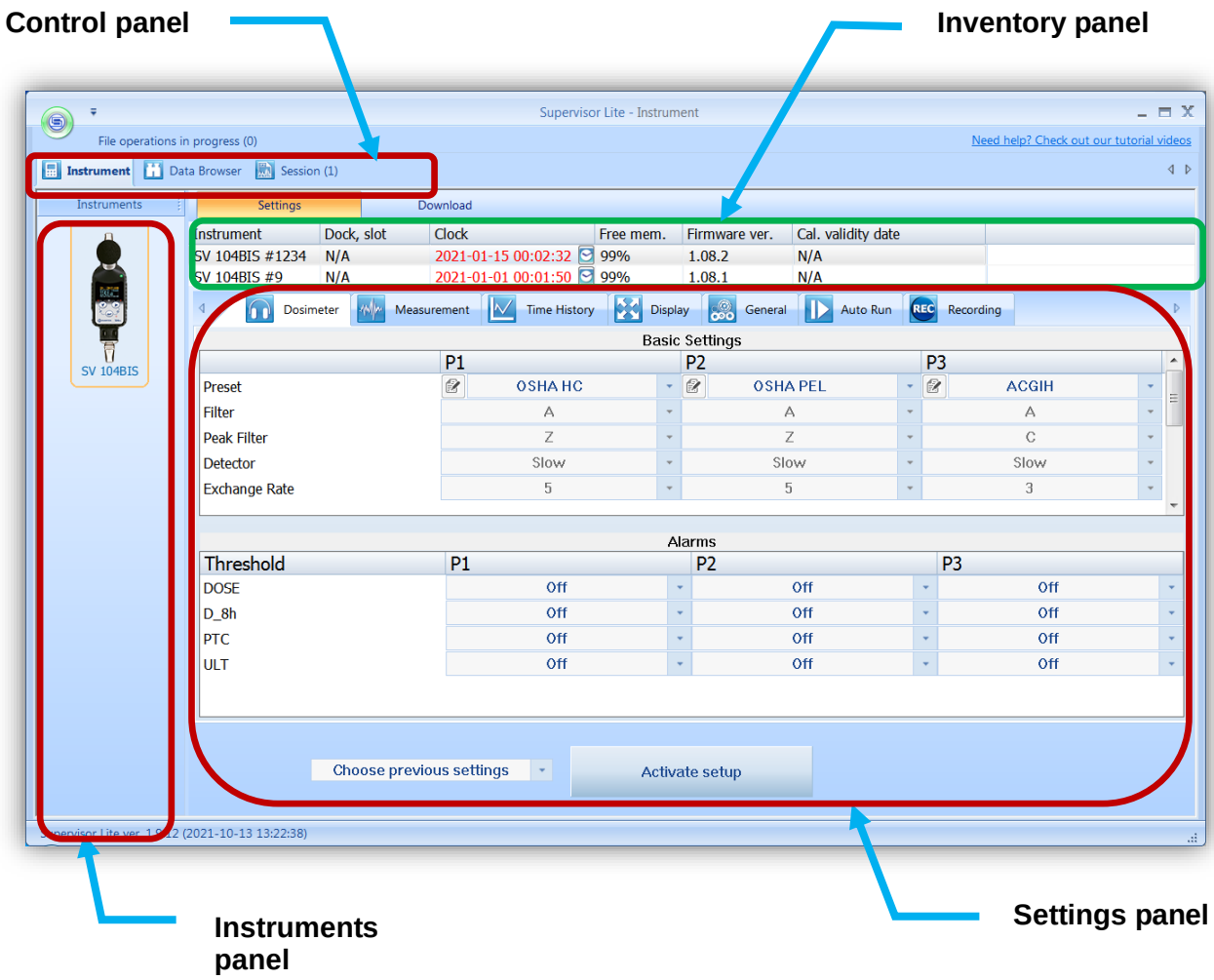


Figure 5-2 Supervisor main window

When a connected Svantek instrument is detected by Supervisor, it is added to the *Instruments* panel. The currently selected instrument is shown in the orange frame. The instrument information is displayed in the Inventory panel.

The *Settings* and *Download* tabs refer to the selected instrument type. When you click on the instrument in the *Instruments* panel, the program automatically downloads the setup file from this instrument and displays its settings in the *Settings* panel. At the same time, the program downloads the list of instrument files and displays them it in the *Download* panel.

If you have more than one instrument of the same type, the Inventory panel will be extended to display the credentials of all these instruments. The *Settings* panel displays the setup of the first connected instrument, and the *Download* panel displays the file list of all connected instruments.

- *Instrument* – the instrument type and number.
- *Name* – the name of the instrument.
- *Clock* – the date and time set in the real-time clock of the Svantek instrument; you can adjust it to the PC's date and time by pressing the button. You can also right-click on the row corresponding to the selected instrument to open a context menu that allows you to set the date and time manually.

- *Free memory* – the percentage of free space on the instrument's memory. This option is only available for selected types of Svantek instruments.
- *Firmware version* – the version number of the firmware installed on the instrument.
- *Last setup upload date* – the date and time when the last setup file was uploaded from Supervisor to the Svantek instrument.
- *Last uploaded setup name* – the name of the last setup file uploaded from Supervisor to the Svantek instrument.
- *Last setup activation date* – the date and time when the last setup file was activated (applied) in the Svantek instrument using Supervisor.
- *Last activated setup name* – the name of the last setup file activated (applied) in the Svantek instrument using Supervisor.
- *Last manual calibration* – the date of the last manual calibration.
- *Instrument calibration certificate* – the title of the calibration certificate.
- *Calibration validity date* – the validity date of the calibration certificate.
- *Calibrator Serial Number* – serial number of the calibrator.
- *Instrument Calibration Report* and *Calibrator Calibration Report* – documents available for download.

You can customise the Inventory table by right-clicking on it and selecting or deselecting items from the pop-up menu.

The calibration validity date in the Inventory panel is coloured according to the time remaining until the validity period is exceeded. By default, the colours have the following meanings:

- Black means there is at least 90 days remaining.
- Yellow means there are at least 14 but less than 90 days remaining.
- Orange means there are less than 14 days remaining.
- Red means that the calibration expiry date has already passed.

Figure 5-3 Calibration validity date is coloured according to the proximity of the expiration date

In the case of the SV 104 instruments connected to a PC via the SB 104B-5 dock station, an additional column is displayed showing the serial number (number after #) of the dock station and the number of the slot occupied by each SV 104 instrument, as shown in the figure below.

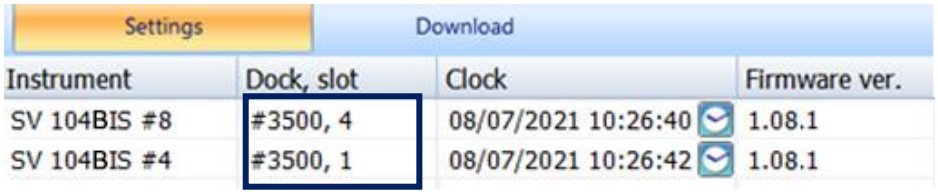


Figure 5-4 Inventory panel view in case of SV 104A instruments connected via the SB 104B-5 dock station

The Inventory panel gives you more possibilities to manage the selected instrument, such as Refresh Catalogue, Set Clock, Edit name, etc., by right-clicking on the instrument's row.

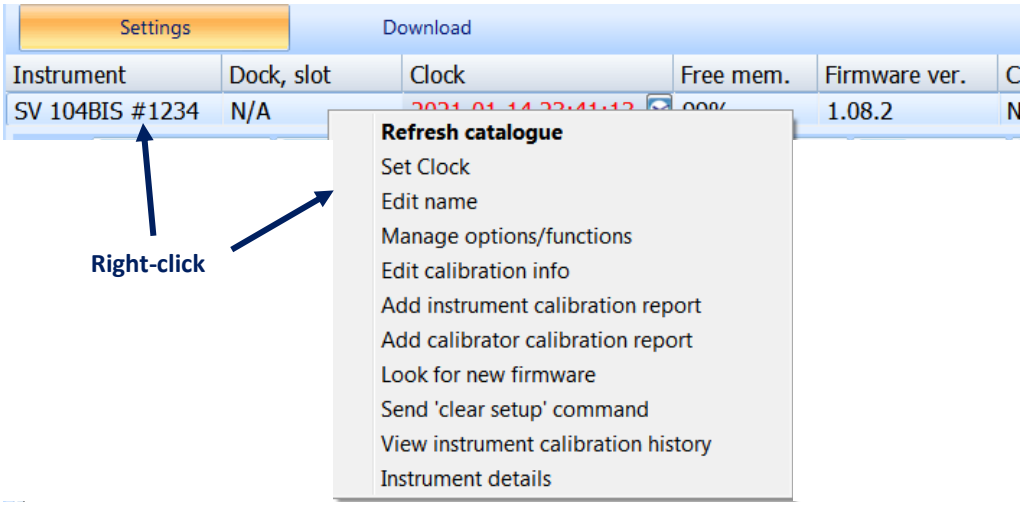


Figure 5-5 Inventory panel and its capabilities

The instrument's name can be specified using the *Edit name* command.

5.1 UNLOCKING OPTIONAL FUNCTIONS

To unlock additional options or measurement functions of the SV 104BIS instrument that are available for purchase, use the *Manage options/functions* command in the instrument's context menu. When you click on this command, Supervisor downloads a list of available functionalities from the connected instrument and displays it in the form of two lists: one for options and one for measurement functions.

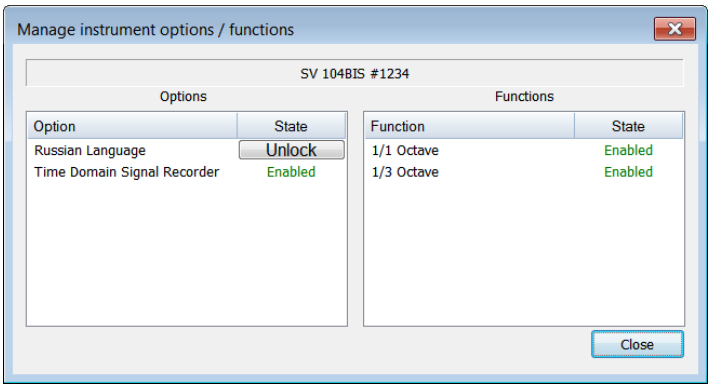


Figure 5-6 Manage instrument options / functions dialog box

The *State* column to the right of each option/function contains the 'Enabled' label for unlocked options/ functions and the 'Unlock' button for those that have not yet been unlocked. To unlock a purchased option or function, press the 'Unlock' button and enter the unlock code in the window that appears.

Note: If an incorrect code is entered three times since the last time the instrument was turned on, any subsequent attempt to lock or unlock an option will fail (whether the code entered is correct or not) until the instrument is restarted.

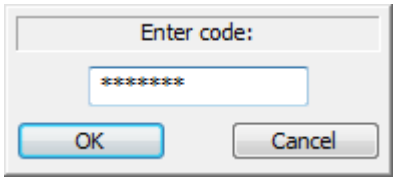


Figure 5-7 Entering code for unlocking an additional option or measurement function

You can also lock again an unlocked option/function by right-clicking on its name, selecting 'Lock' and entering the same code that was used to unlock it.

To search the Internet for the latest firmware for your instrument, right-click on the instrument's line in the Inventory table and select the *Look for new firmware* command from the context menu.

5.2 EDITING THE INSTRUMENT SETTINGS

The *Settings* tool of Supervisor allows you to change the instrument's settings and activate them on the connected instruments of the same type, using a clear graphical interface. To use the *Settings* tool, open the *Settings* tab in the *Instrument* window.

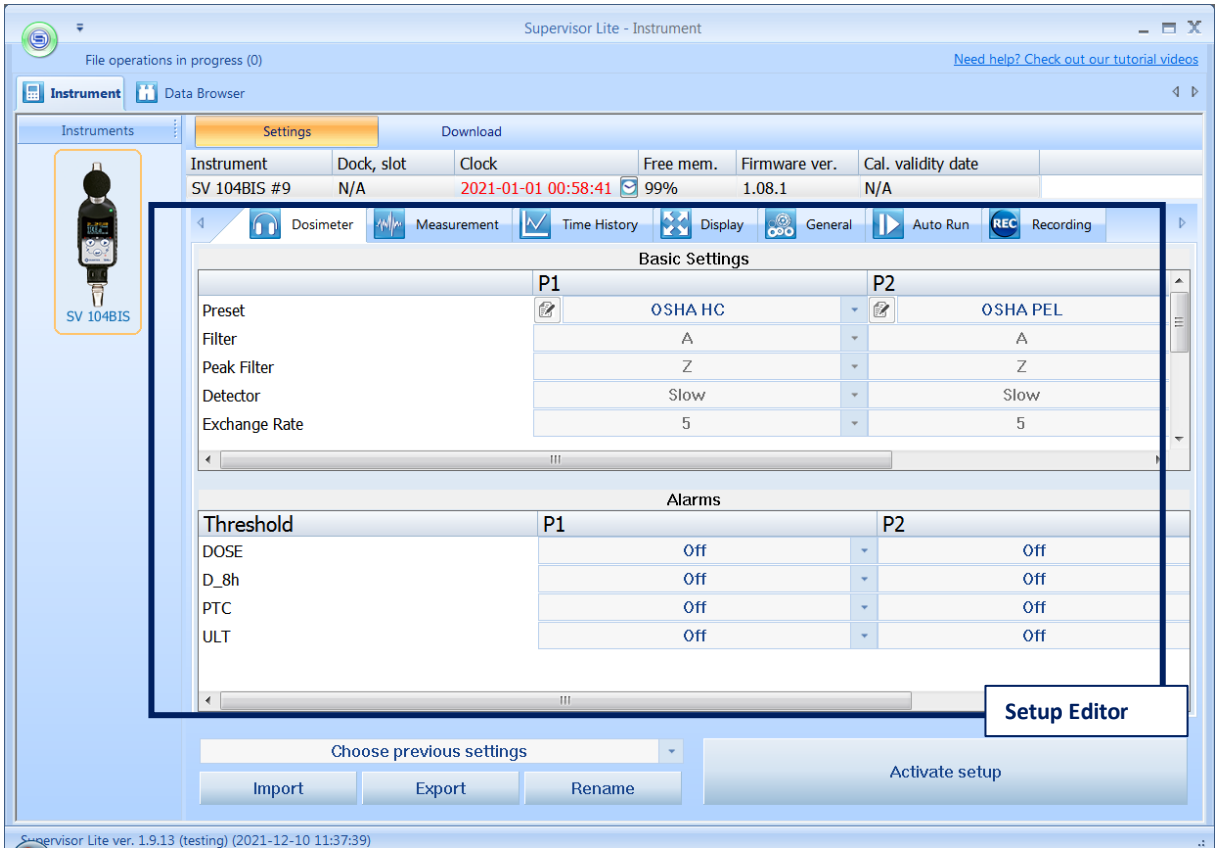


Figure 5-8 Using Supervisor to edit Svantek instruments' settings

When you click on the instrument in the *Instruments* panel, the program automatically downloads the setup file of this instrument and displays its settings in the *Settings* panel.

The buttons below the Setup Editor allow you to:

- select up to ten previous settings that were last used with this type of instrument,
- *Import* a setup file from a PC catalogue,
- *Export* the current settings as a setup file to a PC catalogue,
- *Rename* previous settings.

5.2.1 Editing settings

The settings are divided into several categories, such as *General*, *Measurement*, *Spectrum,* etc. They can be accessed via the tabs located in the bar at the top of the Setup Editor panel. The availability of certain categories depends on the type of instrument with which the edited setup file is compatible. If there are too many categories to display all the tabs at once, you can use the and buttons to scroll the bar.

Settings can be easily edited using the following elements of the Setup Editor graphical interface:

- checkboxes – allowing you to select some of several options,
- list boxes – allowing you to select one of several options,
- text fields – allowing you to specify a text value (e.g., a file name),
- binary buttons – allowing you to enable or disable an option.

5.2.2 Applying settings

Changes made to setup files using the Setup editor are not automatically applied. To apply settings, press the *Activate setup* button.

After the settings have been changed, the *Activate setup* button changes colour.

If you have changed the settings for an instrument type but haven't activated them, the program will warn you before exiting the Setup editor.

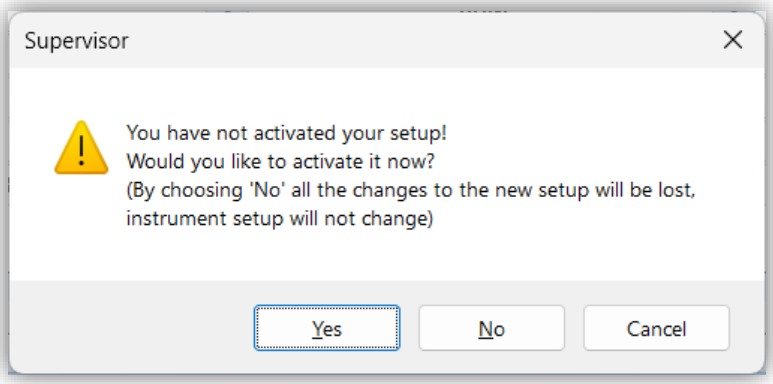


Figure 5-9 Warning that the setup was not activated

If you want to reinstall previous settings, press the *Choose previous settings* button and select the date of the previous settings.

5.2.3 Using presets

The dosimetry profiles (available in the *Dosimeter* category of settings in the Setup editor) can be configured using so-called “presets”. A preset is a set of values for parameters related to the dosimetry profile, such as filter or detector. There are two types of presets: predefined and user-defined. The six predefined presets are provided by Supervisor and comply with the following health and safety standards:

- OSHA HC – Occupational Safety and Health Administration Hearing Conservation,
- OSHA PEL – Occupational Safety and Health Administration Permissible Exposure Level,
- MSHA HC – Mine Safety and Health Administration Hearing Conservation,
- MSHA PEL – Mine Safety and Health Administration Permissible Exposure Level,
- ACGIH – American Conference of Governmental Industrial Hygienists,
- Nordic – standards specific to the Nordic countries.

In addition to these predefined presets, you can create up to three user-defined presets consisting of custom parameter values.

Different presets can be selected for each profile independently. To configure one of the profiles according to a preset, use the *Preset* list box. The first preset in the list, marked as *[Current]*, represents the profile configuration currently stored in the edited setup file. It is provided so that you can reset the changes made in the Setup editor by selecting it. If you make any changes to the *Current* preset, its name will be cleared (the currently selected preset will be named *None*).

When you select one of the predefined presets, the elements of the interface associated with the parameters whose values are specified by the preset are disabled. To change the values of these parameters, you must select the current preset or a user-defined preset.

Note: Presets do not specify the values of all the parameters; the parameters that can still be modified after selecting a predefined preset are not part of the presets. These parameters are separated from those belonging to presets by a blank line.

You can create a user-defined preset by selecting one of the last three presets in the list and configuring the profile as you want it to be stored in the preset. The changes are automatically remembered by Supervisor.

You can change the name of the preset using the  button.

Note: The three user-defined presets only correspond to the currently selected type of Svantek instrument. There are three different presets stored for each type of instrument.

5.2.4 Profile settings

The **Dosimeter** tab contains the main settings where specific acoustic profile configurations can be set. Each profile column has predefined settings. By selecting a predefined configuration, some obvious fields are automatically greyed out. Others must be set by the user.

There are three additional user-defined presets whose names can be changed during configuration by clicking on the small pencil icon to activate them.

In addition to the DOSE alarm threshold, there are three other sources of warning alarms that can be set, see figure below.

Note: Some profiles can be disabled to view them later during the measurement run (Chapter 5.2.7).

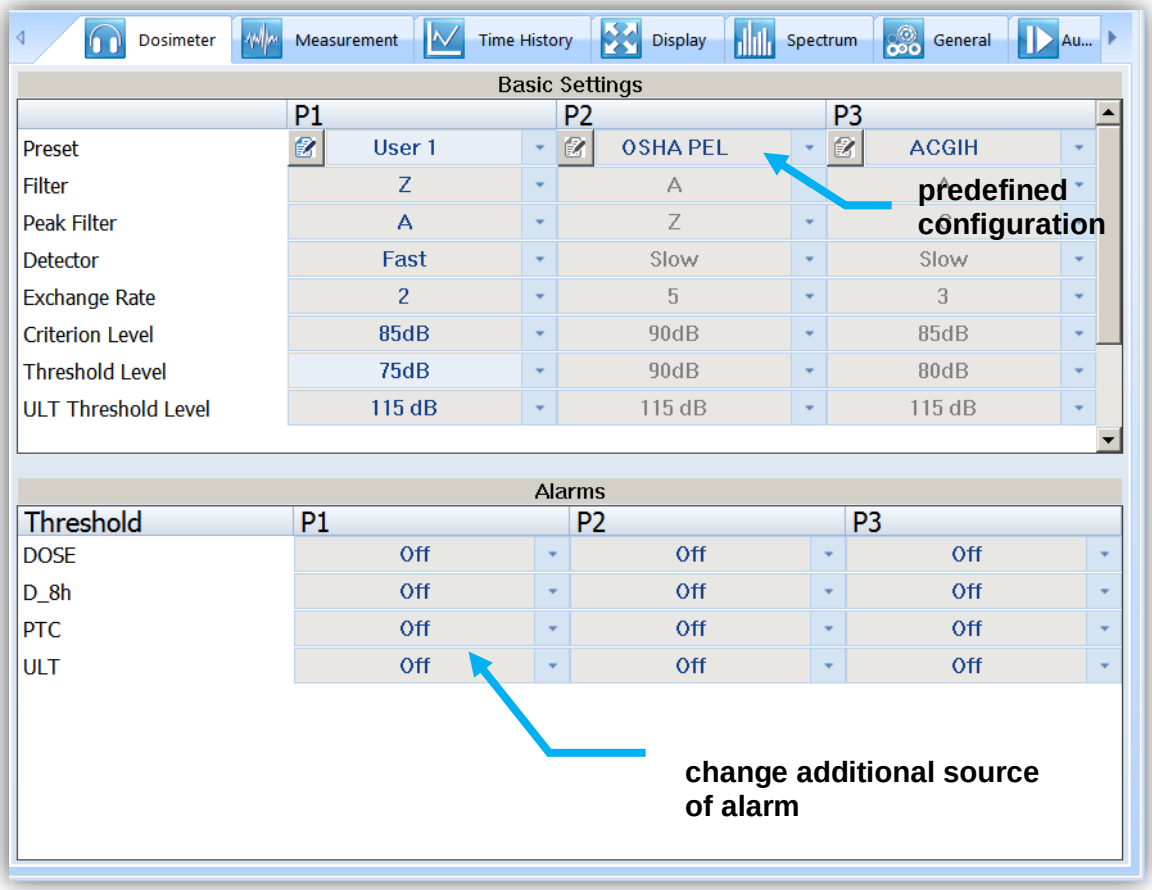


Figure 5-10 Dosimeter settings - profile configuration tab

5.2.5 Measurement parameters settings

In the **Measurement** tab, you can select the mode in which the SV 104A should operate: Dosimeter, or Dosimeter with 1/1 octave or 1/3 octave analysis.

Note: *Enabling 1/1 octave or 1/3 octave analysis will reduce battery life, so be aware of this and check the battery status before running a measurement.*

Note: *Ena and double*

Other basic parameter configuration is shown in the figure below:

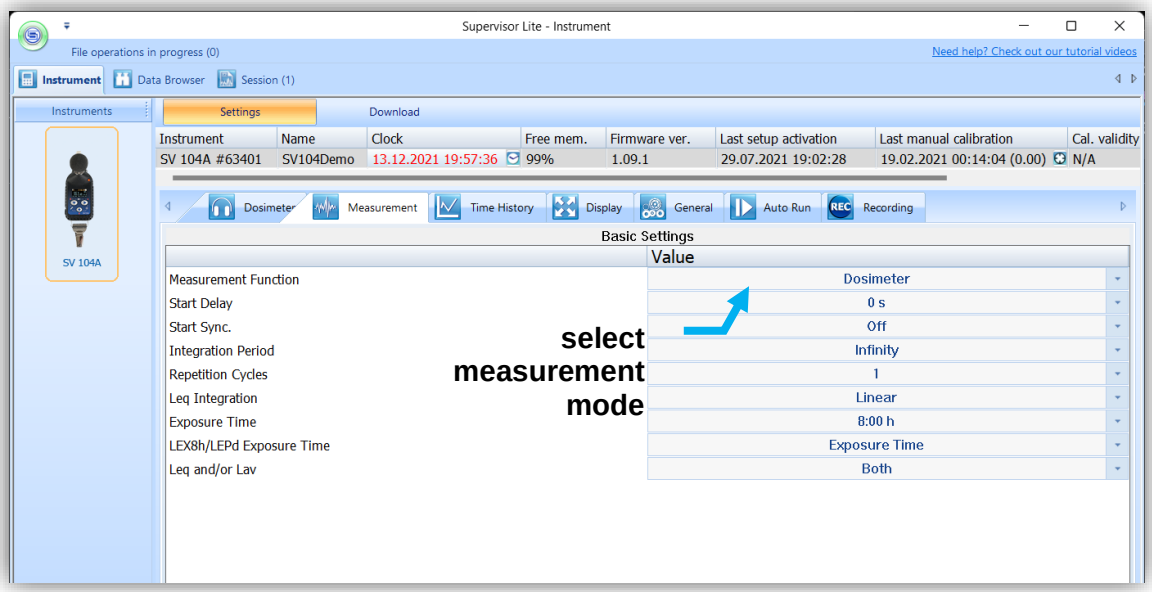


Figure 5-11 Measurement configuration settings tab

5.2.6 Time-history data logging settings

To enable logging of time history data, go to the **Time History** tab and toggle the **Logger** button on the left panel.

- The **Time History Setup** panel allows you to set the step at which the results are to be logged, the name of the logger file and to enable storage of the extended summary results.

  Note: Summary results are stored with the **Integration Period** step (not with the **Logger Step**).

- The **Profile Results** panel is only accessible when the **Logger** is switched on. You can select results for each profile to be logged during the measurement and stored in the instrument's memory.

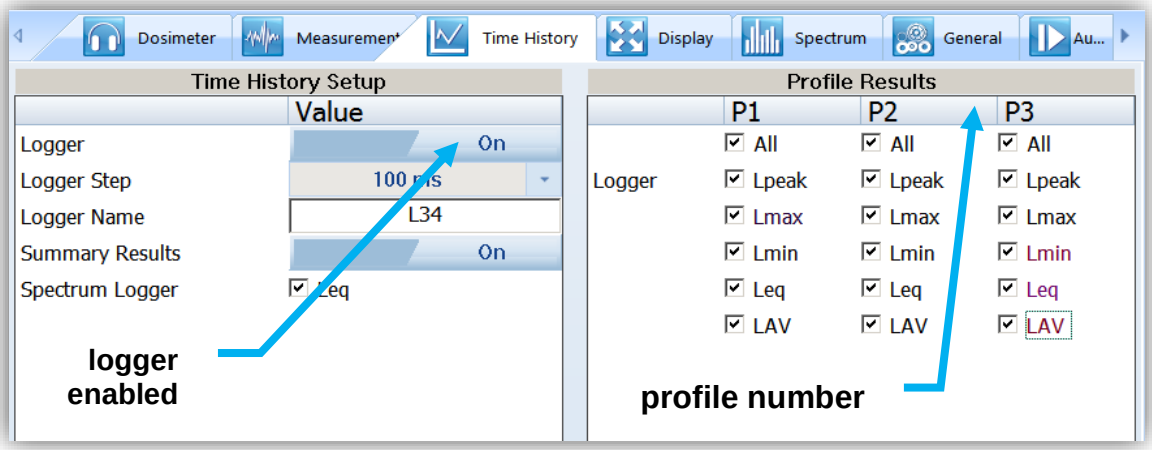


Figure 5-12 Time History (logger) settings tab

5.2.7 VIEW configuration

There are a number of VIEW modes that can be accessed on the dosimeter display when it is performing a measurement run.

- In the left-hand panel **Modes & Views**, you can select which VIEW mode will be present when you press the  key on the dosimeter keypad.

  Note: If you do not want to use all three ACOUSTIC PROFILES, it is convenient to enable the display of only one acoustic PROFILE – simply select the desired one.
  Note: ONE RESULT is the only VIEW mode that is always present and cannot be disabled.

- In the right-hand panel **Display Results**, you will find a list of over a dozen measurement results that can be displayed on the SV 104BIS display when the  key is pressed. See Appendix D for the acronyms of each result.

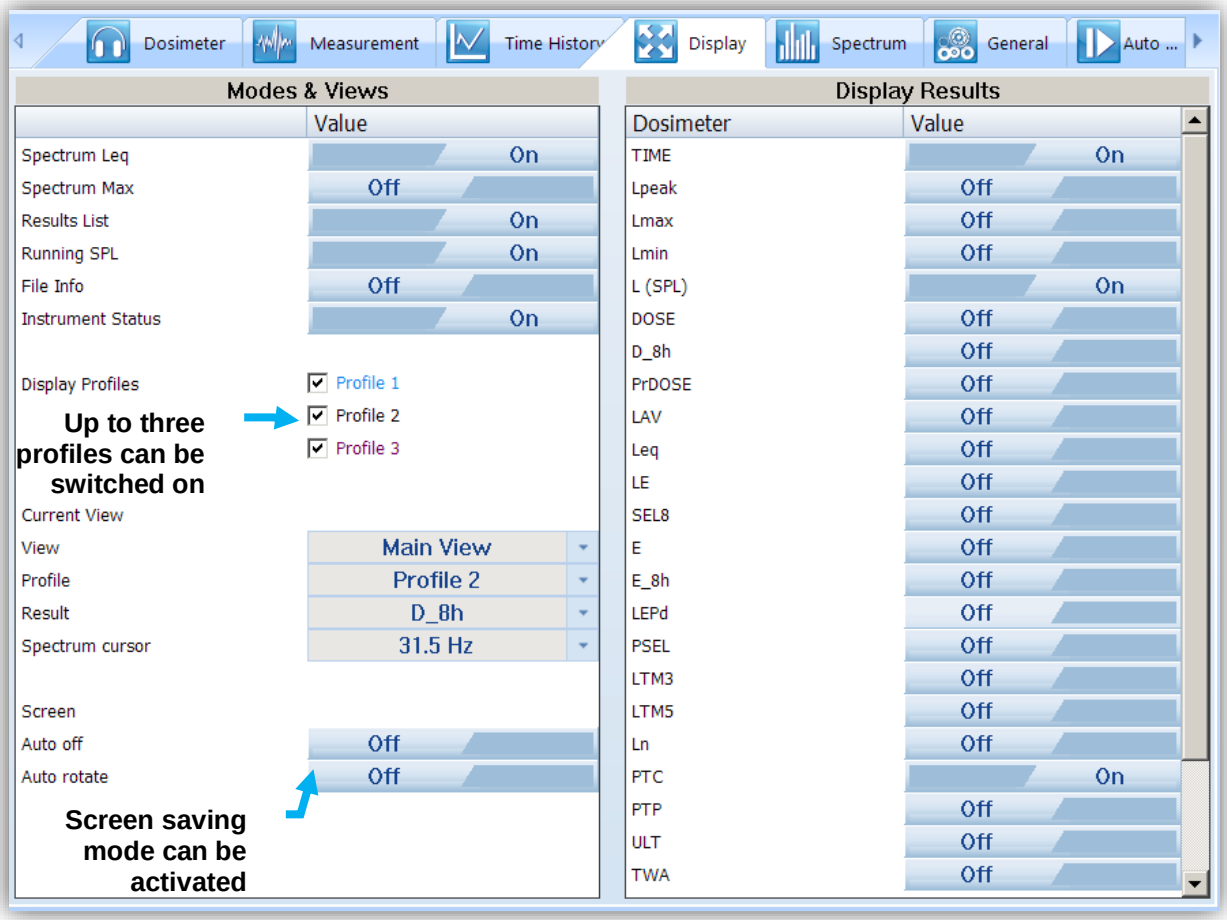


Figure 5-13 Display VIEW configuration tab

5.2.8 Spectrum configuration

Real-time 1/1 octave or 1/3 octave analysis is an additional optional feature. It therefore has its own settings tab. Within this tab there are the following sections:

- **Data**, where you can configure the weighting filter to be used in the octave calculation
- **Display Scale**, where you can set the visible dynamic range of the plot and activate the grid.

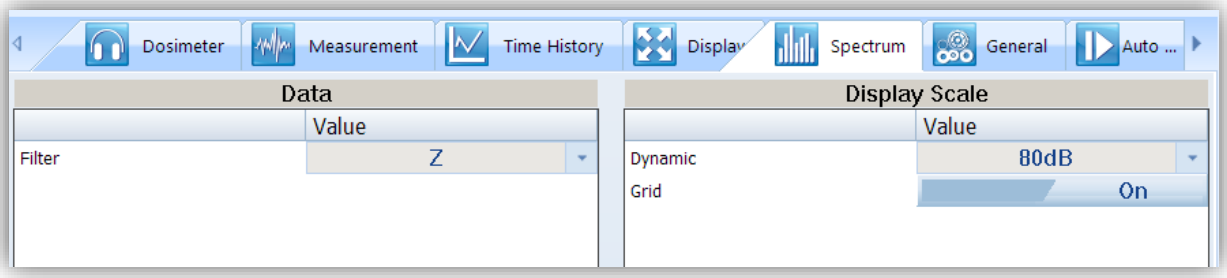


Figure 5-14 Spectrum configuration tab

5.2.9 General settings

The **General** settings tab covers different usability options: see the following chapters to understand exactly how to configure these instrument settings.

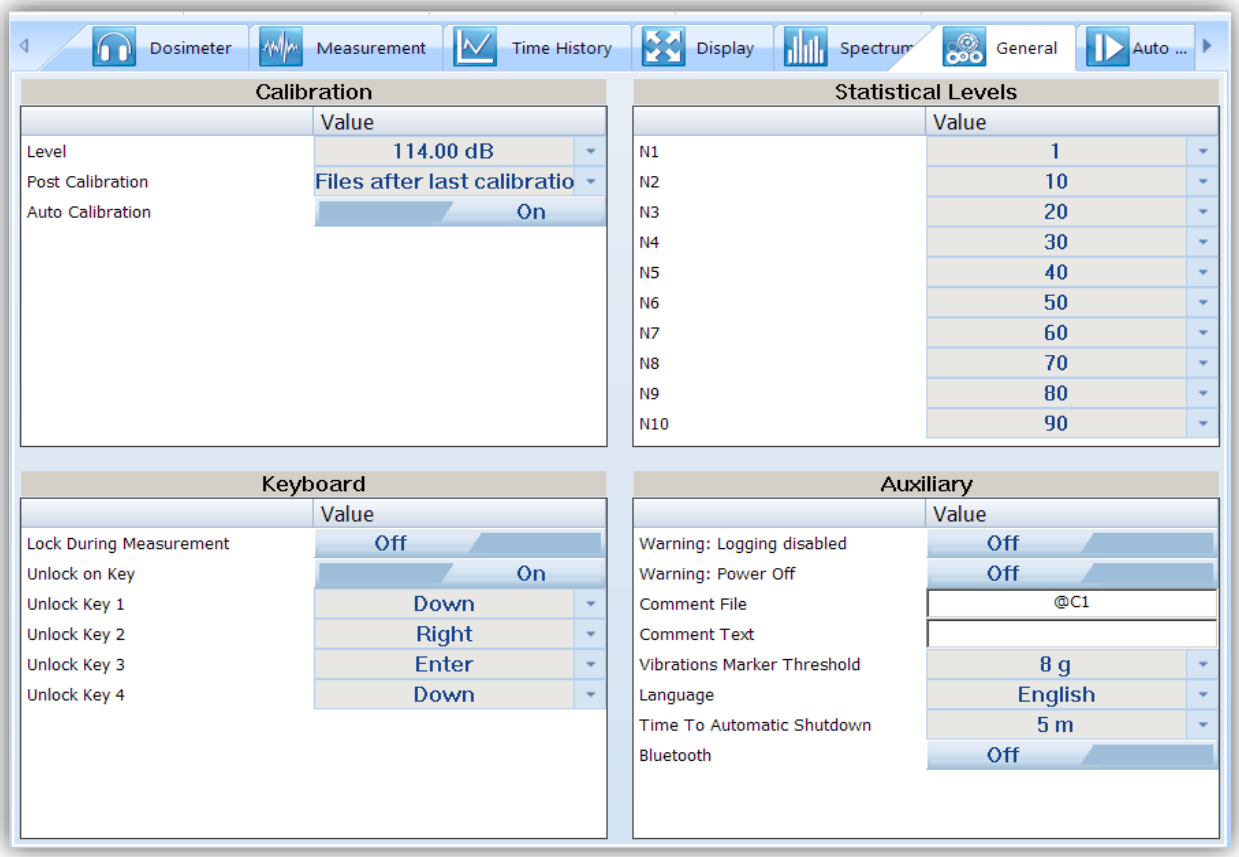


Figure 5-15 General settings tab

5.2.9.1 *Calibration*

Sometimes it is necessary to perform a so-called post-calibration of the instrument. The **Post Calibration** item allows the user to perform an additional calibration after a measurement session and to add the results to the file saved in the memory. There are three options for saving results: not saving (**Off**), saving in the last file (**Last File**) or saving in the files created after the last calibration (**Files after last calibration**). Auto-calibration can be disabled if for some reason it is not required.

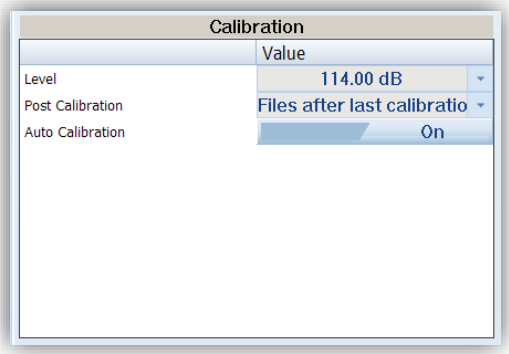


Figure 5-16 Calibration settings panel

5.2.9.2 *Statistical levels*

In the **Statistical Level** panel, you can define ten percentile statistical levels, named from N1 to N10. By default, the statistical levels have the following settings: 1, 10, 20, 30, 40, 50, 60, 70, 80 and 90. All values must be in the integer range [1, 99]. Each value can be set independently from the others.

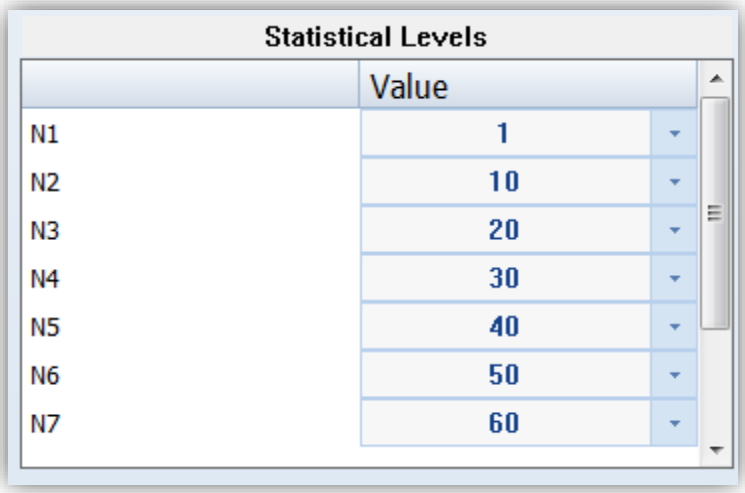


Figure 5-17 Statistical levels settings panel

5.2.9.3 *Keyboard security*

The security setting allows you to protect access to the instrument when it is in use with a simple keypad password to prevent users from accidentally cancelling a measurement run. This feature is set from the **Keyboard** panel.

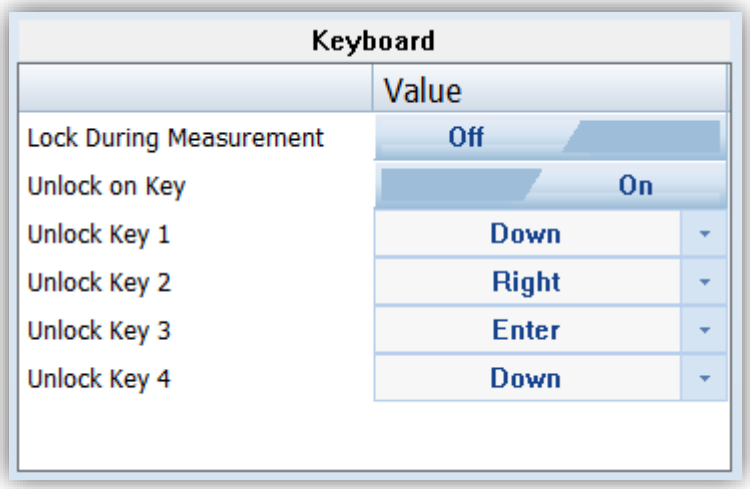


Figure 5-18 Keyboard security settings panel

To activate the security option: switch on **Lock During Measurement**. The instrument will lock the keyboard each time the measurement is started.

When **Unlock on Key** is set to **On**, the instrument requires a special code to be entered by pressing four keys defined in this panel in a certain sequence.

When **Unlock on Key** is set to **Off**, SV 104BIS can be locked/unlocked without a lock/unlock sequence. Simply press and hold the ▼ key for a few of seconds, during which a countdown (**Keyboard lock/unlock 3… 2… 1…**) is displayed, giving you time to decide if you really want to activate/deactivate the security lock. If you release the key too early, the operation will be cancelled.

5.2.9.4 Auxiliary settings

In the **Auxiliary** panel, you can:

- Enable additional warning screens to be displayed under certain conditions:
  - **Logging disabled** warns the operator that time history results will not be stored
  - **Power off** provides additional confirmation just before switching off.
- Define the name of the voice note comment file (**Comment file name**). **Comment Text** can also be entered here if required.
- Use the **Vibration Marker Threshold** based on the acceleration (**Off, 1g,…15g**); the lower the threshold selected, the more sensitive the dosimeter will be to possible impacts during use.
- Select the language of the dosimeter menu (**Language**). The default language is English.
- Set the time after which the unit will be shut down if no key will be pressed (**Time To Automatic Shutdown**).
- Turn the Bluetooth® connection on or off (**Bluetooth**).
- Enter the PIN code to pair the devices **(Bluetooth PIN).**

***Note: Bluetooth** should be turned off for air transport.*

***Note:** For*
file is appli

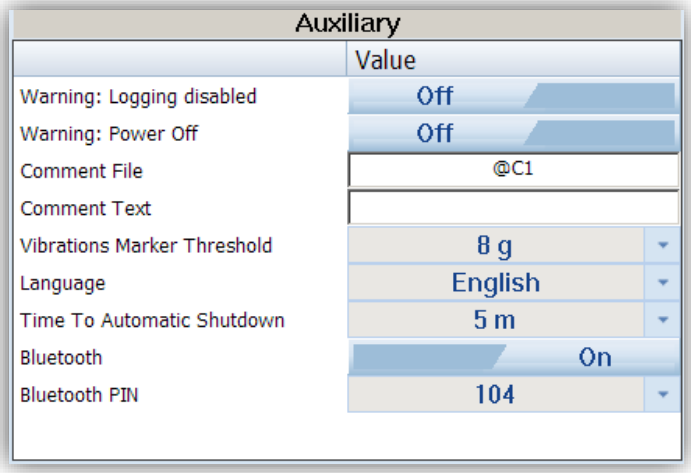


Figure 5-19 Auxiliary settings panel

5.2.10 Auto-Run settings

The **Auto-Run** settings tab contains two panels: **Pause**, which allows you to program five independent pauses in real time, and **Timer**, which allows you to program the internal real-time clock to act as a delayed start and stop timer.

In the **Pause** panel, you can set the start (**Begin**) and **End** of the pause.

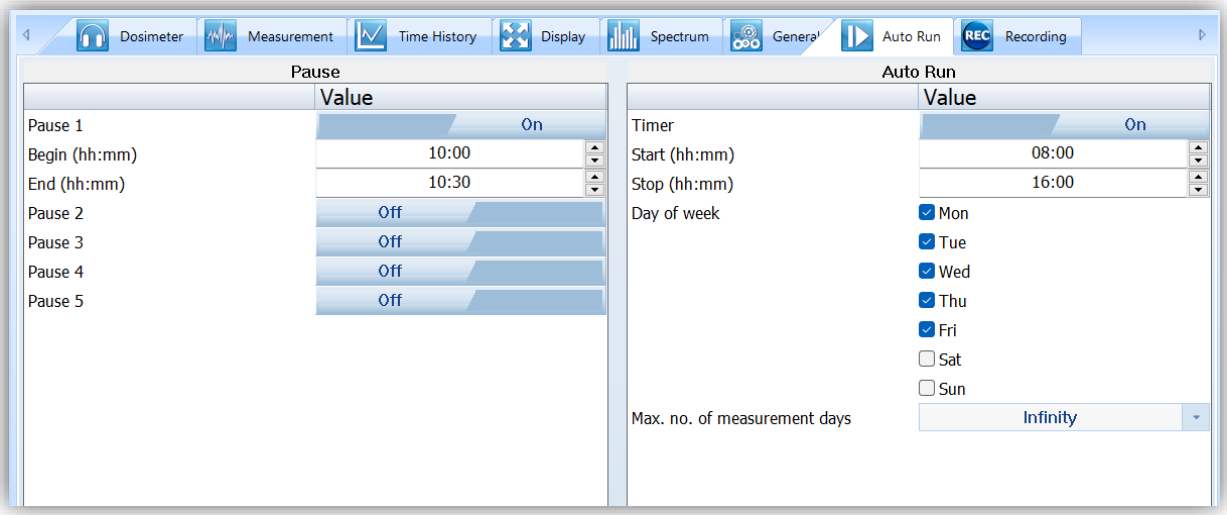


Figure 5-20 Auto-run configuration tab

The **Timer** function allows the instrument to switch on automatically at a pre-selected programmed time and then perform the measurement using the settings that were in use before the last time it was switched off. The **Timer** is useful if you wish to pre-set the instrument to run and stop for a specific period of time, for example, for a week's study.

If the timer is switched on and the instrument is switched on, the **Time** screen will appear until the programmed measurements are completed.

The **Start (hh:mm)** and **Stop (hh:mm)** items define the time at which the measurement will automatically start and to stop.

The **Day of week** determines the days of the week on which the measurements are to start. The timer can be programmed up to 100 days in advance (**Max. no. of measurement days**) or without limitation (**Inf**) and during these days the current state of the real time clock is taken into account. Check that the real time clock settings for the measurement location are correct before starting a delayed timer measurement.

If the timer is **Off**, you can enable the automatic start of the measurement (**Measurement Auto Start**) when the instrument is switched on.

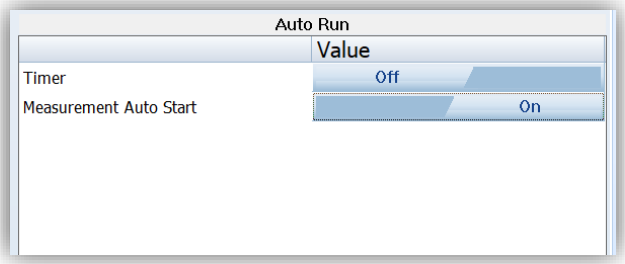


Figure 5-21 Measurement Auto Start enabled

5.2.11 Waveform signal recording

The SV 104 instrument can record the time domain signal as an Event or Wave recording. You can play back and post-process these time domain signal recordings using the *SvanPC++* tools. The difference between the two types of signal recording is that in the case of Event the signal is recorded in the logger file, while in the case of Wave the signal is recorded in a separate WAV file. These recording modes are mutually exclusive.

Note: *The signal recording is an optional function and should be activated before use. The optional functions can be activated using the Supervisor software (see Chapter 5.2) or Assistant Pro mobile application (see Chapter 6.2.3).*

The **Recording** tab has two panels – **Event Recording** and **Wave Recording**. You can switch on the one or other option by selecting a **Recording Mode** other than *Off*: *Continuous*, *Trigger Slope +, Trigger Slope -, Trigger Level +* or *Trigger Level -*. These modes require different parameter sets and use different methods of signal recording (triggering), which are described below.

Four basic audio recording parameters are available for all modes: **Wave File Format** (*PCM* or *Extensible*), **Filter** (*Z, A, CB*), **Sampling** frequency (*12kHz* or *24kHz*) and **Signal Gain** (from *0 dB* to *35 dB*).

Continuous mode means that the audio recording starts when the measurement starts and stops when the measurement stops.

Note: *In some cases, the instrument may split a wave file automatically! This is due to the instrument's limited RAM, where the audio data is buffered.*

Note: *In s limited RA*

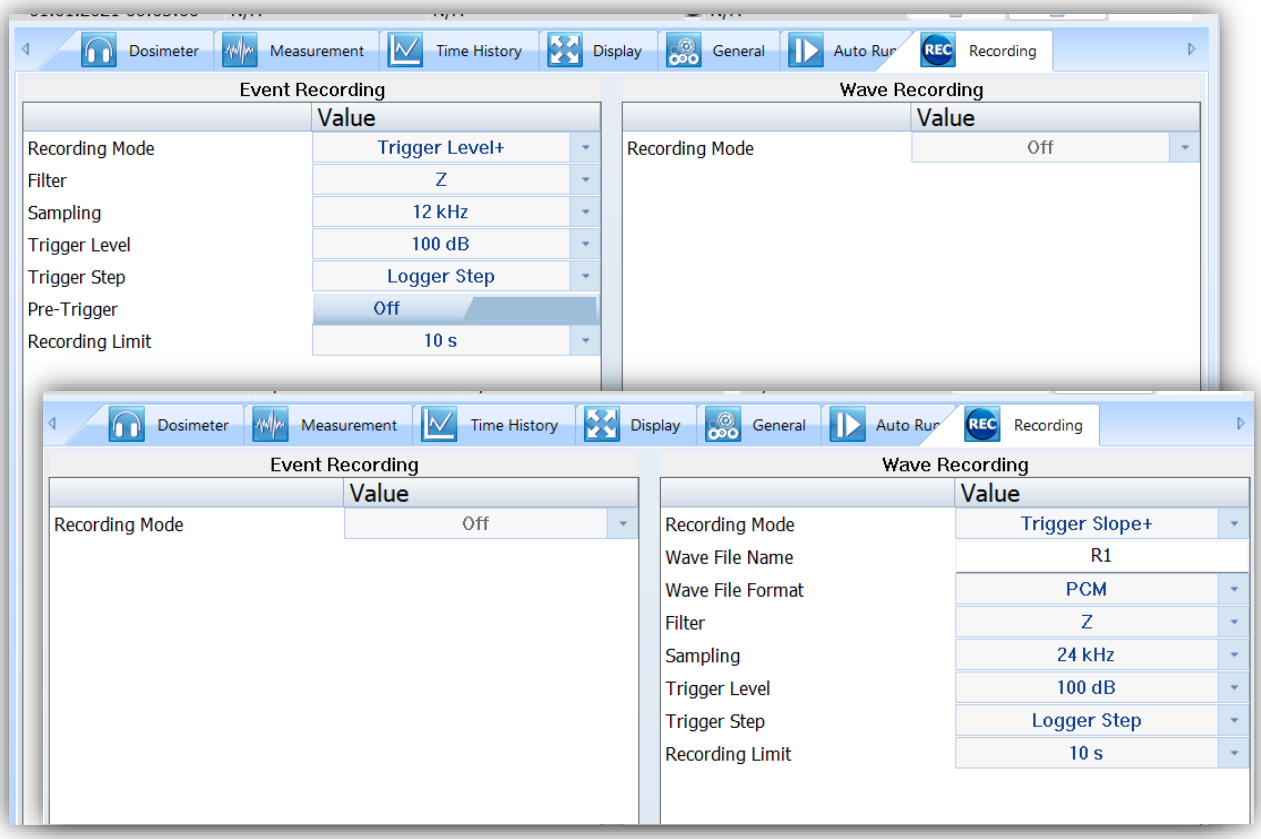


Figure 5-22 Signal recording configuration panels

The *Trigger Slope + / Trigger Slope –* modes mean that the audio recording starts when the rising value of the *Leq* measured in the first profile with the **Trigger Step** (with a value equal to the *Logger step*, *0.5 ms*, *100 ms* or *1 s*) goes above/below the threshold (**Trigger Level**), which for *Slope +* means that the previous result was below the threshold, and the next one is above the threshold. The recording lasts for the minimum time, defined by the **Recording Limit** parameter, and during this time the instrument continues to check the trigger condition at the **Trigger Step** interval. Provided that the **Trigger Step** is shorter than the **Recording Limit,** if the next trigger condition is met during the **Recording Limit** time, the instrument triggers the recording again, so that from that moment it continues with the additional **Recording Limit** time, and so on. If there are no triggers during the next recording time, recording will stop after the last trigger plus the **Recording Limit** time.

Trigger Level + / Trigger Level – modes mean that the audio recording starts when the *Leq* value measured in the first profile with the **Trigger Step** (with a value equal to the *Logger step*, *0.5 ms*, *100 ms* or *1 s*) is greater/less than the threshold (**Trigger Level**). In other cases, recording doesn't start, but if it has already started, it can continue until the **Recording Limit** time has elapsed. If a trigger condition occurs during the **Recording Limit** time, the recording will be extended for another **Recording Limit** time from the time of the trigger condition, and so on. If there are no triggers during the next recording time, the recording will stop after the last trigger plus the **Recording Limit** time.

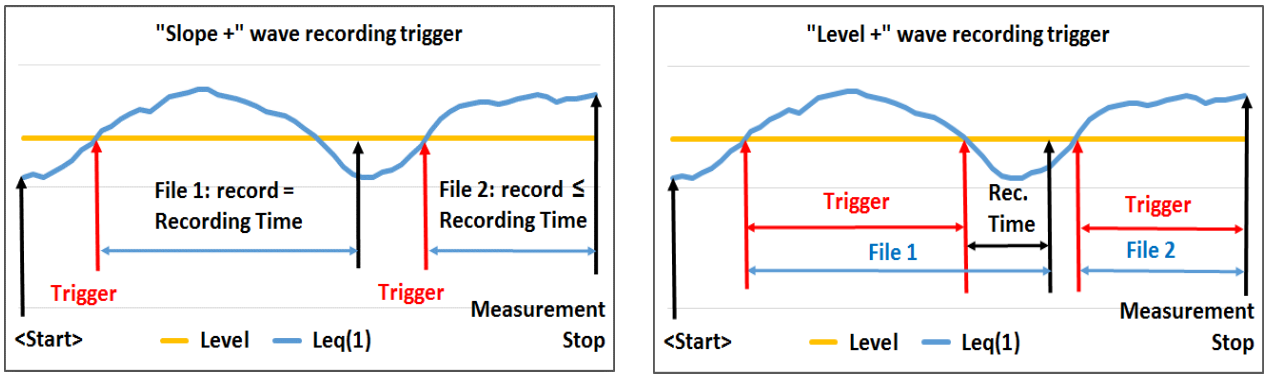


Figure 5-23 *Slope* + vs *Level* + wave recording trigger

5.3 WORKING WITH DATA FILES

5.3.1 Downloading files

To download files from the connected Svantek instrument(s), open the **Download** tab in the **Instrument** window.

The **Download** panel contains a list of files stored in the instrument's memory in the form of a table. It shows different types of files, e.g. measurement files, wave files, etc. The first three columns of the table contain basic information about the files: name, size in bytes and creation date. The last three columns contain additional information (about location, users and tasks) associated with the files. Files that have not yet been downloaded are shown in bold.

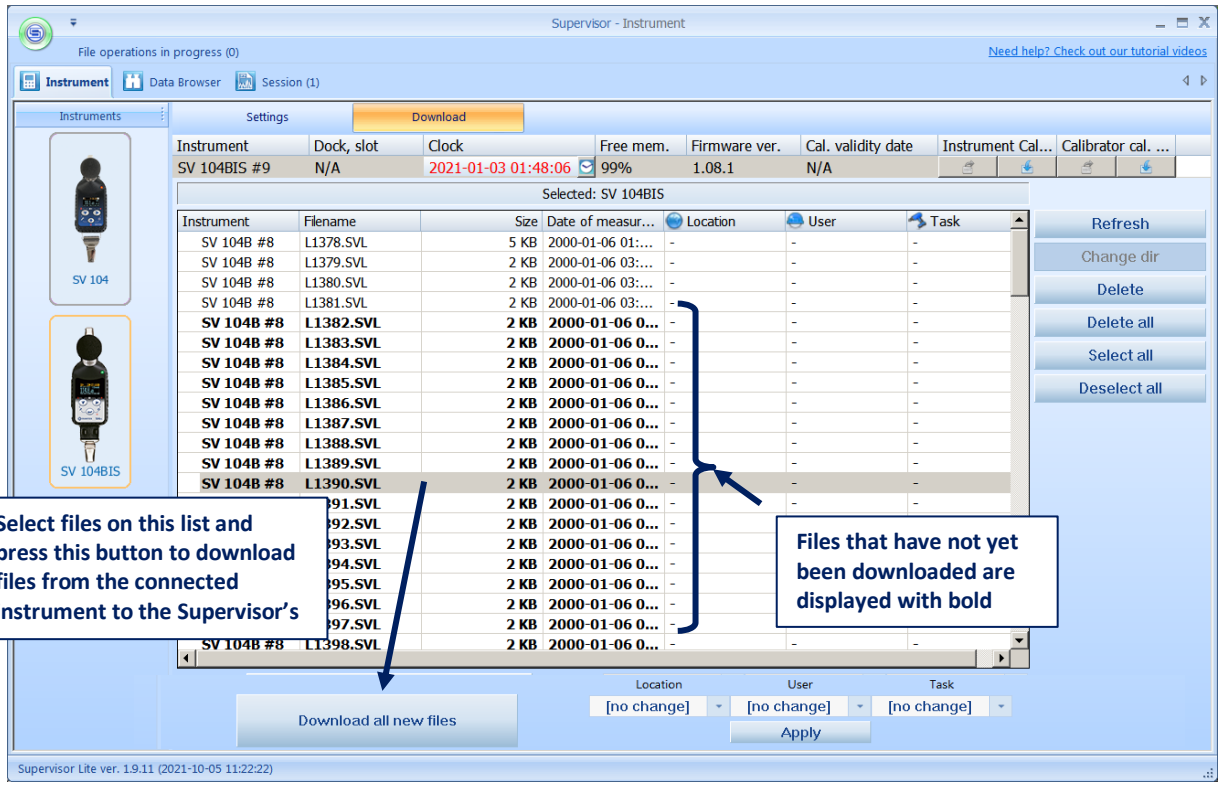


Figure 5-24 SV 104A Download window

To download files, use the **Download** button below the file table. If one or more files are selected in the table, pressing the **Download** button will download the selected files. Otherwise, pressing this button will download all files stored on the connected instrument.

Note: You can select files by clicking on a row in the table. You can select multiple files by clicking with the CTRL or SHIFT keys held down.

Note: You can download individual files by double-clicking on them.

Files from the instrument are downloaded to the special internal Supervisor catalogues, which are automatically created in the parent catalogue called “Catalogue”. By default, the catalogues created are named after the instruments, e.g. SV 104A, etc.

When the download is complete, a window will appear with information about the success or failure of the download.

The buttons on the right side of the Download panel allow you to perform some basic operations with the files stored in the connected instrument:

- *Refresh* – updates the list of files, so that all the files created since entering the Download panel are displayed.

  Note: Each time the list of files is updated, a new “download session” is started, i.e. a new subdirectory is created for the downloaded files. This is why the overwrite warning sometimes does not appear when two files with the same name are downloaded - after a new download session is started, the file is stored in a different location, eliminating the possibility of overwriting.
- *Change dir* – this button is inactive for SV 104BIS instruments.
- *Delete* – deletes a selected file from the instrument’s memory.
- *Delete all* – deletes all result, logger, and WAVE files in the instrument’s current working directory.
- *Select all* – selects all files in the table.
- *Deselect all* – deselects all files.

All downloaded files are stored in the Supervisor’s database and can be viewed and processed using the Data Browser described in the following chapter. The Data Browser is automatically opened each time files are downloaded from a connected Svantek instrument.

Whenever you download/upload files to/from a connected instrument, Supervisor displays the progress in the **File operations** panel at the top left-hand corner of the application window.

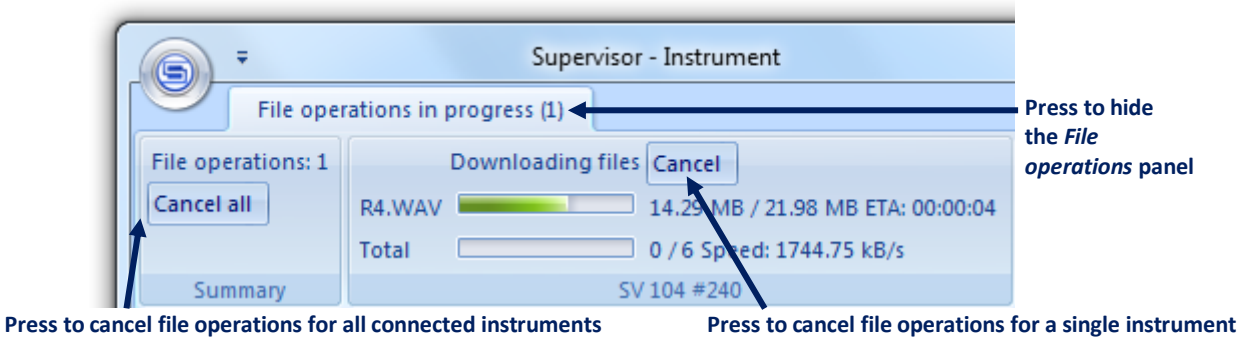


Figure 5-25 File operations panel

Each instrument can perform one operation at a time. If multiple instruments are connected and performing file operations at the same time, you can cancel them all by clicking the **Cancel all** button.

You can show/hide the **File operations** panel by clicking on the **File operations in progress** tab.

5.3.2 Data Browser

To view all files downloaded from Svantek instruments and stored in the Supervisor database, open the Data Browser using the button in the top left corner of the Supervisor window.

The Data Browser consists of three panels:

- On the left side of the window, the File manager panel contains a list of all the files stored in the Supervisor database and allows you to select a group of files to view in detail.
- On the right side of the window, the File list panel contains a list of files belonging to a selected group and allows you to open a file for further processing.
- Below the file list panel, the File preview panel allows you to preview the data contained in a selected file.

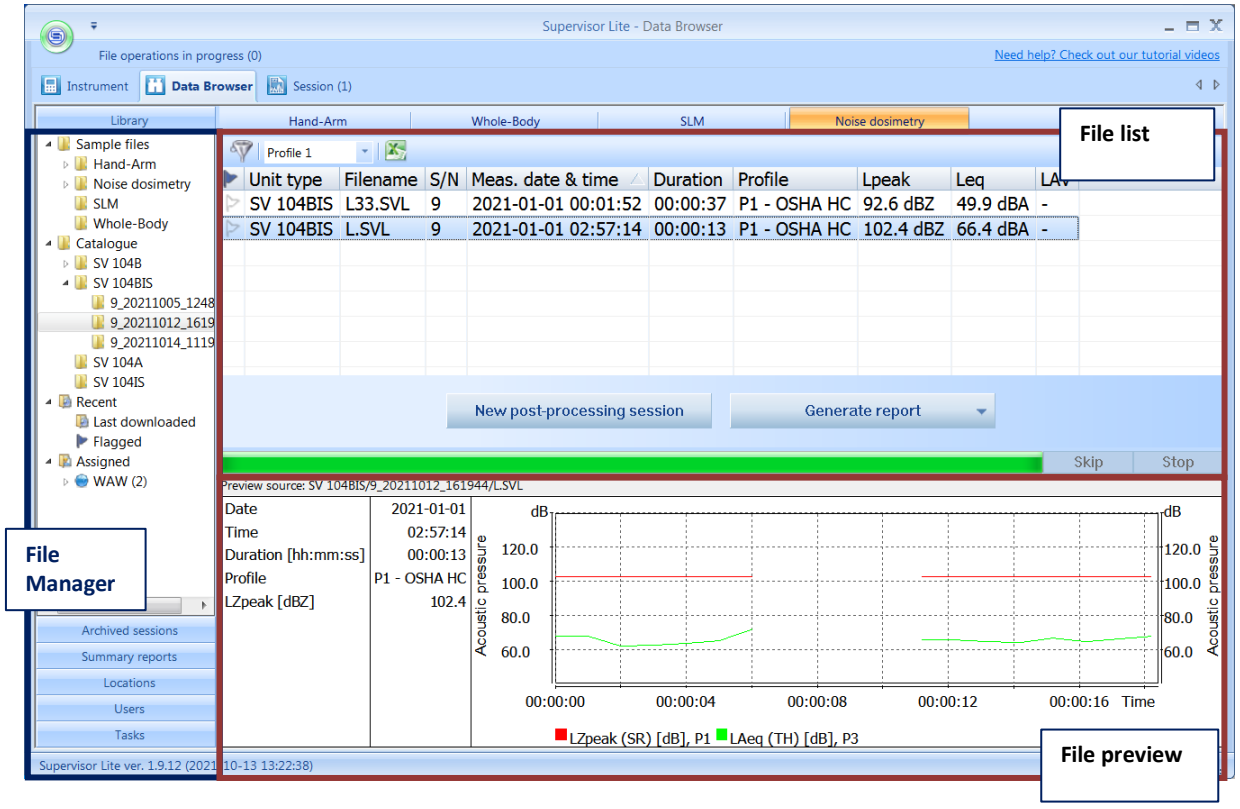


Figure 5-26 Data Browser window

5.3.2.1 *File Manager*

The File Manager panel allows you to select a group of files to view in detail. It is divided into six sub-panels: *Library*, *Archived sessions*, *Summary reports*, *Locations*, *Users*, and *Tasks*. Each can be accessed by pressing the horizontal bar with the corresponding name.

The *Library* sub-panel lists all the files stored in the database in a tree view. It contains four basic items:

- **Sample files**, containing some of the sample files supplied with Supervisor, further grouped according by the type of measurement to which they relate.
- **Catalogue**, containing all files downloaded from instruments. You can arrange the Catalogue as you wish by adding, deleting, moving and renaming files and folders. You can easily drag and drop files and folders from anywhere on your PC to add them to the database. You can also use the right-click context menu to perform various operations on files and folders.

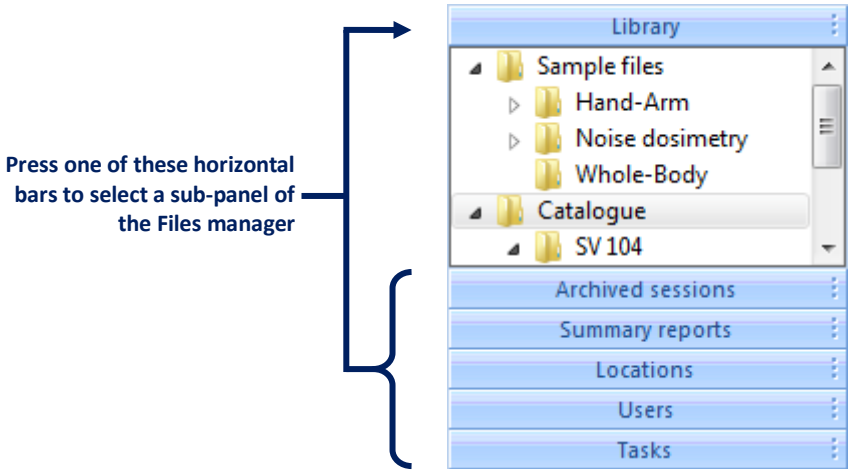


Figure 5-27 File manager

Note: It is also possible to export files from the Supervisor's database by dragging and dropping them outside the application window (dropping files into Windows Explorer).

Note: The catalogues for the downloaded files are automatically created in the *Catalogue*. By default, the catalogues created are named after the instruments, e.g. SV 104A, etc.

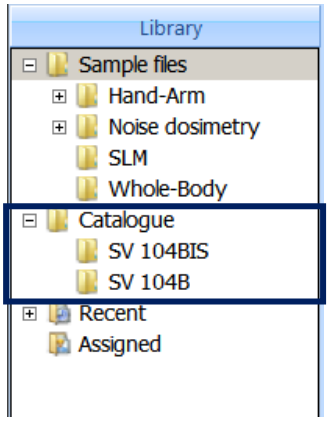


Figure 5-28 Example of the Catalogue content

- **Recent**, containing two items: **Flagged**, which is a folder for grouping a number of selected files - to add a file to this group, you must set its *flag*, which can be done in the File details panel; and **Last downloaded**, which contains a list of files downloaded since the last time you started Supervisor.
- **Assigned**, containing all files that have been assigned additional information about the location, user and task performed during the measurement.

The **Archived sessions** sub-panel contains a list of all the sessions that have been moved to the archive. You can use this list to restore an archived session to view and process it again, or to use the files that were used to create the session. If many sessions have been archived, you can use filters to display only some of them.

The **Summary reports** sub-panel contains a list of Summary reports that you have created. The Summary reports can be used to collect selected measurement results according to additional information assigned to them.

The last three sub-panels of the File manager contain files listed according to the additional information assigned to them.

5.3.2.2 File details

The File details panel contains a table listing the files corresponding to the selected item in the File manager. The files corresponding to all the sub-items of the selected item are also displayed in the Files details panel. Files can be further processed by using them for sessions. To create a session, select one or more files and press the **New post-processing session** button. If you want to create a session starting with a single file, you can do so by double-clicking on the row of the table corresponding to that file.

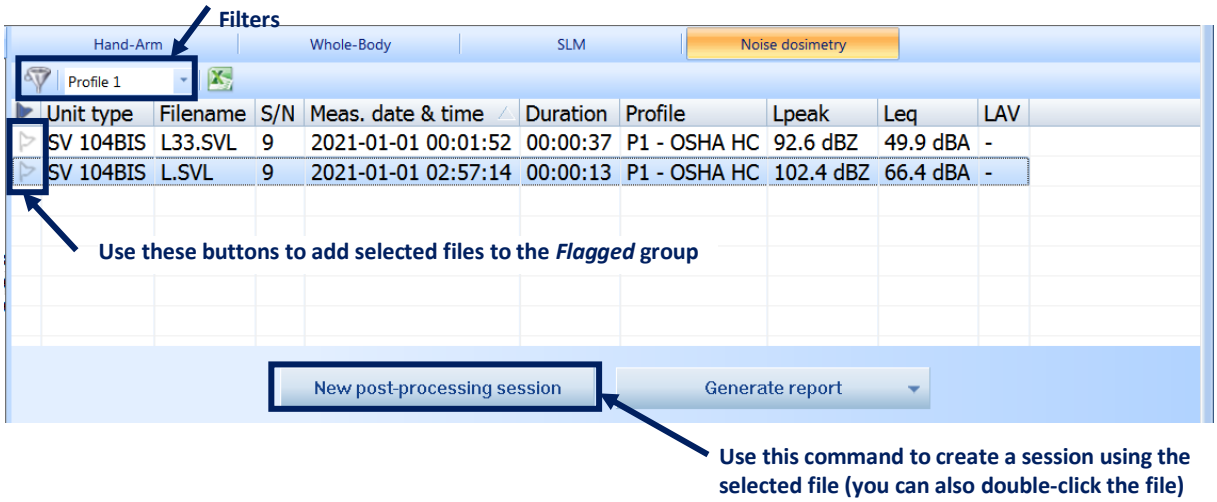


Figure 5-29 File details panel

Setting flags

By pressing the button in the first column on the left side of the File details table, you can set a flag for a selected file. As a result, the file will be accessible in the File manager in the *Recent* → *Flagged* group. You can tag multiple files for quick and easy access.

Dragging files outside of Supervisor

You can easily export files from the Supervisor database to a selected location on your PC using drag and drop technique outside the application window.

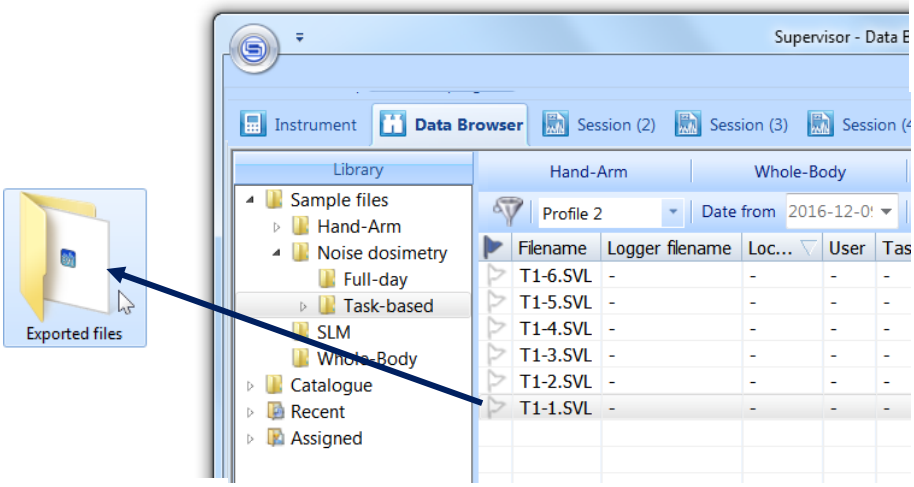


Figure 5-30 Using the drag & drop technique to export files outside the Supervisor's database

Note: Exporting measurement files with comments attached (e.g., WAV files) automatically exports the comment files as well. To export a single file without the attached comments, use the drag and drop technique with the CTRL key held down.

Creating reports

The **Generate report** button allows you to create a report of the selected file(s) based on a number of templates. After pressing this button, you should select a template for the report.

All reports are stored in the **Summary reports** sub-panel.

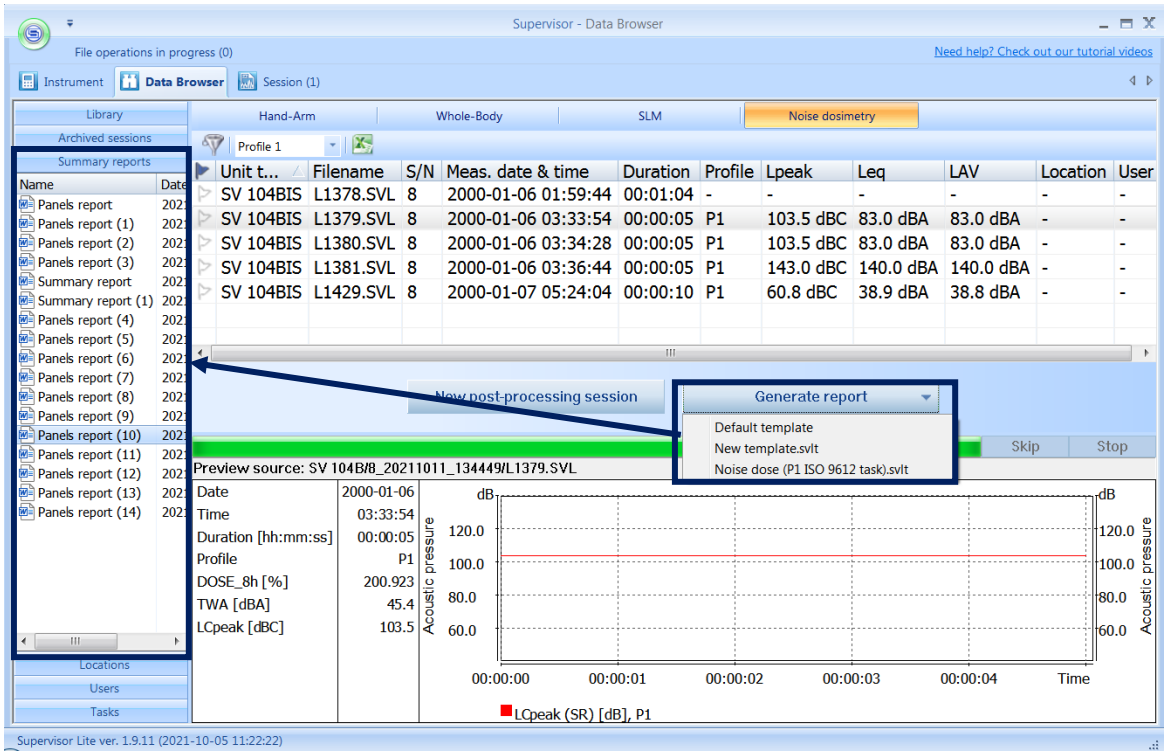


Figure 5-31 Creating general reports

5.3.2.3 File preview

The panel below the File details table provides a brief preview of the data stored in the selected file, giving an initial idea of the time history of the measurement results. If multiple files are selected, the file actually used as the source of the data displayed is indicated in the top left corner of the Preview panel.

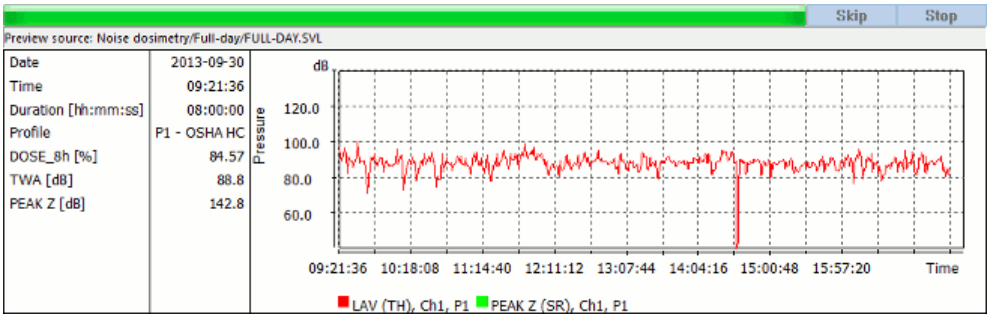


Figure 5-32 Preview panel

You can copy the contents of the **Preview** panel by right-clicking in the area and selecting the **Copy** command. It can then be pasted as an image into another application, such as MS Word.

You can use the Preview settings in the **Main Options** dialog box to specify the type of data (and its order of their priority) to be displayed in the Preview panel. Different types of data are available for different applications. To select the application, use the list box at the top of the **Preview** panel. It is possible to select different types of data for the Parameters & results panel (on the left-hand side of the **Preview** panel, which displays data in numerical form) and for the Plot panel (on the right-hand side of the **Preview** panel, which displays data in graphical form).

5.3.2.4 Using assignments

Three types of additional information can be associated with each file downloaded from a Svantek instrument:

- *Location* (where the measurement was made),
- *User* (who made the measurement),
- *Task* (what the user was doing during the measurement).

This information can then be used to facilitate searching the search for specific measurement results and to generate summary reports.

You can assign this additional information to the files when you download them from the connected instrument. To do this, select one or more files in the *Instrument → Download* panel, then select the *Location* / *User* / *Task* in the list box at the bottom right of the window, and press **Apply**. If you want to add a new location, user or task, select *[new...]* from the list box. If you want to delete information that has already been assigned, select *[none]*. The selected values are assigned when files are downloaded to the Supervisor database.

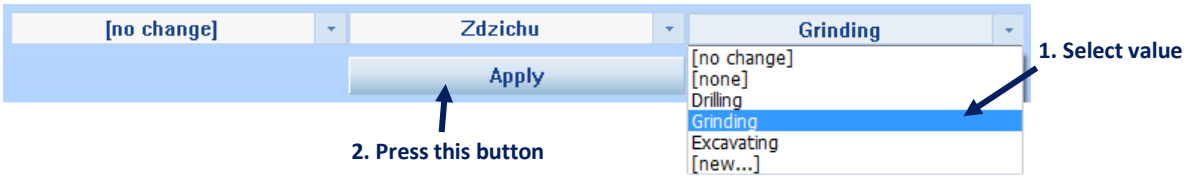


Figure 5-33 Assigning additional information to downloaded files in the Instrument → Download panel

You can also assign additional information to files in a number of ways using the *Data Browser*. In the File details table, left-click on the *Location* / *User* / *Task* field corresponding to a selected file and select a value from the menu.

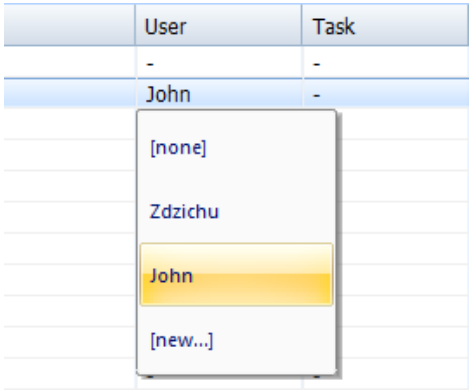


Figure 5-34 Assigning User information to a file in the File details table

Another method of assigning information to files is to drag and drop a file from the File details table onto a particular item in the *Assigned* sub-tree in the Library. Note that if, for example, you drop a file on a sub-sub-item that corresponds to both a User and a Task, both of these values will be assigned to the file.

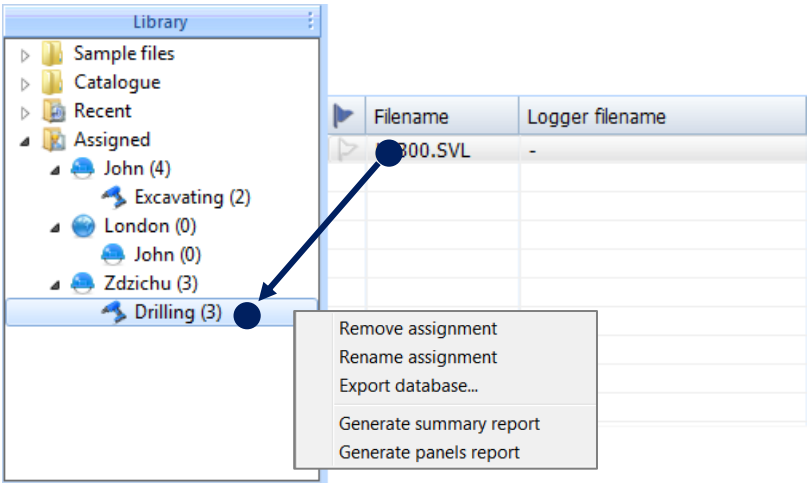


Figure 5-35 Assigning additional information to files using the drag & drop technique

Right-click on the item in the Assigned section to remove and rename assignments.

5.3.2.5 Summary reports

The summary reports can be used to collect measurement results for selected locations, users, or tasks in the form of MS Word documents. To create a summary report, right-click an item corresponding to an object in the *Assigned* sub-tree in the Library sub-panel of the File Manager and select **Generate summary report**. This command opens the **Summary report wizard**. You can also use the **Assigned** item to create a summary report for all the files that have a location, user and/or task value assigned to them.

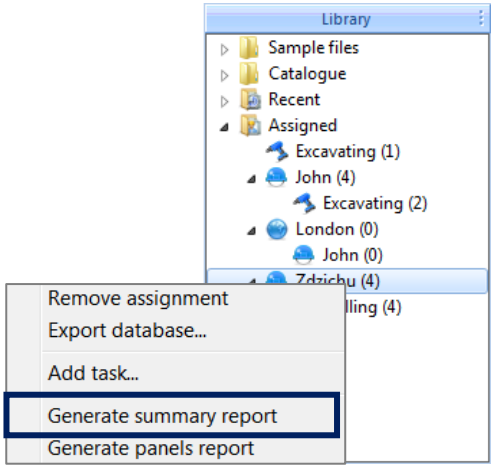


Figure 5-36 Using the Library to generate a summary report

A summary report must be created from a template. The first window that appears when you open the **Summary report wizard** allows you to select a template for the report. When you create your first summary report, you will need to create a new template, but the template will be saved and you can use it later to create

other reports. To create a template, press the **Create new** button. The Summary report template editor window will appear.

Note: You can also create more than one templates; you will be able to select one of them later each time you create a summary report.

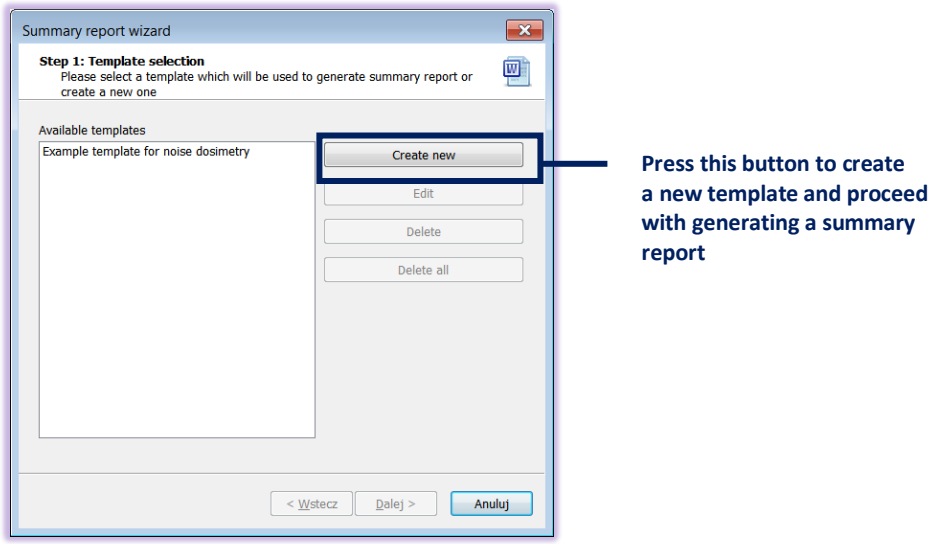


Figure 5-37 Summary report wizard initial window

A summary report template consists of one set of parameters (i.e. Svantek instrument parameters, measurement parameters and measured quantities) to be displayed in numerical views and another set of parameters to be displayed in graph views. To create a template, first specify the application for which you want to use it for, as this determines the availability of certain parameters. The application can be specified using the list box in the top right corner of the window. Next, use the template editor to select the parameters to be included in the report.

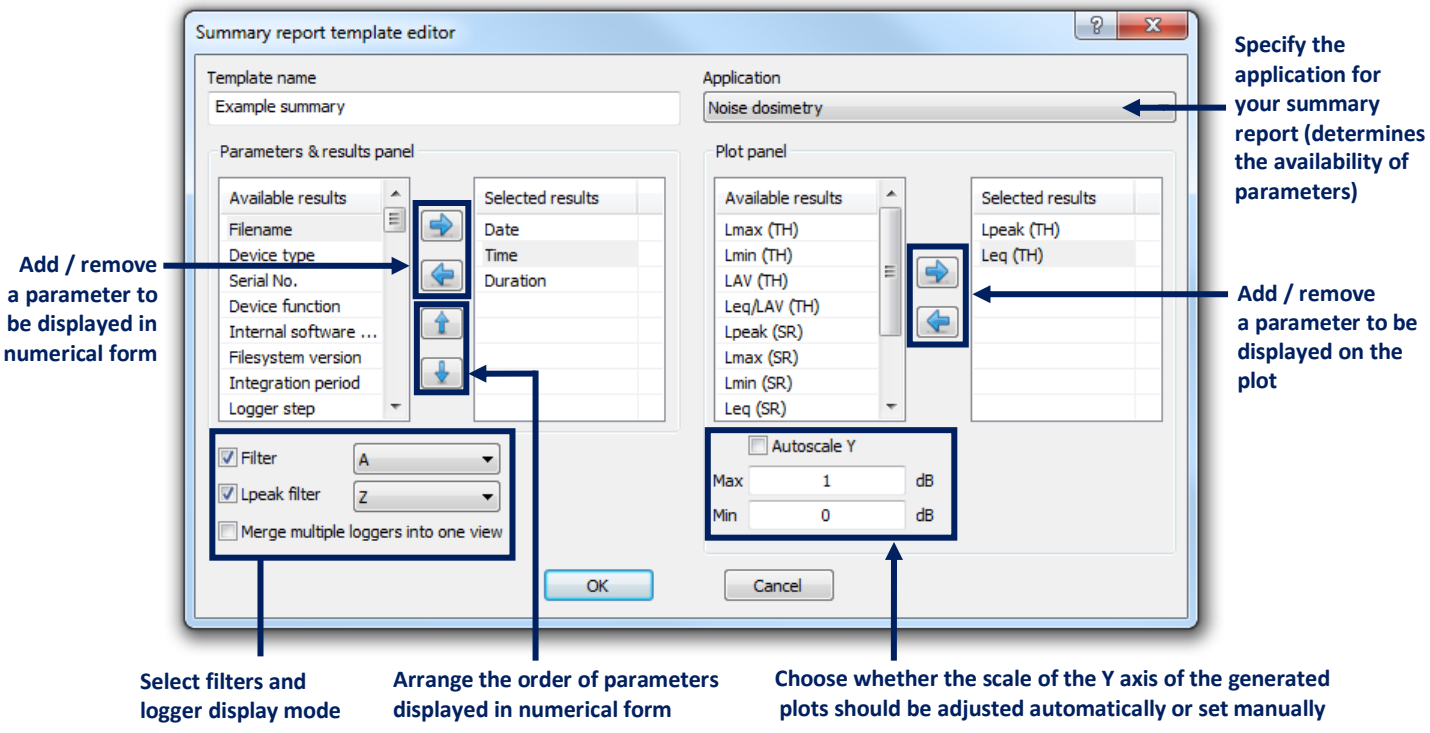


Figure 5-38 Summary report template editor dialog box

Once you have created a report template, you can select it from the list in the **Summary report wizard** and click **Continue** to proceed. In the second step of creating the summary report, you can select the time interval from which the results will be included. After specifying the minimum and maximum dates, press **Finish** to generate the report.

5.4 SESSIONS AND REPORTING

Sessions can be used to work with data downloaded from Svantek instruments and to create reports using this data.

5.4.1 Creating and managing sessions

To create a session, go to the **Data Browser**. In the File details table, select the files containing the data you wish to work with, click the **New post-processing session** button or right-click and select the **New post-processing session** command from the menu that opens. You can create a session from one or more files. To create a session from a single file, simply double-clicking the file.

Note: You cannot create sessions directly from the wave file itself.

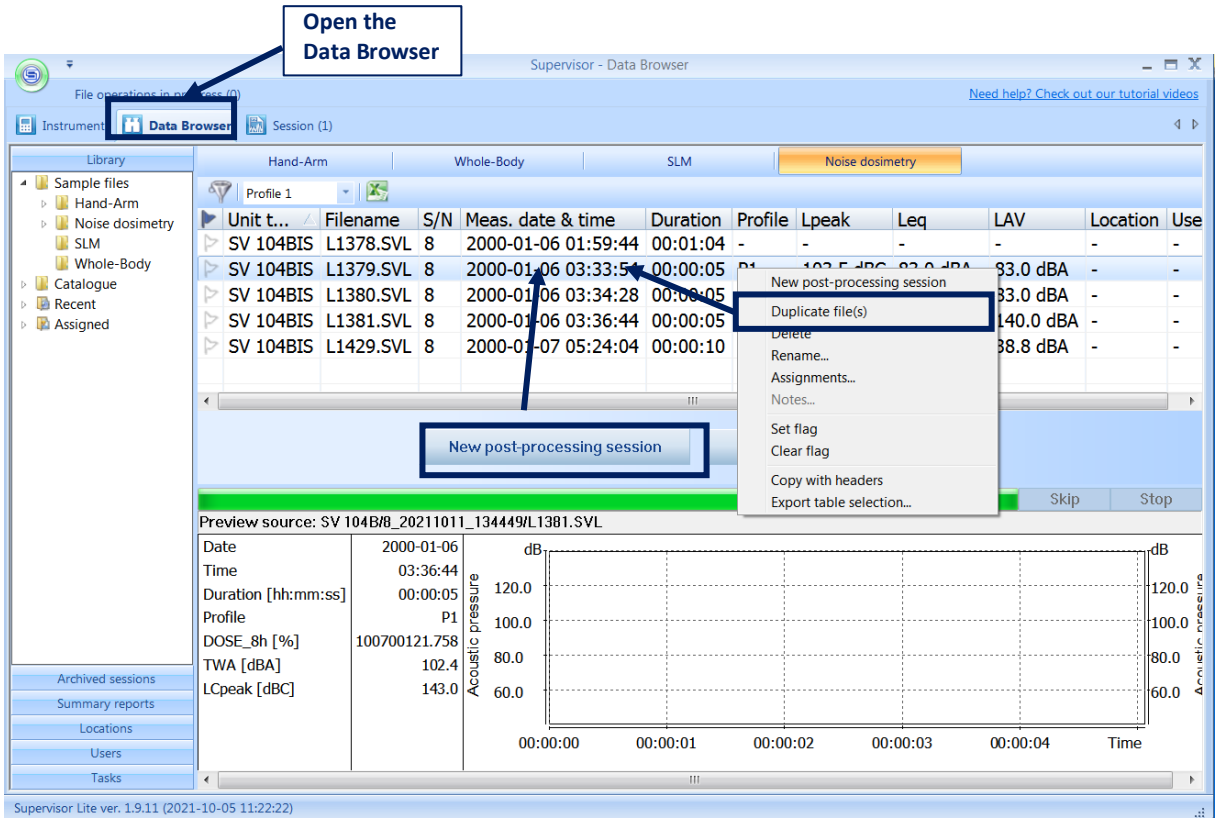


Figure 5-39 Creating a new session using the Data Browser

After using commands mentioned above, the special window will appear in which you should select the template for the post-processing session.

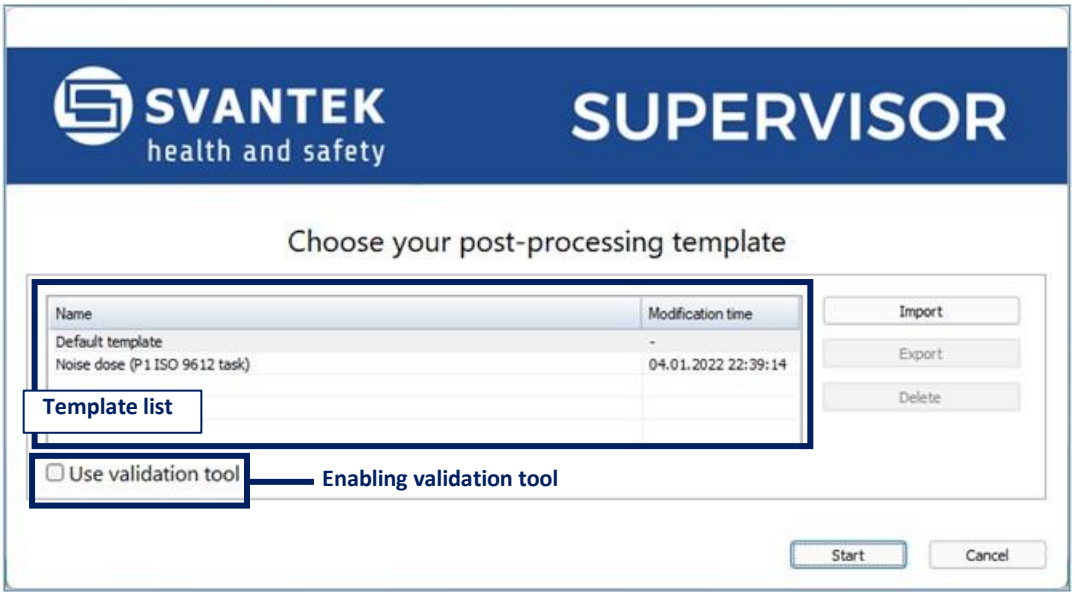


Figure 5-40 Choosing post-processing template

The template list contains predefined templates: *Default template*, templates related to the result type, e.g. *Noise dose (P1 ISO 9612 task)*, and templates created by the user, e.g. *New template*. Predefined templates cannot be deleted. User templates and result type related templates can be exported (saved as an .svlt file) to any catalogue on the PC. You can also import the previously exported template.

Each new session creates a tab in the bar at the top of the application window. To open a session, click the tab. Right-clicking on a tab opens a context menu that allows you to specify a custom name for a session or to close it. You can close a session in two ways: by deleting it (permanently) or by moving it to the archive, which allows you to work with it again later. Deleting a session does not delete any measurement files. The archived sessions are available in the Data Browser, in the Archived Sessions subpanel of the File Manager. The Delete All Sessions command can be used to delete all currently open sessions at once.

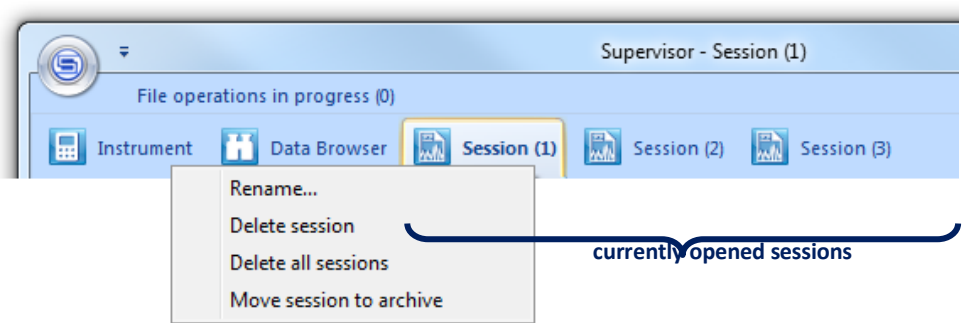


Figure 5-41 Tabs corresponding to the opened sessions

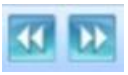
You can also close a session using the **Move to archive** and **Delete session** buttons in the bottom left corner of the window.

5.4.2 Validation tool

The Validation tool is used to check the accuracy of the measured data and to reject "disturbances" if necessary.

After creating a session with the **Use validation tool** option, the logger results view will appear with the Validation tool on the left, allowing automatic searching for marker areas:

- *No Motion*,
- *High vibration level*,
- *Audio event*, which is used as a basis for judging by ear whether a given fragment is correct or not.

You can move between the following ranges of these markers using the  buttons, where the selected range is highlighted with a block on the time history.

If there is an audio signal available within a given fragment of time history, you can listen to it.

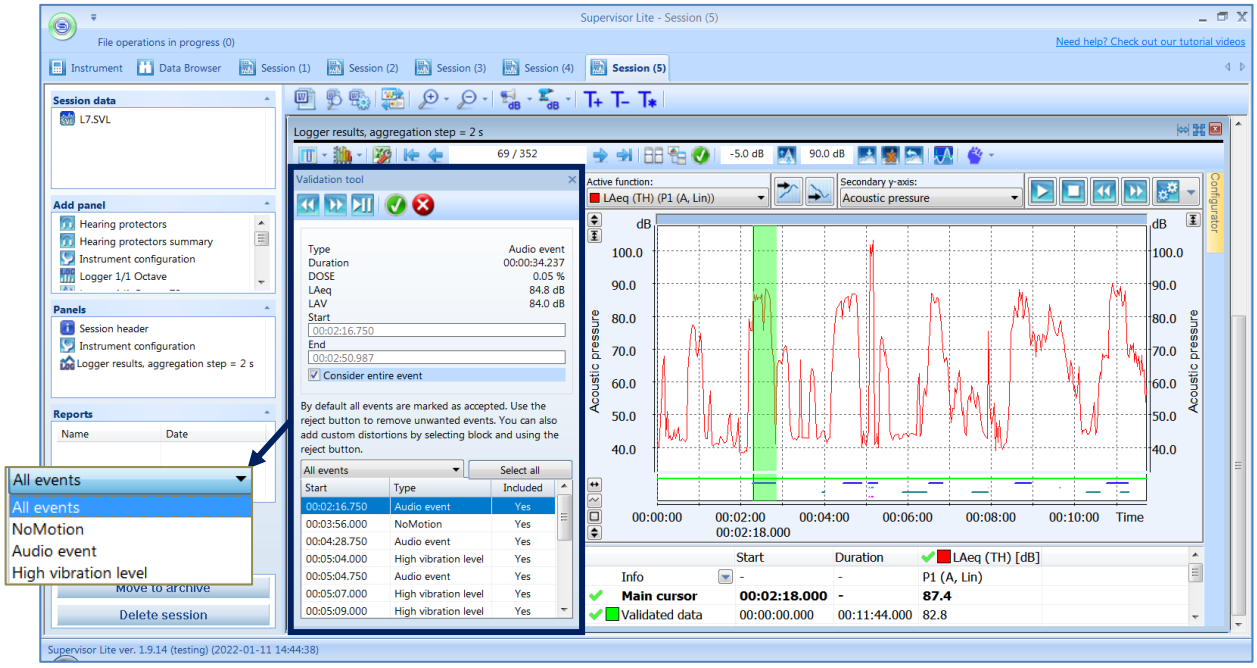


Figure 5-42 Validation tool panel

The following information is displayed for the following ranges:

- *Type* - the type of disturbance (i.e. the name of the marker)
- *Duration* - the length of the selected fragment
- *DOSE* / *LAeq* / *LAV* - dose / LAeq / LAV calculated for the selected fragment
- *Start* / *End* - start and end that can be manually "corrected" if we find that a larger or smaller fragment of the time history should be excluded from further calculations
- *Consider entire event* - is used to select the entire fragment of a given disturbance (selected by default) or should be unchecked if you want to enter it manually.

The disturbance list is displayed at the bottom of the Validation tool panel. The disturbance list is synchronised with the cursor on the time history graph, so that when you select the item in the list, the cursor shows that event on the right-hand graph.

Clicking the left selector above the disturbance list header allows you to apply a filter, for example, *No Motion*, *Audio event* or *High vibration level*. Click the left button above the disturbances list header to select or deselect all items in the list.

By jumping to successive disturbances and selecting them with the button, a given fragment is rejected from the calculations, while the button causes it to be accepted. There is a short blink when accepting/ rejecting.

The Validation tool generates the "Valid data" marker, which indicates the correct fragments of time history to be used in calculations in other calculation panels.

5.4.3 Session's Tollbar

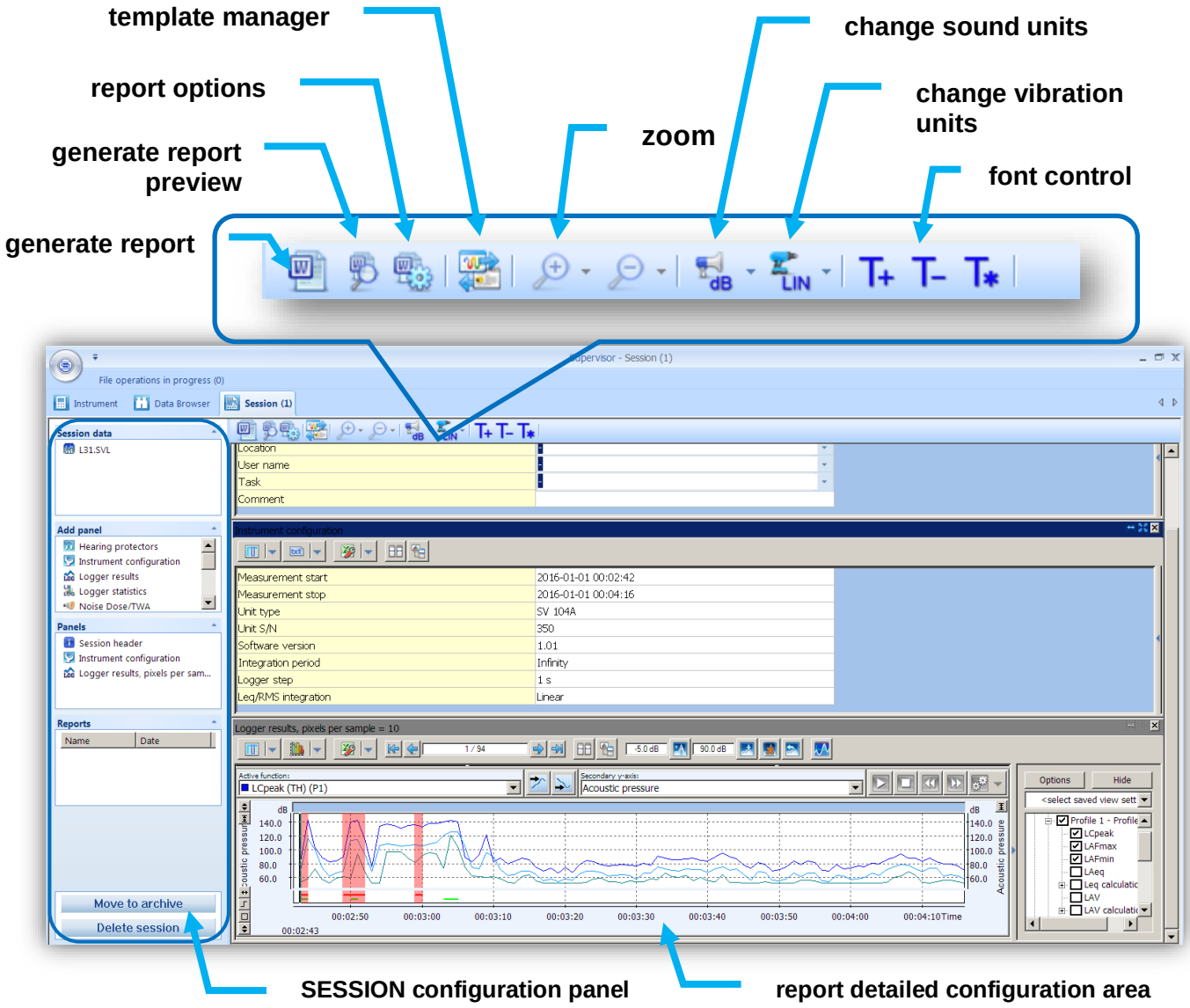


Figure 5-43 Supervisor main SESSION window

5.4.4 Session source data

The measurement data used to create sessions is contained in files stored in the Supervisor database. Several files can be used to create a single session. A list of the files used to create the currently open session is displayed in the **Session data** panel at the top left of the window.

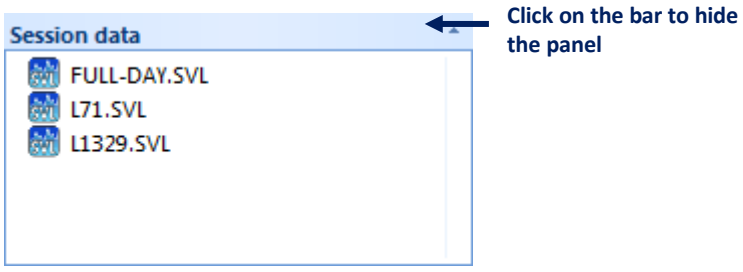


Figure 5-44 Session data panel, containing a list of files which have been used to create the current session

Once a session is created, you cannot change its data source. If you want to use different files in a session, you must create a new session with those files.

5.4.5 Session Panels

Panels are the basic building blocks of the reports created using Supervisor sessions. They can be used to configure the way data is displayed in the report.

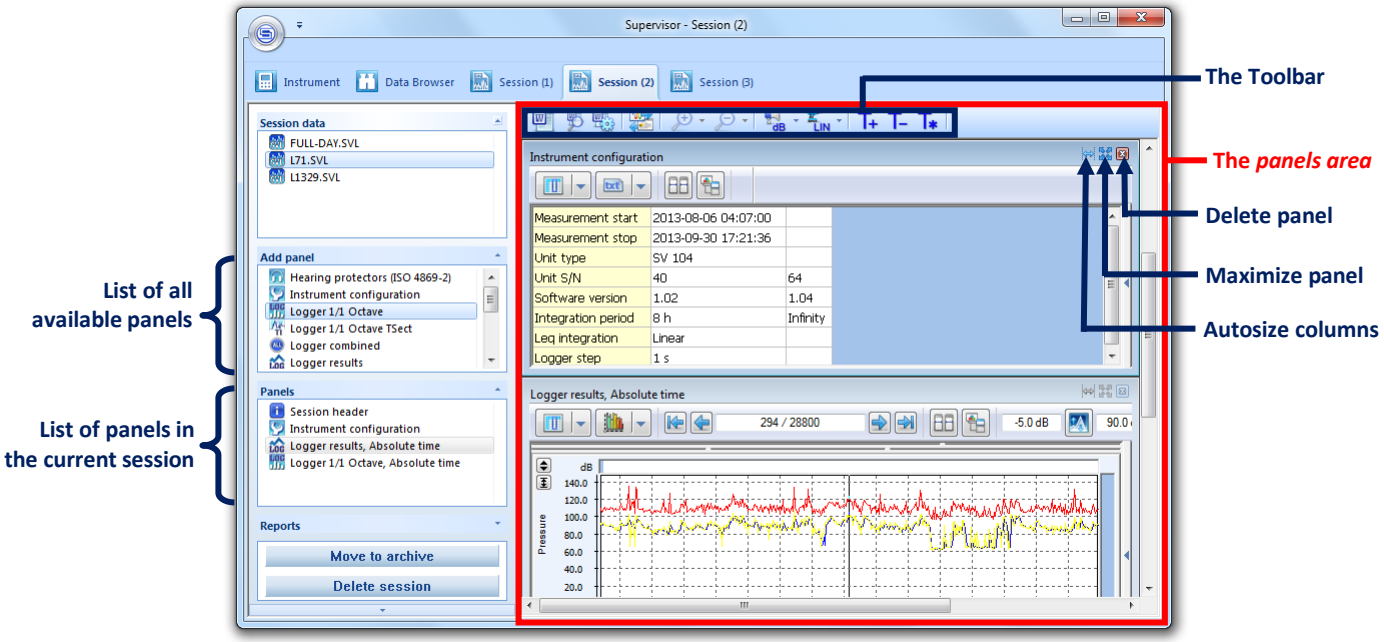


Figure 5-45 Panels in the Session window

The **Add panel** list (on the left of the window) shows all the types of panels available for the current data. You can add a panel to the current session by double-clicking on its name in this list.

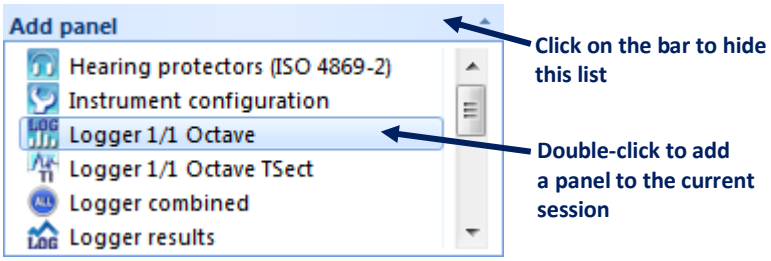


Figure 5-46 Add panel list of all panels available for the current data

You can add any number of panels, including multiple panels of the same type. All panels added to the current session are listed in the **Panels** list on the left of the window. You can use this list to jump to a selected panel by double-clicking on it. You can also rename a panel by selecting it and clicking on its name, or by pressing F2 when a panel is selected.

To delete a panel, use the button in the top right corner of the panel. To fill the entire panel area, use the button. Clicking the button again to return the panel to its previous size.

Panels are automatically scaled horizontally to fit the size of the panel area. Their vertical order determines the order in which the data is presented in the report. You can change the position of a panel using the drag and drop technique.

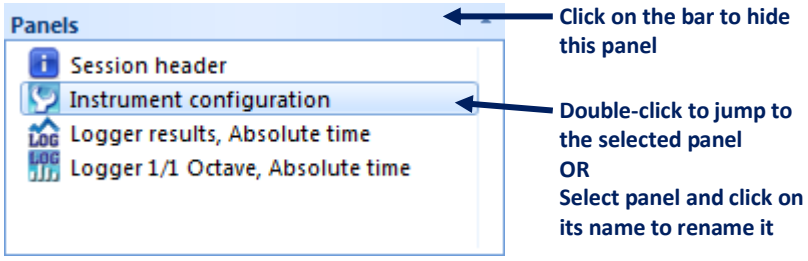


Figure 5-47 Panels panel, containing a list of panels added to the current session

Each panel is equipped with the **Configurator** tool, which allows you to select the information to be displayed on the panel.

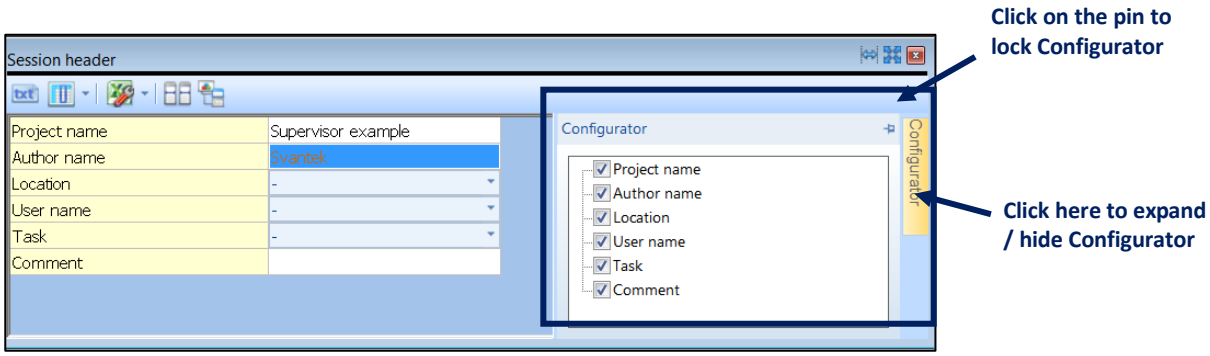


Figure 5-48 Configurator tool

The panel types available for the SV 104 instruments are listed in the table below. For a detailed description of the panels, refer to the Supervisor User Manual.

Icon	Name
	Session header
	Instrument configuration
	Logger results
	Total results
	Logger statistics
	Statistical results
	Logger spectrum results
	Time Intersection
	Spectrum results
	Text
	Hearing protectors / summary
	Noise exposure
	'What if'
	Map
	Wave

5.4.6 Generating reports from sessions

You can easily generate a report with measurement data displayed in the same way as in the current session by clicking on the  button on the Toolbar.

The report can be created in one of the following formats:

- DOC (if MS Word 2003 or newer is installed),
- PDF (if MS Word 2007 or newer is installed),
- RTF.

The generated file will contain a start page and all the contents of the panels (in the same order and with the same graphical settings).

All the reports created during the current session are listed in the **Reports** panel in the bottom left of the window. Double-click on a report name to open it in MS Word.

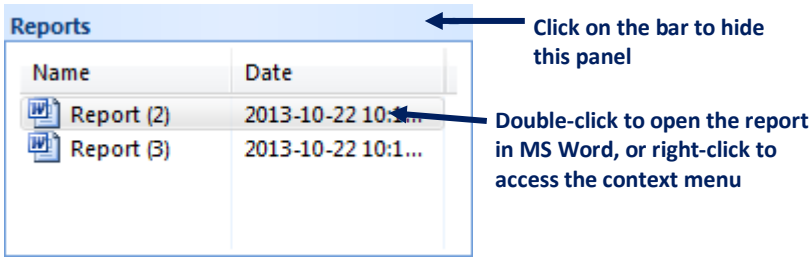


Figure 5-49 Reports panel

Right-click to open a context menu that allows you to open, rename and delete reports.

The report start page and the style can be customised using the **Report options** dialog box, which can be opened by clicking the button. Instead of customising the start page, you can choose not to include it in the reports at all.

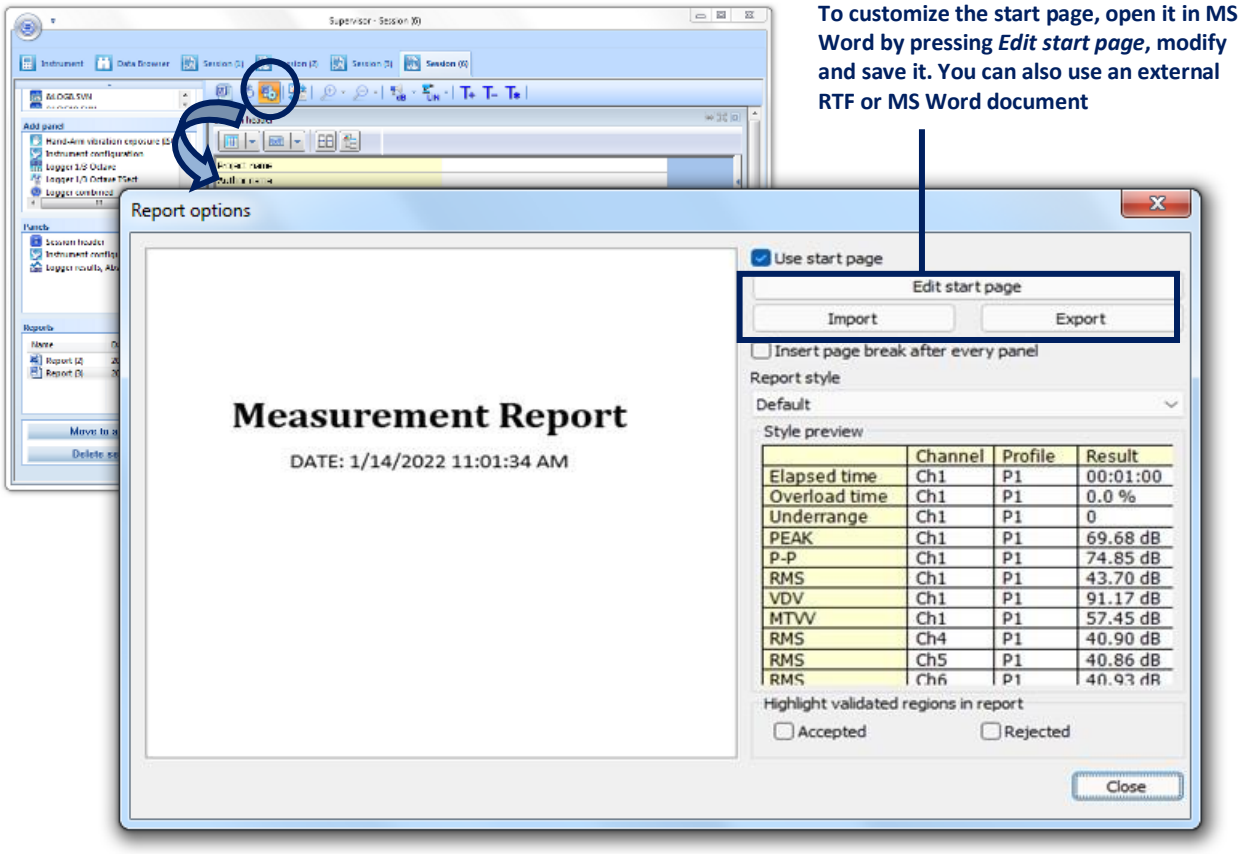


Figure 5-50 Report options dialog box

6 ASSISTANT MOBILE APPLICATIONS

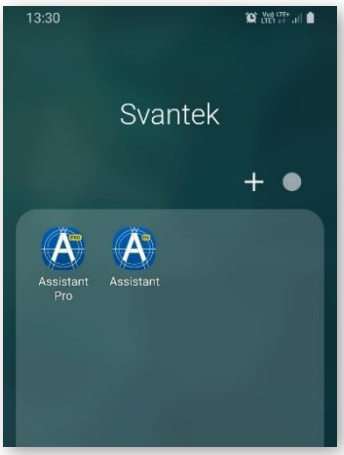
Svantek offers applications for mobile devices (smartphones and tablets) that extend functionality of SV 104 equipped with Bluetooth®: ***Assistant Pro*** and ***Assistant HS***. These applications use the Bluetooth® interface to view current results and control the measurement from a mobile device.

Assistant Pro allows management of instrument settings, download of data files, and create markers for special events that occur during the measurement.

Assistant HS can send e-mail notifications if the certain thresholds are exceeded.

6.1 INSTALLING THE SVANTEK APPLICATION ON A MOBILE DEVICE

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



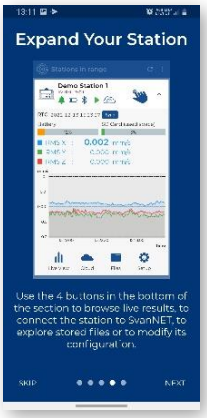
To start working with the Svantek application, tap the application icon on your mobile device.

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

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

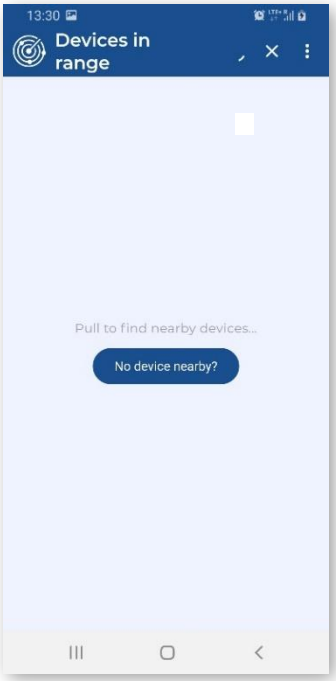
The application will detect visible instruments and, if the automatic connection feature is enabled, will attempt to connect to them.

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



6.2 ASSISTANT PRO

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



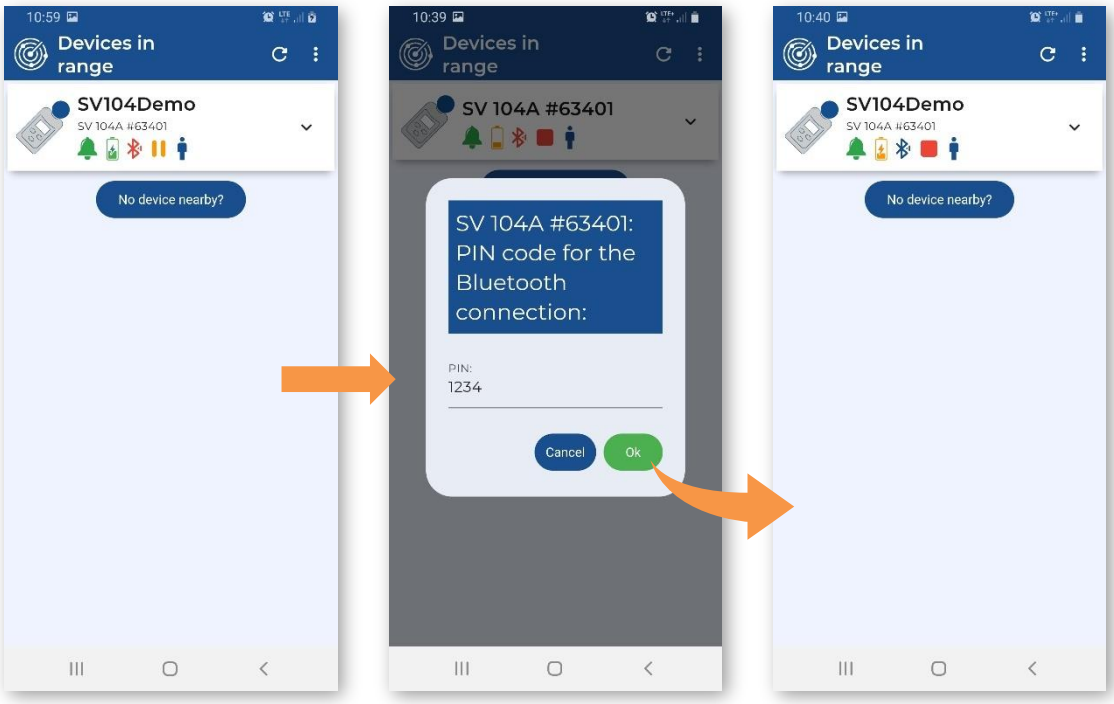
While scanning the instruments, the “scanning” icon is displayed in the upper right corner. You can stop scanning by tapping . When scanning is complete, the “scanning” icon changes to . To start scanning, tap .

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

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

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

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



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

6.2.1 Description of the status icons

The instrument status icons have the following meanings:

Event alarms. If the icon is green there is no current event alarm; if it is red, there is a current event alarm.

Battery status. When the battery is low, the icon changes colour to red.

Bluetooth – connection being used by another mobile device.

Bluetooth – not connected.

Bluetooth – when connecting.

Bluetooth – connected.

The instrument is measuring.

The instrument is not measuring.

The instrument is moving

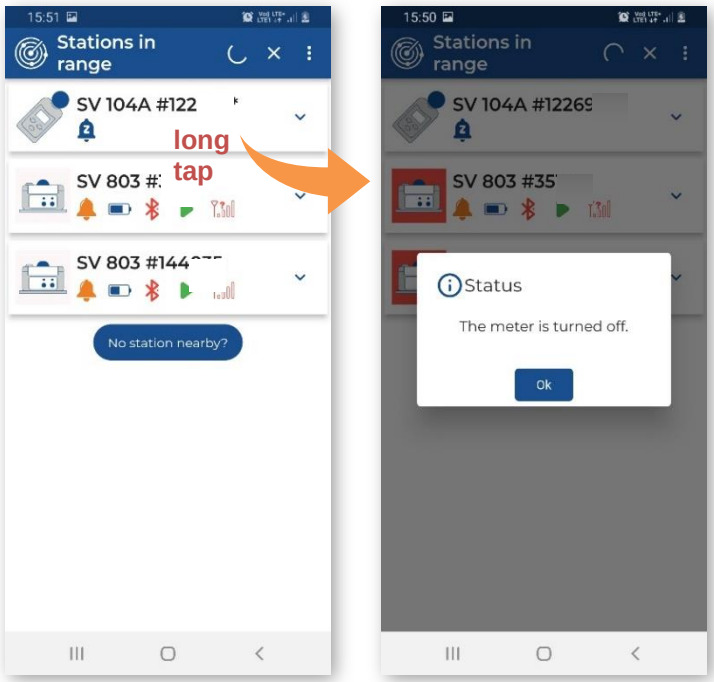
The instrument is in not moving

Snooze state. The SV 104 instrument is off, Bluetooth is on.

When the instrument is in the snooze mode, it emits the Bluetooth signal.

If you long tap the instrument bar in this mode, the only one item in the pop-up menu will appear – **Status**.

If you tap **Status**, the information that the instrument is turned off will appear (see Chapter 6.2.4).



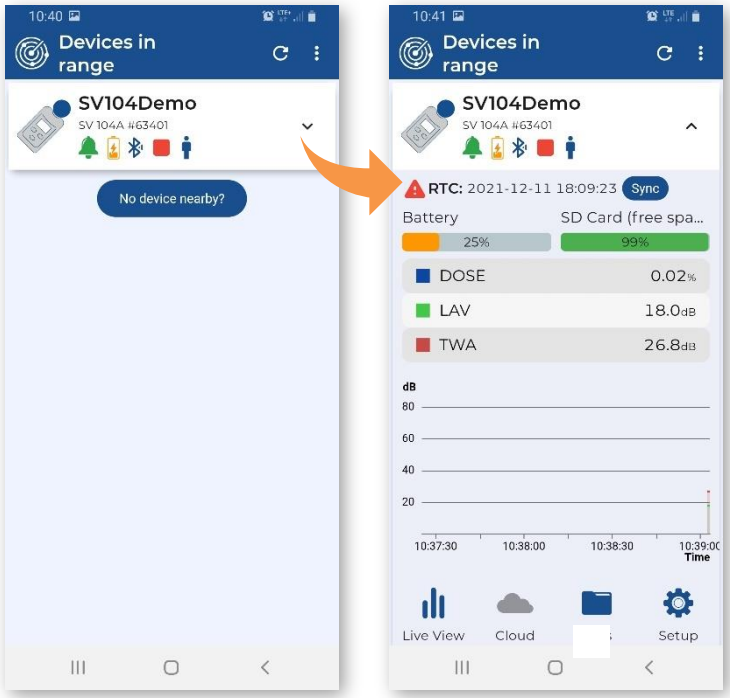
6.2.2 Controlling the instrument

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

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

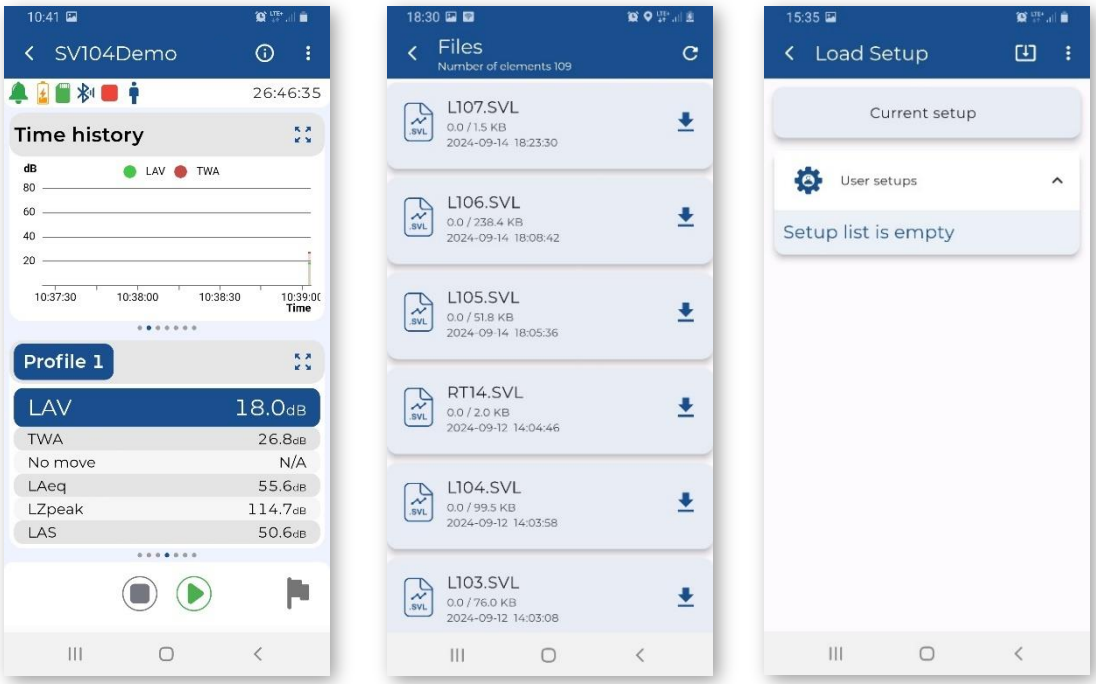
Four icons at the bottom of the panel give you quick access to some functions:

- **Live View** – viewing live results with the possibility to start/stop the measurement,
- **Cloud** – connecting to the *SvanNET* web service (this icon is inactive for SV 104),
- **Files** – downloading instrument files (the icon is hidden by default, see Chapter 6.2.9),
- **Setup** – configuring instrument settings



***Note:** The **Files** icon is hidden by default. To make it visible and to be able to manage instrument files, you should activate it (see Chapter 6.2.9).*

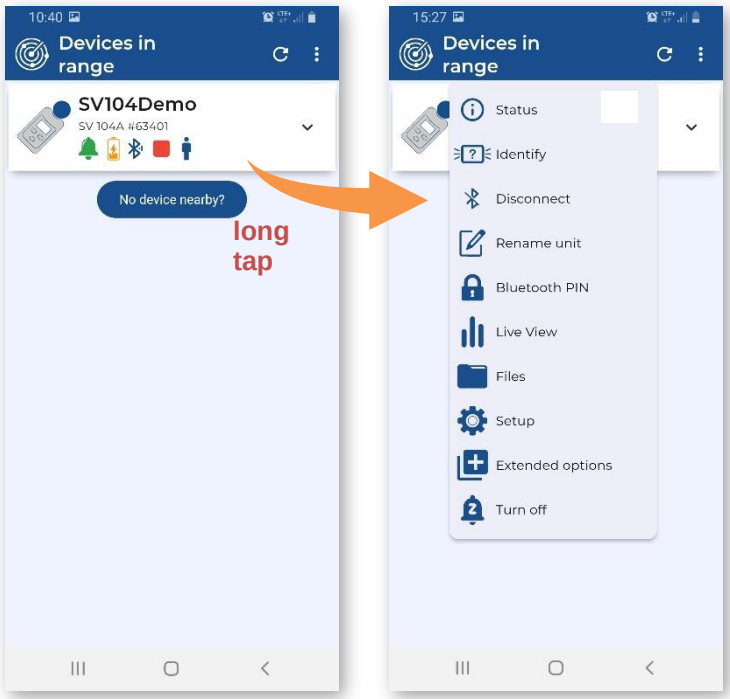
Below are screens after tapping function icons: **Live View**, **Files** and **Setup**.



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

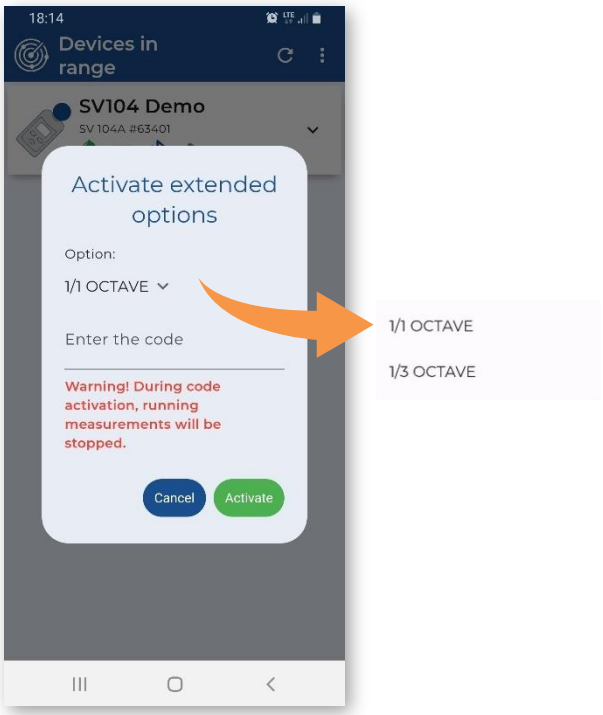
The pop-up menu that appears after a long tap on the instrument bar allows you to:

- check the **Status** of the instrument,
- **Identify** the instrument connected,
- **Connect** or **Disconnect** the instrument,
- **Rename unit** for personalisation,
- enter the **Bluetooth PIN** during connection or change the PIN in the instrument after successful connection,
- view current measurement results - **Live View**,
- open the file list – **Files** (the item is hidden by default, see Chapter 6.2.9),
- configure instrument settings - **Setup**,
- unlock **Extended options**,
- **Turn off** the instrument.



6.2.3 Unlocking extended options

The extended options can be activated by entering the special code that unlocks this option. Once unlocked, the option is permanently available.



6.2.4 Auxiliary commands

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

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

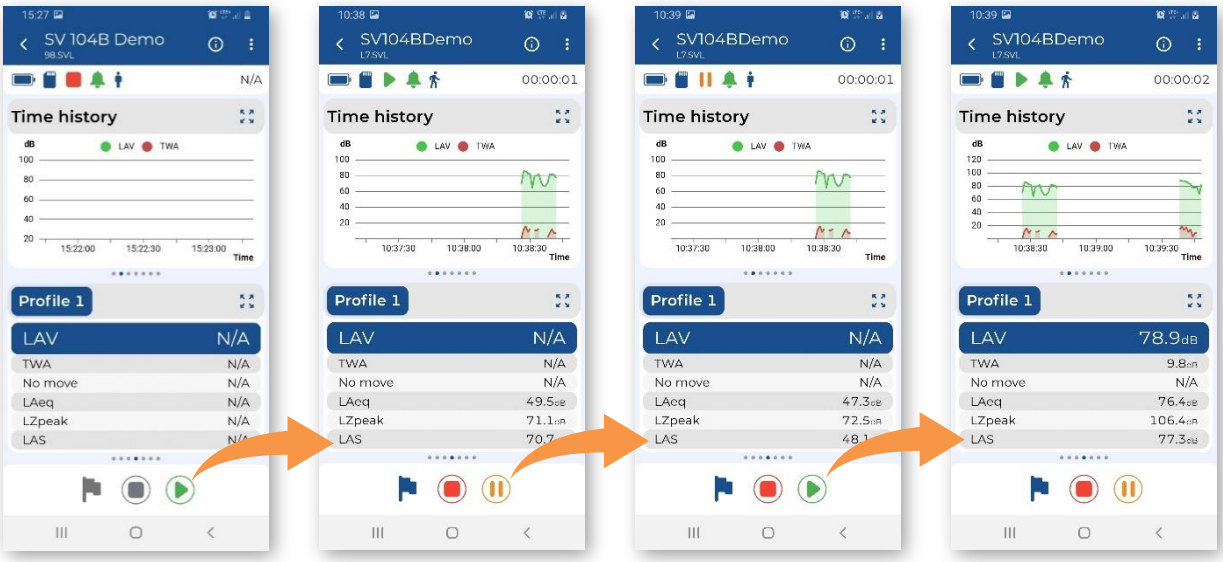
When you tap **Connect**, your mobile device begins to connect to this instrument via Bluetooth. When the connection is successful, this command changes to **Disconnect**. And vice versa.

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

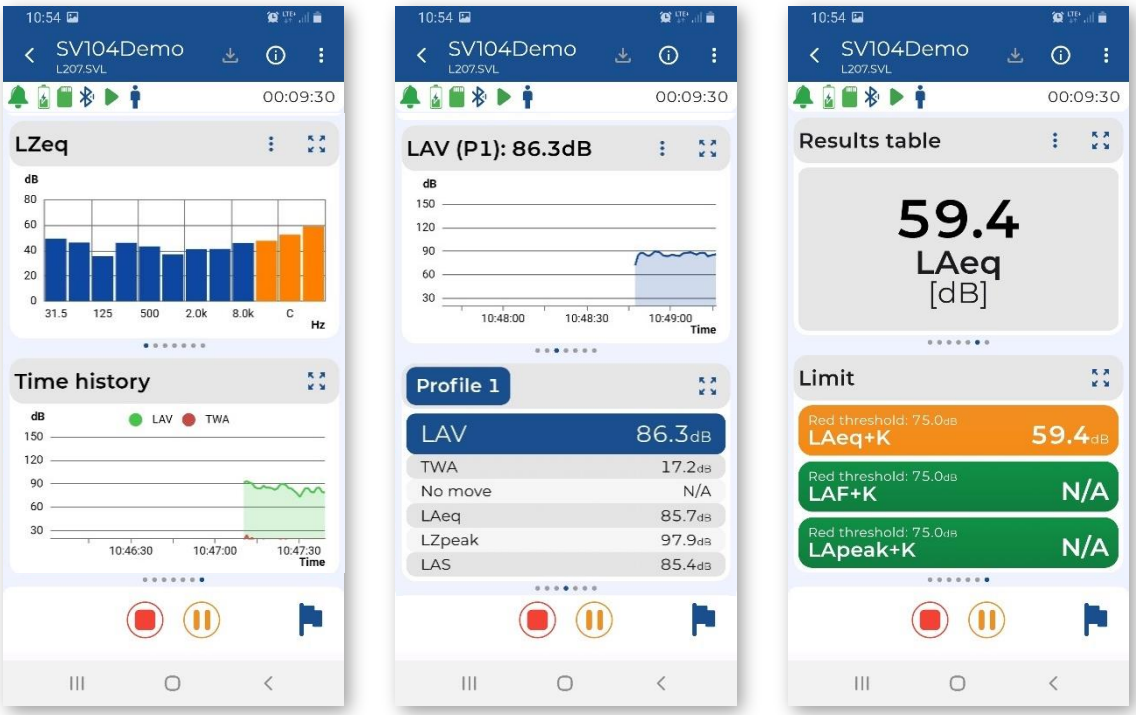
When you tap **Bluetooth PIN**, the dialog appears where you can change the Bluetooth PIN code.

6.2.5 Live View

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

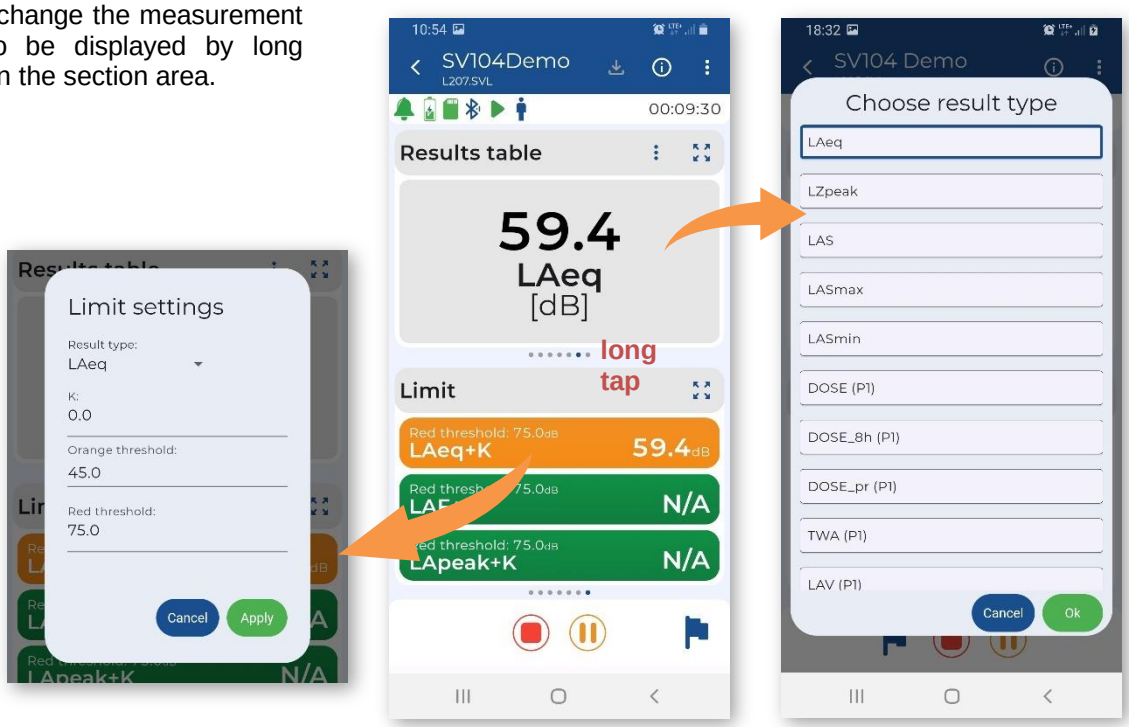


Below are some combinations of view, including spectra, time-histories of some results, current results values.

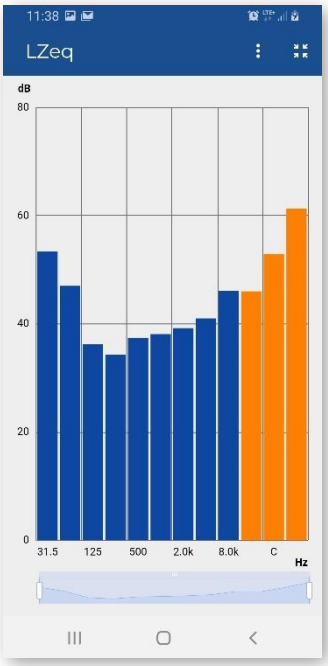


Note: Live view *shows the limited set of measurement results. The full set of measurement results is stored in the instrument files and can be viewed using Supervisor or SvanPC++.*

You can change the measurement results to be displayed by long tapping on the section area.



You can expand each section to the full screen by tapping on the icon.



You can rotate the screen to view the graph at a higher resolution.

Tap on the graph area to activate the cursor with readings.

To deactivate the cursor, tap outside the graph area.

You can zoom in and zoom out the selected time or frequency range using two fingers or the bar below the graph.

During the measurement, you can tap the marker icon to open the **Create Marker** dialogue box, where you can activate the marker and assign to this marker the photo, video, or audio recording.

Tap **Title** to enter the marker name.

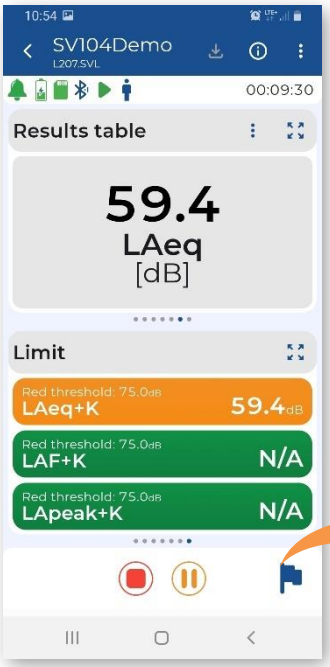
Tap **Comment** to enter the comment text.

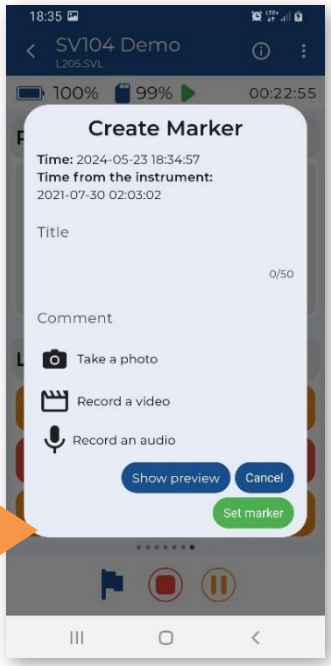
Tap **Take a picture** to add a picture to this marker.

Tap **Record a video** to add a video to this marker.

Tap **Record an audio** to add an audio to this marker.

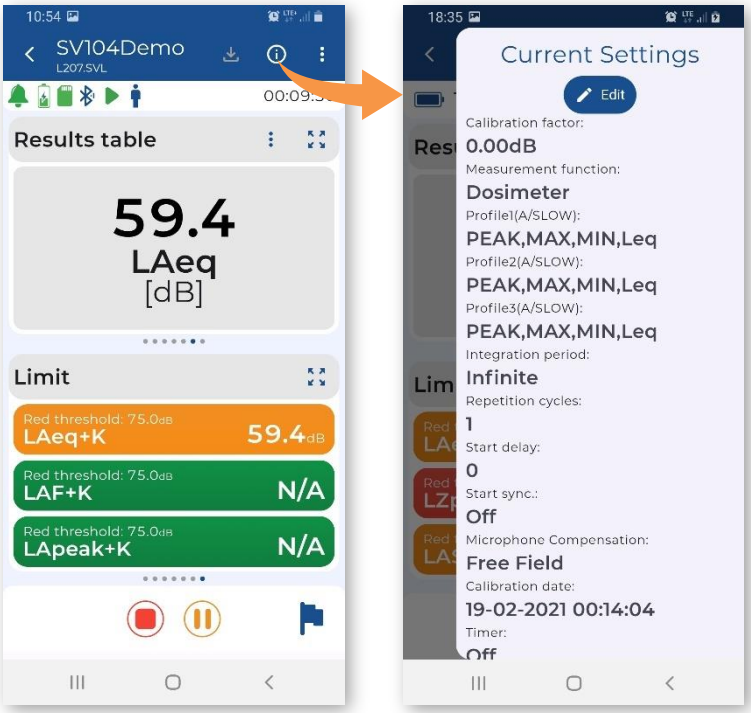
Tap **Set marker** to set a marker.



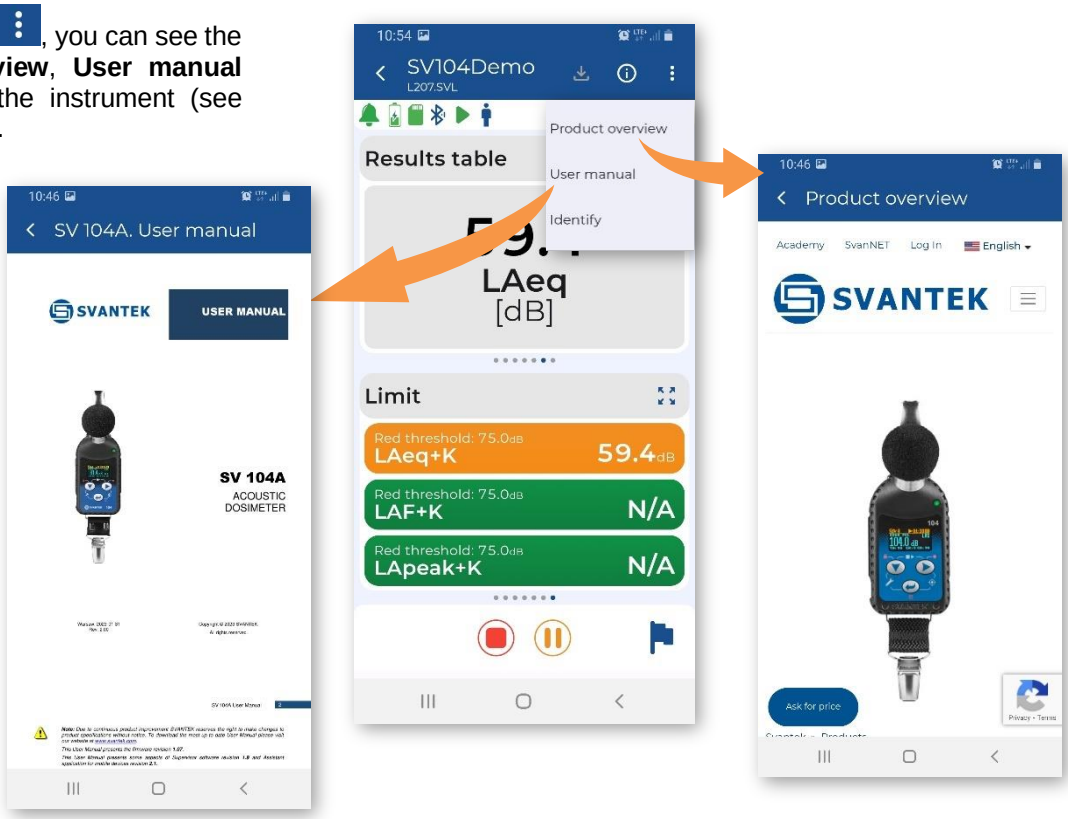


Tap the ⓘ icon to display the current settings for the device.

Tap **Edit** to edit them.



When you tap ⋮, you can see the **Product overview**, **User manual** and **Identify** the instrument (see Chapter 6.2.4).

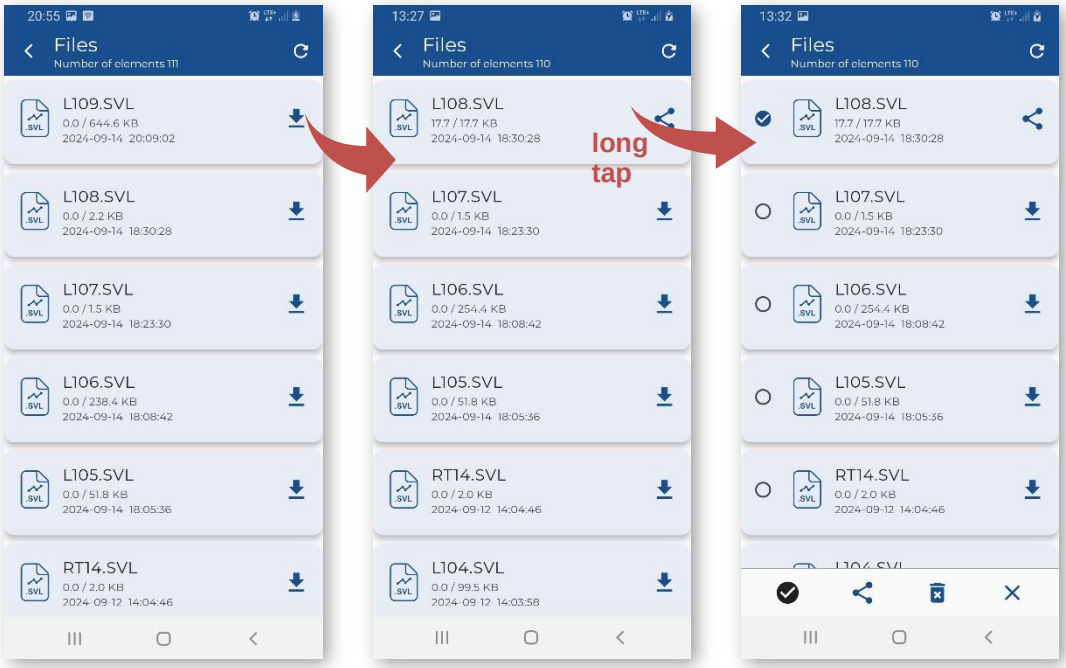


When you tap **Identify**, the name of the device appears on the display.

To return to the “Stations in range” screen, tap the ‹ icon.

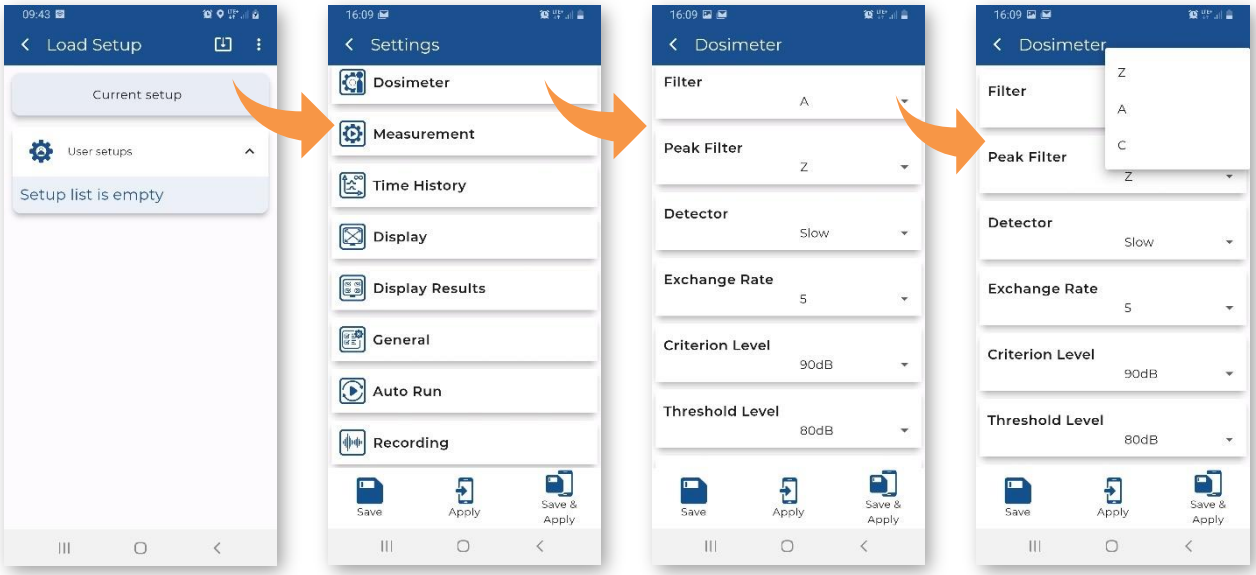
6.2.6 Files

The **Files** section displays the list of files created by the instrument on the instrument's memory card. You can download any file to your mobile device. Once the file is downloaded, you can share it. To delete the file, long tap on the file to select this file or multiple files, then tap the icon.



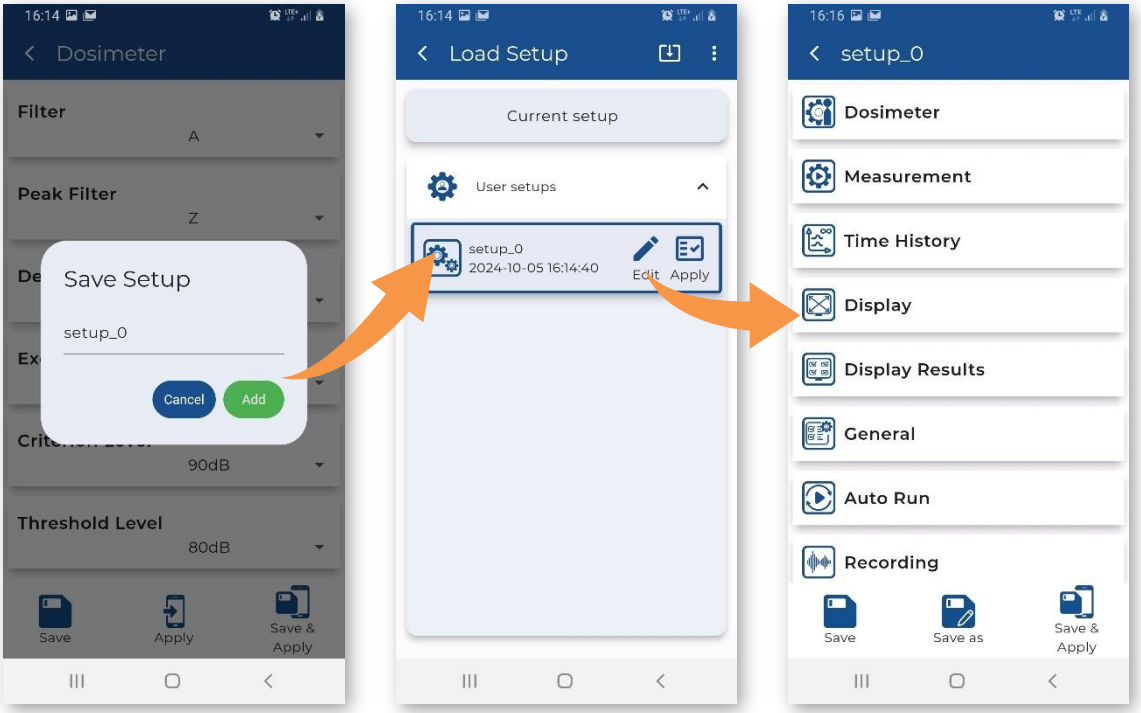
6.2.7 Instrument and measurement settings

The **Settings** section allows you to configure the measurement and specific instrument settings. The settings are grouped in sections such as **Dosimeter**, **Measurement**, etc., which contain sub-sections, etc. The last item in such a hierarchy consists of parameters that you can set, e.g., **Filter**: *Z, A* or *C*.



After configuring the settings, you can save them to the mobile device catalogue (**Save**), load them to the instrument as the current settings (**Apply**), or save and load them simultaneously (**Save & Apply**).

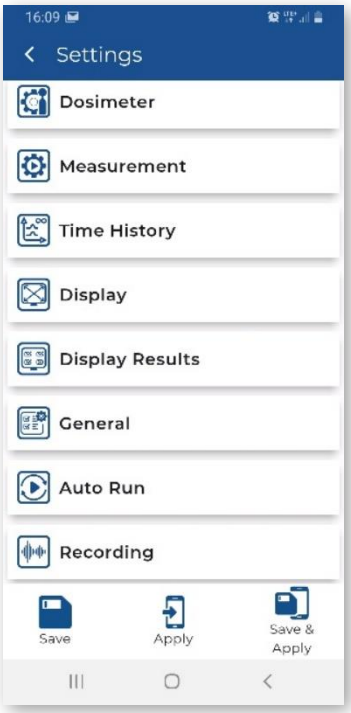
When you save settings, a new setup file is created in the dedicated application's directory on your mobile device, but the current instrument settings are not changed. You can load the settings saved in the file to the instrument. To do this, open the **User Setups** section, select the file with the desired settings, tap it, and select **Apply**. You can **Edit** these settings if necessary.



The measurement and instrument settings generally have a similar structure as in the *Supervisor* PC software (see Chapter 5.2).

The configuration menu (**Settings**) contains the following sections that allow you to:

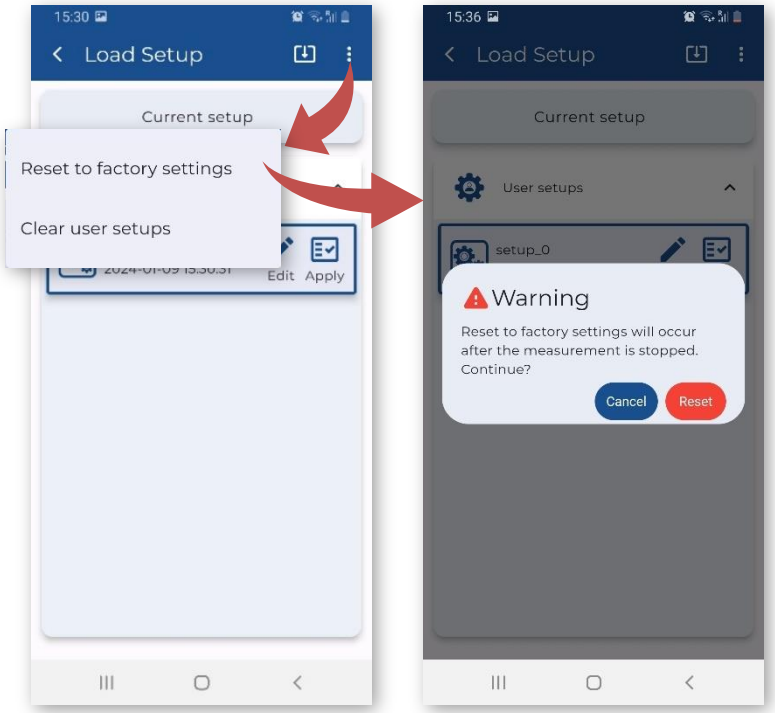
- **Dosimeter** - configure the acoustic profiles (see Chapter 0),
- **Measurement** – select the measurement function and set basic measurement parameters (see Chapter 5.2.5),
- **Display** and **Display Results** – configure the way the measurement results are displayed (see Chapter 5.2.7),
- **General** – configure calibration, statistics, keyboard and auxiliary settings (see Chapter 5.2.9),
- **Auto Run** – configure five independent pauses in real time (see Chapter 5.2.10),
- **Recording** – configure the time domain signal recording (see Chapter 5.2.11),
- **Spectrum** – configure 1/1 octave and 1/3 octave settings if these functions are enabled (see Chapter 5.2.8).



6.2.8 Restoring factory settings

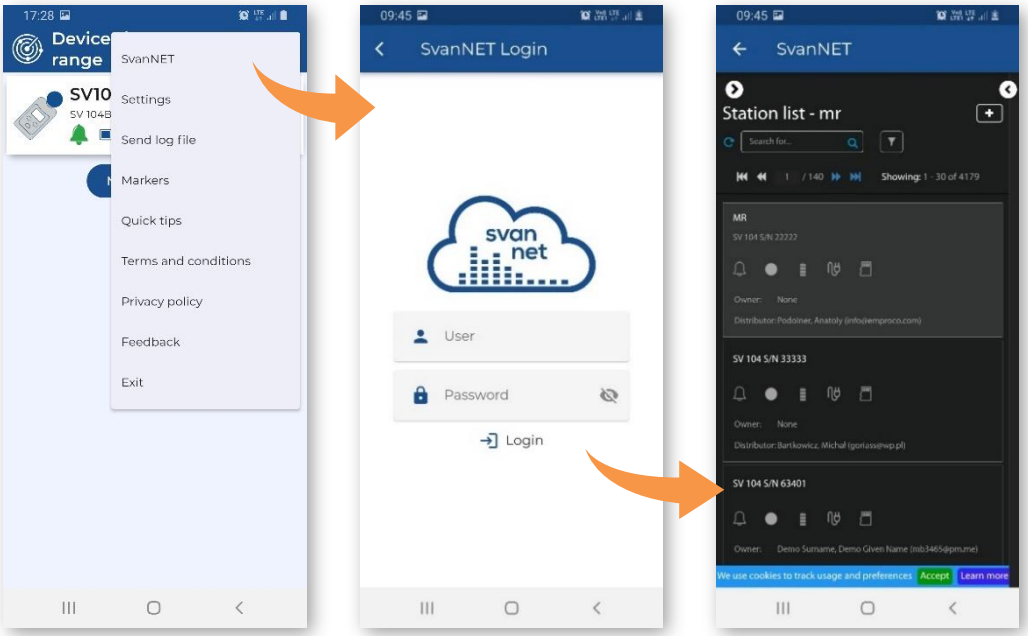
By tapping ⋮ in the **Load Setup** screen, you can:

- **Reset to factory settings** and
- **Clear user setups**.

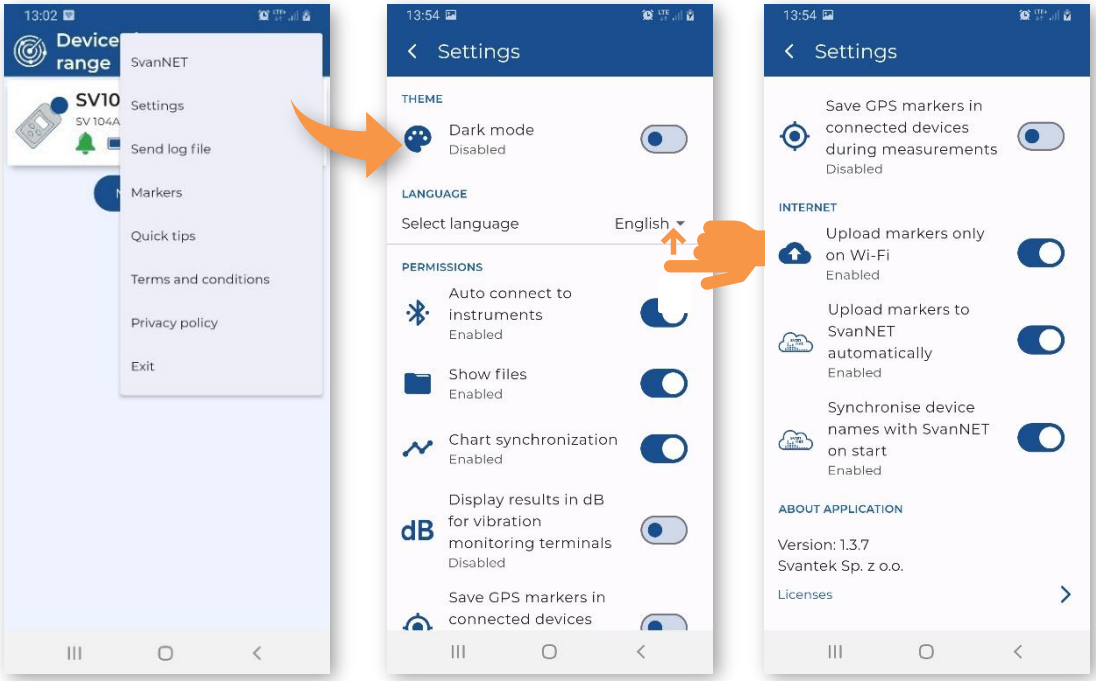


6.2.9 Assistant Pro auxiliary functions and settings

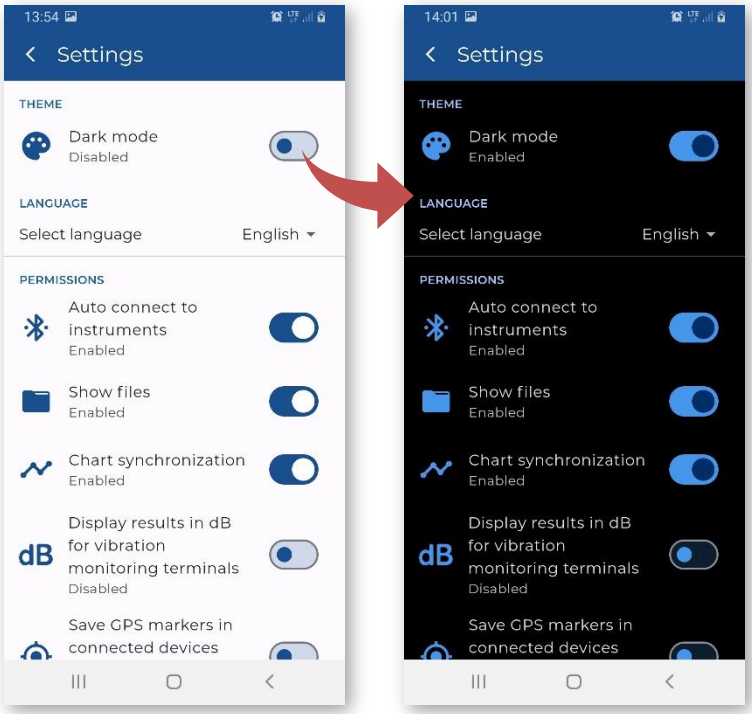
By tapping ⋮ in the **Devices in range** screen, you can open *SvanNET* in your mobile device, configure *Assistant Pro* settings, view, edit and share previously created markers, get quick tips, read the terms and conditions and privacy policy, get feedback, for example, from the Svantek support team and exit the application.



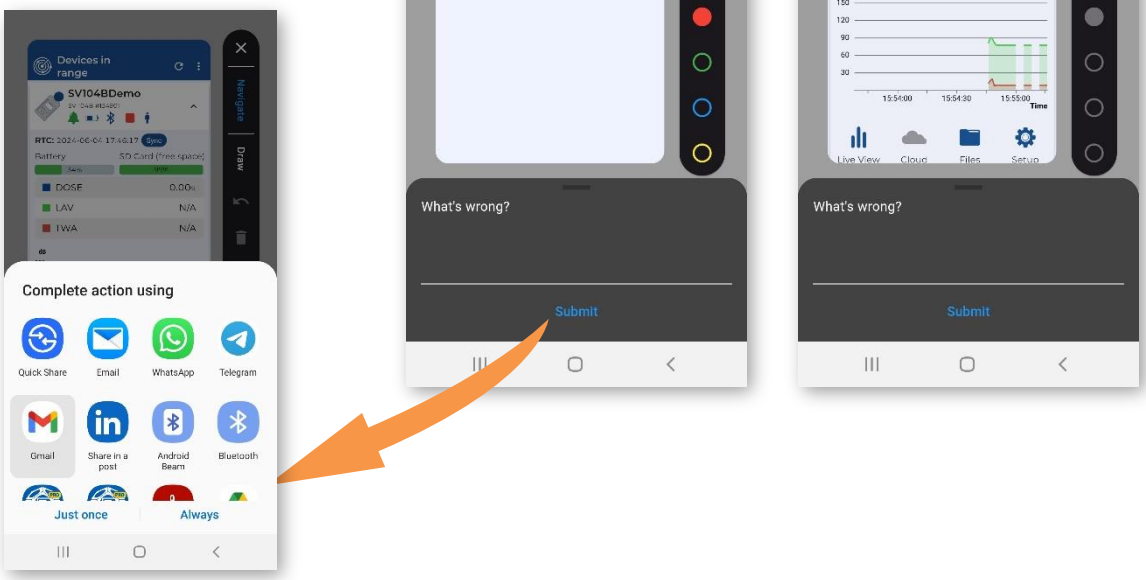
In the *Settings* screen, you can choose the application THEME (enable or disable the **Dark Mode**), choose the application *LANGUAGE*, enable or disable some *PERMISSIONS*: automatic connection with the visible instruments (**Auto connect to instruments**), add/delete the Files item in the pop-up menu (**Show files**), switch on/off synchronization of cursors on different charts (**Chart synchronization**), display results in dB for vibration measurements, save GPS markers in the data files, enable uploading markers (**Upload markers only on Wi-Fi**, **Upload markers to SvanNET automatically**), enable synchronization of the station name with SvanNET and get information about the application version (***ABOUT APPLICATION***).



You can activate the **Dark mode** to save the power of your mobile device.



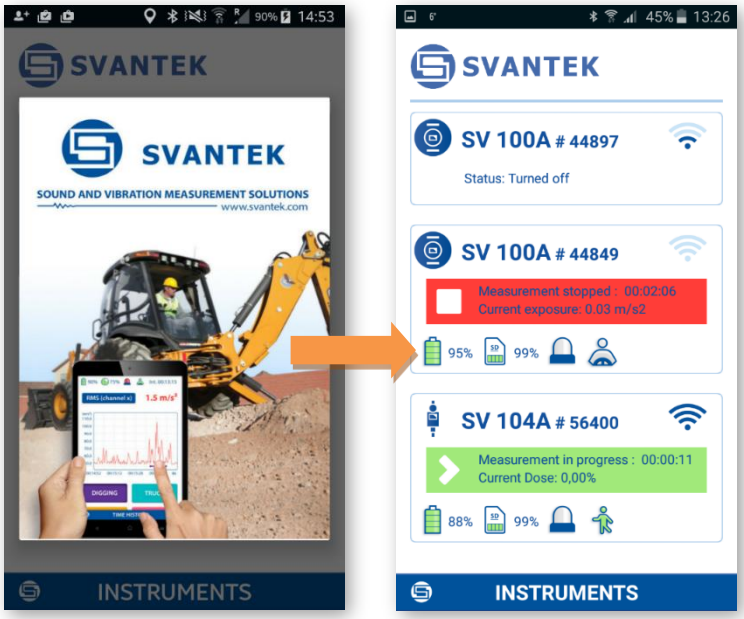
In the Feedback screen, you can select the screen you want to share with, for example, the Svantek support team using the **Navigate** option, then draw any helpful drawing using the **Draw** option, write what is wrong and finally send it where you want using the **Submit** button and the sharing options available on your smartphone.



6.3 ASSISTANT HS

When you run *Assistant HS*, the application starts screening the instruments. Instruments compatible with *Assistant HS* with enabled Bluetooth® broadcast their basic status and some basic data which are visible on a mobile device running the application.

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



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

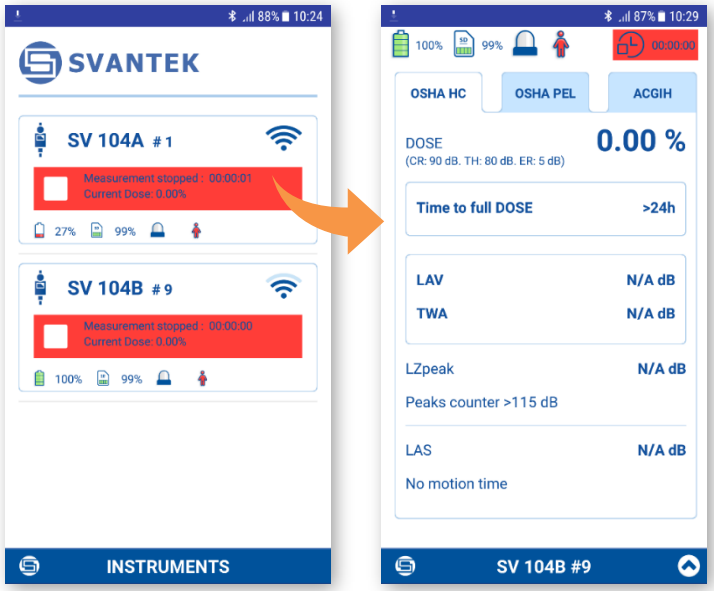
The *Assistant HS* application has two main views: status view and control view.

The status view displays the Svantek instruments which were found in the Bluetooth range.

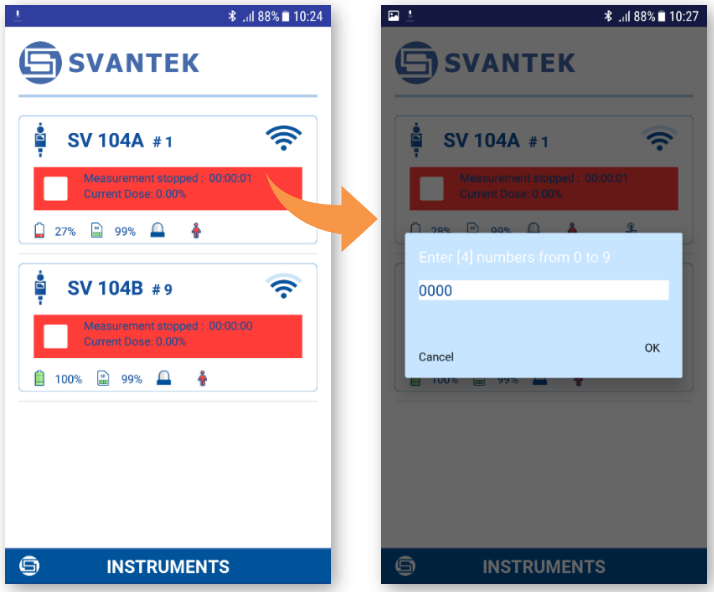
The control view displays current results and spectrum.

To switch from the status view to the control view, tap the instrument you would like to control.

If you wish to come back to the status view, just press the BACK button on your mobile device.



If the instrument was not paired before, you will be asked to enter the PIN code in a special box.



6.3.1 Status view

Each instrument status is displayed in the frame that contain the instrument name and its serial number. Below the instrument status is displayed. If the status is not **Turned off**, the measurement and instrument status is shown. The measurement status is shown by the colour of the measurement status bar, if the measurement is stopped the bar is red, if in progress, the colour is green, if in pause – yellow.

The instrument status is displayed by means of icons that inform you about:

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

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

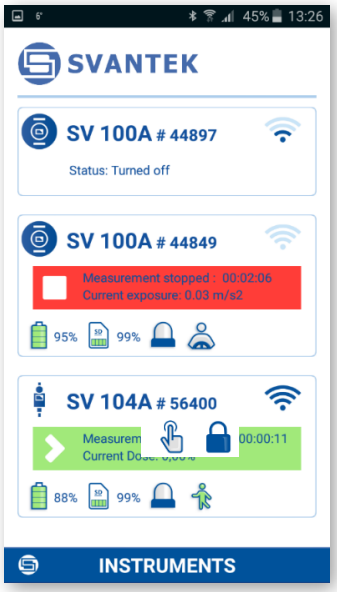
Dose **alarm**. If the dose exceeds the threshold level, the icon is red, and the mobile device vibrates.

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

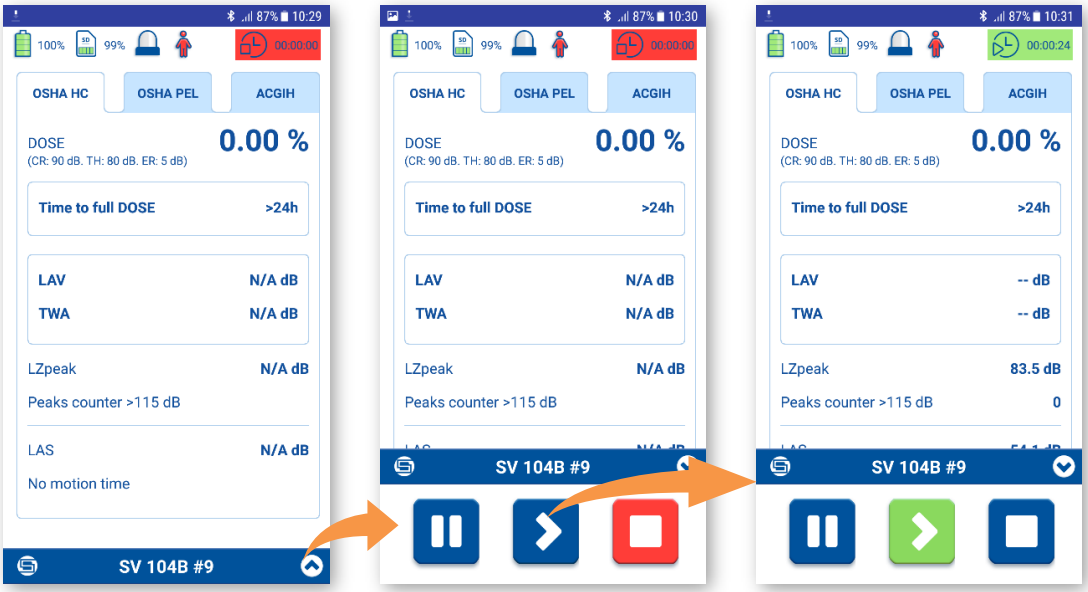
- The instrument SV 104A #56400 is switched on and measurement is running. Current Dose value is displayed. The controlled person presses the instrument's button, and this instrument is already controlled by another mobile device. Note, that since scanning there may be a few seconds' delay.

6.3.2 Control view

The control view enables you viewing of measured results and controlling the measurement.

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

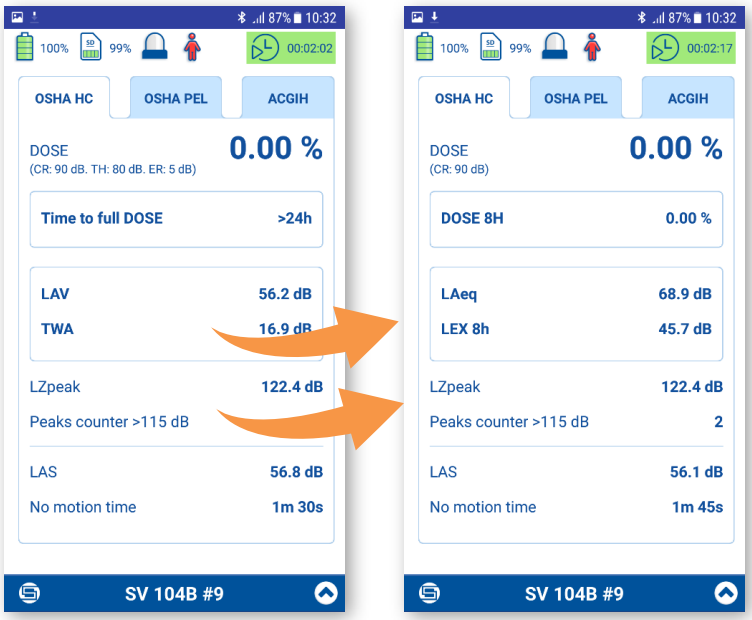
In this view, you can Pause, Start, or Stop a measurement run tapping the appropriate icon on the measurement control bar. Stopping the measurement run requires confirmation.



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

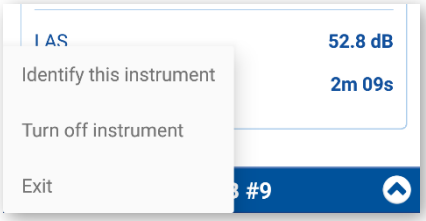
You can also navigate thru the **acoustic profiles** by pressing certain tab at the top of the screen with profile's names, defined in the setup.

You can change the **Time to full DOSE** parameter within **Assistant** application by pressing its bar on the screen.



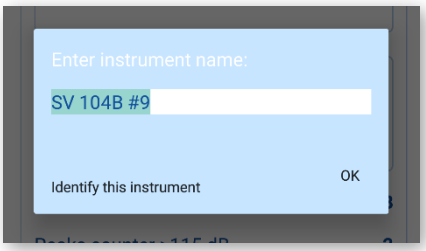
After pressing the  button, the pop-up menu appears in which you can:

- Identify the paired instrument.
- Turn the instrument off.
- Exit the application.



After tapping **Identity this instrument**, the pop-up box with the current name of the paired instrument will appear. If you tap "Identify this instrument" in this box, 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.



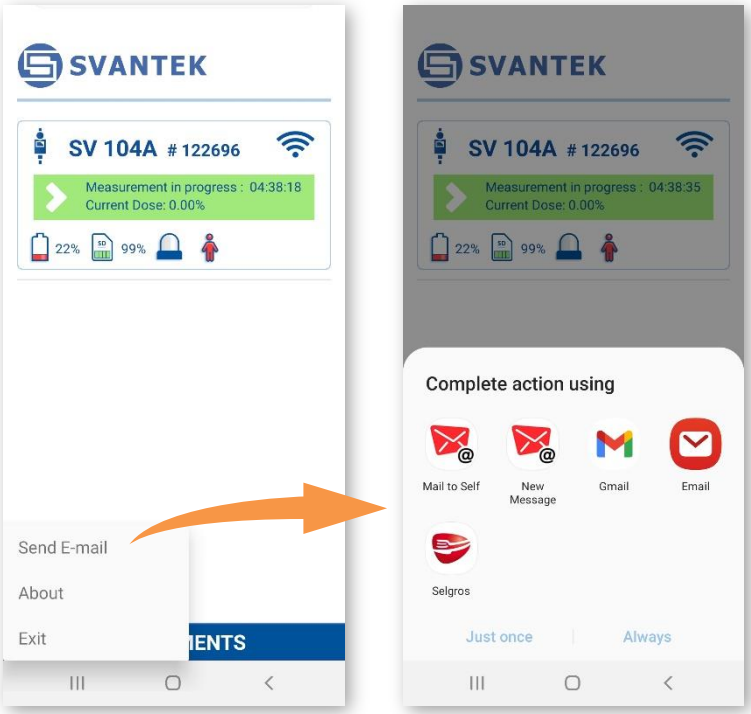
6.3.3 E-mail notifications, software version, exiting the application

If you tap the  icon in the lower left corner of the status view, the menu with three positions appear to enable you to:

- exit the application (Exit),
- check the software version (About),
- send e-mails directly from the application based on pre-programmed alarm conditions. Notifications are sent when the certain thresholds are exceeded.

The recipient and contents of the E-mail is defined after selecting the appropriate e-mail application.

Alarm conditions are set via the **Supervisor** software and uploaded as **setup** configuration files (Chapter 5.2).



7 SV 104A MAINTENANCE

7.1 GENERAL RECOMMENDATIONS FOR USE

- Do not disassemble or modify the instrument. The battery inside contains safety and protective devices which, if damaged, may cause the battery to generate heat, explode or ignite.
- Do not leave the unit or accessories in direct sunlight for long periods of time. Doing so may cause the battery contained inside to generate heat, explode, or ignite. Such use may also result in loss of performance and shortened life expectancy.
- Do not leave the unit discharged for long periods.
- Charge the instrument before switching it on if it has not been used for a long time or has been stored in a low battery condition.
- To improve the accuracy of the remaining battery life indicator, run the instrument to a complete discharge, then proceed with a full charge. This procedure is recommended before first use. Repeat this procedure after each year of use to maintain more accurate battery life indication.

7.2 CLEANING

A few things to remember:

- Whenever the instrument becomes too dirty, clean the surface of the dosimeter with a damp, soft cloth. Under no circumstances should this device be cleaned with a solvent-based cleaner (it may damage the polymer materials of the case).
- Take particular care to ensure that the supplied windscreen is clean, as dirt can affect the measurements. Remove the windscreen, shake off any dirt and clean with a damp cloth. If necessary, replace the windscreen with a new one. The foam windscreen is a consumable item and must be replaced if it is lost or deteriorates excessively. Replacement windscreens are available in packs of 3, part number SA 122A_3**.**
- Make sure that the front of the microphone is clean, as dirt can affect the measurements. Avoid getting too much dirt into the small inlet hole. Clean carefully with a soft, dry, non-fraying cloth.

7.3 IN SITU CALIBRATION

It is recommended that the instrument is calibrated before and after each measurement run. A single calibration at the start of each day of use is usually sufficient for most regulations. See Chapter 4.8 for details on calibration.

7.4 PERIODIC TESTING

The manufacturer's recommended factory calibration interval is every **12 months** for the SV 104A to ensure continued accuracy and compliance with international specifications.

Note: *Please contact your local SVANTEK distributor for further details on traceable recalibrations that are recommended by most regulatory authorities.*

7.5 CHANGING THE MICROPHONE AND WINDSCREEN

In the case the windscreen is accidently destroyed/lost or it becomes too dirty to protect the microphone, SVANTEK offers the set of three windscreens for the SV 104A dosimeter (**SA 122A_3**).

To replace the microphone, first unscrew the windscreen (Chapter 3.3). Then unscrew the microphone protective sleeve and pull the microphone out.

To fit a new microphone, insert the new microphone into the socket and turn the microphone protective sleeve on clockwise until it is firmly seated. Be careful not to break or strip the thread. Then screw on the windscreen until it stops.

Note: *When the microphone is changed, the new microphone serial number is automatically stored in the SV 104A's internal memory.*

7.6 FIRMWARE UPDATE

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

To update the instrument firmware:

- Unpack the provided firmware package (provided as a suitable compressed file).
- Make sure the unit is turned off.
- Hold down the key and press the key to switch on the instrument. This will ensure that the instrument switches on and enters the special reprogramming BOOTSTRAP mode.

Figure 7-1 BOOTSTRAP mode view

- Connect the USB cable with the unzipped firmware package to the PC. The text **<USB>** will now appear on the instrument display.
- Run the **go-usb.bat** file on the PC. A successful firmware update is indicated by a message.
- Switch off the instrument.

Note: *Using the Supervisor, it is very easy to check for new firmware releases available for download (see Figure 5-5 commands).*

7.7 STORING THE INSTRUMENT

- To prolong the life of the internal batteries, it is recommended that the instrument is switched off when stored.
- It is best not to store the dosimeter for long periods of time when the batteries are low.
- In general, the instrument should be stored at room temperature, charged to approximately 40 to 60% of capacity.
- After use, it is best to charge the instrument before storing it for longer than 3 months.
- It is recommended that Bluetooth® is switch off in applied settings.
- If the dosimeter is to be stored for an even longer period, it is best to take the instrument out of storage and recharge it every 8 months. When the instrument is switched off, it still draws a small amount of power from the battery, so regular recharging will prevent the battery from becoming discharged.

7.8 TRANSPORTATION AND CARRYING

Always use the packaging provided by the manufacturer for transport or storage. In a potentially dirty industrial environment, it is advisable to use the SA 144 carrying case supplied by the manufacturer, which provides excellent mechanical and environmental protection and long-term storage conditions. The temperature range in which the instrument can be stored/transported is -20°C to +50°C.

Note: *Bluetooth® should be switched off for air transport!*

7.9 TROUBLESHOOTING

1. When connected to the dock station port, if automatic charging does not start check the colour of the dock station LED for charging status (Chapter 4.2).
2. If the wrong time or date is displayed when the unit is switched on, connect the unit to the computer and use the *Supervisor* software to set the time and date (see) to ensure that the PC clock is set correctly.
3. If the unit does not turn on, make sure it is charged by connecting it to the USB charger or placing it on the docking station. This will ensure that the battery is not depleted. Then proceed with the hardware reset (Chapter 4.18).
4. If your dosimeter does not respond, proceed with the switch-on/switch-off procedure (Chapter 4.4), and hardware reset of the instrument (Chapter 4.18).
5. If the sound level measurement is frozen or set to a fixed value, proceed with the switch-on/switch-off procedure (Chapter 4.4), then with the hardware reset of the instrument (Chapter 4.18).
6. If the reset does not help, proceed to Chapter 9.
7. If the instrument is discharged in conditions where the ambient temperature exceeds 35ºC, it may not respond when connected to the USB charger or placed on the dock station and may not indicate that charging has started. In this case, move the instrument (and the dock station) to a place where the ambient temperature is below 35ºC and charge it for at least 2 hours. If the instrument is undamaged, it should indicate the start of charging within 2 hours ("Bat.Charge" will appear on the screen). If the instrument does not start charging after 6 hours, it may be damaged.

8 RISK ASSESSMENT AND MITIGATION OF RISK

Electrical safety HAZARDS are fully addressed by 6-16 clauses of the IEC 61010-1.

Hazard locations related HAZARDS are fully addressed by IEC 60079-0 IEC 61010-11.

For details see:

- GENERAL WARNINGS, SAFETY CLAUSES, AND STANDARD INFORMATION, page GENERAL WARNINGS, SAFETY CLAUSES, AND STANDARD INFORMATION3
- SPECIAL PRECAUTIONS WHEN USING AND CHARGING LITHIUM BATTERIES, page 4
- ENVIRONMENTAL PROTECTION MARKING OF THE UNIT, page 5

HAZARDS related to reliable function, performance and wrong software setup are covered by:

- Chapter 4, RUNNING AND OPERATING BASIC PROCEDURES, page 32
- Chapter 6, SUPERVISOR BASIC OPERATIONS, page 96
- Chapter 7, SV 104A MAINTENANCE, page 97

9 SVANTEK SERVICE

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

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

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

Internet: www.svantek.com

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

***Note:* International customers:**

Contact your local authorized distributor from whom the product was purchased. You can obtain the name and contact information of your local authorized distributor from SVANTEK by using the e-mail or telephone information listed above or use our website to find nearest distributor office.

APPENDIX A REMOTE CONTROL

USB 2.0 interface is the serial one 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 in all produced nowadays Personal Computers.

The functions, which are developed in order to control data flow in the serial interfaces, ensure:

- Bi-directional data transmission,
- Remote control of the instrument.

The user, in order to program the serial interface, has to:

1. send "the function code",
2. send an appropriate data file or
3. receive a data file.

A.1 INPUT / OUTPUT TRANSMISSION TYPES

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

#1 input/output of the control setting codes,

#2 read out of the measurement results in the **DOSE METER** mode,

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

#4 read out of the data file from the internal Flash-disc or RAM memory,

#5 read out of the statistical analysis results,

#7 special control functions,

#9 writing the data file into the internal flash-disk.

#D read/write the data file from the external memory (SD Card),

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

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

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

or

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

where:

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

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

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

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

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

#1;

The instrument outputs in this case a file containing all control settings given in Tab. A1 in the format:

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

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

#1,U104,N12342,W1.07.1,Q0.01,M4,F2:1,F3:2,F1:3,J2:1,J3:2,J1:3,f1,C1:1,C0:2,C2:3,B0:1,B3:2,B15:3,b0,d1s,D10s,K5,L0,Y3,y0,XC115:1,XC115:2,XC115:3,Xl115:1,Xl115:2,Xl115:3,S0,T1,e480,c1:1,c1:2,c1:3,h0:1,h0:2,h0:3,x3:1,x3:2,x5:3;

means that:

- SV 104A is investigated (U104);
- number is 12342 (N12342);
- software version number is 1.07.1;
- calibration factor is equal to 0.01 dB (Q0.01);
- **DOSE METER** is selected as the measurement function (M4);
- **A** filter is selected in profile 1 (F2:1);
- **C** filter is selected in profile 2 (F3:2);
- **Z** filter is chosen in profile 3 (F1:3);
- **A** Peak filter is selected in profile 1 (J2:1);
- **C** Peak filter is selected in profile 2 (J3:2);
- **Z** Peak filter is selected in profile 3 (J1:3);
- **Z** filter is selected for **1/1 OCTAVE or 1/3 OCTAVE** analysis (f1)
- **FAST** detector is selected in profile 1 (C1:1);
- **IMPULSE** detector is chosen in profile 2 (C0:2);
- **SLOW** detector is selected in profile 3 (C2:3);
- logger's buffer is not filled by the results from profile 1 (B0:1);
- **PEAK** and **MAX** values are stored in the files of the logger from profile 2 (B3:2);
- **PEAK**, **MAX**, **MIN** and **LEQ** values are stored in the files of the logger from profile 3 (B15:3);
- results of **1/1 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);
- measurement has to be repeated 5 times (K5);
- linear detector is selected for **LEQ** calculations (L0);
- delay of the start of the measurements is equal to 3 seconds (Y3);
- synchronization the start of measurement with RTC is switched off (y0);
- threshold level for PTC calculation in profile 1, is set to 115 dB (XC115:1);
- threshold level for PTC calculation in profile 2, is set to 115 dB (XC115:2);
- threshold level for PTC calculation in profile 3, is set to 115 dB (XC115:3);
- threshold level for ULT calculation in profile 1, is set to 115 dB (Xl115:1);
- threshold level for ULT calculation in profile 2, is set to 115 dB (Xl115:2);
- threshold level for ULT calculation in profile 3, is set to 115 dB (Xl115:3);
- instrument is in the Stop state (S0);
- logger is active (T1);
- exposition time is set to 8 hours (e480);
- criterion level in profile 1 is chosen as 80 dB (c1:1);
- criterion level in profile 2 is chosen as 80 dB (c1:2);
- criterion level in profile 3 is chosen as 80 dB (c1:3);

- threshold level in profile 1 is None (h0:1);
- threshold level in profile 2 is None (h0:2);
- threshold level in profile 3 is None (h0:3);
- exchange rate in profile 1 is set to 3 (x3:1).
- exchange rate in profile 2 is set to 3 (x3:2).
- exchange rate in profile 3 is set to 5 (x5:3).

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

A.3 FUNCTION #2 - MEASUREMENT RESULTS READ-OUT IN DOSE METER MODE

#2 function enables one to read out the current measurement result from the selected profile in the **SLM** mode.

Note: *This function can also be programmed while measurements are taking place. In this case, the LEQ values measured **after entering #2 function** are sent out.*

#2 function has the format defined as follows:

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

where:

<aver> – type of results:

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

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

<profile> – profile number:

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

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

Note: *After finishing the measurement, **#2** function is no longer active and has to be reprogrammed in order to read-out successive measurements.*

The instrument sends the values of results in the format defined as follows:

#2,p,Xccc,Xccc,Xccc,(...),Xccc; (where **p** - the number of the results set)

or

#2,?; (when the results are not available).

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

v the 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 the overload flag (ccc equals to 0 or 1);

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

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

M the **Lmax** value (ccc – the value in dB);
N the **Lmin** value (ccc – the value in dB);
S the **L** result (ccc – the value in dB);
D the **DOSE** result (ccc – the value in %);
d the **D_8h** result (ccc – the value in %);
p the **PrDOSE** result (ccc – the value in %);
A the **LAV** result (ccc – the value in dB);
R the **Leq** result (ccc – the value in dB);
U the **LE** result (ccc – the value in dB);
u the **SEL8** result (ccc – the value in dB);
E the **E** result (ccc – the value in Pa^2h);
e the **E_8h** result (ccc – the value in Pa^2h);
l(nn) the **LEPd** result (ccc – the value in dB, nn – the value of Exposure Time in minutes);
J the **PSEL** result (ccc – the value in dB);
Y the **Ltm3** result (ccc – the value in dB);
Z the **Ltm5** result (ccc – the value in dB);
L(nn) the value L of the nn statistics (ccc – the value in dB);
C the **PTC** result (ccc – the counter value);
c the **PTP** result (ccc – the value in %);
l the **ULT** result (ccc – value in seconds);
W the **TWA** result (ccc – the value in dB);
w the **PrTWA** result (ccc – the value in dB);
a the **Lc-a** result (ccc – the value in dB);
t no motion time (ccc – value in seconds);

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:

#2,1,v1,V0,T146,P89.47,M64.73,N46.90,S56.47,D0,d0,p0,A0.00,R50.56,U72.20,u95.15,E0.00,e0.00,l(480)50.57,J27.61,Y53.92,Z54.63,L(01)60.40,L(10)49.80,L(20)48.50,L(30)47.90,L(40)47.70,L(50)47.50,L(60)47.30,L(70)47.10,L(80)46.80,L(90)46.40,C0,c0,l0,W-38.12,w0.01,a4.73,t0;

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,T146,P89.47,R50.56,L(01)60.40,L(10)49.80,L(20)48.50,L(30)47.90,L(40)47.70,L(50)47.50,L(60)47.30,L(70)47.10,L(80)46.80,L(90)46.40;

Note: *The value displayed on the screen during the result's presentation is sent out from the instrument in the case when* ***nn*** *is not given after* ***X*** *character.*

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

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

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

#3 function format is defined as follows:

#3;

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

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

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

D7	D6	D5	D4	D3	D2	D1	D0

where:

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

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

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

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

#4 function formats are defined as follows:

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

#4,1,fname; the file containing the measurement results,
#4,1,fname,?; file size,
#4,1,fname,offset,length; the part of the file containing the measurement results,

where:

fname - name containing not more than eight characters,
offset - offset from the beginning of the file,
length - number of bytes to read,

#4,4; the current settings file,

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

#4,4,offset,length; the part of current settings file,

where:

offset - offset from the beginning of the current settings file,
length - number of bytes to read.

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

All data words are sent as **<LSB>**,**<MSB>**.

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

#4,?;

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

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

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

Note: *There is not any succeeding transmission in the case when the* ***Status Byte*** *is equal to zero.*

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

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

where:

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

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

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

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

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

Note: *The bytes in the words are sent according to the scheme* ***<LSByte>..<MSByte>****.*

A.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 formats are defined as follows:

#7,AC;

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

#7,AC,x;

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

#7,AP;

Reserved.

#7,AR;

Reserved.

#7,AS;

Get settings for the Auto-Run function.

Response format:

#7,AS,e,HH,MM,hh,mm,dW,mR;

where:

e – On (e=1), Off (e=0),

HH – hour of the measurement start,

MM – minutes of the measurement start,

hh – hour of the measurement stop,

mm – minutes of the measurement stop,

dW – day of week in which the measurement will be done:

bit:0 – Monday,

...

bit:6 – Sunday

mR – maximum number of the measurement days,

#7,AS, e,HH,MM,hh,mm,dW,mR;

where:

e – On (e=1), Off (e=0),

HH – hour of the measurement start,

MM – minutes of the measurement start,

hh – hour of the measurement stop,

mm – minutes of the measurement stop,

dW – day of week in which the measurement will be done:

bit:0 – Monday,

...

bit:6 – Sunday

mR – maximum number of the measurement days,

Response format:

#7,AS;

#7,AV;

Reserved.

#7,BC;

The function returns the battery charge level in [mAh].

#7,BD;

The function returns the total battery discharge current in [mAh].

#7,BN;

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

#7,BS;

This function returns battery state in %.

#7,BP;

This function returns the bluetooth PIN number.

Response format:

#7,BT,nnnn;

where:

n: **-** PIN number,

#7,BP,nnnn;

This function sets the the bluetooth PIN number.

where:

n: **-** PIN number,

#7,BT;

This function returns the state of the bluetooth power.

Response format:

#7,BT,n;

where:

n:

0 – Off

1 - On,

#7,BT,n;

This function sets the state of the bluetooth power.

where:

n:

0 – Off

1 - On,

#7,BV;

This function returns battery voltage in 10 mV.

#7,CH;

Get number of records calibration history.

Response format:

#7,CH,n;

where:

n – number of records calibration history,

#7,CH,n;

Get one record from calibration history.

where:

n – record number in the history of calibration,

Response format:

#7,CH,n,cT,hh,mm,ss,DD,MM,YYYY,cF,cL;

where:

n – record number in the history of calibration,

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.

cL – calibration level.

Response #7,CH,-1; denotes incorrect data in the selected record

#7,CS;

This function restores the factory settings.

#7,CT;

Get date and time of last calibration;

Response format:

#7,CT,DD-MM-YYYY,hh:mm:ss,;

where:

hh:mm:ss – time,

DD-MM-YYYY – date.

#7,DL;

Reserved.

#7,DS,file_name;

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

#7,ED;

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

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

#7,EV;

This function returns external power voltage in 10 mV.

#7,FS;

This function returns file system version.

#7,FT;

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

#7,IC;

Reserved.

#7,KL,x;

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

#7,KL;

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

#7,LA;

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

#7,LB;

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

#7,LF;

This function restore Teds factory calibration.

#7,LS,setup_name;

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

#7,LT;

This function reloads microphone parameters from TEDS.

#7,LW;

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

#7,MC;

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

#7,MC,x;

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

#7,NF;

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

#7,NS;

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

#7,PI;

This function returns PIC version.

#7,PO;

This function powers off the instrument.

#7,RT;

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

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

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

#7,SC;

Reserved.

#7,SD;

Get date and time of last loaded setup file;

Response format:

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

where:

hh:mm:ss – time,

DD/MM/YYYY – date.

#7,SE;

Reserved.

#7,SF;

Reserved.

#7,SL;

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

#7,SL,sl_index,sl_level;

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

#7,SN;

Get last loaded setup file name;

Response format:

#7,SN,name;

where:

name – setup file name.

#7,SP;

Reserved.

#7,SS;

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

#7,ST;

Get Standby Delay.

Response format:

#7,ST,xxx;

where:

xxx – time to standby in [s].

#7,ST,x;

Set Standby Delay.

where:

xxx – time to standby in [s].

Response format:

#7,ST;

#7,TC;

This function returns TEDS calibration factor**;**

#7,TF;

This function returns TEDS factory calibration factor**;**

#7,TP;

Get temperature.

Response format:

#7,TP,xx.x;

where:

xx.x – temperature in [˚C].

#7,TT;

This function returns type of microphone saved in TEDS memory. Value of -1 means unknown TEDS, value of 27 means SV27 microphone;

#7,TU;

This function upload calibration factor to microphone's TEDS memory.

#7,UF;

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

#7, UF,x;

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

#7,UN;

This function returns unit name;

#7,US;

This function returns unit subversion.

#7,UV;

This function returns usb voltage in 10 mV.

#7,VB;

This function returns the Bootstrap software version.

#7,VH;

This function returns the Hardboot software version.

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

A.8 FUNCTION #9 - WRITE-IN THE DATA FILE INTO THE INTERNAL FLASH-DISC

#9 function enables the user to write-in the data file into the internal Flash-disc memory. The data file formats are given in Appendix B.

#9 function formats are defined as follows:

#9,FILE_TYPE,FILE_LENGTH,DATA

where:

FILE_TYPE	type of the file 2 - setup file, 4 - current settings file,
FILE_LENGTH	length of the file in bytes,
DATA	binary content of the file.

A.9 FUNCTION #D – READ / WRITE THE DATA FILES FROM THE EXTERNAL MEMORY (SD CARD)

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

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

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

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

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

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

   Response:

   #D,d; - command was executed

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

4) #D,r,<disk>,<address>,<offsetB>,<nB>; function enables the user to read the file (except of internal memory):

   Response:

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

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

   Response:

   #D,w; - command was executed

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

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

   Response:

   #D,e; - command was executed

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

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

   Response:

   #D,e; - command was executed

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

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

   Response:

   #D,m; - command was executed

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

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

   Response:

   #D,f; - command was executed

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

A.10 CONTROL SETTING CODES

The control setting codes used in the SV 104 instrument are given in the table below.

Table A.1. Control setting codes

Group name	Group code	Code description
Unit type	**U**	U104 (read only)
Serial number	**N**	Nxxxx (read only)
Software version	**W**	Wyyy yyy - revision number (read only)
Calibration factor	**Q**	Qnnnn nnnn - real number with the value of the calibration factor ∈(-19.9 ÷ 19.9)
Measurement function	**M**	M2 - **1/1 OCTAVE** analyser M3 - **1/3 OCTAVE** analyser M4 - **DOSE METER**
Filter type in profile n	**F**	F1:n - **Z** filter for profile n F2:n - **A** filter for profile n F3:n - **C** filter for profile n
Filter type for Peak result calculation in profile n	**J**	J1:n - **Z** filter for profile n J2:n - **A** filter for profile n J3:n - **C** filter for profile n
Detector type in profile n	**C**	C0:n - **IMPULSE** detector in profile n C1:n - **FAST** detector in profile n C2:n - **SLOW** detector in profile n
Filter type in **1/1 OCTAVE** analysis	**f**	f1 - **Z** filter f2 - **A** filter f3 - **C** filter
Logger type in profile n	**B**	Bx:n - x - sum of the following flags flags: 1:n - logger with **PEAK** values in profile n 2:n - logger with **MAX** values in profile n 4:n - logger with **MIN** values in profile n 8:n - logger with **LEQ** values in profile n 16:n - logger with **LAV** values in profile n
Storing the results of **1/1 OCTAVE** or **1/3 OCTAVE** analysis in logger's file	**b**	bx - x - sum of the following flags flags: 8 - logger with **LEQ** values
Logger step	**d**	dnns - nn number in seconds ∈(1 ÷ 60) dnnm - nn number in minutes ∈(1 ÷ 60)

Integration period	**D**	D0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) Dnns - nn number in seconds Dnnm - nn number in minutes Dnnh - nn number in hours
Repetition of the measurement cycles (RepCycle)	**K**	K0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) Knnnn - nnnn number of repetitions ∈(1 ÷ 1000)
Detector type in the **LEQ** function	**L**	L0 - **LINEAR** L1 - **EXPONENTIAL**
Exposure Time	**e**	ennn - nnn time in minutes ∈ (1 ÷ 720)
Criterion Level	**c**	c1:p - 80 dB c2:p - 84 dB c3:p - 85 dB c4:p - 90 dB c5:p - 60 dB c6:p - 65 dB c7:p - 70 dB c8:p - 75 dB c9:p - 87 dB c10:p - 81 dB c11:p - 82 dB c12:p - 83 dB p: 1, 2, 3 - profile number
Threshold Level	**h**	h0:p - None h1:p - 70 dB h2:p - 75 dB h3:p - 80 dB h4:p - 85 dB h5:p - 90 dB h6:p - 60 dB h7:p - 65 dB p: 1, 2, 3 - profile number
Exchange Rate	**x**	x2:p - 2 x3:p - 3 x4:p - 4 x5:p - 5

		x6:p - 6 p: 1, 2, 3 - profile number
Logger	**T**	T0 - switched off (**[ ]**) T1 - switched on (**[√]**)
Delay in the start of measurement	**Y**	Ynn - nn delay given in seconds ∈ (0 ÷ 59) and (60 ÷ 3600) with step 60s
Synchronization the start of measurement with RTC	**y**	y0 - switched off (**OFF**) y1 - synchronization to 1 min. y15 - synchronization to 15 min. y30 - synchronization to 30 min. y60 - synchronization to 1 hour.
State of the instrument (Stop, Start or Pause)	**S**	S0 - **STOP** S1 - **START** S2 - **PAUSE**
Threshold level for PTC calculation	**XC**	XCnnn:p - nnn level in dB ∈ (70 ÷ 140) p: 1, 2, 3 - profile number
Threshold level for ULT calculation	**XI**	XInnn:p - nnn level in dB ∈ (70 ÷ 140) p: 1, 2, 3 - profile number

APPENDIX B DATA FILE STRUCTURES

B.1 GENERAL STRUCTURE OF THE SV 104A FILE

Each file containing data from the SV 104A instrument consists of several groups of words. In the case of the SV 104A (the internal file system rev. 1.07), 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:

- the SvanPC file header (cf. Tab. B.1.1)
- a file header (cf. Tab. B.1.2);
- the unit and internal software specification (cf. Tab. B.1.3);
- the calibration settings (cf. Tab. B.1.4)
- the user's text (a header) stored together with the measurement data (cf. Tab. B.1.5);
- the Unit text info (cf. Tab. B.1.24);
- the parameters and global settings, common for all profiles (cf. Tab. B.1.6);
- parameters for Time-domain signal recording (cf. Tab. B.1.9);
- parameters for Wave-file recording (cf. Tab. B.1.10);
- the special settings for profiles (cf. Tab. B.1.12);
- the display settings of the main results (cf. Tab. B.1.13)
- the header of the statistical analysis (cf. Tab. B.1.14);
- header of the file from the logger (cf. Tab. B.1.15)
- contents of the file from the logger (cf. Tab. B.1.16)
- the main results saved in Summary Results Record (cf. Tab. B.1.17)

The other elements of the file structure are not obligatory for each file type stated above. They depend on the file type (**DOSE METER**, **1/1 OCTAVE**, **1/3 OCTAVE** file from the logger) These elements are as follows:

- statistical levels (saved in Summary Results Record) (cf. Tab. B.1.18)
- 1/1 OCTAVE analysis results (saved in Summary Results Record) (cf. Tab. B.1.19)
- 1/3 OCTAVE analysis results (saved in Summary Results Record) (cf. Tab. B.1.20)
- the results of the statistical analysis (saved in Summary Results Record) (cf. Tab. B.1.21);
- the settings of the instrument saved in the setup file (cf. Tab. B.1.22);
- the file-end-marker (cf. Tab. B.1.23);

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	4	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: 104
3	SoftwareVersion	software version: 107
4	SoftwareIssueDate	software issue date
5	DeviceMode	mode of the instrument
6	UnitSubtype	subtype of the unit: 7 - SV 104A
7	FileSysVersion	file system version: 107
8	reserved	Reserved
9	SoftwareSubversion	software subversion: 1
10..11	MicrophoneSN	the serial number of the microphone 0 - undefined
12	UnitNumberH	unit 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** 3 - **FACTORY 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 after the measurement: 0 - none 1 - **BY MEASUREMENT** 3 - **FACTORY CALIBRATION** 0xFFFF - C**alibration not performed**
7	PostCalibrDate	date of calibration performed after the measurement (cf. App. B.4)
8	PostCalibrTime	time of calibration performed after the measurement (cf. App. B.4)
9	PostCalibrFactor	factor (*100 dB) of calibration performed after the measurement
10	PostCalibrLevel	level (*100 dB) of calibration performed prior to measurement
…	…	…

Table B.1.5. USER's text

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

Table B.1.6. Parameters and global settings

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

4	MeasureInput	measurement input type: 2 - **Microphone**
5	Range	measurement range: 2 - **SINGLE**
6	UnitFlags	calibration flags: b0 - if set to 1: calibration coefficient is used b3 - if set to 1: overload occurred b7,b6,b5: type of the result **Lden** 000 – **Lden** result is not available 001 – **Ld** result 010 – **Le** result 011 – **Lde** result 100 – **Ln** result 101 – **Lnd** result 110 – **Len** result 111 – **Lden** result
7	RepCycle	repetition cycle: 0 - infinity nnnn - number of repetitions $\in(1 \div 1000)$
8	NofChannel	number of channels (1)
8	NofProf	number of profiles (3)
10	StartDelay	start delay time
11..12	IntTimeSec	integration time specified in seconds
13	InterfaceMode	reserved
14	LeqInt	reserved
15	SpectrumFilter	**1/1** or **1/3 OCTAVE** analysis filter: 1 - **Z**, 2 - **A**, 3 - **C** in other cases: Reserved
16	SpectrumBuff	**1/1** or **1/3 OCTAVE** logger: sum of the following flags: 8 - logger with **Leq** values in other cases: reserved
17	ExposureTime	exposure time: 1..720 (min)
18	Leq & Lav	the method of viewing results Leq and Lav 0 - **Both** 1 - **Mutually exclusive (**visibility depends of the EXCHANGE RATE parameter**)**
19	MicComp	compensating filter for microphones: 0 - switched off, 1 - switched on
20	UL Th. Level[1]	the 1st profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
21	UL Th. Level[2]	the 2nd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
22	UL Th. Level[3]	the 3rd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
23	PEAK Th. Level[1]	the 1st profile threshold level for PTC calculation 70 ÷ 140 dB (*10)

24	PEAK Th. Level[2]	the 2nd profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
25	PEAK Th. Level[3]	the 3rd profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
26	CriterionLevel[1]	the 1st profile criterion level (only **DOSE METER**): 60, 65, 70, 75, 80, 81, 82, 83, 84, 85, 87, 90 (*10 dB)
27	ThresholdLevel[1]	the 1st profile threshold level (only **DOSE METER**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
28	ExchangeRate[1]	the 1st profile exchange rate (only **DOSE METER**): 2, 3, 4, 5, 6
29	CriterionLevel[2]	the 2nd profile criterion level (only **DOSE METER**): 60, 65, 70, 75, 80, 81, 82, 83, 84, 85, 87, 90 (*10 dB)
30	ThresholdLevel[2]	the 2nd profile threshold level (only **DOSE METER)**: 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
31	ExchangeRate[2]	the 2nd profile exchange rate (only **DOSE METER**): 2, 3, 4, 5, 6
32	CriterionLevel[3]	the 3rd profile criterion level (only **DOSE METER**): 60, 65, 70, 75, 80, 81, 82, 83, 84, 85, 87, 90 (*10 dB)
33	ThresholdLevel[3]	the 3rd profile threshold level (only **DOSE METER**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
34	ExchangeRate[3]	the 3rd profile exchange rate (only **DOSE METER**): 2, 3, 4, 5, 6
35	MainResBuff	Summary results. Contents defined as a sum of: 0 - none 1 - **Main Results** 2 - **Spectrum** 4 - **Spectrum MAX** 8 - **Spectrum MIN** 16 - **reserved** 32 - **Statistical levels** 64 - **Statistical analysis in profiles** 128 – **reserved**
36	StartSync	Synchronization the start of measurement with RTC 0 - switched off. 1 - synchronization to **1 min**. 15 - synchronization to **15 min**. 30 - synchronization to **30 min**. 60 - synchronization to **1 hour**.
37	CalMic10	reserved
38	FreeField	Free Field compensating filter for microphones: 0 - switched off, 1 - switched on
39	ProfileMask	Active profiles. Contents defined as a sum of: 1 - 1st profile 2 - 2nd profile 4 - 3rd profile
40	Pause[1]	Programmable pause no. 1.
41	PauseBegin[1]	The start time of the pause no. 1 in format 0xhhmm hh – hour mm – minute

42	PauseEnd[1]	The end time of the pause no. 1 in format 0xhhmm: hh – hour mm – minute
43	Pause[2]	Programmable pause no. 2.
44	PauseBegin[2]	The start time of the pause no. 2 in format 0xhhmm hh – hour mm – minute
45	PauseEnd[2]	The end time of the pause no. 2 in format 0xhhmm: hh – hour mm – minute
46	Pause[3]	Programmable pause no. 3.
47	PauseBegin[3]	The start time of the pause no. 3 in format 0xhhmm hh – hour mm – minute
48	PauseEnd[3]	The end time of the pause no. 3 in format 0xhhmm: hh – hour mm – minute
49	Pause[4]	Programmable pause no. 4.
50	PauseBegin[4]	The start time of the pause no. 4 in format 0xhhmm hh – hour mm – minute
51	PauseEnd[4]	The end time of the pause no. 4 in format 0xhhmm: hh – hour mm – minute
52	Pause[5]	Programmable pause no. 5.
53	PauseBegin[5]	The start time of the pause no. 5 in format 0xhhmm hh – hour mm – minute
54	PauseEnd[5]	The end time of the pause no. 5 in format 0xhhmm: hh – hour mm – minute
…		

Table B.1.9. Event signal recording parameters

Word number	Name	Comment
0	0xnn31	[31, nn=block's length]
1	TriggerMode	trigger mode: 0 - **OFF**, 1 - recording whole measurement 2 - recording on trigger **SLOPE+** 3 - recording on trigger **SLOPE–** 4 - recording on trigger **LEVEL+** 5 - recording on trigger **LEVEL–** 6 - recording on trigger **GRAD+** 7 - recording on trigger **MANUAL**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLevel	level of triggering: 50 ÷ 136 dB (*10)

4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms
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**
11	BitsPerSample	bits/sample: 16
…		

Table B.1.10. Wave-file recording parameters

Word number	Name	Comment
0	0xnn2D	[2D, nn=block's length]
1	TriggerMode	trigger mode: 0 - **OFF**, 1 - recording whole measurement 2 - recording on trigger **SLOPE+** 3 - recording on trigger **SLOPE–** 4 - recording on trigger **LEVEL+** 5 - recording on trigger **LEVEL–** 6 - recording on trigger **GRAD+** 7 - recording on trigger **MANUAL**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLevel	level of triggering: 50 ÷ 136 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms
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**
11	BitsPerSample	bits/sample: 16
…		

Table B.1.12. Special settings for profiles

Word number	Name	Comment
0	0xnn05	[05, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm06	[06, mm=sub-block's length]
3	DetectorP[1]	detector type in the 1st profile: 0 - **IMP.**, 1 - **FAST**, 2 - **SLOW**
4	FilterP[1]	filter type in the 1st profile: 1 - **Z**, 2 - **A**, 3 - **C**
5	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**
6	FilterPeakP[1]	filter type for Peak result calculation in the 1st profile: 1 - **Z**, 2 - **A**, 3 – **C**
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**
11	BufferP[2]	logger contents in the 2nd profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxvmax[2] 4 - Lxvmin[2] 8 - Lxveq[23] 16 - **LAV**
12	FilterPeakP[2]	filter type for Peak result calculation in the 2nd profile: 1 - **Z**, 2 - **A**, 3 - **C**
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**
17	BufferP[3]	logger contents in the 3rd profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxvmax[2] 4 - Lxvmin[2] 8 - Lxveq[23] 16 - **LAV**
18	FilterPeakP[3]	filter type for Peak result calculation in the 3rd profile: 1 - **Z**, 2 - **A**, 3 – **C**
19	reserved	reserved
…		

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

[2] x - depends of the filter type in selected profile: A, C, Z (cf. Tab. B.1.12)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.12)

[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.13. Display settings of the main results

Word number	Name	Comment
0	0xnn48	[48, nn=header's length]
1	TIME	0 – TIME result not displayed, 1 - TIME result displayed
2	L_peak	0 – Lxpeak[1] result not displayed, 1 – Lxpeak[1] result displayed
3	L_max	0 – Lxvmax[2] result not displayed, 1 – Lxvmax[2] result displayed
4	L_min	0 – Lxvmin[2] result not displayed, 1 – Lxvmin[2] result displayed
5	L_	0 – Lxv[2] result not displayed, 1 – Lxv[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	L_eq	0 – Lxveq[23] result not displayed, 1 – Lxveq[23] result displayed
10	L_E	0 – LxvE[23] result not displayed, 1 - LxvE[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	Reserved
15	LEPd	0 – LEPd result not displayed, 1 - LEPd result displayed
16	PSEL	0 – PSEL result not displayed, 1 - PSEL result displayed
17	Ltm3	0 – Ltm3 result not displayed, 1 - Ltm3 result displayed
18	Ltm5	0 – Ltm5 result not displayed, 1 - Ltm5 result displayed
19	Ln	0 – Ln result not displayed, 1 - Ln result displayed
20	PTC	0 – PTC result not displayed, 1 - PTC result displayed
21	PTP	0 – PTP result not displayed, 1 - PTP result displayed
22	ULT	0 – ULT result not displayed, 1 - ULT result displayed
23	TWA	0 – TWA result not displayed, 1 - TWA result displayed
24	PrDOSE	0 – PrDOSE result not displayed, 1 - PrDOSE result displayed
25	PrTWA	0 – PrTWA result not displayed, 1 - PrTWA result displayed
26	LR15	Reserved
27	LR60	Reserved
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	NoMotion	0 – NoMotion result not displayed, 1 - NoMotion result displayed
…	…	…

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

Table B.1.14. Header of the statistical analysis

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

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

Table B.1.15. Header of the file from the logger

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

Note: *The current logger time step in seconds can be obtained from the formulae:*
T = BuffTSec + BuffTMillisec / 1000

Table B.1.16. Contents of the file from the logger

Word number	Name	Comment
0..(BuffLength/2-1)		result#1, result#2, ... result#(BuffLength/2-1)

Table B.1.17. Main results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	Lxpeak[1] value in the 1st profile (*100 dB)
6	Result[1][2]	LxyE[23] value in the 1st profile (*100 dB)
7	Result[1][3]	maximal value (Lxymax[2]) in the 1st profile (*100 dB)
8	Result[1][4]	minimal value (Lxymin[2]) in the 1st profile (*100 dB)
9	Result[1][5]	Lxy[2] value in the 1st profile (*100 dB)
10	Result[1][6]	Lxyeq[23] value in the 1st profile (*100 dB)
11	Result[1][7]	Lc-a (LCeq-LAeq) value (*100 dB)
12	Result[1][8]	**Ltm3** value in the 1st profile (*100 dB)
13	Result[1][9]	**Ltm5** value in the 1st profile (*100 dB)
14	Result[1][10]	**LAV** value in the 1st profile (*100 dB)
15	Result[1][11]	**TLAV** value in the 1st profile (*100 dB)
16	UnderRes[1]	under-range value in the 1st profile
17..18	ULTime[1]	**ULT** value in the 1st profile (sec.)
19..20	PTC[1]	**PTC** value in the 1st profile
21	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
22	0xmm08	[08, mm=sub-block's length]
23..24	OVL	overlad time
25	Result[2][1]	Lxpeak[1] value in the 2nd profile (*100 dB)
26	Result[2][2]	LxyE[23] value in the 2nd profile (*100 dB)
27	Result[2][3]	maximal value (Lxymax[2]) in the 2nd profile (*100 dB)
28	Result[2][4]	minimal value (Lxymin[2]) in the 2nd profile (*100 dB)
29	Result[2][5]	Lxy[2] value in the 2nd profile (*100 dB)
30	Result[2][6]	Lxyeq[23] value in the 2nd profile (*100 dB)
31	Result[2][7]	reserved

32	Result[2][8]	**Ltm3** value in the 2nd profile (*100 dB)
33	Result[2][9]	**Ltm5** value in the 2nd profile (*100 dB)
34	Result[2][10]	**LAV** value in the 2nd profile (*100 dB)
35	Result[2][11]	**TLAV** value in the 2nd profile (*100 dB)
36	UnderRes[2]	under-range value in the 2nd profile
37..38	ULTime[2]	**ULT** value in the 2nd profile (sec.)
39..40	PTC[2]	**PTC** value in the 2nd profile
41	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
42	0xmm08	[08, mm=sub-block's length]
43..44	NoMotion	No Motion Time (sec.)
45	Result[3][1]	Lxpeak[1] value in the 3rd profile (*100 dB)
46	Result[3][2]	LxvE[23] value in the 3rd profile (*100 dB)
47	Result[3][3]	maximal value (Lxvmax[2]) in the 3rd profile (*100 dB)
48	Result[3][4]	minimal value (Lxvmin[2]) in the 3rd profile (*100 dB)
49	Result[3][5]	Lxv[2] value in the 3rd profile (*100 dB)
50	Result[3][6]	Lxveq[23] value in the 3rd profile (*100 dB)
51	Result[3][7]	reserved
52	Result[3][8]	**Ltm3** value in the 3rd profile (*100 dB)
53	Result[3][9]	**Ltm5** value in the 3rd profile (*100 dB)
54	Result[3][10]	**LAV** value in the 3rd profile (*100 dB)
55	Result[3][11]	**TLAV** value in the 3rd profile (*100 dB)
56	UnderRes[3]	under-range value in the 3rd profile
57..58	ULTime[3]	**ULT** value in the 3rd profile (sec.)
59..60	PTC[3]	**PTC** value in the 3rd profile
61	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
…	…	…

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

[2] x - depends of the filter type in selected profile: A, C, Z (cf. Tab. B.1.12)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.12)

[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.18. 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 **Lnn** statistics; i=0..N-1
3+i*(pp+1)+p	**Lnn**[i,p]	value of the **Lnn** statistics for profile p (p=1..pp) (*100 dB)
…	…	…

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

Word number	Name	Comment
0	0xnn0E, 0xnn26, 0xnn27	[block_id, nn=block_length] 0xnn**0E** - averaged spectrum results, 0xnn**26** - min. spectrum results, 0xnn**27** - max. spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	the lowest **1/1 OCTAVE** frequency (*100 Hz): 3150 (**AUDIO BAND**)
3	NOct	number of **1/1 OCTAVE** values: 9 (**AUDIO BAND**)
4	NOctTot	number of **TOTAL** values: 3
5÷20	Octave[i]	1/1 octave[i] value (*100 dB); i=1÷NOct+NoctTot (1÷13)
…	…	…

Table B.1.20. 1/3 OCTAVE analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn10, 0xnn28, 0xnn29	[block_id, nn=block_length] 0xnn1**0** - averaged spectrum results, 0xnn**28** - min. spectrum results, 0xnn**29** - max. spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz): 2000 (**AUDIO BAND**)
3	NTer	number of **1/3 OCTAVE** values: 28 (**AUDIO BAND**)
4	NTerTot	number of **TOTAL** values: 3
5÷50	Tercje[i]	1/3 octave[i] value (*100 dB); i=1÷NTer+NTerTot (1÷34)
…	…	…

Table B.1.21. Results of the statistical analysis in profiles (saved in Summary Results Record)

Word number	Name	Comment
0	0x010B	[0B, prof_mask#1]
1	SubblockLength	2 * number of classes in the first profile + 2
2..3	Histogram[1][1]	the first counter in the first profile
4..5	Histogram[1][2]	the second counter in the first profile
.....	.....	.....
0	0x020B	[0B, prof_mask#2]
1	SubblockLength	2 * number of classes in the second profile + 2
2..3	Histogram[2][1]	the first counter in the second profile
4..5	Histogram[2][2]	the second counter in the second profile
.....	.....	.....
0	0x040B	[0B, prof_mask#3]
1	SubblockLength	2 * number of classes in the third profile + 2
2..3	Histogram[3][1]	the first counter in the third profile
4..5	Histogram[3][2]	the second counter in the third profile
.....	.....	.....

Table B.1.22. 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.1.23. File-end-marker

Word number	Name	Comment
0	0xFFFF	file end marker

Table B.1.24. Unit text info

Word number	Name	Comment
0	0xnn58	[58, nn=block's length]
1	"UN"	Unit name header
2..8	UnitName	Unit name
9	"SE"	Setup name header
10..14	SetupName	Setup name
15	"P1"	1st profile name header
16..20	ProfileName[1]	1st profile name
21	"P2"	2nd profile name header
22..26	ProfileName[2]	2nd profile name
27	"P3"	3rd profile name header
28..32	ProfileName[3]	3rd profile name
.....	.....	.....

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.

Unit text info - cf. Tab. B.1.24.

Parameters and global settings - cf. Tab. B.1.6.

Event signal recording parameters - cf. Tab. B.1.9.

Wave-file recording parameters - cf. Tab. B.1.10.

Special settings for profiles - cf. Tab. B.1.12.

Display settings of the main results - cf. Tab. B.1.13.

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

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

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

B.2.1 The contents of the files in the logger

The records with the results and the records with the state of the markers as well as the records with the breaks in the results registration are saved in the files in the logger. All results are written in dB*100.

B.2.1.1 Record with the results

The contents of the record with the results depends on the selected measurement function and the value set in the **LOGGER** position of the **PROFILE x** and **SPECTRUM** sub-lists. The following elements can be present (in the given sequence):

- 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 not detected
- b2: 1- the No Motion detected, 0 - the No Motion not detected

- results of the measurement from the first profile if the corresponding **LOGGER** position was active (BufferP [1] in Tab. B.1.12); up to five words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result2> - Lxymax[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result3> - Lxymin[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result4> - Lxyeq[23] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result5> - **LAV** result, depending on the value of BufferP[1] (cf. Tab. B.1.12)

- results of the measurement from the second profile if the corresponding **LOGGER** position was active (BufferP [2] in Tab. B.1.12); up to five words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[2] (cf. Tab. B.1.12)
<result2> - Lxymax[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.12)
<result3> - Lxymin[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.12)
<result4> - Lxyeq[23] result, depending on the value of BufferP[2] (cf. Tab. B.1.12)
<result5> - **LAV** result, depending on the value of BufferP[2] (cf. Tab. B.1.12)

(4) results of the measurement from the third profile if the corresponding **LOGGER** position was active (BufferP [3] in Tab. B.1.12); up to five words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[3] (cf. Tab. B.1.12)
<result2> - Lxymax[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.12)
<result3> - Lxymin[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.12)
<result4> - Lxyeq[23] result, depending on the value of BufferP[3] (cf. Tab. B.1.12)
<result5> - **LAV** result, depending on the value of BufferP[3] (cf. Tab. B.1.12)

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

(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 (SpectrumBuff in Tab. B.1.6);
the sequence of words is written:

<Octave Leq[1]> <Octave Leq[2]> ... <Octave Leq[NOct+NOctTot]>

where:
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)
- Statistical levels (optional, cf. Tab. B.1.18)
- 1/1 OCTAVE analysis results (optional, cf. Tab. B.1.19)
- 1/3 OCTAVE analysis results (optional, cf. Tab. B.1.20)
- The results of the statistical analysis in profiles(optional, cf. Tab. B.1.21)

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

The HEADER format is as follows:

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

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:
0 - HS
1 - HE
b10 - 0
b9 - 1
b8 - 1

b15÷b8 – HS (0xC3), HE (0xCB)
b7÷b0 – length of the block (if zero length of the block is saved in additional word L)

B.2.1.7 Record with audio data

This record exists only in the case when the **EVENT RECORDING** function is active (cf. Tab. B.1.9). Samples of the signal, taken in the periods from 1 second to 8 hours, are saved in the blocks. Each block is divided into frames, which are stored in a file among the logger results. The frame starting block and the frame ending it are marked with the set b10 and b9 bits in the header of the frame, respectively. It happens in the case of stopping the recording that the ending frame does not exist.

The format of the data frame is as follows:

HS	L	S	L	HE

where:

HS starting header (1 word)

L block length (1 word), expressed in words (4 + (number of samples)*(BitsPerSample/16))

S samples of the measured signal (sample are written in the two or three bytes depending of the configuration (cf. Tab. B.1.9); the recording starts with the least significant byte)

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

The HEADER format is as follows:

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

where:

b15 - 1

b14 - 0

b13 - 0

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

b11 - header type:

0 - HS

1 - HE

b10 - 1 denotes the first frame in the block

b9 - 1 denotes the last frame in the block

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

b8, b6÷b0 – reserved

B.2.1.8 Record with name of the comment file

The format of the data frame is as follows:

HS	D	HE

where:

HS starting header (1 word)

D The full name of the comment file (e.g. “REC62.WAV”).

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

The HEADER format is as follows:

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

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:

0 - HS

1 - HE

b10 - 1

b9 - 0

b8 - 0

b15÷b8 – HS (0xC4), HE (0xCC)
b7÷b0 – length of the block

B.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.1.22.

File-end-marker - cf. Tab. B.1.23.

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 104A AS DOSIMETER

C.1.1 Specification of SV 104A as dosimeter in standard configuration

Statement of performance

SV 104A meets requirements of the IEC 61252 ed1.2 (2017) and ANSI/ASA S1.25-1991 (R2020) standards for personal noise dosimeters.

SV 104A with all listed below accessories meets requirements of IEC 61672-1:2013 for sound level meters of Class 2 Group X instruments.

Configuration of the complete SLM and with its normal mode of operation:

SV 104A	dosimeter/analyser including ST 104A microphone (1/2", nominal sensitivity 1 mV/Pa, polarization 0 V) and SA 122A windscreen
SV 34B	Recommended Class 2 acoustic calibrator 114 dB@1000 Hz or equivalent (not included in the standard set)

Accessories included in SV 104A instrument set

ST 104A	½ MEMS microphone the SV 104A dosimeter
SA 122A	foam windscreen
SC 156	micro-USB to USB type A cable

Accessories available

SB 104B-1 / **SB 104B-5**	Charging dock stations: 1-bay / 5-bay .

Measured quantities

The measured quantities in the *DOSE METER* mode are: **Time, Lpeak, Lmax, Lmin,** SPL (**L**)**, DOSE, D_8h, PrDOSE, Lav, Leq,** SEL (**LE**)**, SEL8, E, E_8h, LEPd, PSEL, Ltm3, Ltm5,** Leq statistics (**Ln**)**, PTC, PTP, ULT, TWA, PrTWA, Lc-a, No Motion Time.** Definitions for measured quantities are given in Appendix D.

Conformance testing

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

Mounting for acoustical tests	The microphone must be mounted on the instrument.

Electrical substitute for the microphone To obtain a BNC Class electrical input, the microphone must be replaced by an electrical microphone impedance adapter SC 104AT **before turning the instrument on**. Total microphone substitute impedance is 125 Ω.

Note: *The recommended time interval for periodic test of noise exposure meter for checking its acoustic and electrical working characteristics is one year.*

Note: *For the conformance electrical tests the* ***Microphone Compensation*** *must be disabled (see Chapter 4.16).*

Note: *For the conformance acoustical tests with the microphone the* ***Microphone Compensation*** *must be enabled (see Chapter 4.16).*

For the comparison coupler evaluation, the ***Free Field*** *compensation must be disabled.*

For the free filed evaluation, the ***Free Filed*** *compensation must be enabled.*

Linear Operating Ranges

The starting point at which tests of level linearity shall begin is 114.0 dB for the frequencies specifies below.

Linear operating range for the sinusoidal signal and microphone sensitivity 1 mV/Pa

SV 104A has one measuring range – see table below.

Table C.1. Linear operating ranges for Leq

[dB]	$L_{AS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31.5 Hz	53	98.6	53	135	63	138	53	98.6	53	135	53	101.6	56	138
500 Hz	53	134.8	53	138	63	138	53	134.8	53	138	53	137.8	56	141
1 kHz	53	138	53	138	63	138	53	138	53	138	53	141	56	141
4 kHz	53	139	53	137.2	63	138	53	139	53	137.2	53	142	56	140.2
8 kHz	53	136.9	53	135	63	138	53	136.9	53	135	53	139.9	56	138

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:*

$A_n = 137 - 20\,log(n/\sqrt{2})$, *where* ***A*** *is the upper limit for the sinusoidal signal*

Example: *For the crest factor* ***n = 10*** *the upper limit is* A_{10} = ***120 dB***

Measurement frequency range of the acoustic pressure (-3 dB): 20 Hz – 10000 Hz

Basic measurement error of the acoustic pressure: < 1 dB (measured for the reference conditions, see below).

Noise exposure values displayed range: 0.01Pa^{2}h ÷ 99.99 Pa^{2}h

Noise exposure values displayed resolution: 0.01 Pa^{2}h

Note: *The instrument can measure wider Sound Exposure (**E**) range than displayed. Based on the measured **Leq (dB)** value and exposure time **T (h)**,* $E = p_0^2 T(10^{0.1 x Laqe,T})$

Example: For the L_{Aeq} ***= 124 dB*** *and* ***T= 1h*** *exposure value* $E = 1004\ Pa^2h$

Weighting filters

Z meeting requirements of the IEC 61672-1:2013 standard for the Class 1 "**Z**" filter

A meeting requirement of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 "**A**" filter

C meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 "**C**" filter

Self-generated noise (electrical)

"A" weighting	< 42 dB
"C" weighting	< 42 dB
"Z" weighting	< 52 dB

Self-generated noise (acoustical compensated)

"A" weighting	< 43 dB
"C" weighting	< 43 dB
"Z" weighting	< 53 dB

RMS detector

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

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 RMS value for the elapsed time is below the lower linear operating range.

Time weighting characteristics (Exponential averaging)

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

Reference conditions as per IEC 61252

Class of the acoustic field	Free field
Reference acoustic pressure	114.0 dB (related to 20 μPa)
Reference integration time	1 min
Reference noise exposure level	1.67 Pa^2h
Reference frequency	1000 Hz
Reference temperature	+20°C
Reference relative humidity	65 %
Reference static pressure	1013 hPa
Reference incidence direction	perpendicular to the microphone diaphragm

Calibration

Acoustical **-** with the **SV 34B** 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 — 113.9 dB (equal to the calibration level for the pressure field minus Free Field correction of ST 104A at 1000 Hz - see Table C.1.3)

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

Maximum peak voltage 3 V Peak-Peak

Maximum peak voltage of input sinusoidal signal, which can be led to the electrical input without destruction to the meter.

Warm-up time: 1 minute (for 0.1 dB accuracy)

Typical stabilization time after change the temperature in environmental conditions by 20°C is 1 hour.

Nominal delay 1 second

Delay between operating of the "Reset-Button" and beginning of a new measurement.

Time shift after completion of a measurement, before a measurement is shown: < 1 second.

Note: *When the instrument is moved from a warm environment with high humidity, to a colder environment, care should be taken to avoid condensation inside the instruments. In such 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 meets requirements of IEC 61252 p.12.5 (below electrical noise level for 80 A/m @ 50/60 Hz)

The maximum susceptibility (the least immunity) is achieved when in the Dosimeter the **Z** filter and time weighting **F** are selected, and the dosimeter measurements are considered.

The maximum susceptibility is achieved when the dosimeter is placed in plane of the magnetic field test coil, so the vertical axis of dosimeter is in parallel with wiring of the test frame (Fig. C.1).

In addition, with microphone cable, the maximum susceptibility is achieved when the dosimeter and cable is placed along field and the cable is coil as solenoid.

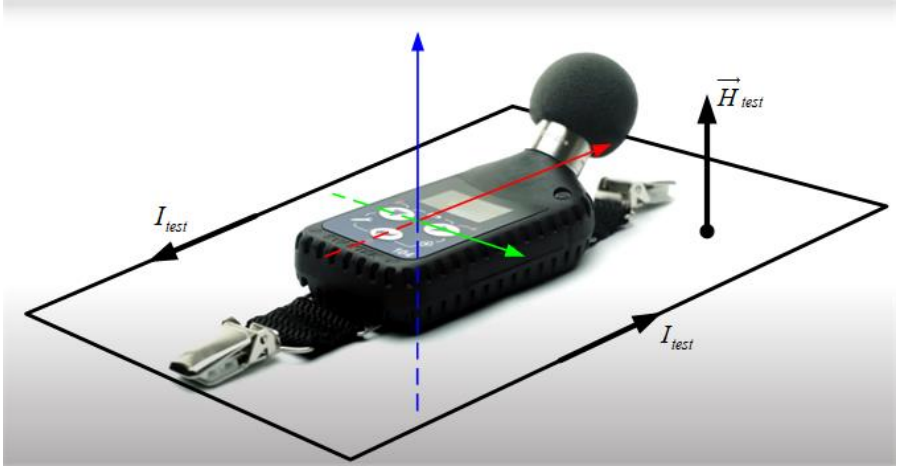


Figure C.1 SV 104A placed in magnetic field test coil in the direction of maximum response

Effect of radio frequency fields – meets requirements of IEC 61672-1

The greatest susceptibility (the least immunity) is achieved when in the dosimeter the **Z** filter and time weighting **F** are selected, and the dosimeter measurements are considered.

The greatest susceptibility is achieved when the dosimeter is placed parallel to the radio frequency field. In addition, with microphone cable, the greatest susceptibility is achieved when the dosimeter and cable is placed along field and the cable forms coil as solenoid.

Effect of electrostatic discharge – meets requirements of IEC 61672-1

During electrostatic discharge, the influence on the displayed results can be observed.

No changes in instrument operation state, configuration or stored data corruption were found out.

Effect of ambient pressure < 0.02 dB/kPa

Effect of temperature < 1.0 dB (from -10°C to +50°C)

Effect of vibration

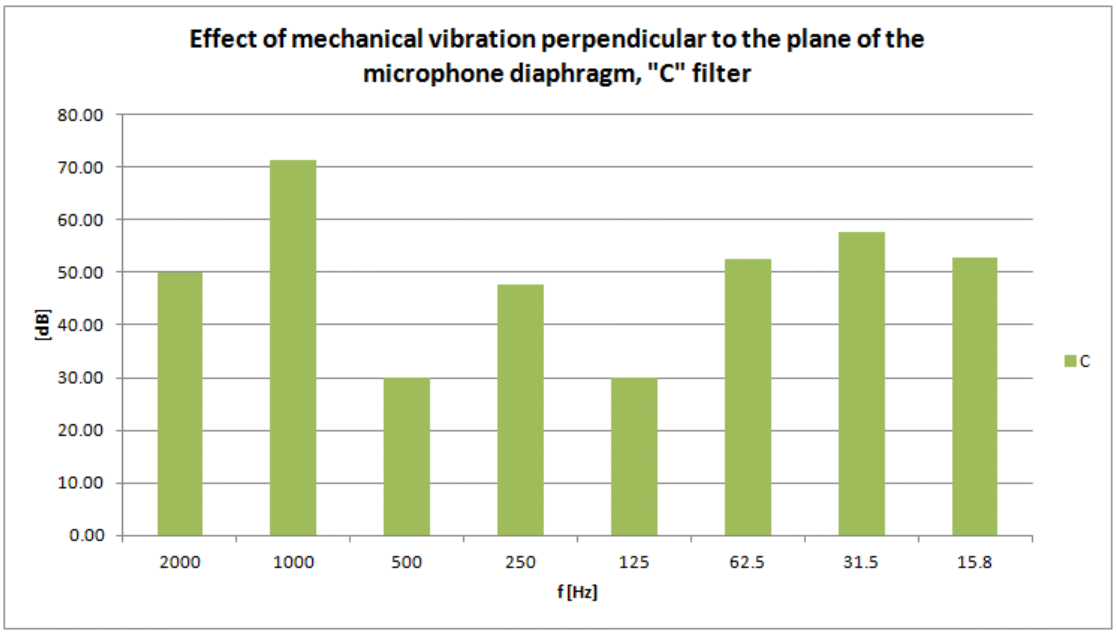
Microphone type **ST 104A** on the dosimeter is mounted on the shaker. Vibration is applied in a direction perpendicular or parallel to the plane of the microphone diaphragm.

Table C.2. Typical effect of vibration perpendicular to the plane of microphone diaphragm

f (Hz)	15.8	31.5	62.5	125	250	500	1000	2000
Typical effect of vibration [dB]	53	58	53	<30	48	<30	72	51

Table C.3. Typical effect of vibration parallel to the plane of microphone diaphragm

f (Hz)	15.8	31.5	62.5	125	250	500	1000	2000
Typical effect of vibration [dB]	<30	<30	<30	49	<30	57	<30	60



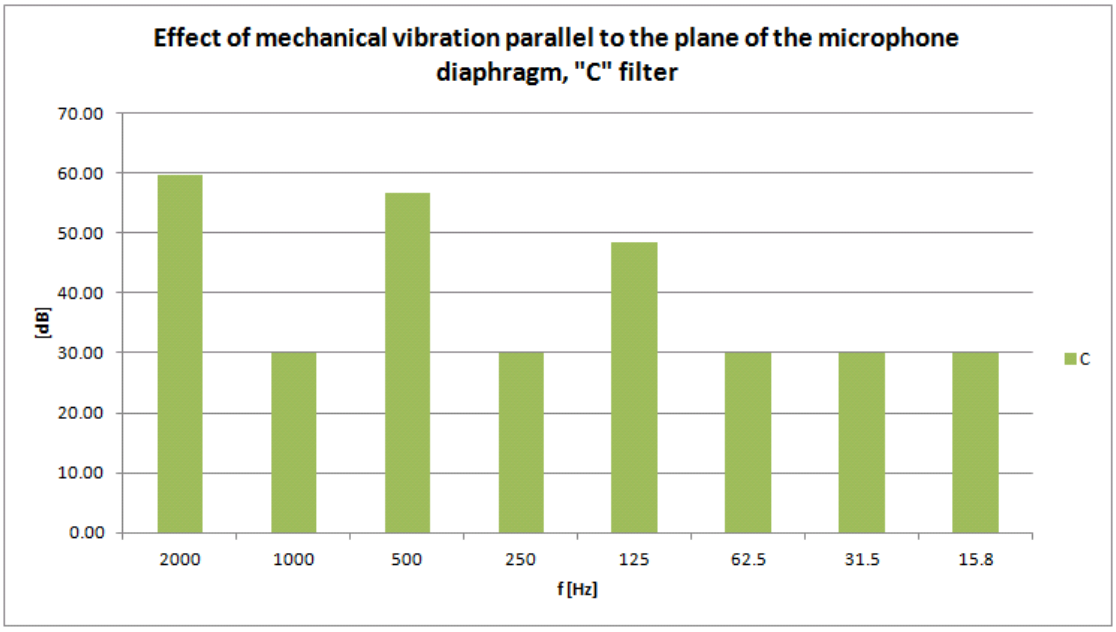


Figure C.2 Effect of mechanical vibration

Operating temperature range	from -10°C to +50°C
Storage temperature range	from -20°C to +60°C
Charging temperature range	from 0°C to +40°C

Microphone

ST 104A	MEMS type (½" housing)
Nominal sensitivity	1 mV/Pa (corresponding to app. -60 dBV/Pa re 1 V/Pa)
Impedance	350 Ohm
Static pressure coefficient	0.02 dB/kPa

Note: *Maximum sound pressure level that can affect the microphone without destroying the microphone: 160 dB.*

ST 104A and SV 104A frequency characteristics

The instrument should be mounted so that the microphone diaphragm is perpendicular to the direction of the sound wave.

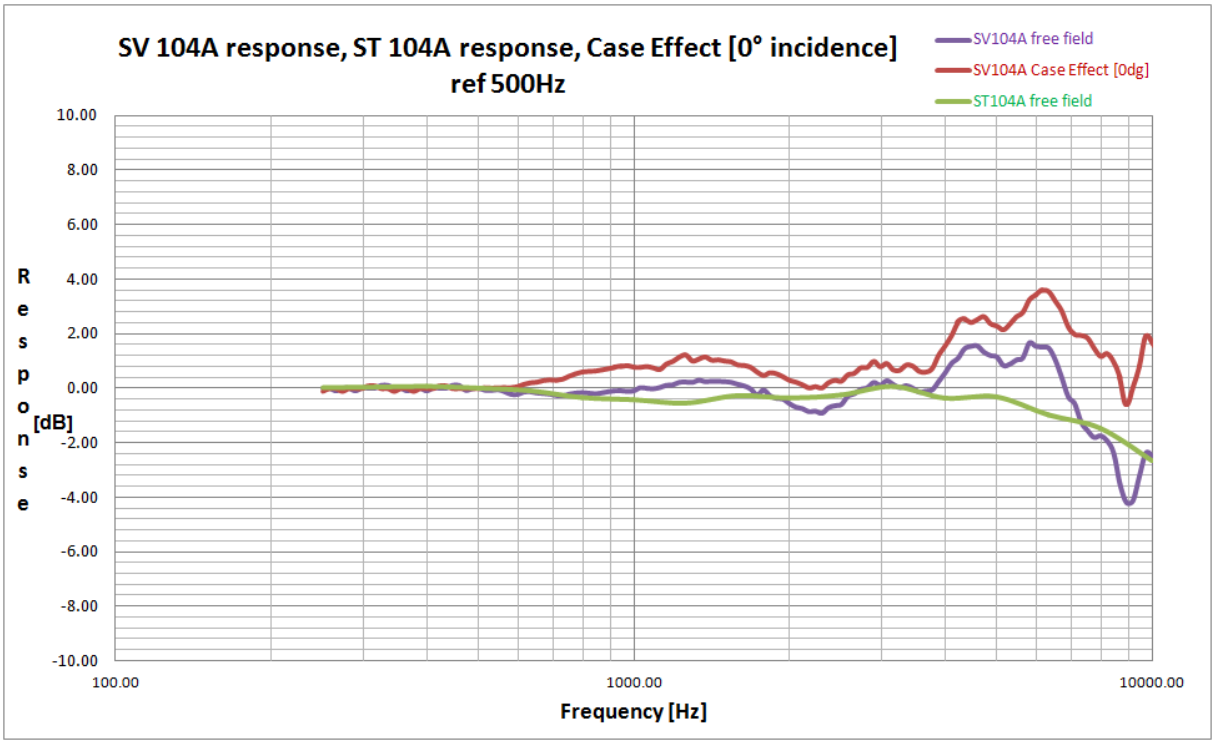


Figure C.3 SV 104A frequency characteristics

Table C.4. ST 104A Free Field corrections with the use of the G.R.A.S. 51AB calibrator, and reference BK4136 ¼" microphone

[dB]	Frequency [Hz]																
	31.5	63	125	250	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000
Uncertainty (IEC 62585:2012)	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	0.35
ST 104A Free Field corrections	0.00	0.00	0.00	0.00	0.02	0.07	0.11	0.12	0.18	0.35	0.60	0.80	1.05	1.58	1.88	2.77	4.28

Table C.5. SV 104A Case Effect (including SA 122A windscreen)

f, [Hz]	Case Effect [dB]	Uncertainty (IEC 62585:2012) [dB]	f, [Hz]	Case Effect [dB]	Uncertainty (IEC 62585:2012) [dB]
251.19	0.00	0.25	2818.38	0.77	0.25
316.23	-0.02	0.25	3162.28	0.68	0.25
398.11	-0.01	0.25	3548.13	0.63	0.25
501.19	0.02	0.25	3981.07	1.56	0.25
630.96	0.21	0.25	4466.84	2.42	0.35
794.33	0.61	0.25	5011.87	2.29	0.35
1000.00	0.67	0.25	5623.41	2.79	0.35
1258.93	1.04	0.25	6309.57	3.55	0.35
1584.89	0.87	0.25	7079.46	1.98	0.35
1995.26	0.30	0.25	7943.28	1.18	0.35
2238.72	0.07	0.25	8912.51	-0.59	0.35
2511.89	0.27	0.25	10000	1.66	0.35

Table C.6. ST 104A typical Free Field response

f, [Hz]	Response, [dB]	f, [Hz]	Response, [dB]
251.19	0.00	2818.38	-1.27
316.23	0.00	3162.28	-0.26
398.11	0.01	3548.13	-1.63
501.19	0.00	3981.07	-1.82
630.96	-0.14	4466.84	-1.90
794.33	-0.45	5011.87	-2.56
1000.00	-0.67	5623.41	-3.16
1258.93	-1.04	6309.57	-3.87
1584.89	-0.86	7079.46	-4.30
1995.26	-1.26	7943.28	-4.74
2238.72	-1.28	8912.51	-5.24
2511.89	-1.23	10000	-5.94

Directional characteristics of SV 104A

Directional response for dosimeter SV 104A with microphone ST 104A and SA 122A windscreen (symmetrical axis) for specified frequencies:

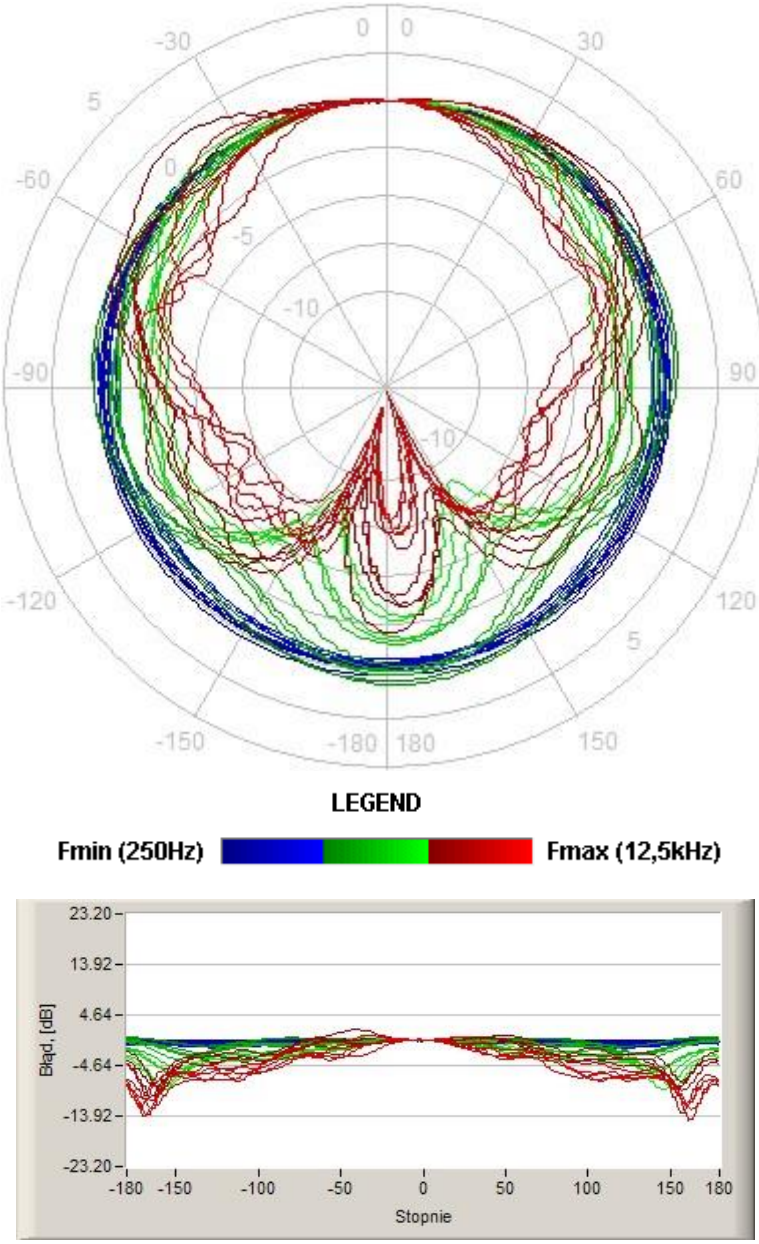
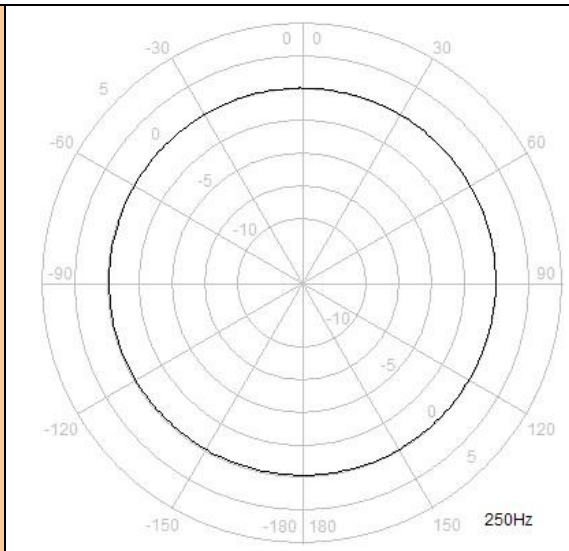
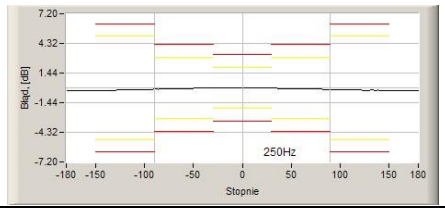


Figure C.4 Total directional characteristics (symmetrical axis)

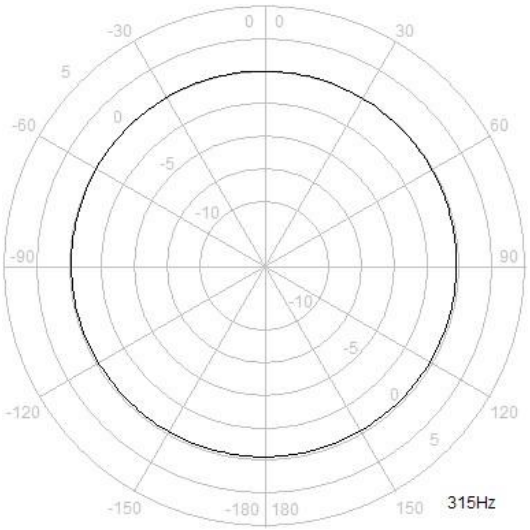
The round charts show the directional characteristic and the charts below shows the errors for particular angles (note: limits are for class 1).

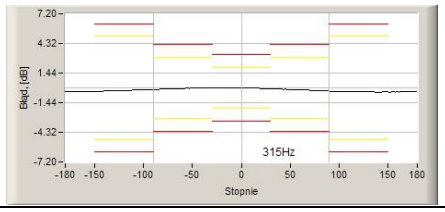
250 Hz



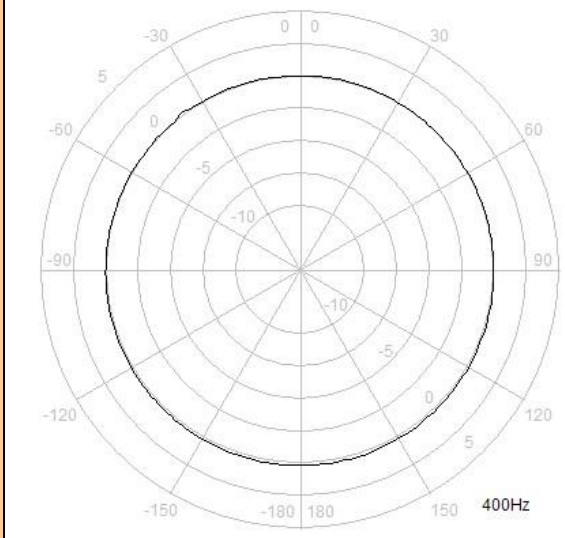


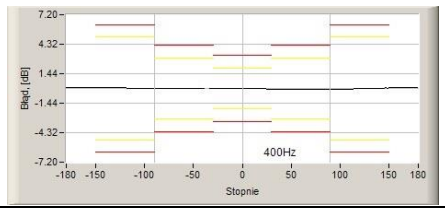
315 Hz



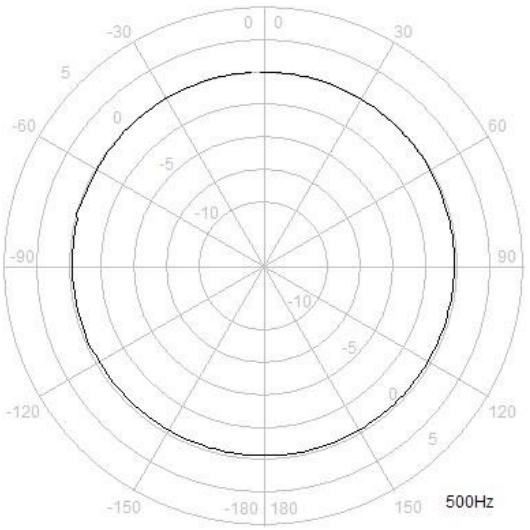


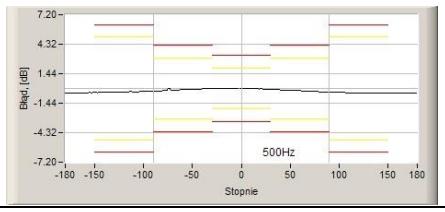
400 Hz



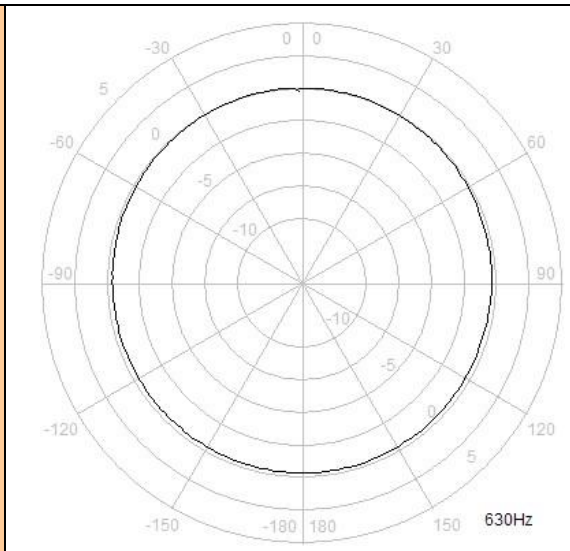


500 Hz

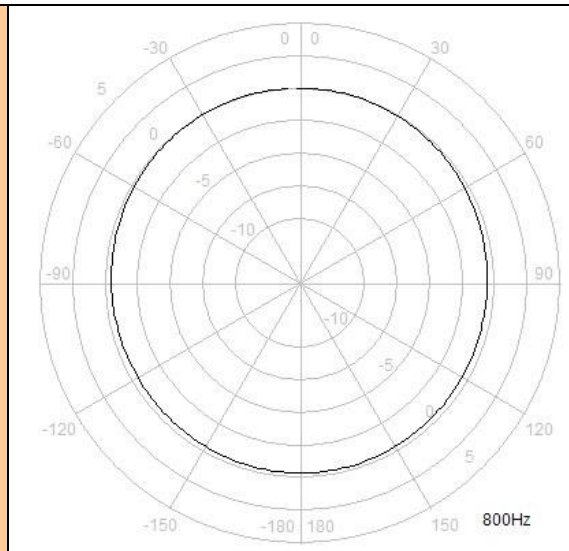




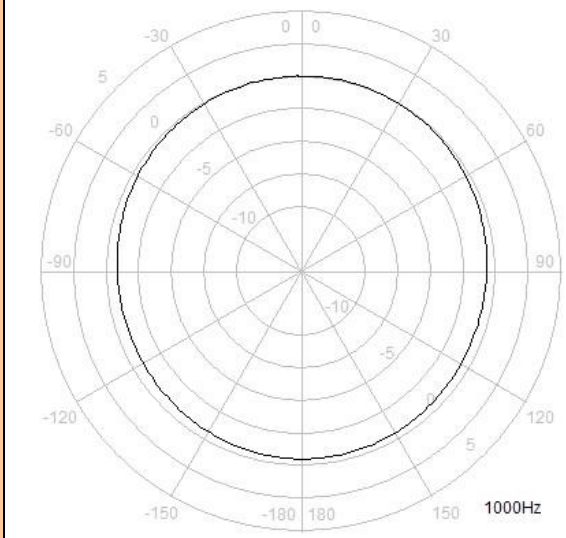
630 Hz



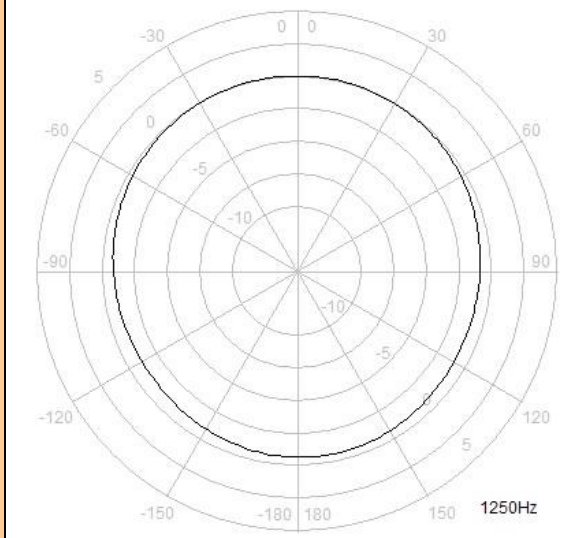
800 Hz



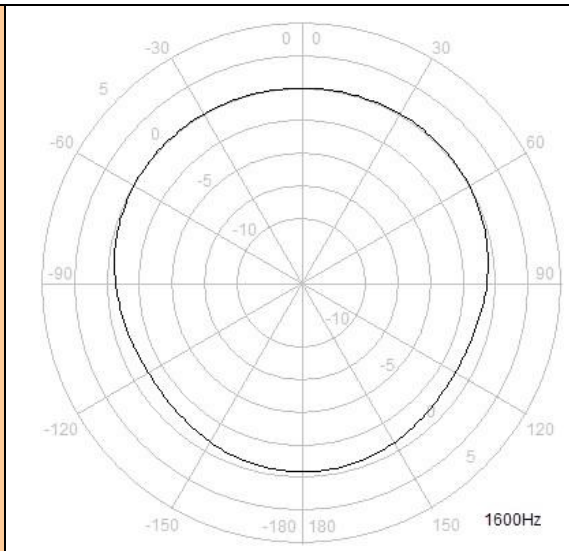
1000 Hz

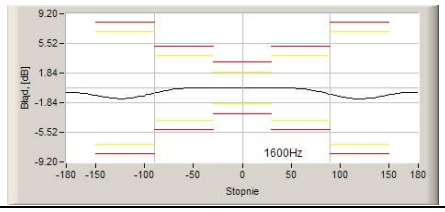


1250 Hz

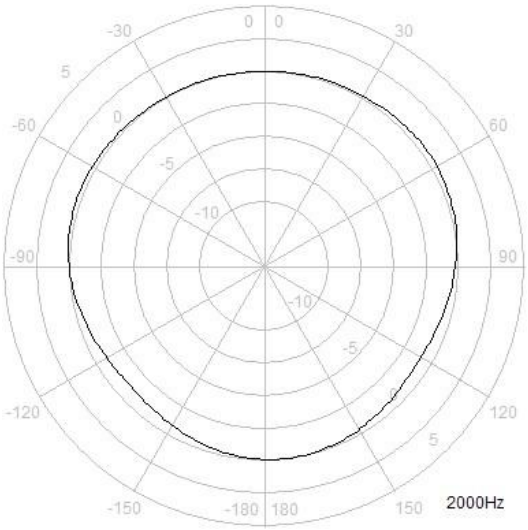


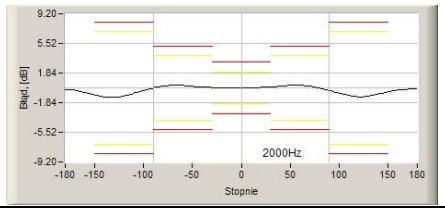
1600 Hz



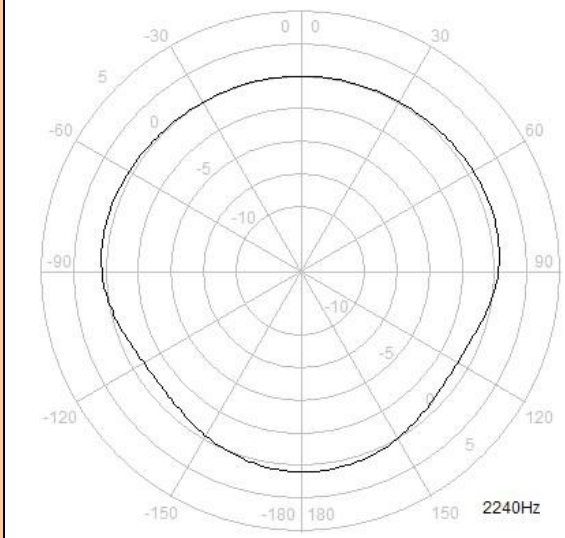


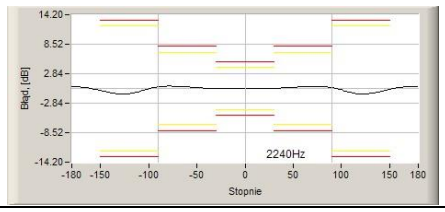
2000 Hz



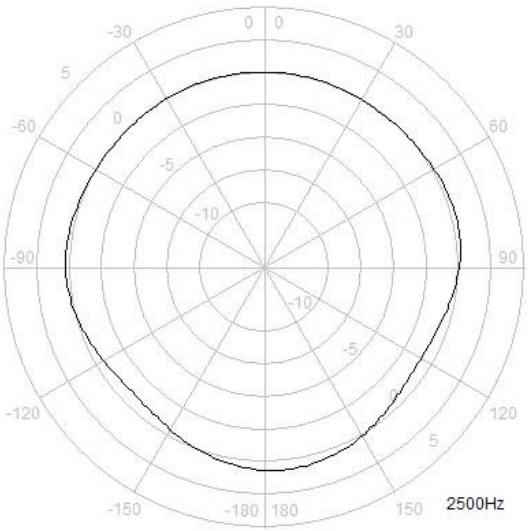


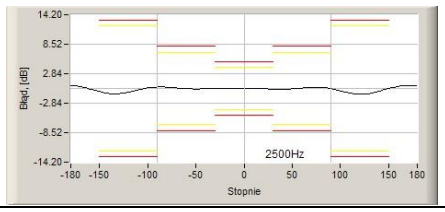
2240 Hz



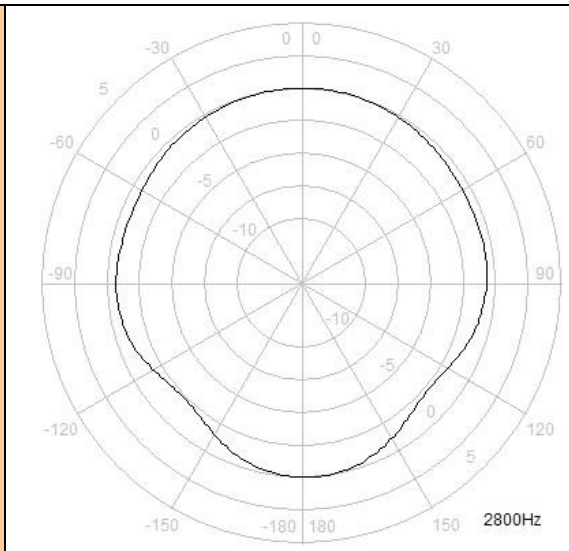


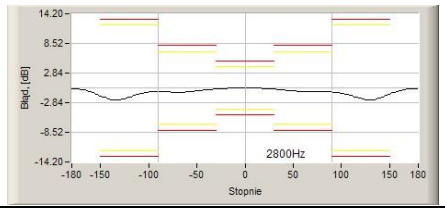
2500 Hz



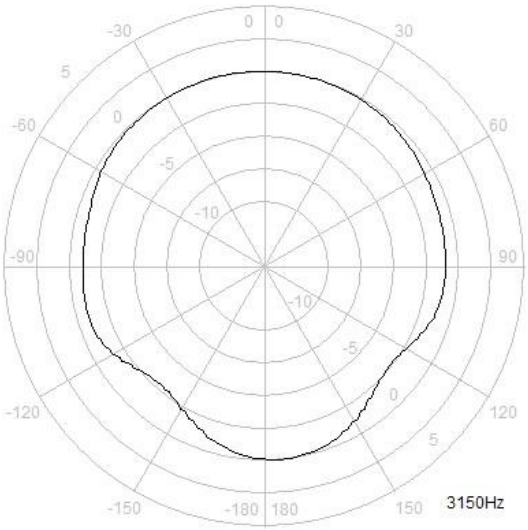


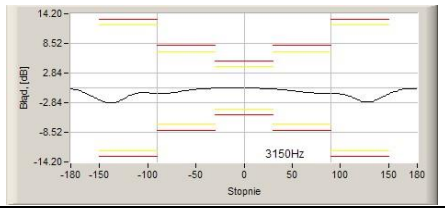
2800 Hz



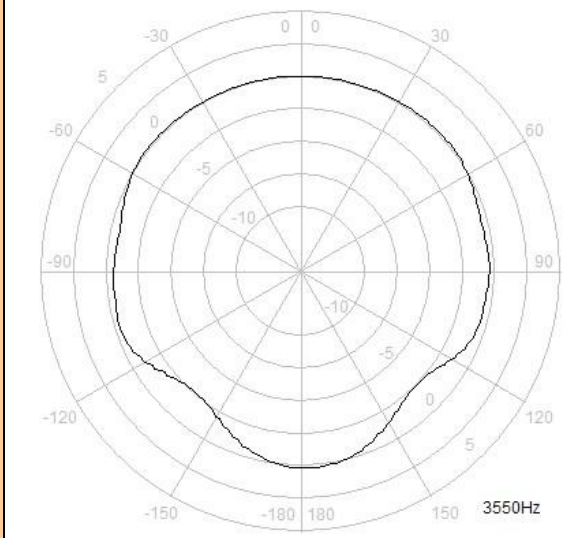


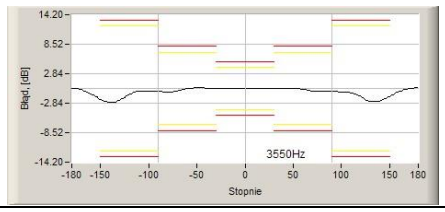
3150 Hz



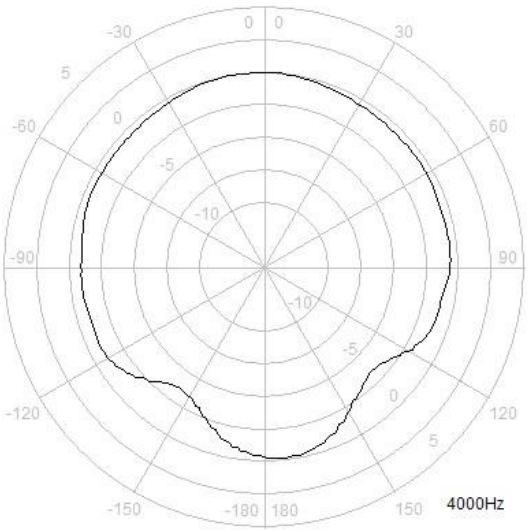


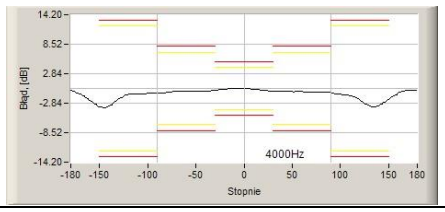
3550 Hz



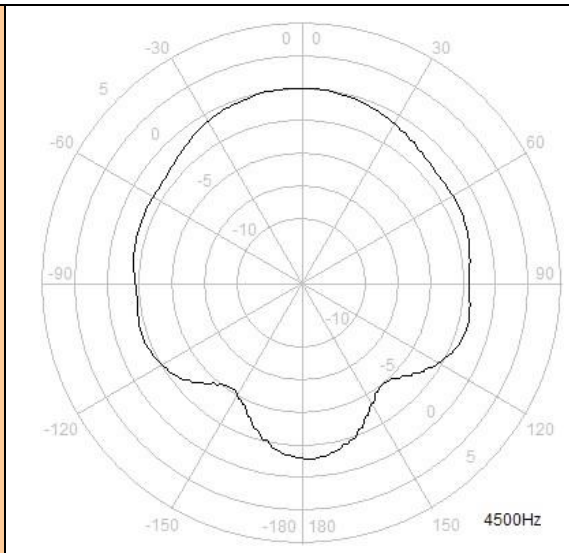


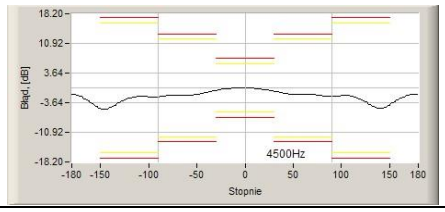
4000 Hz



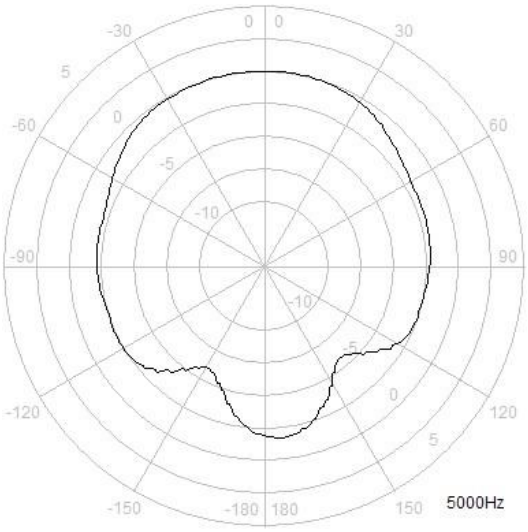


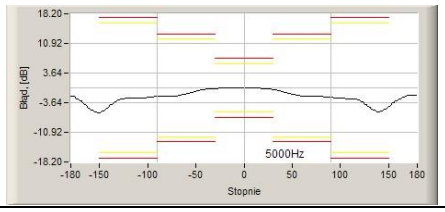
4500 Hz



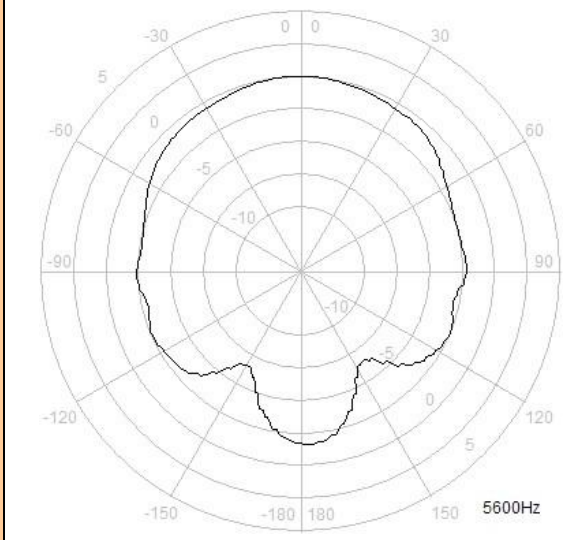


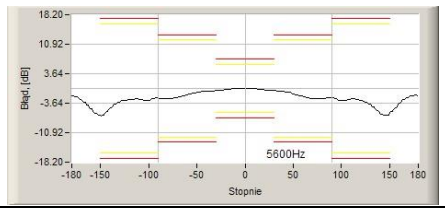
5000 Hz



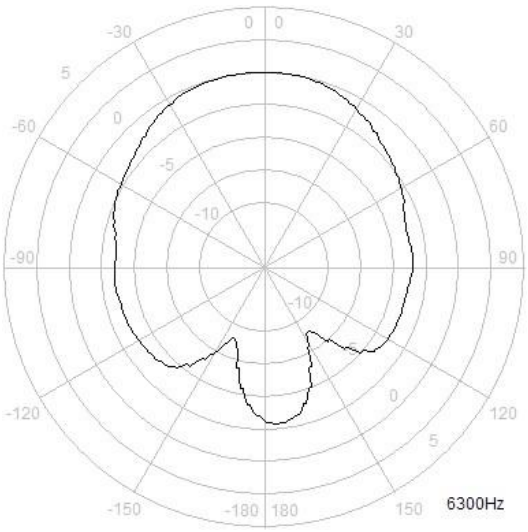


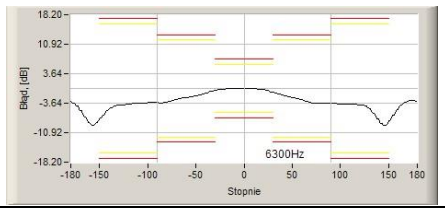
5600 Hz



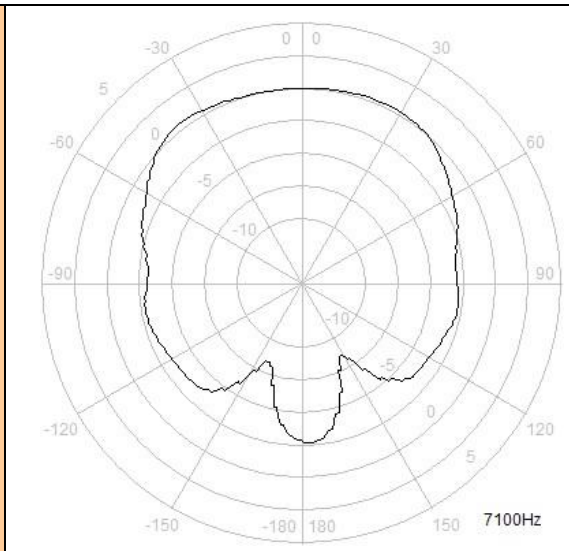


6300 Hz

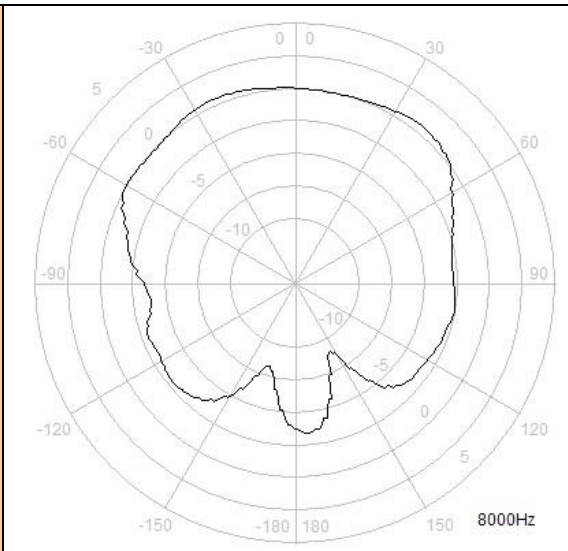




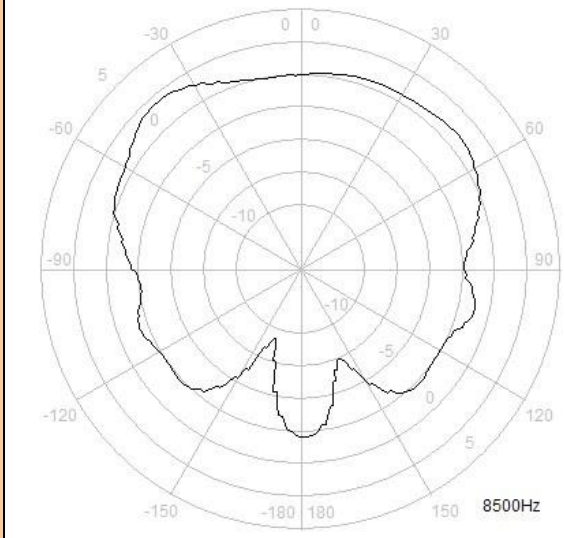
7100 Hz



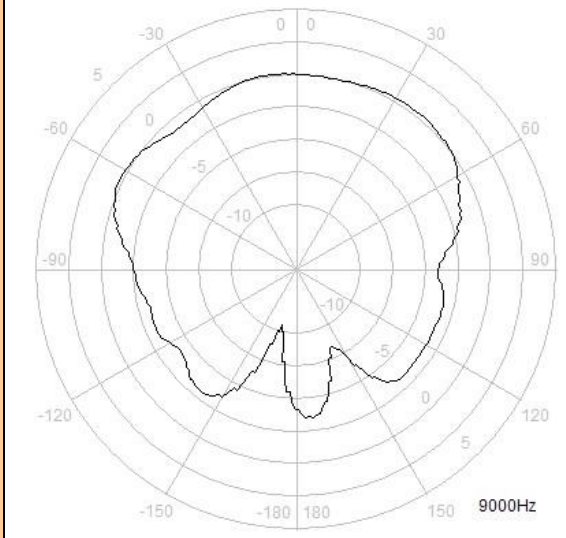
8000 Hz



8500 Hz



9000 Hz



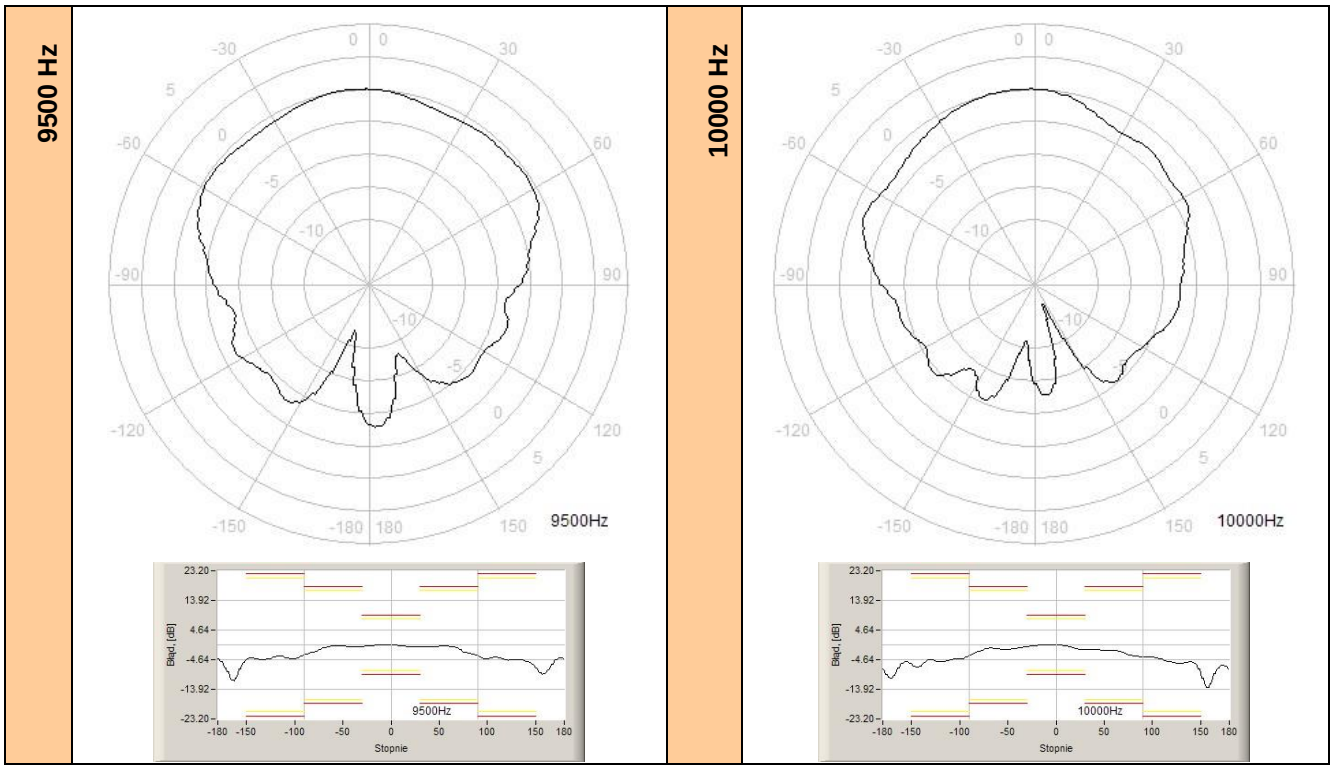


Table C.5 Directional response for SV 104A with microphone ST 104A and SA 122A windscreen (symmetrical axis)

Angle [˚]									
f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
250	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2
315	-0.0	-0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3
400	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
500	0.0	-0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3
630	-0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4	-0.4	-0.5
800	-0.0	-0.1	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.6
1000	0.0	-0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.7	-0.8
1250	-0.0	-0.0	-0.1	-0.2	-0.3	-0.5	-0.7	-0.8	-1.0
1600	-0.0	0.0	0.0	0.0	-0.0	-0.1	-0.3	-0.5	-0.8
2000	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.2	-0.3
2240	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.4	0.4
2500	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.2	0.2	0.2
2800	-0.0	-0.1	-0.2	-0.4	-0.6	-0.7	-0.8	-0.8	-0.8
3150	-0.0	-0.1	-0.2	-0.3	-0.5	-0.7	-1.0	-1.0	-1.1
3550	0.0	0.0	0.0	0.1	0.1	-0.1	-0.5	-0.6	-0.6
4000	-0.1	-0.3	-0.5	-0.6	-0.6	-0.6	-0.7	-0.8	-0.7
4500	-0.1	-0.4	-0.8	-1.3	-1.6	-1.6	-1.6	-1.9	-2.1
5000	-0.0	-0.2	-0.4	-0.9	-1.6	-2.0	-2.1	-2.1	-2.3
5600	-0.1	-0.3	-0.5	-0.7	-1.3	-1.9	-2.5	-2.5	-2.5
6300	-0.1	-0.3	-0.8	-1.6	-2.3	-2.8	-3.6	-3.7	-3.7
7100	0.1	0.2	0.2	0.2	-0.9	-1.5	-2.2	-3.0	-3.1
8000	-0.1	-0.1	0.2	0.5	0.5	-1.1	-2.2	-2.8	-2.9
8500	0.2	0.5	0.5	0.7	0.9	0.9	0.4	-1.5	-2.4

9000	-0.1	-0.1	0.2	0.2	0.2	-0.6	-1.6	-2.9	-4.1
9500	-0.3	-0.6	-0.7	-0.6	-0.5	-0.4	-1.2	-2.6	-3.2
10000	-0.3	-1.1	-1.6	-1.6	-1.8	-1.9	-2.4	-3.4	-3.8
Angle [˚]									
f [Hz]	90-100	100-110	110-120	120-130	130-140	140-150	150-160	160-170	170-180
250	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
315	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
400	-0.1	-0.1	-0.1	-0.0	0.0	0.0	0.1	0.1	0.1
500	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
630	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
800	-0.7	-0.7	-0.7	-0.7	-0.6	-0.6	-0.5	-0.5	-0.4
1000	-0.8	-0.9	-0.9	-0.8	-0.8	-0.7	-0.7	-0.6	-0.6
1250	-1.1	-1.1	-1.1	-1.1	-1.0	-1.0	-0.8	-0.8	-0.7
1600	-1.1	-1.3	-1.4	-1.4	-1.3	-1.1	-0.9	-0.7	-0.6
2000	-0.7	-0.9	-1.1	-1.1	-1.0	-0.7	-0.5	-0.3	-0.2
2240	-0.2	-0.8	-1.0	-1.1	-0.9	-0.6	0.2	0.4	0.4
2500	-0.5	-0.9	-1.1	-1.1	-0.9	-0.5	0.4	0.6	0.6
2800	-1.0	-1.5	-1.9	-2.3	-2.3	-1.9	-1.3	-0.5	-0.2
3150	-1.2	-1.7	-2.3	-2.7	-2.7	-2.0	-1.3	-0.4	-0.2
3550	-0.7	-0.8	-1.4	-2.5	-2.6	-2.3	-1.6	-0.5	0.1
4000	-1.2	-1.3	-2.0	-3.4	-3.5	-3.2	-2.2	-0.8	-0.3
4500	-2.1	-2.0	-2.7	-4.0	-5.0	-5.1	-4.3	-2.4	-1.7
5000	-2.5	-2.6	-3.0	-4.8	-5.9	-5.9	-4.5	-2.7	-1.9
5600	-3.0	-3.0	-2.9	-3.8	-6.0	-6.7	-6.2	-3.7	-2.0
6300	-3.9	-4.0	-4.0	-5.1	-7.5	-9.0	-8.0	-4.6	-3.2
7100	-3.0	-3.2	-3.7	-3.9	-5.5	-8.2	-8.7	-6.1	-3.2
8000	-2,9	-3,0	-3,3	-3,5	-4,5	-8,2	-9,2	-6,6	-3,8
8500	-2,4	-1,7	-2,6	-2,6	-2,7	-4,7	-7,5	-6,8	-3,0
9000	-4,2	-3,5	-3,5	-3,5	-3,8	-6,4	-8,5	-6,9	-4,3
9500	-4,5	-4,4	-4,8	-4,8	-5,1	-6,7	-9,2	-8,6	-4,7
10000	-3,9	-4,5	-5,3	-5,8	-5,7	-7,5	-13,4	-12,2	-7,5
Angle [˚]									
f [Hz]	180-190	190-200	200-210	210-220	220-230	230-240	240-250	250-260	260-270
250	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2
315	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2
400	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
500	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
630	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
800	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5
1000	-0.6	-0.7	-0.7	-0.8	-0.9	-1.0	-1.0	-1.0	-0.9
1250	-0.8	-0.9	-1.0	-1.1	-1.2	-1.2	-1.2	-1.1	-1.0
1600	-0.6	-0.7	-0.9	-1.2	-1.3	-1.4	-1.4	-1.2	-0.9
2000	-0.3	-0.6	-0.8	-1.1	-1.2	-1.2	-1.0	-0.6	-0.3
2240	0.4	0.3	-0.4	-0.8	-1.1	-1.1	-1.0	-0.6	0.3
2500	0.5	0.3	-0.5	-1.0	-1.1	-1.0	-0.7	-0.2	0.2
2800	-0.4	-0.8	-1.5	-2.2	-2.4	-2.3	-1.7	-1.1	-0.8
3150	-0.5	-1.3	-2.3	-2.9	-2.9	-2.5	-1.5	-1.0	-1.0
3550	-0.2	-1.0	-2.1	-2.7	-2.7	-2.2	-1.0	-0.5	-0.6
4000	-1.0	-2.2	-3.5	-3.7	-3.1	-2.0	-1.1	-1.1	-1.0
4500	-2.2	-3.6	-4.9	-5.3	-4.8	-3.3	-2.5	-2.2	-2.2
5000	-3.3	-4.9	-6.1	-6.1	-4.2	-3.0	-2.5	-2.5	-2.3
5600	-2.7	-5.1	-6.7	-6.7	-4.8	-3.2	-2.8	-3.0	-2.9
6300	-5.6	-8.4	-9.1	-7.2	-4.7	-4.1	-3.9	-3.7	-3.5

7100	-4.6	-8.2	-8.5	-6.7	-4.1	-3.6	-3.5	-3.0	-3.0
8000	-6.7	-8.4	-8.0	-4.8	-3.4	-3.1	-3.3	-3.7	-3.9
8500	-4.4	-9.3	-9.3	-5.3	-2.7	-2.5	-2.4	-2.4	-2.6
9000	-9.1	-10.6	-7.7	-3.7	-3.9	-4.2	-3.8	-3.4	-3.1
9500	-8.6	-11.3	-9.1	-4.4	-4.7	-4.5	-4.0	-4.5	-4.3
10000	-10.6	-9.6	-5.8	-7.0	-6.0	-5.4	-5.4	-4.5	-4.4
Angle [˚]									
f [Hz]	270-280	280-290	290-300	300-310	310-320	320-330	330-340	340-350	350-360
250	-0.2	-0.2	-0.1	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0
315	-0.2	-0.1	-0.1	-0.1	-0.0	-0.0	0.0	0.0	0.0
400	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
500	-0.2	-0.2	-0.1	-0.1	-0.1	-0.0	-0.0	0.0	-0.6
630	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1	-0.1	-0.0	-0.3
800	-0.5	-0.4	-0.3	-0.2	-0.1	-0.1	-0.0	0.0	-0.4
1000	-0.8	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	-0.1	-0.0
1250	-0.9	-0.7	-0.5	-0.4	-0.2	-0.1	-0.1	-0.0	-0.0
1600	-0.7	-0.4	-0.2	-0.0	0.0	0.0	0.0	-0.0	-0.0
2000	0.2	0.3	0.3	0.3	0.2	0.1	0.0	0.0	0.0
2240	0.5	0.5	0.4	0.3	0.1	0.0	0.0	-0.0	0.0
2500	0.3	0.2	-0.1	-0.1	-0.1	-0.1	-0.0	-0.0	0.0
2800	-0.8	-0.9	-0.9	-0.8	-0.5	-0.4	-0.2	-0.1	-0.0
3150	-1.1	-1.0	-0.8	-0.5	-0.2	-0.1	-0.0	-0.0	-0.0
3550	-0.7	-0.7	-0.4	0.1	0.1	0.1	0.0	0.0	0.0
4000	-0.9	-0.8	-0.6	-0.6	-0.6	-0.5	-0.3	-0.1	-0.1
4500	-2.2	-1.9	-1.8	-1.8	-1.5	-1.1	-0.6	-0.2	-0.0
5000	-2.1	-2.1	-2.0	-1.5	-0.8	-0.3	-0.1	-0.1	0.0
5600	-2.6	-2.6	-2.2	-1.6	-0.9	-0.7	-0.5	-0.3	-0.1
6300	-3.6	-3.3	-2.7	-2.2	-1.8	-1.1	-0.5	-0.1	-0.0
7100	-3.1	-2.7	-1.8	-1.2	0.4	0.5	0.3	0.1	-0.0
8000	-3.4	-1.9	-1.1	-0.1	-0.1	0.4	0.4	0.4	0.2
8500	-1.9	-0.8	0.6	1.6	2.0	2.0	1.2	0.3	-0.2
9000	-2.5	-1.2	0.2	-0.4	-0.9	-0.9	-0.6	-0.1	-0.1
9500	-3.0	-2.0	-1.0	-0.4	-0.5	-0.6	-0.5	-0.2	-0.0
10000	-3.1	-1.9	-1.3	-1.5	-1.4	-1.0	-0.5	-0.1	0.0

Directional response for dosimeter Class SV 104A with microphone ST 104A and SA 122A windscreen (for orthogonal asymmetrical axis) for specified frequencies:

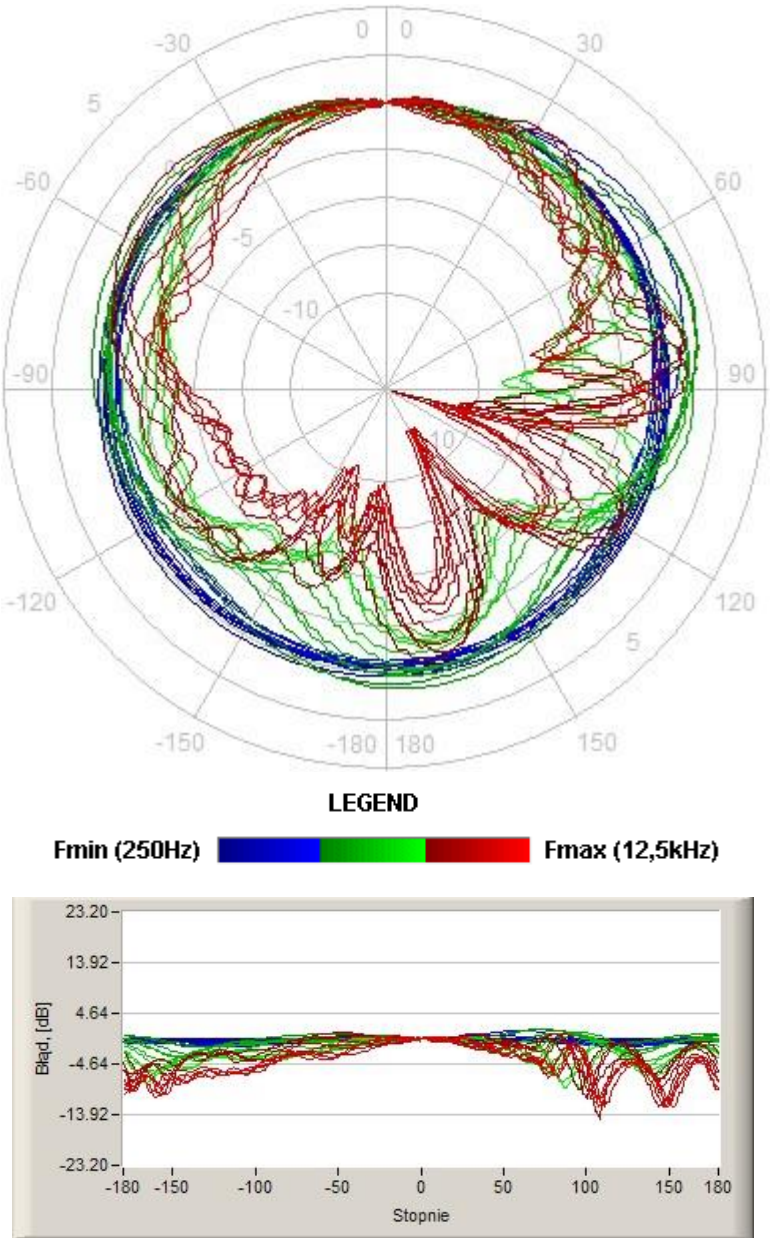
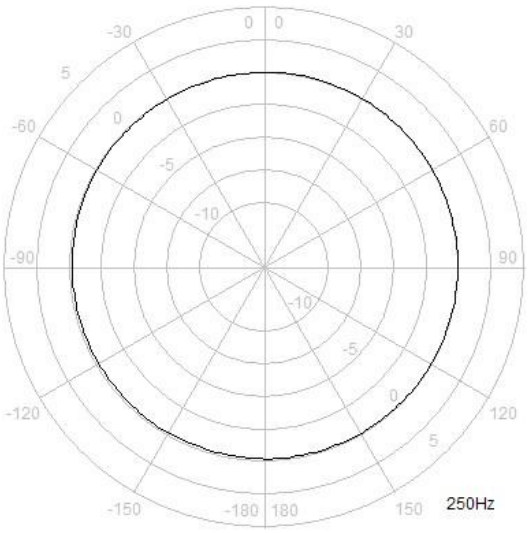
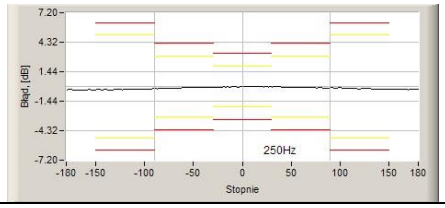


Figure C.5 Total directional characteristics (asymmetrical axis)

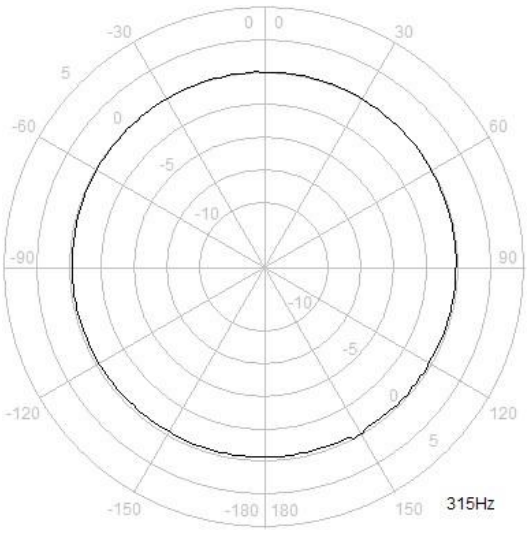
The round charts show the directional characteristic and the charts below shows the errors for particular angles (note: limits are for class 1).

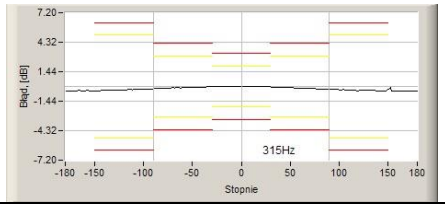
250 Hz



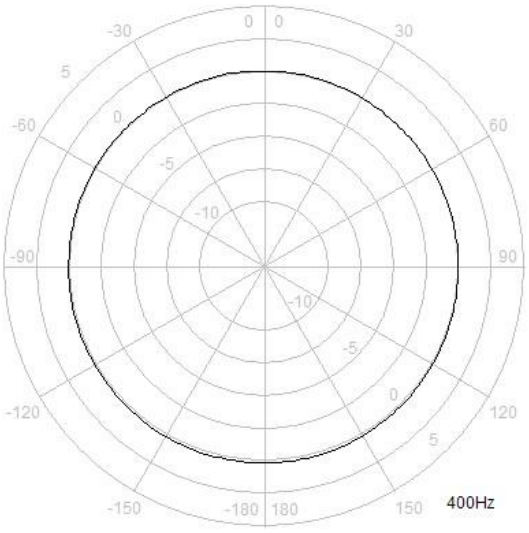


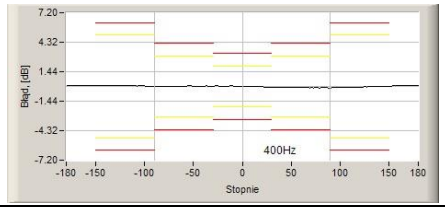
315 Hz



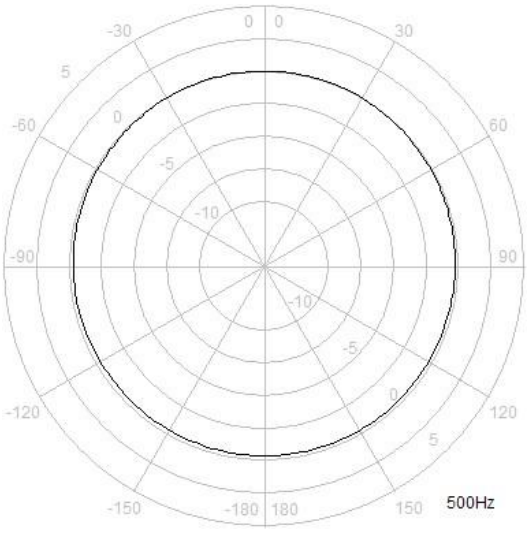


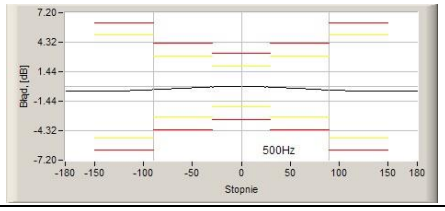
400 Hz



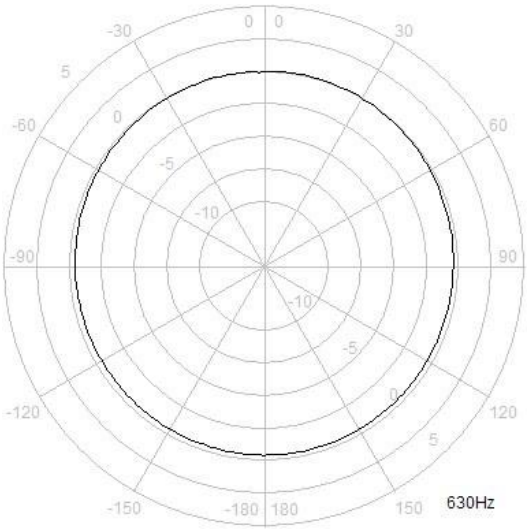


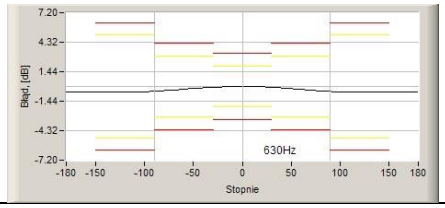
500 Hz



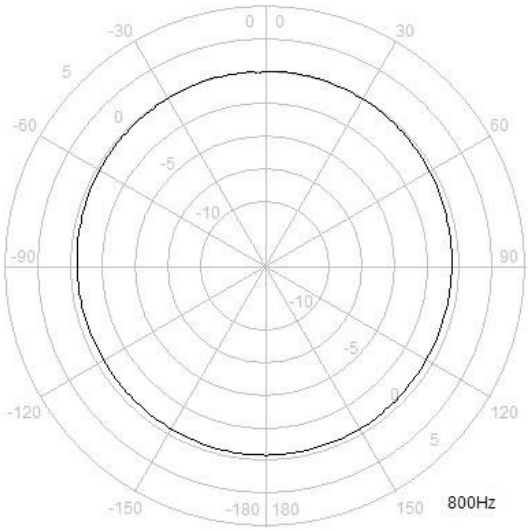


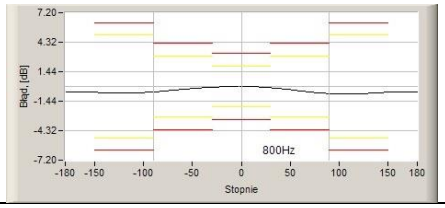
630 Hz



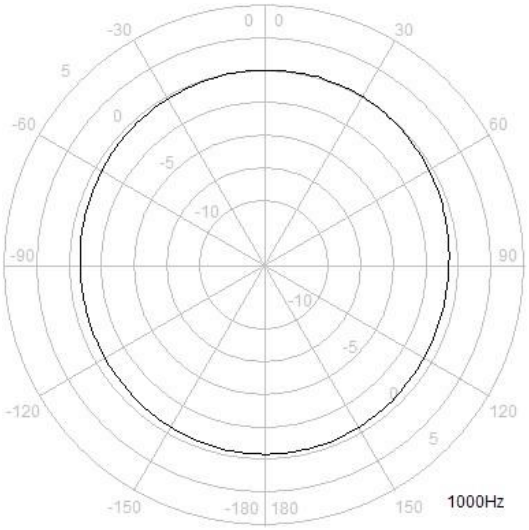


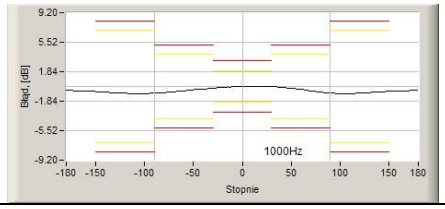
800 Hz



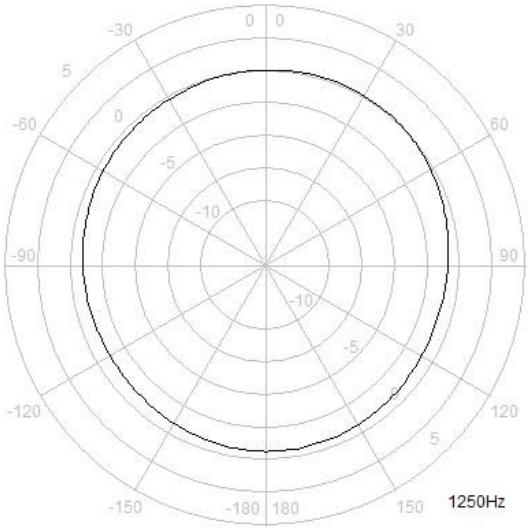


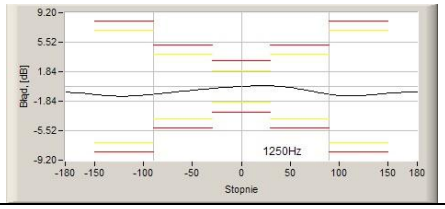
1000 Hz



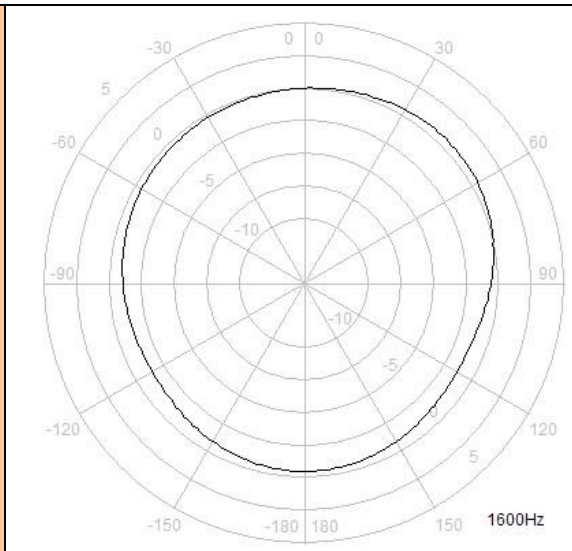


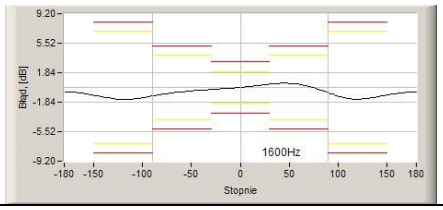
1250 Hz



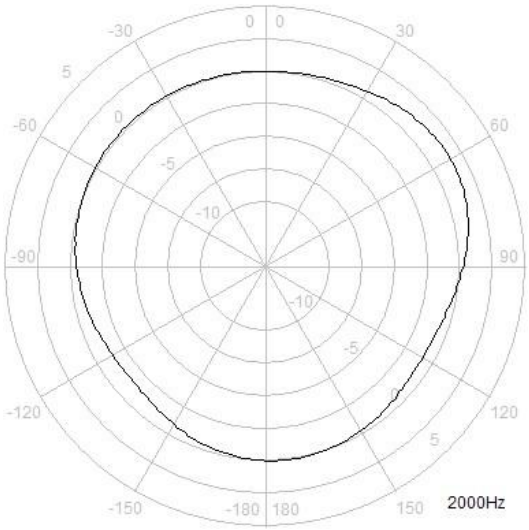


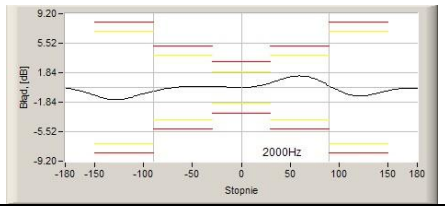
1600 Hz



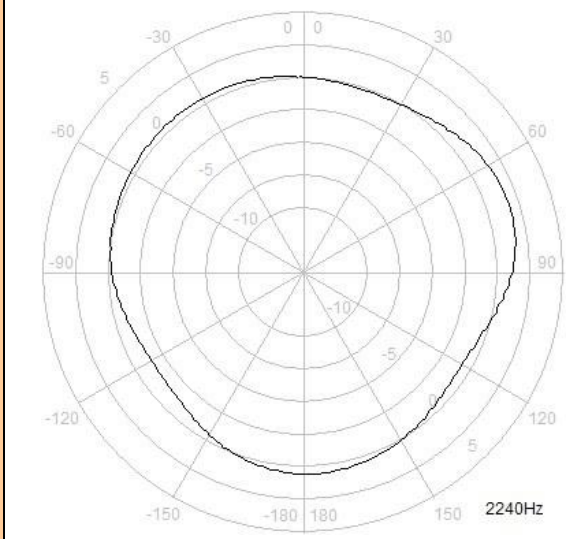


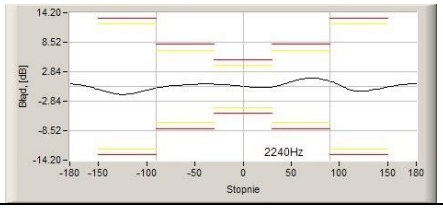
2000 Hz



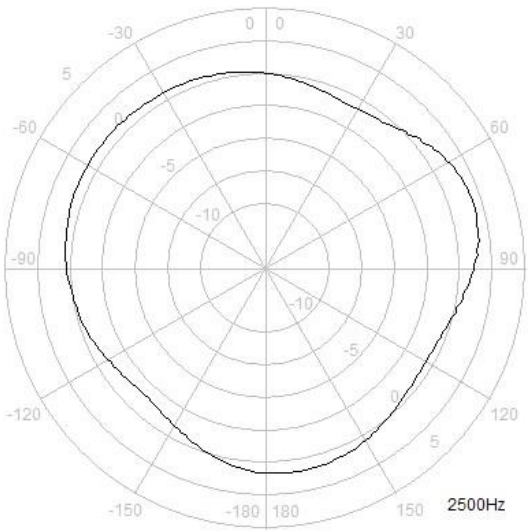


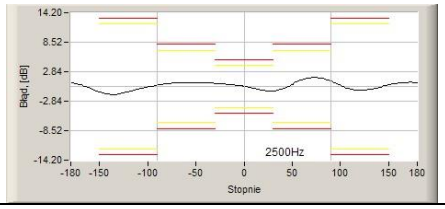
2240 Hz



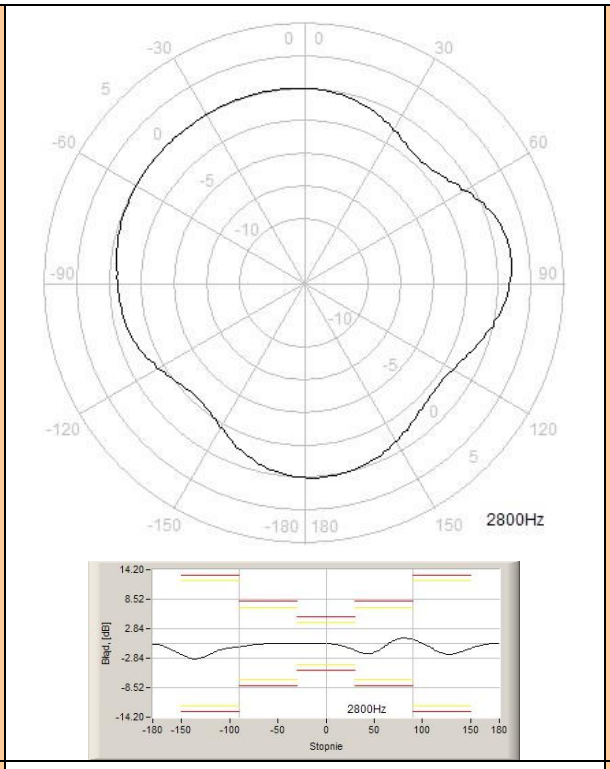


2500 Hz

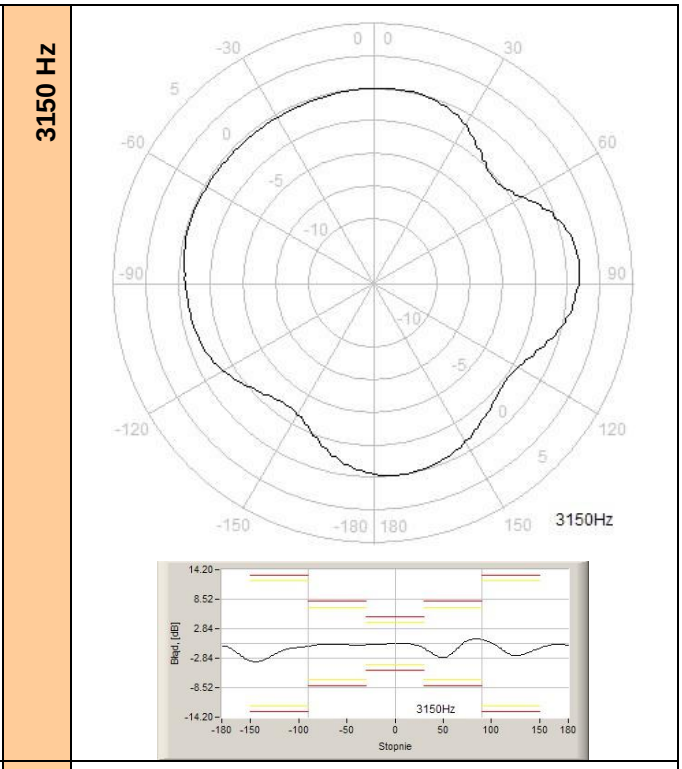




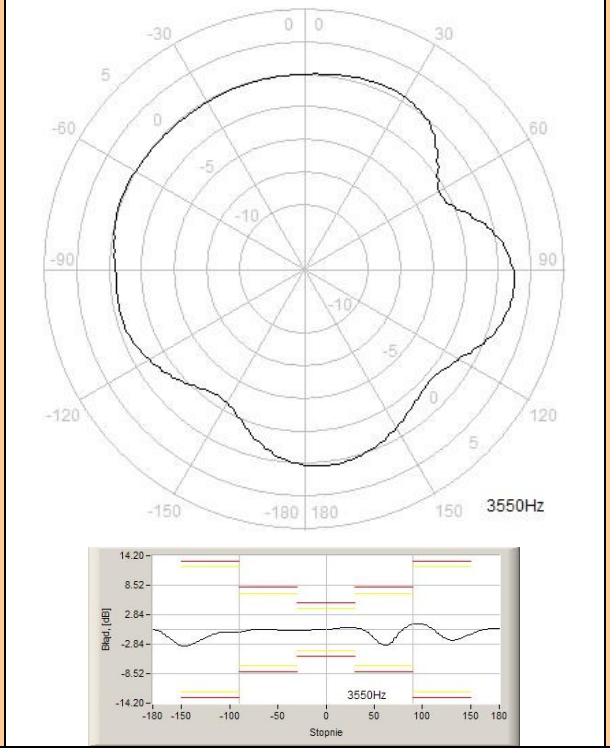
2800 Hz



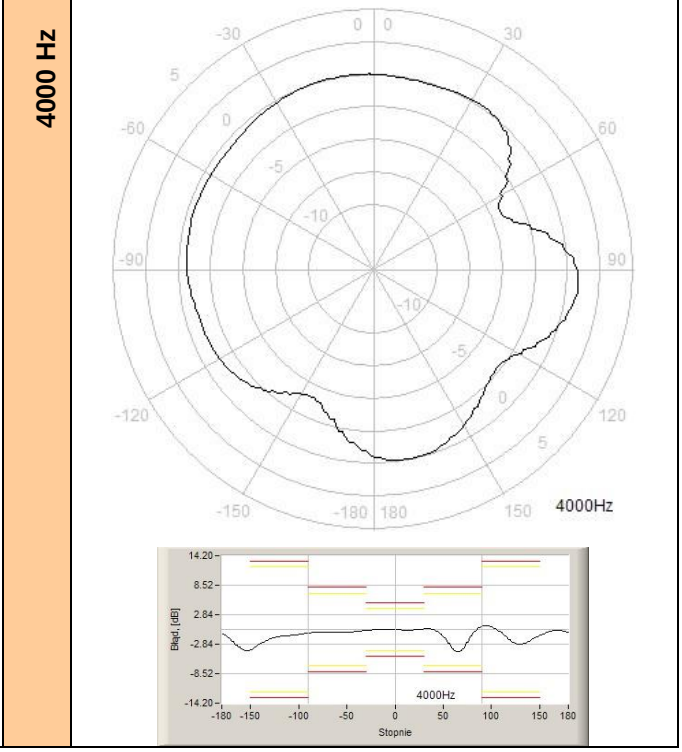
3150 Hz



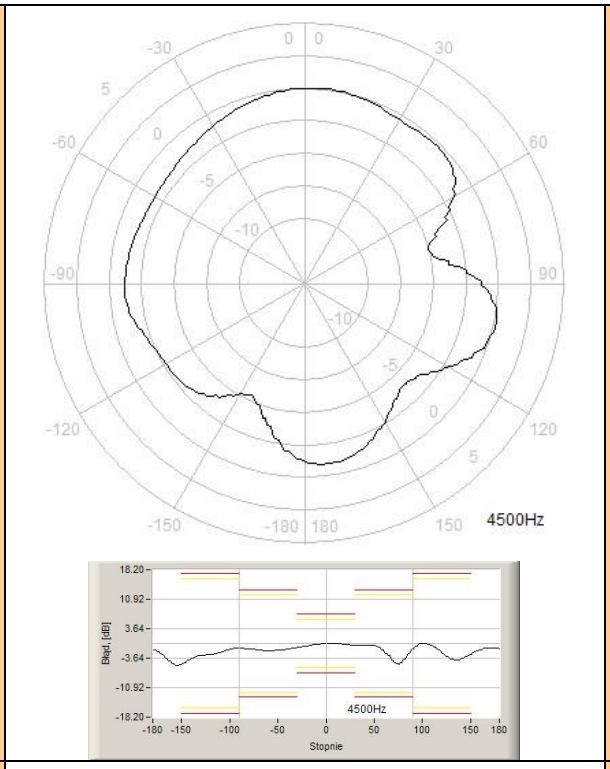
3550 Hz



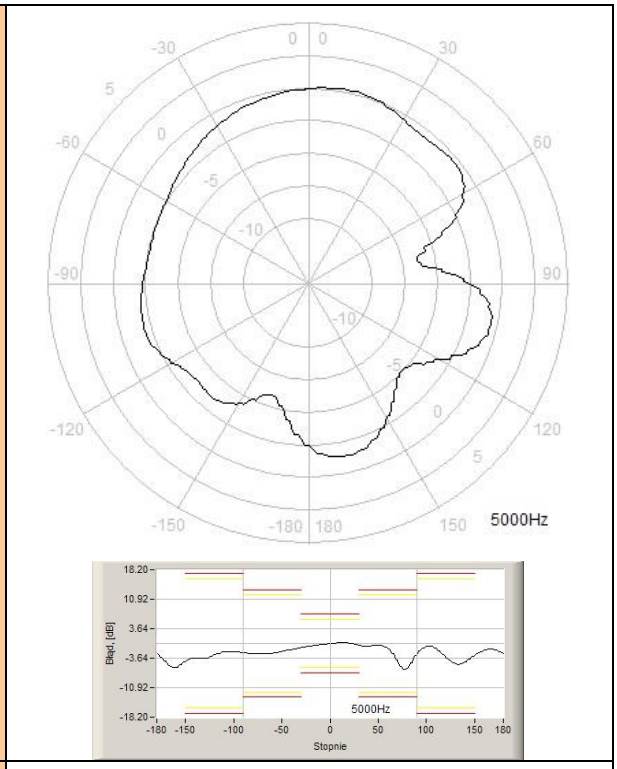
4000 Hz



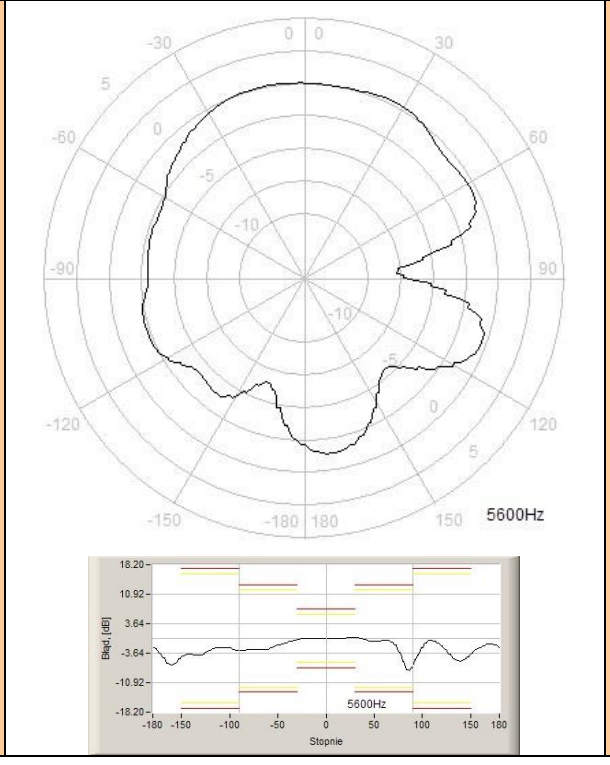
4500 Hz



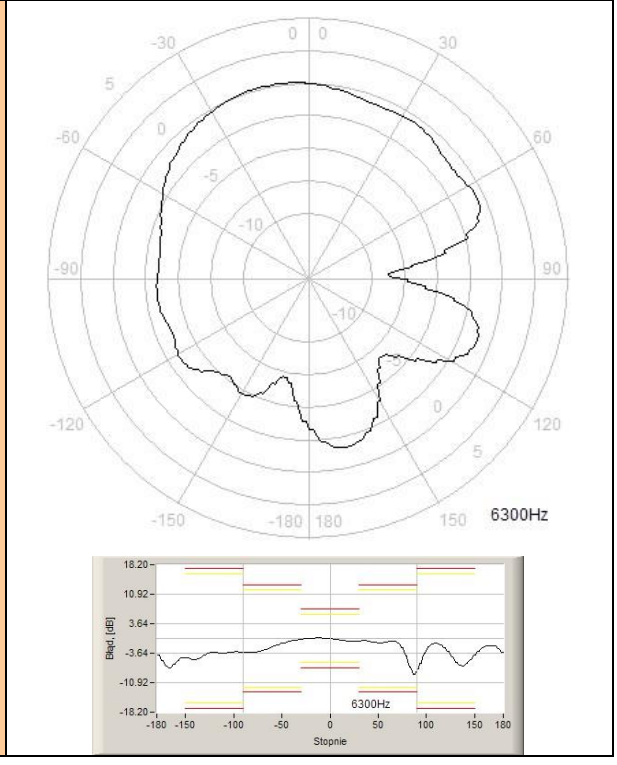
5000 Hz



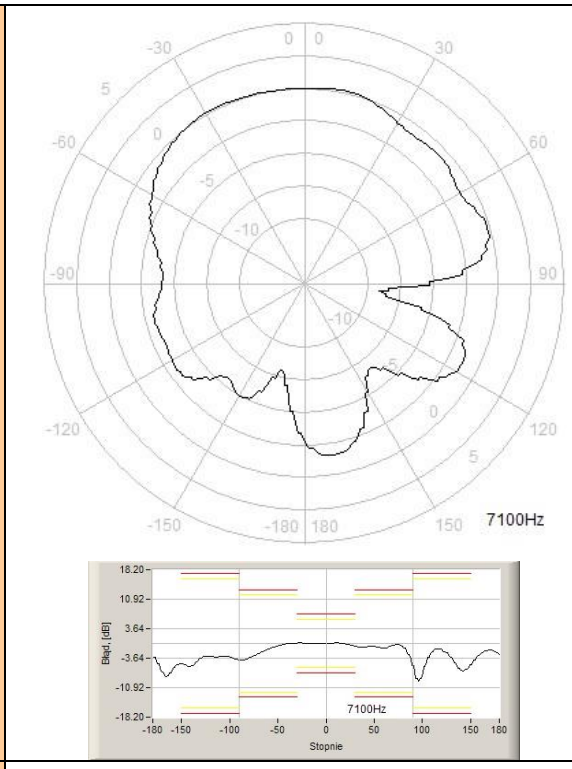
5600 Hz



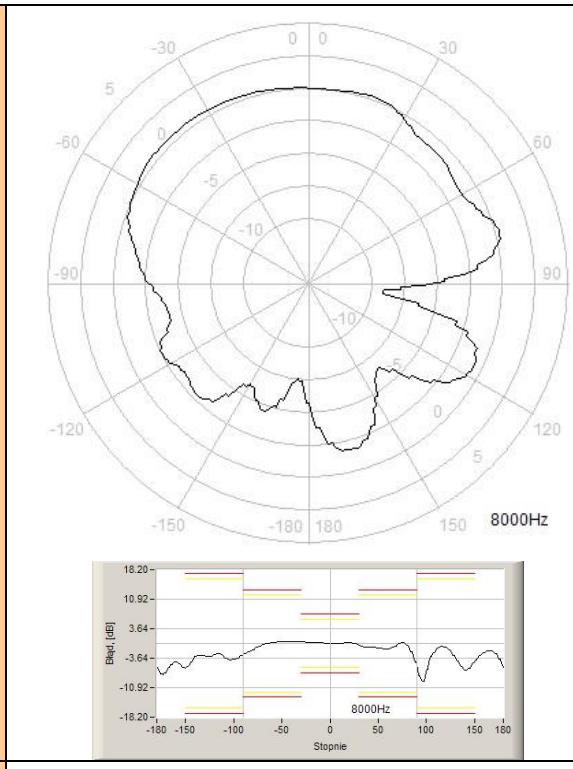
6300 Hz



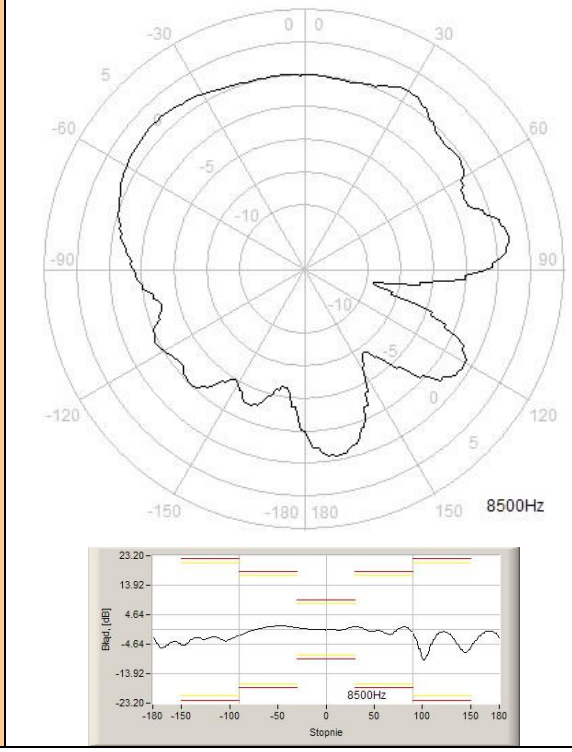
7100 Hz



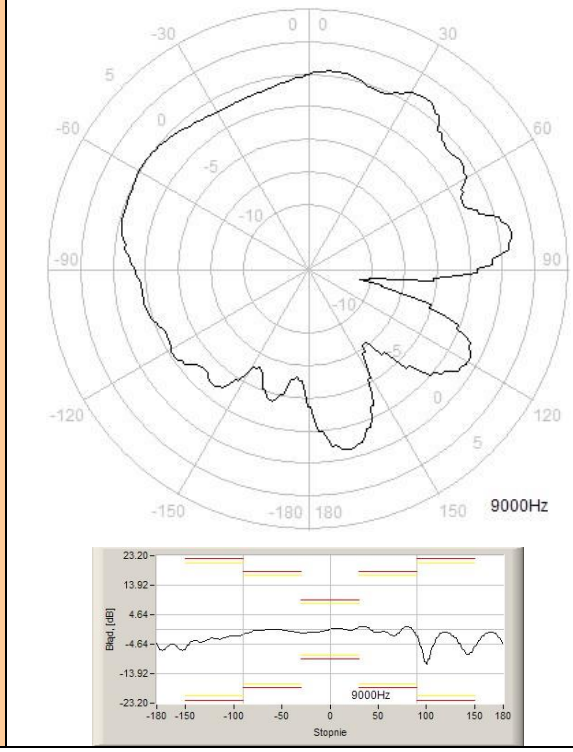
8000 Hz



8500 Hz



9000 Hz



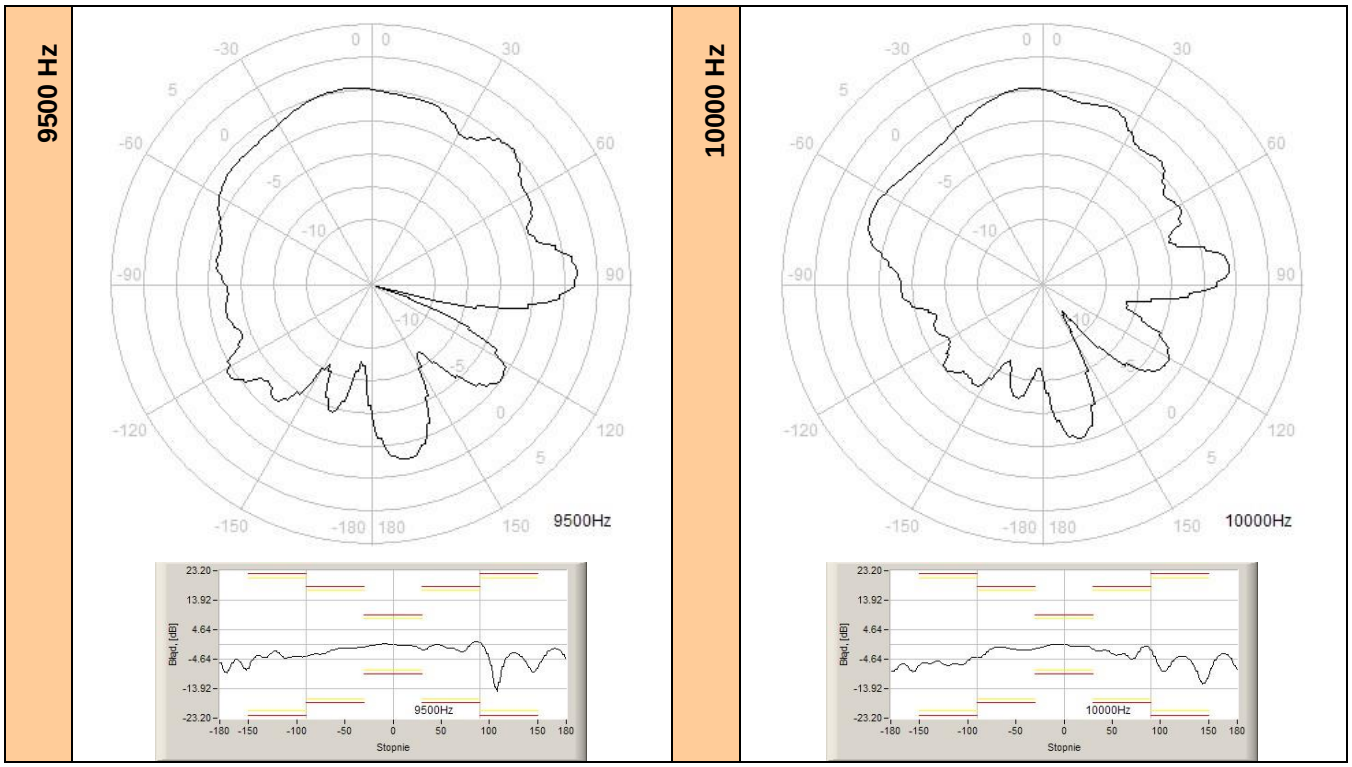


Table C.6 Directional response for SV 104A with microphone ST 104A and SA 122A windscreen (asymmetrical axis)

Angle [˚]									
f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
630	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
800	0.0	-0.0	-0.0	-0.1	-0.1	-0.2	-0.2	-0.2	-0.3
1000	0.0	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
1250	-0.0	-0.0	-0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.3
1600	0.0	-0.0	-0.1	-0.1	-0.2	-0.3	-0.4	-0.4	-0.5
2000	-0.0	-0.1	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.7
2240	0.0	0.0	-0.0	-0.1	-0.2	-0.4	-0.6	-0.7	-0.8
2500	0.1	0.1	0.1	0.1	-0.1	-0.3	-0.6	-0.8	-1.0
2800	0.1	0.3	0.4	0.5	0.5	0.5	0.4	-0.2	-0.7
3150	0.0	0.2	0.5	1.0	1.3	1.4	1.4	1.2	0.8
3550	-0.2	-0.3	-0.3	0.3	0.8	1.3	1.6	1.6	1.5
4000	-0.5	-0.8	-1.0	-0.9	-0.4	1.1	1.6	1.7	1.5
4500	-0.2	-0.6	-1.3	-1.9	-2.0	-1.6	-0.7	1.0	1.0
5000	0.0	-0.2	-0.9	-2.1	-2.7	-2.7	-1.5	0.8	0.9
5600	0.1	0.3	0.4	0.3	-1.6	-3.1	-3.1	-1.5	1.0
6300	-0.1	-0.1	-0.1	0.1	-1.2	-3.6	-4.3	-3.7	-0.8
7100	0.1	-0.2	-0.4	-0.5	-0.5	-1.5	-4.2	-5.1	-3.8
8000	0.2	0.2	-0.4	-0.6	-0.6	-1.0	-4.0	-6.4	-6.1
8500	-0.1	0.1	0.2	-0.3	-0.7	-0.7	-1.2	-5.8	-7.9
9000	-0.4	-0.7	-0.7	-0.6	-1.1	-1.1	-1.2	-4.3	-8.9
9500	0.1	0.1	-0.7	-0.9	-0.8	-1.2	-1.2	-0.8	-5.4
10000	-0.1	0.1	-0.2	-1.0	-1.1	-1.4	-1.4	-0.6	-4.6
Angle [˚]									
f [Hz]	90-100	100-110	110-120	120-130	130-140	140-150	150-160	160-170	170-180
630	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3
800	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5
1000	-0.1	-0.1	-0.1	-0.0	-0.0	0.0	0.1	0.1	0.1

1250	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5
1600	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5
2000	-0.7	-0.7	-0.7	-0.7	-0.7	-0.6	-0.6	-0.5	-0.5
2240	-0.9	-0.9	-0.9	-0.8	-0.8	-0.7	-0.6	-0.5	-0.5
2500	-1.1	-1.2	-1.2	-1.1	-1.1	-0.9	-0.9	-0.8	-0.7
2800	-1.1	-1.4	-1.4	-1.4	-1.4	-1.1	-0.9	-0.7	-0.6
3150	-0.5	-0.9	-1.1	-1.1	-1.0	-0.7	-0.4	-0.2	-0.1
3550	0.9	-0.6	-1.0	-1.0	-0.9	-0.5	0.2	0.4	0.4
4000	0.9	-0.6	-0.8	-0.8	-0.7	0.2	0.5	0.7	0.7
4500	0.7	-1.0	-1.7	-2.1	-2.1	-1.5	-1.0	-0.3	-0.1
5000	0.8	-0.9	-2.1	-2.3	-2.3	-1.6	-0.8	-0.3	-0.3
5600	1.1	0.9	-1.3	-2.1	-2.1	-1.6	-0.8	-0.2	0.2
6300	0.8	-0.6	-1.9	-2.9	-2.8	-2.0	-1.0	-0.4	-0.6
7100	-1.4	-0.3	-2.0	-3.8	-4.1	-3.7	-2.6	-1.5	-1.3
8000	-2.3	-1.0	-3.1	-4.8	-5.1	-4.4	-2.7	-1.6	-2.5
8500	-6.4	-1.6	-1.8	-3.9	-5.7	-5.6	-3.7	-2.2	-2.2
9000	-7.4	-2.2	-2.2	-5.3	-6.8	-6.2	-4.1	-2.1	-3.4
9500	-9.3	-5.8	-2.0	-3.5	-6.6	-6.8	-5.3	-2.6	-2.8
10000	-9.3	-6.4	-1.2	-2.9	-6.6	-6.6	-4.2	-2.2	-5.9
Angle [˚]									
f [Hz]	180-190	190-200	200-210	210-220	220-230	230-240	240-250	250-260	260-270
630	-0.3	-0.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
800	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3
1000	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
1250	-0.5	-0.5	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3
1600	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6	-0.5	-0.5
2000	-0.5	-0.5	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
2240	-0.5	-0.6	-0.6	-0.7	-0.8	-0.9	-0.9	-0.9	-0.9
2500	-0.8	-0.9	-1.0	-1.1	-1.2	-1.2	-1.2	-1.2	-1.1
2800	-0.6	-0.7	-1.0	-1.2	-1.4	-1.5	-1.5	-1.4	-1.2
3150	-0.2	-0.6	-1.0	-1.4	-1.5	-1.5	-1.4	-1.1	-0.8
3550	0.4	0.2	-0.6	-1.2	-1.5	-1.6	-1.5	-1.2	-0.8
4000	0.6	-0.4	-1.1	-1.6	-1.6	-1.5	-1.0	-0.6	0.2
4500	-0.4	-1.2	-2.2	-2.9	-3.0	-2.7	-1.9	-1.2	-0.8
5000	-0.9	-2.4	-3.3	-3.5	-3.3	-2.3	-1.6	-0.9	-0.7
5600	-0.6	-2.0	-3.2	-3.3	-2.9	-1.9	-1.1	-0.5	-0.5
6300	-2.0	-3.7	-4.1	-3.9	-2.7	-1.8	-1.3	-1.2	-1.0
7100	-2.8	-5.0	-5.4	-5.0	-3.5	-2.9	-2.7	-2.1	-1.3
8000	-4.3	-5.9	-5.8	-4.1	-3.6	-3.5	-2.8	-1.9	-2.2
8500	-4.3	-6.5	-6.4	-4.3	-4.2	-4.0	-2.6	-2.4	-3.0
9000	-6.8	-7.2	-5.5	-5.3	-5.2	-3.8	-3.7	-3.7	-3.4
9500	-7.0	-8.1	-6.0	-5.6	-5.5	-3.4	-3.4	-3.3	-4.1
10000	-7.7	-6.6	-6.1	-5.8	-3.3	-3.3	-3.2	-4.1	-4.0
Angle [˚]									
f [Hz]	270-280	280-290	290-300	300-310	310-320	320-330	330-340	340-350	350-360
630	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
800	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.0	-0.0	0.0
1000	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0
1250	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	-0.0	-0.0	0.0
1600	-0.5	-0.4	-0.4	-0.3	-0.2	-0.1	-0.1	-0.0	-0.3
2000	-0.5	-0.4	-0.4	-0.3	-0.2	-0.1	-0.1	-0.0	-0.3
2240	-0.8	-0.8	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	-0.0
2500	-1.0	-0.8	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	-0.1
2800	-1.0	-0.8	-0.7	-0.5	-0.4	-0.3	-0.2	-0.1	-0.1

3150	-0.4	-0.2	0.1	0.2	0.2	0.2	0.1	0.1	-0.0
3550	-0.3	0.1	0.3	0.4	0.4	0.4	0.4	0.3	-0.5
4000	0.5	0.6	0.7	0.7	0.7	0.6	0.5	0.4	0.2
4500	-0.6	-0.4	-0.1	-0.1	-0.0	-0.0	0.0	0.0	0.0
5000	-0.5	-0.2	-0.2	-0.2	-0.3	-0.3	-0.2	-0.2	-0.1
5600	-0.5	-0.1	0.1	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1
6300	-0.7	-0.6	-0.5	-0.6	-0.6	-0.4	-0.2	0.0	0.0
7100	-1.3	-1.5	-1.7	-1.7	-1.6	-1.3	-0.9	-0.5	-0.2
8000	-2.5	-2.5	-2.5	-2.3	-1.8	-1.4	-0.8	-0.5	-0.2
8500	-3.0	-2.8	-2.8	-2.5	-1.5	-0.9	-0.3	0.1	0.2
9000	-3.5	-3.4	-3.0	-1.9	-1.2	-0.5	-0.1	0.1	0.1
9500	-4.1	-3.5	-2.5	-1.4	-0.5	0.1	0.1	0.1	-0.0
10000	-2.4	-1.6	-0.2	0.4	0.4	0.4	0.3	0.2	0.1

C.2 SPECIFICATION OF THE SV 104A AS 1/1 AND 1/3 OCTAVE ANALYSER

The SV 104A instrument operating as **1/1 OCTAVE or 1/3 OCTAVE** sound analyser meets the IEC 61260-1:2014 standard for the pass band filters.

Note: *Simultaneously to the frequency analysis SV 104A operates as a Dosimeter!*

Signal input

Connector	6 pin SVANTEK
Maximum input voltage	SV 104A meets the requirements of the EN/IEC 61010-1 category I measurement circuit. The input voltage shall not exceed the limits between 0 V and +3 V.
Impedance	41 kΩ / 11 nF.

Linear operating ranges

For the sinusoidal signal and microphone sensitivity 1 mV/Pa.

See Table C.1 on page 142 for details.

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* A_{10} = ***120 dB***

Measuring frequency range with the Z filter (-3 dB): 20 Hz ÷ 10.0 kHz

Maximum peak voltage of input sinusoidal signal, which can be led to the Dose Meter without destruction of the meter: 3 V Peak-Peak

RMS detector

Digital	“True RMS“ with Peak detection
Resolution	0.1 dB
Range	327.7 dB
Crest Factor	unlimited (for signals in 10 kHz band)

Reference conditions as per IEC 61260-1:2014

Reference frequency	1000 Hz
Reference level	114 dB
Reference temperature	from +20°C to +26°C
Reference relative humidity	from 35% to 65%

Calibration (electrical)

Calibration level	114.0 dB (ref. 1μV_{RMS})
Basic accuracy	< ± 0.1 dB (for the temperature T=+23°C ± 5°C for the sinusoidal signal 114 dB_{RMS} in the bandwidth 20 Hz ÷ 10 kHz with the **Z** input filter

Voltage measurement error in the full temperature range

< ± 0.1 dB when the temperature is from -10°C to +40°C for the sinusoidal signal.

Overload detector

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

Anti-aliasing filter

Built-in electric anti-aliasing filter ensuring correct sampling of the measured signal.

Pass band (-3 dB)	11.3 kHz
Stop band	14.4 kHz
Attenuation in the stop band	> 50 dB
Sampling frequency	24 kHz
Analogue to digital converter	sigma-delta 24 bit
Internal oscillator accuracy	0.01% (for f = 1 kHz and T = +23°C)

Digital filters

Weighting filters

Z meeting requirements of the IEC 61672-1:2013 standard for the Class 2 "**Z**" filter

A meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 2 "**A**" filter

C meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 2 "**C**" filter

See part for the A and C filters characteristics.

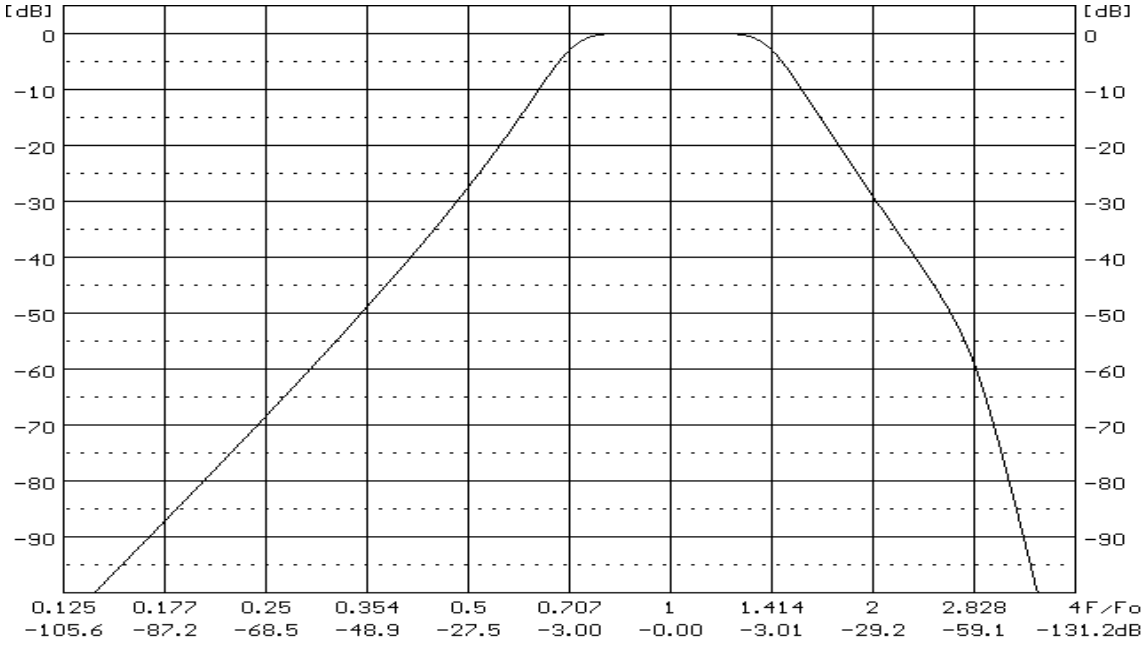
Noise levels (measured with the SC 104AT and source impedance **50 Ω**, **Microphone** compensation switched-off)

"**Z**" weighting	< 398 μV_{RMS}, (52 dB)
"**A**" weighting	< 126 μV_{RMS}, (42 dB)
"**C**" weighting	< 126 μV_{RMS}, (42 dB)

1/1 octave filters

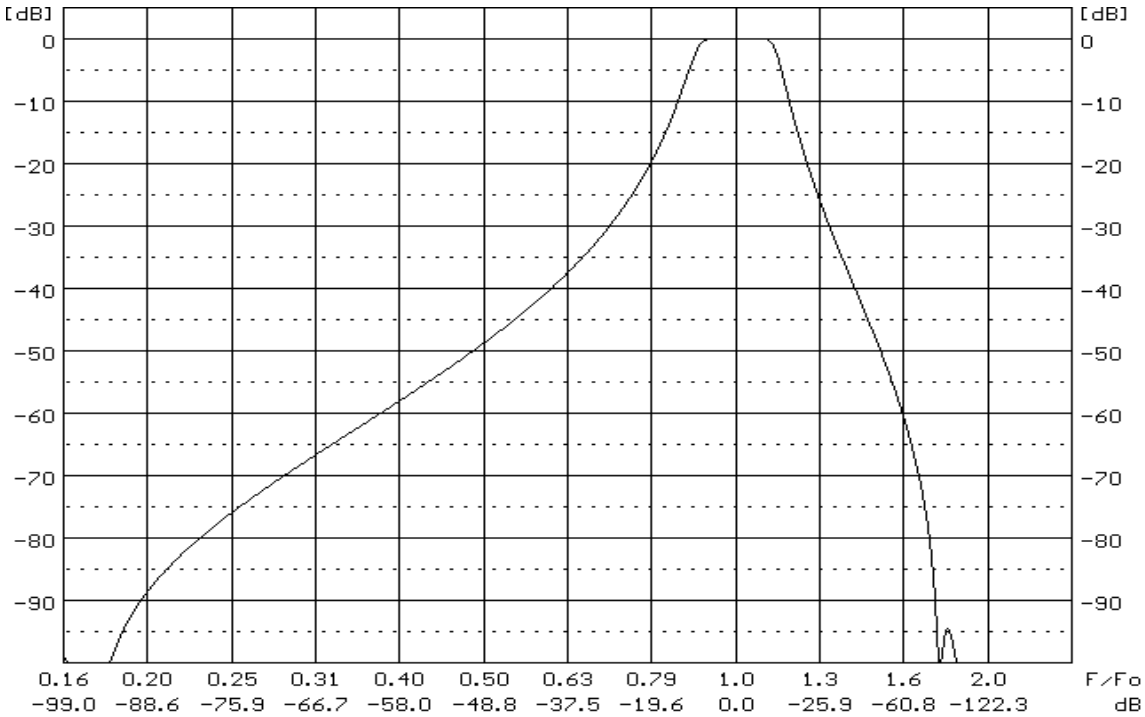
9 filters with centre frequencies from 31.5 Hz to 8 kHz (base 2), meeting DIN 45651, IEC 61260:1995 and ANSI S1.11-1986 for Class 1.

8.0 kHz 1/1 octave filter



1/3 octave filters

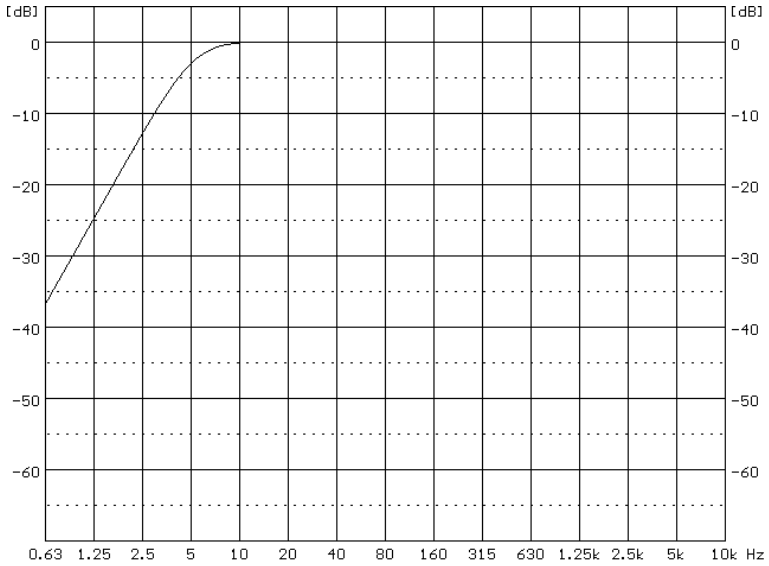
28 filters with centre frequencies from 20 Hz to 10 kHz (base 2), meeting DIN 45651, IEC 61260:1995 and ANSI S1.11-1986 for Class 1.



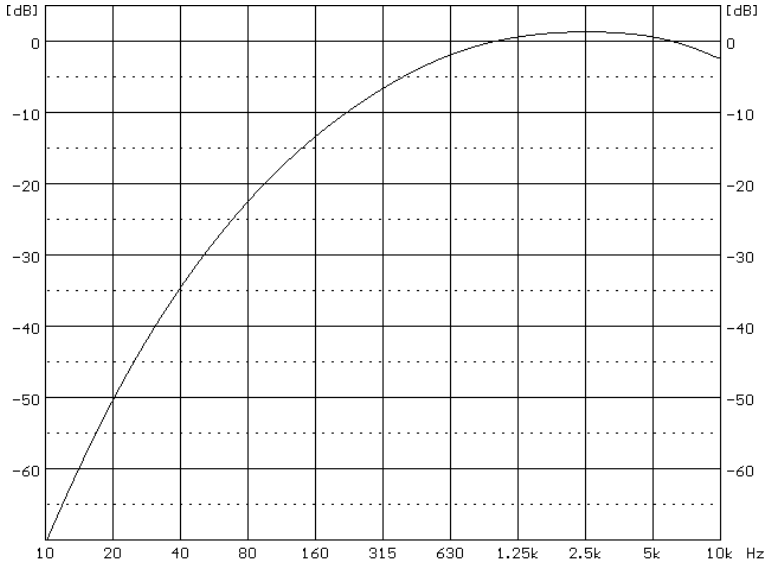
C.3 FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED DIGITAL FILTERS

Digital weighting filters implemented in dose and octave mode

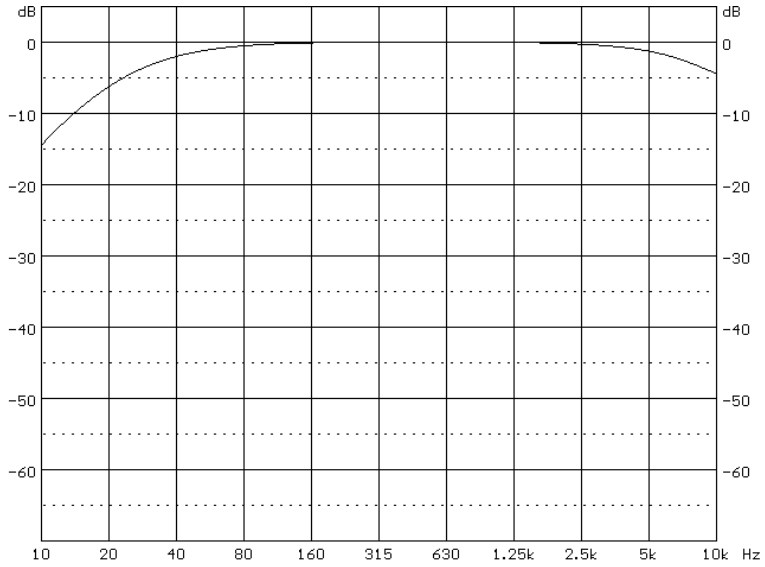
Z Filter: Class 2 according to the IEC 61672-1:2013 standard.



A Filter: Class 2 according to the IEC 61672-1:2013 standard.



C Filter Class 2 according to the IEC 61672-1:2013 standard.



The weighting filters, which are available in sound modes (**Z**, **A**, and **C**) are selected in thru SUPERVISOR software under the settings window.

C.4 GENERAL SPECIFICATION OF SV 104A

Signal input

The input of the measured signal (mounting head):

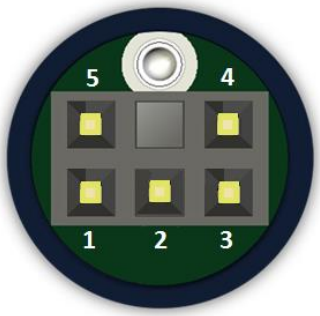


Figure C.6 ST 104A microphone connector (mounting head outer view)

Table C.7. Pin out of the microphone connector

Pin Number	Function
1	"SIGNAL" Input channel 1 *(shorted with chn.2 in dosimeter)*
2	2.8V/5mA supply DC voltage
3	"SIGNAL" Input channel 2 *(shorted with chn.1 in dosimeter)*
4	TEDS
5	GND
Chassis	Ground

Power supply

- Instrument is dedicated for the operation from the internal rechargeable battery.
- Power consumption 14 mA[3] under measurement run from 3.7 V internal cells.
- Typical operating time from internal single Li-ion rechargeable batteries is about **48 hours**.
- The recommended charging dock station is: **SB 104B-1, SB 104B-5**.
- Power consumption from the external ⎓6V source is approx. 200 mA at + 20°C (315mA max) under battery charging,
- Power consumption from the USB source is approx. 400 mA at + 20°C (500mA max) under battery charging,
- Internal rechargeable battery is protected against overcurrent and overvoltage conditions. Safety Maximum Charging Current for Li-ion cells used in SV 104A is 725 mA and Maximum Charging Voltage is 4.4 VDC.

Note: *For the temperatures below 10℃ operating time can decrease.*

[3] display off, octave/one-third analysis off

Communication Interface and external Power Connector

The SV 104A electrical interface enables remote control of the instrument and data transfer up to attainable with 6 MHz clock.

"Client" communication port

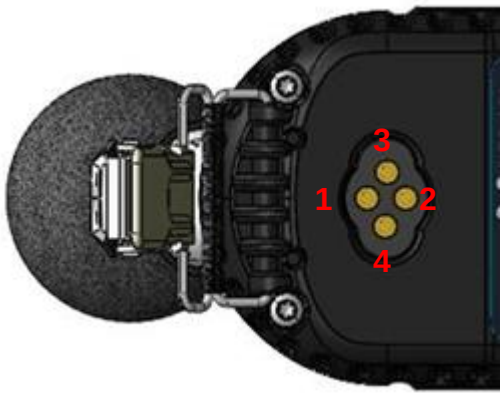


Figure C.7 Power and Communication Port (external bottom view)

Table C.8. Pin-out of the electrical interface

Pin number	Function
1	Power supply: ⎓**6V** ±1.3V
2	Ground
3	Receiver
4	Transmitter

USB Interface

The SV 104A micro-USB interface enables remote control of the instrument and data transfer up to attainable with 12 MHz/480MHz clock.

"Client" micro-USB port

Figure C.8 Micro USB socket (external view)

Table C.9. Pin-out of the USB-Device connector

Pin number	Function
1	VBUS ⎓ **5V** ±0.5V
2	D-
3	D+
4	ID
5	GND
Shield	Ground

Real Time Clock	built-in, accuracy better than 1 minute/month
Weight with the battery	~140 g (SV 104A with mounting clips and ST 104A and SA 122A)
Dimensions	90x50x31 mm (base: no microphone, no mounting accessories).

Environmental parameters

Dedicated for indoor and outdoor use:

Operating temperature range	-10°C ÷ +50°C
Storing temperature range	-20°C ÷ +50°C
Charging temperature range	0°C ÷ +40°C
Humidity	≤ 90% RH in 40°C (uncondensed vapour)
Atmospheric pressure	65 kPa ÷ 111.43 kPa
Atmosphere	air with normal oxygen content, typically 21% v/v

WIRELESS BLUETOOTH 4.0 CONNECTIVITY

This dosimeter supports wireless connection via Long-Range Bluetooth® 4.0 (Low energy or Smart). This connectivity is compatible with mobile and PC devices that support Bluetooth® 4.0.

- TX power: up to 8 dBm
- Receiver sensitivity: -98 dBm
- Range: Typically >100m line-of-sight and depending on local RF conditions.

The instrument contains a wireless transmission module, BLE121LR from Bluegiga technologies. Copies of the modules regional approvals certificates may be obtained from Svantek or Bluegiga.

- Declaration ID: D023154, Controller Subsystem Qualified Design ID: 57409

FCC and IC

This product contains an FCC and Industry Canada certified Bluetooth® Low energy wireless transmission module:-

- **FCC IDENTIFIER:** QOQBLE121LR
- **Industry Canada IC:**5123A-BGTBLE121LR

- Producer: BlueGiga Technologies Inc.
- Model: BLE121LR 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. 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.

IC Statements:

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Compatibility with EU Directives

CE mark indicates compliance with:

- **EMC**, Electro-Magnetic Compatibility Directive 2014/30/EU
- **LVD**, Low Voltage Directive 2014/35/EU
- **RED**, Radio Equipment Directive 2014/53/EU
- **RoHS2**, Restriction of Hazardous Substances in Electrical and Electronic Equipment 2011/65/EU
- **WEEE**, Waste of Electrical and Electronic Equipment 2012/19/EU

Electromagnetic Compatibility (EMC)

The product described above is compliant with the following EMC standards:

1. **For the EMC emissions specification:**

   according to EN 61672-1:2014 (Chapter 5.21) and EN 61672-2:2014 (Chapter 8), applying test methods in accordance with CISPR 22, Clause 10 and CISPR 16-1,

2. **For the EMC immunity specification:**

   according to EN 61672-1:2014 (Chapters 6.5 and 6.6) and EN 61672-2:2014 (Chapter 7.9 and 7.10), applying test methods in accordance with IEC 61000-4-2, IEC 61000-4-3:2002 and IEC 61000-4-8.

Note: *EMC compatibility is guaranteed only with the original accessories supplied by SVANTEK!.*

Safety

The product described above is compliant with following standards: EN/IEC 61010-1:2010

Note: *The measurement circuit is safety category I according to EN/IEC 61010-1:2010 standard. This measurement equipment should not be used for measurements in categories II, III, IV. The input voltage should be within the 30 V Peak – Peak.*

Category I equipment: *dedicated to measurements performed on circuits not directly connected to mains, such as circuits not derived from mains or protected mains-derived circuits, including low-voltage circuits from power supplies.*

Note: *SV 104A acoustic measurement is contactless.*

The device marked with symbol ⚠, meaning:

ATTENTION, CONSULT ACCOMPANYING DOCUMENTS

Environmental Ingress Protection: **IP65** per EN 60529:1991/A2:2013 (IEC 60529:1989/Amd2: 2013). Dust-tight. Protected against water jets. Suitable for outdoor use.

APPENDIX D DEFINITIONS AND FORMULAE OF MEASURED VALUES

D.1 BASIC TERMS AND DEFINITIONS

T — Current time period of the measurement in seconds.

T_1 — Last second of the measurement.

T_e — Exposure time in seconds (time period during which a person is exposed to the action of noise). This parameter can be set in the **Exposure Time** setup (**Measurement** menu). The available values are from 1 minute to 12 hours with 1-minute step.

T_{8h} — Time period equal to 8 hours (28 800 seconds).

τ — Exponential time constant in seconds for the giving time-weighting. Three time constants are available: **Slow** (1000 ms), **Fast** (125 ms), **Impulse** (35 ms, but on falling values a longer time constant of 1500 ms is applied).

W — Frequency-weighting filter: **A**, **C, B** or **Z**.

$p_W(t)$ — Instantaneous frequency-weighted sound pressure with the weighting filter **W**. Sound pressure is expressed in pascals (Pa).

$p_{W\tau}(t)$ — Instantaneous frequency and time-weighted sound pressure with the weighting filter **W** and time constant τ calculated from the equation:

$$p_{W\tau}(t) = \sqrt{\frac{1}{\tau}\int_{-\infty}^{t} p_W^2(\xi)\, e^{-(t-\xi)/\tau}\, d\xi}$$

where: ξ – variable of integration.

$r(t)$ — Instantaneous sound pressure depends on the <**RMS Integration>** parameter:

$$r(t) = \begin{cases} p_W(t) & \text{RMS Integration = Lin} \\ p_{W\tau}(t) & \text{RMS Integration = Exp} \end{cases}$$

p_0 — Reference value (20 μPa).

$\log(x)$ — Logarithm of x to the base 10.

Q — Exchange rate in decibels is equal to 2, 3, 4, 5 or 6. The value of Q influences the calculations of dose meter results, namely **DOSE**, **D_8h** and **LAV**. The exposure rate equal to 3 complies with ISO R 1999 “Assessment of Occupational Noise Exposure for Hearing Conservation Purposes”, while Q equal to 5 complies with the American “Occupational Safety and Health Act” – OSHA.

q

Value of q is used in the calculations of **DOSE**, **D_8h** and **LAV** is taken from the formula

$$q = \begin{cases} \frac{Q}{\log 2} & \text{for } Q \neq 3 \\ 10 & \text{for } Q = 3 \end{cases}$$

L_T

Threshold sound level set in the **Threshold Level** via the SUPERVISOR software. 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** set via the SUPERVISOR software. 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 the **None** option is selected

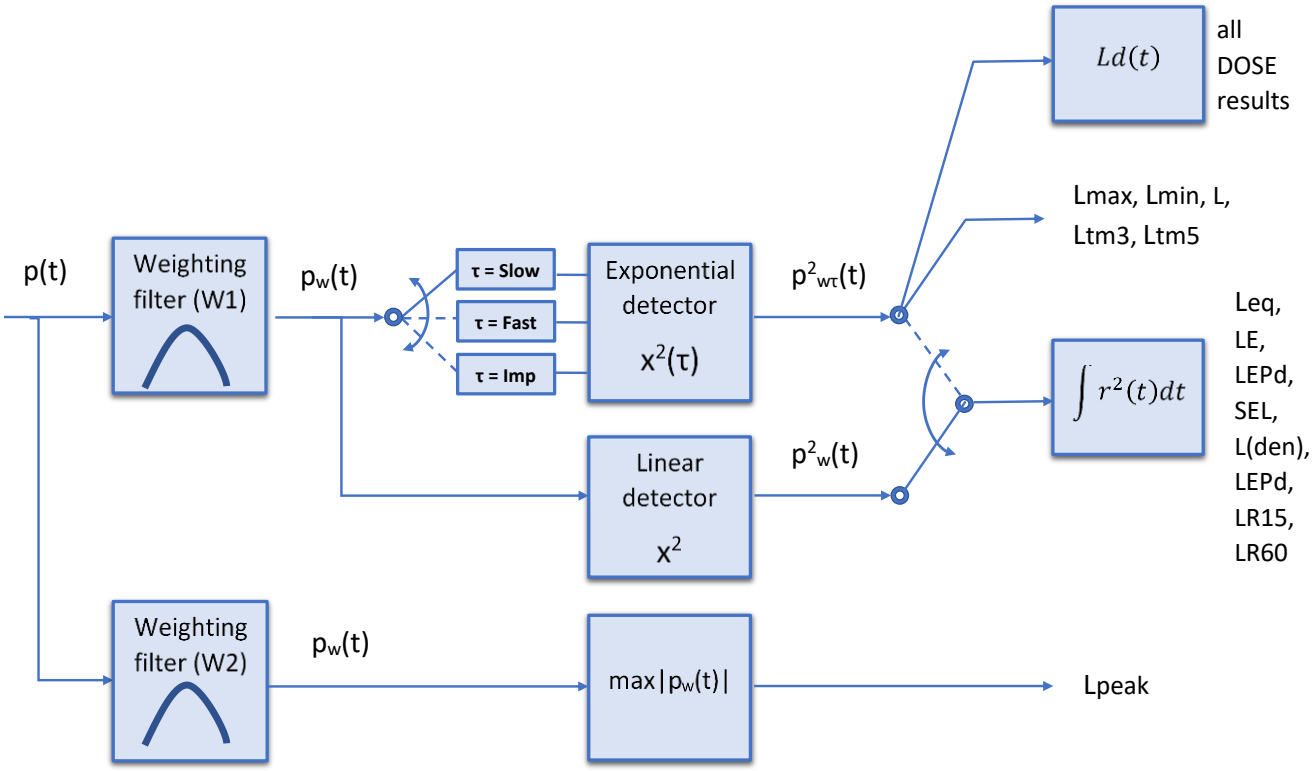
$$L_d(t) = L(t)$$

In other cases (when the **Threshold Level** set via the SUPERVISOR software 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 FUNCTION RESULTS

The instrument calculates the sound measurement results for three profiles. The calculation flow diagram for one profile is presented below:



OVL — Percentage of the overloaded input signal, which occurred during the current time period of the measurement (**T**)

L(A/C/Z)peak — Peak sound level expressed in dB, for frequency weightings A, C, Z, symbols are **LApeak**, **LCpeak** and **LZpeak**. Peak sound level is calculated for the given **T**.

$$\mathbf{Peak = 10 \log \left(max_T \frac{p_w^2(t)}{p_0^2} \right)}$$

L(A/C/Z)(S/F/I) max — The highest time weighted sound level (**Max**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are **LAFmax**, **LASmax**, **LCFmax**, **LCSmax** etc.

$$\mathbf{Max = 10 \log \left(max_T \frac{p_{w\tau}^2(t)}{p_0^2} \right)}$$

L(A/C/Z)(S/F/I) min

The lowest time weighted sound level (**Min**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are **LAFmin**, **LASmin**, **LCFmin**, **LCSmin** etc.

$$\mathbf{Min = 10 \log \left(\min_T \frac{p^2_{W\tau}(t)}{p_0^2} \right)}$$

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.

$$\mathbf{L = 10 \log \left(1/\tau \frac{p^2_{W\tau}(t)}{p_0^2} \right)}$$

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**).

$$\mathbf{SEL = 10 \log \left(\int_0^T \left(r(t)/p_0 \right)^2 dt \right) = Leq + 10 \log \frac{T}{1s}}$$

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**

$$\mathbf{LEPd = Leq + 10 \log \frac{T_e}{T_{8h}}}$$

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 **nn %** of the observation period

Example: Let us assume that **L35** is equal to 76.8 dB. It means that during the measurements the noise level 76.8 dB was exceeded in not more than 35% of the observation period.

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.

$$\mathbf{DOSE} = \frac{100\%}{T_{8h}} \int_0^T 10^{\frac{L_d(t)-L_c}{q}} dt$$

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: the time that the 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:

$$P_k\left[L_k \le L(t) \le L_k + \Delta L\right] = \sum_{i=1}^{n} \Delta t_i \Big/ P$$

where: Δt_i - time intervals, in which the noise level $L(t) \in \langle L_k, L_k + \Delta L \rangle$ occurs,

ΔL - so-called class interval or distribution class of the series,

P - total observation period.

In case when the class interval approaches infinity, the probability of **L(t)** tends to the probability of L_k. In practice, ΔL value is strictly determined, and it depends mainly on the dynamics of the measurements performed in the instrument. There are 100 classes in the instrument and the width of each class is 1 dB. The histogram is the set of the class density values calculated for all classes.

The statistical distribution function, which determines the probability (expressed in %) of the noise occurrence on the level equal or less than $L_k + \Delta L$ is given by the formulae:

$$P\left[L(t) \le L_j\right] = \sum_{k=1}^{j} P_k(L)$$

The cumulative density function, expressed by the equation:

$$P\left[L(t) > L_j\right] = 1 - P\left[L(t) \le L_j\right]$$

is directly used to determine so-called statistical levels **Ln** or position parameters of the distribution.

The **Ln** is the certain boundary level surpassed by the temporary noise level values in not more than **n%** of the observation period.

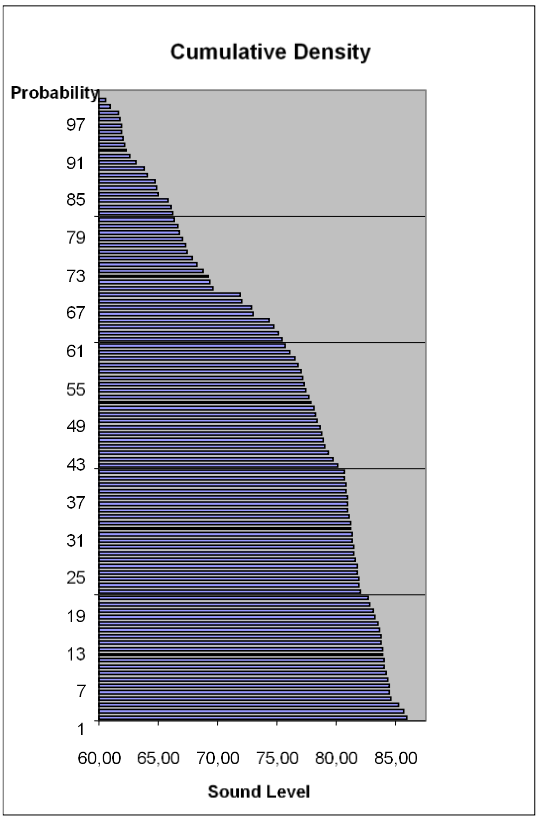
Example:

Let us assume that **L35** is equal to 76.8 dB. It means that during the measurements the noise level 76.8 dB was exceeded in not more than 35% of the observation period.

The cumulative density function for the exemplary data is presented in Figure on the right side. In order to determine the **Ln** level, one has to draw the horizontal cursor and find out the crossing point between the cumulative density function and the cursor. In the instrument the user can determine 10 statistical levels - from **L01** to **L99** (1% step of observation period).

The display in the instrument presents only first statistical level N1 (set to: L01 up to L99).

The statistical level **Ln** value, the profile's number the statistics are taken from, the RMS detector (**Lin.**, or **Exp.**: **Fast**, **Slow** or **Imp**.), the filter's name (**A**, **C** or **Z**) and real time are displayed in the top-right side of the display in one-result view mode.



Exemplary cumulative density