SVANTEK

USER MANUAL

SV 104

ACOUSTIC DOSIMETER

Warsaw, 2024-02-04
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 web site at www.svantek.com.*

*This User Manual presents the firmware revision **1.15.x**.*

*This User Manual presents some aspects of SUPERVISOR software revision **1.9.x** and Assistant application for mobile devices revision **2.1.x**.*

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.*

Technical Support Contact Information:

web: www.svantek.com

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 104*** *dosimeter contains no user serviceable parts. Opening product case invalidates the warranty.*

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

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 via the micro-USB port. The procedure is recommended before first use. Repeat this procedure every few months of use to maintain more accurate current battery condition indication.*

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.*

ENVIRONMENTAL PROTECTION MARKING OF THE UNIT

Marking on the Unit	Explanation
	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 has met EU consumer safety, health or environmental requirements
	This product can be recycled (sign is placed on the battery)

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CONTENTS

1 INTRODUCTION

The **SV 104** instrument is a revolutionary new approach to occupational health and safety noise monitoring offering **voice comments**, **audio events 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 **SV 27)** 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 104** instrument can simultaneously measure the dosimeter results and perform real time **1/1 Octave** analysis including the calculations of the statistical levels.

An inbuilt tri-axial accelerometer for **vibration shock detection** firmly places **SV 104** as both the most technically advanced and the most robust personal dosimeter out there.

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 Ni-MH **rechargeable batteries** offering circa **40 hours**[1] of continuous operation. This new cell technology offers up to **1800 charge cycles** in comparison to standard maximum 500 cycles. Low battery self-discharge is about 3% per month in comparison to 40% per month in standard NiMH technology. The **powering and charging of the instrument from the USB** interface is provided which also enables easy data exchange connection between the **SV 104** and a PC without the requirement of a special docking station.

The instrument works with Svantek's specialist health and safety software package - **SUPERVISOR**, and also with the full analysis package **SVAN PC++**.

Robust and lightweight design including innovative **magnetic mounted windscreen** 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 the **SV 104**, the first part of the manual describes basic noise dosimetry information followed by a guide to setting up the dosimeter and running measurements.

[1] Display off. Octave analysis off;

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 104 noise dosimeter is extremely well suited to ISO, OSHA, ACGIH, MSHA, NIOSH, workplace noise measurements in noise exposure assessments. 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
- transportation noise studies
- personal noise verifications
- peak dosimeter for example in military applications

One of the most desirable SV 104 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.

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. The **SV 104** 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, the SV 104 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 104 DOSIMETER SHORT FORM SPECIFICATION

- SV 104 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
- Class 2 Microphone, MEMS type: **SV27**, 1/2" housing
- **OLED colour display** with super brightness and contrast
- Large **8GB memory**
- **USB 2.0** high speed interface
- Parallel **Slow, Fast**, **Impulse** detectors for the measurements with **A**, **C**, **Z** filters
- Frequency Range **20 Hz ÷ 10 kHz**
- Measurement range better than **60 dBA RMS ÷ 140.1 dBA Peak**
- Dynamic Range better than **90 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**
- **3** 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 31 Hz ÷ 8 kHz, Type 2 – IEC 1260; presented as a bar graph with Leq and Lmax band levels plus overall A, C and Z broadband weightings (as option called SF 104-OCT)
- **Audio events recording**, triggered and continuous mode, 12/24 kHz sampling rate, wav format (as option called SF 104-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 **> 40 hours** *(display off, octave analysis off)*
- Extremely **compact, lightweight, and robust case with IP65 ingress protection**

Figure 2-1 SV 104 with the microphone and windscreen

2.2 ACCESSORIES INCLUDED

- **SV 27** ½" MEMS microphone for SV 104 dosimeter
- **SA 122** foam windscreen
- **SC 156** micro-USB 2.0 cable

2.3 ACCESSORIES AVAILABLE

- **SV 27** ½" MEMS microphone for SV 104 dosimeter
- **SA 122_3** Windscreens for SV 104 dosimeter 3 pcs per pack
- **SV 34B** Class 2 acoustic calibrator: 114dB@1000Hz
- **SC 156** Micro-USB 2.0 cable
- **SA 54** Charger/power supply for 1 x SV 104
- **SA 73** Carrying case for 5 x SV 104 dosimeters and accessories (waterproof)
- **SA 156** USB HUB for charging and data download from 5 x SV 104 dosimeters

2.4 INSTRUMENT SOFTWARE (FIRMWARE) OPTIONS AVAILABLE

- **SF 104 OCT 1/1** Real time 9 band 1/1 Octave analysis option
- **SF 104 WAV** Audio events recording option

Note: *The software options can be purchased in any time as only the introduction of a special code is required for their activation.*

3 GETTING STARTED

3.1 SYSTEM DESCRIPTION

The following Figure 3-1 shows the **SV 104** controls and ports:

Figure 3-1 SV 104 at a glance

3.2 INPUT / OUTPUT INTERFACES

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

- microphone connector (essential for measuring)
- micro-USB connector (charging, and data download)
- charging connector (reserved for future use)
- fast infrared port (reserved for future use)

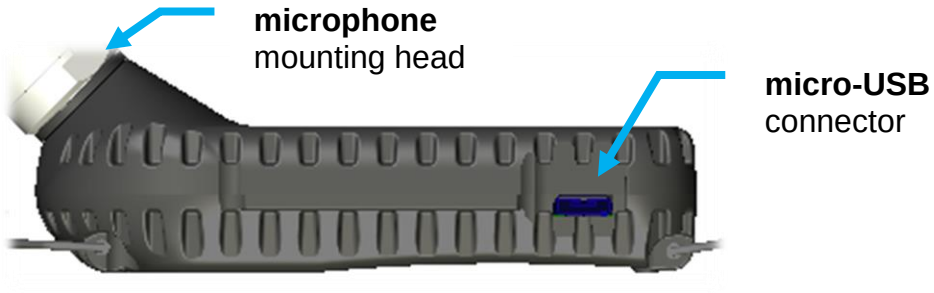


Figure 3-2 SV 104 side view – microphone and micro-USB connector

Figure 3-3 SV 104 back view - charging and infrared port (reserved for future use)

3.3 WINDSCREEN

During use, it is strongly recommended that the **SV 104** is fitted with the supplied **SA 122** 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 the voice note comments.

The **SV 104** uses an innovative windscreen magnetic technique to fit tightly onto the microphone housing. To remove the windscreen just put more force holding the lower half of the foam and lift the windscreen off the microphone housing. Once the **SV 104** has been calibrated, refit the windscreen by carefully placing it back over the microphone again.

Figure 3-4 SA 122 windscreen

3.4 MOUNTING CLIPS

Upon delivery, the **SV 104** will be fitted with the standard mounting clips. Mounting clips can changed using pliers.

Figure 3-5 SV 104 standard mounting clips

3.5 MOUNTING AND POSITIONING SV 104

Unless specified by local legislation, personal noise dosimeters should always be mounted on the shoulder, circa 10 cm from the most exposed ear, with the microphone approximately a few cm above the shoulder. SV 104 shape and microphone height ensures proper instrument position.

Figure 3-6 SV 104 positioning

3.6 LED STATUS INDICATOR

There is a three-colour instrument LED status indicator on the SV 104, located to the right of the microphone mounting head and above the display.

Table 3-1 explains conditions under which the specific LED colour appears.

LED status indication	Description
GREEN flashing once per second	Indicates the **measurement is running** and the dose alarm level has not been exceeded.
AMBER flashing once per over a dozen seconds	Indicates the **measurement is stopped** and the dose alarm level has not been exceeded.
RED single isolated flashes with a duration of nominally one second	Indicates **vibration shock threshold has been detected**. This will go off once the high vibration shock has ceased.
RED flashing quickly, four times per second	Indicates the **alarm conditions**: for instance: 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 as basic status information provider. See the description below.

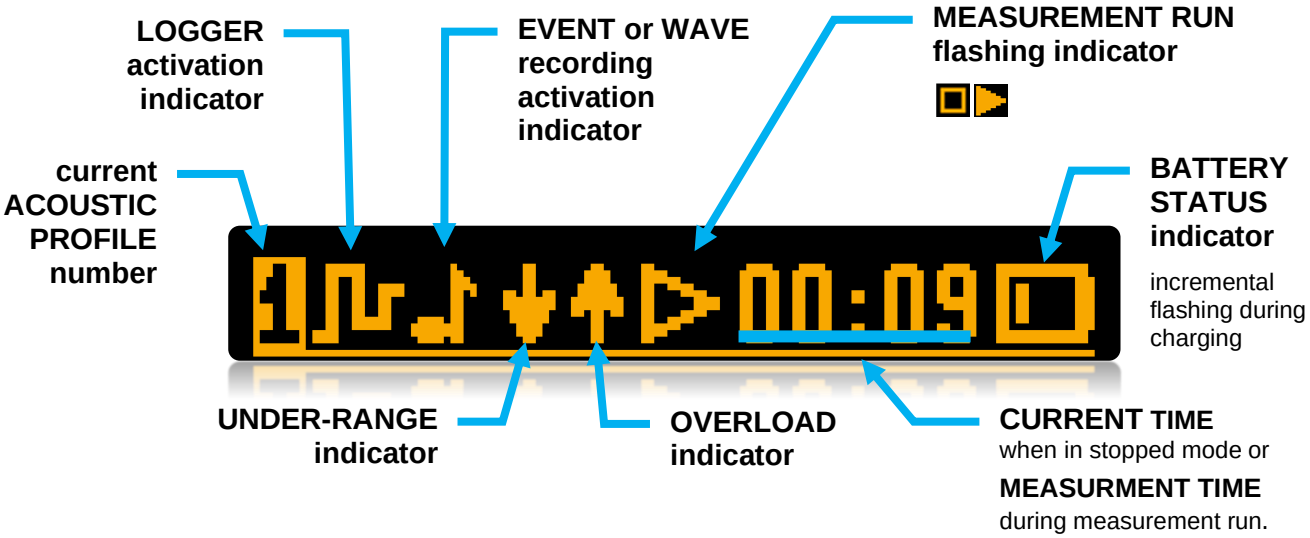


Figure 3-7 SV 104 display icons description

Overload detector

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

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

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

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

Underrange detector

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

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

3.8 MANUAL CONTROL OF THE INSTRUMENT

Although the Instrument is small, its keypad is designed to be minimal, but still highly ergonomic and easy to use providing effective operational capabilities. Thanks to that, the number of the control keys of the instrument is reduced to only three.

Generally, the user can operate the instrument by:

- change the **VIEW** mode with the key
- select the required **ACOUSTIC PROFILE** with the key
- and **SCROLL** through the results with the key

> ***Note:*** *To save power consumption and extend battery life* ***SV 104*** *will automatically switch off the display after 30 seconds if no button on the keypad is pressed. The LED indicator will still inform the user about the current state of operation and any possible 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:

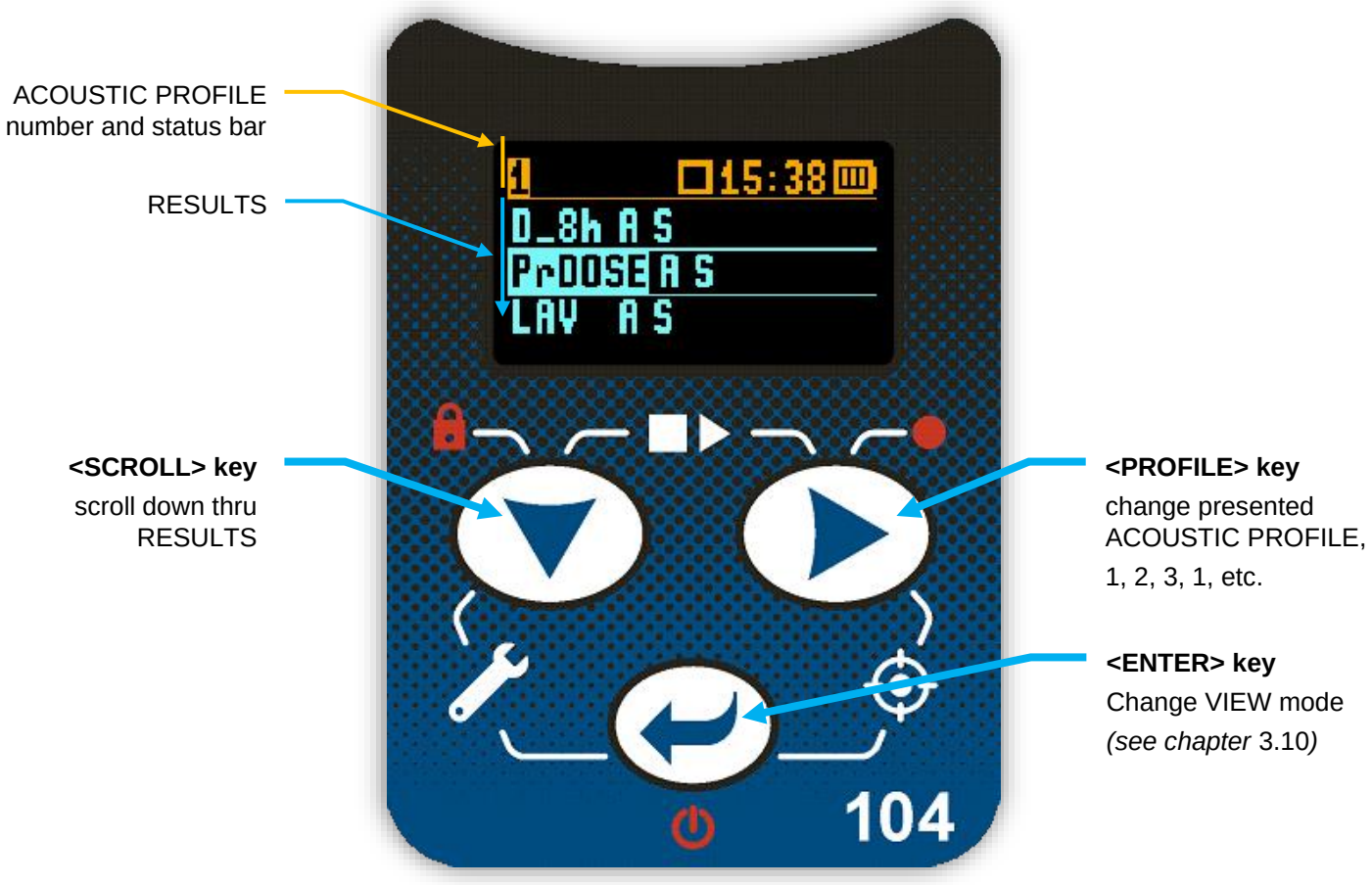


Figure 3-8 Control keypad on the front panel – primary key functions

3.8.2 Alternate key functions

Alternative **long press of single key** (keypad icons marked with red colour) allows quick access to special functions:

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

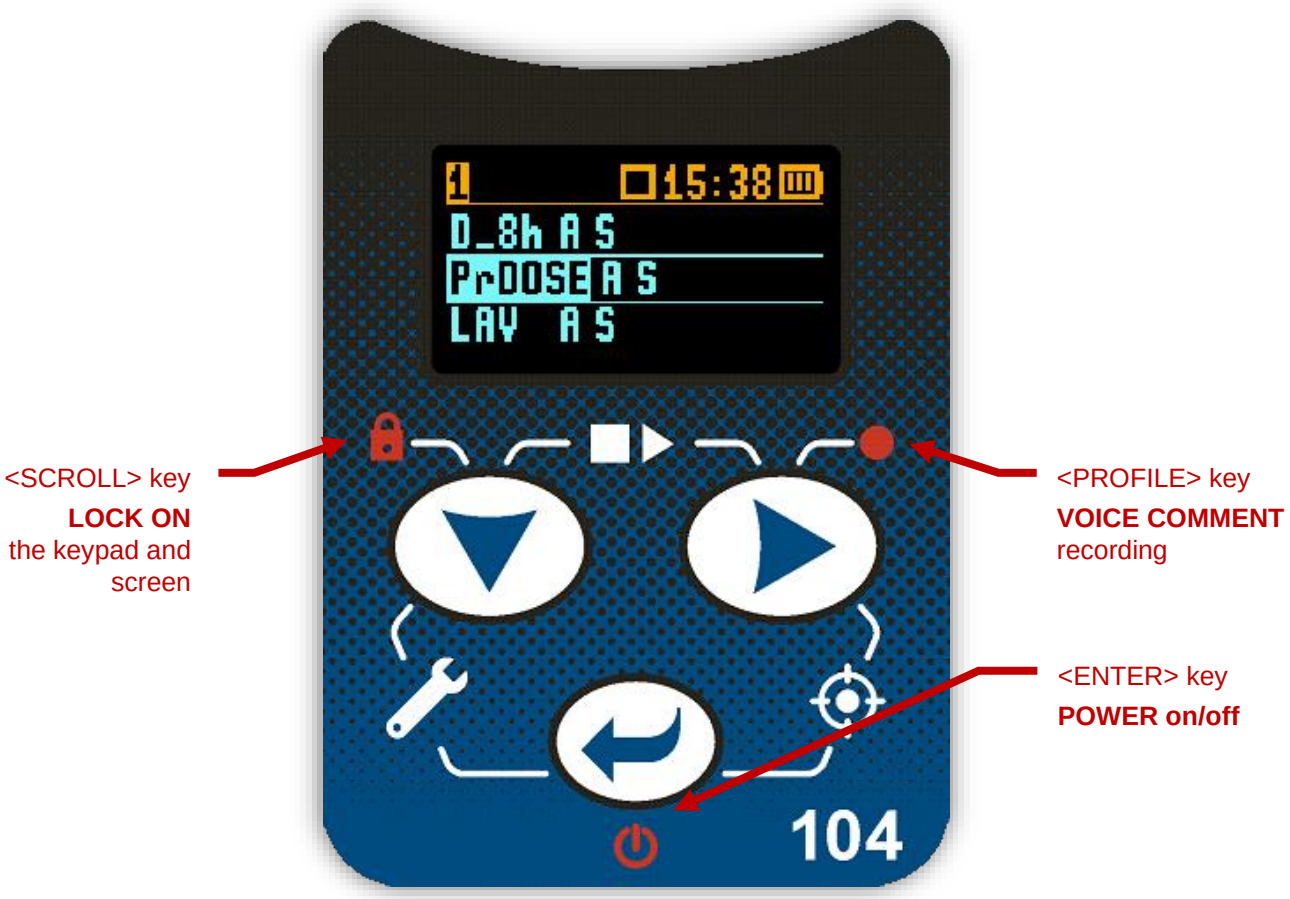


Figure 3-9 Control keypad on the front panel – alternate key functions

Holding down individual key for few seconds during which a countdown is displayed the SV 104 gives you time to decide if you really want to access the function that is going to be executed:

- 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, **SV 104** returns to the last used **VIEW** mode and the selected control is not executed.

3.8.3 Alternate combined keys functions

Additionally, **combined short press of two keys simultaneously** (keypad icons marked with white colour) allow quick access to even more functionalities.

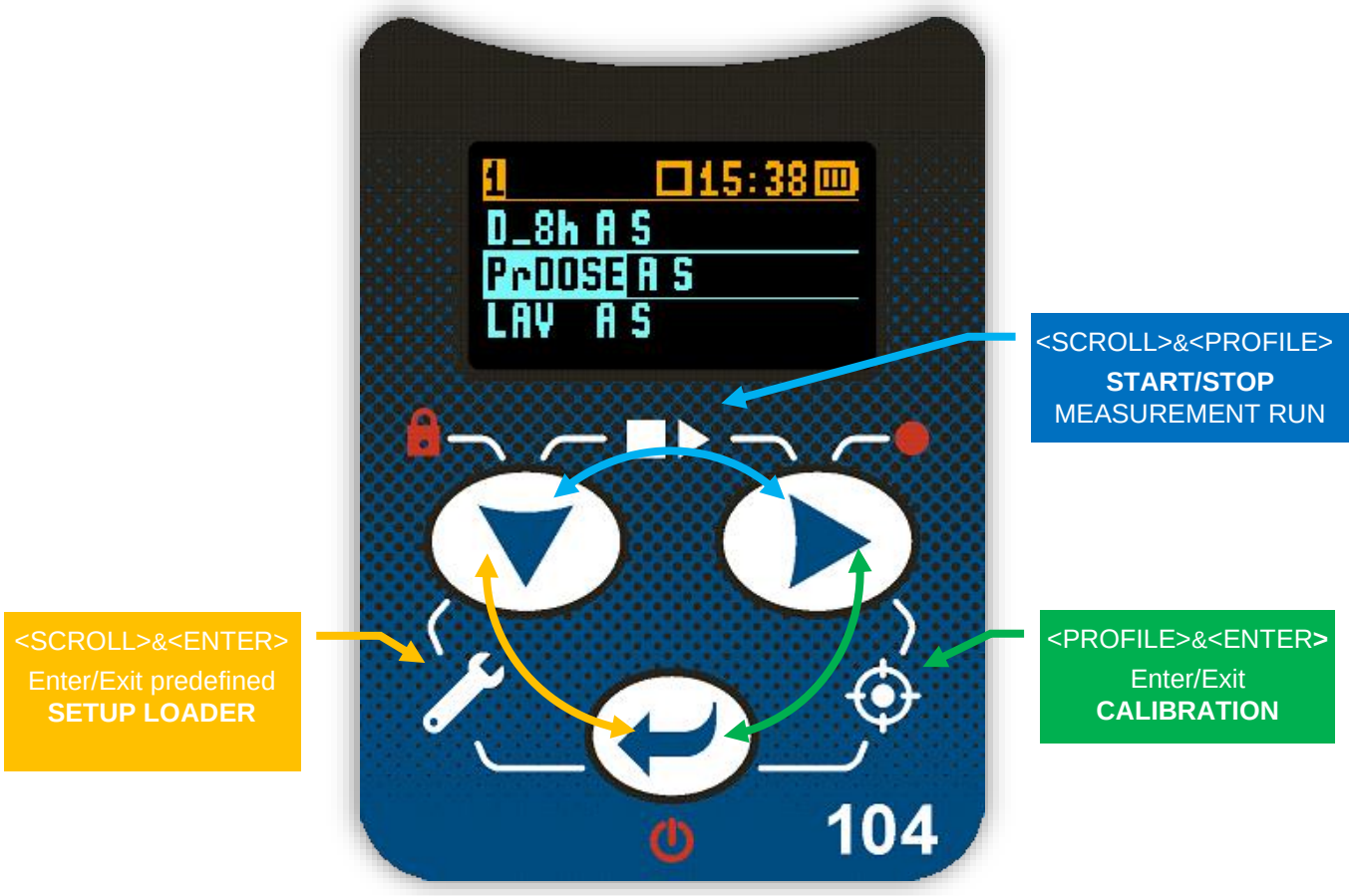


Figure 3-10 Control keypad on the front panel – alternate combined keys function

Note: *Extra additional keypad functionality is also available to display the instrument's* ***Unit Label*** *screen showing the current firmware revision number. It is accessible by a* ***short press of all three keys at once****.*

Note: *Microphone compensation filter setting is accessible by holding down ▼ and ↵ keys simultaneously for three seconds.*

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

3.9 THREE INSTRUMENTS IN ONE – ACOUSTIC PROFILE CONCEPT

SV 104 is able to monitor and log noise by enabling up to three different parameter configuration settings, also referred to as "**ACOUSTIC PROFILE**". One can set profile no 1 to run measurements using the OSHA HC (Occupational Safety and Health Administration - Hearing Conversation) parameters and at the same time set profile no 2 to monitor the noise with the OSHA PEL (Occupational Safety and Health Administration – Permissible Exposure Level) parameters while profile no 3 is set to ACGIH parameters. This is the true triple instrument in one.

3.10 THE VIEW MODE PRESENTATION CONCEPT

Such an advanced noise dosimeter as the **SV 104** offers a large number of parameters for the operator to inspect. Therefore, all information is divided in a neatly organized manner as VIEW modes for each PROFILE.

The **VIEW** mode is a way in which the measurement parameters are presented to the operator. In other words, when you change the VIEW mode, specific measurement parameters and status information will be presented in different manner as distinct screen content.

SV 104 features the following VIEW modes, where most of them can be individually disabled:

- Running instantaneous SPL view mode (Chapter 3.10.1) - *can be disabled with PC software*
- Primary "one-result" parameters view mode (Chapter 3.10.2) - *cannot be disabled*
- Results list view mode (Chapter 3.10.3) - *can be disabled with PC software*
- Octave analysis spectrum LEQ view mode (Chapter 3.10.4) - *can be disabled with PC software*
- Octave analysis spectrum MAX view mode (Chapter 3.10.4) - *can be disabled with PC software*
- Instrument Status view mode (Chapter 3.10.5) - *can be disabled with PC software*

3.10.1 Running SPL view mode

Running SPL presentation mode is used when measurement run is not actually running, that is 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 a first indication of the sound levels about to be measured. This can be useful for some measurements. The instrument behaves as a simple general purpose sound pressure level meter in this view mode.

Figure 3-11 Running SPL view mode screen

3.10.2 Primary “ONE-RESULT” view mode

The one result mode is always available in all measurement modes and cannot be disabled. In one result mode any measurement result, selected with the key, may be presented. The user may change the actual profile view by pressing the key. This view mode is useful if in low vision conditions or is suitable for operators with some visual impairment.

Figure 3-12 Primary ONE RESULT view mode screen

3.10.3 RESULTS LIST view mode

To get information about a number of results at one time it is handy to switch to the “results list” view mode. Up to three parameters at a time are accessible for the operator.

Figure 3-13 RESULTS LIST view mode screens

3.10.4 1/1 OCTAVE analysis spectrum view mode

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 dose meter operations. All 1/1-octave digital pass-band filters (with 9 centre frequencies from 8 kHz down to 31.5 Hz; in base two system) are working in real-time with the broadband frequency weighting filters (Z, A or C) and the linear LEQ (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 1/1 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 Spectrum VIEW presentation mode. 1/1 Octave spectra for all 9 centre frequencies of pass-band 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 configuration setup. Spectrum cursor can be moved left and right with the and keys respectively.

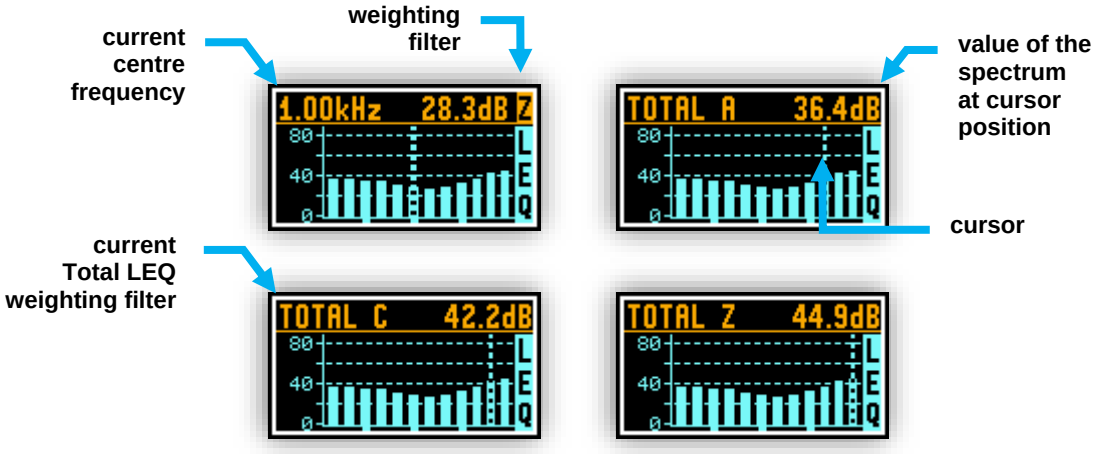


Figure 3-14 1/1 OCTAVE analysis spectrum graph LEQ view mode screens

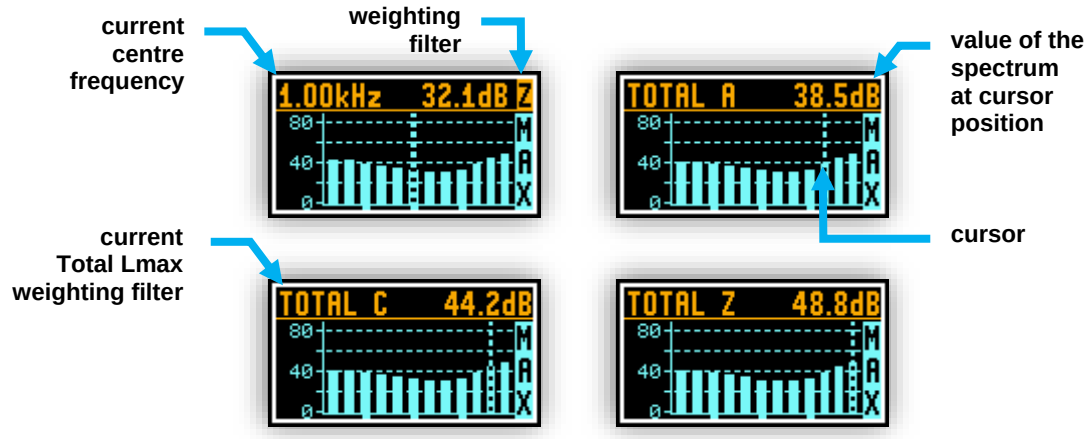


Figure 3-15 1/1 OCTAVE analysis spectrum graph MAX view mode screens

3.10.5 INSTRUMENT STATUS view mode

Instrument Status view presents:

- the battery charge status
- along with estimated working time which is Left until the battery is expected to be completely drained
- and current configuration information

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

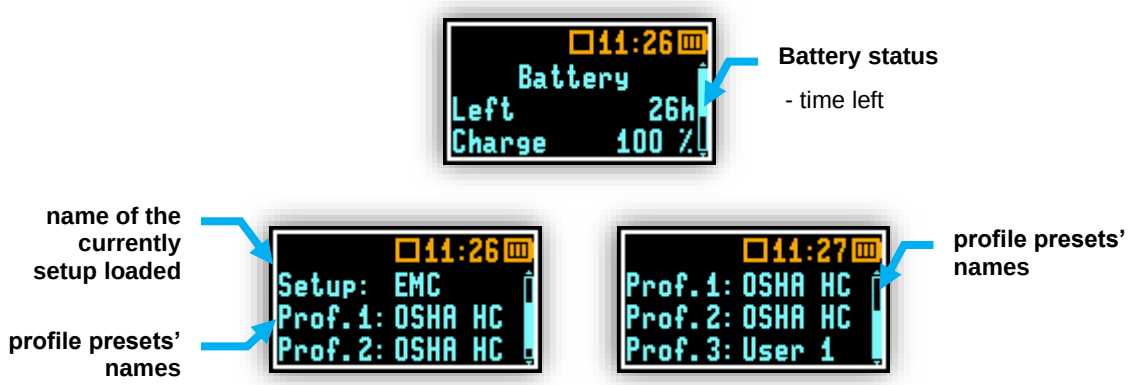


Figure 3-16 INSTRUMENT STATUS view mode screens

3.11 ALARM SCREEN REVIEW

Apart from simple LED alarm indications (see chapter 3.6) there are a few alarm conditions, when ALARM presentation screens will appear. During a measurement run the **SV 104** will immediately turn on the display at the time that 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.

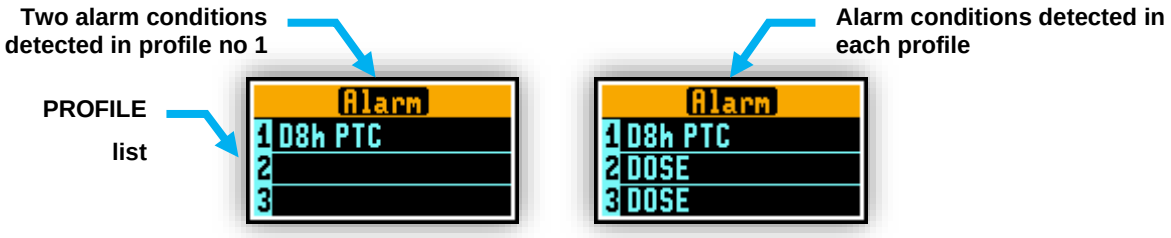


Figure 3-17 ALARM view screens

Note: *At any time when battery power is almost exhausted the "low battery" alarm screen may inform you about immediate recharging requirement.*

4 RUNNING AND OPERATING BASIC PROCEDURES

4.1 CHARGING

SV 104 dosimeter is equipped with an internal charger, so that the fixed internal batteries can be charged directly from computer USB port or optionally provided charger (**SA 54**).

Ensure the SV 104 is fully charged prior to use by connecting it to a USB port or to USB charger. Ensure the power supply is connected and the supply is switched on. The SV 104 will automatically turn on the display during charging and present how much charge is within the instrument. The SV 104 will display 'Fully charged' once charging is complete. This should take approximately 2 hours from a fully discharged state. A charging time of about 30 minutes will be sufficient to perform greater than 8 hours of measurement. A fully charged instrument holds enough charge to run for approximately 40 hours.

Note that once disconnected from USB power supply, the dosimeter will automatically switch off. If returned to the USB connection or put again onto the docking station the dosimeter keeps trickle charging regardless of whether or not it is fully charged. This keeps the battery performance in steady condition. If the battery is fully discharged prior to being placed on a charger, the SV 104 trickle charges for a short time prior to the fast charge cycle, this prevents damage to the batteries.

The number of hours you have used your dosimeter from your last charge will impact the total charge time. For example, if the battery clock indicator displays 40 hours remaining on the battery and you wish to charge the battery, the approximate charging time is 1 hour.

Note: *To charge a fully discharged battery, it would take approximately 1.5 to 2.5 hours.*

Note also, that instrument under charging condition is slightly warm. It is normal state for NiMH type cells and does not affect the measurement accuracy.

Note: To charge multiple dosimeters *at the same time via the USB port, ensure your computer or possibly the powered USB hub such as the* ***SA 156*** *or switch is capable in terms of providing enough current performance. Standard hub or switches without external power supply are not capable to charge multiple SV 104 dosimeters due to insufficient current supply.*

Current estimation: Assume the current consumption on 0.5A level and calculate required power supply requirement (N x 0.5A).

Power wattage estimation: With nominal voltage of 5V per USB, the power supply wattage should be 2.5W per dosimeter (Nx2.5W).

For example, 5 dosimeters charged at once require: 2.5A/12.5W USB power supply

For example, 3 dosimeters charged at once require: 1.5A/7.5W USB power supply

For example, 1 dosimeter charged alone requires: 0.5A/2.5W USB power supply

Note: *Use only high-quality USB cables, such as* ***SC 156****. Many poor-quality cables do not ensure low resistance of the cable, thus disabling proper charging of the internal cells.*

4.2 BEFORE YOU TURN THE INSTRUMENT ON

There are only a few things to remember:

- Make sure the microphone is properly fastened onto mounting head before turning on the instrument.
- When in use for a measurement run, always use the **SA 122** windscreen provided.

Note: *On new products there is a display shipping protection foil which is used on new products being sent to protect from accidental scratches. It is ~25x15mm foil rectangle.*

Figure 4-1 Peel off the protection foil and throw it away

4.3 TURNING ON/OFF

TURNING ON: To switch the power on the operator should hold the key for a couple of seconds. The instrument switches on and goes the self-test routine (during this time the manufacturer's logo, the name of the instrument and firmware version is displayed).

Then the **SV 104** will run through a short start-up sequence, showing the current configuration setup loaded along with the names of all of three profiles, followed by battery state screen. After this, the instrument will enter the stopped (ready to measure) mode and enter the running instantaneous SPL mode if enabled.

Note: *Warm up time - After power on, the instrument should be warmed up for at least 60 seconds before starting measurement.*

Note: *If you leave the instrument in stopped (ready to measure) mode, the display will be switched off after 30 seconds, and the unit will turn off after approximately 5 minutes of no keypad activity to save the batteries.*

Note: *SV 104 will show a warning screen if the battery capacity is below 2 hours of potential measurement time.*

TURNING OFF: To shut down the unit the operator should hold the key for a couple of seconds during which a countdown ("Shutting down" 3… 2… 1…) is displayed. Thus, the **SV 104** gives you time to decide if you really want to turn off the instrument. If you release the key too early, the **SV 104** returns to the last presented **VIEW** mode.

If enabled in the configuration setup there may be presented an additional, double-check, warning screen. This is for the operator to be aware and convinced the unit is really to be turned off. See figure below:

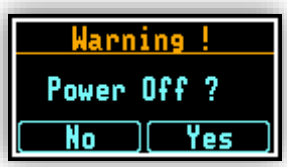


Figure 4-2 Power-off warning screen

Note: *SV 104 will automatically shut down after 5 minutes in stopped (ready to measure) mode.*

Note: *If* ***auto-run*** *(timer) mode is active, SV 104 will automatically stop the measurement when the set time is over and then turn off. If no* ***auto-run*** *mode is used and specific time has not been preset, the unit will continue to measure until the battery is exhausted. Just before switch off, the measurement run will be stopped and all data until that point will be saved securely for later download to the PC.*

4.4 BATTERY CHECK

Observe the battery icon in the instrument's icon status bar or press the key until the Instrument Status view mode is presented and check the battery state. If it is too low, charge the batteries (chapter 4).

Figure 4-3 Instrument Status - Battery state

Battery status screen is moved down and up with the and keys.

Press to change to the next **VIEW** mode.

Note: *Battery state of charge calculation is based on internal charge counter and should be considered only as an overall, not very precise estimation. Therefore, the time left could be noticeably different. Although the newest technology cells are used the slight degradation over time is inevitable thus aging requires occasionally factory based (or authorised service centre) replacement of the rechargeable battery cells.,*

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 via the micro-USB port or docking station. The procedure is recommended before first use. Repeat this procedure every few months of use to maintain more accurate current battery condition indication.*

4.5 REVIEWING UNIT LABEL

Unit label screen provides information about elementary dosimeter properties such as:

- Copyrighted manufacturer name: **SVANTEK (C)**
- Instrument name: **SV 104**
- Unit serial number: **SN XXXXX**
- SV 27 microphone serial number: **MicSN 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 Unit Label screen short press three keys: , and at the same time.

The following screen will be presented:

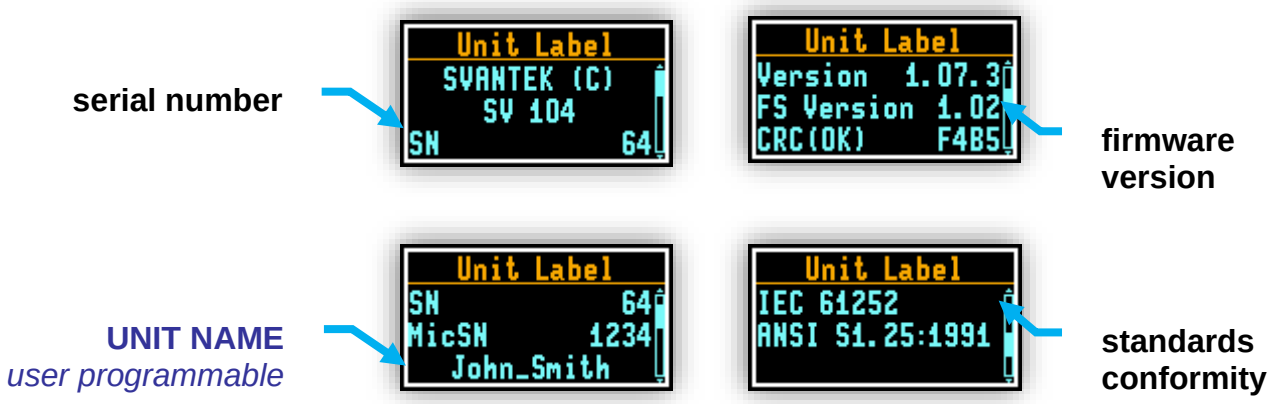


Figure 4-4 Unit label screens

Unit label screen is moved with the and keys.

To exit the Unit Label screen just short press the key. Then **SV 104** will return to the last presented **VIEW** mode.

> ***Note:*** *The personalized* ***Unit Name*** *can be set arbitrarily with SUPERVISOR software.*

4.6 MEASUREMENT SETUPS - BASIC CONFIGURATION

Press two keys and at the same time. The **"Load Setup"** menu will appear with the list of loaded configuration setups to choose.

Figure 4-5 Load setup menu

To abandon setup selection, press again the and at the same time. Otherwise select the required configuration setup with the key navigating thru the list with the or key.

The following screen will appear, that will allow you to confirm you really want to load the selected setup or cancel the selection and return to configuration setup list:

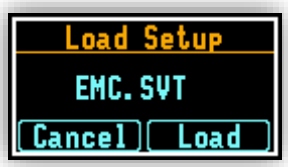


Figure 4-6 Load setup confirmation

Press the key to cancel the setup loading, or the key to confirm loading selected setup configuration.

Confirming the loading of configuration setup leads to the screen with status of the loading procedure:

Figure 4-7 Status of setup loading

After successfully setup loading it is possible to return back to list of predefined setups by pressing the key or go further to measurement screen by pressing the key.

Note: *Detailed description of uploading setup files onto the SV 104 can be found in Chapter 5.3.*

4.7 CALIBRATION

The SV 104 dosimeter is offered with the dedicated **SV 27** MEMS microphone with ½" housing. It makes the calibration very easy by direct usage of commonly available acoustic calibrators with a ½" cavity. The instrument is factory calibrated with the supplied microphone for the standard environmental conditions. Because the microphone sensitivity is a function of the temperature, ambient pressure and humidity, the absolute calibration of the measurement channel should be performed locally. The instrument performs the acoustic calibration automatically when the calibrator is placed over the microphone (first remove the windscreen). The calibrator level is automatically detected, and the calibration procedure is started.

The user simply must press the key to confirm the calibration results. Calibration is only allowed in the stopped mode. A sound measurement cannot be in progress while the calibration is being performed.

Note: *During the calibration measurement, the instrument automatically changes the setting to filter C. When the calibration measurement is complete, the previous settings are restored.*

Note: *It is advised to perform an acoustic calibration of the instrument each time before and after the 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 Dose Meter or 1/1 Octave analysis mode.*

Note: *The manufacturer's recommended factory calibration interval is every 12 months for this instrument to be confident in its continuing accuracy and compliance with the international specifications. Please contact your local SVANTEK distributor for further details.*

To calibrate the instrument manually the user should enter the Calibration menu.

1. Adjust the actual calibration level of the calibrator to be used with the and keys.

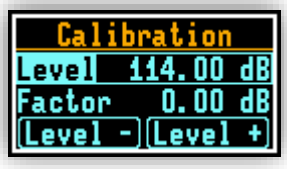


Figure 4-8 Calibration menu

2. Attach the acoustic calibrator, **SV 30A**, **SV 31**, **SV 34B**, **B&K 4231** (or equivalent 114 dB / 1000 Hz) carefully yet tightly over the microphone of the instrument. The presence of the calibrator will be detected automatically.

Note: *It is also possible to use an electro-mechanical pistonphone, which generates the signal (ca 124 dB) or different type of acoustic calibrator dedicated for ½" microphones with an alternative output level such as 94 dB at 1 kHz. In any case, before starting the calibration measurement, the user has to set the level of the signal generated by the given calibrator (Level position), which is stated in the calibration certificate of the unit (the default expected value of the Calibration Level set by the manufacturer of* ***SV 104*** *is equal to 114 dB).*

3. Switch on the calibrator and wait ca 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 seconds delay and stops until the same result is obtained 3 consecutive times. It is possible to stop the calibration measurement by pressing two keys at the same time and .

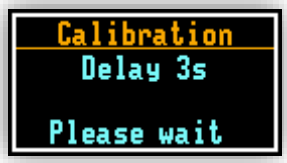


Figure 4-9 Calibration - initial delay screen

6. Delay before starting calibration measurement is counted down on the display. After the measurement, its result is presented on the display.

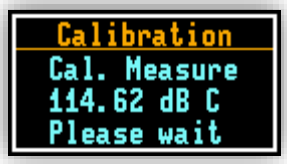


Figure 4-10 Calibration in progress screen

Note: *To quit the calibration procedure without saving the calibration factor press and .*

7. It is recommended to repeat the calibration measurement a few times. The obtained results should be almost the same (with ±0.1 dB difference). 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 close by
   - the calibrator or the measurement channel (for example the microphone) is damaged

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

8. Press the key to accept the measurement result.

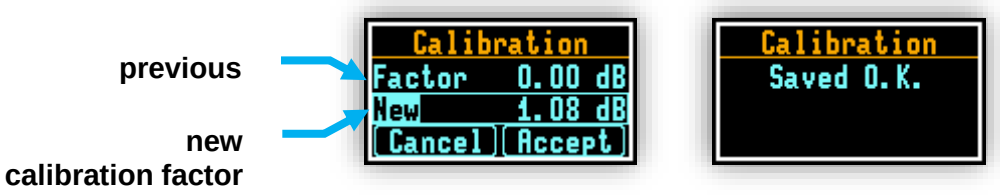


Figure 4-11 Calibration confirmation screen

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

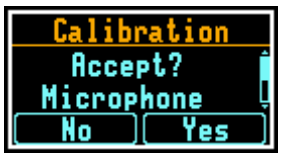


Figure 4-12 Calibration - microphone not in tolerance screen

9. Post calibration. If enabled, the post processing is performed automatically under acceptance of calibration measurement.

Note: If it is required to perform so called post-calibration of the instrument. In case the Post Calibration is pre-programmed within configuration setup, SV 104 automatically adds the results to the previously saved files.

4.8 VOICE COMMENTS RECORDING

In order 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. Thus, the **SV 104** gives you time to decide if you really want to record a voice comment. In case you release the key too early, **SV 104** returns to the last used **VIEW** mode.

Entering the voice comment recording usually brings up a window with a question to which logger file the voice comment is to be linked - to the previous or to the next one. NOTE: This window will be skipped if there are no previous logger files, or the unit is just turned on.

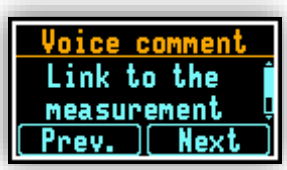


Figure 4-13 Voice comment linking screen

After selecting an answer by pressing the or key the record command window will open.

Figure 4-14 Voice comment recording command screen

Starting the recording by means of the key, flashing circle that indicates recording in progress will appear on the screen.

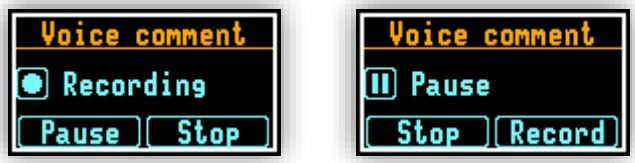


Figure 4-15 Voice comment recording in progress screens

Further, one can continue to record a comment about the measurement and press the key to finish recording. The recording end will be confirmed with the 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 takes place and linked to the Previous or the Next measurement run. But be beware, that linking to the previous measurement will not be possible in case when the unit is switched off and on again or there are no previous logger files. In this case the recording screen will appear (with default linking the comment to the next logger file).*

4.9 BEFORE AND AFTER MEASUREMENT RUN

Before starting a measurement ensure:

1. the instrument is turned on (see Chapter 4.3)
2. there is sufficient battery operating life and free memory by checking the status screen (see Chapter 4.4)
3. required configuration setup is selected (see Chapter 4.6)
4. the **SV 104A** is calibrated because it affects the results (see Chapter 4.7)
5. the windscreen is put on because it protects the microphone from industrial environment such as dust and moisture or from effects of impact (see Chapter 3.3)

After stopping the measurement run, make sure:

1. calibration is still maintained (see Chapter 4.7)
2. data is properly downloaded to PC for further analysis (see Chapter 5.4.1)
3. instrument is turned off (see Chapter 4.3).

4.10 STARTING AND STOPPING MEASUREMENT RUN

START:

To start the measurements the user has to press the ▼ and ▶ keys at the same time. The results of the measurement are displayed in the last used result's display view mode. As an example, ONE RESULT view mode is displayed. ONE RESULT view mode is always available for most functions of the instrument. The results of the measurements can also be presented in other view modes, which can be enabled or disabled and adjusted to the user's needs.

Figure 4-17 One profile mode screen view

STOP:

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

4.11 AUTO-RUN MODE INFORMATION

Note, that when auto-run mode (timer and/or pause) is configured, there is information on the screen available for the user. There is no need to turn on the instrument manually. All the timer procedures can be easily pre-programmed with the use of the **Supervisor** software.

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

4.12 SECURITY LOCK

Please consider locking the keypad and display during the measurement to prevent the wearer or anybody else from tampering with the measurement run. SV 104 can be set up to automatically go into locked mode when it starts. That automatically prevents any tampering, but the unit can still be unlocked, if necessary, with proper sequence of key presses.

Locking SV 104: To lock the instrument the operator should hold the **<SCROLL>** key for a couple of seconds during which a countdown ("Keyboard lock" 3… 2… 1…) is displayed and the unit gives you time to decide if you really want to activate security lock. If you release the key too early, SV 104 returns to the last presented **VIEW** mode.

Unlocking SV 104: To unlock the unit one has to press the keys in the correct sequence. The sequence is pre-programmed in the configuration setup (see chapter 5.3.9). Note that in case the security sequence is configured via SUPERVISOR software, the simple hold of **<SCROLL>** key for a couple of seconds during which a countdown ("Keyboard unlock" 3… 2… 1…) is displayed and the unit gives you time to decide if you really want to deactivate security lock.

Figure 4-19 Unlocking the unit sequence screens

4.13 REVIEWING MEASUREMENTS

Most of the parameters can be inspected in real-time during either measurement run or stopped mode of operation. If the display screen is turned off just press any key (but watch notice below).

The keys on the keypad of the instrument enable you to navigate thru most of the parameters. For specific information on the VIEW modes - see Chapter 3.10.

- Use the key to move down the list through the various measurements
- Use the key to change the ACOUSTIC PROFILE you would like to inspect
- Use the key to change the VIEW mode

Note: *In most cases the keypad will be probably locked. To gain access to the results and unlock the keypad - see Chapter 4.12.*

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

4.14 RESETTING THE DOSIMETER

- **SYSTEM RESET:** (internal software reset clears any setup configuration and brings back the default factory settings).

See **Appendix A** for remote control commands description.

- **HARDWARE RESET:** (internal hardware reset, no user data is changed)

Make sure the battery is not exhausted, and the unit is turned off. Hold down the key for more than 15 seconds, and then release it. Turn on the instrument as usually (see Chapter 4.3).

Note: *Hardware reset is only to be used in extreme situations such as an instrument hang-up. Be aware, that a hardware reset:*

- will stop any pre-programmed auto-run modes

- will stop measurement run

- HARDWARE RESET works, even if the keyboard becomes locked out!

5 SUPERVISOR BASIC OPERATIONS

This chapter explains how to download data and configure dosimeter settings as well as analyse data and prepare reports with 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 to work with the program. This manual gives an overview of the basic features of the Lite option. Both program options are widely described in Supervisor User Manual.

With use of micro-USB cable, software, and SV 104, it is easy to:

- set required configuration parameters and upload these, so called **SETUPS,** straight to the instrument,
- retrieve time history data to view and analyse your noise recorded charts, graphs, with extended reporting functionality.

5.1 INSTALLING AND CONNECTING

Download the **SUPERVISOR** installation file to your PC and run the installation program. The USB drivers are integrated with the installation file, and you do not have to download them yourself from the website.

After installation, you are ready to connect the SV 104 dosimeter.

- Plug the USB cable into the computer
- Plug the opposite end of the cable (micro-USB) into the dosimeter itself
- SV 104 is powered and charged directly through the computer; thus, you do not need separate charger. The dosimeter screen will be switched on automatically with current charging information only
- Turn on the dosimeter (see chapter 4.3) - long press of the **<ENTER>** key
- Once switched on, run the **SUPERVISOR** software and choose its mode – Advanced or Lite.

Figure 5-1 Choosing the SUPERVISOR mode

You can also switch between the modes when SUPERVISOR is running by clicking the Svantek icon and clicking in the opened menu **Run as Supervisor Advanced** or **Run as Supervisor Lite**.

Note: *This User Manual describes the basic features of the* ***Supervisor Lite*** *mode and most important operations with the SV 104 instruments, like: instrument configuration, data download and report generation. To have full description of the SUPERVISOR software, follow Supervisor User Manual.*

5.2 SUPERVISOR MAIN WINDOW

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

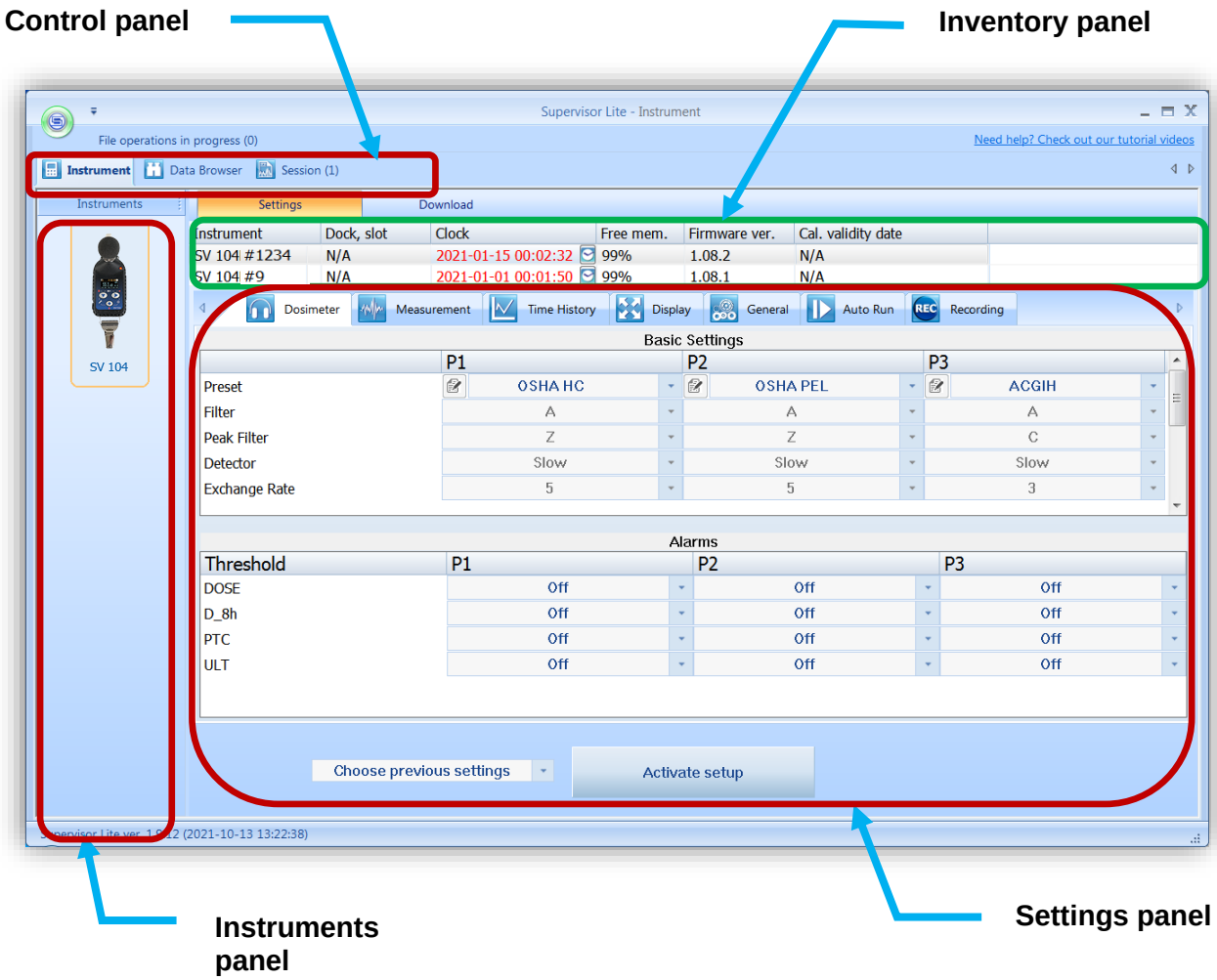


Figure 5-2 SUPERVISOR main window

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

Settings and *Download* tabs relate to the selected instrument type. If you click the instrument in the *Instruments* panel the program automatically downloads the setup file from this instrument and shows its settings in the *Settings* panel. At the same time the program downloads the list of instrument files and shows it in the *Download* panel.

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

The Inventory table contain information about the Svantek instruments:

- *Name* – the instrument's name.
- *Clock* – the date and time set in the real-time clock of the Svantek instrument; you can adjust it to match the PC's date and time by pressing the button. You can also right-click on the row corresponding to the selected instrument in order to open a context menu, allowing to specify the date and time manually.
- *Free memory* – the amount of free space on the instrument's SD card in percent. This option is available only for selected types of Svantek instruments.
- *Firmware version* – the version number of 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.
- *Instrument calibration certificate* – the title of the calibration certificate.
- *Calibration validity date* – date of calibration certificate's validity.
- *Calibrator Serial Number* – serial number of the instrument's calibrator.
- *Instrument Calibration Report* and *Calibrator Calibration Report*.

You can customize the Inventory table by clicking right mouse button on it and selecting/deselecting appropriate positions in 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 mean the following:

- Black means that there are at least 90 days left,
- Yellow means that there are at least 14, but less than 90 days left,
- Orange means that there are less than 14 days left,
- Red means that the calibration validity period is already exceeded.

Connected	Instrument	Cal. validity date
No	SV 104 #64	2021-11-03
No	SV 104 #40	2021-01-01

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

The Inventory panel gives you more capabilities to manage the selected instrument, like: Refresh Catalogue, Set Clock, Edit name, etc.; if you click right mouse button on the instrument's row.

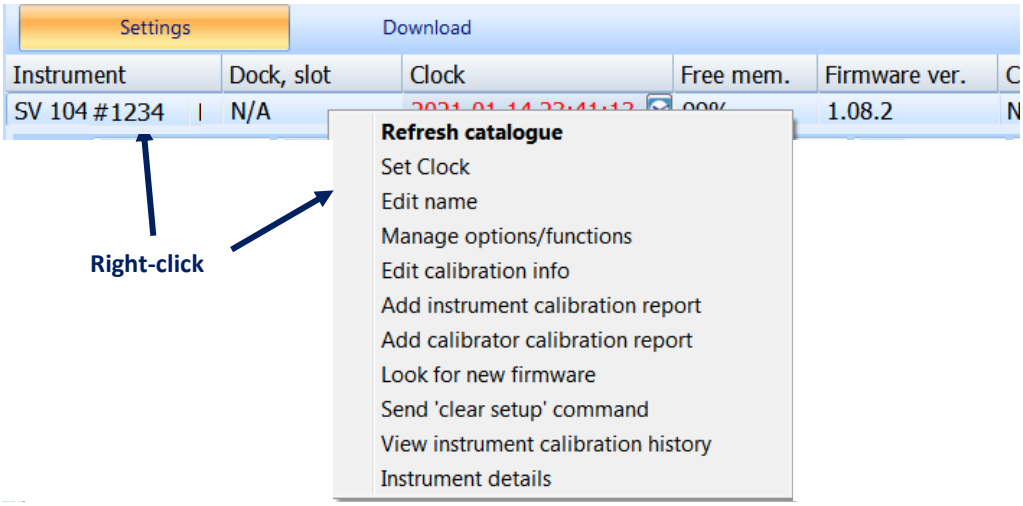


Figure 5-4 Inventory panel and its capabilities

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

In order to unlock additional options or measurement functions of the SV 104 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.

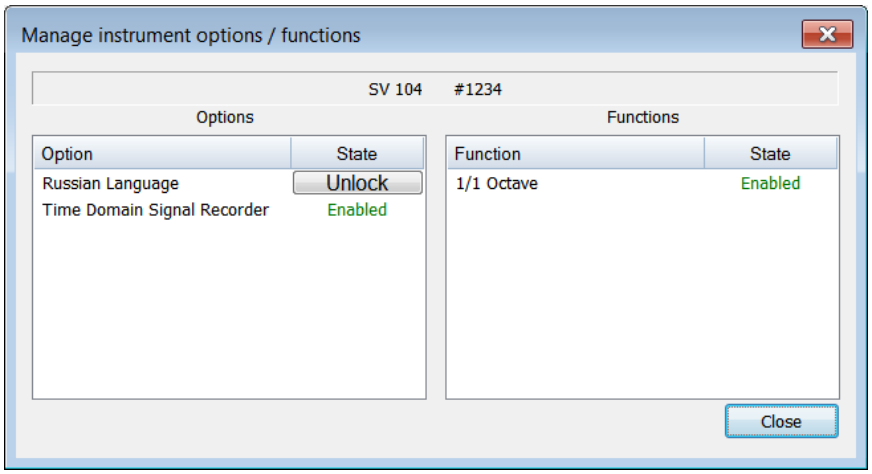


Figure 5-5 Manage instrument options / functions dialog box

The *State* column, located at the right-hand side of each option / function, contains the 'Enabled' label for unlocked options / functions, and the 'Unlock' button for the ones that have not yet been unlocked. If you wish to unlock an option or function that you purchased, press the 'Unlock' button and enter the unlocking code in the window that appears.

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

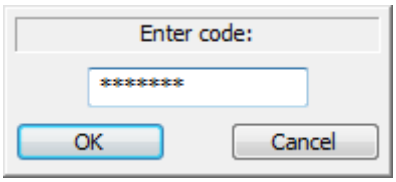


Figure 5-6 Entering code for unlocking an additional option or measurement function

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 for unlocking.

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

5.3 EDITING THE INSTRUMENT'S SETTINGS

The *Settings* tool of SUPERVISOR enables one to modify the instrument settings using the clear graphical interface and activate them on the connected instruments of the same type. In order to use the *Settings* tool, open the *Settings* tab in the *Instrument* window.

If you click the instrument in the *Instruments* panel the program automatically downloads the setup file from this instrument and shows its settings in the *Settings* panel.

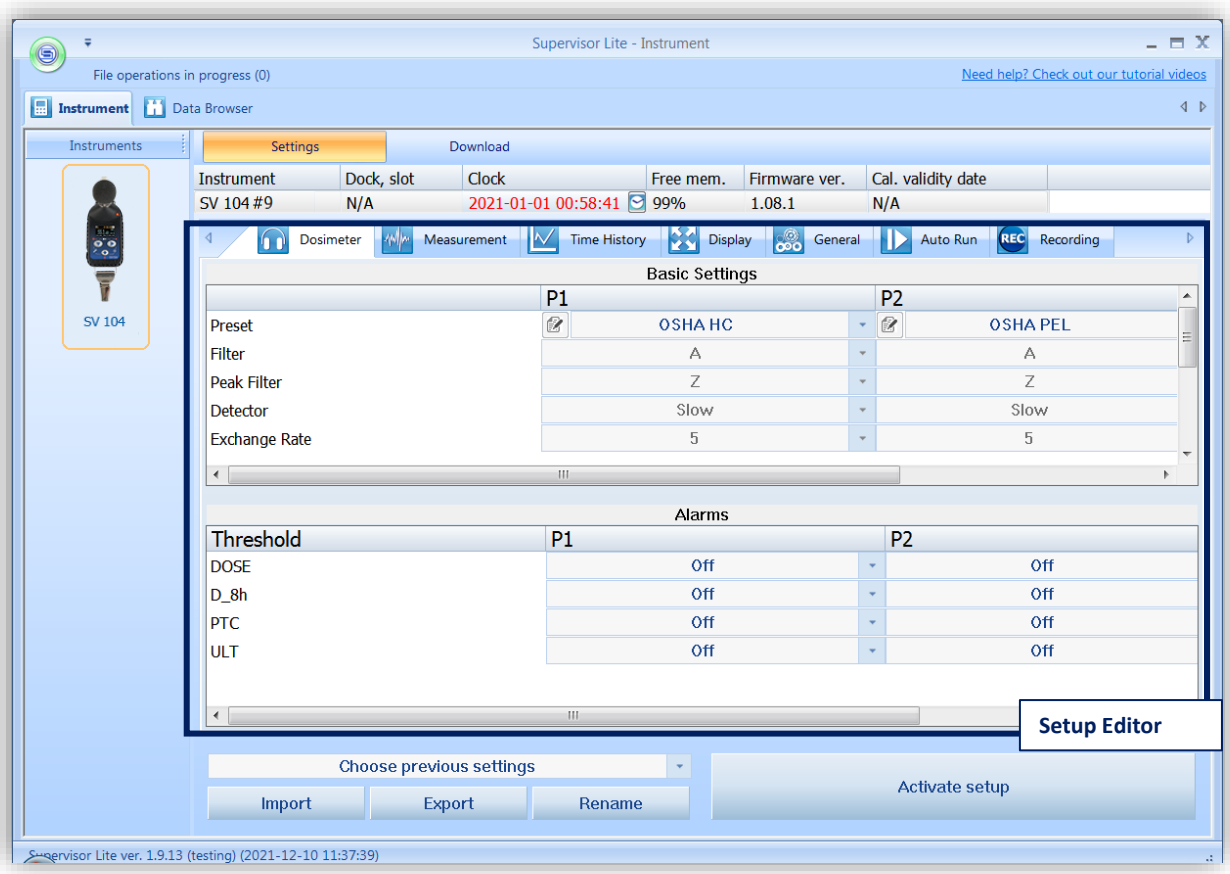


Figure 5-7 Using SUPERVISOR to edit Svantek instruments' settings

Using the buttons below the Setup Editor, you can:

- choose up to ten previous settings that have been used most recently with this type of instrument,
- *Import* a setup file from a PC catalogue,
- *Export* current settings as a setup file to a PC catalogue,
- *Rename* previous settings.

5.3.1 Editing settings

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

The settings can be easily edited using the following elements of the Setup Editor's graphical interface:

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

In some cases, the 'Settings currently not available' message may appear, all settings in a particular category being unavailable for modification. It only occurs if the particular category of settings is triggered by enabling an option from another category in the same setup file. For example, the *Spectrum* settings will be available only if an analyser function (*e.g.,* 1/1 Octave) is selected in the *Measurement* category of settings.

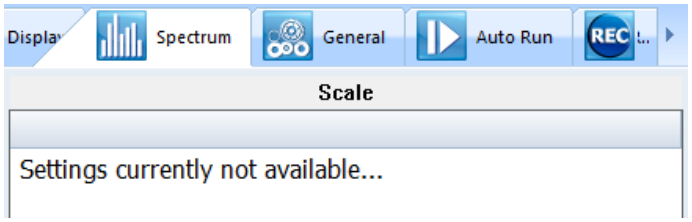


Figure 5-8 Example of a category of settings unavailable due to some other options in the same setup file being disabled

5.3.2 Applying settings

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

After changing the settings, the *Activate setup* button changes its colour.

If you changed the settings for the one instrument type but haven't activated them, the program will warn you about this before leaving the Setup editor.

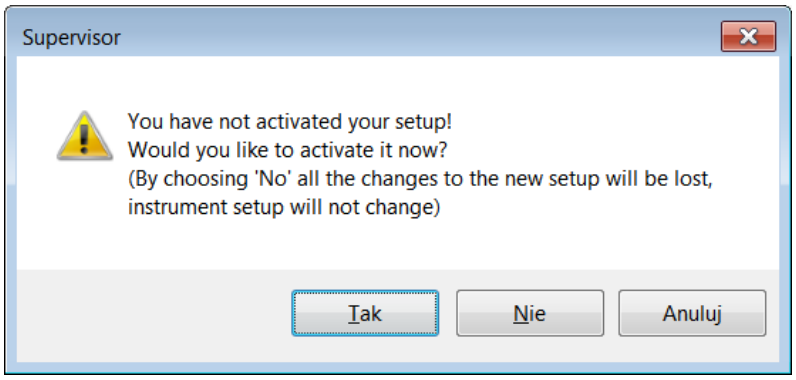


Figure 5-9 Warning that the setup was not activated

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

5.3.3 Using presets

The dosimetry profiles (available in the *Dosimeter* category of settings in the Setup editor) can be configured using so-called “presets”. A presets is a set of values of parameters related to the dosimetry profile, such as *e.g.* Filter or Detector. There are two types of presets: predefined and user defined. The six predefined presets are provided with SUPERVISOR by default and are compliant with the following health and safety norms:

- 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 for the Nordic countries.

Except of these predefined presets, you can create up to three user defined presets, consisting of custom parameters values.

Different presets can be selected for each profile independently. In order to configure one of the profiles according to a preset, use the *Preset* list-box. The first preset on the list, marked as *[Current]*, represents the profile configuration currently saved in the edited setup file. It is provided so you can reset the changes you made in Setup editor by selecting it. If you make any changes in 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 related to the parameters whose values are specified by the preset will be disabled. In order to change the values of those parameters, you need to select the current preset or a user-defined preset.

Note: Presets do not specify the values of all parameters; the parameters whose modification remains possible after selecting a predefined preset do not belong to the presets. These parameters are separated from the ones belonging to presets with a blank row.

You can create a user-defined preset by selecting one of the three last presets on the list and configuring the profile in a way 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 correspond only to the currently selected type of Svantek instrument. Different three presets are stored for each instrument type.

5.3.4 Profile settings

The main settings where specific acoustic profile configuration can be set are located under “Dosimeter” tab. There are already predefined pre-sets in each profile column. By choosing predefined configuration some obvious fields will be automatically greyed. Others must be setup by the user.

There are three additional user-defined pre-sets whose names can be changed during configuration with use of the little icon (notes with a pen) which is then enabled.

Apart from alarm **DOSE** threshold there are three additional source of warning alarm, which can be set. See figure below.

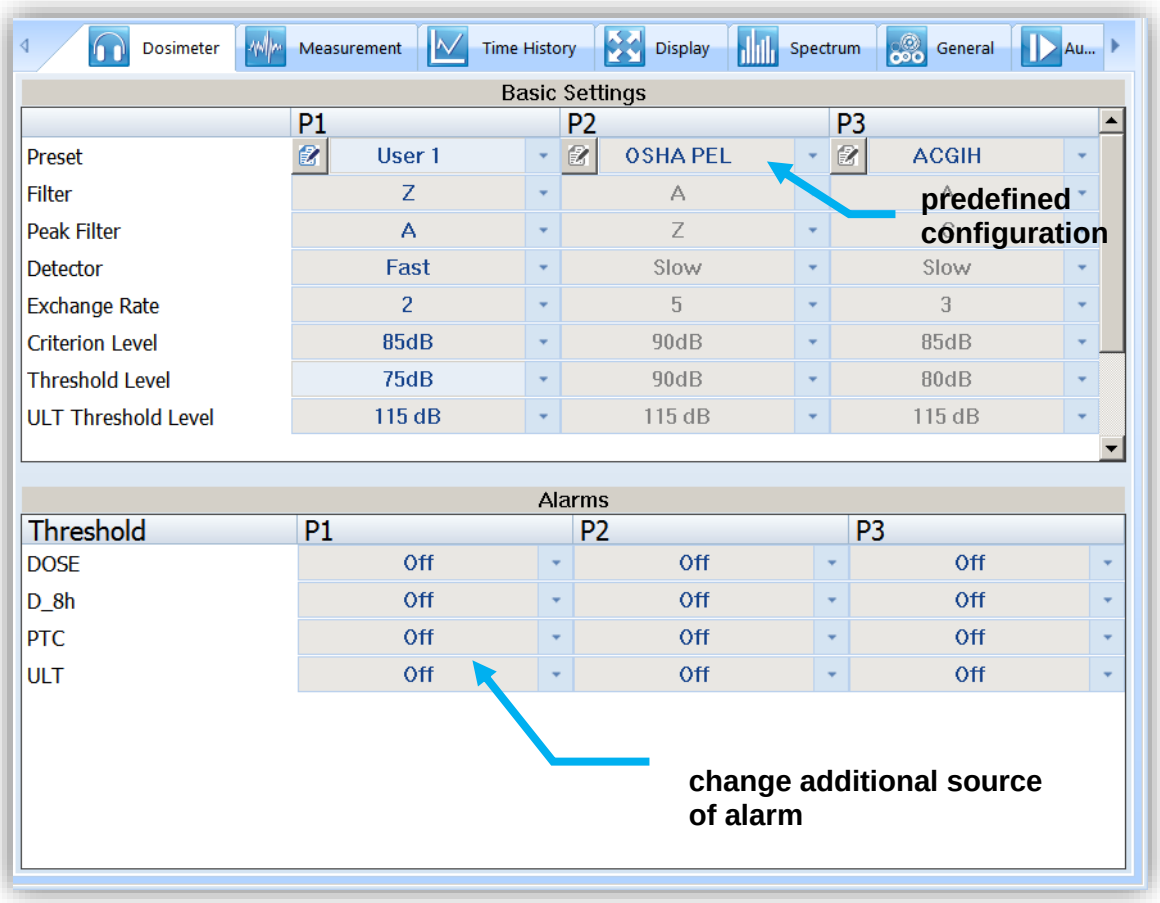


Figure 5-10 Dosimeter settings - profile configuration tab

Note: Some profiles can be disabled to be seen later during measurement run.

5.3.5 Measurement parameters settings

Within the measurement tab you can choose in which mode of operation the SV 104 should work: Dosimeter, or Dosimeter with 1/1-octave analysis.

Note: *Enabling 1/1 octave analysis shortens battery life, so take it into consideration and double check the battery status before measurement run.*

Other basic parameters configuration is shown on the figure below:

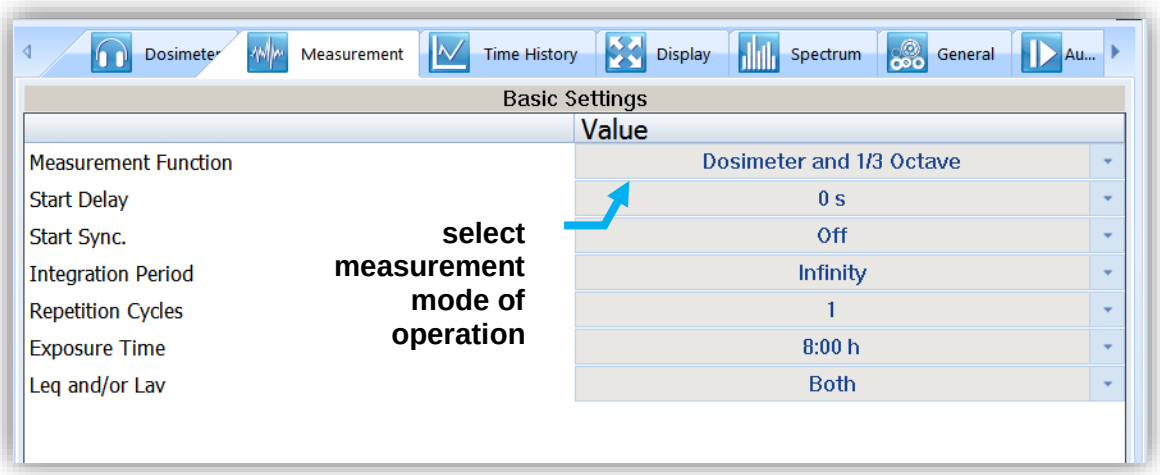


Figure 5-11 Measurement configuration settings tab

5.3.6 Time-history data logging settings

To enable logging the time-history data go to the **"Time History"** settings tab and switch the very first switch button on the left panel.

- In the **left panel** named **"Time History Setup"** there are basic configuration fields related to: how frequently do you want to log the parameters, what name the logger file should have, and if extended summary results should be saved.

  Note: Summary results are saved on the **"Integration Period"** basis (not on **"Logger Step"** time).

- **Right panel** named **"Profile Results"** is accessible only if the **"Logger"** switch button is set to **"On"**. You can choose which basic results for each acoustic profile should be logged during the measurement run and saved in the internal storage memory.

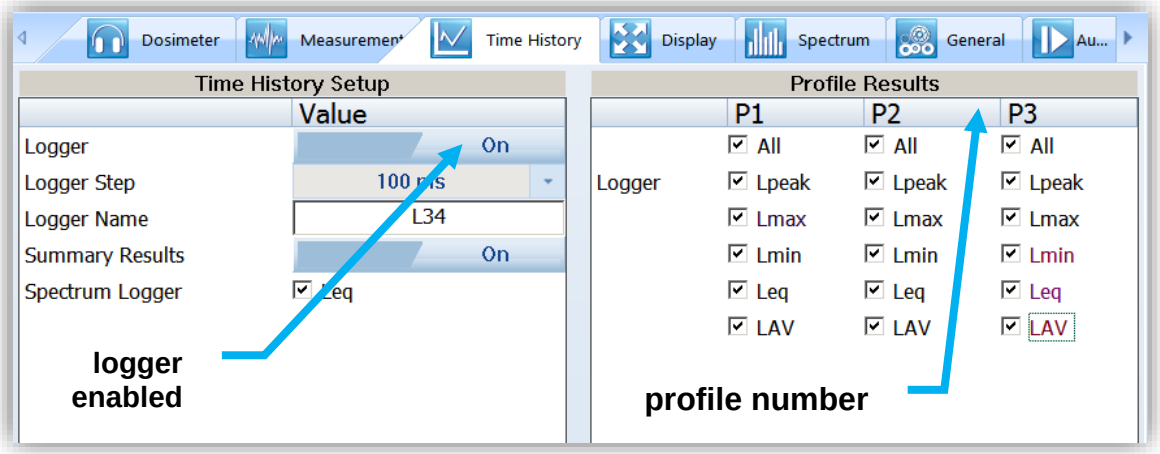


Figure 5-12 Time History (logger) settings tab

5.3.7 VIEW configuration

As mentioned in Chapter 3.10 there are quite a few VIEW modes accessible on the display, when the dosimeter is performing a measurement run.

- In the **left panel** named **"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 would be convenient for you to enable only one acoustic PROFILE to be displayed – just select the required one.
  Note: The "ONE-RESULT" (Chapter 3.10.2) is the only VIEW mode that is always present and cannot be disabled.

- In the **right panel** named **"Display Results"**, you will find a list of over a dozen measurement parameters, that can be configured to be presented on the SV 104 display, when you press ▼ key. See Appendix D to review acronyms for each parameter.

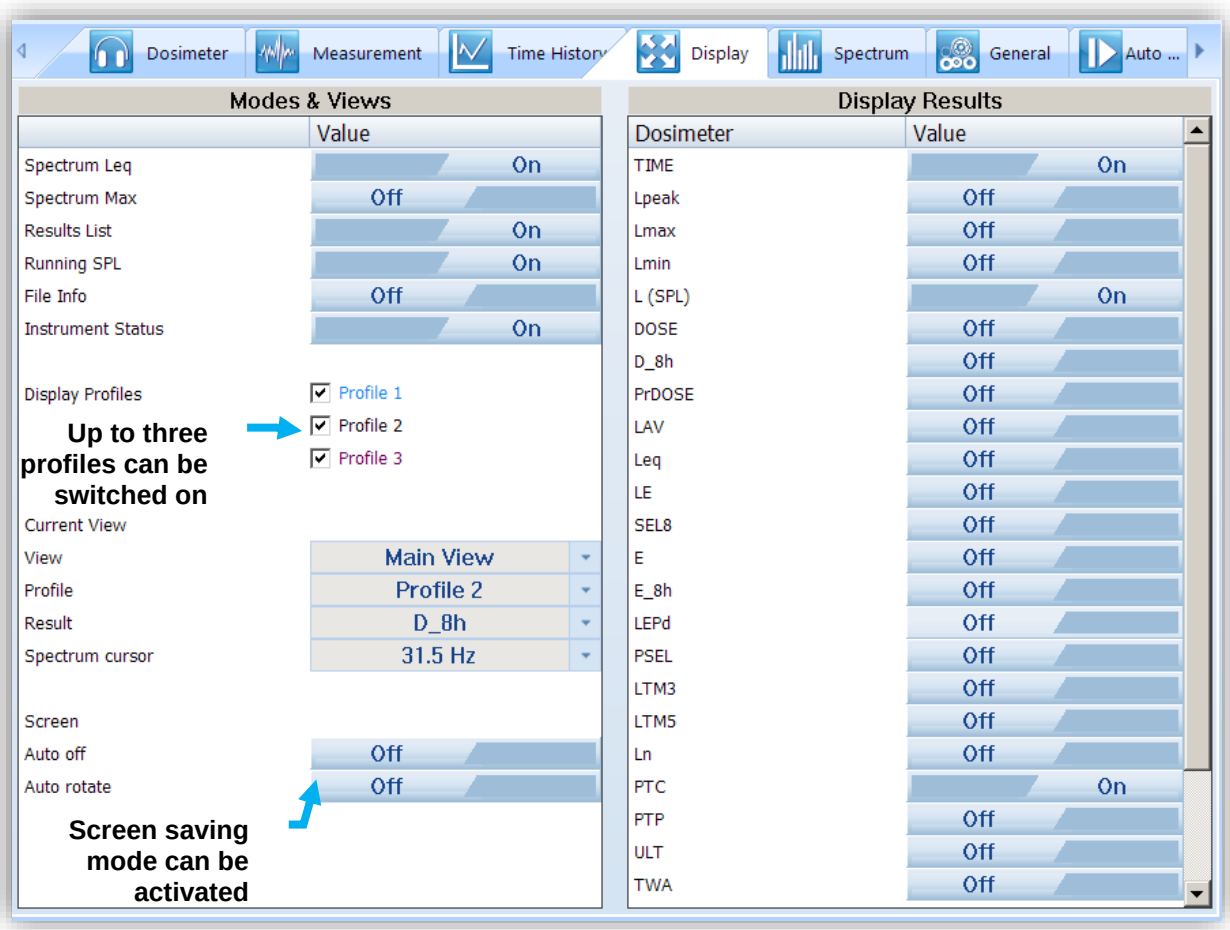


Figure 5-13 Display VIEW configuration tab

5.3.8 Spectrum configuration

Real time 1/1 octave analysis is an additional optional feature. Therefore, it has its own settings tab. Within this tab there are the following panels:

- named **"Data"**: This configures the weighting filter that is to be used with octave calculation
- named **"Display Scale"**: Here the visible dynamic range of the graphical plot can be set, as well as the grid visibility enabled.

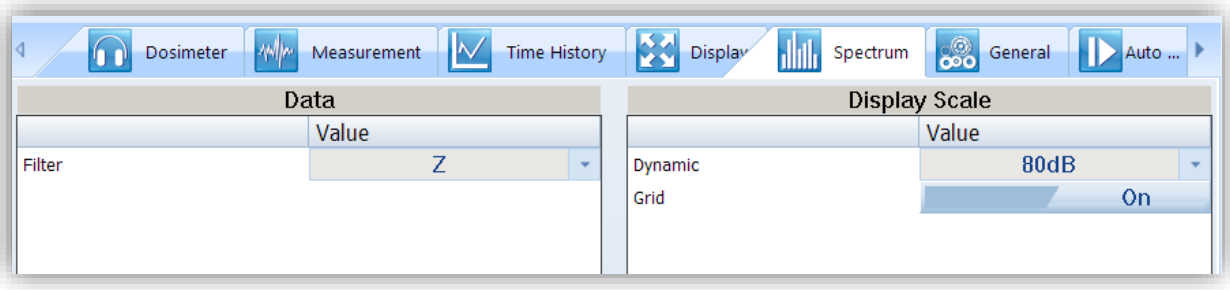


Figure 5-14 Spectrum configuration tab

5.3.9 General settings

General settings tab concerns to many different usability options: see the followed by chapters to understand exactly how to configure these instrument settings.

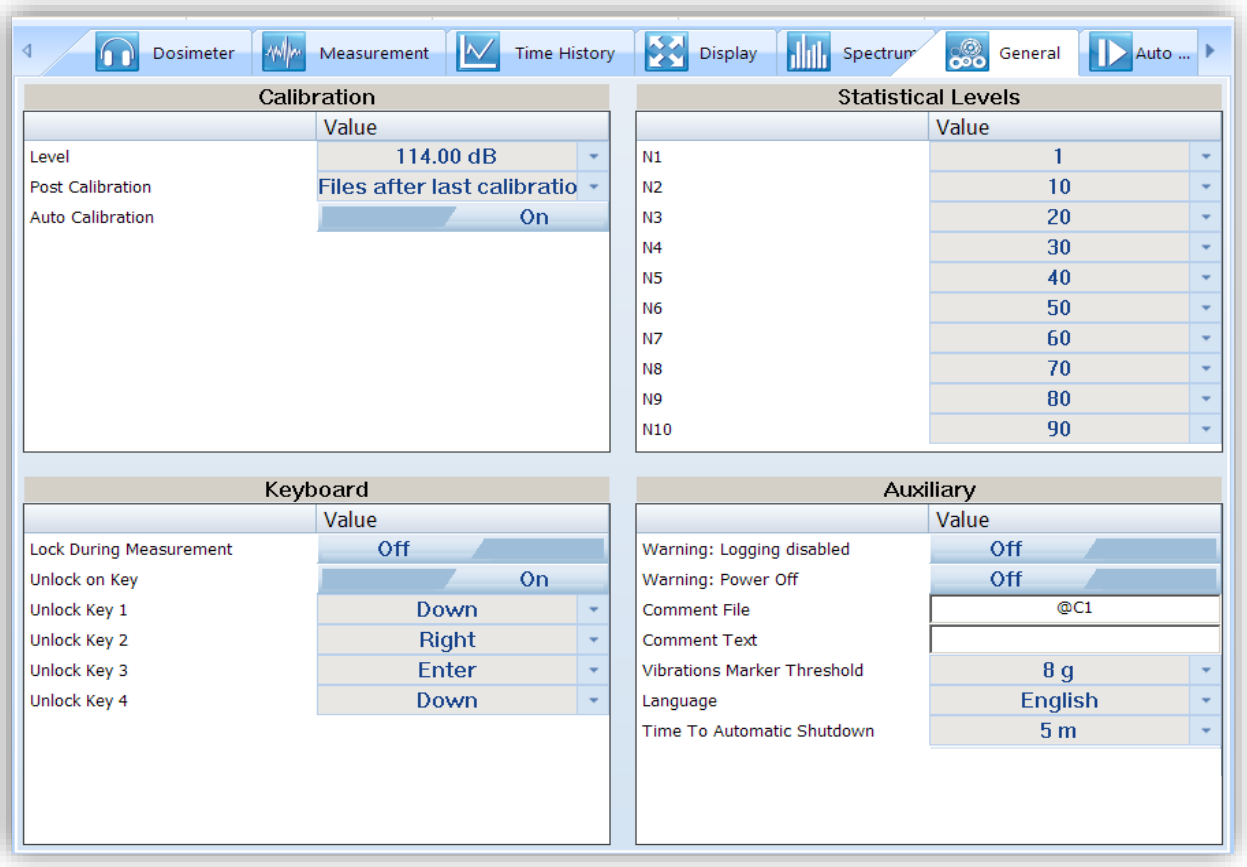


Figure 5-15 General settings tab

Sometimes it is required to perform so called post-calibration of the instrument. The **Post Calibration** position enables the user to perform additional calibration after a measurement session and add the results to the file saved in the memory. In the panel below, there are three options for saving results: not to save **"Off"**, save in the last file **"Last File"** or save in the files which will be created after last calibration (**"Files after last calibration"**). Auto-calibration can be disabled if required for any reason.

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

The security setting enables you to protect access to the instrument when in use with a simple keypad password to prevent users from inadvertently terminating a measurement run. This feature is set through the **SUPERVISOR "General"** settings tab.

To turn on the security option: switch on **"Lock During Measurement"**. SV 104 will disable the keyboard every time, the measurement run is started.

See Chapter 4.12 how to lock and unlock the SV 104 instrument.

If **"Unlock on Key"** is set to **On**, SV 104 will require special code to be input by pressing four keys defined in this panel in a particular sequence

If **"Unlock on Key"** is set to **Off**, SV 104 can be locked/unlocked without providing Lock/Unlock sequence. Simply hold the  key for a couple of seconds during which a countdown (**"Keyboard lock/unlock" 3… 2… 1…**) is displayed and the unit gives 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.

In the auxiliary settings panel, it is possible to:

- Enable additional warning screens to be displayed under certain conditions:
  - **"Logging disabled"** it warns the operator that time history results will not be stored
  - **"Power off"** additional confirmation just before switching off.
- **"Comment file name"** defines the name of the Voice note comment file. "**Comment Text"** is also able to be entered here if required.
- **"Vibration Marker"** is used on the basis of acceleration threshold setting (**Off, 1g,…15g**) the lower the threshold level selected then the more sensitive the dosimeter will be to possible bumps and shocks during use.
- **"Language"** enables the user to change the menu language displayed on the screen of the dosimeter. The default language is English.
- **"Time To Automatic Shutdown"** enables the user to change time period after which the unit will be shut down if no key will be pressed.

5.3.10 Auto-Run settings (timer, pauses)

In the **Pause** panel the user may program five independent pauses in real time – **Begin** and **End** of the pause.

The **Timer** panel enables the user to program the internal real time clock to act as a delayed start and stop timer. The instrument can be switched on by itself at the pre-selected programmed time and it can then perform the measurement run, which was used before it was last switched off. Auto-run feature is useful if you wish to pre-set the instruments to run and stop for a specific period, such as a week-long study.

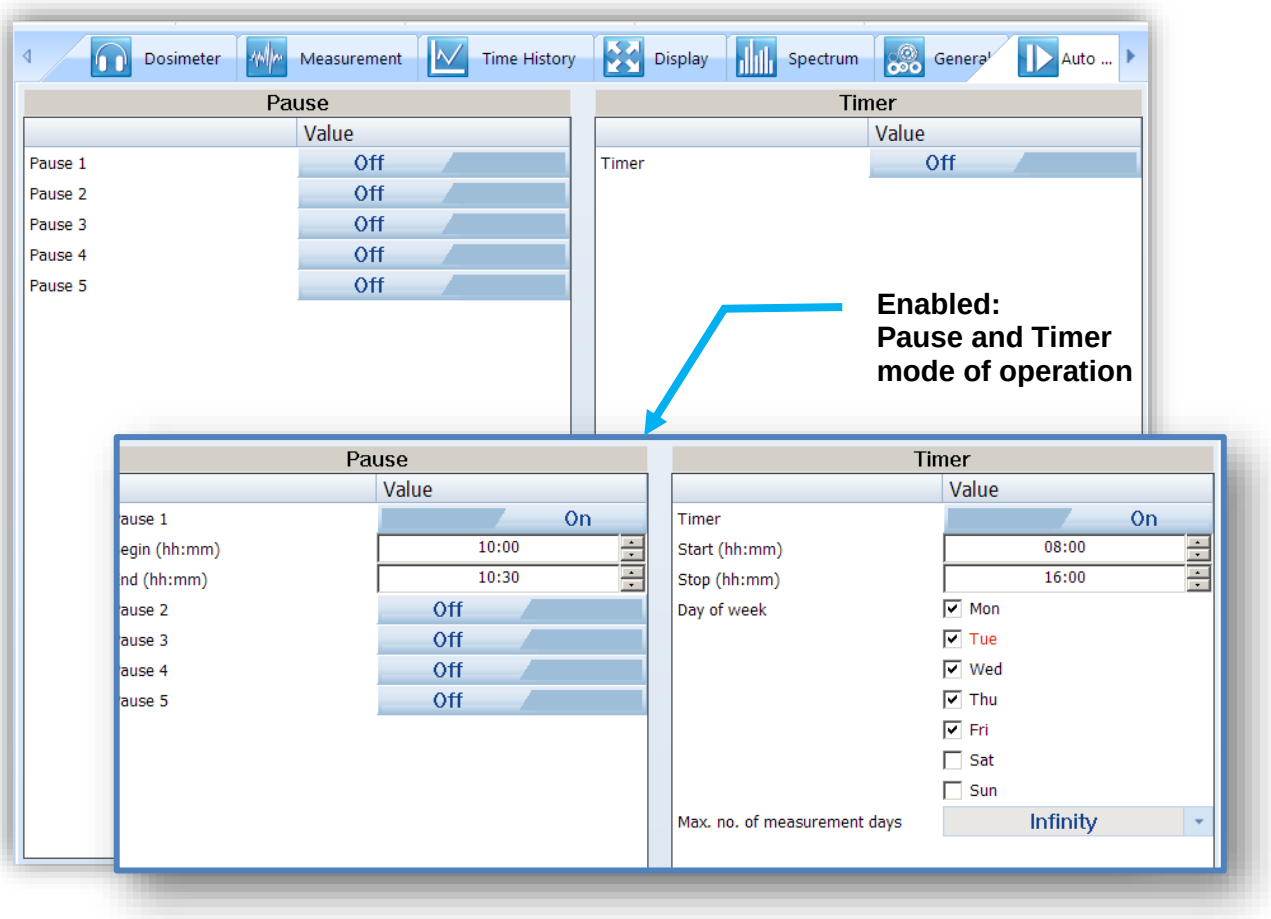


Figure 5-16 Auto-run configuration tab

The timer can be switched off **"Off"** or switched on **"On"**.

In case the timer function is active (**On**) and the instrument is switched on the **Time** screen appears until the programmed measurement runs are finished.

The **Start (hh:mm)** and **Stop (hh:mm)** positions determines the time for the measurement to start and to stop automatically. The required hour and minute should be selected.

The **Day of week** determines the days in a week when the measurements should start. The timer can be programmed (**Max. no. of measurement days**) up to 100 days ahead or without limitation (**Inf**) and during these days' settings of the current state of the **R**eal **T**ime **C**lock is taken into account. Make sure to check that the real-time clock settings for the measurement location are correct before beginning a delayed timer measurement.

5.3.11 Domain signal recording

The SV 104 instrument can record the time domain signal as Event or Wave. You can playback and post-process these time domain signal records using the SUPERVISOR tools. The difference between two types of signal recording is that the first one is recorded to the logger file, while the second one is recorded to the separate WAV file.

Note: *The signal recording 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 5.2.*

The time domain signal **Recording** tap has two panels – **Event Recording** and **Wave Recording**.

Note: *Event and Wave recording options are mutually exclusive. If you wish to switch on one option, another one should be switched off.*

You can switch on the one or another option choosing the **Recording Mode** other than *Off*: *Continuous*, *Trigger Slope +, Trigger Slope -, Trigger Level +* or *Trigger Level -*. These modes require different sets of parameters and use different ways of signal recording (triggering) which are described below.

There are four basic parameters of audio recording 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 with the measurement start and stops with the measurement stop.

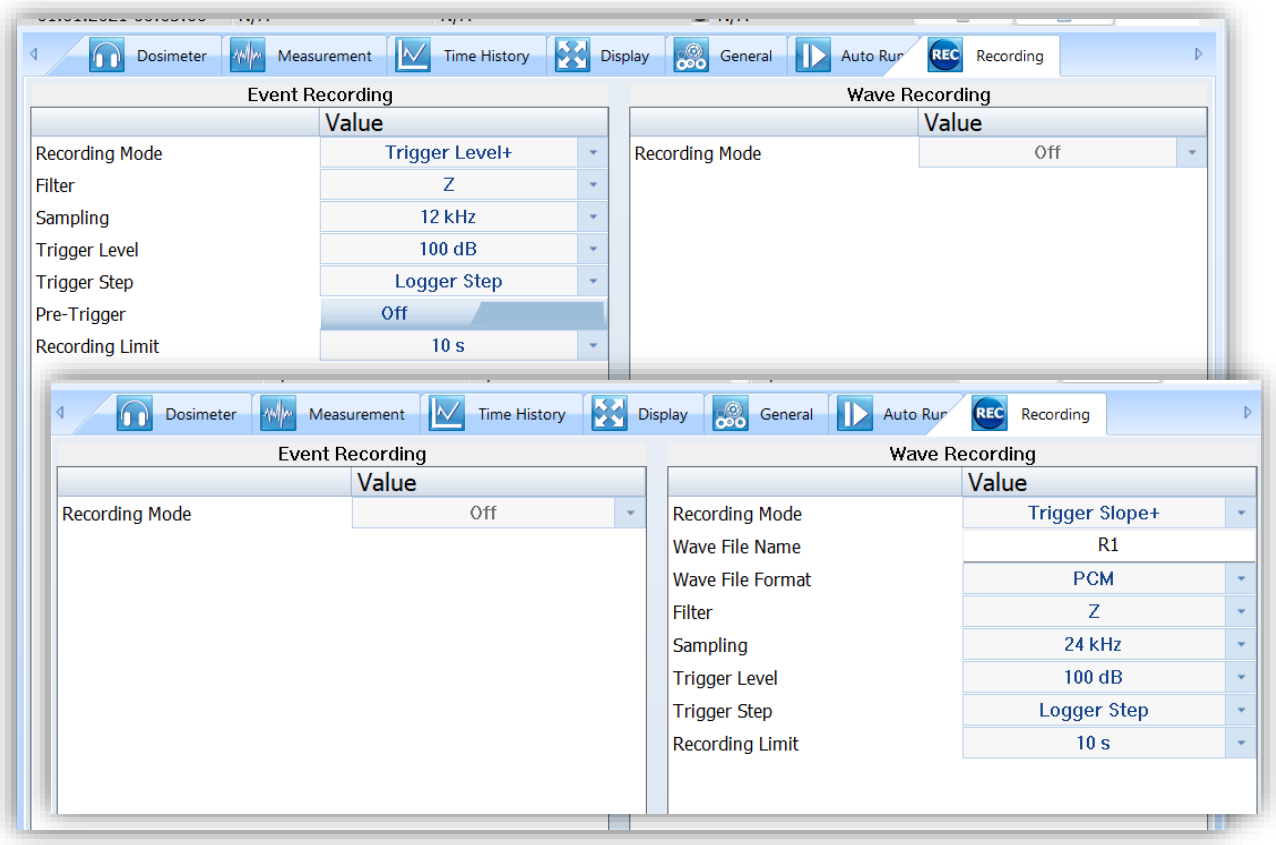


Figure 5-17 Signal recording configuration panels

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

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

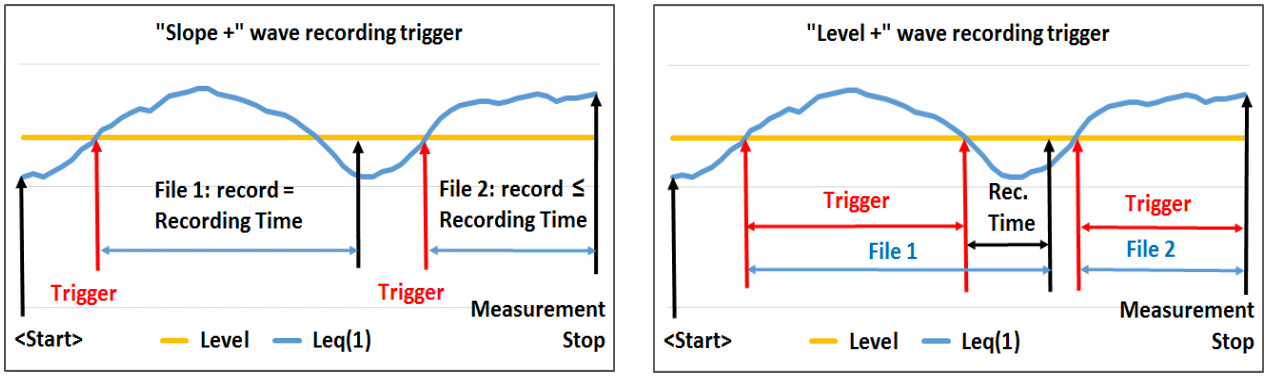


Figure 5-18 *Slope* + vs *Level* + wave recording trigger

Note: *In some cases, the instrument may split a wave file automatically! The reason for this is the limited RAM of the instrument in which the audio data is buffered.*

5.4 WORKING WITH DATA FILES

5.4.1 Downloading files

In order 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. Various types of files are displayed there, *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 date of creation. The last three columns contain additional information (concerning location, users and tasks) assigned to files. Files that have not yet been downloaded are displayed with bold font.

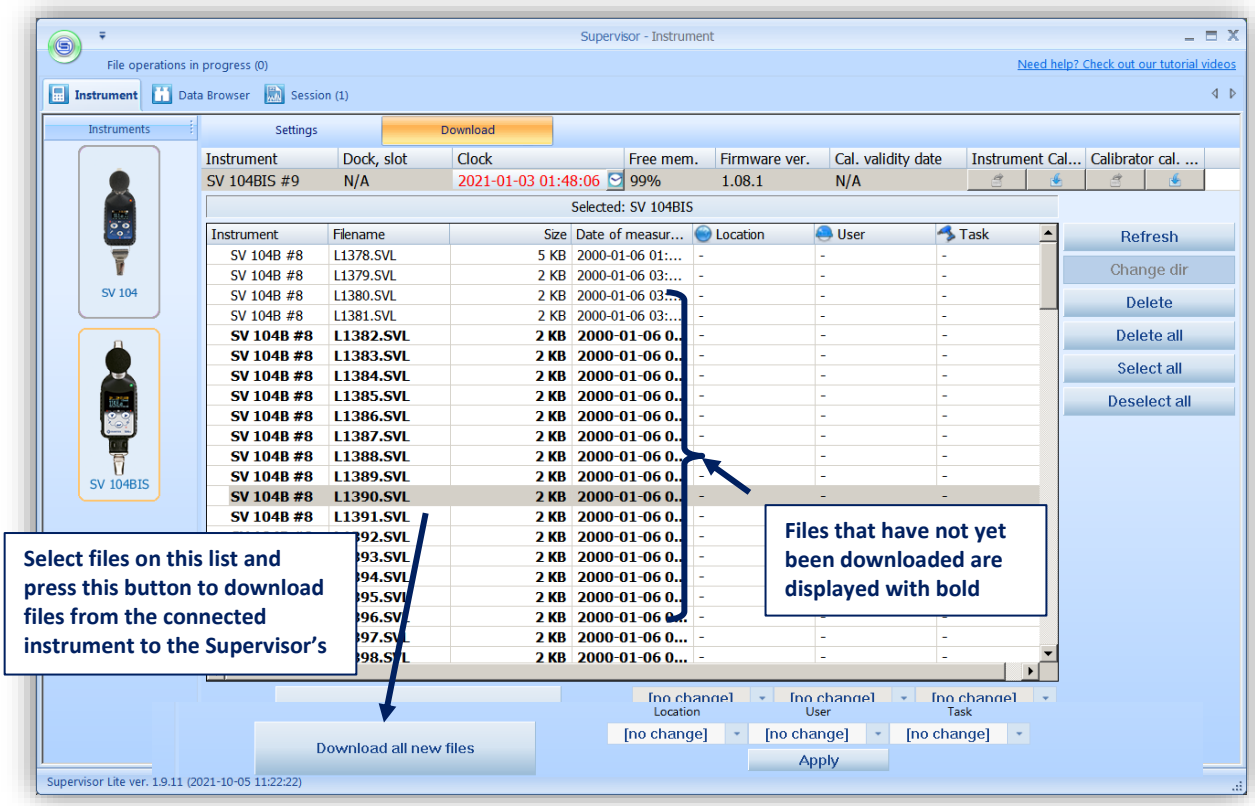


Figure 5-19 SV 104 Download window

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

Note: You can select files by clicking a row of the table. Clicking with the CTRL or SHIFT button pressed allows to select multiple files.

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

Files from the instrument are downloaded to the special internal SUPERVISOR catalogues that are created automatically in the parent catalogue with the name "Catalogue". Created catalogues by default have names of the instruments, for example, SV 104B, SV 104, etc.

After the downloading procedure is completed, a window, containing information about success or failure of downloading, is shown.

The buttons located at the right side of the Download panel enable you to perform some basic operations concerning the files stored in the connected instrument:

- *Refresh* – updates the list of files, so that all the files created after you entered the Download panel will also be shown.

  Note: Every time the list of files is refreshed, a new "downloading session" begins, i.e. a new subdirectory is created for the downloaded files. This is why sometimes the overwrite warning does not appear even though two files of the same name are downloaded — after beginning a new download session, the file will be stored in a different location, thus eliminating the possibility of overwriting.
- *Change dir* – for SV 104 instruments this button is inactive.
- *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* – clears the selection.

All downloaded files are stored in the SUPERVISOR database, and they can be viewed and processed using the Data Browser, which is 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 from / to a connected instrument, SUPERVISOR displays the progress in the *File operations* panel, located at the top-left corner of the application window.

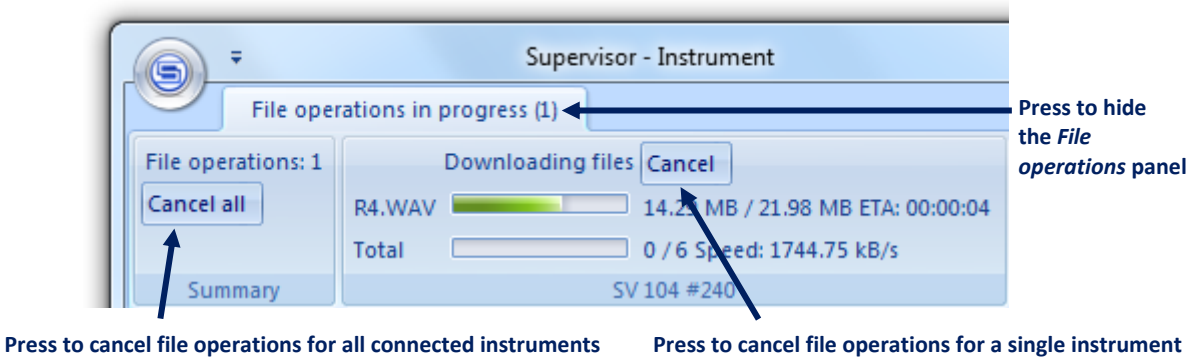


Figure 5-20 File operations panel

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 pressing the *Cancel all* button.

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

5.4.2 Data Browser

In order to view all the files downloaded from Svantek instruments and stored in the SUPERVISOR database, open the Data Browser using the button located in the top-left corner of the SUPERVISOR window.

The Data Browser is composed of three panels:

- on the left side of the window, the File manager panel contains a list of all files stored in the SUPERVISOR database and allows you to select a group of files to be displayed 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 to open a file for further processing
- below the file list panel, the File preview panel enables to preview data contained in a selected file.

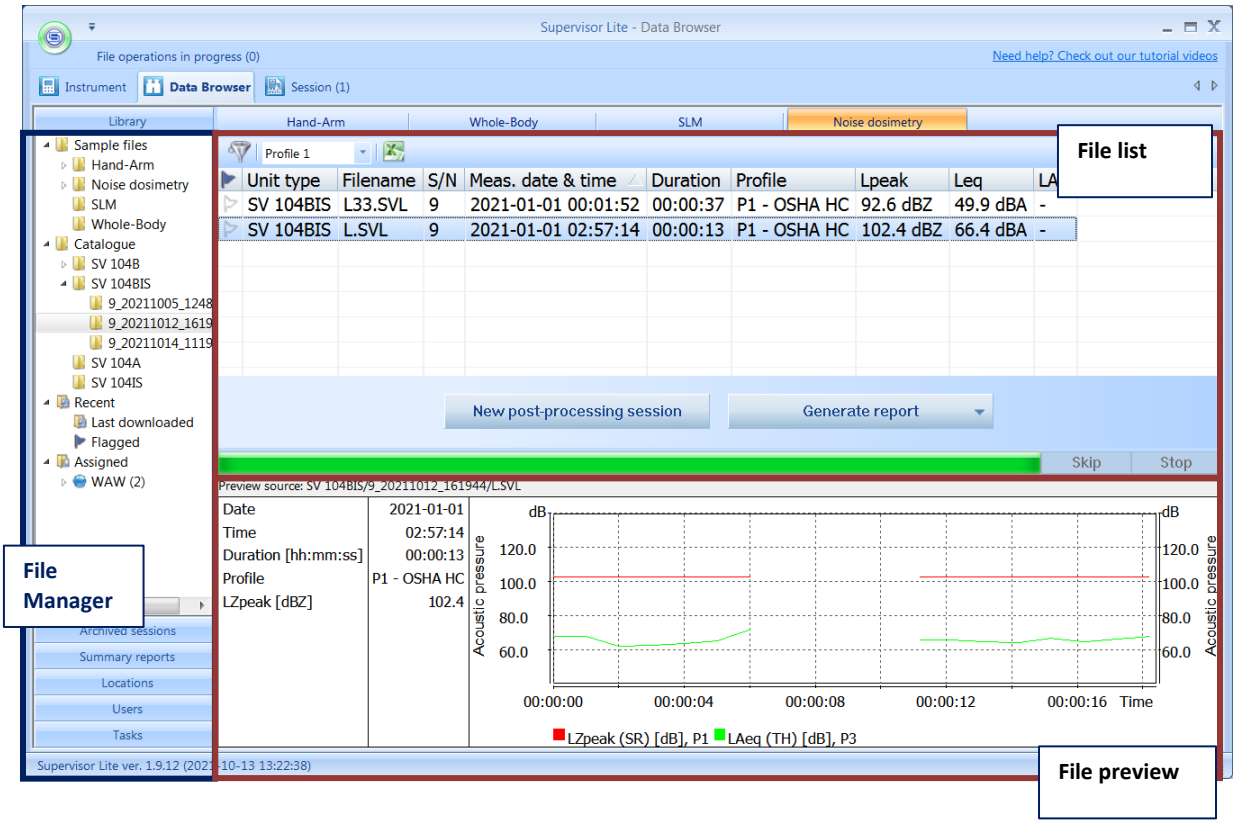


Figure 5-21 Data Browser window

5.4.2.1 File Manager

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

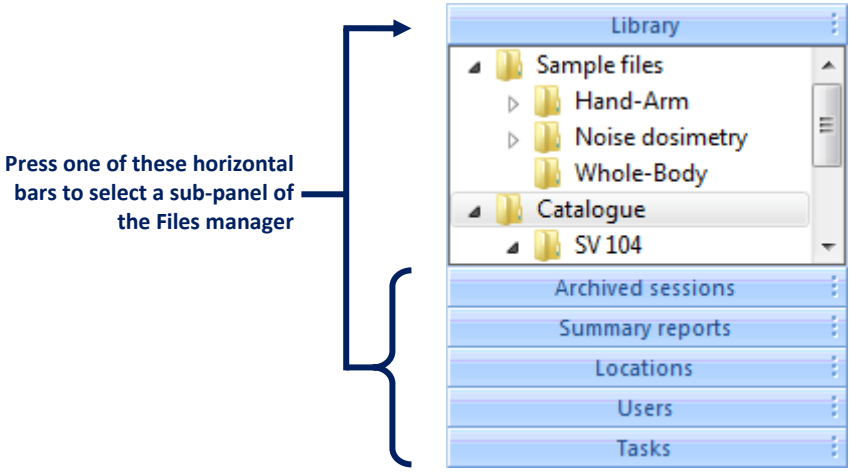


Figure 5-22 File manager

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

- *Sample files* containing some sample files provided with SUPERVISOR, grouped further according to the type of measurement they refer to.
- *Catalogue* containing all the files downloaded from instruments. You can arrange the Catalogue in any way by adding, deleting, moving and renaming files and folders. You can easily move files and folders, as well as add them to the database from any location on the PC, using the drag & drop technique. You can also use the context menu, opened by right-clicking, for various operations on files and folders.
  Note: It is also possible to export files from the SUPERVISOR database using the drag & drop technique outside the application window (dropping files into Windows Explorer).
  Note: The catalogues for the downloaded files are created automatically in the *Catalogue*. Created catalogues by default have names of the instruments, for example, SV 104B, SV 104, etc.

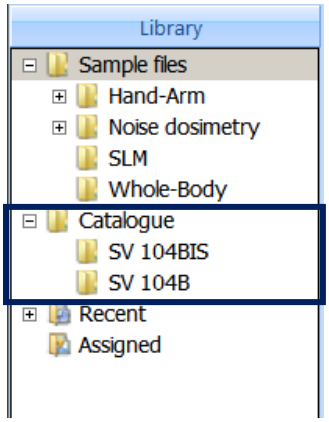


Figure 5-23 Example of the Catalogue content

- *Recent* containing two sub-items: *Flagged*, which is a folder for grouping a number of selected files—in order to add a file to this group, you have to 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 launch of SUPERVISOR.
- *Assigned* containing all files to which additional information about location, user, and task performed during measurement have been assigned.

The *Archived sessions* sub-panel contains a list of all the sessions that have been moved to archive. You can use this list to restore an archived session for viewing and processing it again, or to use files which have been used to create that session. In case many sessions are 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 gather selected measurement results according to additional information that has been assigned to them.

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

5.4.2.2 File details

The File details panel contains a table in which files corresponding to the selected item of the File manager are listed. The files corresponding to all sub-items of the selected item are also shown in the Files details panel. Files can be further processed by using them for sessions. In order 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 only one file, you can do it by double-clicking with the left mouse button the row of the table corresponding to that file.

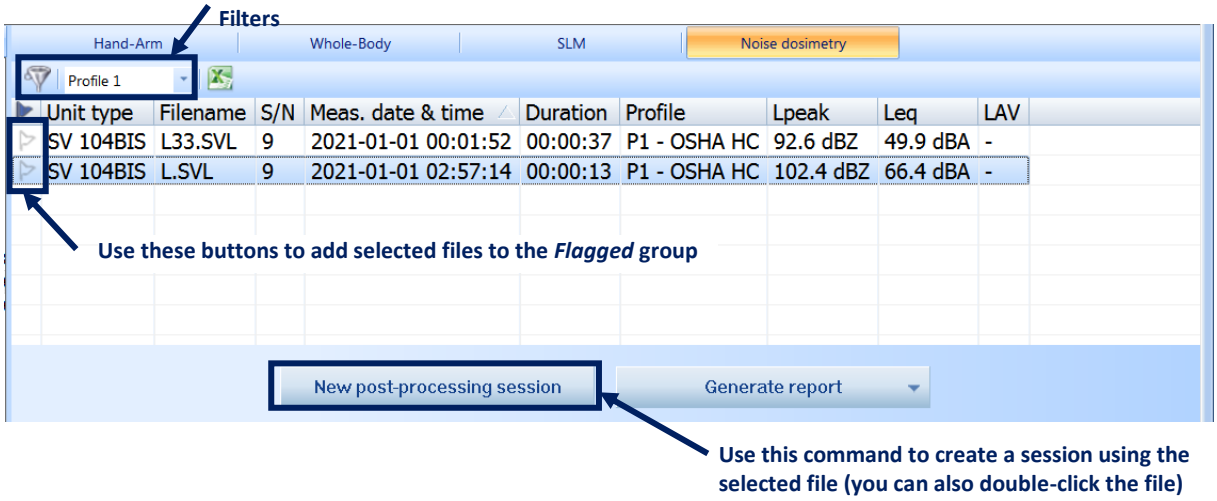


Figure 5-24 File details panel

Setting flags

By pressing the button located in the first column at 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 flag several files in order to get a quick and easy access to them.

Dragging files outside SUPERVISOR

You can easily export files from the SUPERVISOR database to a selected location on the PC using the drag & drop technique outside of the application window.

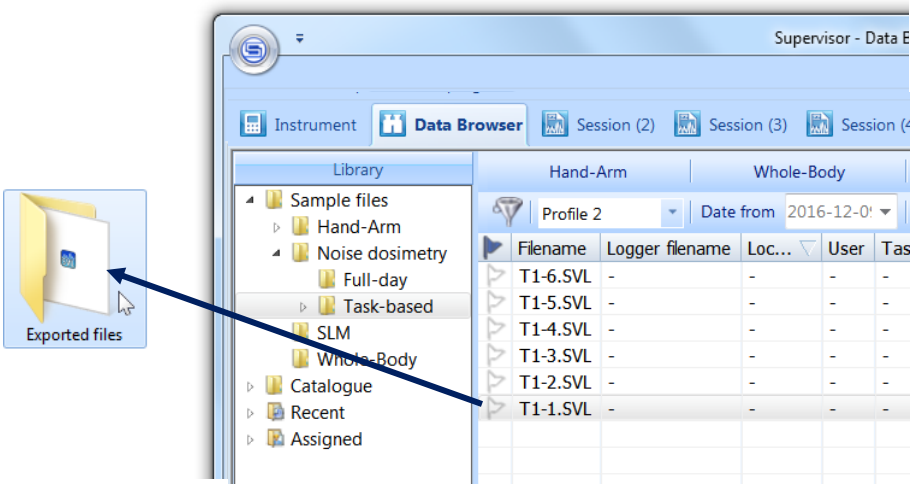


Figure 5-25 Using the drag & drop technique to export files outside the SUPERVISOR database

Note: Exporting measurement files with comments (*e.g.* WAVE files) attached to them automatically exports the comment files too. In order to export a single file without the attached comments, use the drag & drop technique with the CTRL button pressed.

Creating reports

You can generate a report of the selected file(s) based on some templates using the *General report* button. After pressing this button, you should select a template for the report.

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

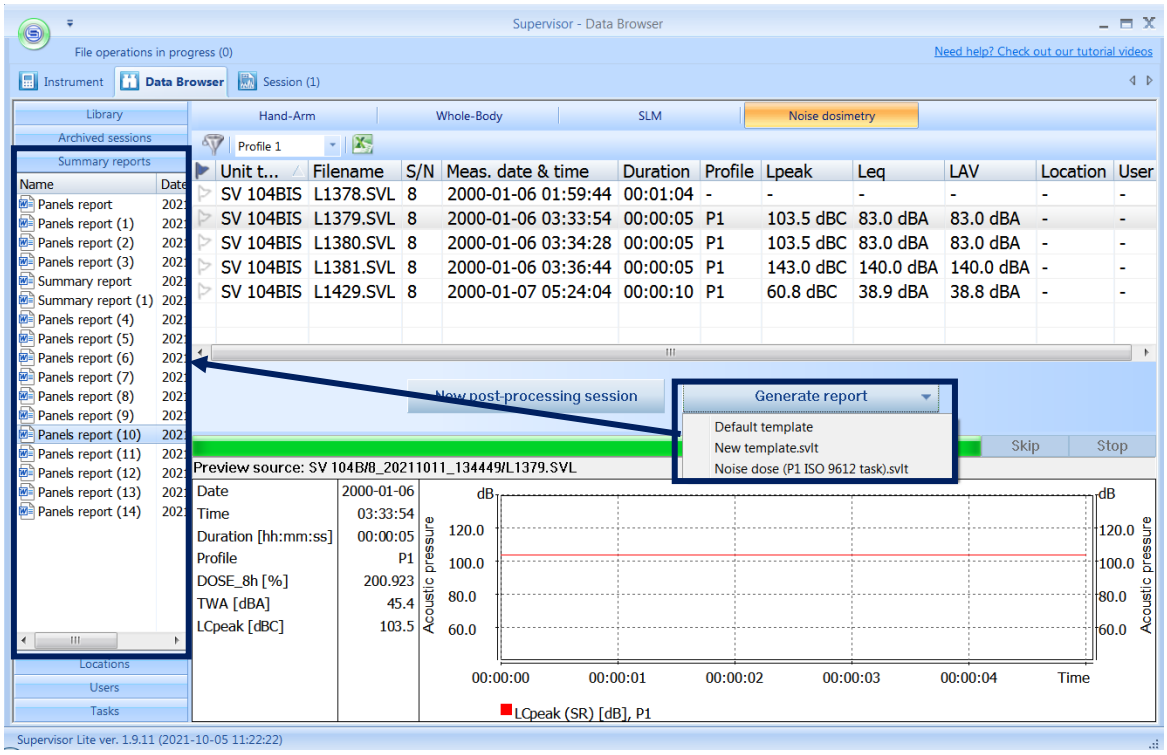


Figure 5-26 Creating general reports

5.4.2.3 File preview

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

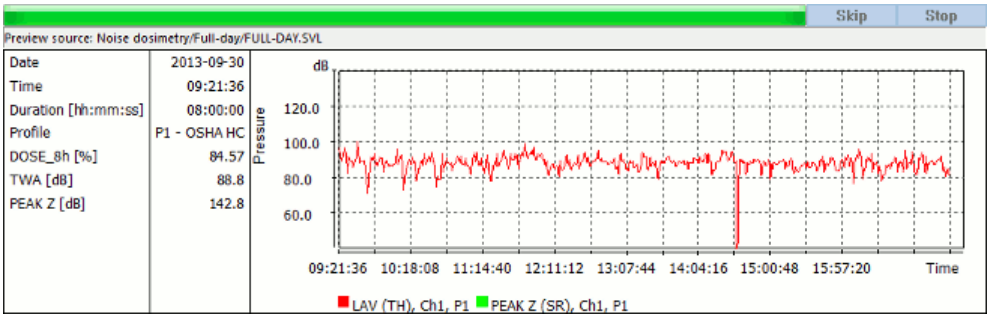


Figure 5-27 Preview panel

It is possible to copy the contents of the Preview panel by right-clicking in its area and activating the *Copy* command. It can then be pasted as an image in another application, such as *e.g.* MS Word.

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

5.4.2.4 Using assignments

Three types of additional information can be assigned to each file downloaded from a Svantek instrument:

- *Location* (where the measurement was carried out),
- *User* (whom the measurement concerned),
- *Task* (which was being performed by the user during the measurement).

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

You can assign this additional information to the files when you download them from the connected instrument. For this, in the *Instrument → Download* panel, select one or more files, select the *Location* / *User* / *Task* in the respective list-box located at the bottom-right corner of the window and press *Apply*. If you want to add a new location, user or task, in the list-box select *[new...]*. If you want to erase information already assigned, select *[none]*. Chosen values will be assigned upon downloading files to the SUPERVISOR database.

Figure 5-28 Assigning additional information to downloaded files in the Instrument → Download panel

You can also assign additional information to files in several 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.

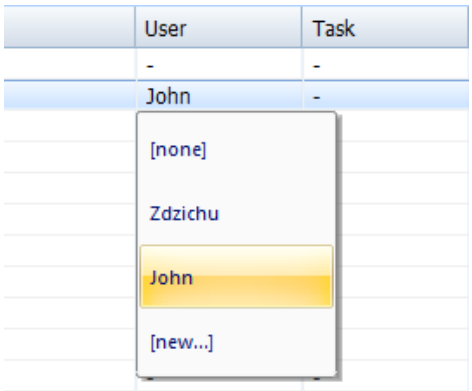


Figure 5-29 Assigning User information to a file in the File details table

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

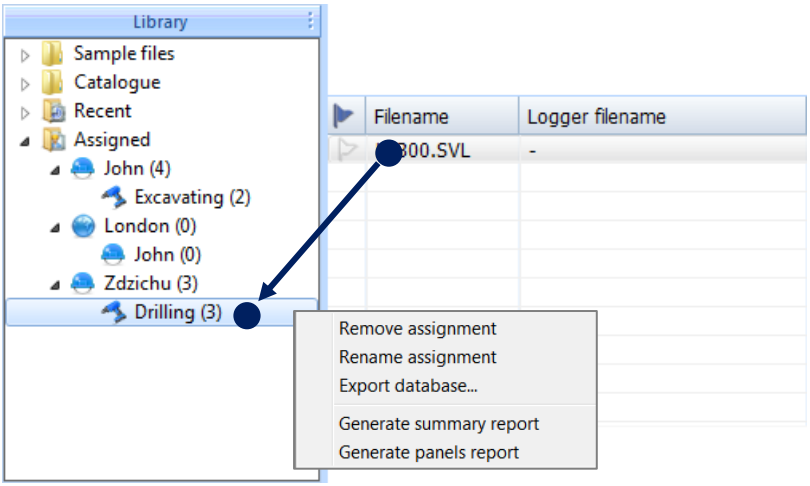


Figure 5-30 Assigning additional information to files using the drag & drop technique

Right-clicking on the item in the Assigned section, you can remove, and rename assignments.

5.4.2.5 Summary reports

The summary reports can be used to gather measurement results related to selected locations, users, or tasks, in the form of MS Word documents. In order to create a summary report, right-click on 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” root item to create a summary report for all the files that have a location, user and/or task value assigned to them.

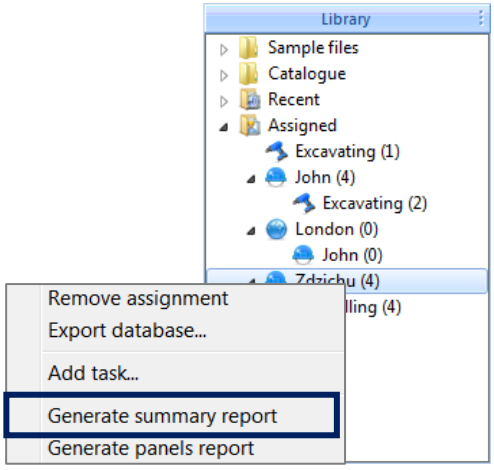


Figure 5-31 Using the Library to generate a summary report

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

to generate more reports. In order to create a template, press the *Create new* button. The Summary report template editor window will appear.

Note: You can also create multiple templates; later you will be able to choose one of them each time you generate a summary report.

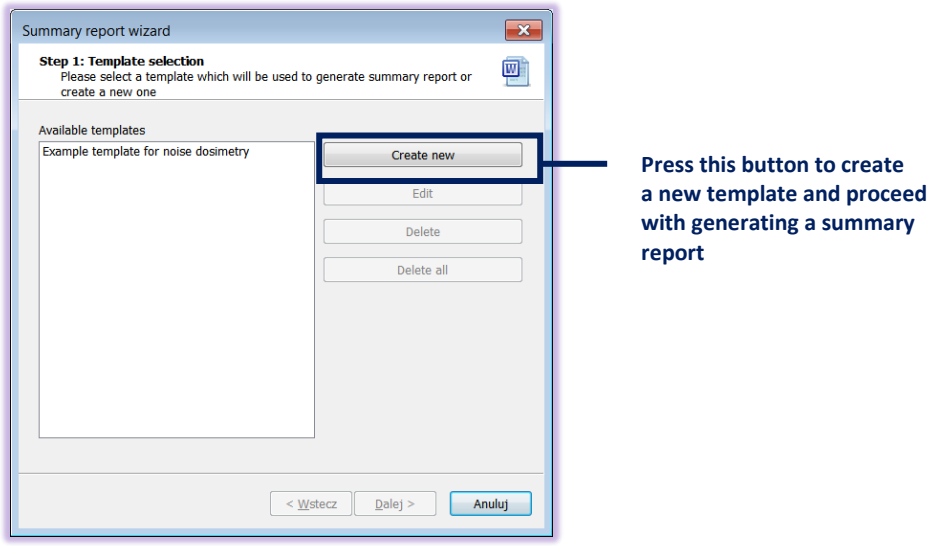


Figure 5-32 Summary report wizard initial window

A template of the summary report consists of a set of parameters (*i.e.* the parameters of the Svantek instrument, parameters of the measurement, and measured quantities) to be displayed in numerical form, and another set of parameters to be displayed on a plot. In order to create a template, first specify the application you intend to use it for, since it determines the availability of particular parameters. The application can be specified using the list box in the top-right corner of the window. Next, select the parameters to be included in the report using the template editor.

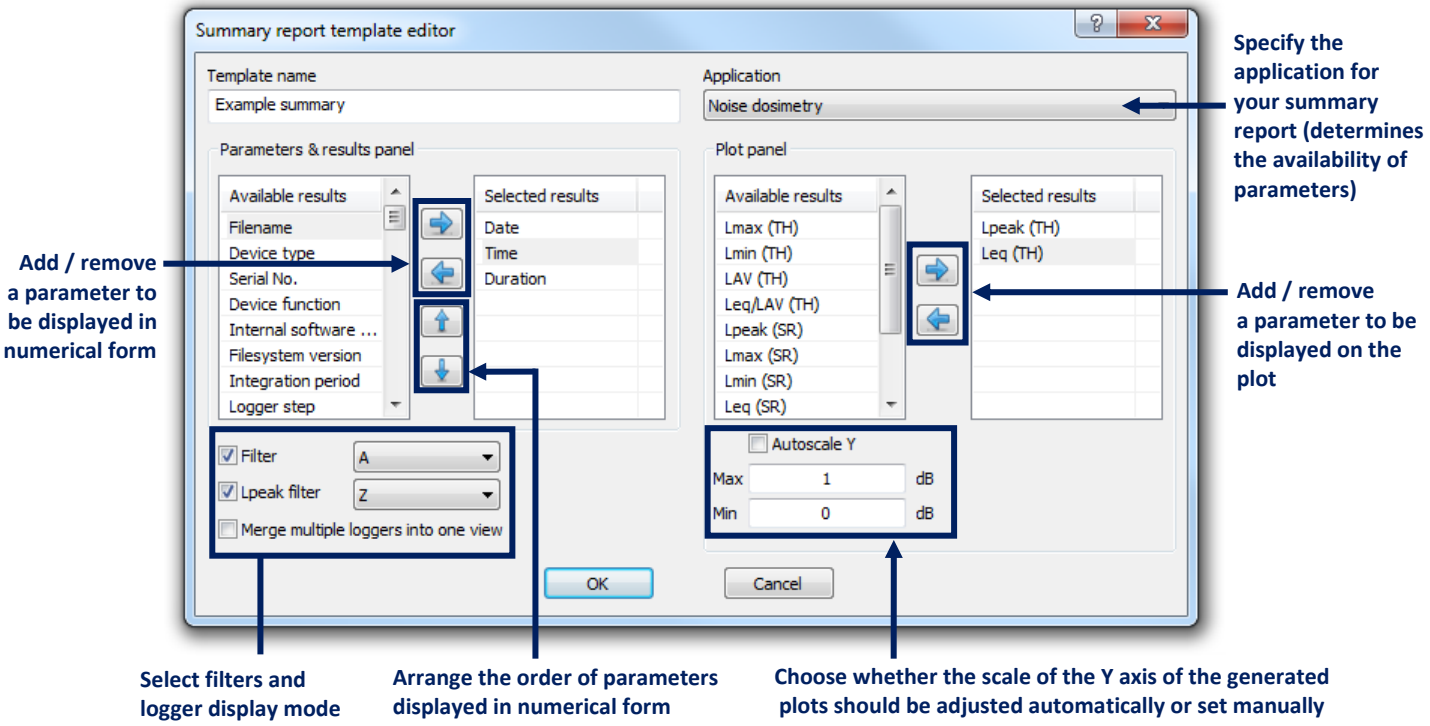


Figure 5-33 Summary report template editor dialog box

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

5.5 SESSIONS AND REPORTING

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

5.5.1 Creating and managing sessions

To create a session, go to the *Data Browser*. In the File Details table, select the files which contain the data you wish to work with, press the *New post-processing session* button or right-click and select the *New post-processing session* command in the opened menu. You can create a session with one or multiple files. To create a session from a single file just double-clicking it.

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

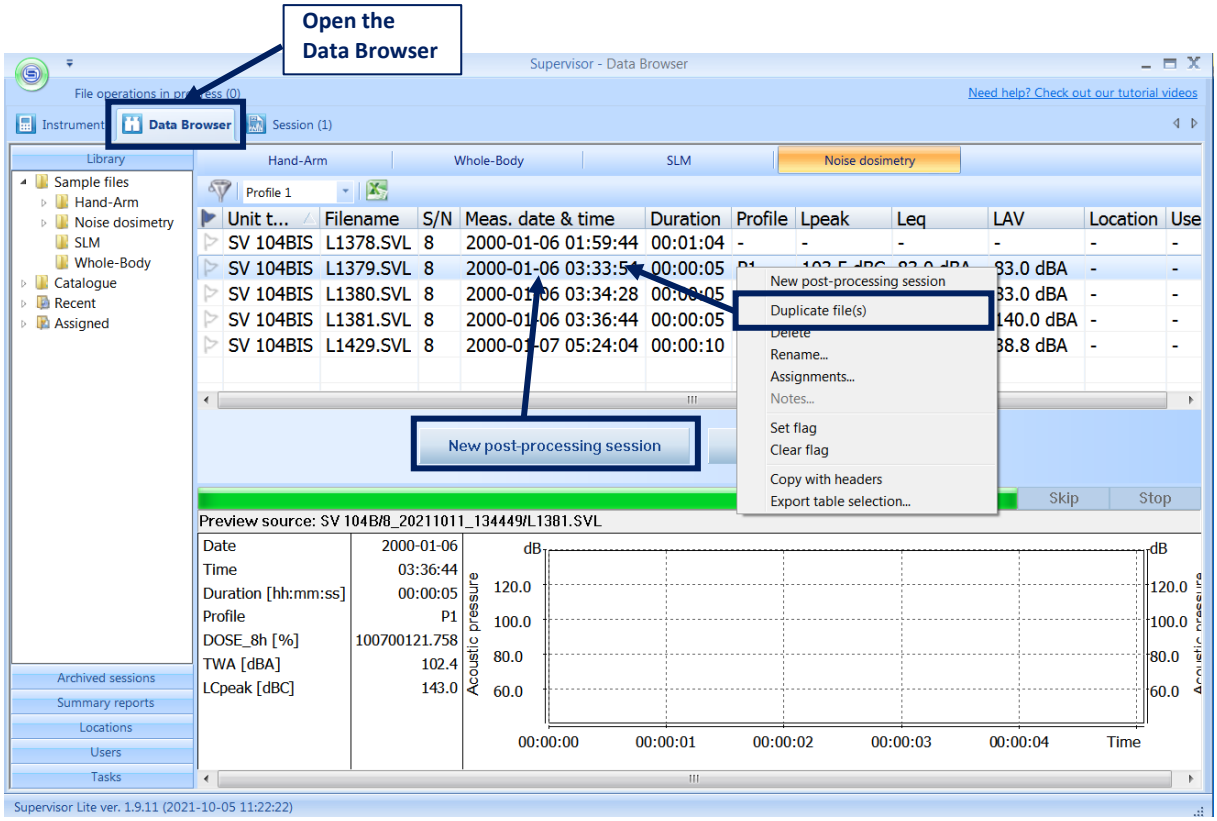


Figure 5-34 Creating a new session using the Data Browser

After using above mention commands, the special window appears in which you should choose the template for the post-processing session.

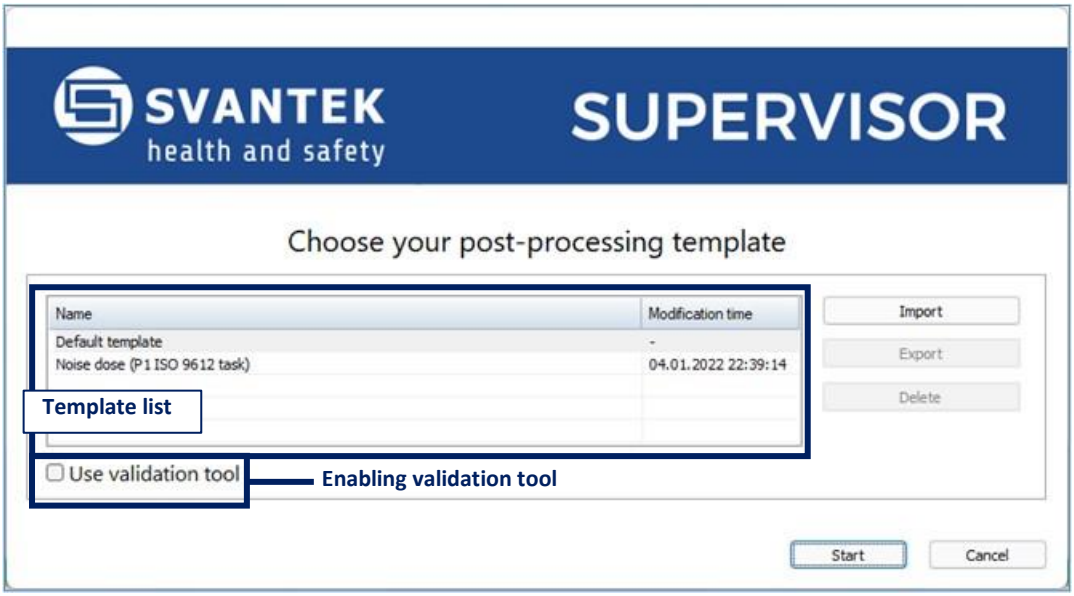


Figure 5-35 Choosing post-processing template

The template list includes predefined templates: *Default template*, templates related to the results type, for example, *Noise dose (P1 ISO 9612 task)*; and templates created by the user, for example, *New template*. You cannot delete predefined templates. User templates and results type related templates can be exported (saved as the .svlt file) to the any catalogue on the PC. You can also import the previously exported template.

For each new session a tab is created on the bar at the top of the application window. To open a session, click on the tab. By right-clicking on a tab you can open a context menu, allowing 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 will allow you to later work with that session again. Deleting a session does not cause measurement files to be deleted. The archived sessions are available in the Data Browser, in the *Archived sessions* sub-panel of the File Manager. Using the *Delete all sessions* command it is possible to delete all the currently opened sessions at once.

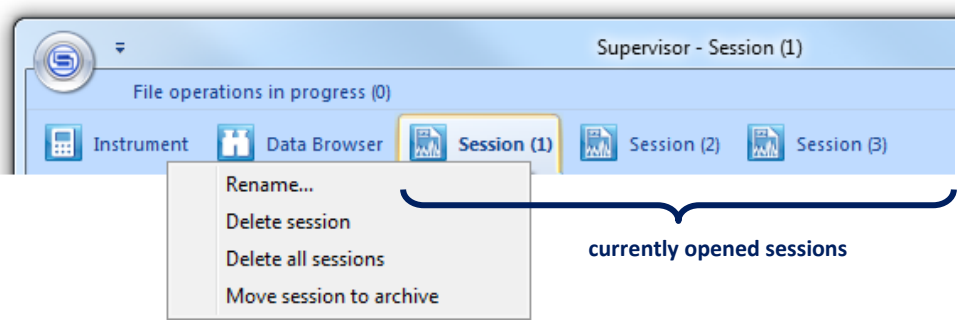


Figure 5-36 Tabs corresponding to the opened sessions

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

5.5.2 Validation tool

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

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

- NoMotion,
- High vibration level,
- Audio, which serves as a basis to judge by ear whether a given fragment is correct or not.

You can move between the following ranges of these markers with 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 the time history, you can listen to it.

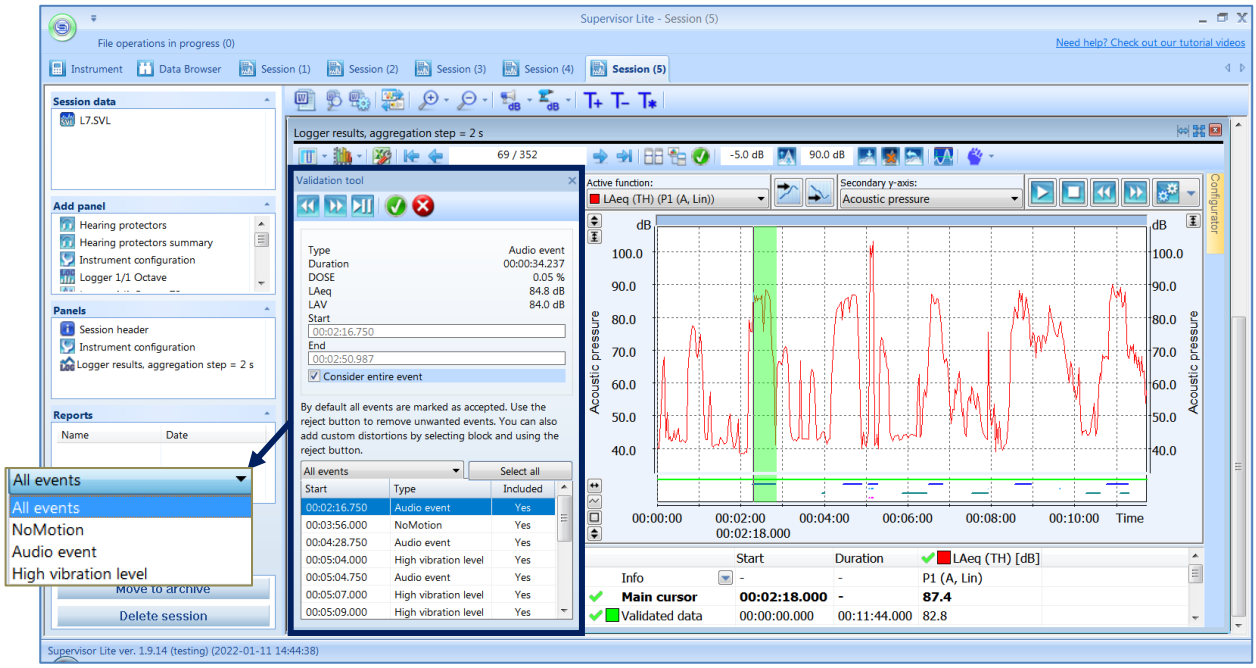


Figure 5-37 Validation tool panel

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 whole fragment of a given disturbance (selected by default) or if you want to enter it manually, you should uncheck it.

The disturbances list is presented on the bottom part of the Validation tool panel. The disturbances list is synchronized with the cursor on the time-history graph, so that if you select the item in the list the cursor will be show this event on the right graph.

Clicking the left selector above the disturbances list header, you can apply the filter, for example, *NoMotion*, *Audio event* or *High vibration level*. Clicking the left button above the disturbances list header, you can select or deselect all items in the list.

Jumping on successive disturbances and selecting them with the  button rejects a given fragment from the calculations, while the  button causes the acceptation of that fragment. There is a short blink when accept / reject is used.

The Validation tool generates the "Valid data" marker that specifies the correct fragments of the time history that are taken into calculations in other calculation panels.

5.5.3 Session's Tollbar

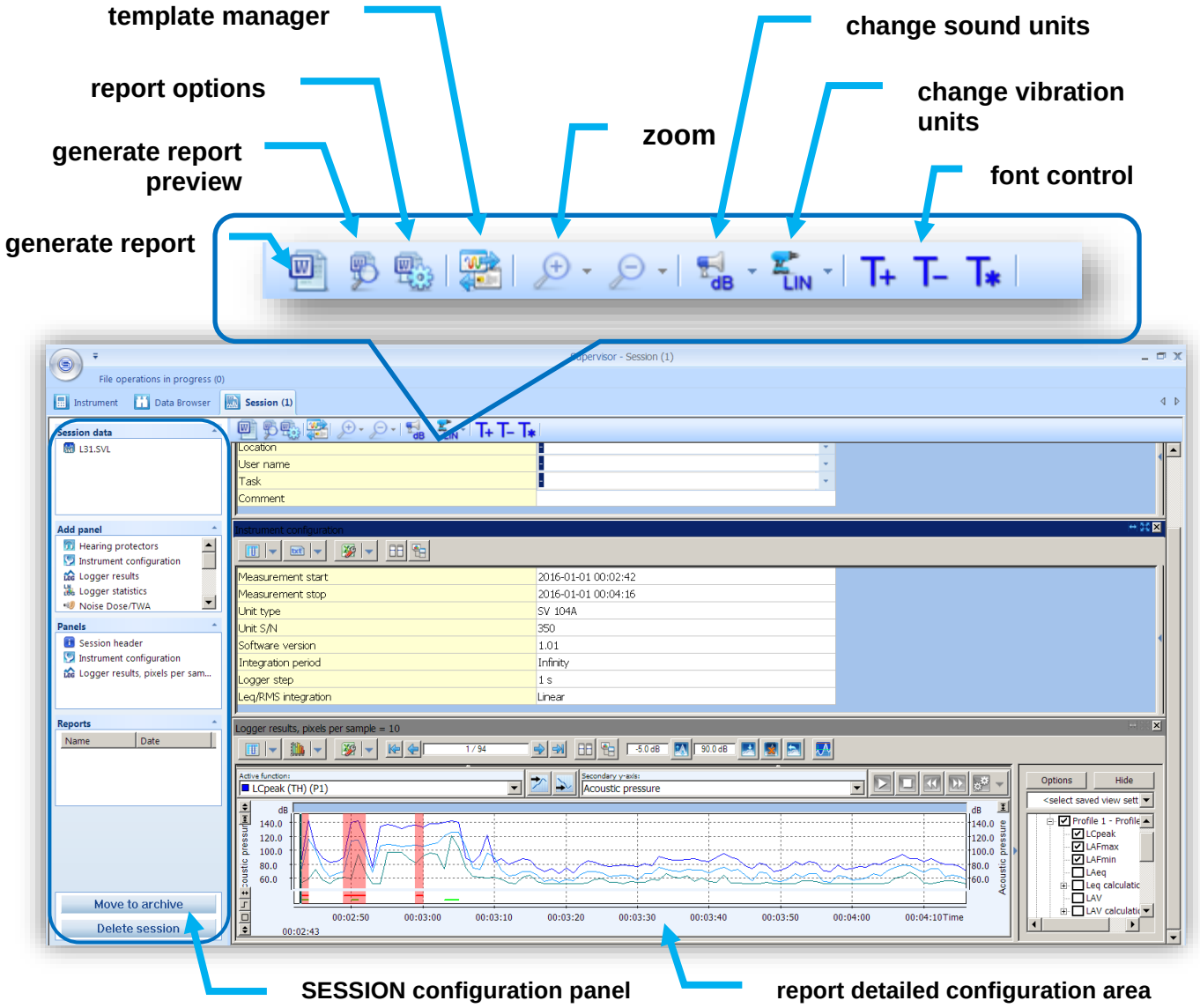


Figure 5-38 SUPERVISOR main SESSION window

5.5.4 Session source data

The measurement data used to create sessions are contained in files, stored in the SUPERVISOR local database. Several files can be used to create a single session. A list of files which have been used to create the currently opened session is displayed in the *Session data* panel at the top-left corner of the window.

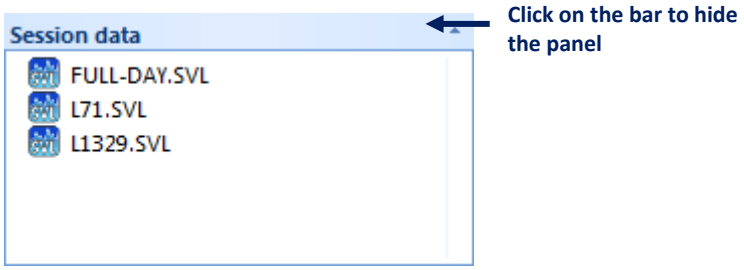


Figure 5-39 Session data panel, containing a list of files which have been used to create the current session

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

5.5.5 Session Panels

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

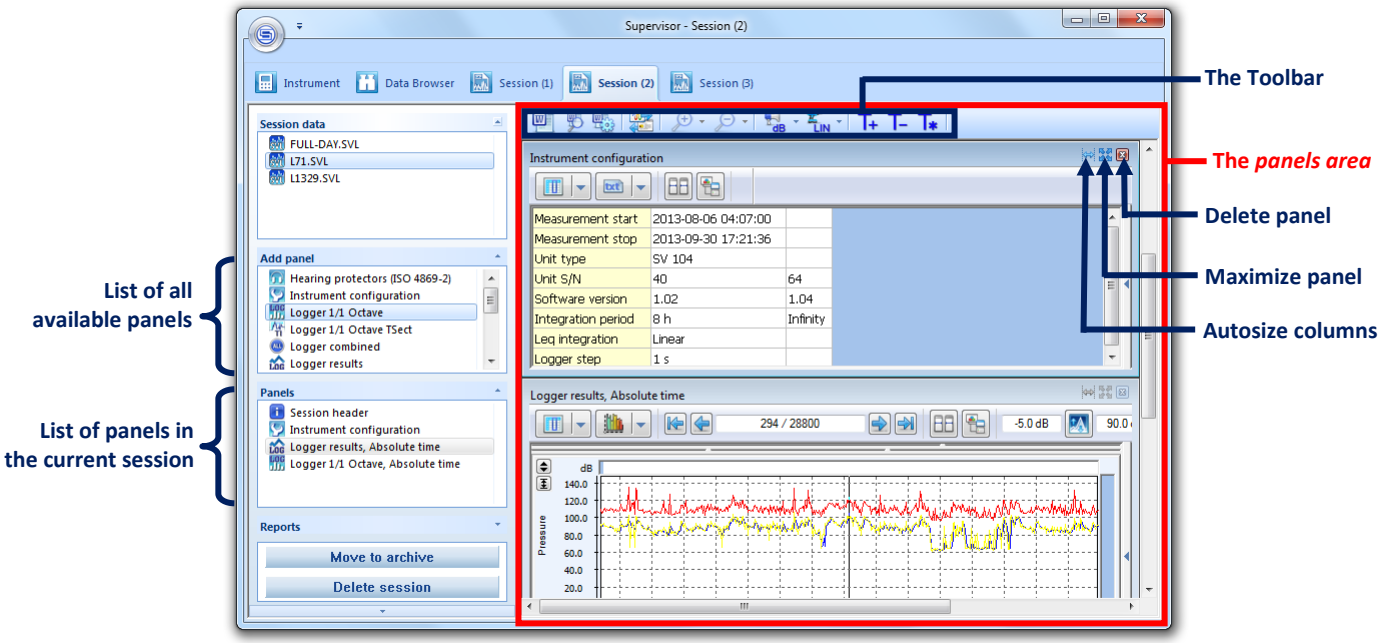


Figure 5-40 Panels in the Session window

The *Add panel* list (at the left side of the window) shows all 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.

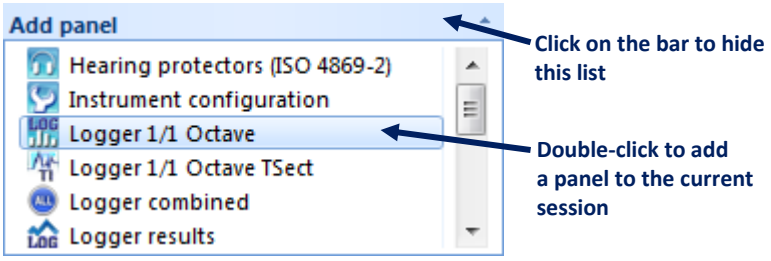


Figure 5-41 Add panel list of all panels available for the current data

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

To delete a panel, use the button located at its top-right corner. To make it fill the whole panels area, use the button. By clicking the button once again you can shrink the panel to its previous size.

Panels are automatically scaled to fit the size of the panels area in horizontal direction. Their order in the vertical direction specifies the order in which data will be contained in the report. You can change the position of a panel using the drag & drop technique.

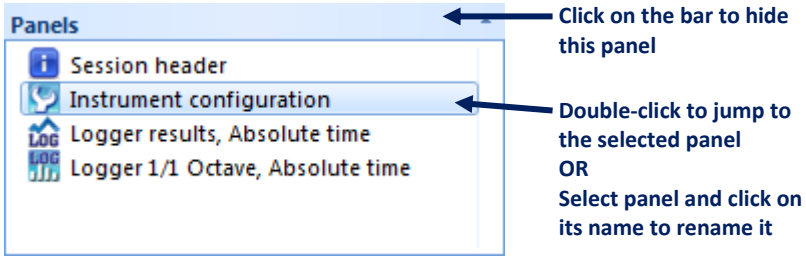


Figure 5-42 Panels panel, containing a list of panels added to the current session

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

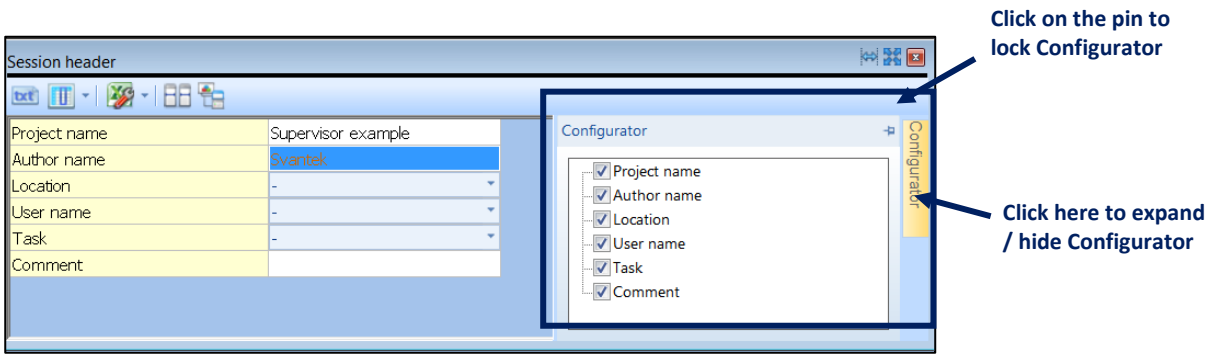


Figure 5-43 Configurator tool

The available types of panels for the SV 104 instruments are listed in the below Table. For detailed panel description follow 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

5.5.6 Generating reports from sessions

You can easily generate a report containing measurement data displayed in the same way as in the current session by clicking the  button, located 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 in the current session are listed in the *Reports* panel, located at the bottom-left corner of the window. By double-clicking a report's name, you can open it in MS Word.

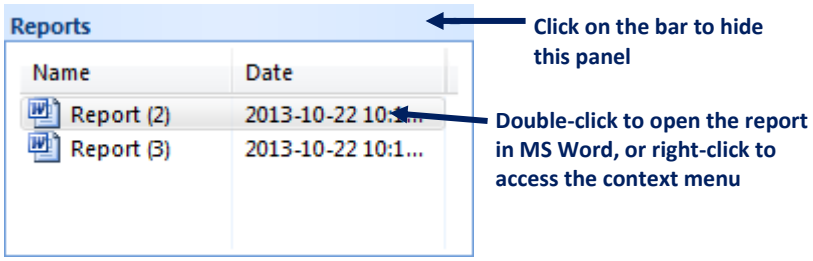


Figure 5-44 Reports panel

By right-clicking you can open a context menu allowing for opening, renaming and deleting reports.

The start page and the style of the report can be customized using the *Report options* dialog box, opened by clicking the button. Instead of customizing the start page, you can also disable adding it to the reports at all.

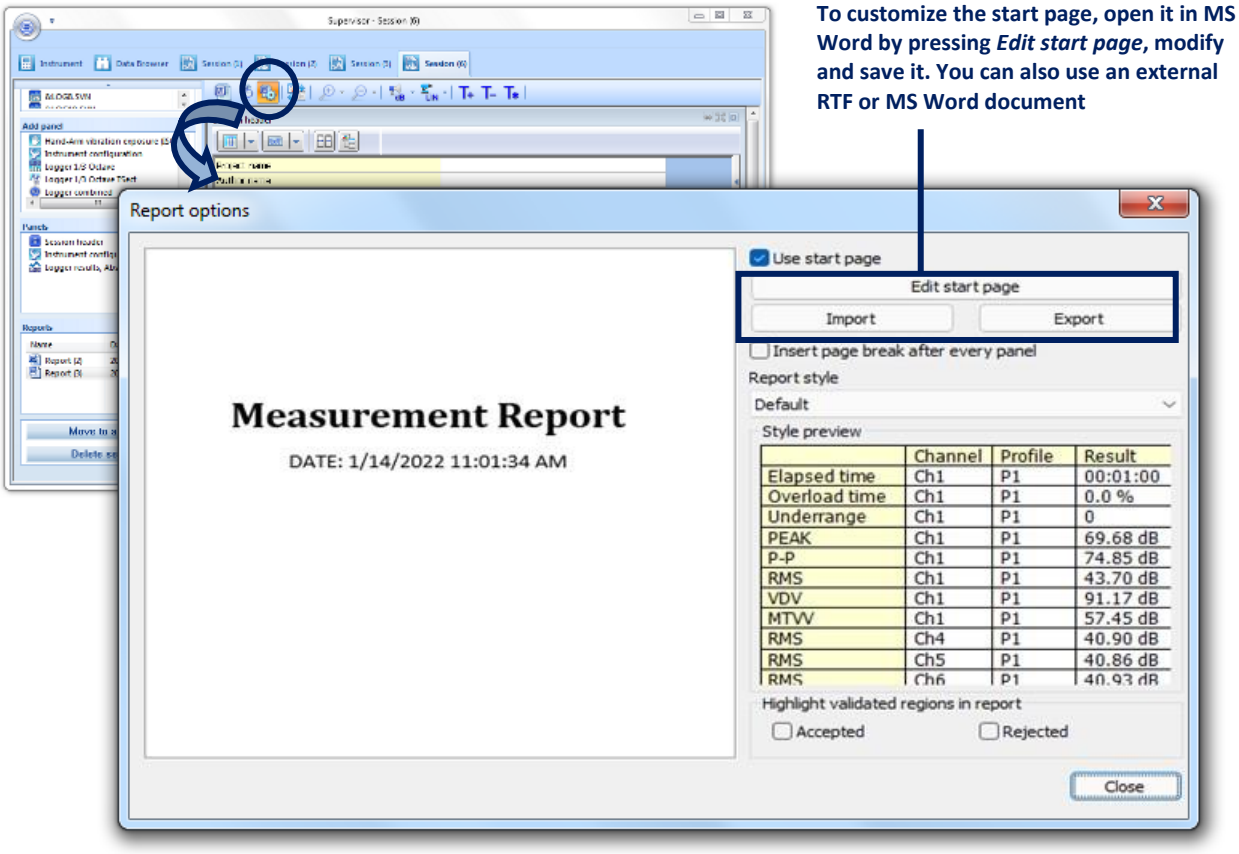


Figure 5-45 Report options dialog box

6 SV 104 MAINTENANCE

6.1 GENERAL RECOMMENDATIONS FOR USE

- Use only high-quality USB cables, such as SC 156. Many poor-quality cables do not ensure low resistance of the cable, thus disabling proper charging of the internal cells
- It is not recommended to leave the instrument in direct sunlight conditions for prolonged periods of time. Extended exposure such as behind the car window may affect the performance.
- To improve accuracy of remaining battery life indicator, run the dosimeter until it is fully discharged; then proceed with a full charge via the micro-USB port. The procedure is recommended before first use. Repeat this procedure every few months of use to maintain more accurate current battery condition indication.
- Do not keep the instrument for a long time discharged.

6.2 CLEANING

Few things to remember:

- Every time the SV 104 gets too dirty, clean the surface of the dosimeter with damp soft cloth.
- Pay special attention that the provided SA 122 windscreen is clean because dirtiness can affect the measurements. Take off the windscreen, shake off any dirt, and clean it with damp cloth. If necessary, change the windscreen to new one. The foam windscreen is considered a consumable item and will need replacing if it becomes lost or its condition deteriorates too much. Packs of 3 replacement windscreens are available under the part number SA 122_3.
- Pay special attention that the SV 27 microphone front part is clean because dirtiness can affect the measurements. Avoid the small inlet hole getting too dirty. Clean carefully with a dry and soft non-fraying cloth.

6.3 IN SITU CALIBRATION

It is advised to perform an acoustic calibration of the instrument each time before and after the measurement run. A single calibration at the start of each day of use is usually sufficient for most regulations. See Chapter 4.7 for calibration details.

6.4 PERIODIC TESTING

The manufacturer's recommended factory calibration interval is every **12 months** for SV 104 to be confident in its continuing accuracy and compliance with the international specifications.

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

6.5 CHANGING THE MICROPHONE AND WINDSCREEN

To change the microphone, take off the windscreen first (see chapter 3.3). Now, you need to unfasten the microphone from the mounting head. Unscrew the microphone in a counter-clockwise direction.

To attach a new microphone, screw the microphone on clockwise until it fits tightly. It is critical to make sure the sensor is tightly fitted. Be gently and be aware not to break or strip the thread.

Note: *Note, when the microphone is changed, the new* ***microphone serial number*** *should be programmed into the SV 104 internal memory. It can be easily programmed through the freely provided SUPERVISOR software.*

In case the windscreen is destroyed/lost by any accident, or it gets too dirty to afford the microphone the best protection then SVANTEK offers three pcs of SA 122 per pack (windscreens for SV 104 dosimeter).

6.6 FIRMWARE UPDATE

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

To update the instrument firmware:

- Unpack the provided firmware package (provided as a suitable compressed file).
- Make sure the unit is turned off.
- Hold down the **<PROFILE>** key and press the ***<ENTER>*** key to turn on the unit. This ensures the unit will switch on and enter the special reprogramming **BOOTLOADER** mode.

Figure 6-1 Bootloader update mode view

- Then connect the USB cable. The **<USB>** text will now appear on the instrument display.
- Run the **start.bat** file.
- Successful firmware update will be indicated by relevant message.
- Turn off the unit.

Note: *With use of SUPERVISOR software, it is very easy to check if there are any new firmware releases available for download (see* ***Error! Reference source not found.****Supervisor User M anual).*

6.7 STORING THE INSTRUMENT

- To preserve the life of the internal batteries, it is recommended that the SV 104 instrument is turned off when it is stored.
- It is best not to store the dosimeter for any period of time in low battery state condition.
- Do not store the instrument permanently connected to the USB port. It shortens battery lifecycle
- When the SV 104 is turned off, it still draws a small amount of battery power. Therefore, it is recommended to charge the battery every few months if it is not going to be used regularly.

6.8 TRANSPORTATION AND CARRYING

For transportation or storage purpose, always use the packaging provided by the manufacturer. In a potentially dirty industrial environment, it is advisable to use the carrying case provided by the manufacturer such as the **SA 73** (see Chapter 2.3), which ensures excellent mechanical and environmental protection and long-term storage conditions.

6.9 TROUBLESHOOTING

1. Upon connection to the USB port, if automatic charging is not started: check the USB cable and power supply ratings of the source.
2. If the incorrect time or date is displayed when turning on the instrument connect the device to the computer and use the SUPERVISOR software to set the time and date (see) ensuring PC clock is set correctly
3. In case the instrument is not able to turn on, ensure the unit is charged by connecting to USB or recommended charger. This ensures the battery is not exhausted. Then proceed with hardware reset (Chapter 4.14)
4. In case your dosimeter does not respond proceed with turn-off/turn-on procedure (Chapter 4.3), and hardware reset of the instrument (Chapter 4.14).
5. In case the measurement of the sound level is frozen or set to a fixed value proceed with turn-off/turn-on procedure (Chapter 4.3), then with hardware reset of the instrument (Chapter 4.14).
6. In case the reset does not help proceed to Chapter 7.

7 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.

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

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** 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,W1.15.1,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 104 is investigated (U104);
- number is 12342 (N12342);
- software version number is 1.15.1 (W1.15.1);
- 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** 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 the **LEQ** calculations;
- 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);
I(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,I(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 MODE

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

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 (the internal software revision 1.15.6) 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 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** 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	**Xl**	Xlnnn: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 104 FILE

Each file containing data from the SV 104 instrument consists of several groups of words. In the case of the SV 104 (the internal file system rev. 1.15), there are two different types of files containing:

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

Each file has the following elements:

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

The other of 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** 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)
- results of the statistical analysis (saved in Summary Results Record) (cf. Tab. B.1.21)
- settings of the instrument saved in the setup file (cf. Tab. B.1.22)
- 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: 115
4	SoftwareIssueDate	software issue date
5	DeviceMode	mode of the instrument
6	UnitSubtype	subtype of the unit: 1 - SV 104
7	FileSysVersion	file system version: 115
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, 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	detector's type in the **Leq** function: **0 - LINEAR,** 1 - **EXPONENTIAL**
15	SpectrumFilter	**1/1 OCTAVE** analysis filter: 1 - **Z**, 2 - **A**, 3 - **C** in other cases: Reserved
16	SpectrumBuff	**1/1 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	Windscreen	reserved
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 recording parameters

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 – Lxymax[2] result not displayed, 1 – Lxymax[2] result displayed
4	L_min	0 – Lxymin[2] result not displayed, 1 – Lxymin[2] result displayed
5	L_	0 – Lxy[2] result not displayed, 1 – Lxy[2] result displayed
6	DOSE	0 – DOSE result not displayed, 1 - DOSE result displayed
7	D_8h	0 – D_8h result not displayed, 1 - D_8h result displayed
8	LAV	0 – LAV result not displayed, 1 - LAV result displayed
9	L_eq	0 – Lxyeq[23] result not displayed, 1 – Lxyeq[23] result displayed
10	L_E	0 – LxyE[23] result not displayed, 1 - LxyE[23] result displayed
11	SEL8	0 – SEL8 result not displayed, 1 - SEL8 result displayed
12	E	0 – E result not displayed, 1 – E result displayed
13	E_8h	0 – E_8h result not displayed, E_8h 1 - result displayed
14	Lden	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** frequency (*100 Hz)
4	NOctTer	number of **1/1 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]	LxyE[23] value in the 3rd profile (*100 dB)
47	Result[3][3]	maximal value (Lxymax[2]) in the 3rd profile (*100 dB)
48	Result[3][4]	minimal value (Lxymin[2]) in the 3rd profile (*100 dB)
49	Result[3][5]	Lxy[2] value in the 3rd profile (*100 dB)
50	Result[3][6]	Lxyeq[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.1.21. 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 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> - Lxvmax[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result3> - Lxvmin[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result4> - Lxveq[23] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result5> - **LAV** result, depending on the value of BufferP[1] (cf. Tab. B.1.12)

- 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 if **1/1 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** 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)
- 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 104 AS DOSIMETER

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

Statement of performance

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

SV 104 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 104	dosimeter/analyser including SV 27 microphone (1/2", nominal sensitivity 0.56 mV/Pa, polarization 0 V) and SA 122 windscreen
Recommended calibrator	
SV 34B	Class 2 acoustic calibrator 114 dB@1000 Hz or equivalent (not included in the standard set)

Accessories included in SV 104 instrument set

SV 27	½ MEMS microphone
SA 122	windscreen
SC 156	micro USB 2.0 cable

Measured quantities

The measured quantities for *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.** 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 ST 104 **before turning the instrument on**. Total microphone substitute impedance is 300 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 3.8.3).*

Note: *For the conformance acoustical tests with the microphone the* ***Microphone Compensation*** *must be enabled (see Chapter 3.8.3).*

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 0.56 mV/Pa

Single 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	60	97	60	134	70	137	60	97	60	134	63	100	80	137
500 Hz	60	133	60	137	70	137	60	133	60	137	63	136	80	140
1 kHz	60	137	60	137	70	137	60	137	60	137	63	140	80	140
4 kHz	60	138	60	136	70	137	60	138	60	136	63	141	80	139
8 kHz	60	136	60	134	70	137	60	136	60	134	63	139	80	137

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	0.01Pa²h ÷ 99.99 Pa²h
Noise exposure values displayed resolution	0.01 Pa²h

Note: *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 Pa²h***

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	< 49 dB
"C" weighting	< 49 dB
"Z" weighting	< 60 dB

Self-generated noise (acoustical compensated)

"A" weighting	< 50 dB
"C" weighting	< 50 dB
"Z" weighting	< 60 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 — 113.81 dB (equal to the calibration level for the pressure field minus Free Field correction of SV 27 at 1000 Hz - see Table C.2)

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.

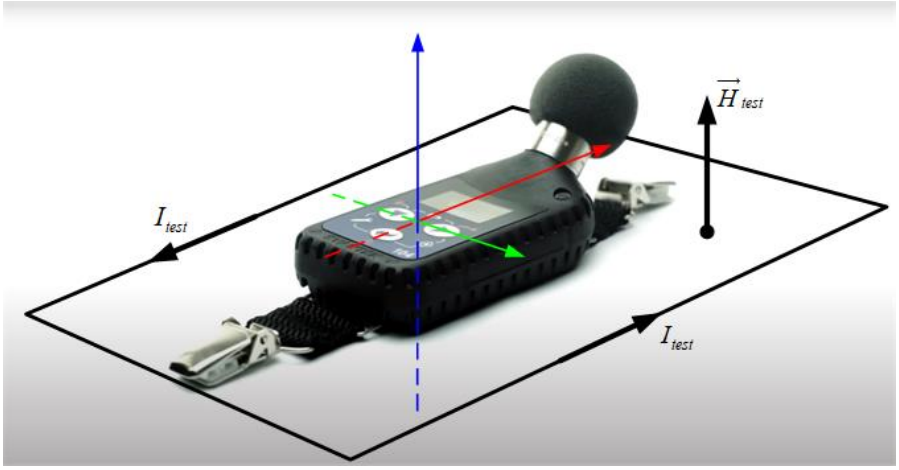


Figure C.1 SV 104 placed in magnetic field test coil in the direction of maximum response

Effect of radio frequency fields – meets requirements of IEC 61672-1

The greatest susceptibility (the least immunity) is achieved when in the dose meter the **Z** filter and time weighting **F** are selected and the dose meter measurements are considered.

The greatest susceptibility is achieved when the dose meter is placed parallel to the radio frequency field. In addition, with microphone cable, the greatest susceptibility is achieved when the dose meter and cable is placed along field and the cable is coil as solenoid.

Effect of electrostatic discharge – meets requirements of IEC 61672-1

During electrostatic discharge, the influence of the displayed results could be observed.

No changes in instrument operation state, configuration or stored data corruption were found out.

Effect of ambient pressure	< 0.01 dB/kPa
Effect of temperature	< 1.0 dB (from -10°C to +50°C)
Operating temperature range	from 0°C to +40°C
Storage temperature range	from -20°C to +60°C

Microphone

SV 27	Free Field ½" MEMS microphone
Nominal sensitivity	0.56 mV/Pa (corresponding to app. -60 dBV/Pa re 1 V/Pa)

Note: *Maximum sound pressure level that can affect the microphone without destroying the microphone: 160 dB.*

Table C.2. SV 27 Free Field corrections for the 0 deg incidence (for G.R.A.S. 51AB calibrator, and reference BK4136 ¼" microphone)

[dB]	Frequency [Hz]												
	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	0.35
ST 104B Free Field corrections	0.06	0.09	0.13	0.19	0.26	0.36	0.51	0.70	0.98	1.38	1.95	2.80	4.06

Table C.3. SV 27 Free Field corrections for the 0 deg incidence (for B&K 4226 calibrator)

[dB]	Frequency [Hz]				
	500	1000	2000	4000	8000
Uncertainty (IEC 62585:2012)	0.25	0.25	0.25	0.25	0.35
ST 104B Free Field corrections	0.03	0.15	0.44	1.11	2.87

SV 27 and SV 104 frequency characteristics

The instrument should be mounted so that the microphone diaphragm is perpendicular to the direction of the sound wave.

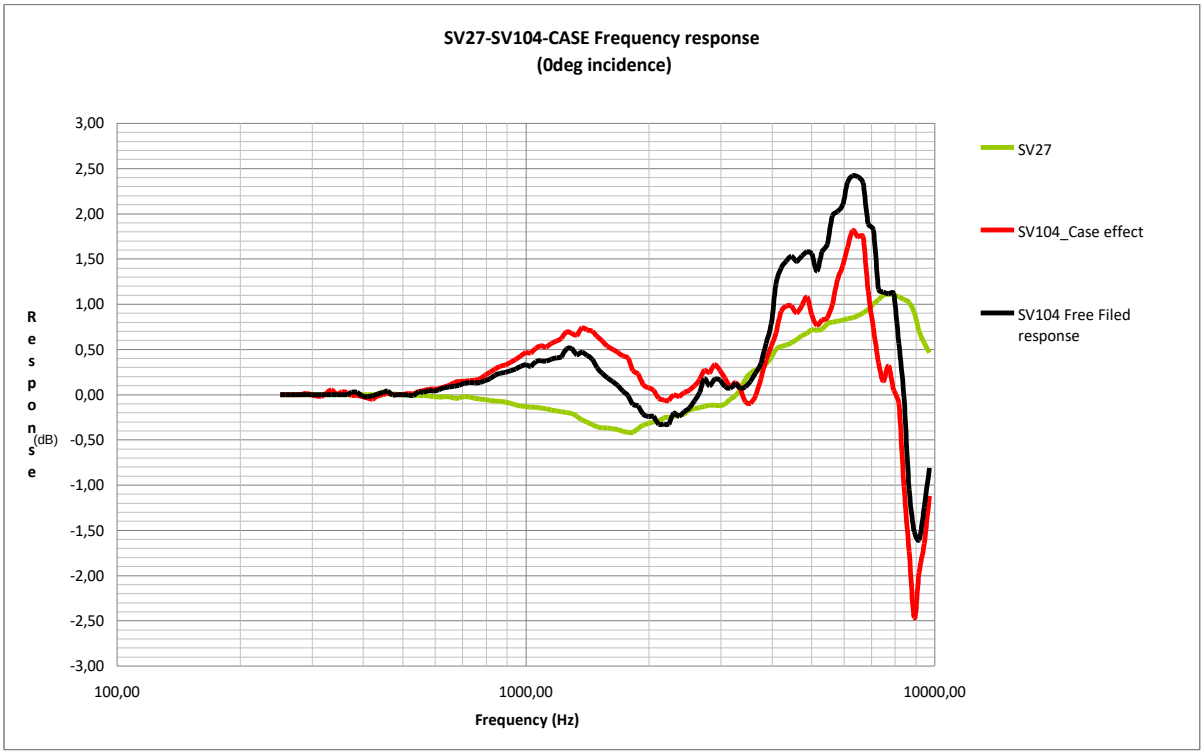


Figure C.2 SV 104 frequency characteristics

Table C.4. SV104 Case Effect (including SA122 windscreen)

f, [Hz]	Case Effel t [dB]	f, [Hz]	Case Effect [dB]
251,19	0,00	**2818,38**	0,24
316,23	-0,02	**3162,28**	0,09
398,11	-0,02	**3548,13**	-0,09
501,19	0,00	**3981,07**	0,53
630,96	0,08	**4466,84**	0,97
794,33	0,21	**5011,87**	0,88
1000,00	0,46	**5623,41**	1,00
1258,93	0,69	**6309,57**	1,81
1584,89	0,53	**7079,46**	0,73
1995,26	0,07	**7943,28**	0,05
2238,72	-0,06	**8912,51**	-2,46
2511,89	0,05	**10000**	-1,12

Directional characteristics of SV 104

Directional response for dosimeter SV 104 with microphone **SV 27** and **SA 122** windscreen (symmetrical axis) for specified frequencies (Table C.5):

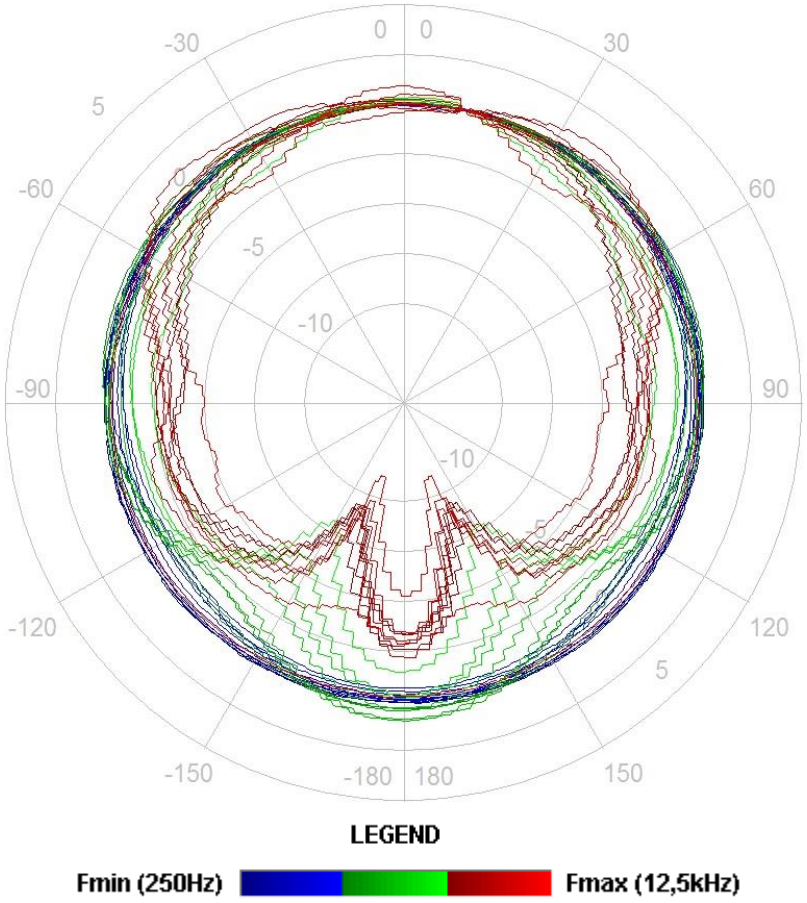
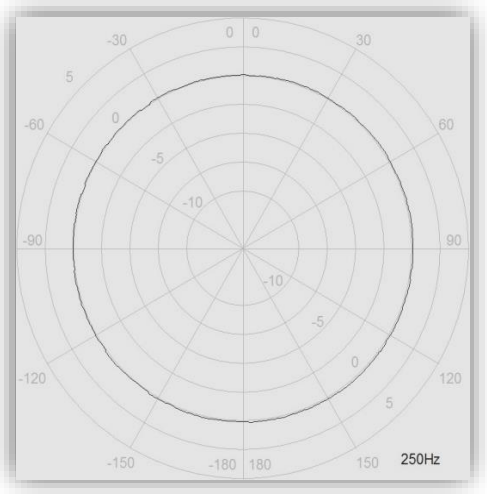
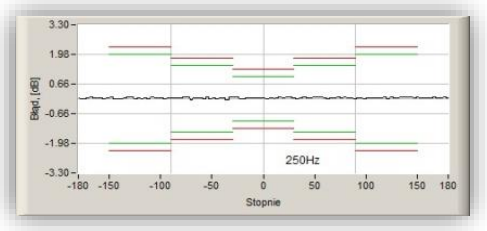


Figure C.3 Total directional characteristics (symmetrical axis)

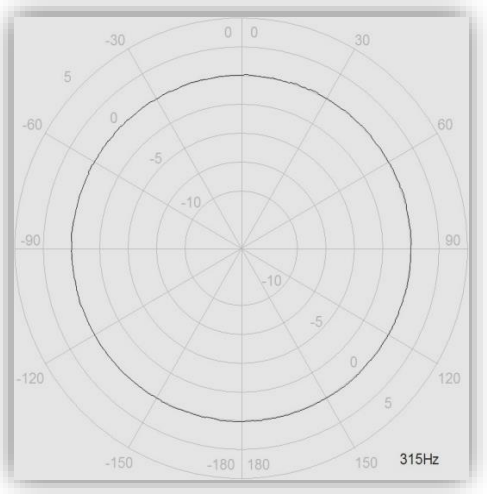
The round charts show the directional characteristic, and the charts below shows the errors for particular angles (note: limits are for class 1).

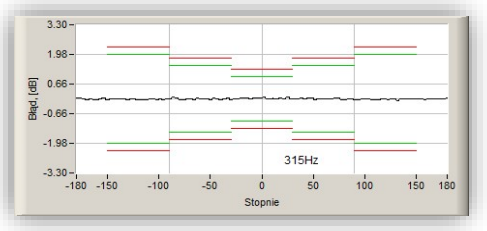
250 Hz



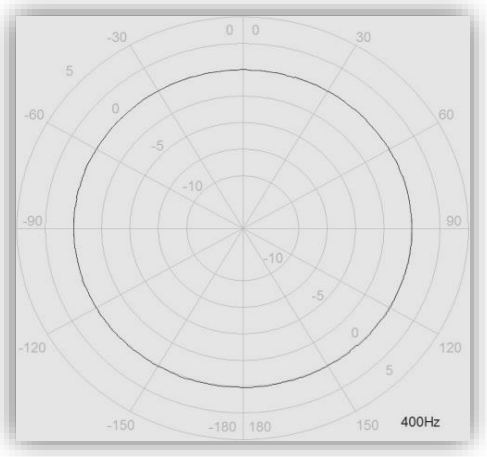


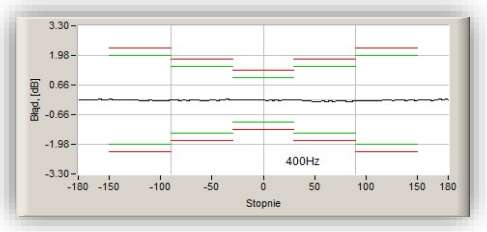
315 Hz



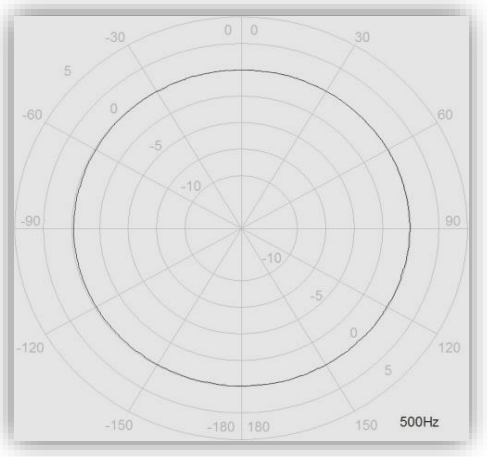


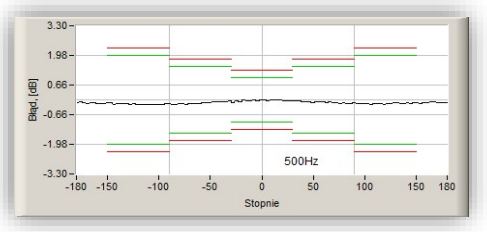
400 Hz



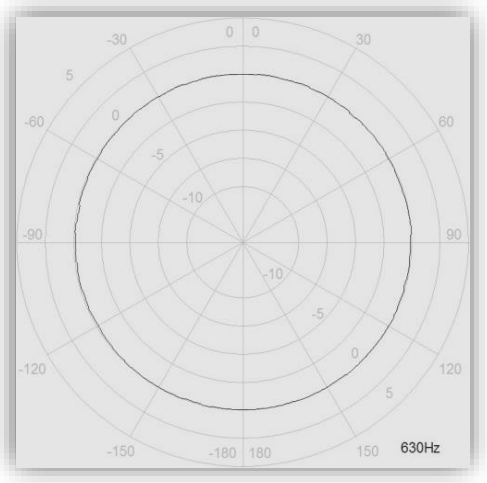


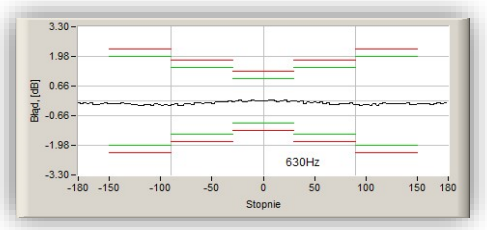
500 Hz



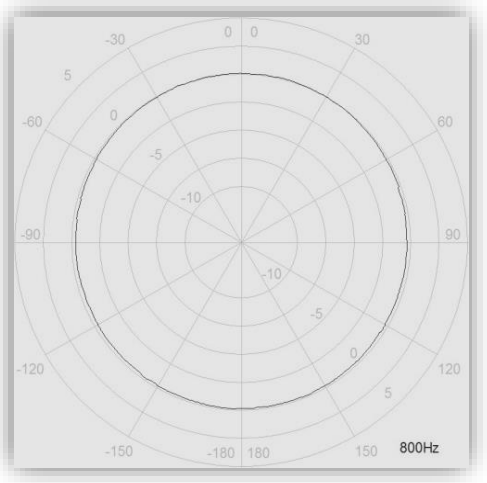


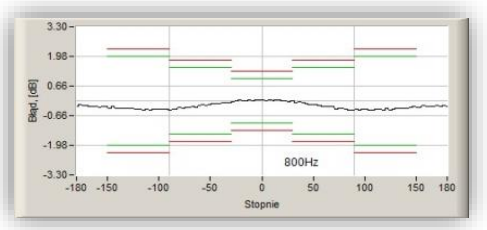
630 Hz



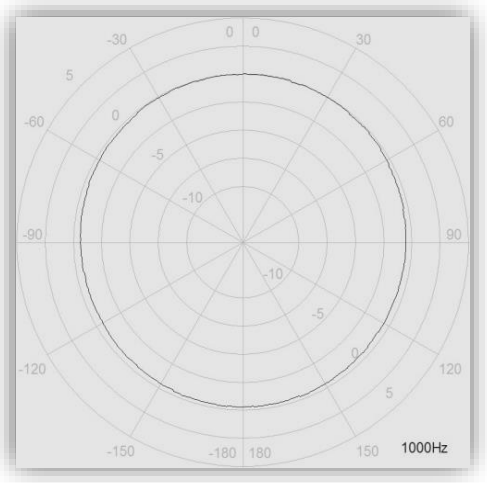


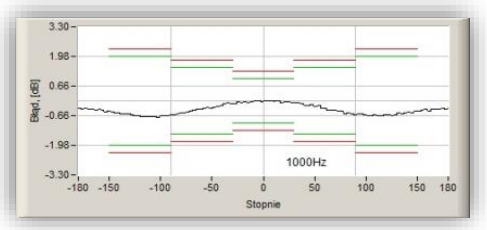
800 Hz



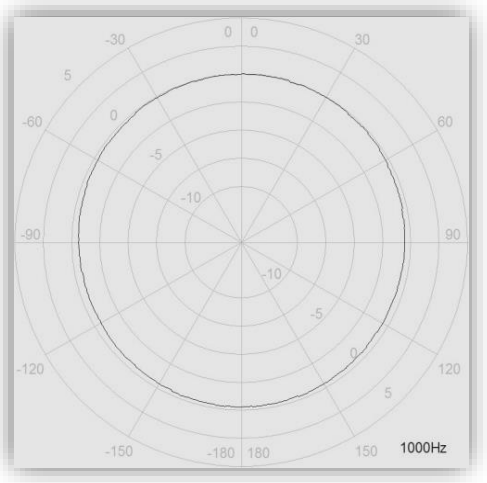


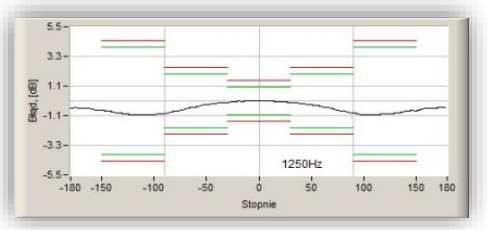
1000 Hz



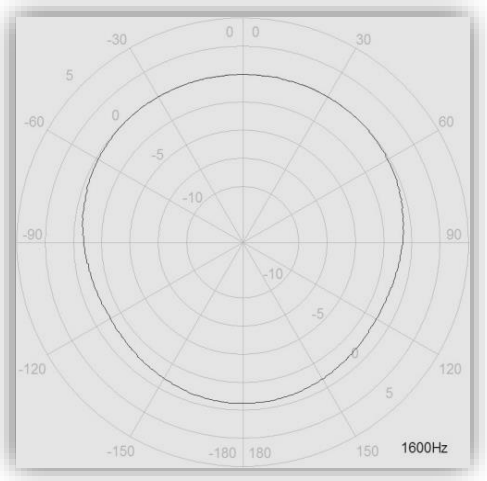


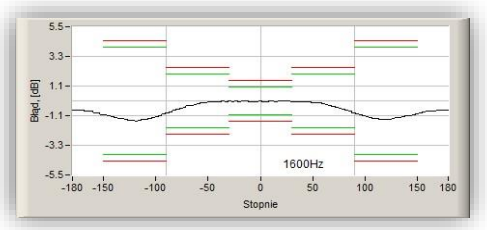
1250 Hz



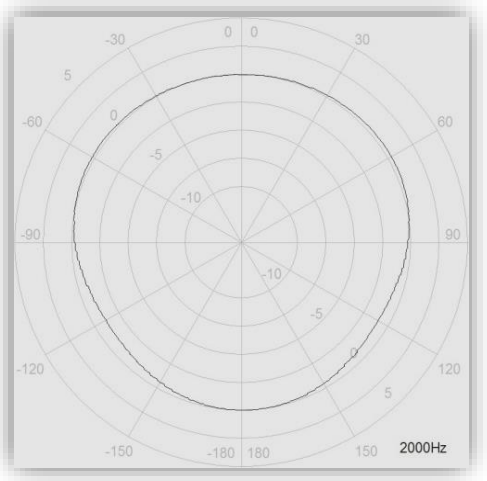


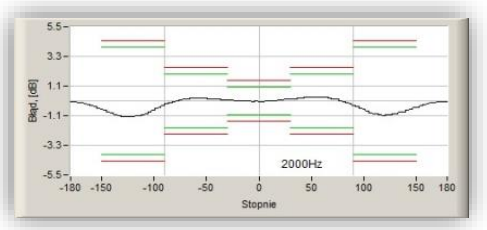
1600 Hz



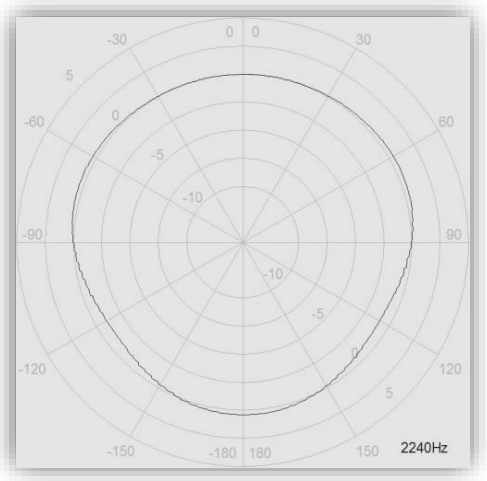


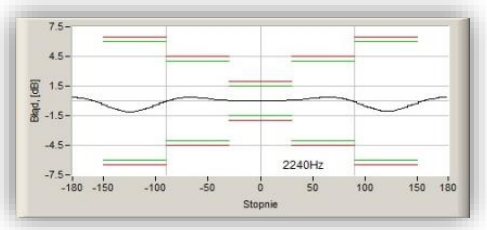
2000 Hz



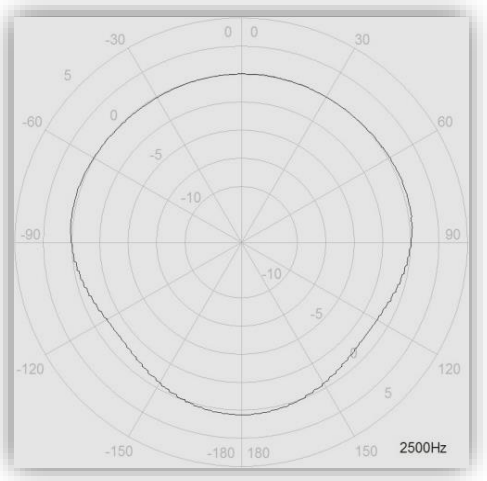


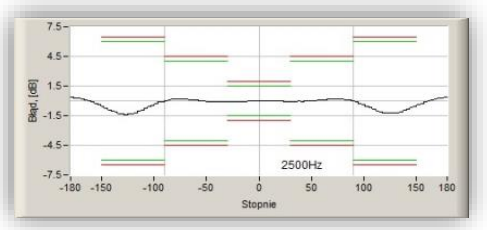
2240 Hz

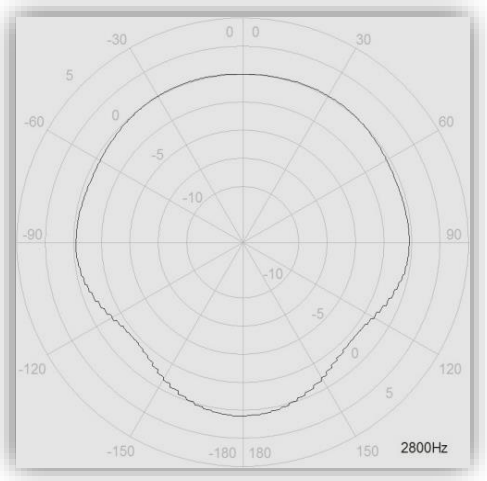
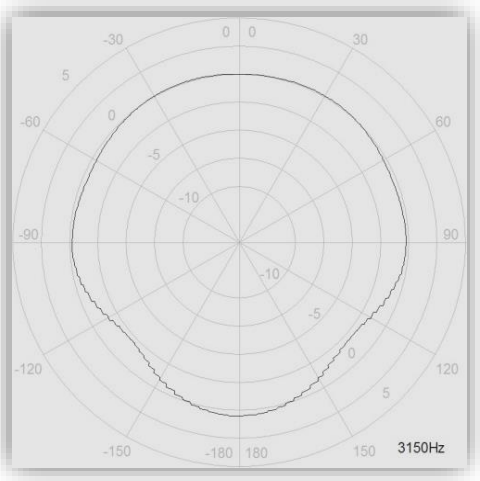
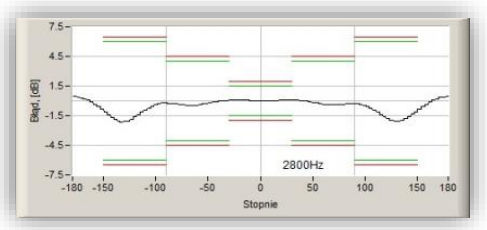
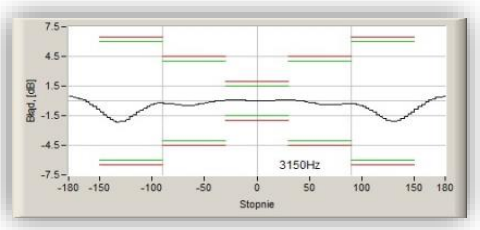
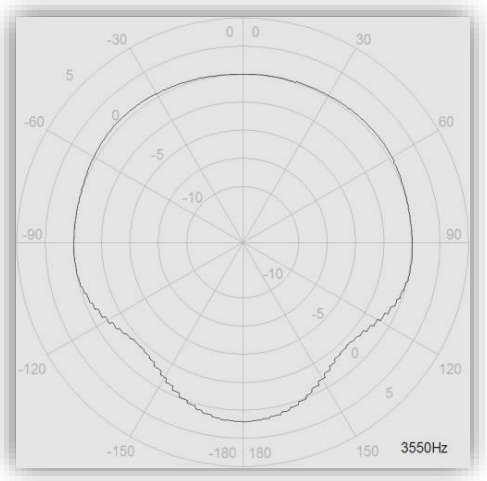
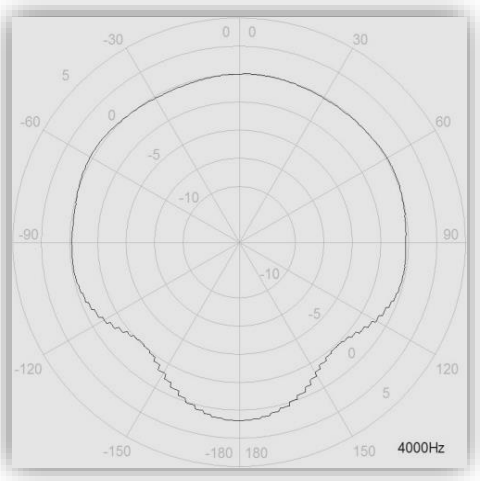
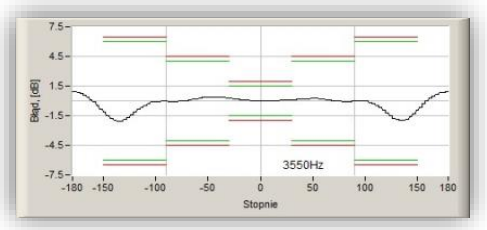
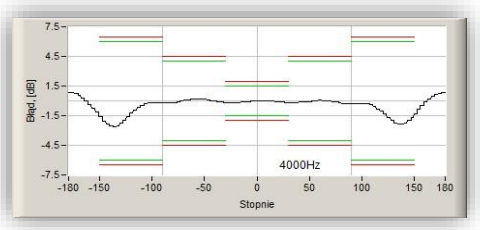




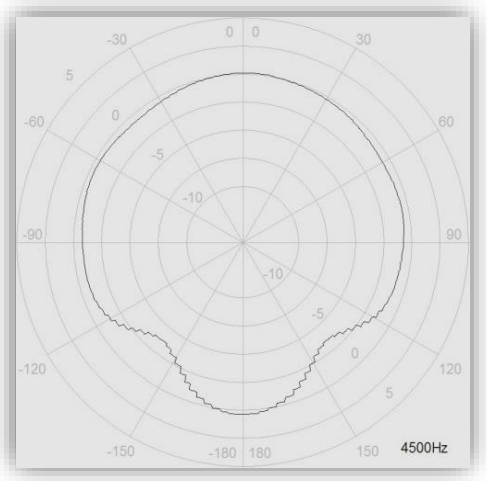
2500 Hz

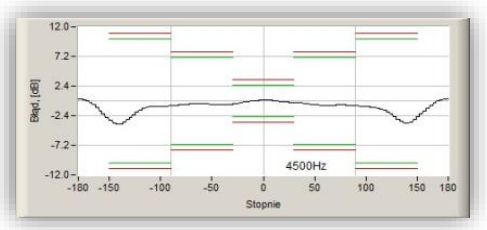




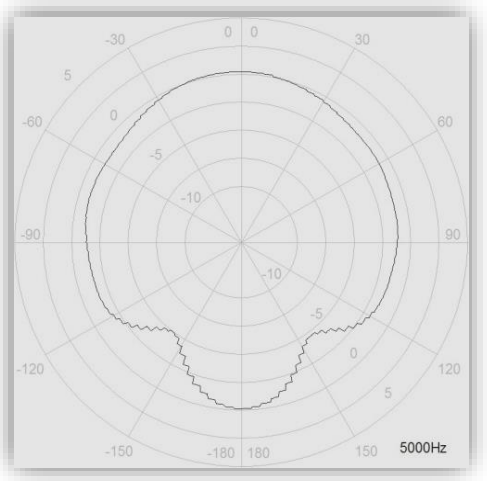
2800 Hz		3150 Hz	
			
3550 Hz		4000 Hz	
			

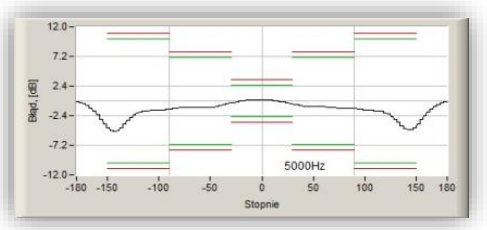
4500 Hz



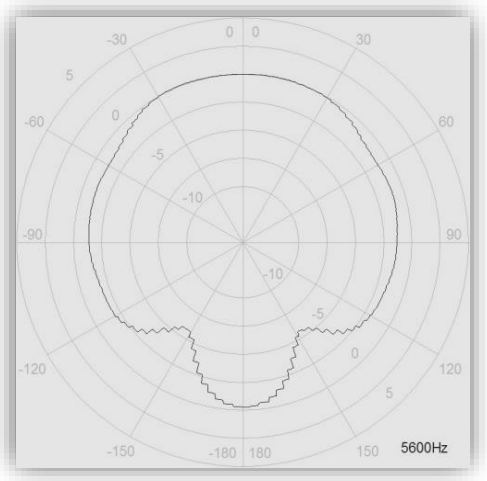


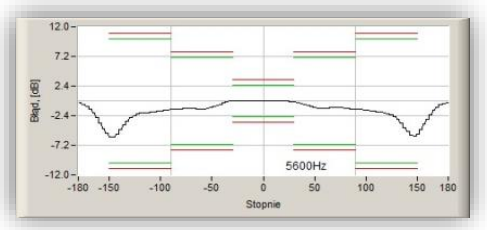
5000 Hz



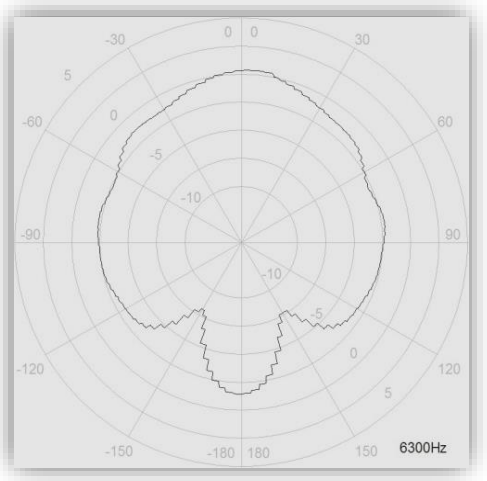


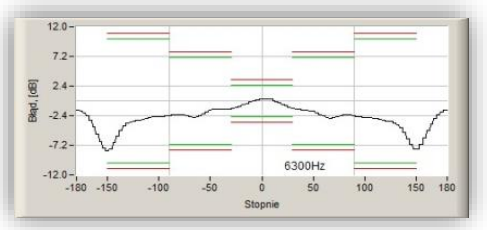
5600 Hz

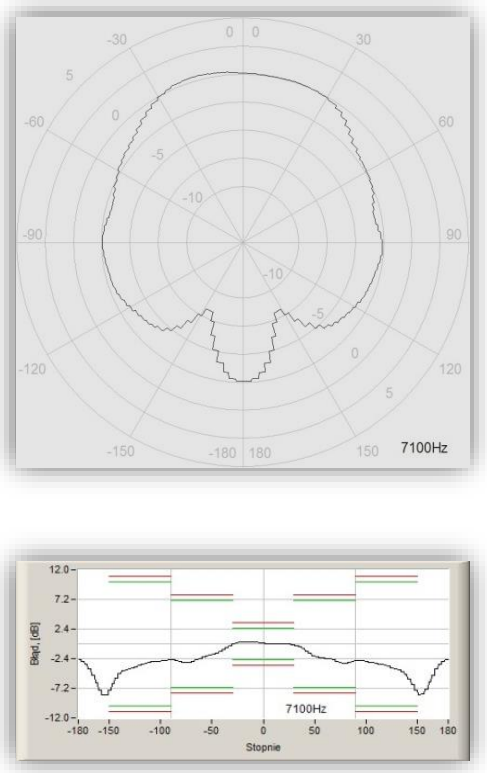
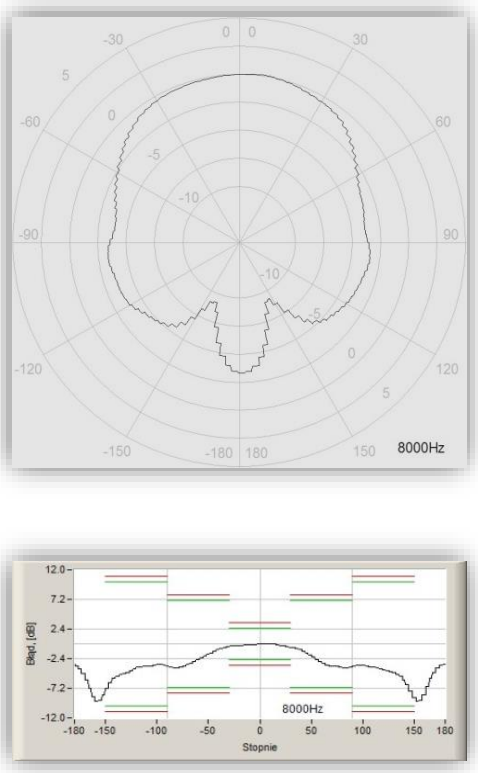
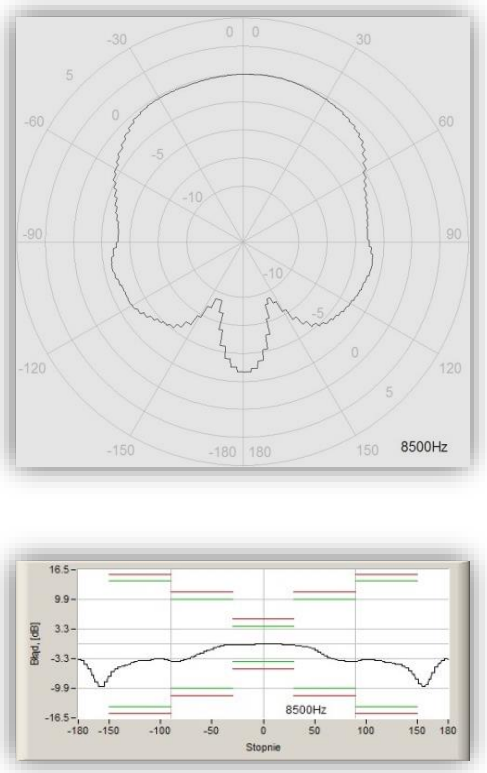
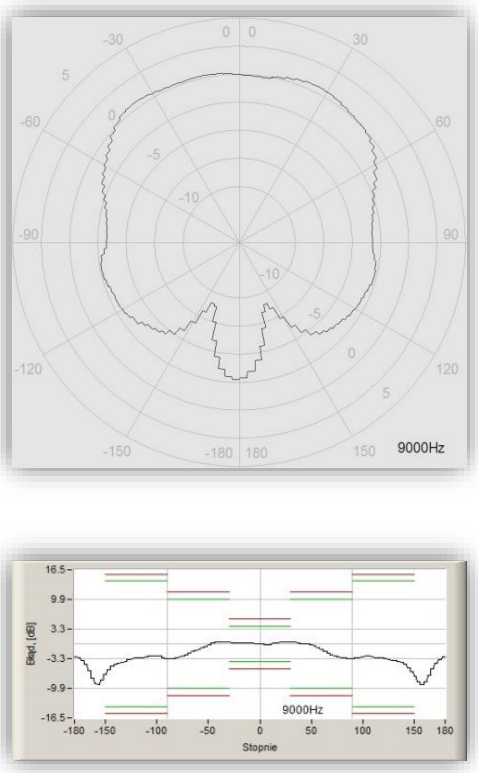




6300 Hz





7100 Hz	
8000 Hz	
8500 Hz	
9000 Hz	

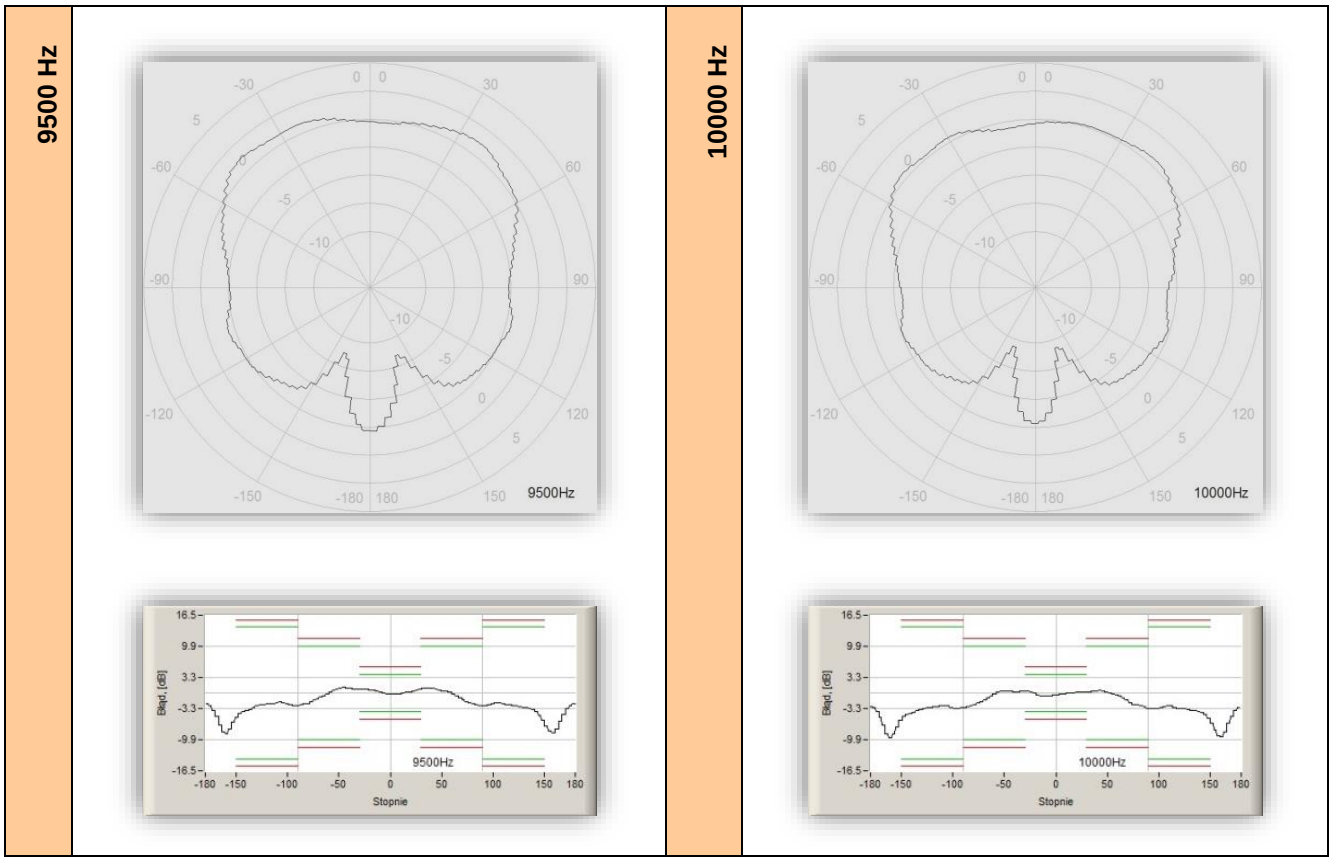


Table C.5. Directional response for SV 104 with microphone SV 27 and SA 122 windscreen (symmetrical axis)

Angle [˚]									
f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
250	0.08	0.08	0.07	0.09	0.09	0.06	0.09	0.06	0.06
315	0.05	0.08	0.05	0.04	-0.04	0.05	0.05	-0.05	-0.05
400	-0.05	0.02	-0.06	-0.08	-0.08	-0.09	-0.08	-0.08	-0.05
500	-0.03	-0.05	-0.07	-0.12	-0.10	-0.13	-0.16	-0.18	-0.18
630	0.06	0.06	-0.14	-0.14	-0.12	-0.16	-0.16	-0.16	-0.20
800	0.06	-0.04	-0.09	-0.16	-0.24	-0.36	-0.37	-0.41	-0.41
1000	-0.09	-0.08	-0.20	-0.23	-0.32	-0.43	-0.56	-0.60	-0.64
1250	-0.07	-0.13	-0.21	-0.29	-0.47	-0.63	-0.77	-0.91	-1.01
1600	-0.06	-0.04	-0.06	-0.13	-0.24	-0.38	-0.71	-0.97	-1.20
2000	0.06	0.16	0.20	0.27	0.28	0.27	0.17	-0.34	-0.64
2240	-0.01	0.08	0.16	0.27	0.36	0.38	0.33	0.16	-0.54
2500	-0.02	-0.05	-0.05	-0.05	0.11	0.19	0.20	0.12	-0.40
2800	0.05	0.07	0.07	-0.15	-0.34	-0.42	-0.42	-0.31	-0.45
3150	0.05	0.07	0.07	-0.15	-0.34	-0.42	-0.42	-0.31	-0.45
3550	0.06	0.10	0.20	0.24	0.25	0.14	-0.06	-0.06	0.03
4000	-0.09	-0.17	-0.17	-0.12	-0.06	-0.06	-0.24	-0.31	-0.31
4500	-0.14	-0.28	-0.43	-0.64	-0.73	-0.75	-0.68	-0.82	-0.97
5000	-0.22	-0.55	-0.84	-0.94	-0.97	-1.11	-1.16	-1.25	-1.46
5600	-0.03	-0.14	-0.58	-1.08	-1.21	-1.17	-1.26	-1.40	-1.54
6300	-0.57	-1.17	-1.47	-1.72	-2.47	-2.79	-2.56	-2.53	-2.67
7100	0.02	-0.26	-1.18	-2.14	-2.39	-2.84	-3.18	-3.15	-2.89
8000	-0.24	-0.54	-1.18	-2.17	-3.14	-3.57	-3.86	-3.86	-3.58
8500	-0.11	-0.38	-0.70	-1.43	-2.67	-3.47	-3.85	-3.99	-3.85

9000	0.40	0.51	0.46	-0.16	-1.15	-2.38	-3.19	-3.27	-3.27
9500	0.47	1.00	1.11	1.00	0.43	-1.51	-2.28	-2.73	-2.70
10000	0.11	0.23	0.53	0.53	-0.70	-2.02	-2.67	-3.34	-3.34
Angle [°]									
f [Hz]	90-100	100-110	110-120	120-130	130-140	140-150	150-160	160-170	170-180
250	0.06	0.07	0.09	0.10	0.10	0.06	0.09	0.09	0.08
315	-0.06	-0.06	-0.07	-0.07	0.02	-0.03	-0.02	0.03	-0.06
400	-0.05	-0.05	-0.04	-0.05	-0.03	0.00	0.03	0.05	0.02
500	-0.20	-0.19	-0.17	-0.18	-0.15	-0.15	-0.12	-0.14	-0.16
630	-0.22	-0.19	-0.14	-0.14	-0.15	-0.12	-0.15	-0.12	-0.13
800	-0.41	-0.40	-0.40	-0.33	-0.32	-0.28	-0.24	-0.25	-0.23
1000	-0.66	-0.66	-0.66	-0.58	-0.52	-0.46	-0.45	-0.39	-0.39
1250	-1.03	-1.02	-0.97	-0.92	-0.78	-0.67	-0.58	-0.52	-0.54
1600	-1.34	-1.37	-1.38	-1.26	-1.12	-0.89	-0.76	-0.68	-0.73
2000	-0.99	-1.08	-1.06	-0.97	-0.72	-0.45	-0.23	-0.10	-0.16
2240	-0.89	-1.04	-1.04	-0.85	-0.51	0.16	0.33	0.35	0.33
2500	-0.86	-1.20	-1.26	-1.19	-0.83	-0.36	0.28	0.34	0.33
2800	-1.16	-1.81	-2.03	-2.02	-1.59	-0.83	0.33	0.45	0.45
3150	-1.16	-1.81	-2.03	-2.02	-1.59	-0.83	0.33	0.45	0.45
3550	-0.45	-1.25	-1.89	-2.00	-1.83	-0.95	0.69	0.95	0.92
4000	-0.59	-1.35	-2.24	-2.37	-2.23	-1.27	0.65	0.88	0.88
4500	-1.14	-1.78	-2.98	-3.57	-3.57	-2.61	-0.70	0.32	-0.29
5000	-1.58	-2.14	-2.96	-4.68	-4.68	-3.72	-1.82	-0.55	-0.79
5600	-1.78	-2.03	-2.97	-4.98	-5.67	-4.65	-2.18	-0.65	-1.33
6300	-2.92	-3.23	-3.86	-6.11	-7.75	-7.75	-4.79	-2.28	-2.47
7100	-3.16	-3.67	-4.19	-5.72	-8.18	-8.18	-6.17	-3.32	-4.11
8000	-3.81	-4.14	-4.65	-6.67	-8.67	-9.35	-6.86	-3.90	-5.87
8500	-3.71	-4.04	-4.45	-5.32	-8.94	-9.49	-7.83	-4.29	-5.56
9000	-3.02	-3.28	-3.77	-4.61	-7.32	-9.06	-8.46	-4.38	-4.63
9500	-2.23	-2.69	-3.17	-4.00	-6.93	-8.51	-7.58	-3.34	-5.05
10000	-3.11	-3.34	-3.68	-4.15	-6.45	-9.34	-9.34	-4.90	-6.76
Angle [°]									
f [Hz]	180-190	190-200	200-210	210-220	220-230	230-240	240-250	250-260	260-270
250	0.08	0.09	0.09	0.09	0.09	0.07	0.07	0.06	0.05
315	-0.06	0.03	-0.03	-0.04	-0.04	-0.06	-0.06	-0.03	0.07
400	0.06	0.06	0.04	-0.02	-0.03	-0.05	-0.06	-0.04	-0.05
500	-0.16	-0.16	-0.20	-0.21	-0.21	-0.22	-0.21	-0.21	-0.20
630	-0.16	-0.11	-0.14	-0.18	-0.22	-0.21	-0.22	-0.22	-0.22
800	-0.27	-0.32	-0.34	-0.34	-0.38	-0.43	-0.43	-0.40	-0.40
1000	-0.41	-0.49	-0.59	-0.60	-0.71	-0.71	-0.73	-0.67	-0.62
1250	-0.61	-0.72	-0.83	-0.98	-1.03	-1.06	-1.05	-0.98	-0.87
1600	-0.86	-1.04	-1.21	-1.39	-1.48	-1.48	-1.35	-1.17	-0.89
2000	-0.37	-0.72	-0.91	-1.15	-1.19	-1.13	-0.95	-0.58	-0.22
2240	0.19	-0.48	-0.86	-1.09	-1.11	-1.06	-0.74	-0.34	0.28
2500	0.20	-0.58	-1.06	-1.38	-1.38	-1.19	-0.75	-0.30	0.17
2800	-0.34	-1.12	-1.87	-2.11	-2.09	-1.41	-0.72	-0.31	-0.30
3150	-0.34	-1.12	-1.87	-2.11	-2.09	-1.41	-0.72	-0.31	-0.30
3550	0.60	-1.14	-1.93	-2.04	-1.88	-0.88	-0.45	-0.05	-0.05
4000	-0.34	-1.59	-2.52	-2.61	-2.29	-0.90	-0.45	-0.20	-0.23
4500	-1.58	-3.17	-3.75	-3.70	-2.64	-1.44	-0.89	-0.85	-0.78
5000	-2.32	-4.36	-4.98	-4.80	-2.72	-1.78	-1.56	-1.50	-1.30
5600	-3.57	-5.81	-5.81	-4.67	-2.71	-1.96	-1.86	-1.59	-1.36
6300	-5.34	-8.12	-7.74	-4.81	-3.42	-3.15	-2.76	-2.51	-2.37

7100	-7.47	-8.26	-7.52	-4.86	-3.87	-3.31	-2.89	-2.72	-2.94
8000	-9.29	-9.29	-7.13	-5.21	-4.60	-3.82	-3.64	-3.58	-3.93
8500	-9.45	-9.45	-6.29	-5.19	-4.18	-3.65	-3.47	-3.95	-3.95
9000	-8.92	-9.10	-5.74	-4.32	-3.49	-3.02	-2.75	-3.29	-3.29
9500	-8.75	-8.75	-5.09	-3.64	-2.76	-2.35	-2.53	-2.64	-2.51
10000	-9.42	-8.65	-5.03	-4.09	-3.21	-2.97	-3.20	-3.25	-3.01
Angle [˚]									
f [Hz]	270-280	280-290	290-300	300-310	310-320	320-330	330-340	340-350	350-360
250	0.08	0.06	0.07	0.05	0.09	0.08	0.06	0.06	0.06
315	-0.04	-0.04	-0.03	0.04	0.03	0.05	0.05	0.07	0.07
400	-0.05	-0.04	-0.04	-0.03	0.03	0.01	-0.02	-0.02	-0.04
500	-0.22	-0.16	-0.14	-0.10	-0.11	-0.11	-0.04	-0.03	-0.05
630	-0.22	-0.15	-0.13	-0.12	-0.06	-0.06	0.04	0.01	0.05
800	-0.34	-0.27	-0.19	-0.13	-0.08	-0.05	0.04	0.06	0.06
1000	-0.52	-0.40	-0.31	-0.28	-0.14	-0.13	-0.09	-0.04	-0.03
1250	-0.74	-0.57	-0.39	-0.29	-0.16	-0.12	-0.04	0.02	0.02
1600	-0.62	-0.37	-0.20	-0.09	-0.04	-0.04	-0.06	-0.06	-0.06
2000	0.16	0.20	0.23	0.17	0.14	0.06	-0.03	-0.05	-0.05
2240	0.36	0.37	0.32	0.22	0.10	-0.02	-0.04	-0.04	-0.02
2500	0.19	0.15	-0.08	-0.11	-0.12	-0.09	-0.05	-0.02	0.03
2800	-0.47	-0.47	-0.39	-0.22	0.05	0.08	0.08	0.03	-0.01
3150	-0.47	-0.47	-0.39	-0.22	0.05	0.08	0.08	0.03	-0.01
3550	0.09	0.27	0.41	0.42	0.38	0.27	0.13	0.03	0.00
4000	-0.17	0.22	0.22	0.16	-0.20	-0.20	-0.17	-0.06	0.04
4500	-0.59	-0.47	-0.62	-0.67	-0.65	-0.47	-0.20	0.10	0.10
5000	-1.07	-1.09	-1.12	-1.08	-0.65	-0.23	0.19	0.20	0.19
5600	-1.26	-1.29	-1.28	-0.93	-0.35	0.04	0.04	-0.03	-0.01
6300	-2.57	-2.64	-2.13	-1.40	-1.37	-1.26	-0.63	0.34	0.35
7100	-3.00	-2.78	-2.16	-1.69	-0.87	0.34	0.36	0.28	0.06
8000	-3.81	-3.11	-2.29	-1.45	-0.73	-0.36	-0.23	-0.13	0.05
8500	-3.65	-2.92	-2.00	-0.90	-0.29	-0.21	-0.21	-0.13	-0.02
9000	-2.96	-2.08	-1.20	0.48	0.50	0.33	0.20	0.14	-0.16
9500	-1.87	-0.92	1.11	1.20	0.97	0.83	0.72	-0.25	-0.29
10000	-2.47	-1.43	0.50	0.50	0.41	0.36	-0.64	-0.62	-0.31

Directional response for dosimeter Class SV 104 with microphone **SV 27** and **SA 122** windscreen (for orthogonal asymmetrical axis) for specified frequencies (Table C.6):

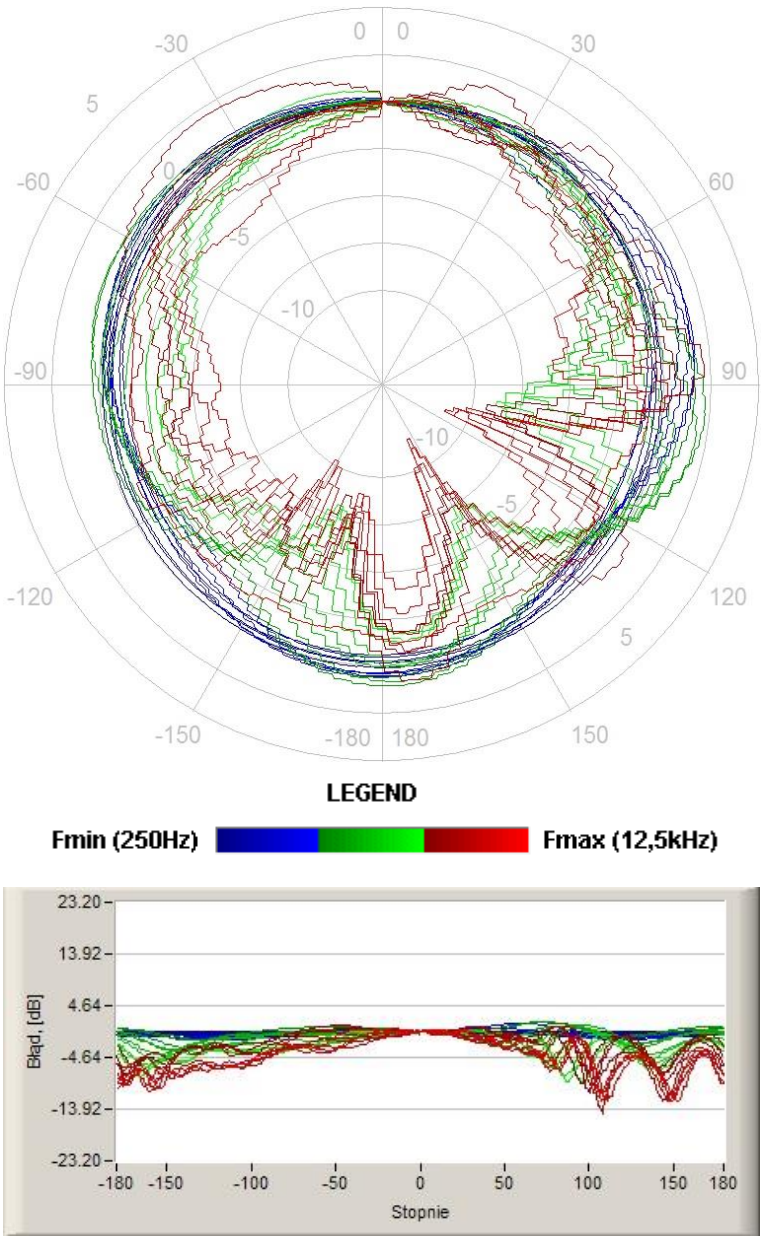
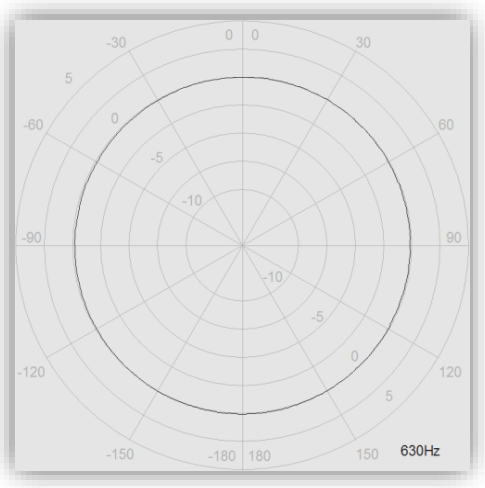


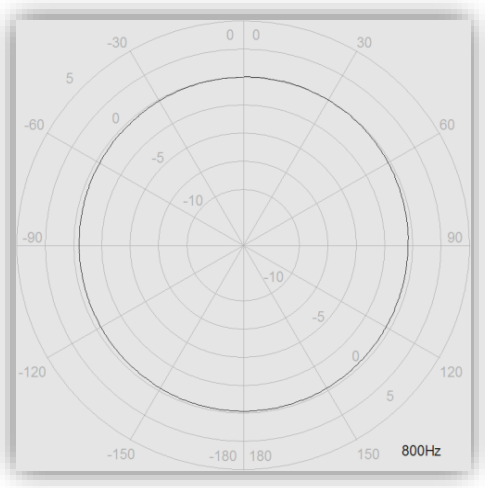
Figure C.4 Total directional characteristics (asymmetrical axis)

The round charts show the directional characteristic, and the charts below shows the errors for particular angles (note: limits are for class 1).

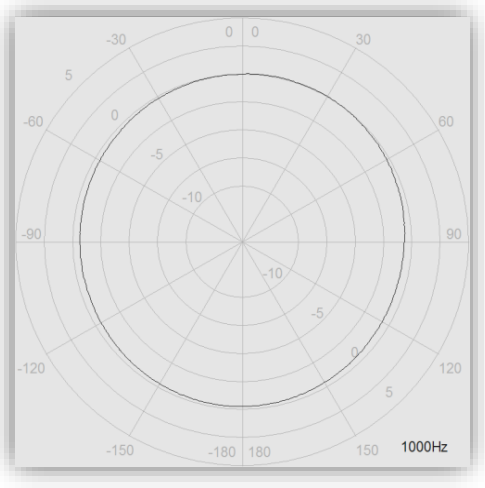
630 Hz



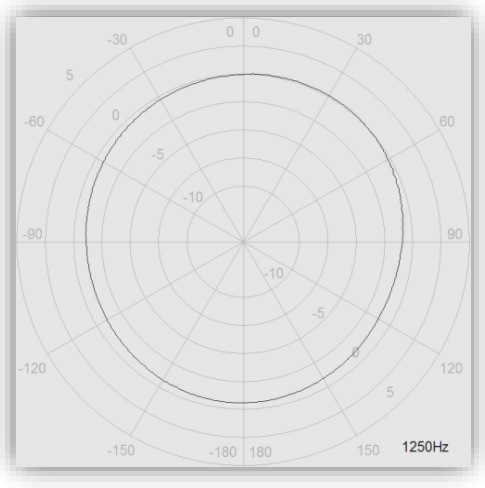
800 Hz



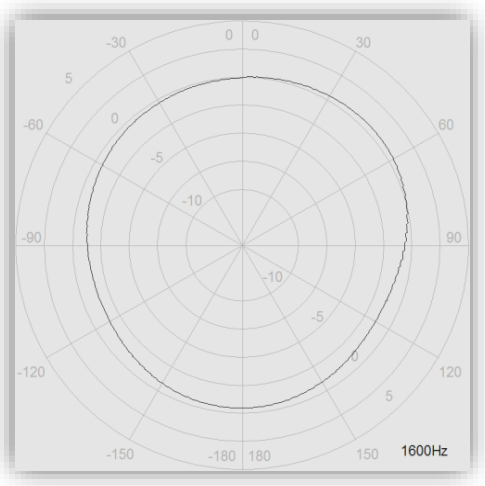
1000 Hz

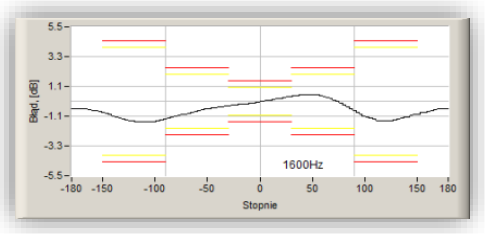


1250 Hz

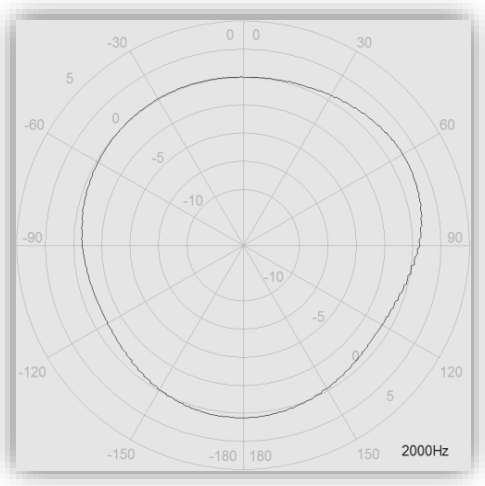


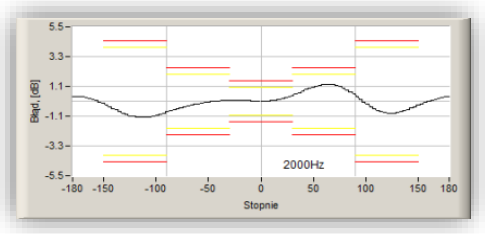
1600 Hz



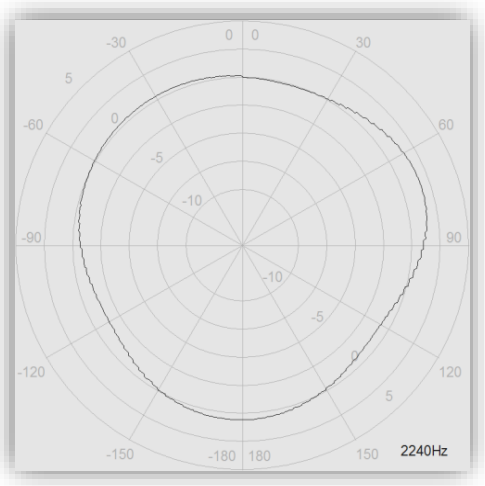


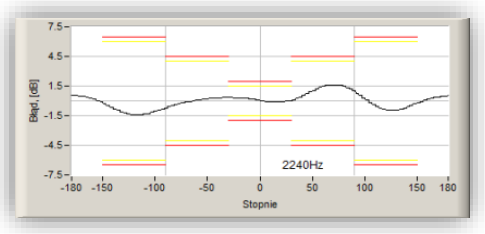
2000 Hz



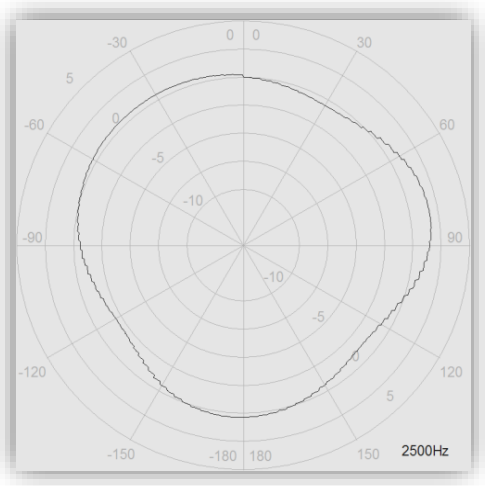


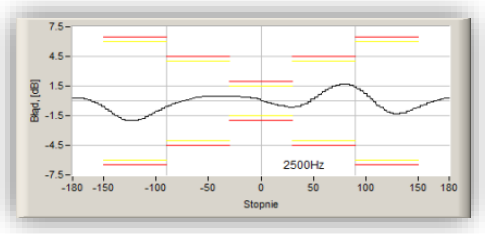
2240 Hz



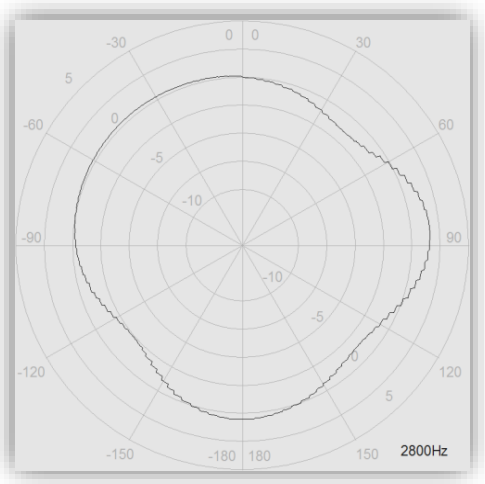


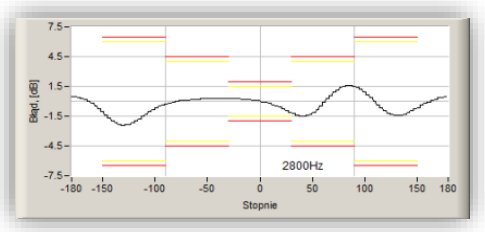
2500 Hz



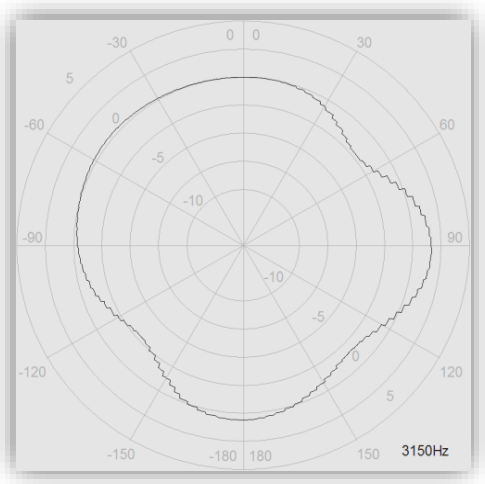


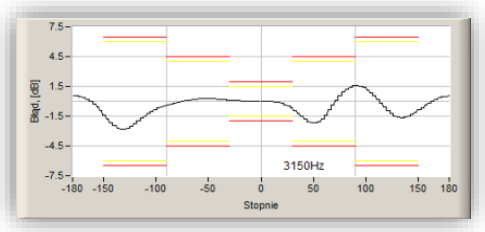
2800 Hz



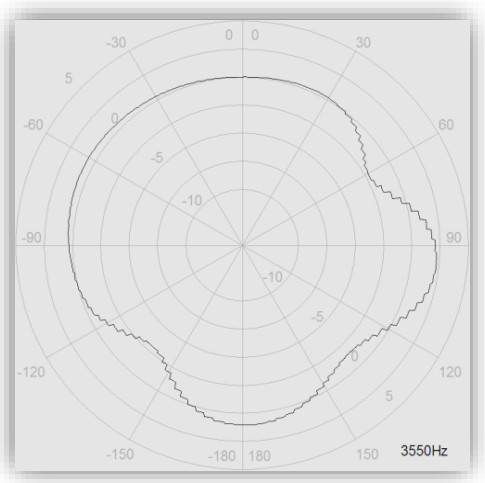


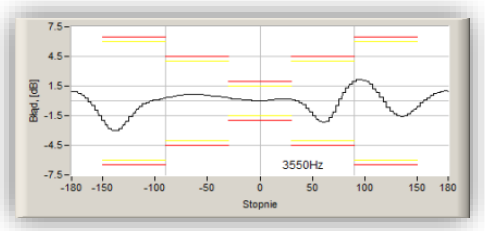
3150 Hz



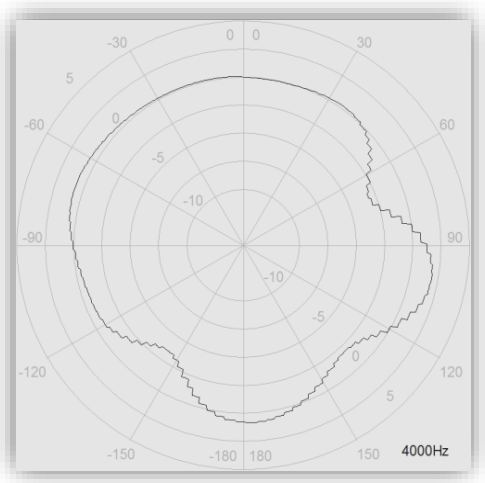


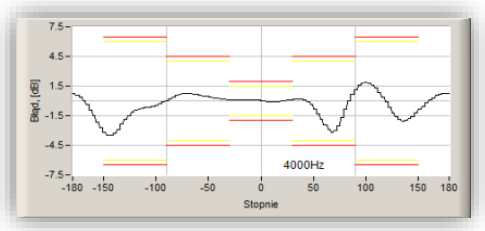
3550 Hz



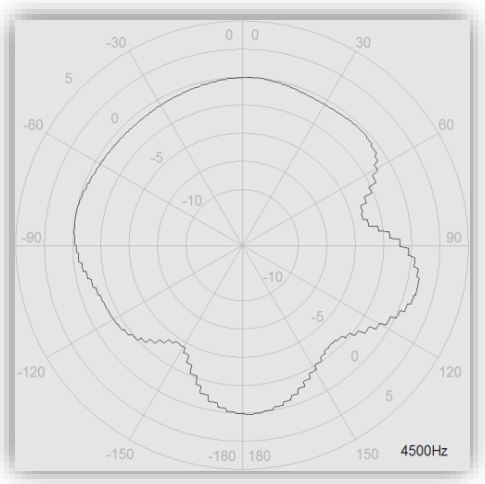


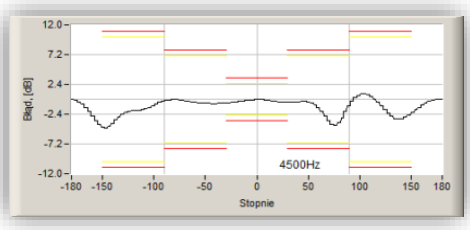
4000 Hz



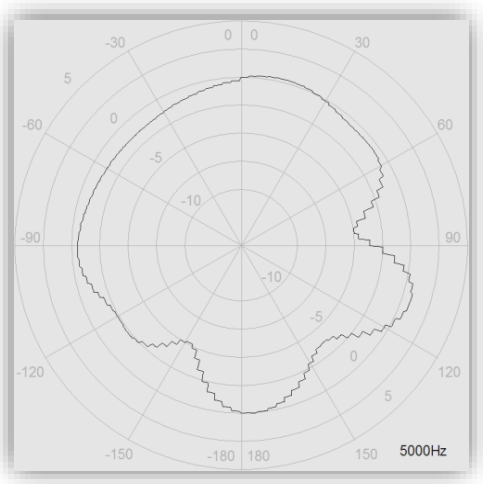


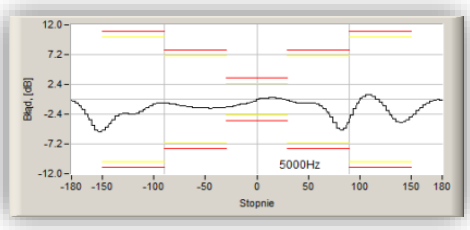
4500 Hz



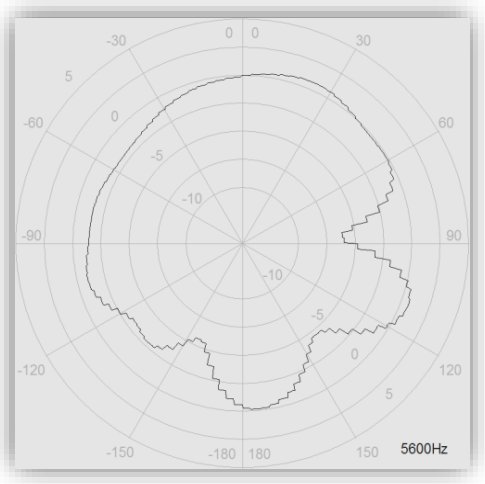


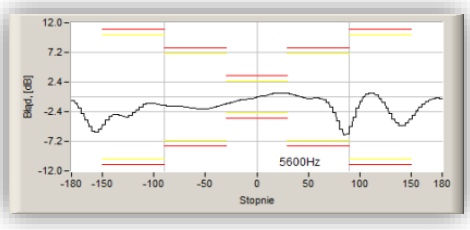
5000 Hz



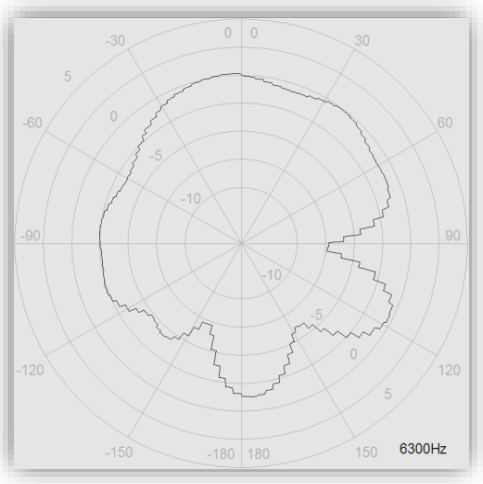


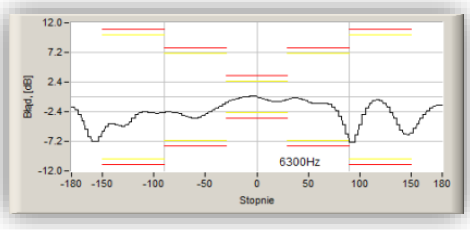
5600 Hz



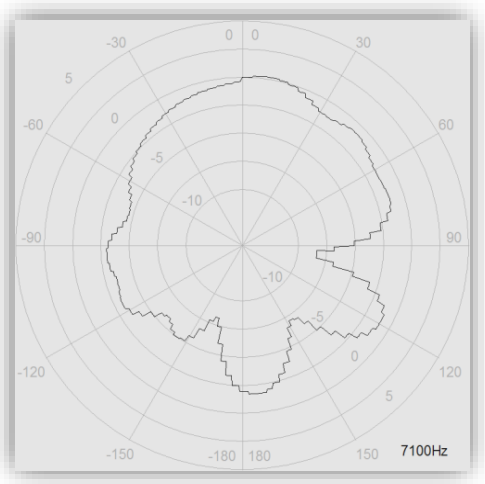


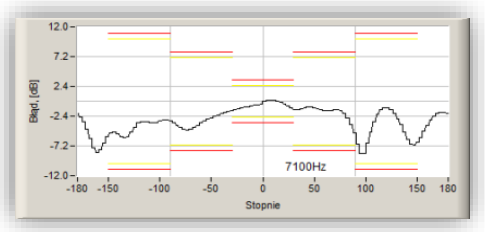
6300 Hz



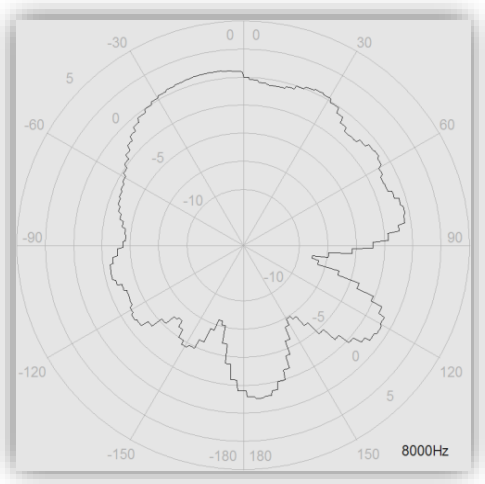


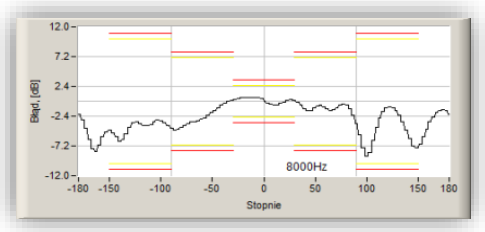
7100 Hz



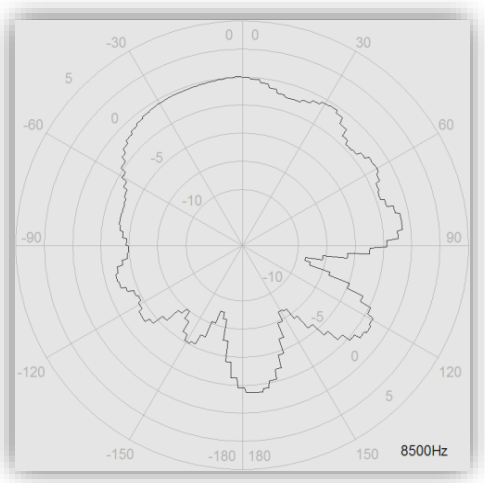


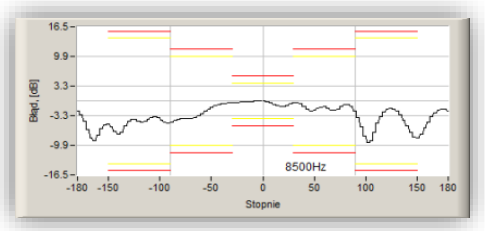
8000 Hz



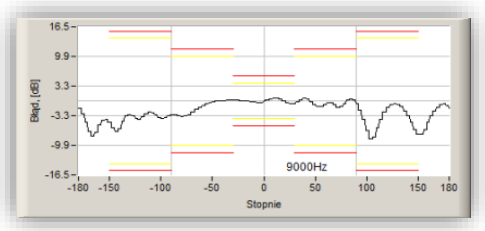


8500 Hz





9000 Hz



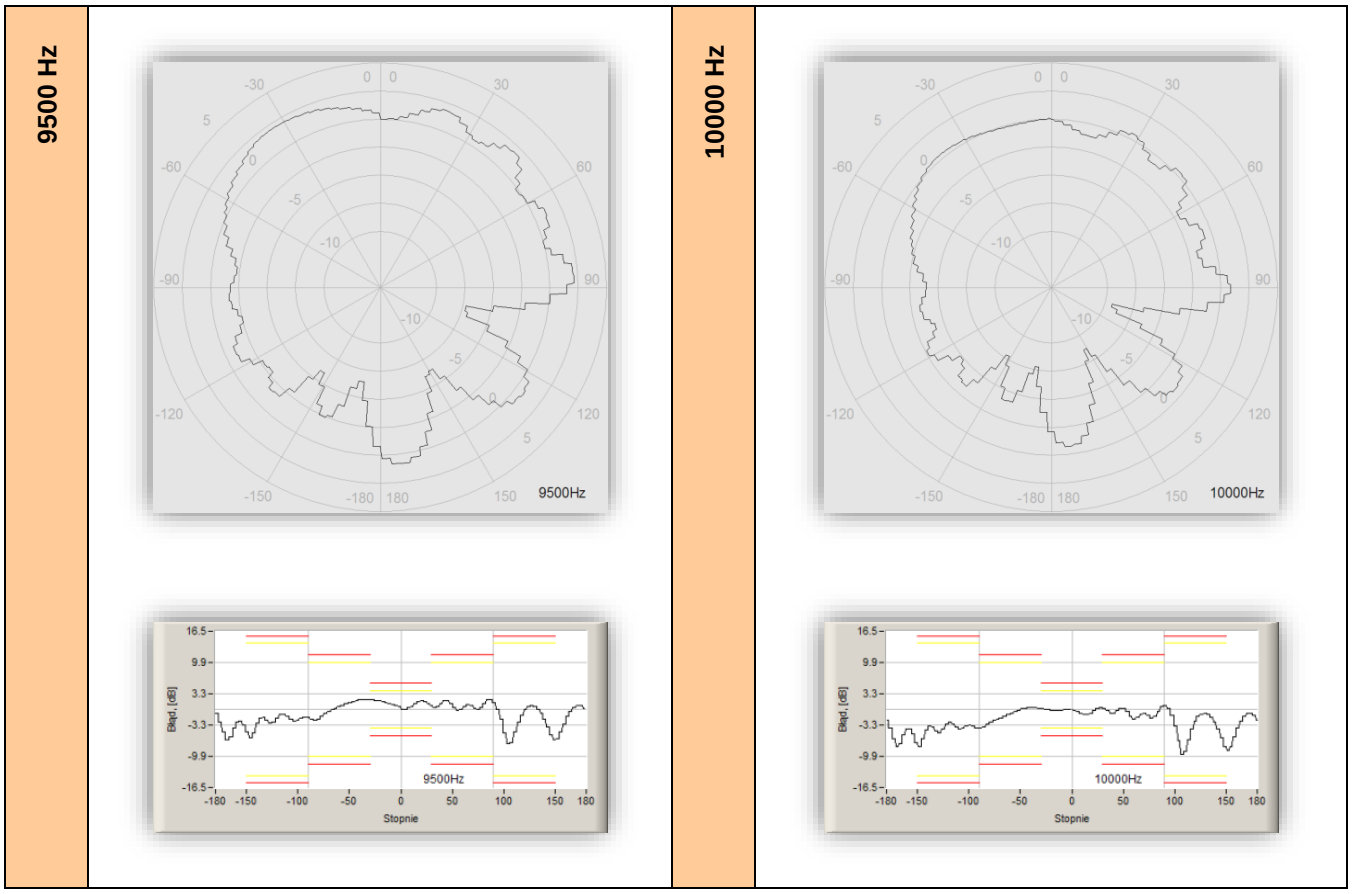


Table C.6. Directional response for SV 104 with microphone SV 27 and SA 122 windscreen (asymmetrical axis)

Angle [°]									
f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
630	0.02	-0.02	-0.03	-0.05	-0.09	-0.13	-0.17	-0.20	-0.21
800	0.02	0.02	-0.04	-0.12	-0.18	-0.26	-0.34	-0.41	-0.47
1000	0.02	0.04	0.00	-0.07	-0.17	-0.29	-0.45	-0.56	-0.69
1250	0.05	0.08	0.08	0.08	-0.09	-0.28	-0.50	-0.73	-0.97
1600	0.09	0.23	0.36	0.45	0.50	0.48	0.36	-0.27	-0.69
2000	0.04	0.18	0.43	0.76	1.04	1.23	1.25	1.16	0.84
2240	-0.11	-0.14	-0.12	0.57	1.07	1.47	1.63	1.63	1.47
2500	-0.26	-0.51	-0.61	-0.61	-0.40	0.90	1.48	1.68	1.68
2800	-0.22	-0.59	-1.08	-1.46	-1.50	-1.11	0.90	1.51	1.58
3150	-0.03	-0.22	-0.70	-1.51	-2.18	-2.20	-1.37	0.92	1.56
3550	0.07	0.19	0.22	-0.18	-1.10	-2.20	-2.20	-1.10	2.00
4000	-0.07	-0.07	0.14	0.20	-0.80	-2.44	-3.17	-3.02	1.17
4500	-0.14	-0.40	-0.51	-0.51	-0.42	-1.32	-3.42	-4.13	-3.73
5000	0.22	0.25	0.20	-0.57	-0.63	-0.77	-2.09	-4.62	-4.99
5600	0.31	0.61	0.64	0.55	-0.23	-0.23	-0.91	-3.83	-6.17
6300	-0.45	-0.75	-0.70	-0.24	-0.84	-1.07	-1.23	-3.17	-7.29
7100	0.16	-0.40	-1.29	-1.33	-0.98	-1.52	-1.55	-1.98	-5.15
8000	-0.55	-0.55	0.26	-1.13	-1.49	-1.21	-1.45	-1.03	-3.58
8500	-0.78	-1.28	-1.25	-1.18	-2.18	-2.06	-2.15	-2.15	-2.25
9000	0.58	0.58	-0.70	-0.62	-0.83	-1.31	-1.37	-1.37	-0.61
9500	0.72	1.77	1.77	1.25	1.85	0.40	1.03	1.33	2.08
10000	-0.82	-1.13	0.45	-0.79	-0.77	-2.10	-2.10	-1.79	-1.49

Angle [°]									
f [Hz]	90-100	100-110	110-120	120-130	130-140	140-150	150-160	160-170	170-180
630	-0.21	-0.22	-0.22	-0.15	-0.15	-0.10	-0.05	-0.04	0.02
800	-0.50	-0.50	-0.50	-0.47	-0.42	-0.37	-0.32	-0.29	-0.26
1000	-0.78	-0.81	-0.80	-0.76	-0.72	-0.61	-0.50	-0.41	-0.36
1250	-1.19	-1.26	-1.28	-1.25	-1.17	-1.04	-0.92	-0.79	-0.70
1600	-1.07	-1.34	-1.44	-1.44	-1.38	-1.14	-0.94	-0.73	-0.58
2000	0.53	-0.68	-0.88	-0.91	-0.83	-0.59	-0.29	0.23	0.34
2240	0.99	-0.40	-0.94	-0.96	-0.90	-0.59	-0.19	0.42	0.52
2500	1.42	0.75	-0.93	-1.30	-1.30	-1.06	-0.64	-0.19	0.30
2800	1.51	0.94	-0.96	-1.44	-1.45	-1.15	-0.61	0.33	0.47
3150	1.59	1.17	-0.95	-1.62	-1.67	-1.51	-0.87	0.33	0.54
3550	2.19	2.10	1.26	-1.33	-1.56	-1.49	-0.52	0.85	1.00
4000	1.85	1.85	1.31	-1.61	-2.02	-1.82	-0.89	0.67	0.78
4500	0.65	0.89	-1.06	-2.76	-3.22	-3.15	-2.17	-0.93	-0.12
5000	-2.51	0.70	0.68	-2.53	-3.74	-3.74	-2.88	-1.36	-0.31
5600	-4.83	-0.78	0.61	-2.68	-4.60	-4.60	-2.96	-1.14	-0.64
6300	-7.40	-4.43	-0.98	-2.50	-5.41	-6.15	-5.78	-3.49	-1.73
7100	-8.40	-6.82	-2.12	-2.78	-6.13	-7.12	-6.66	-3.87	-1.99
8000	-8.85	-8.85	-4.26	-2.29	-6.07	-7.45	-6.85	-3.37	-2.06
8500	-7.83	-9.33	-4.97	-2.30	-5.63	-8.28	-8.28	-4.73	-2.32
9000	-6.64	-8.50	-6.06	-1.41	-3.36	-7.50	-7.50	-4.81	-1.66
9500	-4.88	-7.27	-4.84	0.76	-2.08	-6.41	-6.13	-1.53	-0.86
10000	-3.49	-9.43	-8.88	-2.56	-4.22	-7.90	-8.76	-3.99	-2.17
Angle [°]									
f [Hz]	180-190	190-200	200-210	210-220	220-230	230-240	240-250	250-260	260-270
630	0.02	-0.02	-0.01	-0.07	-0.11	-0.15	-0.17	-0.20	-0.21
800	-0.25	-0.27	-0.32	-0.39	-0.42	-0.47	-0.51	-0.52	-0.52
1000	-0.31	-0.34	-0.39	-0.44	-0.53	-0.59	-0.67	-0.67	-0.68
1250	-0.65	-0.70	-0.75	-0.89	-1.00	-1.10	-1.18	-1.18	-1.17
1600	-0.55	-0.66	-0.83	-1.07	-1.30	-1.52	-1.53	-1.52	-1.44
2000	0.34	0.32	-0.15	-0.54	-0.99	-1.18	-1.19	-1.16	-1.00
2240	0.52	0.45	0.16	-0.80	-1.25	-1.44	-1.44	-1.35	-1.06
2500	0.31	0.25	-0.60	-1.28	-1.95	-2.01	-1.96	-1.59	-1.07
2800	0.47	0.32	-1.04	-1.93	-2.40	-2.39	-1.96	-1.28	-0.68
3150	0.54	0.37	-1.37	-2.48	-2.85	-2.85	-2.28	-1.21	-0.66
3550	0.98	0.58	-1.99	-3.00	-3.00	-2.44	-1.19	-0.32	0.29
4000	0.72	-1.50	-3.19	-3.50	-3.26	-1.89	-0.92	-0.70	-0.45
4500	-0.81	-2.70	-4.56	-4.63	-3.88	-2.45	-1.81	-1.54	-0.74
5000	-1.63	-4.16	-5.20	-5.02	-3.23	-2.39	-2.39	-1.67	-0.78
5600	-2.71	-5.52	-5.66	-4.46	-3.18	-3.24	-2.56	-1.24	-1.41
6300	-3.94	-7.26	-7.26	-5.53	-4.79	-4.79	-3.41	-2.59	-2.63
7100	-4.55	-8.21	-7.77	-5.23	-5.89	-4.99	-3.51	-3.52	-3.17
8000	-6.10	-8.03	-7.03	-6.38	-6.38	-4.20	-3.95	-3.73	-4.34
8500	-6.40	-8.84	-7.70	-7.48	-7.48	-4.50	-4.79	-3.77	-4.93
9000	-6.76	-7.90	-5.36	-6.89	-6.20	-4.05	-3.58	-3.93	-3.93
9500	-6.47	-6.47	-4.83	-5.91	-2.96	-2.88	-1.83	-2.50	-2.22
10000	-7.82	-7.82	-7.00	-7.81	-4.89	-4.89	-4.21	-4.21	-3.96
Angle [°]									
f [Hz]	270-280	280-290	290-300	300-310	310-320	320-330	330-340	340-350	350-360
630	-0.24	-0.24	-0.19	-0.18	-0.13	-0.11	-0.09	-0.04	-0.03
800	-0.51	-0.47	-0.41	-0.32	-0.27	-0.22	-0.14	-0.08	-0.03
1000	-0.66	-0.61	-0.53	-0.44	-0.39	-0.28	-0.20	-0.12	-0.06
1250	-1.10	-1.00	-0.86	-0.73	-0.59	-0.46	-0.34	-0.25	-0.14

1600	-1.33	-1.13	-0.86	-0.69	-0.53	-0.41	-0.32	-0.23	-0.16
2000	-0.77	-0.55	-0.34	-0.18	-0.05	0.07	0.07	0.06	0.03
2240	-0.71	-0.39	-0.14	0.21	0.30	0.33	0.33	0.29	0.20
2500	-0.58	-0.18	0.33	0.45	0.50	0.50	0.49	0.42	0.30
2800	-0.26	0.14	0.22	0.29	0.31	0.31	0.29	0.24	0.18
3150	-0.33	0.11	0.25	0.29	0.29	0.20	0.10	0.03	-0.01
3550	0.48	0.65	0.65	0.65	0.56	0.43	0.29	0.15	0.05
4000	0.55	0.74	0.74	0.56	0.36	0.21	0.11	0.09	0.08
4500	-0.17	-0.28	-0.51	-0.65	-0.68	-0.68	-0.59	-0.42	-0.22
5000	-0.81	-1.09	-1.32	-1.39	-1.43	-1.41	-1.23	-0.93	-0.57
5600	-1.49	-1.59	-1.86	-1.95	-1.88	-1.68	-1.06	-0.62	-0.32
6300	-2.52	-3.17	-3.40	-3.38	-2.75	-1.75	-0.90	-0.30	0.14
7100	-4.27	-4.61	-4.50	-3.52	-2.63	-2.00	-1.46	-1.05	-0.65
8000	-4.58	-4.19	-3.37	-2.92	-1.45	-0.34	0.60	0.67	0.66
8500	-4.75	-3.99	-3.92	-2.79	-1.41	-0.68	-0.38	-0.28	-0.15
9000	-3.50	-3.50	-2.48	-0.97	-0.26	0.18	0.18	-0.29	-0.36
9500	-2.24	-2.00	0.58	1.38	1.97	2.05	2.03	1.77	1.06
10000	-3.96	-2.63	-1.80	-0.74	0.37	0.37	0.18	-0.17	-0.15

C.2 SPECIFICATION OF THE SV 104 AS 1/1 OCTAVE ANALYSER

The SV 104 instrument operating as **1/1 OCTAVE** sound analyser meets the IEC 61260-1:2014 standard for the pass band filters.

Note: *Simultaneously to the frequency analysis SV 104 operates as a Dosimeter!*

Signal input

Connector	6 pin SVANTEK
Maximum input voltage	SV 104 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	**ST 104** (300 kΩ)

Linear operating ranges

For the sinusoidal signal and microphone sensitivity 0.56 mV/Pa.

Table C.7. Linear operating ranges

[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	57	97	57	134	70	137	57	97	57	134	60	100	80	137
500 Hz	57	133	57	137	70	137	57	133	57	137	60	136	80	140
1 kHz	57	137	57	137	70	137	57	137	57	137	60	140	80	140
4 kHz	57	138	57	136	70	137	57	138	57	136	60	141	80	139
8 kHz	57	136	57	134	70	137	57	136	57	134	60	139	80	137

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. $1\mu V_{RMS}$)
Basic accuracy	$< \pm$ 0.1 dB (for the temperature T = +23°C $\pm$ 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

$< \pm$ 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	48 kHz (internal only)
Analogue to digital converter	sigma-delta 2 x 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 1 "**Z**" filter

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

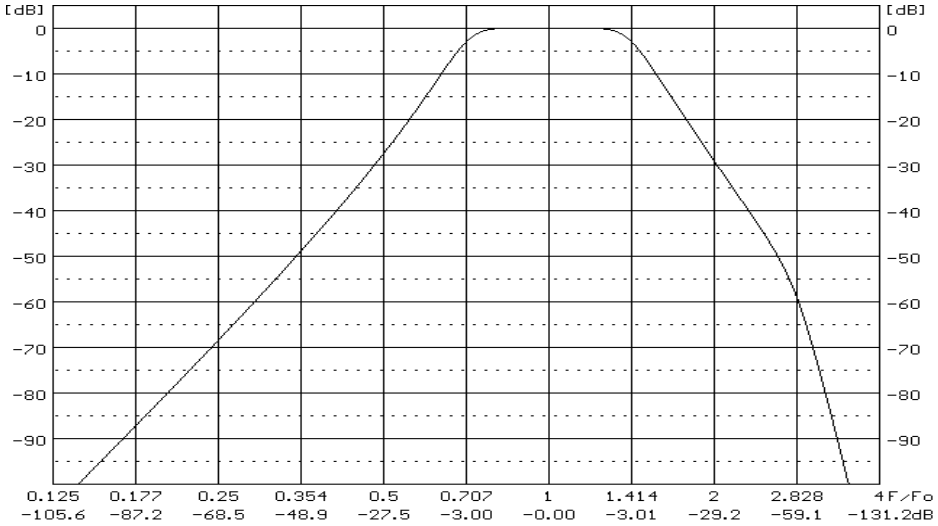
C meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 "**C**" filter

See part for the A and C filters characteristics.

Noise levels (measured with the **SC 104** and source impedance **50 Ω**)

"**Z**" weighting	< 1000 μV_{RMS}, (60 dB)
"**A**" weighting	< 224 μV_{RMS}, (47 dB)
"**C**" weighting	< 224 $\mu V_{RMS,}$ (47 dB)

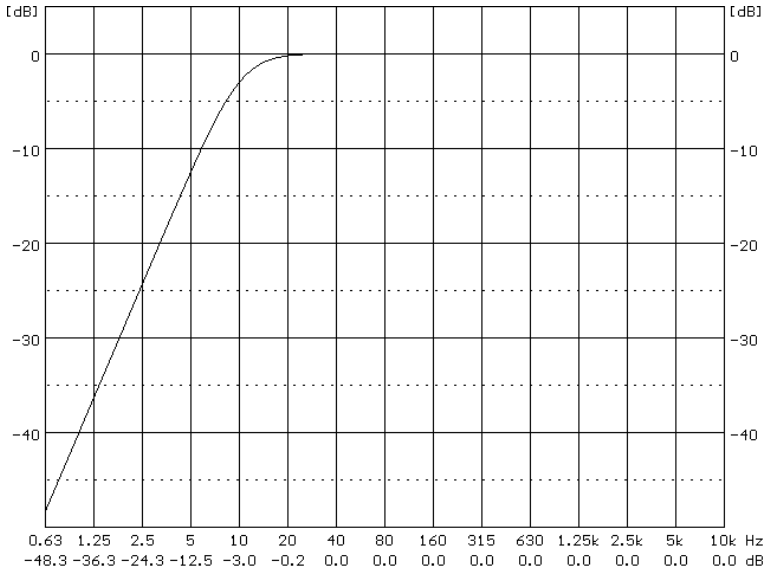
1/1 Octave filters 9 filters with centre frequencies from 31.5 Hz to 8 kHz (base 2), meeting DIN 45651, IEC 61260:1995 and ANSI S1.11-1986 for Class 1.



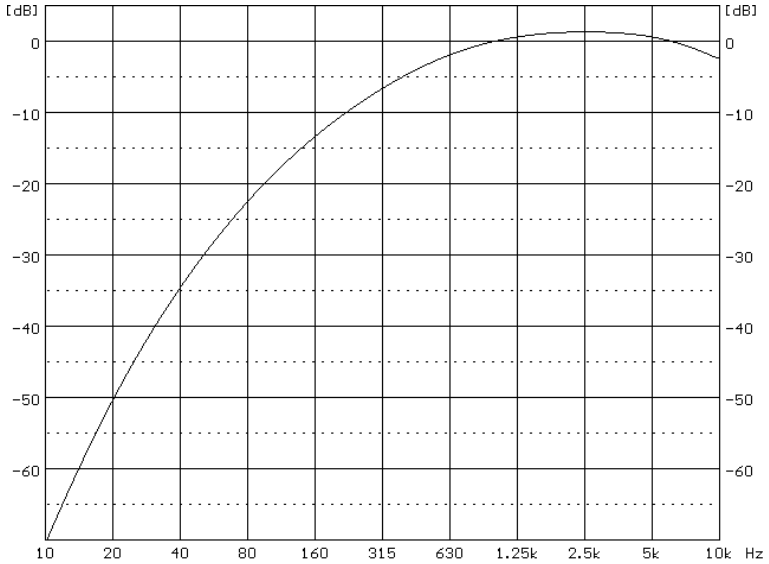
C.3 FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED DIGITAL FILTERS

Digital weighting filters implemented in dose and octave mode

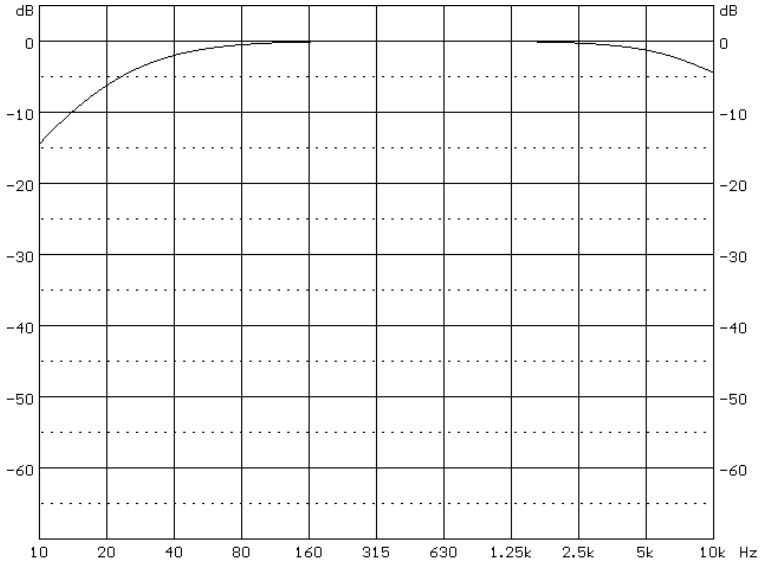
Z Filter: cut-off frequency: 10.0 Hz / -3.0 dB



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 though the *SUPERVISOR* software under the settings window.

C.4 GENERAL SPECIFICATION OF THE SV 104

Signal input

The input of the measured signal (mounting head):

Figure C.5 SV 27 microphone connector (mounting head outer view)

Table C.1. Pin out of the microphone connector

Pin Number	Function
1	2.0V/5mA supply DC voltage
2	Ground
3	"SIGNAL" Input channel 1
4	Reserved
Chassis	Ground

Power supply

The instrument is dedicated for the operation from the internal rechargeable battery only.

- Instrument is dedicated for the operation from the internal rechargeable battery.
- Power consumption 12 mA[2] under measurement run from 2.4 V internal cells.
- Typical operating time from internal single Li-ion rechargeable batteries is about **40 hours**.
- Power consumption from the 5V source is approx. 400 mA (at + 20°C) (500mA max) under battery charging,

Note: *For the temperatures below 10°C operating time can decrease.*

[2] display off, octave analysis off

Interface USB

The **SV 104** 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.6 Power and Communication Port (external bottom view)

Table C.2. Pin-out of the USB-Device connector

Pin number	Function
1	VBUS
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 ca.100 g (no mounting accessories)

Dimensions 90x50x31 mm (base: no microphone, no mounting accessories).

Electromagnetic Compatibility (EMC)

The product described above is compliant with the following EMC standards:

1. **For the EMC emissions specification:**
   a) according to EN-61672-1 (Chapter 5.18) and EN-61672-2 (Chapter 9), applying test methods in accordance with CISPR 22:1997, Clause 10 and CISPR 16-1:1999,
2. **For the EMC immunity specification:**
   a) according to EN-61672-1 (Chapters 6.5 and 6.6) and EN-61672-2 (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.*

Environmental Ingress Protection: **IP64** per EN/IEC 60529:2001 standard

Environmental parameters

Dedicated for indoor and outdoor use:

Operating temperature range	-10°C ÷ +50°C
Storing temperature range	-20°C ÷ +50°C
Humidity	≤ 90% RH in 40°C (uncondensed vapour)
Atmospheric pressure	80 kPa ÷ 110 kPa
Atmosphere	air with normal oxygen content, typically 21% v/v

Compliance with EU Directives

CE mark indicates compliance with EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.

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

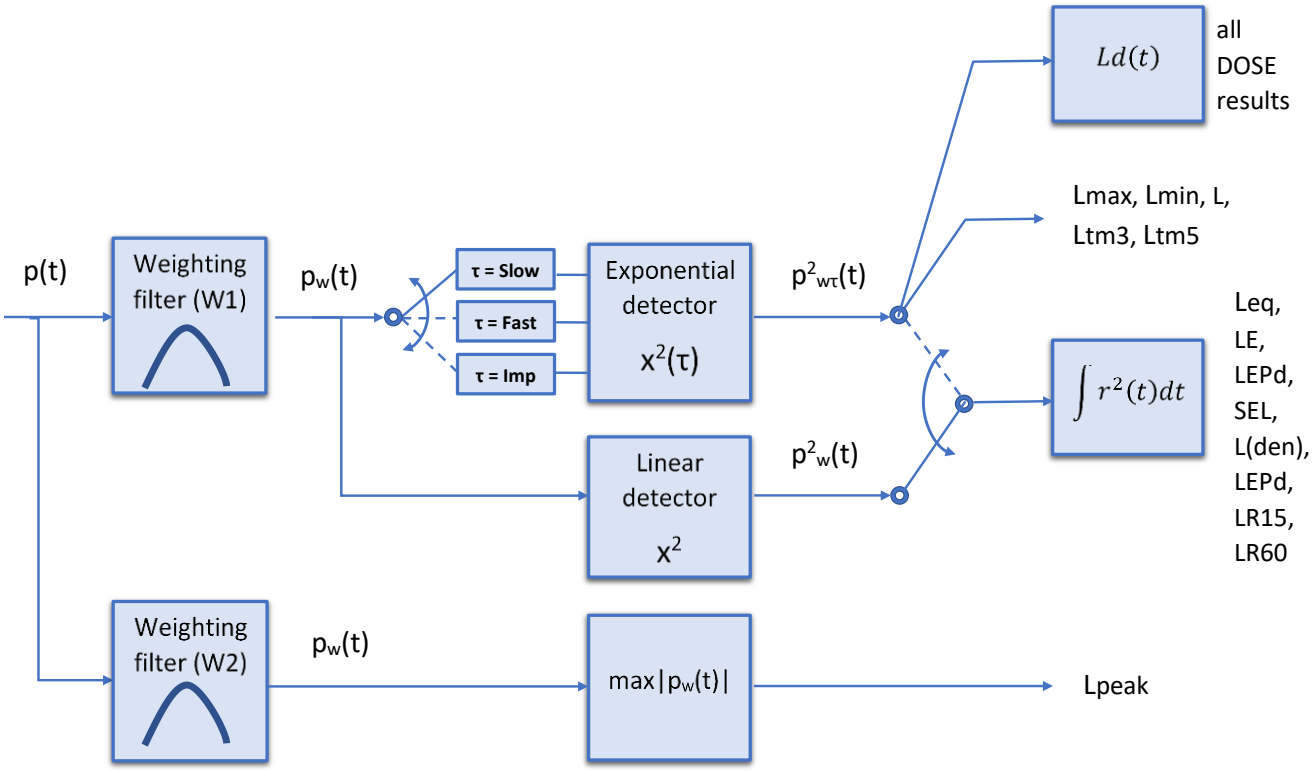
$$L_d(t) = L(t)$$

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.

$$\mathbf{Min = 10 \log \left(\min_T \frac{p^2_{W\tau}(t)}{p^2_0} \right)}$$

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.

$$\mathbf{L = 10 \log \left(1/\tau \frac{p^2_{W\tau}(t)}{p^2_0} \right)}$$

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.

$$DOSE = \frac{100\%}{T_{8h}} \int_0^T 10^{\frac{L_d(t)-L_c}{q}} dt$$

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.

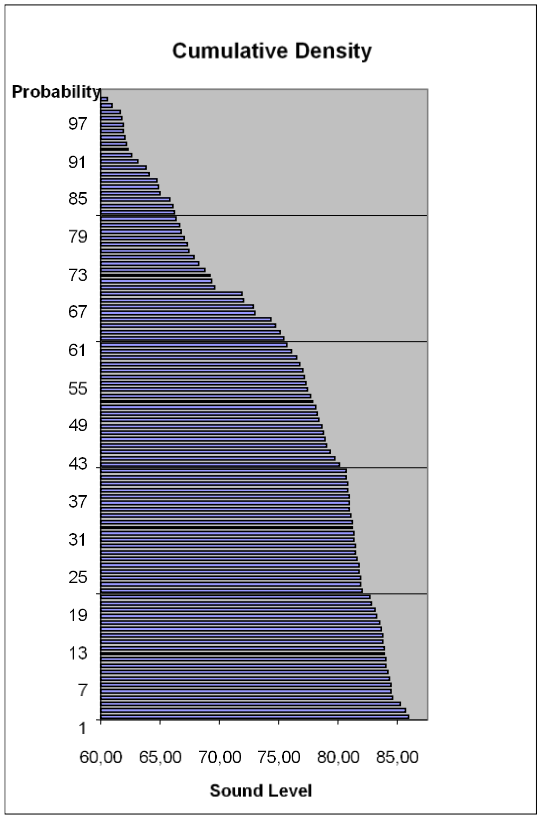
Example:

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