SVANTEK

# USER MANUAL


# SV 104A

**(microphone ST 104A)**

ACOUSTIC
DOSIMETER

Warsaw, 2026-01-20
Rev. 3.00

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

*This User Manual presents the firmware revision **1.10**.*

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

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



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**Technical Support Contact Information:**

web: svantek.com/contact/

# GENERAL WARNINGS, SAFETY CLAUSES, AND STANDARD INFORMATION

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

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

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

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

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

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

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

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

***Note:*** *For air-transport turn off **Bluetooth interface*** (*Chapters 3.8.3 and 5.8)*.

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# SPECIAL PRECAUTIONS WHEN USING AND CHARGING LITHIUM BATTERIES

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

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

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

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

# ENVIRONMENTAL PROTECTION MARKING OF THE UNIT

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

# INDEX

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**CONTENTS**

# 1 INTRODUCTION

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

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

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

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

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

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

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

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

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

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

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

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

[2] Depending on configuration.

## 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**

## 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.

## 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

## APPLICATIONS

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

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

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

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

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

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

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

## 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

## SV 104A DOSIMETER SHORT FORM SPECIFICATION

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

## ACCESSORIES INCLUDED

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

## ACCESSORIES AVAILABLE

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

## EXTENDED FIRMWARE OPTIONS

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

***Note:*** *Extended firmware options can be purchased in any time as only the introduction of a special code is required for their activation. The activation of the optional functions can be made with the use of the Supervisor PC software or the Assistant Pro mobile application (see Appendix R).*

# 3 GETTING STARTED

## SYSTEM DESCRIPTION

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


**Figure 3-1 SV 104A at a glance**

## 3.2 INPUT / OUTPUT INTERFACES

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

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


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

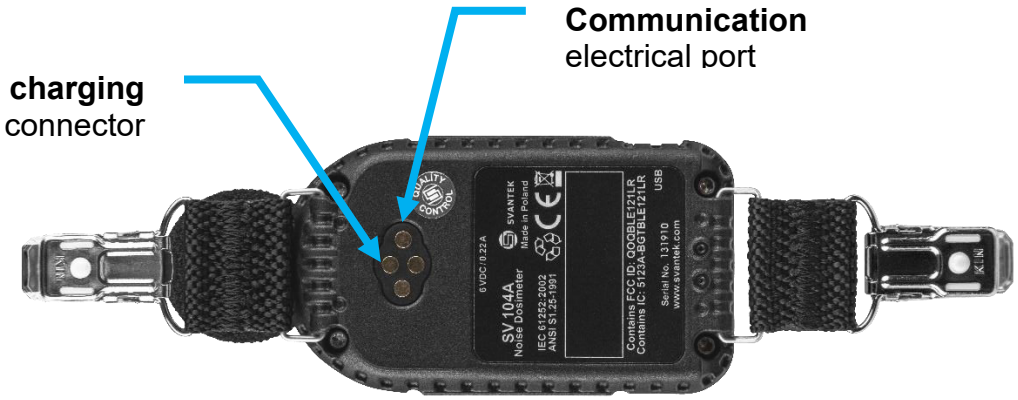



**Figure 3-3 SV 104A back view - charging and communication port (reserved for dock stations)**

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

## 3.3 WINDSCREEN

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

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


**Figure 3-4 SA 122A windscreen**

## 3.4 MOUNTING CLIPS

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

**Figure 3-5 SV 104A standard mounting clips**

## 3.5 MOUNTING AND POSITIONING SV 104A

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

**Figure 3-6 SV 104A positioning**

## LED STATUS INDICATOR

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

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

**Table 3-1 LED status description**

## 3.7 STATUS BAR ICONS

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

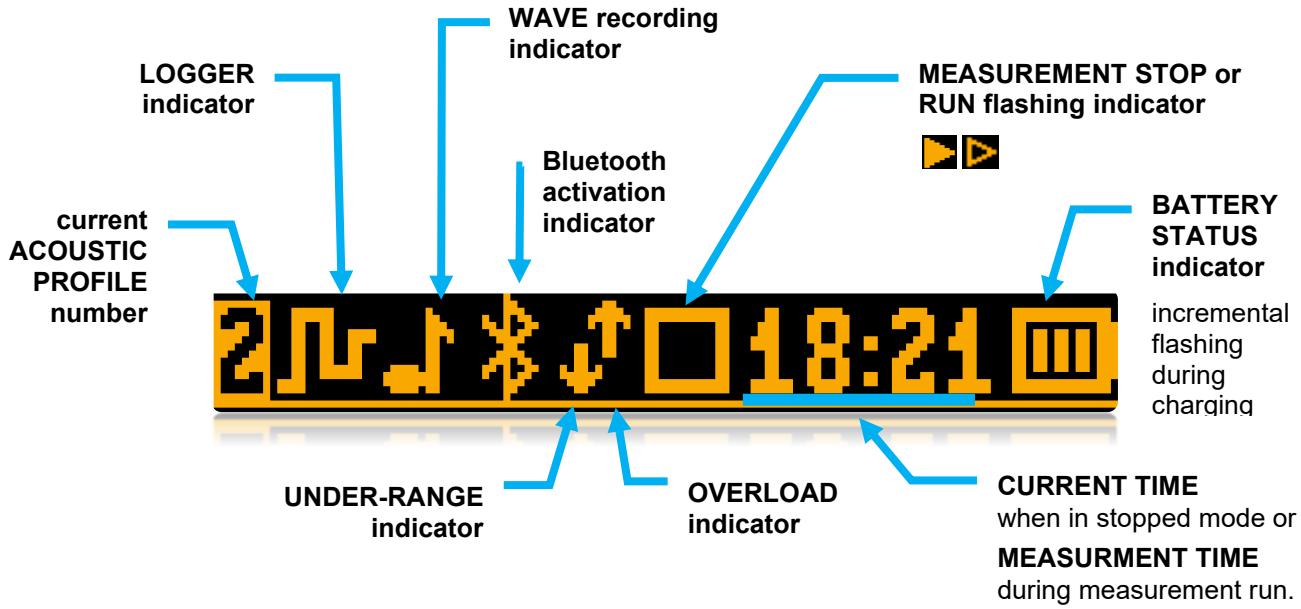



**Figure 3-7 SV 104A display icons description**

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

**Overload detector**

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

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

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

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

**Underrange detector**

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

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

## MANUAL CONTROL OF THE INSTRUMENT

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

In general, the user can operate the instrument by:

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

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

### 3.8.1 Primary key functions

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

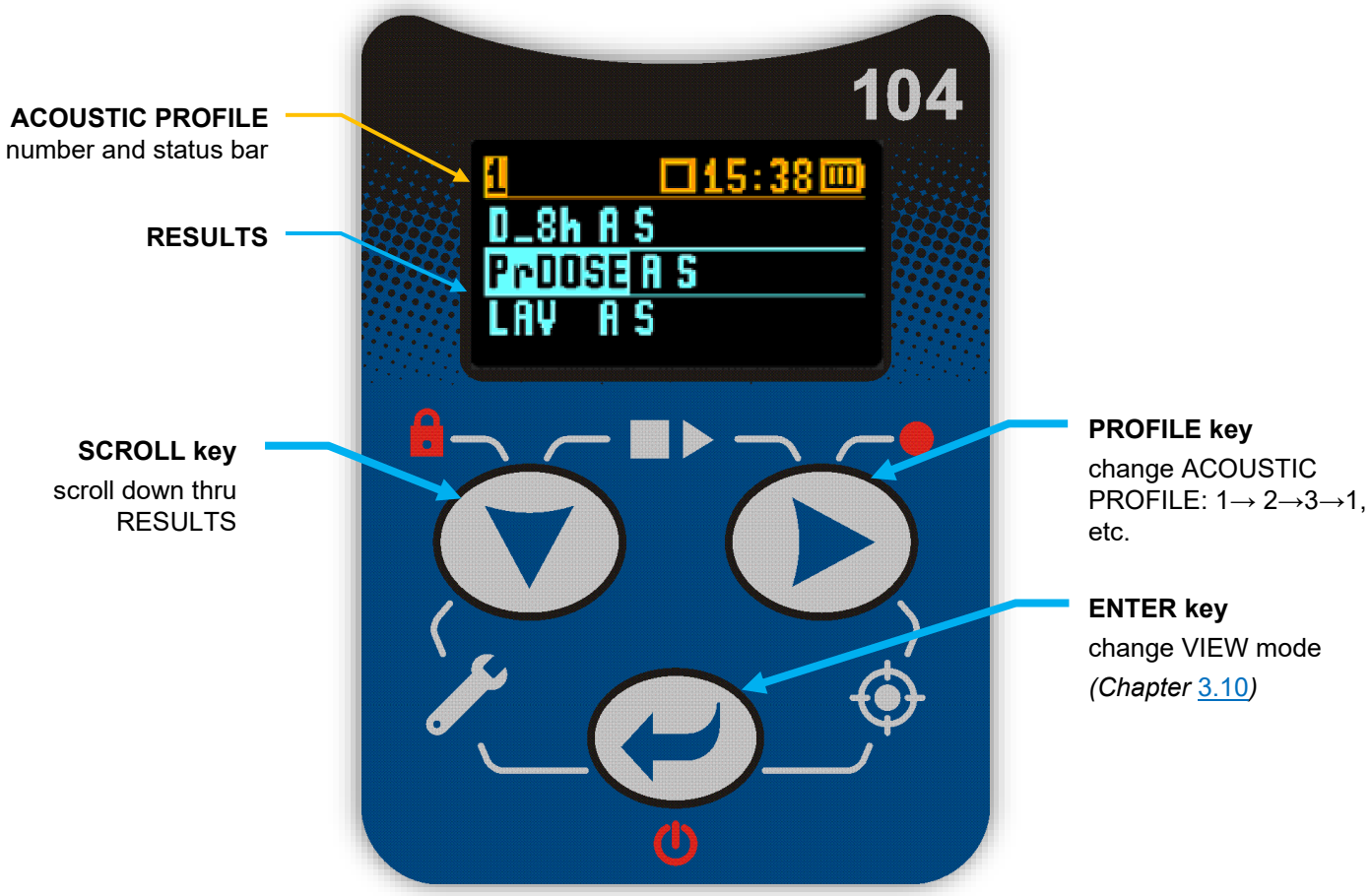



**Figure 3-8 Control keypad on the front panel – primary key functions**

### 3.8.2 Alternate key functions

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

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

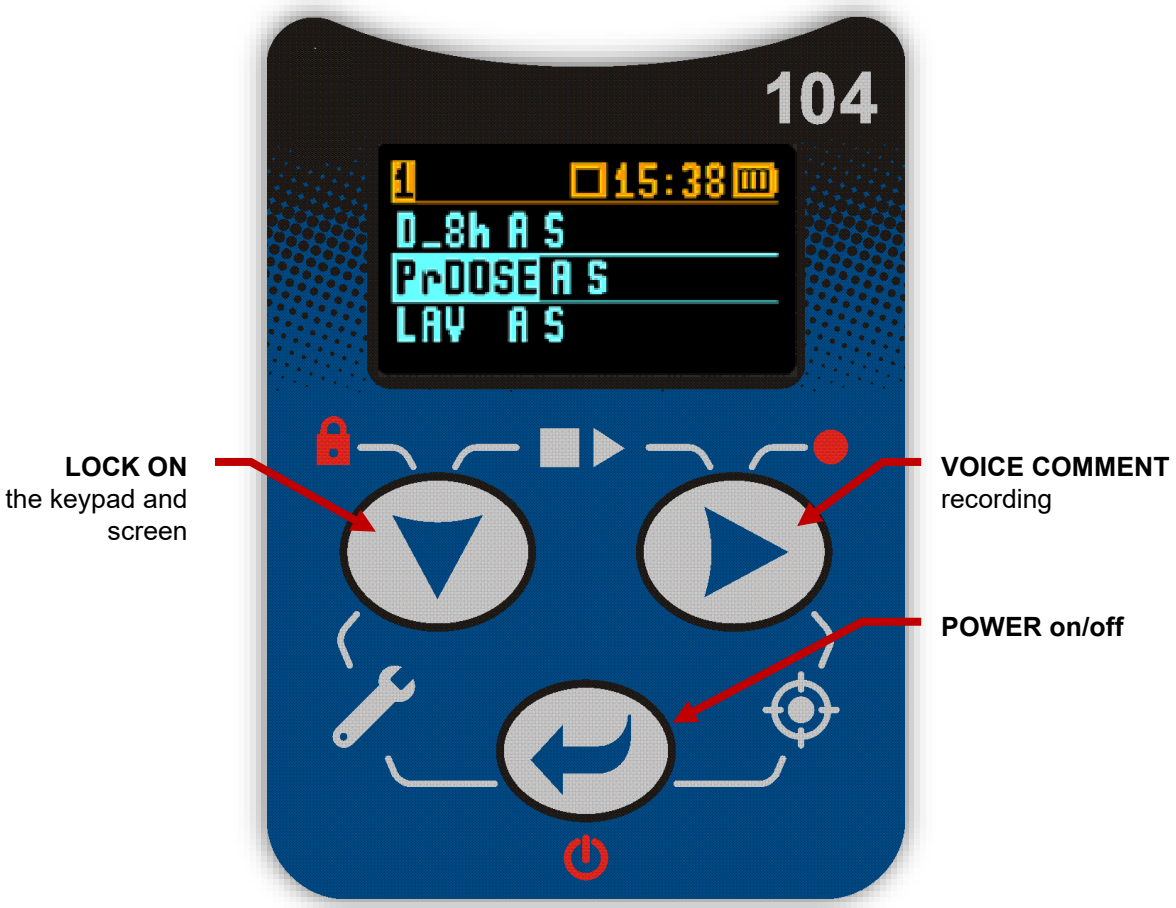



**Figure 3-9 Control keypad on the front panel – alternate key functions**

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

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

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

### 3.8.3 Alternate combined keys functions

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

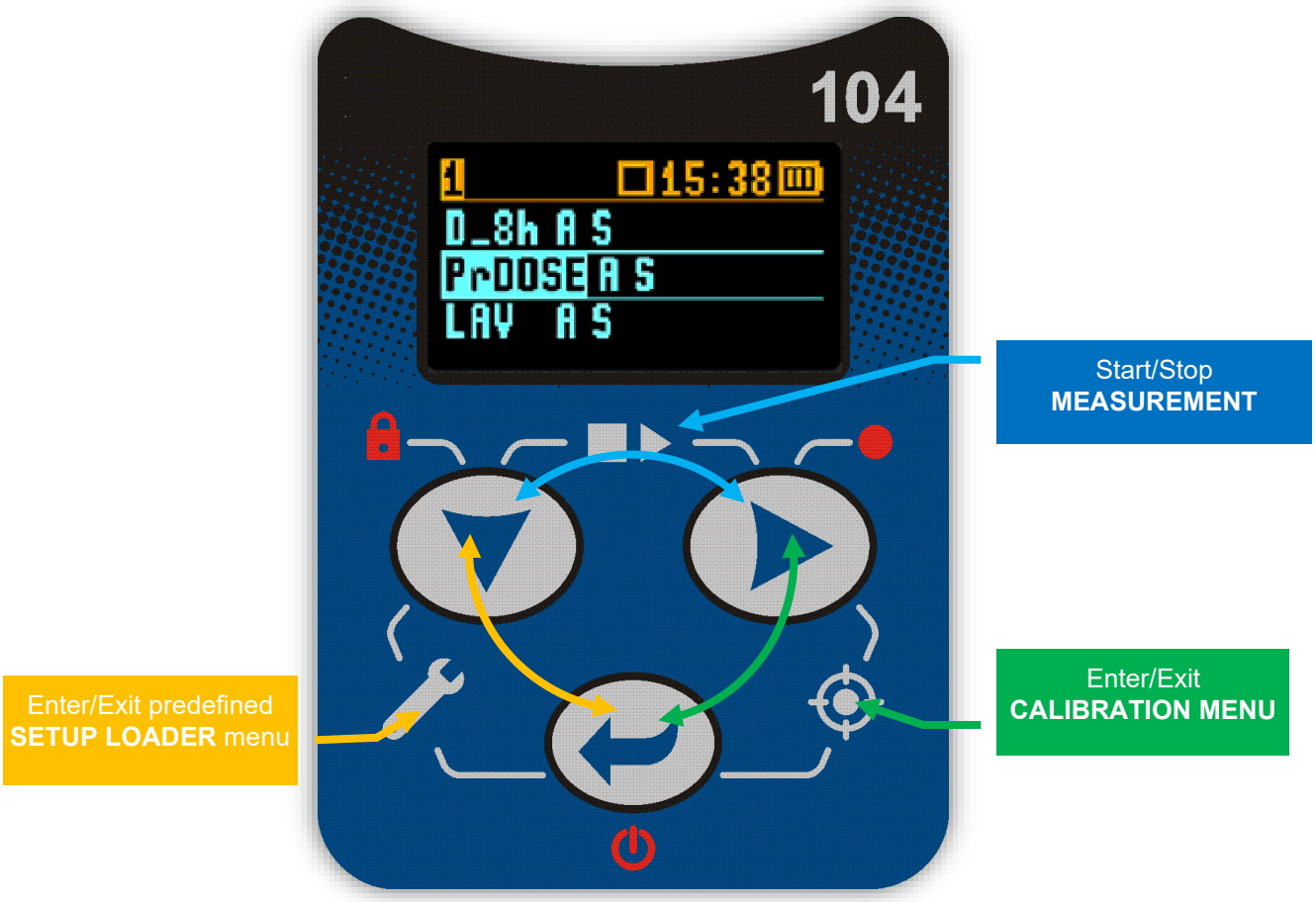



**Figure 3-10 Control keypad on the front panel – alternate combined keys function**

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

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

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

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

## 3.9 THREE INSTRUMENTS IN ONE – ACOUSTIC PROFILE CONCEPT

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

## 3.10 THE VIEW MODE PRESENTATION CONCEPT

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

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

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

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

### 3.10.1 Running SPL view

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


**Figure 3-11 Running SPL view**

### 3.10.2 Primary ONE RESULT view

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

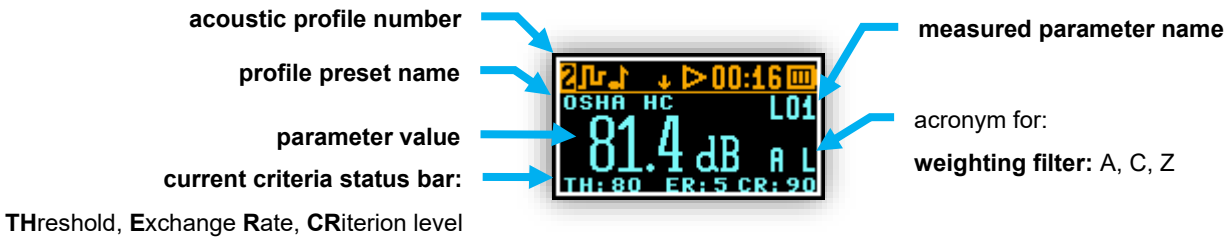



**Figure 3-12 Primary ONE RESULT view**

### 3.10.3 RESULTS LIST view mode

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

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

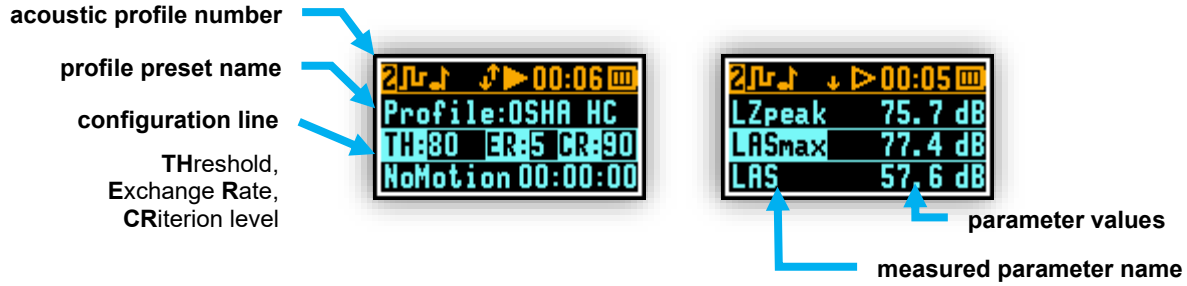



**Figure 3-13 RESULTS LIST view**

### 3.10.4 1/1 octave analysis spectrum view mode

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

***Note:*** *The 1/1 octave analysis is an optional function and should be activated before use. Activation of the optional functions can be made with the use of the Supervisor PC software or the Assistant Pro mobile application (see Appendix R).*

If the 1/1 octave option is enabled, the instrument operates as a dosimeter and in parallel as a real time 1/1 octave band analyser. In addition, 1/1 octave analysis is performed in parallel with the dosimeter operations. All 1/1 octave digital passband filters (with 9 centre frequencies from 8 kHz down to 31.5 Hz; in base 10 system) are working in real-time with the broadband frequency weighting filters (Z, A or C) and the linear LEQ detector. This enables the user to pre-weight a spectrum with one of the selected broadband frequency curves if required for a particular application such as the provision of hearing protectors in the control of high workplace noise levels.

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

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

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

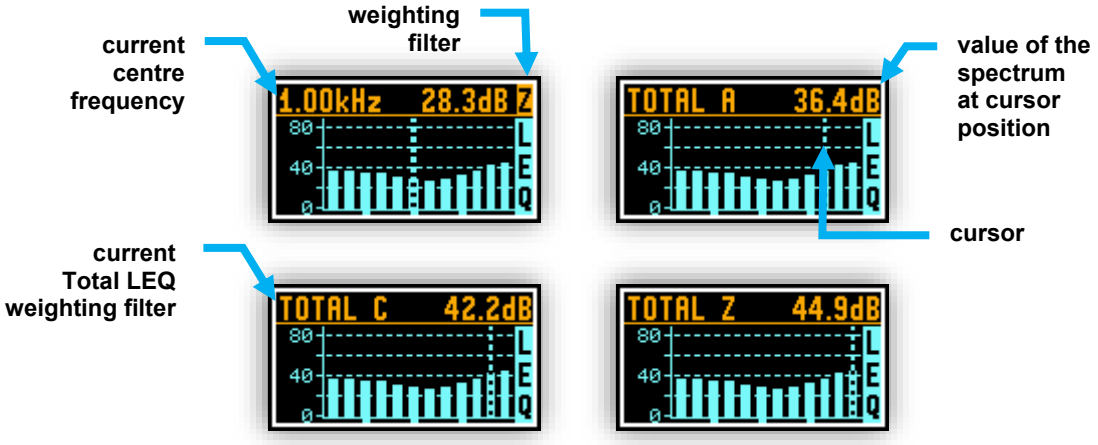



**Figure 3-14 1/1 octave analysis LEQ spectrum graph view**

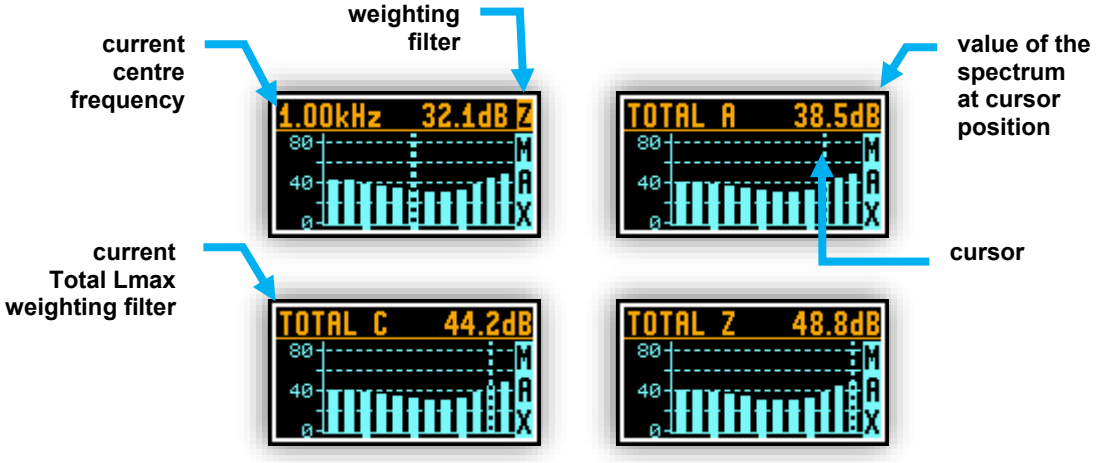



**Figure 3-15 1/1 octave analysis MAX spectrum plot view**

### 3.10.5 1/3 octave analysis spectrum view mode

***Note:*** *The 1/3 octave analysis is an optional function and should be activated before use. Activation of the optional functions can be made with the use of the Supervisor PC software or the Assistant Pro mobile application (see Appendix R).*

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

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

***Note:*** *The taking into averaged. obtained fo*

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

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

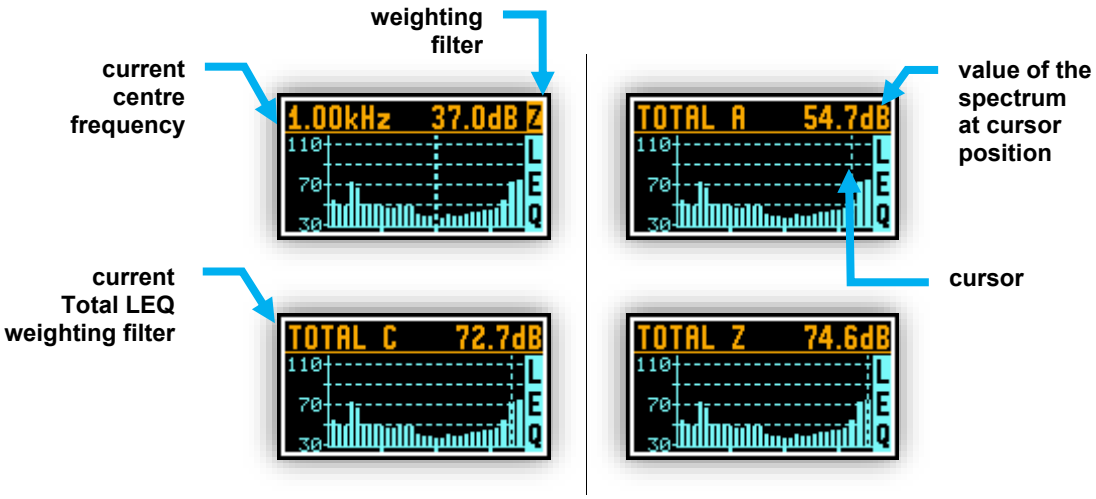



**Figure 3-16 1/3 octave analysis LEQ spectrum plot view**

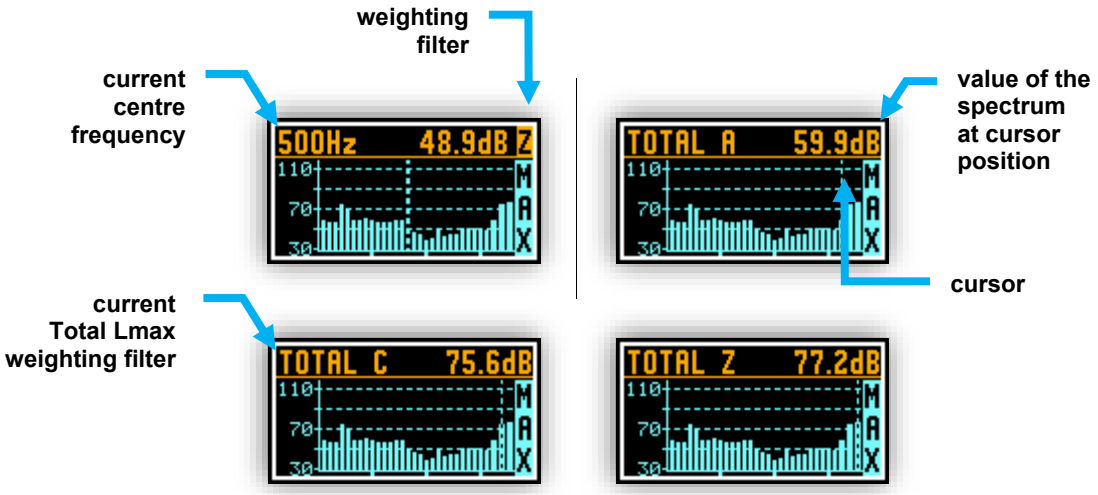



**Figure 3-17 1/3 octave analysis MAX spectrum plot view**

### 3.10.6 INSTRUMENT STATUS view mode and Bluetooth security PIN code

The Instrument Status view presents:

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

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

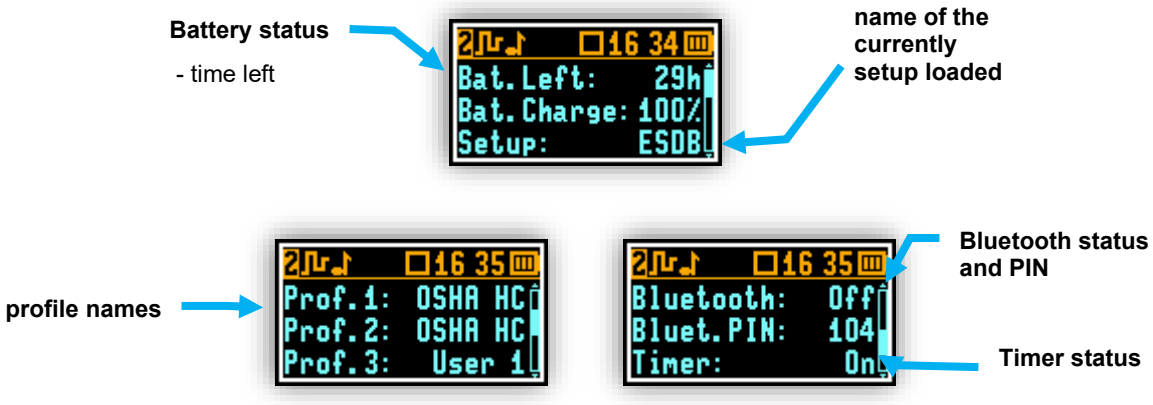



**Figure 3-18 INSTRUMENT STATUS view screens**

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

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


**Figure 3-19 Timer information**

## 3.11 ALARM SCREEN REVIEW

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

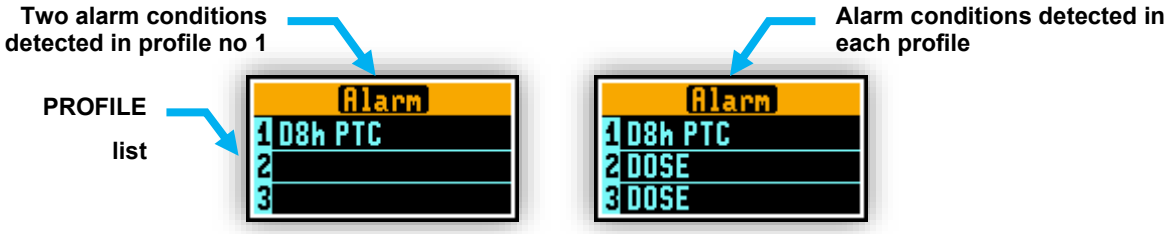



**Figure 3-20 ALARM view screens**

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

# 4 RUNNING AND OPERATING BASIC PROCEDURES

## 4.1 USB CHARGING

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

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

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

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

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

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

## 4.2 DOCK STATION CHARGING

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

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


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

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

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

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

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

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

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

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

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

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

## 4.3 BEFORE YOU TURN THE INSTRUMENT ON

There are only a few things to remember:

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

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

***Remove and discard the protective film***


## 4.4 TURNING ON/OFF

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

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

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

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

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

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

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

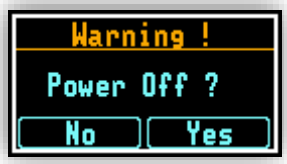



**Figure 4-2 Power-off warning screen**

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

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

## 4.5 BATTERY CHECK

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

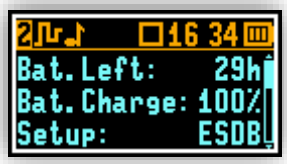



**Figure 4-3 Instrument Status - battery status**

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

Press to switch to the next VIEW mode.

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

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

## 4.6 REVIEWING UNIT LABEL

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

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

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

The following screen will be displayed:

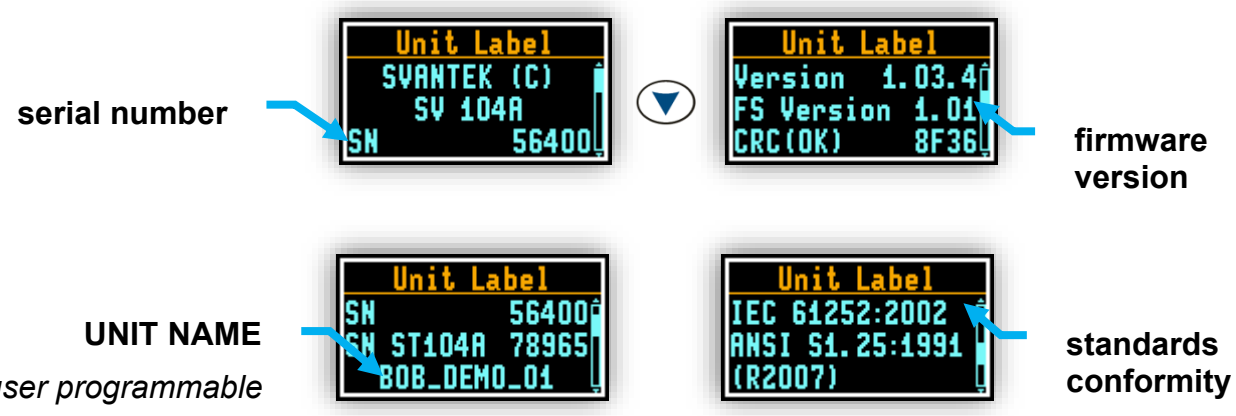



**Figure 4-4 Unit Label screens**

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

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

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

## 4.7 MEASUREMENT SETUP - BASIC CONFIGURATION

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

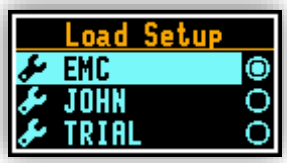



**Figure 4-5 Load setup menu**

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

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

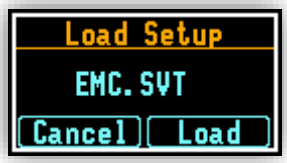



**Figure 4-6 Load setup confirmation**

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


**Figure 4-7 Status of setup loading**

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

***Note:*** *For a detailed description of how to upload setup files to the instrument (see Appendix R).*

## 4.8 CALIBRATION

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

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

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

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

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

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

*Therefore, calibration must be performed with the sound calibrator placed over the microphone and using the* ***Calibration*** *menu or the automatic calibration function instead of the normal measurement mode!*

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

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

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

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

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

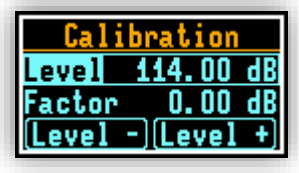



**Figure 4-8 Calibration menu**

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

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

3. Switch on the calibrator and wait about 30 seconds for the tone to stabilise before starting the calibration measurement.
4. Start the calibration measurement by pressing the key.

The calibration measurement time is set to 1 second with 3 second delay. Calibration stops when either 5 consecutive results do not differ from each other by more than 0.02 dB or 10 consecutive results do not differ from each other by more than 0.05 dB. It is possible to stop the calibration measurement by pressing the and keys simultaneously.

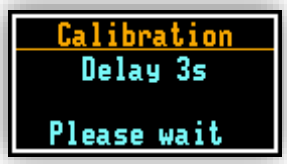



**Figure 4-9 Calibration - initial delay screen**

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

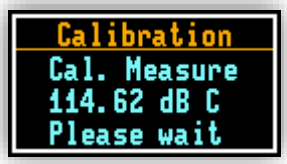



**Figure 4-10 Calibration in progress screen**

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

It is recommended to repeat the calibration measurement several times. The results obtained should be almost the same (with a difference of ±0.1 dB). The reasons for the unstable results are as follows:

- the calibrator is not properly attached to the instrument
- there are external acoustic disturbances such as high noise levels in the vicinity
- the calibrator or the measurement channel (e.g. microphone) is damaged.

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

5. Press to accept the measurement result.

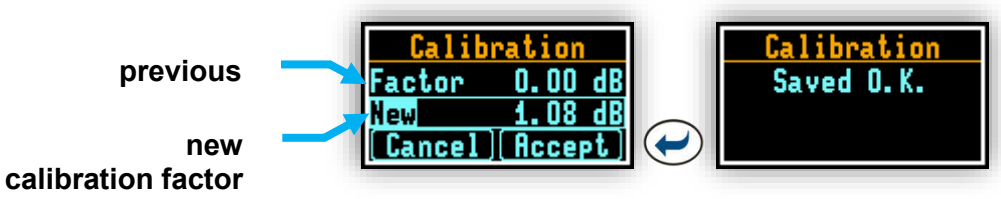



**Figure 4-11** **Calibration confirmation screen**

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

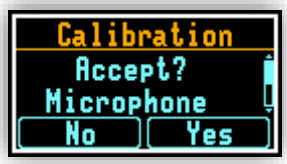



**Figure 4-12** **Calibration - microphone not in tolerance screen**

**Post-calibration**

If enabled using Supervisor or Assistant Pro, the post-calibration is performed automatically after the calibration measurement has been accepted. The instrument automatically adds the calibration factor to the header of the result files. This doesn't modify the saved results and gives the user to possibility to compare the possible changes of accelerometer sensitivity before and after the measurements. Before saving the calibration factor, the text "Post Calibration" is displayed.

## 4.9 VOICE COMMENTS RECORDING

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

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

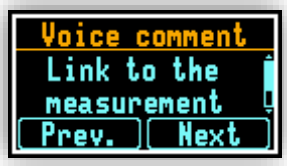



**Figure 4-13** **Voice comment linking screen**

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


**Figure 4-14 Voice comment recording command screen**

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

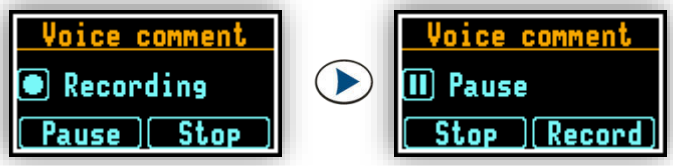



**Figure 4-15 Voice comment recording in progress screens**

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


**Figure 4-16 Voice comment record confirmation screen**

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

## 4.10 BEFORE AND AFTER THE MEASUREMENT RUN

Before starting a measurement, ensure that:

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

After stopping the measurement run, check that:

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

## 4.11 START AND STOP THE MEASUREMENT

**START:**

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

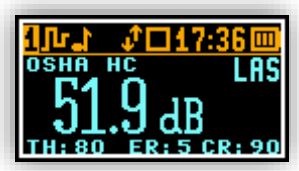



**Figure 4-17 ONE RESULT mode view**

**STOP:**

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

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

## 4.12 AUTO-RUN MODE INFORMATION

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


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

## 4.13 SECURITY LOCK

The purpose of locking the keypad and display during a measurement is to prevent the wearer or anyone else from tampering with the measurement. The SV 104A can be set to automatically enter the locked mode when

it is started. This automatically prevents tampering, but the unit can still be unlocked, if necessary, by pressing the correct sequence of keys.

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

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


**Figure 4-19 Unlocking the unit sequence screens**

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

## 4.14 REVIEWING MEASUREMENTS

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

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

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

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

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

## 4.15 CONTROLLING THE INSTRUMENT VIA BLUETOOTH®

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

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

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


**Figure 4-20 Switching the Bluetooth® on**

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

## 4.16 SWITCHING OFF MICROPHONE COMPENSATION

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

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

To access the **Microphone** menu, press and hold for 3 seconds the ▼ and ↵ keys simultaneously. To switch the compensation on or off, press the ▶ key. Press ↵ and **Accept** to confirm the selection.


**Figure 4-21 Disabling the Free Field filter**

## 4.17 DATA DOWNLOAD AND UPLOAD

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

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

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


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

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

## 4.18 RESETTING THE DOSIMETER

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

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

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

# 5 SV 104A MAINTENANCE

## 5.1 GENERAL RECOMMENDATIONS FOR USE

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

## 5.2 CLEANING

A few things to remember:

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

## 5.3 IN SITU CALIBRATION

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

## 5.4 PERIODIC TESTING

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

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

## 5.5 CHANGING THE MICROPHONE AND WINDSCREEN

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

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

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

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

## 5.6 FIRMWARE UPDATE

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

To update the instrument firmware:

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


**Figure 5-1 BOOTSTRAP mode view**

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

***Note:*** *Using the Supervisor, it is very easy to check for new firmware releases available for download (see Appendix R).*

## 5.7 STORING THE INSTRUMENT

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

## 5.8 TRANSPORTATION AND CARRYING

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

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

## 5.9 TROUBLESHOOTING

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

# 6 RISK ASSESSMENT AND MITIGATION OF RISK

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

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

For details see:


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


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


- Chapter 4, RUNNING AND OPERATING BASIC PROCEDURES, page 32
- Chapter 7, SV 104A MAINTENANCE, page 46

# 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.

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.*

# 8 REMOTE CONTROL AND DEDICATED SOFTWARE

The basic control operations of the instrument include:

- Control measurements.
- Viewing measurement results.
- Download files.
- Instrument configuration.

Some of these operations can be performed manually from the instrument's control panel, but you can also use Svantek dedicated software.

Svantek offers several software solutions for data downloading and processing as well as remote control and communication with SV 104B depending on the user's needs and possibilities:

- *Supervisor* - PC software for data downloading via the USB or RS232 connection with a PC, and reporting,
- *Assistant Pro* – mobile device application for general measurements (via Bluetooth® connection with a mobile device),
- *Remote Dosimetry* – mobile device application for connection to the *SvanNET* web service (via Bluetooth® connection with a mobile device),

The *Supervisor* installation package is available to download from the official Svantek website. *Assistant Pro* and *Remote Dosimetry* can be installed via the *Google Play Store or App Store* platforms.

The *SvanNET* web service provides users with basic functions, such as viewing real-time measurement results, starting/stopping measurements, downloading files and reconfiguring measurement instruments.

The general functionality of *Supervisor* and *Assistant Pro* is described in Appendix R.

Most of the software's functionality is described in:

- Supervisor User Manual
- SvanNET User Manual.

The remote control of the instrument via the USB interface or Bluetooth uses the setting codes described in Appendix A.

# APPENDIX A REMOTE CONTROL

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

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

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

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

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

## A.1 INPUT / OUTPUT TRANSMISSION TYPES

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

**#1** input/output of the control setting codes,

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

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

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

**#5** read out of the statistical analysis results,

**#7** special control functions,

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

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

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

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

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

or

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

where:

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

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

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

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

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

**#1;**

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

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

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

**#1,U104,N12342,W1.07.1,Q0.01,M4,F2:1,F3:2,F1:3,J2:1,J3:2,J1:3,f1,C1:1,C0:2,C2:3,B0:1,B3:2,B15:3,b0,d1s,D10s,K5,L0,Y3,y0,XC115:1,XC115:2,XC115:3,XI115:1,XI115:2,XI115:3,S0,T1,e480,c1:1,c1:2,c1:3,h0:1,h0:2,h0:3,x3:1,x3:2,x5:3;**

means that:

- SV 104A is investigated (U104);
- number is 12342 (N12342);
- software version number is 1.07.1;
- calibration factor is equal to 0.01 dB (Q0.01);
- **DOSE METER** is selected as the measurement function (M4);
- **A** filter is selected in profile 1 (F2:1);
- **C** filter is selected in profile 2 (F3:2);
- **Z** filter is chosen in profile 3 (F1:3);
- **A** Peak filter is selected in profile 1 (J2:1);
- **C** Peak filter is selected in profile 2 (J3:2);
- **Z** Peak filter is selected in profile 3 (J1:3);
- **Z** filter is selected for **1/1 OCTAVE or 1/3 OCTAVE** analysis (f1)
- **FAST** detector is selected in profile 1 (C1:1);
- **IMPULSE** detector is chosen in profile 2 (C0:2);
- **SLOW** detector is selected in profile 3 (C2:3);
- logger's buffer is not filled by the results from profile 1 (B0:1);
- **PEAK** and **MAX** values are stored in the files of the logger from profile 2 (B3:2);
- **PEAK**, **MAX**, **MIN** and **LEQ** values are stored in the files of the logger from profile 3 (B15:3);
- results of **1/1 OCTAVE** analysis are not stored in the files of the logger (b0);
- results are stored in a logger's file every 1 second (d1s);
- integration period is equal to 10 seconds (D10s);
- measurement has to be repeated 5 times (K5);
- linear detector is selected for **LEQ** calculations (L0);
- delay of the start of the measurements is equal to 3 seconds (Y3);
- synchronization the start of measurement with RTC is switched off (y0);
- threshold level for PTC calculation in profile 1, is set to 115 dB (XC115:1);
- threshold level for PTC calculation in profile 2, is set to 115 dB (XC115:2);
- threshold level for PTC calculation in profile 3, is set to 115 dB (XC115:3);
- threshold level for ULT calculation in profile 1, is set to 115 dB (XI115:1);
- threshold level for ULT calculation in profile 2, is set to 115 dB (XI115:2);
- threshold level for ULT calculation in profile 3, is set to 115 dB (XI115:3);
- instrument is in the Stop state (S0);
- logger is active (T1);
- exposition time is set to 8 hours (e480);
- criterion level in profile 1 is chosen as 80 dB (c1:1);
- criterion level in profile 2 is chosen as 80 dB (c1:2);
- criterion level in profile 3 is chosen as 80 dB (c1:3);

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

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

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

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

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

**#2 function** has the format defined as follows:

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

where:

**<aver>** – type of results:

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

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

**<profile>** – profile number:

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

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

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

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

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

or

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

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

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

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

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

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

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

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

**#2,1,v1,V0,T146,P89.47,M64.73,N46.90,S56.47,D0,d0,p0,A0.00,R50.56,U72.20,u95.15,E0.00,e0.00,l(480)50.57,J27.61,Y53.92,Z54.63,L(01)60.40,L(10)49.80,L(20)48.50,L(30)47.90,L(40)47.70,L(50)47.50,L(60)47.30,L(70)47.10,L(80)46.80,L(90)46.40,C0,c0,I0,W-38.12,w0.01,a4.73,t0;**

***Note:*** *The presented above order of the measurement results sent out by the instrument does not depend about the characters sent to the unit.*

**Example:** After sending to the instrument the string:

**#2,1,T?,R?,V?,P?,L?;**

the unit sends out the results of measurement coming from the first profile in predefined, described above, order:

**#2,1,V0,T146,P89.47,R50.56,L(01)60.40,L(10)49.80,L(20)48.50,L(30)47.90,L(40)47.70,L(50)47.50,L(60)47.30,L(70)47.10,L(80)46.80,L(90)46.40;**

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

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

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

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

**#3 function** format is defined as follows:

**#3;**

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

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

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

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|

where:

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

D5 = 0 means that "spectrum is not averaged ",
= 1 means that "spectrum is averaged ",

D4 = 0 the instantaneous current result (RUN State),
= 1 the final result (STOP State),

D3 = 1 results in **1/3 OCTAVE** mode,

D2 = 1 results in **1/1 OCTAVE** mode,

D6, D3, D1, D0 reserved bits.

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

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

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

**#4 function** formats are defined as follows:

**#4,0,\;** the file containing the catalogue,

**#4,0,?;** the count of the files,

**#4,0,index,count;** the part of the file containing the catalogue,

where:

**index** - first record,
**count** - number of records in the catalogue.

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

**#4,1,fname,?;** file size,

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

where:

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

**#4,4;** the current settings file,

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

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

where:

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

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

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

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

**#4,?;**

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

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

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

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

**#5 function** format is defined as follows:

**#5,p;**

where:

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

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

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

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

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|

where:

D7 = 0 means "overload does not happen",

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

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

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

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

where:

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

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

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

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

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

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

## A.7 FUNCTION #7 - SPECIAL CONTROL FUNCTIONS

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

**#7 function** formats are defined as follows:

**#7,AC;**

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

**#7,AC,x;**

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

**#7,AP;**

Reserved.

**#7,AR;**

Reserved.

**#7,AS;**

Get settings for the Auto-Run function.

Response format:

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

where:

e – On (e=1), Off (e=0),

HH – hour of the measurement start,

MM – minutes of the measurement start,

hh – hour of the measurement stop,

mm – minutes of the measurement stop,

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

bit:0 – Monday,

...

bit:6 – Sunday

mR – maximum number of the measurement days,

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

where:

e – On (e=1), Off (e=0),

HH – hour of the measurement start,

MM – minutes of the measurement start,

hh – hour of the measurement stop,

mm – minutes of the measurement stop,

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

bit:0 – Monday,

...

bit:6 – Sunday

mR – maximum number of the measurement days,

Response format:

**#7,AS;**

**#7,AV;**

Reserved.

**#7,BC;**

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

**#7,BD;**

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

**#7,BN;**

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

**#7,BS;**

This function returns battery state in %.

**#7,BP;**

This function returns the bluetooth PIN number.

Response format:

**#7,BT,nnnn;**

where:

**n:** **-** PIN number,

**#7,BP,nnnn;**

This function sets the the bluetooth PIN number.

where:

**n:** **-** PIN number,

**#7,BT;**

This function returns the state of the bluetooth power.

Response format:

**#7,BT,n;**

where:

**n:**

0 – Off

1 - On,

**#7,BT,n;**

This function sets the state of the bluetooth power.

where:

**n:**

0 – Off

1 - On,

**#7,BV;**

This function returns battery voltage in 10 mV.

**#7,CH;**

Get number of records calibration history.

Response format:

**#7,CH,n;**

where:

**n** – number of records calibration history,

**#7,CH,n;**

Get one record from calibration history.

where:

**n** – record number in the history of calibration,

Response format:

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

where:

**n** – record number in the history of calibration,

**cT** – type of calibration:

0 - none,

1 - by measurement,

2 - by sensitivity,

3 - factory calibration,

**hh:mm:ss** – time of calibration,

**DD/MM/YYYY** – date of calibration,

**cF** – calibration factor.

**cL** – calibration level.

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

**#7,CS;**

This function restores the factory settings.

**#7,CT;**

Get date and time of last calibration;

Response format:

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

where:

**hh:mm:ss** – time,

**DD-MM-YYYY** – date.

**#7,DL;**

Reserved.

**#7,DS,file_name;**

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

**#7,ED;**

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

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

**#7,EV;**

This function returns external power voltage in 10 mV.

**#7,FS;**

This function returns file system version.

**#7,FT;**

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

**#7,IC;**

Reserved.

**#7,KL,x;**

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

**#7,KL;**

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

**#7,LA;**

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

**#7,LB;**

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

**#7,LF;**

This function restore Teds factory calibration.

**#7,LS,setup_name;**

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

**#7,LT;**

This function reloads microphone parameters from TEDS.

**#7,LW;**

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

**#7,MC;**

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

**#7,MC,x;**

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

**#7,NF;**

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

**#7,NS;**

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

**#7,PI;**

This function returns PIC version.

**#7,PO;**

This function powers off the instrument.

**#7,RT;**

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

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

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

**#7,SC;**

Reserved.

**#7,SD;**

Get date and time of last loaded setup file;

Response format:

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

where:

**hh:mm:ss** – time,

**DD/MM/YYYY** – date.

**#7,SE;**

Reserved.

**#7,SF;**

Reserved.

**#7,SL;**

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

**#7,SL,sl_index,sl_level;**

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

**#7,SN;**

Get last loaded setup file name;

Response format:

**#7,SN,name;**

where:

name – setup file name.

**#7,SP;**

Reserved.

**#7,SS;**

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

**#7,ST;**

Get Standby Delay.

Response format:

**#7,ST,xxx;**

where:

xxx – time to standby in [s].

**#7,ST,x;**

Set Standby Delay.

where:

xxx – time to standby in [s].

Response format:

**#7,ST;**

**#7,TC;**

This function returns TEDS calibration factor**;**

**#7,TF;**

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

**#7,TP;**

Get temperature.

Response format:

**#7,TP,xx.x;**

where:

**xx.x** – temperature in [˚C].

**#7,TT;**

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

**#7,TU;**

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

**#7,UF;**

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

**#7, UF,x;**

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

**#7,UN;**

This function returns unit name;

**#7,US;**

This function returns unit subversion.

**#7,UV;**

This function returns usb voltage in 10 mV.

**#7,VB;**

This function returns the Bootstrap software version.

**#7,VH;**

This function returns the Hardboot software version.

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

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

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

**#9 function** formats are defined as follows:

**#9,FILE_TYPE,FILE_LENGTH,DATA**

where:

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

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

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

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

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

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

   Response:

   #D,d; - command was executed

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

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

   Response:

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

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

   Response:

   #D,w; - command was executed

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

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

   Response:

   #D,e; - command was executed

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

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

   Response:

   #D,e; - command was executed

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

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

   Response:

   #D,m; - command was executed

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

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

   Response:

   #D,f; - command was executed

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

## A.10 CONTROL SETTING CODES

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

**Table A.1. Control setting codes**

| Group name | Group code | Code description |
|---|---|---|
| Unit type | **U** | U104 (read only) |
| Serial number | **N** | Nxxxx (read only) |
| Software version | **W** | Wyyy yyy - revision number (read only) |
| Calibration factor | **Q** | Qnnnn nnnn - real number with the value of the calibration factor ∈(-19.9 ÷ 19.9) |
| Measurement function | **M** | M2 - **1/1 OCTAVE** analyser<br>M3 - **1/3 OCTAVE** analyser<br>M4 - **DOSE METER** |
| Filter type in profile n | **F** | F1:n - **Z** filter for profile n<br>F2:n - **A** filter for profile n<br>F3:n - **C** filter for profile n |
| Filter type for Peak result calculation in profile n | **J** | J1:n - **Z** filter for profile n<br>J2:n - **A** filter for profile n<br>J3:n - **C** filter for profile n |
| Detector type in profile n | **C** | C0:n - **IMPULSE** detector in profile n<br>C1:n - **FAST** detector in profile n<br>C2:n - **SLOW** detector in profile n |
| Filter type in **1/1 OCTAVE** analysis | **f** | f1 - **Z** filter<br>f2 - **A** filter<br>f3 - **C** filter |
| Logger type in profile n | **B** | Bx:n - x - sum of the following flags flags:<br>1:n - logger with **PEAK** values in profile n<br>2:n - logger with **MAX** values in profile n<br>4:n - logger with **MIN** values in profile n<br>8:n - logger with **LEQ** values in profile n<br>16:n - logger with **LAV** values in profile n |
| Storing the results of **1/1 OCTAVE** or **1/3 OCTAVE** analysis in logger's file | **b** | bx - x - sum of the following flags flags:<br>8 - logger with **LEQ** values |
| Logger step | **d** | dnns - nn number in seconds ∈(1 ÷ 60)<br>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)<br>Dnns - nn number in seconds<br>Dnnm - nn number in minutes<br>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)<br>Knnnn - nnnn number of repetitions $\in$(1 ÷ 1000) |
| Detector type in the **LEQ** function | **L** | L0 - **LINEAR**<br>L1 - **EXPONENTIAL** |
| Exposure Time | **e** | ennn - nnn time in minutes $\in$ (1 ÷ 720) |
| Criterion Level | **c** | c1:p - 80 dB<br>c2:p - 84 dB<br>c3:p - 85 dB<br>c4:p - 90 dB<br>c5:p - 60 dB<br>c6:p - 65 dB<br>c7:p - 70 dB<br>c8:p - 75 dB<br>c9:p - 87 dB<br>c10:p - 81 dB<br>c11:p - 82 dB<br>c12:p - 83 dB<br>p: 1, 2, 3 - profile number |
| Threshold Level | **h** | h0:p - None<br>h1:p - 70 dB<br>h2:p - 75 dB<br>h3:p - 80 dB<br>h4:p - 85 dB<br>h5:p - 90 dB<br>h6:p - 60 dB<br>h7:p - 65 dB<br>p: 1, 2, 3 - profile number |
| Exchange Rate | **x** | x2:p - 2<br>x3:p - 3<br>x4:p - 4<br>x5:p - 5 |

| | | |
|---|---|---|
| | | x6:p - 6<br>p: 1, 2, 3 - profile number |
| Logger | **T** | T0 - switched off (**[ ]**)<br>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**)<br>y1 - synchronization to 1 min.<br>y15 - synchronization to 15 min.<br>y30 - synchronization to 30 min.<br>y60 - synchronization to 1 hour. |
| State of the instrument<br>(Stop, Start or Pause) | **S** | S0 - **STOP**<br>S1 - **START**<br>S2 - **PAUSE** |
| Threshold level for PTC calculation | **XC** | XCnnn:p - nnn level in dB ∈ (70 ÷ 140)<br>p: 1, 2, 3 - profile number |
| Threshold level for ULT calculation | **Xl** | Xlnnn:p - nnn level in dB ∈ (70 ÷ 140)<br>p: 1, 2, 3 - profile number |

# APPENDIX B DATA FILE STRUCTURES

## B.1 GENERAL STRUCTURE OF THE SV 104A FILE

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

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

Each file has the following elements:

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

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

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

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

**Table B.1.1. SvanPC file header**

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

**Table B.1.2. File header**

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

**Table B.1.3. Unit and software specification**

| Word number | Name | Comment |
|---|---|---|
| 0 | 0xnn02 | [02, nn=specification’s length] |
| 1 | UnitNumberL | unit number (LSB word) |
| 2 | UnitType | type of the unit: 104 |
| 3 | SoftwareVersion | software version: 107 |
| 4 | SoftwareIssueDate | software issue date |
| 5 | DeviceMode | mode of the instrument |
| 6 | UnitSubtype | subtype of the unit:<br>7 - SV 104A |
| 7 | FileSysVersion | file system version: 107 |
| 8 | reserved | Reserved |
| 9 | SoftwareSubversion | software subversion: 1 |
| 10..11 | MicrophoneSN | the serial number of the microphone<br>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:<br>0 - none<br>1 - **BY MEASUREMENT**<br>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:<br>0 - none<br>1 - **BY MEASUREMENT**<br>3 - **FACTORY CALIBRATION**<br>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:<br>2 - **1/1 OCTAVE** analyser,<br>3 - **1/3 OCTAVE** analyser,<br>4 - **DOSE METER** |

| | | |
|---|---|---|
| 4 | MeasureInput | measurement input type:<br>2 - **Microphone** |
| 5 | Range | measurement range:<br>2 - **SINGLE** |
| 6 | UnitFlags | calibration flags:<br>b0 - if set to 1: calibration coefficient is used<br>b3 - if set to 1: overload occurred<br>b7,b6,b5: type of the result **Lden**<br>000 – **Lden** result is not available<br>001 – **Ld** result<br>010 – **Le** result<br>011 – **Lde** result<br>100 – **Ln** result<br>101 – **Lnd** result<br>110 – **Len** result<br>111 – **Lden** result |
| 7 | RepCycle | repetition cycle:<br>0 - infinity<br>nnnn - number of repetitions $\in(1 \div 1000)$ |
| 8 | NofChannel | number of channels (1) |
| 8 | NofProf | number of profiles (3) |
| 10 | StartDelay | start delay time |
| 11..12 | IntTimeSec | integration time specified in seconds |
| 13 | InterfaceMode | reserved |
| 14 | LeqInt | reserved |
| 15 | SpectrumFilter | **1/1** or **1/3 OCTAVE** analysis filter:<br>1 - **Z**,<br>2 - **A**,<br>3 - **C**<br>in other cases:<br>Reserved |
| 16 | SpectrumBuff | **1/1** or **1/3 OCTAVE** logger:<br>sum of the following flags:<br>8 - logger with **Leq** values<br>in other cases:<br>reserved |
| 17 | ExposureTime | exposure time: 1..720 (min) |
| 18 | Leq & Lav | the method of viewing results Leq and Lav<br>0 - **Both**<br>1 - **Mutually exclusive (**visibility depends of the EXCHANGE RATE parameter**)** |
| 19 | MicComp | compensating filter for microphones:<br>0 - switched off,<br>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**):<br>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**):<br>0, 60, 65, 70, 75, 80, 85, 90 (*10 dB) |
| 28 | ExchangeRate[1] | the 1st profile exchange rate (only **DOSE METER**):<br>2, 3, 4, 5, 6 |
| 29 | CriterionLevel[2] | the 2nd profile criterion level (only **DOSE METER**):<br>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)**:<br>0, 60, 65, 70, 75, 80, 85, 90 (*10 dB) |
| 31 | ExchangeRate[2] | the 2nd profile exchange rate (only **DOSE METER**):<br>2, 3, 4, 5, 6 |
| 32 | CriterionLevel[3] | the 3rd profile criterion level (only **DOSE METER**):<br>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**):<br>0, 60, 65, 70, 75, 80, 85, 90 (*10 dB) |
| 34 | ExchangeRate[3] | the 3rd profile exchange rate (only **DOSE METER**):<br>2, 3, 4, 5, 6 |
| 35 | MainResBuff | Summary results. Contents defined as a sum of:<br>0 - none<br>1 - **Main Results**<br>2 - **Spectrum**<br>4 - **Spectrum MAX**<br>8 - **Spectrum MIN**<br>16 - **reserved**<br>32 - **Statistical levels**<br>64 - **Statistical analysis in profiles**<br>128 – **reserved** |
| 36 | StartSync | Synchronization the start of measurement with RTC<br>0 - switched off.<br>1 - synchronization to **1 min**.<br>15 - synchronization to **15 min**.<br>30 - synchronization to **30 min**.<br>60 - synchronization to **1 hour**. |
| 37 | CalMic10 | reserved |
| 38 | FreeField | Free Field compensating filter for microphones:<br>0 - switched off,<br>1 - switched on |
| 39 | ProfileMask | Active profiles. Contents defined as a sum of:<br>1 - 1st profile<br>2 - 2nd profile<br>4 - 3rd profile |
| 40 | Pause[1] | Programmable pause no. 1. |
| 41 | PauseBegin[1] | The start time of the pause no. 1 in format 0xhhmm<br>hh – hour<br>mm – minute |

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

**Table B.1.9. Event signal recording parameters**

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

| | | |
|---|---|---|
| 4 | TriggerGrad | gradient of triggering:<br>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:<br>0 - recording to the end of measurement<br>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:<br>1 - **Z**,<br>2 - **A**,<br>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:<br>0 - **OFF**,<br>1 - recording whole measurement<br>2 - recording on trigger **SLOPE+**<br>3 - recording on trigger **SLOPE–**<br>4 - recording on trigger **LEVEL+**<br>5 - recording on trigger **LEVEL–**<br>6 - recording on trigger **GRAD+**<br>7 - recording on trigger **MANUAL** |
| 2 | TriggerSource | source of the triggering signal:<br>0 - **Leq(1)** the **Leq** result from the first profile |
| 3 | TriggerLevel | level of triggering:<br>50 ÷ 136 dB (*10) |
| 4 | TriggerGrad | gradient of triggering:<br>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:<br>0 - recording to the end of measurement<br>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:<br>1 - **Z**,<br>2 - **A**,<br>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:<br>0 - **IMP.**,<br>1 - **FAST**,<br>2 - **SLOW** |
| 4 | FilterP[1] | filter type in the 1st profile:<br>1 - **Z**,<br>2 - **A**,<br>3 - **C** |
| 5 | BufferP[1] | logger contents in the 1st profile defined as a sum of:<br>0 - none,<br>1 - Lxpeak[1]<br>2 - Lxymax[2]<br>4 - Lxymin[2]<br>8 - Lxyeq[23]<br>16 - **LAV** |
| 6 | FilterPeakP[1] | filter type for Peak result calculation in the 1st profile:<br>1 - **Z**,<br>2 - **A**,<br>3 – **C** |
| 7 | reserved | reserved |
| 8 | 0xmm06 | [06, mm=sub-block's length] |
| 9 | DetectorP[2] | detector type in the 2nd profile:<br>0 - **IMP.**,<br>1 - **FAST**,<br>2 - **SLOW** |

| | | |
|---|---|---|
| 10 | FilterP[2] | filter type in the 2nd profile:<br>1 - **Z**,<br>2 - **A**,<br>3 - **C** |
| 11 | BufferP[2] | logger contents in the 2nd profile defined as a sum of:<br>0 - none,<br>1 - Lxpeak[1]<br>2 - Lxvmax[2]<br>4 - Lxvmin[2]<br>8 - Lxveq[23]<br>16 - **LAV** |
| 12 | FilterPeakP[2] | filter type for Peak result calculation in the 2nd profile:<br>1 - **Z**,<br>2 - **A**,<br>3 - **C** |
| 13 | reserved | reserved |
| 14 | 0xmm06 | [06, mm=sub-block's length] |
| 15 | DetectorP[3] | detector type in the 3rd profile:<br>0 - **IMP.**,<br>1 - **FAST**,<br>2 - **SLOW** |
| 16 | FilterP[3] | filter type in the 3rd profile:<br>1 - **Z**,<br>2 - **A**,<br>3 - **C** |
| 17 | BufferP[3] | logger contents in the 3rd profile defined as a sum of:<br>0 - none,<br>1 - Lxpeak[1]<br>2 - Lxvmax[2]<br>4 - Lxvmin[2]<br>8 - Lxveq[23]<br>16 - **LAV** |
| 18 | FilterPeakP[3] | filter type for Peak result calculation in the 3rd profile:<br>1 - **Z**,<br>2 - **A**,<br>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** or **1/3 OCTAVE** frequency (*100 Hz) |
| 4 | NOctTer | number of **1/1 OCTAVE** or **1/3 OCTAVE** results |
| 5 | NOctTerTot | number of **TOTAL** values |
| 6..7 | BuffLength | logger length (bytes) |
| 8..9 | RecsInBuff | number of records in the logger |
| 10..11 | RecsInObserv | number of records in the observation period equal to:<br>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;<br>i=0..N-1 |
| 3+i*(pp+1)+p | **Lnn**[i,p] | value of the **Lnn** statistics<br>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]<br>0xnn**0E** - averaged spectrum results,<br>0xnn**26** - min. spectrum results,<br>0xnn**27** - max. spectrum results |
| 1 | 0x0101 | [used_profile, profile's mask] |
| 2 | LowestFreq | the lowest **1/1 OCTAVE** frequency (*100 Hz): 3150 (**AUDIO BAND**) |
| 3 | NOct | number of **1/1 OCTAVE** values: 9 (**AUDIO BAND**) |
| 4 | NOctTot | number of **TOTAL** values: 3 |
| 5÷20 | Octave[i] | 1/1 octave[i] value (*100 dB); i=1÷NOct+NoctTot (1÷13) |
| … | … | … |

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

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

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

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

**Table B.1.22. SETUP file**

| Word number | Name | Comment |
|---|---|---|
| 0 | 0x0020 | [20, 00=block's length in the second word] |
| 1 | BlockLength | length of the block |
| 2..BlockLength-1 | SetupTextData | saved setup values |

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

| Word number | Name | Comment |
|---|---|---|
| 0 | 0xFFFF | file end marker |

**Table B.1.24. Unit text info**

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

## B.2 STRUCTURE OF THE FILE CONTAINING RESULTS FROM LOGGER'S FILE

SvanPC file header - cf. Tab. B.1.1.

File header - cf. Tab. B.1.2.

Unit and software specification - cf. Tab. B.1.3.

Calibration settings - cf. Tab. B.1.4.

USER'S text - cf. Tab. B.1.5.

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

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

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

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

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

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

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

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

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

## B.2.1 The contents of the files in the logger

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

### *B.2.1.1 Record with the results*

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

- flag record

< flags > :

- b0: 1- the overload detected, 0 - the overload not detected
- b1: 1- the excessive self-vibration detected, 0 - the excessive self-vibration not detected
- b2: 1- the No Motion detected, 0 - the No Motion not detected

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

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

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

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

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

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

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

(5) results of **1/1 OCTAVE** analysis or **1/3 OCTAVE** analysis if **1/1 OCTAVE** analysis or **1/3 OCTAVE** analysis was selected as the measurement function and the **LOGGER** was active (SpectrumBuff in Tab. B.1.6);
the sequence of words is written:

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

where:
Octave Leq[i] - the result of **1/1 OCTAVE** or **1/3 OCTAVE** Leq analysis (*100 dB); i = 1..NOct+NOctTot

#### *B.2.1.2 Record with the state of the markers*

The record with the state of the markers consists of one word:

<0x8nnn>

in which 12 bits nnn denote the state of the markers:

b11 = state of #12 marker

b10 = state of #11 marker

...

b1 = state of #2 marker

b0 = state of #1 marker

#### *B.2.1.3 Record with the breaks in the results registration*

The record with the breaks in the results registration consists of four words:

<0xB0ii> <0xB1jj> <0xB2kk> <0xB3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter of left or skipped records: nnkkjjii (ii is the least significant byte, nn – the most significant byte).

#### *B.2.1.4 Record with the breaks account PAUSE in the results registration*

The record with the breaks in the results registration consists of four words:

<0xA0ii> <0xA1jj> <0xA2kk> <0xA3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter duration of PAUSE in milliseconds:

nnkkjjii (ii is the least significant byte, nn - the most significant byte).

#### *B.2.1.5 Record with the wave file name*

The record with the wave file name consists of six words:

**<0xC2aa>**
**<0xccbb>**
**<0xeedd>**
**<0xggff>**
**<0xiihh>**
**<0xCAaa>**

in which:

**aa** - size of records,

**bb cc dd ee ff gg hh ii** - 8-bytes name of wave file name

#### *B.2.1.6 Record with Summary Results*

The format of the data frame is as follows:

| HS | L (optional) | D | L (optional) | HE |
|---|---|---|---|---|

where:

HS starting header (1 word)
L length of the block (field is optional and occurs only when b7..b0 in header are set to zero)
D Summary Data:
- Main results (cf. Tab. B.1.17)
- Statistical levels (optional, cf. Tab. B.1.18)
- 1/1 OCTAVE analysis results (optional, cf. Tab. B.1.19)
- 1/3 OCTAVE analysis results (optional, cf. Tab. B.1.20)
- The results of the statistical analysis in profiles(optional, cf. Tab. B.1.21)

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

The HEADER format is as follows:

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

where:

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

0 - HS

1 - HE

b10 - 0

b9 - 1

b8 - 1

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

### *B.2.1.7 Record with audio data*

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

The format of the data frame is as follows:

| HS | L | S | L | HE |
|---|---|---|---|---|

where:

HS starting header (1 word)

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

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

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

The HEADER format is as follows:

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

where:

b15 - 1

b14 - 0

b13 - 0

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

b11 - header type:

0 - HS

1 - HE

b10 - 1 denotes the first frame in the block

b9 - 1 denotes the last frame in the block

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

b8, b6÷b0 – reserved

### *B.2.1.8 Record with name of the comment file*

The format of the data frame is as follows:

| HS | D | HE |
|---|---|---|

where:

HS starting header (1 word)

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

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

The HEADER format is as follows:

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

where:

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

0 - HS

1 - HE

b10 - 1

b9 - 0

b8 - 0

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

## B.3 Structure of the SETUP file

SvanPC file header - cf. Tab. B.1.1.

File header - cf. Tab. B.1.2.

Unit and software specification - cf. Tab. B.1.3.

**SETUP DATA** - cf. Tab. B.1.22.

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

## B.4 Date and time

Following function written in C explain how the date and time are coded:

```
void ExtractDateTime(int date, unsigned int time, int dt[])
{
      dt[0] = time % 30;                  /* sec */
      dt[1] = (time/30) % 60;             /* min */
      dt[2] = time/1800;                  /* hour */

      dt[3] = date & 0x001F;              /* day */
      dt[4] = (date>>5) & 0x000F;         /* month */
      dt[5] = (date>>9) & 0x007F + 2000;  /* year */
}
```

# APPENDIX C TECHNICAL SPECIFICATIONS

## C.1 SPECIFICATION OF SV 104A AS DOSIMETER

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

**Statement of performance**

SV 104A meets requirements of the IEC 61252 ed1.2 (2017) and ASA/ANSI S1.25-1991 (R2024) standards for personal noise dosimeters.

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

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

| | |
|---|---|
| **SV 104A** | dosimeter/analyser including ST 104A microphone and SA 122A windscreen |
| **SV 34B** | Recommended Class 2 acoustic calibrator 114 dB@1000 Hz or equivalent (not included in the standard set) |

**Accessories included in SV 104A instrument set**

| | |
|---|---|
| **ST 104A** | ½ MEMS microphone, nominal sensitivity 2.5 mV/Pa, polarization 0 V |
| **SA 122A** | foam windscreen |
| **SC 156** | micro-USB to USB type A cable |

**Accessories available**

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

**Measured quantities**

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

**Conformance testing**

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

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

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

***Note:*** *The recommended time interval for periodic test of the dosimeter for checking its acoustic and electrical characteristics is one year.*

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

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

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

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

## Linear Operating Ranges

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

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

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

**Table C.1.** Linear operating ranges for Leq

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

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

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

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

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

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

**Noise exposure values displayed range** 0.01Pa²h ÷ 99.99 Pa²h

**Noise exposure values displayed resolution** 0.01 Pa²h

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

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

## Weighting filters

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

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

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

### Self-generated noise

Electrical, using the SC 104AT microphone adapter:

| | |
|---|---|
| **"A" weighting** | < 42 dB |
| **"C" weighting** | < 42 dB |
| **"Z" weighting** | < 52 dB |

Acoustical, compensated:

| | |
|---|---|
| **"A" weighting** | < 43 dB |
| **"C" weighting** | < 43 dB |
| **"Z" weighting** | < 53 dB |

## RMS detector

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

## Overload detector

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

## Underrange detector

The instrument has the built-in under-range detector. The "underrange" indication appears when the RMS value for the elapsed time is below the lower linear operating range.

## Time weighting characteristics (Exponential averaging)

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

**Reference conditions as per IEC 61252**

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

**Maximum peak voltage** 3 V Peak-Peak

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

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

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

**Nominal delay** 1 second

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

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

***Note:*** *When the instrument is moved from a warm environment with high humidity, to a colder environment, care should be taken to avoid condensation inside the instruments. In such case, much longer stabilization periods may be necessary.*

**Environmental, electrostatic** and radio frequency criteria

| | |
|---|---|
| **Effect of humidity** | < 0.5 dB (for 30%<RH<90% at 40°C and 1000 Hz) |
| **Effect of magnetic field** | meets requirements of IEC 61252 p.12.5 (below electrical noise level for 80 A/m @ 50/60 Hz) |

The maximum susceptibility (the least immunity) is achieved when in the Dosimeter the **Z** filter and time weighting **F** are selected, and the dosimeter measurements are considered.

The maximum susceptibility is achieved when the dosimeter is placed in plane of the magnetic field test coil, so the vertical axis of dosimeter is in parallel with wiring of the test frame (Fig. C.1).

In addition, with microphone cable, the maximum susceptibility is achieved when the dosimeter and cable is placed along field and the cable is coil as solenoid.

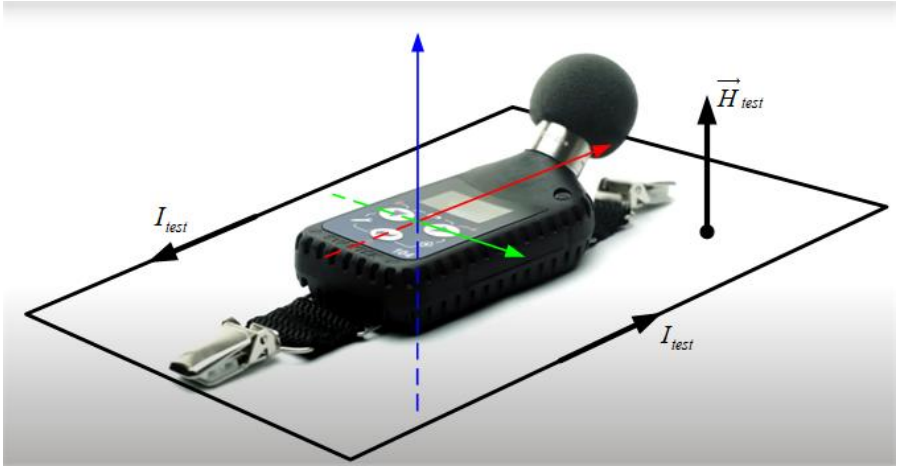



**Figure C.1 SV 104A placed in magnetic field test coil in the direction of maximum response**

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

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

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

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

During electrostatic discharge, the influence on the displayed results can be observed.

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

**Effect of ambient pressure** < 0.02 dB/kPa

**Effect of temperature** < 1.0 dB (from -10°C to +50°C)

**Effect of vibration**

Microphone type **ST 104A** on the dosimeter is mounted on the shaker. Vibration is applied in a direction perpendicular or parallel to the plane of the microphone diaphragm.

**Table C.2.** Typical effect of vibration perpendicular to the plane of microphone diaphragm

| f (Hz) | 15.8 | 31.5 | 62.5 | 125 | 250 | 500 | 1000 | 2000 |
|---|---|---|---|---|---|---|---|---|
| Typical effect of vibration [dB] | 53 | 58 | 53 | <30 | 48 | <30 | 72 | 51 |

**Table C.3.** Typical effect of vibration parallel to the plane of microphone diaphragm

| f (Hz) | 15.8 | 31.5 | 62.5 | 125 | 250 | 500 | 1000 | 2000 |
|---|---|---|---|---|---|---|---|---|
| Typical effect of vibration [dB] | <30 | <30 | <30 | 49 | <30 | 57 | <30 | 60 |

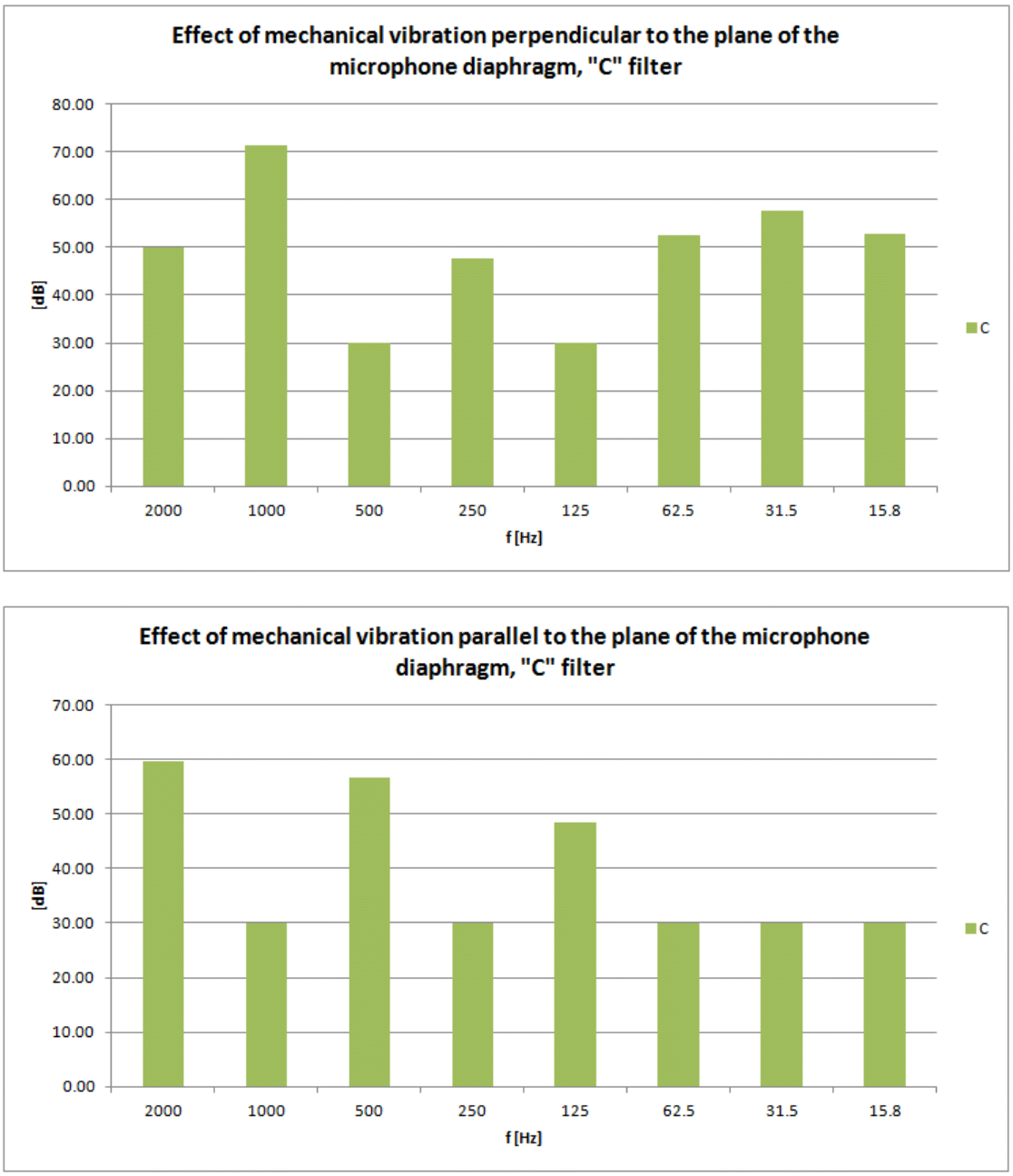



**Figure C.2 Effect of mechanical vibration**

| | |
|---|---|
| **Operating temperature range** | from -10°C to +50°C |
| **Storage temperature range** | from -20°C to +60°C |
| **Charging temperature range** | from 0°C to +40°C |

## 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 — Calibrator pressure level - 0.08 dB = 113.92 dB
  (equal to the calibration level for the pressure field minus Free Field correction of SV 104A at 1000 Hz - see Table C.8)

***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.*

## Microphone

| | |
|---|---|
| **ST 104A** | MEMS type (½" housing) |
| Nominal sensitivity | 1 mV/Pa (corresponding to app. -60 dBV/Pa re 1 V/Pa) |
| Impedance | 350 Ohm |

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

## ST 104A and SV 104A frequency characteristics

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

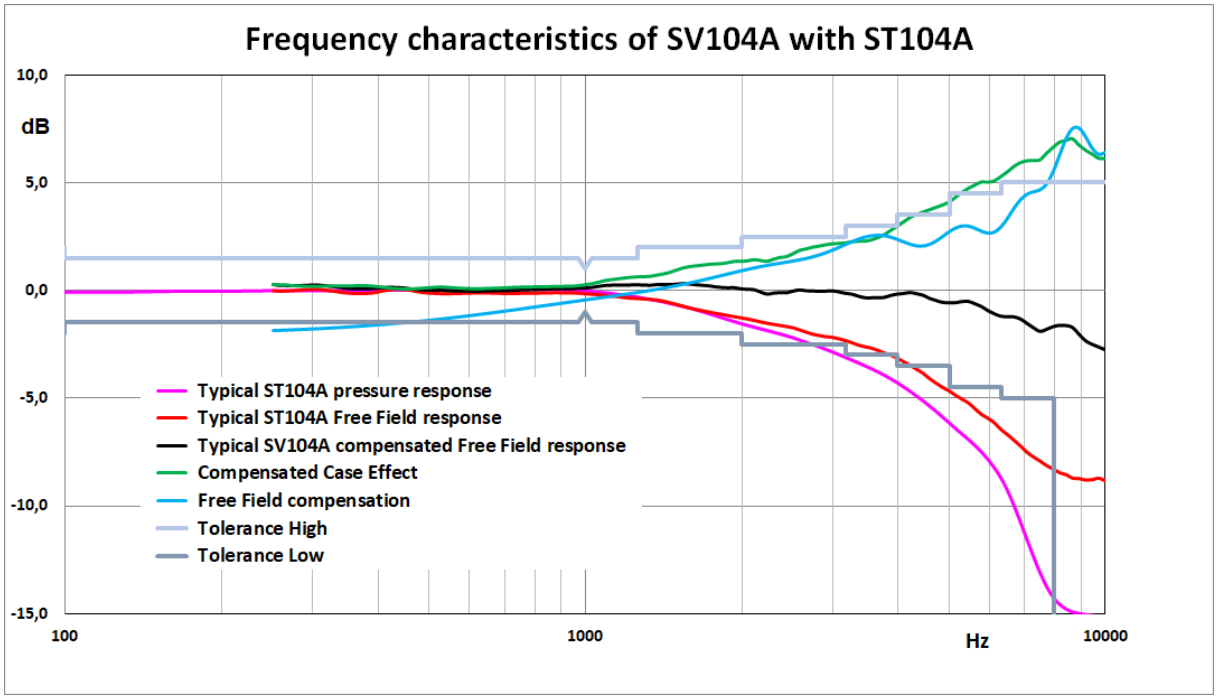



**Figure C.3 SV 104A frequency characteristics**

**Table C.4.** ST 104A Free Field corrections using the Bruel & Kjaer 4226

| Corrections [dB] | Frequency [Hz] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| Typical pressure response | 0.01 | -0.08 | -0.10 | 0.00 | 0.00 | -0.02 | -1.38 | -3.98 | -11.02 |
| Free Field corrections | 0.00 | 0.00 | 0.00 | 0.00 | -0.13 | -0.08 | 0.09 | 0.79 | 2.71 |
| Uncertainty (IEC 62585) | -- | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.35 |

**Table C.5.** ST 104A Free Field corrections with the use of the G.R.A.S. 51AB calibrator, and reference B&K 4192 ½" microphone

| Corrections [dB] | Frequency [Hz] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | 10000 |
| Typical pressure response | 0.08 | -0.04 | -0.07 | 0.00 | 0.02 | -0.01 | -1.53 | -4.27 | -14.24 | -15.24 |
| Free Field corrections | 0.00 | 0.00 | 0.00 | 0.00 | -0.16 | -0.09 | 0.24 | 1.08 | 5.93 | 6.39 |
| Uncertainty (IEC 62585) | -- | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.35 | 0.35 |

**Table C.6.** ST 104A and SV 104A typical frequency characteristics

| Frequency [Hz] | ST 104A Free Field response [dB] | SV 104A compensated Free Field response [dB] | Compensated case effect [dB] | Uncertainty (IEC 62585:2012) [dB] |
|---|---|---|---|---|
| **251** | 0.00 | 0.26 | 0.27 | 0.25 |
| 259 | -0.04 | 0.21 | 0.25 | 0.25 |
| 266 | -0.03 | 0.20 | 0.23 | 0.25 |
| 274 | 0.00 | 0.22 | 0.22 | 0.25 |
| 282 | -0.02 | 0.21 | 0.24 | 0.25 |
| 290 | 0.08 | 0.21 | 0.13 | 0.25 |
| 299 | 0.07 | 0.24 | 0.16 | 0.25 |
| 307 | 0.11 | 0.27 | 0.16 | 0.25 |
| **316** | 0.04 | 0.27 | 0.22 | 0.25 |
| 325 | -0.01 | 0.21 | 0.22 | 0.25 |
| 335 | -0.11 | 0.09 | 0.20 | 0.25 |
| 345 | -0.11 | 0.05 | 0.16 | 0.25 |
| 355 | -0.12 | 0.07 | 0.19 | 0.25 |
| 365 | -0.17 | 0.07 | 0.24 | 0.25 |
| 376 | -0.14 | 0.08 | 0.22 | 0.25 |
| 387 | -0.14 | 0.09 | 0.23 | 0.25 |
| **398** | -0.12 | 0.06 | 0.18 | 0.25 |
| 410 | -0.04 | 0.09 | 0.13 | 0.25 |
| 422 | 0.09 | 0.18 | 0.10 | 0.25 |
| 434 | 0.17 | 0.22 | 0.05 | 0.25 |
| 447 | 0.09 | 0.13 | 0.03 | 0.25 |
| 460 | -0.03 | 0.02 | 0.05 | 0.25 |
| 473 | -0.04 | 0.00 | 0.04 | 0.25 |
| 487 | -0.08 | 0.01 | 0.09 | 0.25 |

| Frequency [Hz] | ST 104A Free Field response [dB] | SV 104A compensated Free Field response [dB] | Compensated case effect [dB] | Uncertainty (IEC 62585:2012) [dB] |
|---|---|---|---|---|
| **501** | -0.13 | 0.02 | 0.16 | 0.25 |
| 516 | -0.17 | 0.00 | 0.16 | 0.25 |
| 531 | -0.15 | 0.00 | 0.15 | 0.25 |
| 546 | -0.12 | 0.02 | 0.14 | 0.25 |
| 562 | -0.15 | -0.02 | 0.12 | 0.25 |
| 579 | -0.14 | -0.06 | 0.08 | 0.25 |
| 596 | -0.13 | -0.07 | 0.06 | 0.25 |
| 613 | -0.10 | -0.03 | 0.07 | 0.25 |
| **631** | -0.09 | -0.01 | 0.07 | 0.25 |
| 649 | -0.10 | -0.04 | 0.07 | 0.25 |
| 668 | -0.13 | -0.04 | 0.09 | 0.25 |
| 688 | -0.13 | -0.03 | 0.11 | 0.25 |
| 708 | -0.14 | -0.01 | 0.13 | 0.25 |
| 729 | -0.14 | -0.01 | 0.12 | 0.25 |
| 750 | -0.13 | 0.01 | 0.14 | 0.25 |
| 772 | -0.12 | 0.05 | 0.17 | 0.25 |
| **794** | -0.11 | 0.04 | 0.15 | 0.25 |
| 818 | -0.11 | 0.04 | 0.15 | 0.25 |
| 841 | -0.12 | 0.04 | 0.16 | 0.25 |
| 866 | -0.11 | 0.05 | 0.16 | 0.25 |
| 891 | -0.08 | 0.10 | 0.19 | 0.25 |
| 917 | -0.09 | 0.11 | 0.20 | 0.25 |
| 944 | -0.11 | 0.07 | 0.17 | 0.25 |
| 972 | -0.15 | 0.05 | 0.19 | 0.25 |
| **1000** | -0.10 | 0.07 | 0.17 | 0.25 |
| 1029 | -0.15 | 0.19 | 0.34 | 0.25 |
| 1059 | -0.23 | 0.16 | 0.38 | 0.25 |
| 1090 | -0.22 | 0.19 | 0.41 | 0.25 |
| 1122 | -0.23 | 0.30 | 0.53 | 0.25 |
| 1155 | -0.28 | 0.28 | 0.56 | 0.25 |
| 1189 | -0.32 | 0.25 | 0.57 | 0.25 |
| 1223 | -0.35 | 0.21 | 0.56 | 0.25 |
| **1259** | -0.43 | 0.17 | 0.59 | 0.25 |
| 1296 | -0.38 | 0.32 | 0.69 | 0.25 |
| 1334 | -0.36 | 0.32 | 0.68 | 0.25 |
| 1372 | -0.41 | 0.18 | 0.60 | 0.25 |
| 1413 | -0.48 | 0.18 | 0.65 | 0.25 |
| 1454 | -0.54 | 0.33 | 0.87 | 0.25 |
| 1496 | -0.64 | 0.32 | 0.96 | 0.25 |
| 1540 | -0.76 | 0.29 | 1.04 | 0.25 |
| **1585** | -0.79 | 0.32 | 1.11 | 0.25 |
| 1631 | -0.87 | 0.29 | 1.16 | 0.25 |
| 1679 | -0.95 | 0.23 | 1.18 | 0.25 |
| 1728 | -0.98 | 0.18 | 1.16 | 0.25 |
| 1778 | -1.07 | 0.14 | 1.21 | 0.25 |
| 1830 | -1.09 | 0.21 | 1.30 | 0.25 |
| 1884 | -1.17 | 0.06 | 1.24 | 0.25 |
| 1939 | -1.20 | 0.07 | 1.26 | 0.25 |
| **1995** | -1.29 | 0.10 | 1.39 | 0.25 |

| Frequency [Hz] | ST 104A Free Field response [dB] | SV 104A compensated Free Field response [dB] | Compensated case effect [dB] | Uncertainty (IEC 62585:2012) [dB] |
|---|---|---|---|---|
| 2054 | -1.34 | 0.15 | 1.49 | 0.25 |
| 2113 | -1.35 | -0.04 | 1.31 | 0.25 |
| 2175 | -1.42 | -0.07 | 1.36 | 0.25 |
| 2239 | -1.53 | 0.00 | 1.53 | 0.25 |
| 2304 | -1.64 | -0.44 | 1.20 | 0.25 |
| 2371 | -1.63 | -0.33 | 1.30 | 0.25 |
| 2441 | -1.62 | 0.20 | 1.82 | 0.25 |
| **2512** | -1.68 | 0.06 | 1.74 | 0.25 |
| 2585 | -1.78 | -0.04 | 1.74 | 0.25 |
| 2661 | -1.94 | -0.08 | 1.87 | 0.25 |
| 2738 | -2.12 | -0.06 | 2.06 | 0.25 |
| 2818 | -2.15 | 0.01 | 2.16 | 0.25 |
| 2901 | -2.15 | 0.00 | 2.14 | 0.25 |
| 2985 | -2.10 | -0.09 | 2.01 | 0.25 |
| 3073 | -2.21 | -0.06 | 2.15 | 0.25 |
| **3162** | -2.27 | 0.02 | 2.29 | 0.25 |
| 3255 | -2.48 | -0.22 | 2.26 | 0.25 |
| 3350 | -2.56 | -0.33 | 2.23 | 0.25 |
| 3447 | -2.58 | -0.29 | 2.29 | 0.25 |
| 3548 | -2.78 | -0.52 | 2.26 | 0.25 |
| 3652 | -2.66 | -0.35 | 2.31 | 0.25 |
| 3758 | -2.79 | -0.26 | 2.53 | 0.25 |
| 3868 | -3.06 | -0.30 | 2.76 | 0.25 |
| **3981** | -3.19 | -0.20 | 2.99 | 0.25 |
| 4097 | -3.32 | -0.08 | 3.25 | 0.35 |
| 4217 | -3.31 | -0.03 | 3.29 | 0.35 |
| 4340 | -3.65 | -0.12 | 3.53 | 0.35 |
| 4467 | -3.87 | -0.08 | 3.79 | 0.35 |
| 4597 | -4.15 | -0.49 | 3.66 | 0.35 |
| 4732 | -4.26 | -0.42 | 3.84 | 0.35 |
| 4870 | -4.57 | -0.75 | 3.82 | 0.35 |
| **5012** | -4.71 | -0.61 | 4.09 | 0.35 |
| 5158 | -4.84 | -0.51 | 4.34 | 0.35 |
| 5309 | -4.94 | -0.60 | 4.34 | 0.35 |
| 5464 | -5.32 | -0.39 | 4.93 | 0.35 |
| 5623 | -5.48 | -0.50 | 4.98 | 0.35 |
| 5788 | -5.60 | -0.58 | 5.02 | 0.35 |
| 5957 | -6.17 | -1.07 | 5.10 | 0.35 |
| 6131 | -6.27 | -1.22 | 5.04 | 0.35 |
| **6310** | -6.20 | -1.35 | 4.86 | 0.35 |
| 6494 | -6.58 | -1.23 | 5.35 | 0.35 |
| 6683 | -7.13 | -1.14 | 5.99 | 0.35 |
| 6879 | -7.35 | -1.16 | 6.19 | 0.35 |
| 7079 | -7.56 | -1.28 | 6.28 | 0.35 |
| 7286 | -7.56 | -1.84 | 5.73 | 0.35 |
| 7499 | -8.03 | -2.26 | 5.77 | 0.35 |
| 7718 | -8.23 | -2.14 | 6.09 | 0.35 |
| **7943** | -8.31 | -1.99 | 6.32 | 0.35 |
| 8175 | -8.60 | -0.81 | 7.79 | 0.35 |

| Frequency [Hz] | ST 104A Free Field response [dB] | SV 104A compensated Free Field response [dB] | Compensated case effect [dB] | Uncertainty (IEC 62585:2012) [dB] |
|---|---|---|---|---|
| 8414 | -8.33 | -1.24 | 7.09 | 0.35 |
| 8660 | -8.90 | -1.93 | 6.97 | 0.35 |
| 8913 | -8.71 | -2.20 | 6.51 | 0.35 |
| 9173 | -9.12 | -2.43 | 6.69 | 0.35 |
| 9441 | -8.71 | -2.38 | 6.33 | 0.35 |
| 9716 | -8.65 | -2.75 | 5.90 | 0.35 |
| **10000** | -8.85 | -2.75 | 6.10 | 0.35 |

**Table C.7.** SV 104A combined Free Field corrections (ST 104A + Compensated Case Effect) using the Bruel & Kjaer 4226

| Corrections [dB] | Frequency [Hz] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| **Compensated Case Effect** | 0.00 | 0.00 | 0.00 | 0.27 | 0.16 | 0.17 | 1.39 | 2.99 | 6.32 |
| **Free Field corrections** | 0.00 | 0.00 | 0.00 | 0.26 | 0.02 | 0.09 | 1.48 | 3.78 | 9.03 |
| **Uncertainty (IEC 62585)** | -- | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.35 |

**Table C.8.** SV 104A combined Free Field corrections (ST 104A + Compensated Case Effect) using the G.R.A.S. 51AB comparison coupler and the reference B&K 4192 ½" microphone

| Corrections [dB] | Frequency [Hz] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | 10000 |
| **Compensated Case Effect** | 0.00 | 0.00 | 0.00 | 0.27 | 0.16 | 0.17 | 1.39 | 2.99 | 6.32 | 6.10 |
| **Free Field corrections** | 0.00 | 0.00 | 0.00 | 0.26 | 0.00 | 0.08 | 1.63 | 4.07 | 12.25 | 12.49 |
| **Uncertainty (IEC 62585)** | -- | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.49 | 0.49 |

## Directional characteristics of SV 104A

Directional response for dosimeter SV 104A with microphone ST 104A and SA 122A windscreen (symmetrical axis) for specified frequencies:

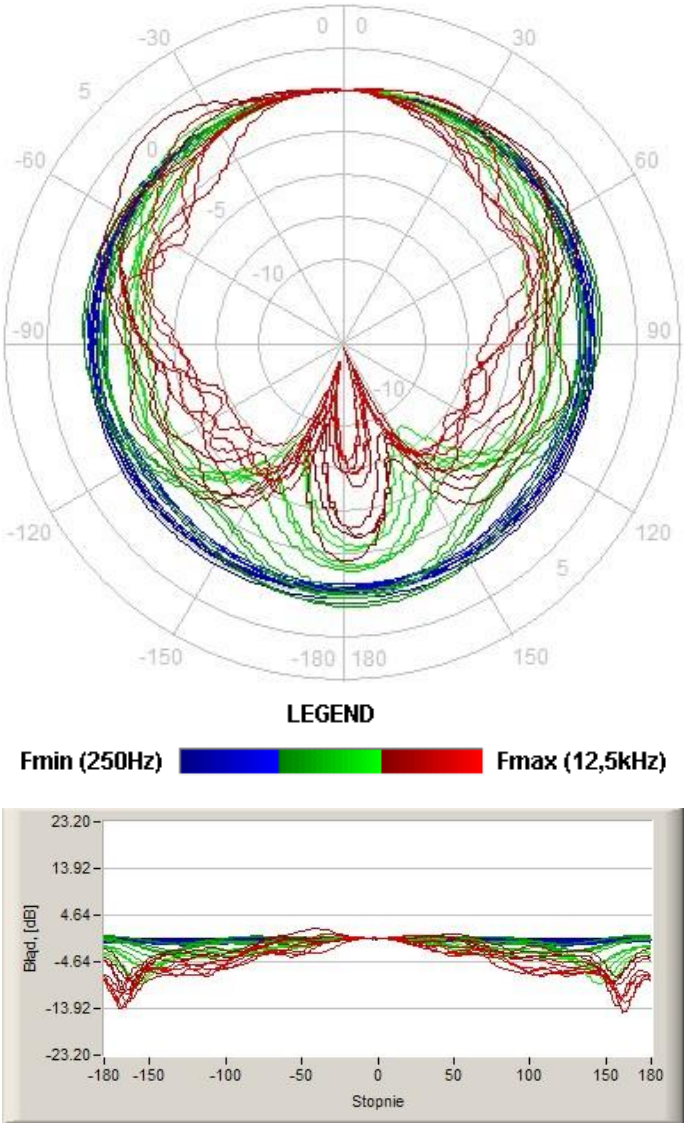
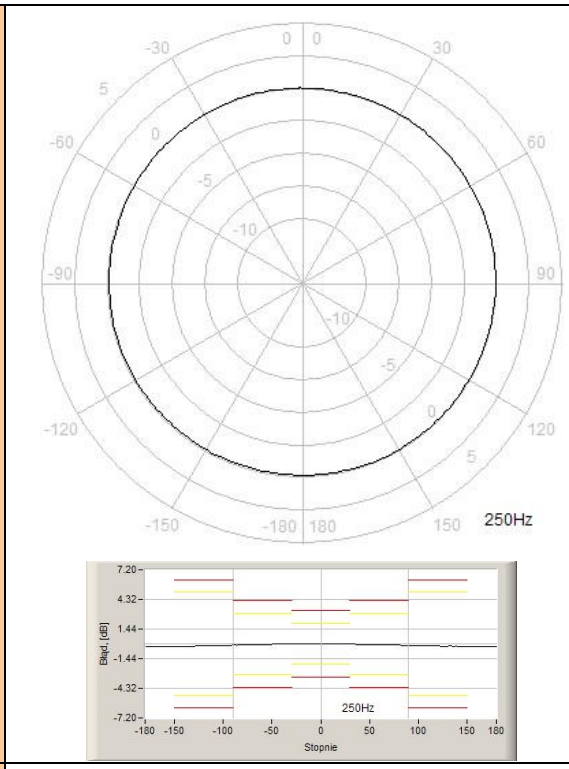


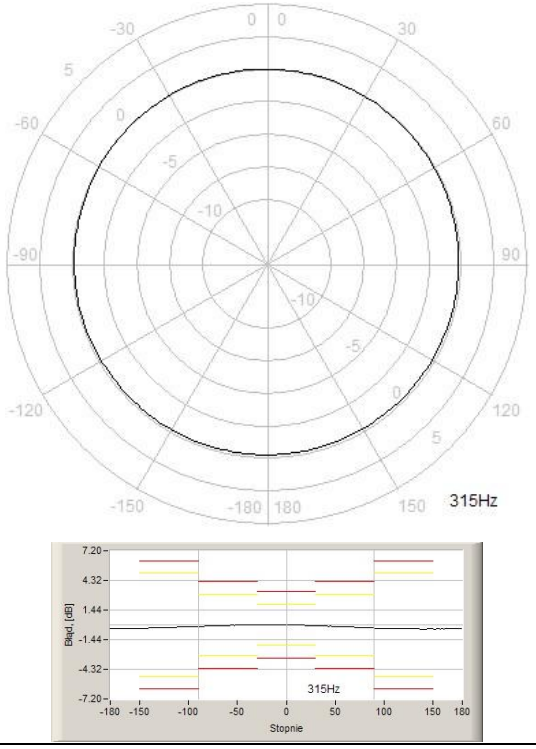

**Figure C.4 Total directional characteristics (symmetrical axis)**

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

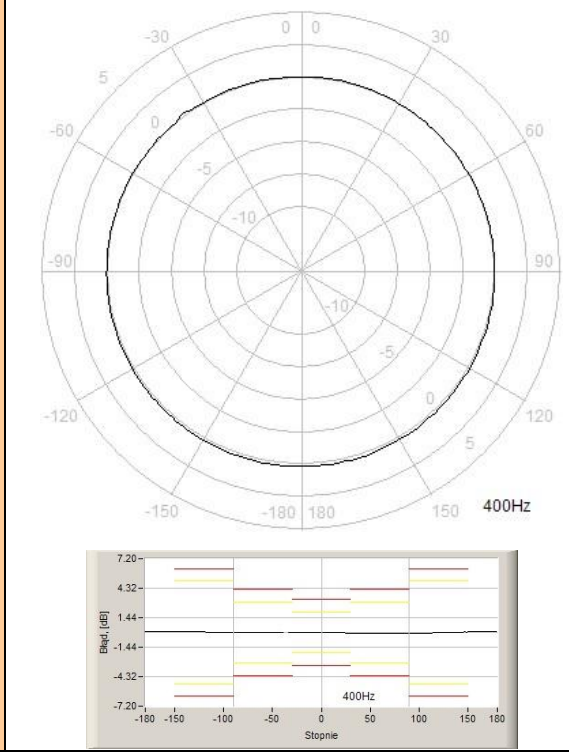
**250 Hz**



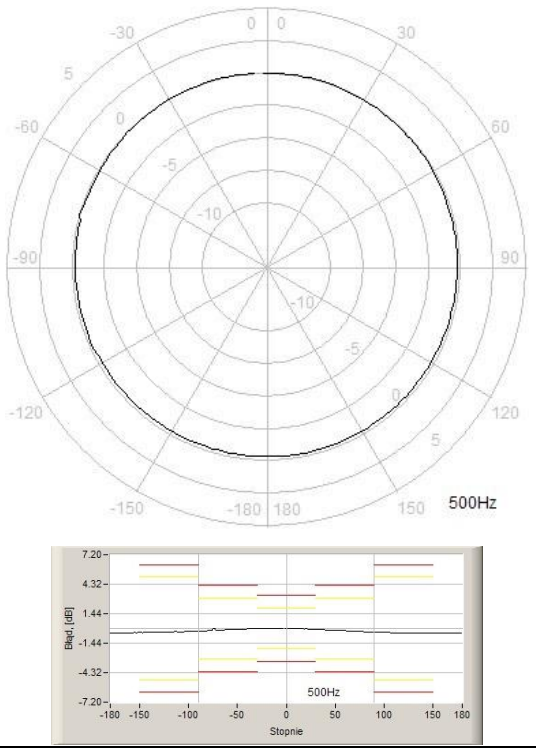

**315 Hz**



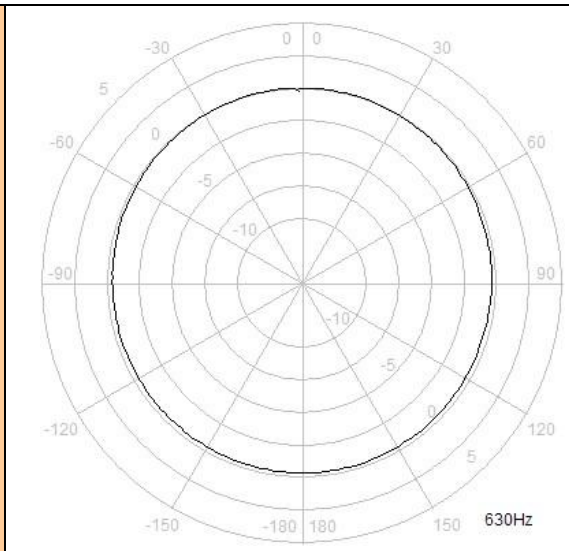

**400 Hz**



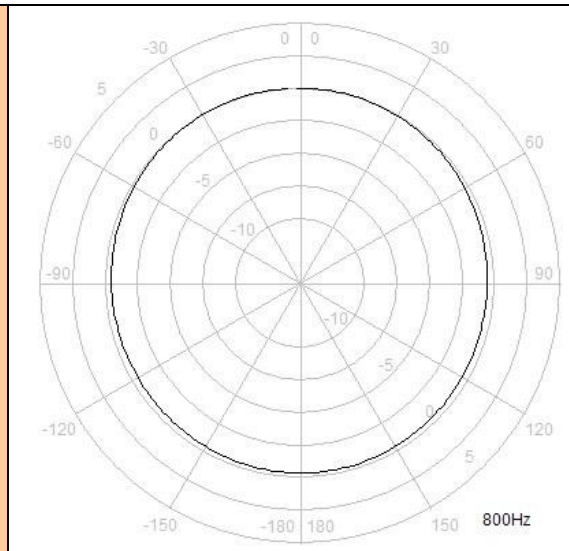

**500 Hz**



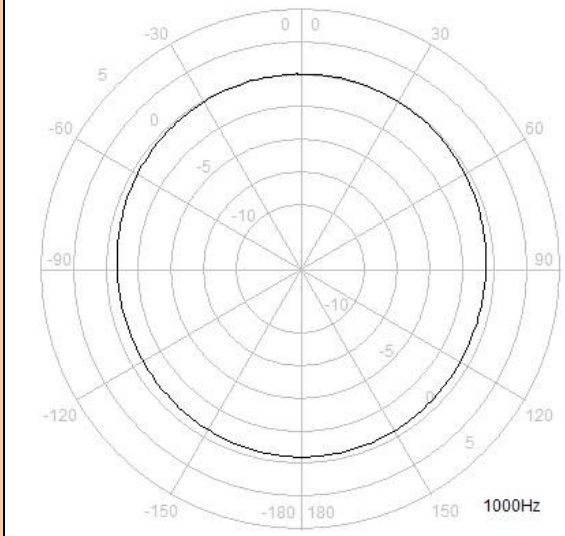
**630 Hz**



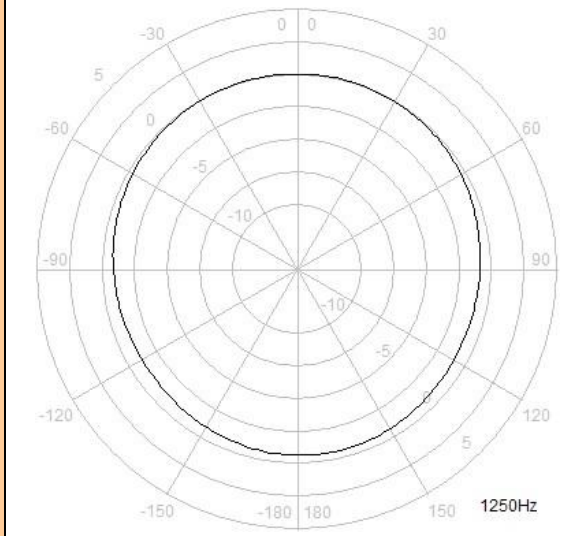

**800 Hz**



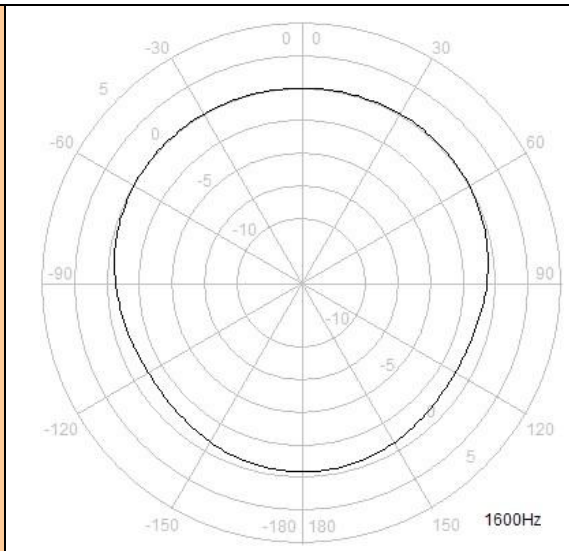

**1000 Hz**

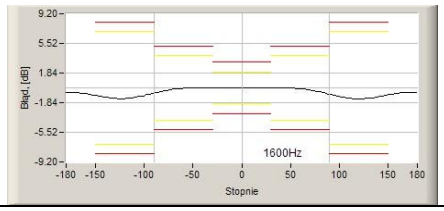



**1250 Hz**

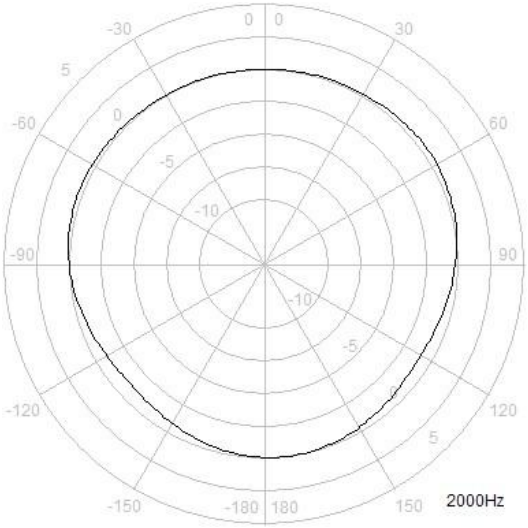


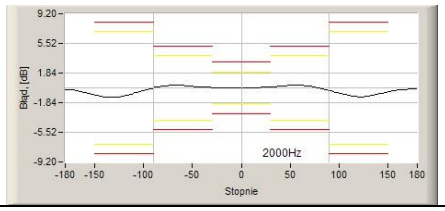
**1600 Hz**



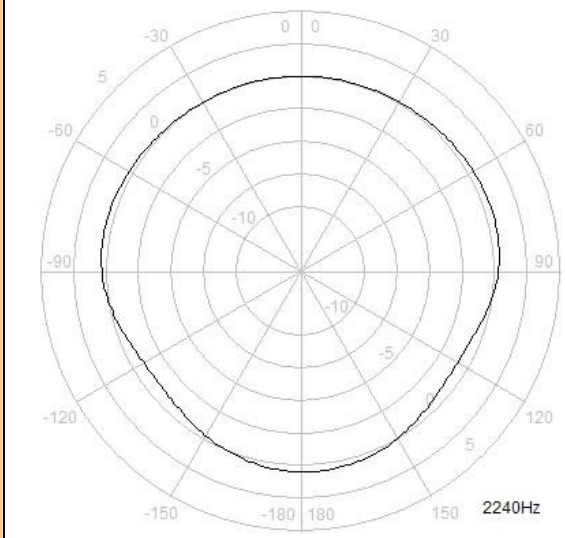



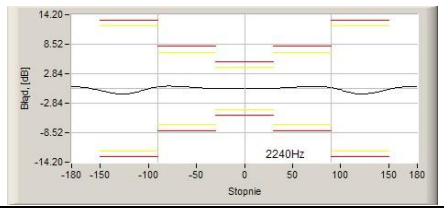

**2000 Hz**



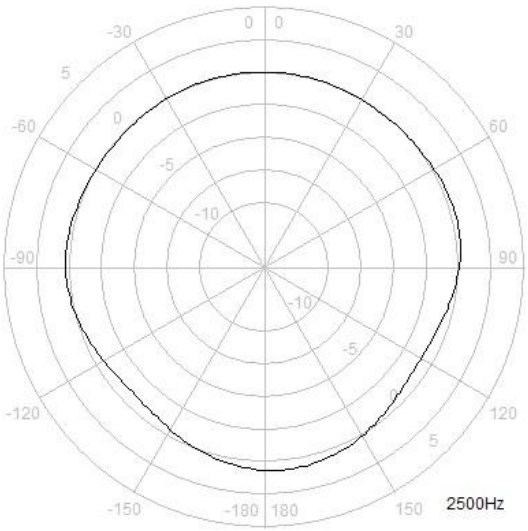



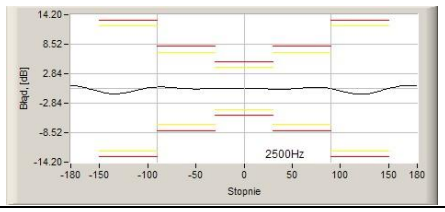

**2240 Hz**



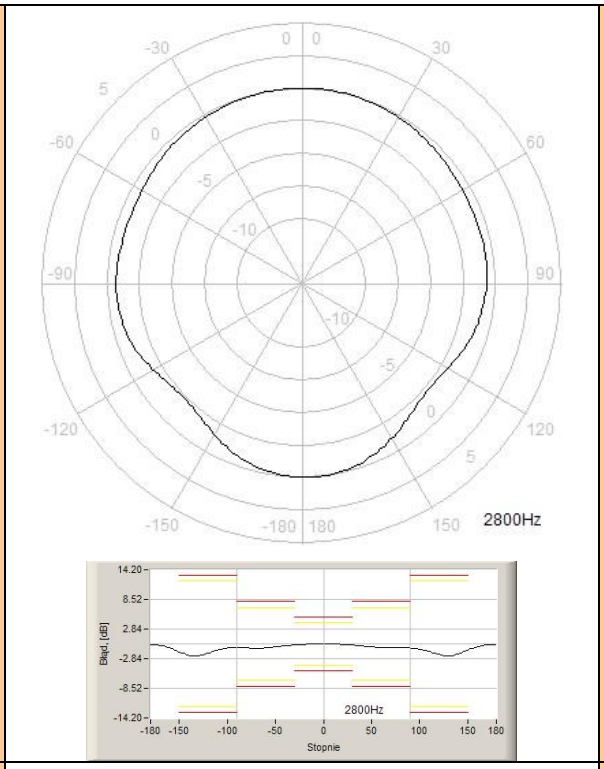




**2500 Hz**

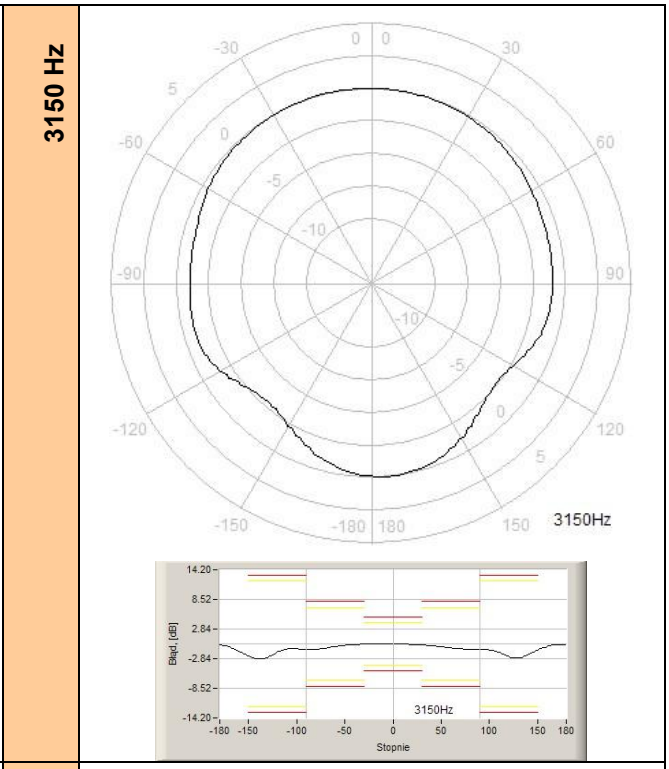


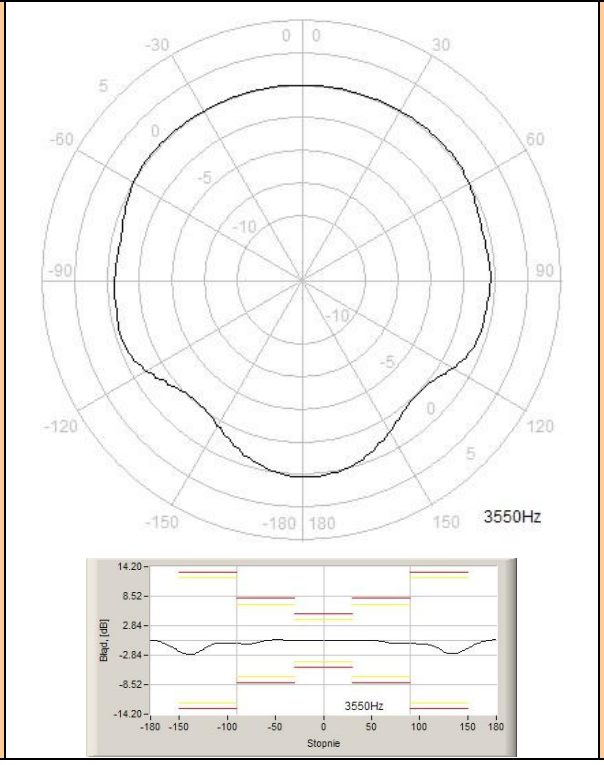
**2800 Hz**



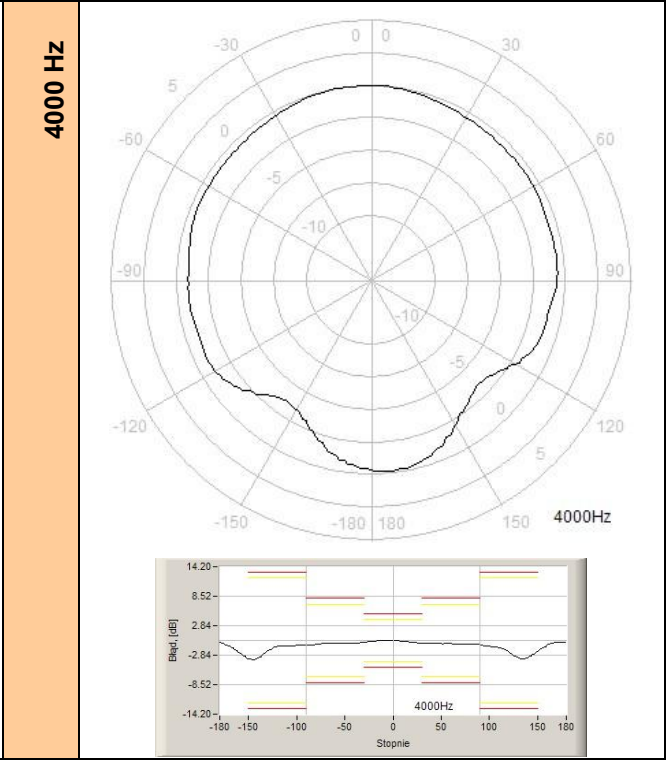

**3150 Hz**



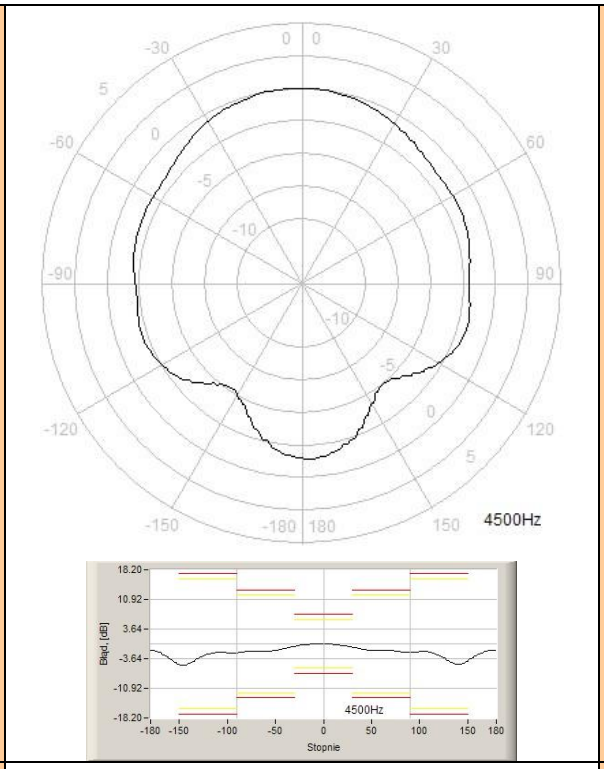

**3550 Hz**



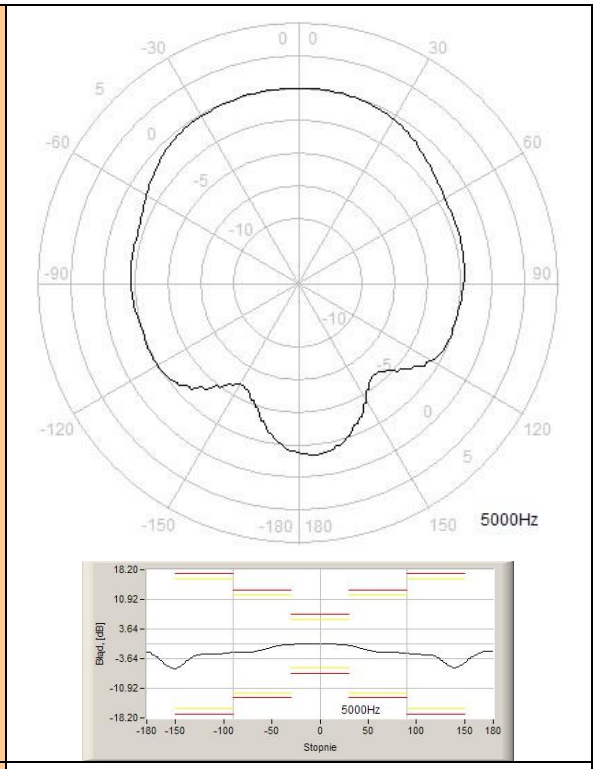

**4000 Hz**



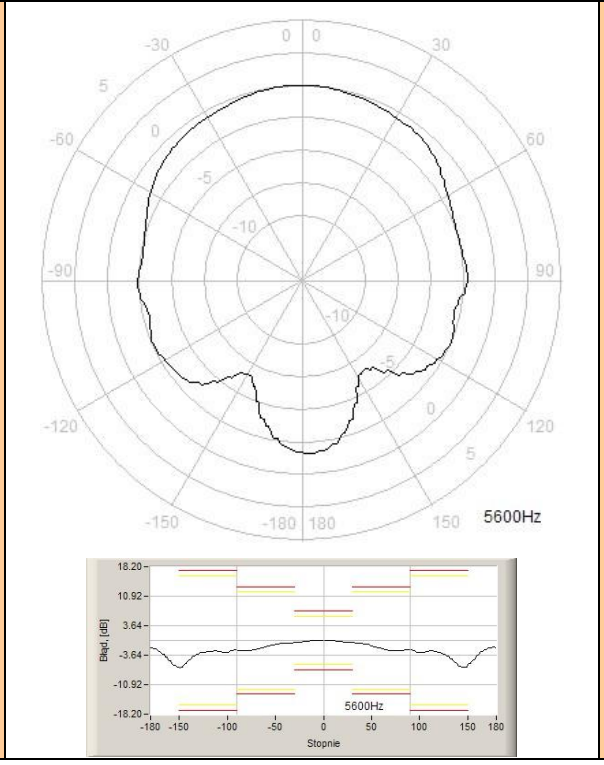
**4500 Hz**



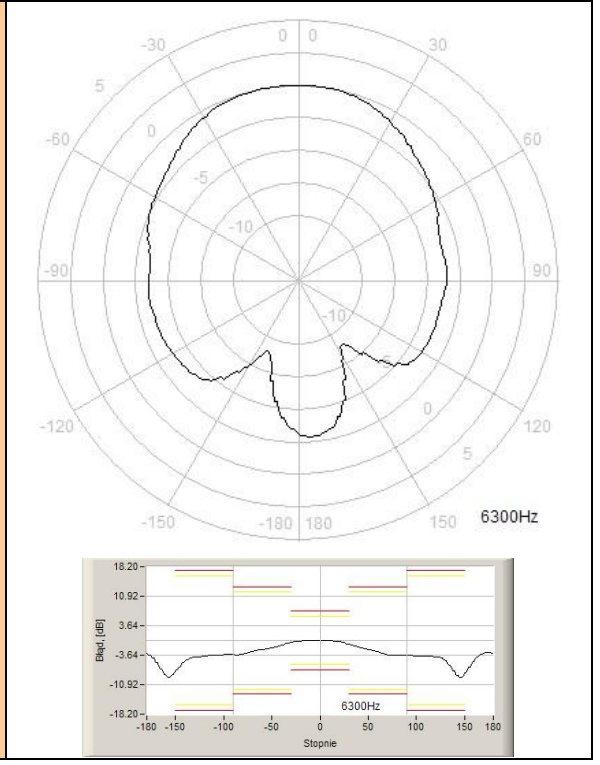

**5000 Hz**



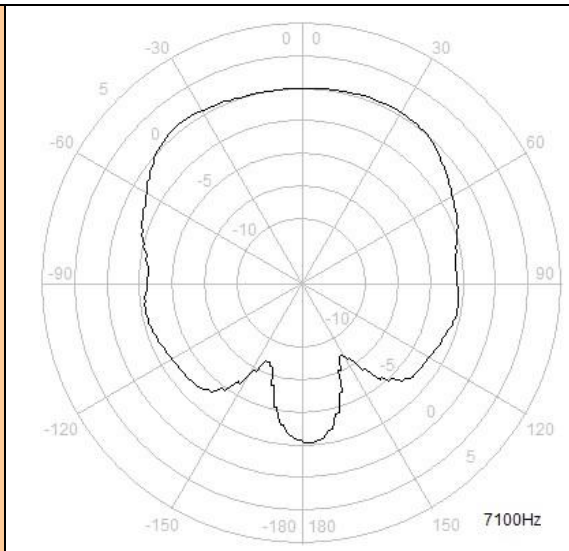

**5600 Hz**

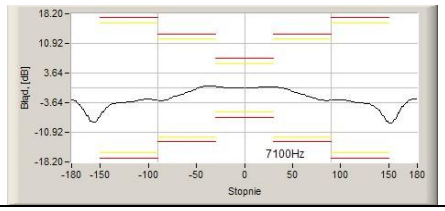



**6300 Hz**

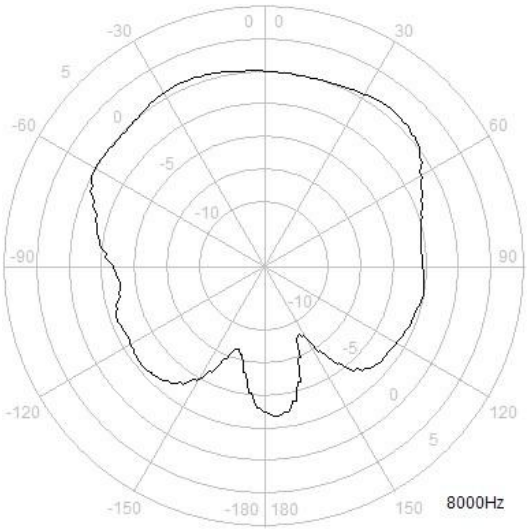


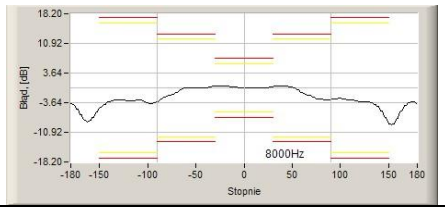
7100 Hz



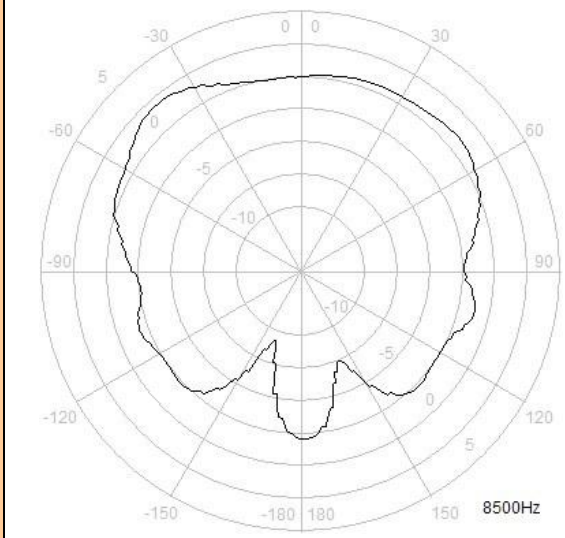



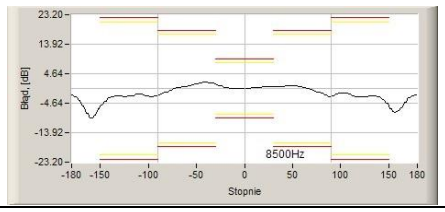

8000 Hz



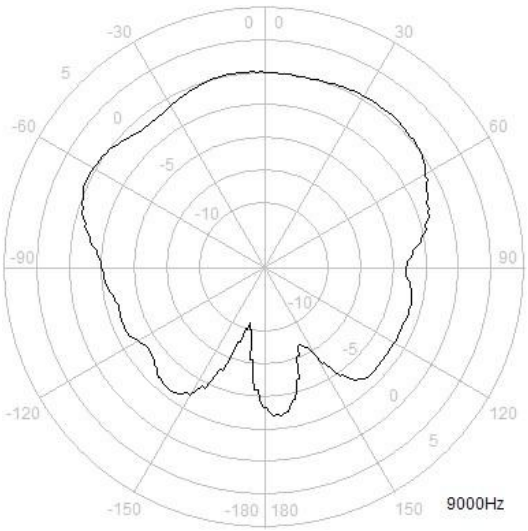



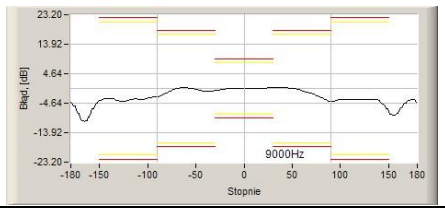

8500 Hz




9000 Hz



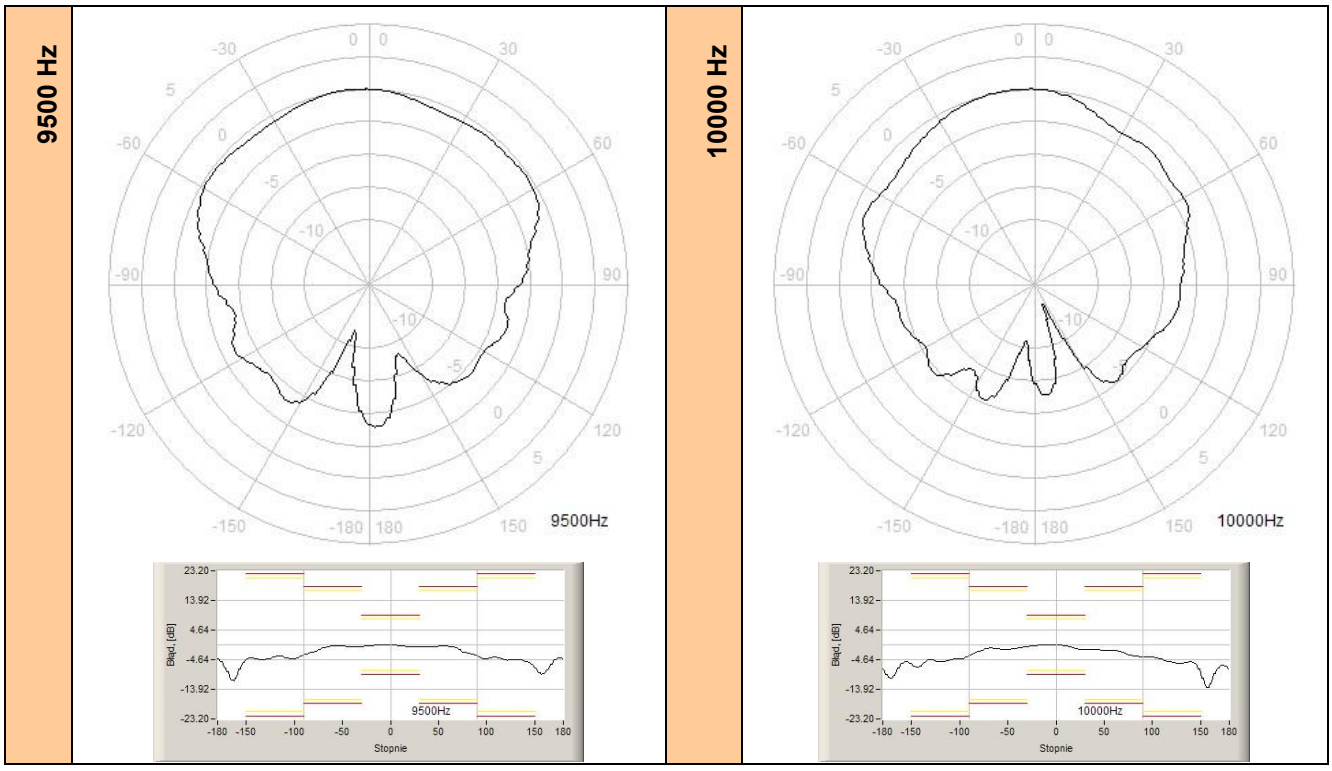


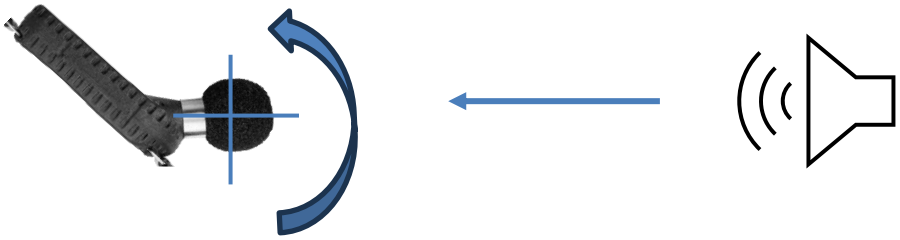

**Table C.5** Directional response for SV 104A with microphone ST 104A and SA 122A windscreen (symmetrical axis)

| Angle [˚] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| f [Hz] | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
| 250 | -0.0 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.2 |
| 315 | -0.0 | -0.0 | -0.1 | -0.1 | -0.1 | -0.2 | -0.2 | -0.3 | -0.3 |
| 400 | -0.0 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 |
| 500 | 0.0 | -0.0 | -0.1 | -0.1 | -0.2 | -0.2 | -0.3 | -0.3 | -0.3 |
| 630 | -0.0 | -0.1 | -0.1 | -0.2 | -0.2 | -0.3 | -0.4 | -0.4 | -0.5 |
| 800 | -0.0 | -0.1 | -0.1 | -0.2 | -0.3 | -0.4 | -0.5 | -0.6 | -0.6 |
| 1000 | 0.0 | -0.0 | -0.1 | -0.2 | -0.3 | -0.4 | -0.5 | -0.7 | -0.8 |
| 1250 | -0.0 | -0.0 | -0.1 | -0.2 | -0.3 | -0.5 | -0.7 | -0.8 | -1.0 |
| 1600 | -0.0 | 0.0 | 0.0 | 0.0 | -0.0 | -0.1 | -0.3 | -0.5 | -0.8 |
| 2000 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 | -0.3 |
| 2240 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 |
| 2500 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | 0.2 | 0.2 | 0.2 |
| 2800 | -0.0 | -0.1 | -0.2 | -0.4 | -0.6 | -0.7 | -0.8 | -0.8 | -0.8 |
| 3150 | -0.0 | -0.1 | -0.2 | -0.3 | -0.5 | -0.7 | -1.0 | -1.0 | -1.1 |
| 3550 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | -0.1 | -0.5 | -0.6 | -0.6 |
| 4000 | -0.1 | -0.3 | -0.5 | -0.6 | -0.6 | -0.6 | -0.7 | -0.8 | -0.7 |
| 4500 | -0.1 | -0.4 | -0.8 | -1.3 | -1.6 | -1.6 | -1.6 | -1.9 | -2.1 |
| 5000 | -0.0 | -0.2 | -0.4 | -0.9 | -1.6 | -2.0 | -2.1 | -2.1 | -2.3 |
| 5600 | -0.1 | -0.3 | -0.5 | -0.7 | -1.3 | -1.9 | -2.5 | -2.5 | -2.5 |
| 6300 | -0.1 | -0.3 | -0.8 | -1.6 | -2.3 | -2.8 | -3.6 | -3.7 | -3.7 |
| 7100 | 0.1 | 0.2 | 0.2 | 0.2 | -0.9 | -1.5 | -2.2 | -3.0 | -3.1 |
| 8000 | -0.1 | -0.1 | 0.2 | 0.5 | 0.5 | -1.1 | -2.2 | -2.8 | -2.9 |
| 8500 | 0.2 | 0.5 | 0.5 | 0.7 | 0.9 | 0.9 | 0.4 | -1.5 | -2.4 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9000 | -0.1 | -0.1 | 0.2 | 0.2 | 0.2 | -0.6 | -1.6 | -2.9 | -4.1 |
| 9500 | -0.3 | -0.6 | -0.7 | -0.6 | -0.5 | -0.4 | -1.2 | -2.6 | -3.2 |
| 10000 | -0.3 | -1.1 | -1.6 | -1.6 | -1.8 | -1.9 | -2.4 | -3.4 | -3.8 |
| Angle [˚] | | | | | | | | | |
| f [Hz] | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | 140-150 | 150-160 | 160-170 | 170-180 |
| 250 | -0.2 | -0.2 | -0.2 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 |
| 315 | -0.3 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 |
| 400 | -0.1 | -0.1 | -0.1 | -0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| 500 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 |
| 630 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 |
| 800 | -0.7 | -0.7 | -0.7 | -0.7 | -0.6 | -0.6 | -0.5 | -0.5 | -0.4 |
| 1000 | -0.8 | -0.9 | -0.9 | -0.8 | -0.8 | -0.7 | -0.7 | -0.6 | -0.6 |
| 1250 | -1.1 | -1.1 | -1.1 | -1.1 | -1.0 | -1.0 | -0.8 | -0.8 | -0.7 |
| 1600 | -1.1 | -1.3 | -1.4 | -1.4 | -1.3 | -1.1 | -0.9 | -0.7 | -0.6 |
| 2000 | -0.7 | -0.9 | -1.1 | -1.1 | -1.0 | -0.7 | -0.5 | -0.3 | -0.2 |
| 2240 | -0.2 | -0.8 | -1.0 | -1.1 | -0.9 | -0.6 | 0.2 | 0.4 | 0.4 |
| 2500 | -0.5 | -0.9 | -1.1 | -1.1 | -0.9 | -0.5 | 0.4 | 0.6 | 0.6 |
| 2800 | -1.0 | -1.5 | -1.9 | -2.3 | -2.3 | -1.9 | -1.3 | -0.5 | -0.2 |
| 3150 | -1.2 | -1.7 | -2.3 | -2.7 | -2.7 | -2.0 | -1.3 | -0.4 | -0.2 |
| 3550 | -0.7 | -0.8 | -1.4 | -2.5 | -2.6 | -2.3 | -1.6 | -0.5 | 0.1 |
| 4000 | -1.2 | -1.3 | -2.0 | -3.4 | -3.5 | -3.2 | -2.2 | -0.8 | -0.3 |
| 4500 | -2.1 | -2.0 | -2.7 | -4.0 | -5.0 | -5.1 | -4.3 | -2.4 | -1.7 |
| 5000 | -2.5 | -2.6 | -3.0 | -4.8 | -5.9 | -5.9 | -4.5 | -2.7 | -1.9 |
| 5600 | -3.0 | -3.0 | -2.9 | -3.8 | -6.0 | -6.7 | -6.2 | -3.7 | -2.0 |
| 6300 | -3.9 | -4.0 | -4.0 | -5.1 | -7.5 | -9.0 | -8.0 | -4.6 | -3.2 |
| 7100 | -3.0 | -3.2 | -3.7 | -3.9 | -5.5 | -8.2 | -8.7 | -6.1 | -3.2 |
| 8000 | -2,9 | -3,0 | -3,3 | -3,5 | -4,5 | -8,2 | -9,2 | -6,6 | -3,8 |
| 8500 | -2,4 | -1,7 | -2,6 | -2,6 | -2,7 | -4,7 | -7,5 | -6,8 | -3,0 |
| 9000 | -4,2 | -3,5 | -3,5 | -3,5 | -3,8 | -6,4 | -8,5 | -6,9 | -4,3 |
| 9500 | -4,5 | -4,4 | -4,8 | -4,8 | -5,1 | -6,7 | -9,2 | -8,6 | -4,7 |
| 10000 | -3,9 | -4,5 | -5,3 | -5,8 | -5,7 | -7,5 | -13,4 | -12,2 | -7,5 |
| Angle [˚] | | | | | | | | | |
| f [Hz] | 180-190 | 190-200 | 200-210 | 210-220 | 220-230 | 230-240 | 240-250 | 250-260 | 260-270 |
| 250 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.2 | -0.2 | -0.2 | -0.2 |
| 315 | -0.4 | -0.4 | -0.4 | -0.3 | -0.3 | -0.3 | -0.3 | -0.2 | -0.2 |
| 400 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| 500 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.3 | -0.3 | -0.3 |
| 630 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 |
| 800 | -0.5 | -0.5 | -0.5 | -0.5 | -0.6 | -0.6 | -0.6 | -0.6 | -0.5 |
| 1000 | -0.6 | -0.7 | -0.7 | -0.8 | -0.9 | -1.0 | -1.0 | -1.0 | -0.9 |
| 1250 | -0.8 | -0.9 | -1.0 | -1.1 | -1.2 | -1.2 | -1.2 | -1.1 | -1.0 |
| 1600 | -0.6 | -0.7 | -0.9 | -1.2 | -1.3 | -1.4 | -1.4 | -1.2 | -0.9 |
| 2000 | -0.3 | -0.6 | -0.8 | -1.1 | -1.2 | -1.2 | -1.0 | -0.6 | -0.3 |
| 2240 | 0.4 | 0.3 | -0.4 | -0.8 | -1.1 | -1.1 | -1.0 | -0.6 | 0.3 |
| 2500 | 0.5 | 0.3 | -0.5 | -1.0 | -1.1 | -1.0 | -0.7 | -0.2 | 0.2 |
| 2800 | -0.4 | -0.8 | -1.5 | -2.2 | -2.4 | -2.3 | -1.7 | -1.1 | -0.8 |
| 3150 | -0.5 | -1.3 | -2.3 | -2.9 | -2.9 | -2.5 | -1.5 | -1.0 | -1.0 |
| 3550 | -0.2 | -1.0 | -2.1 | -2.7 | -2.7 | -2.2 | -1.0 | -0.5 | -0.6 |
| 4000 | -1.0 | -2.2 | -3.5 | -3.7 | -3.1 | -2.0 | -1.1 | -1.1 | -1.0 |
| 4500 | -2.2 | -3.6 | -4.9 | -5.3 | -4.8 | -3.3 | -2.5 | -2.2 | -2.2 |
| 5000 | -3.3 | -4.9 | -6.1 | -6.1 | -4.2 | -3.0 | -2.5 | -2.5 | -2.3 |
| 5600 | -2.7 | -5.1 | -6.7 | -6.7 | -4.8 | -3.2 | -2.8 | -3.0 | -2.9 |
| 6300 | -5.6 | -8.4 | -9.1 | -7.2 | -4.7 | -4.1 | -3.9 | -3.7 | -3.5 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7100 | -4.6 | -8.2 | -8.5 | -6.7 | -4.1 | -3.6 | -3.5 | -3.0 | -3.0 |
| 8000 | -6.7 | -8.4 | -8.0 | -4.8 | -3.4 | -3.1 | -3.3 | -3.7 | -3.9 |
| 8500 | -4.4 | -9.3 | -9.3 | -5.3 | -2.7 | -2.5 | -2.4 | -2.4 | -2.6 |
| 9000 | -9.1 | -10.6 | -7.7 | -3.7 | -3.9 | -4.2 | -3.8 | -3.4 | -3.1 |
| 9500 | -8.6 | -11.3 | -9.1 | -4.4 | -4.7 | -4.5 | -4.0 | -4.5 | -4.3 |
| 10000 | -10.6 | -9.6 | -5.8 | -7.0 | -6.0 | -5.4 | -5.4 | -4.5 | -4.4 |
| Angle [˚] | | | | | | | | | |
| f [Hz] | 270-280 | 280-290 | 290-300 | 300-310 | 310-320 | 320-330 | 330-340 | 340-350 | 350-360 |
| 250 | -0.2 | -0.2 | -0.1 | -0.1 | -0.1 | -0.0 | -0.0 | -0.0 | -0.0 |
| 315 | -0.2 | -0.1 | -0.1 | -0.1 | -0.0 | -0.0 | 0.0 | 0.0 | 0.0 |
| 400 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| 500 | -0.2 | -0.2 | -0.1 | -0.1 | -0.1 | -0.0 | -0.0 | 0.0 | -0.6 |
| 630 | -0.4 | -0.4 | -0.3 | -0.2 | -0.2 | -0.1 | -0.1 | -0.0 | -0.3 |
| 800 | -0.5 | -0.4 | -0.3 | -0.2 | -0.1 | -0.1 | -0.0 | 0.0 | -0.4 |
| 1000 | -0.8 | -0.7 | -0.6 | -0.5 | -0.3 | -0.2 | -0.1 | -0.1 | -0.0 |
| 1250 | -0.9 | -0.7 | -0.5 | -0.4 | -0.2 | -0.1 | -0.1 | -0.0 | -0.0 |
| 1600 | -0.7 | -0.4 | -0.2 | -0.0 | 0.0 | 0.0 | 0.0 | -0.0 | -0.0 |
| 2000 | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2240 | 0.5 | 0.5 | 0.4 | 0.3 | 0.1 | 0.0 | 0.0 | -0.0 | 0.0 |
| 2500 | 0.3 | 0.2 | -0.1 | -0.1 | -0.1 | -0.1 | -0.0 | -0.0 | 0.0 |
| 2800 | -0.8 | -0.9 | -0.9 | -0.8 | -0.5 | -0.4 | -0.2 | -0.1 | -0.0 |
| 3150 | -1.1 | -1.0 | -0.8 | -0.5 | -0.2 | -0.1 | -0.0 | -0.0 | -0.0 |
| 3550 | -0.7 | -0.7 | -0.4 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| 4000 | -0.9 | -0.8 | -0.6 | -0.6 | -0.6 | -0.5 | -0.3 | -0.1 | -0.1 |
| 4500 | -2.2 | -1.9 | -1.8 | -1.8 | -1.5 | -1.1 | -0.6 | -0.2 | -0.0 |
| 5000 | -2.1 | -2.1 | -2.0 | -1.5 | -0.8 | -0.3 | -0.1 | -0.1 | 0.0 |
| 5600 | -2.6 | -2.6 | -2.2 | -1.6 | -0.9 | -0.7 | -0.5 | -0.3 | -0.1 |
| 6300 | -3.6 | -3.3 | -2.7 | -2.2 | -1.8 | -1.1 | -0.5 | -0.1 | -0.0 |
| 7100 | -3.1 | -2.7 | -1.8 | -1.2 | 0.4 | 0.5 | 0.3 | 0.1 | -0.0 |
| 8000 | -3.4 | -1.9 | -1.1 | -0.1 | -0.1 | 0.4 | 0.4 | 0.4 | 0.2 |
| 8500 | -1.9 | -0.8 | 0.6 | 1.6 | 2.0 | 2.0 | 1.2 | 0.3 | -0.2 |
| 9000 | -2.5 | -1.2 | 0.2 | -0.4 | -0.9 | -0.9 | -0.6 | -0.1 | -0.1 |
| 9500 | -3.0 | -2.0 | -1.0 | -0.4 | -0.5 | -0.6 | -0.5 | -0.2 | -0.0 |
| 10000 | -3.1 | -1.9 | -1.3 | -1.5 | -1.4 | -1.0 | -0.5 | -0.1 | 0.0 |

Directional response for dosimeter Class SV 104A with microphone ST 104A and SA 122A windscreen (for orthogonal asymmetrical axis) for specified frequencies:



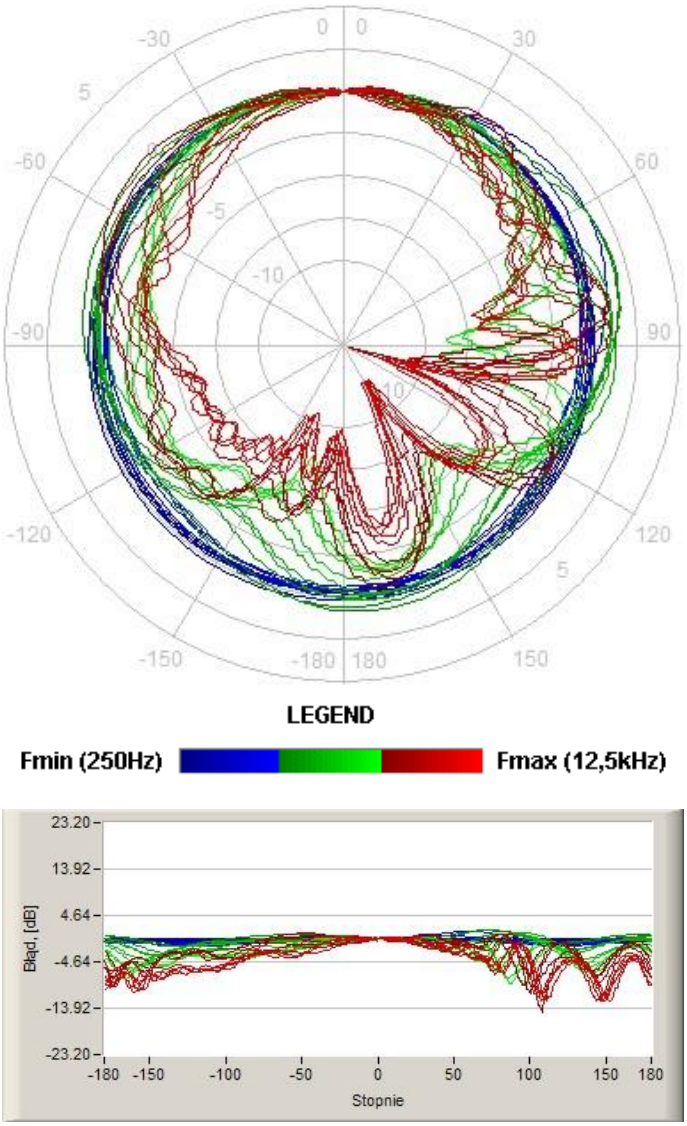
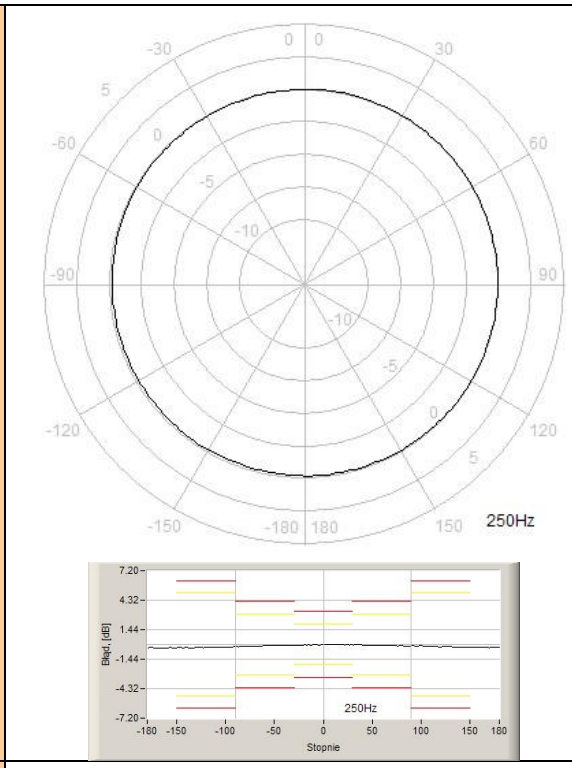


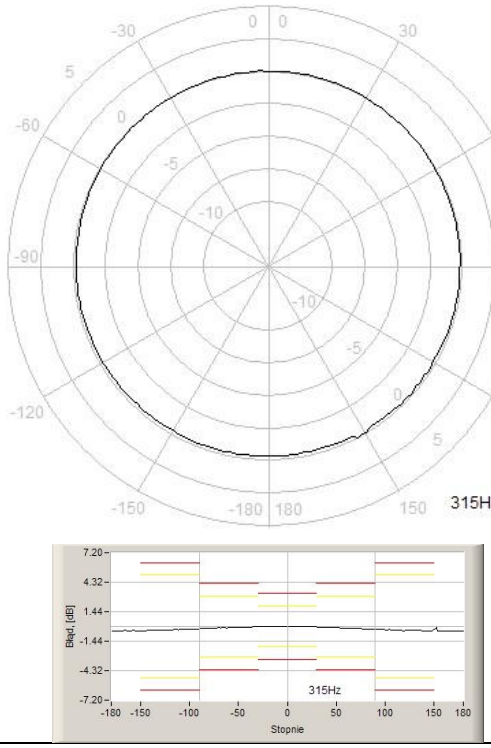

**Figure C.5 Total directional characteristics (asymmetrical axis)**

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

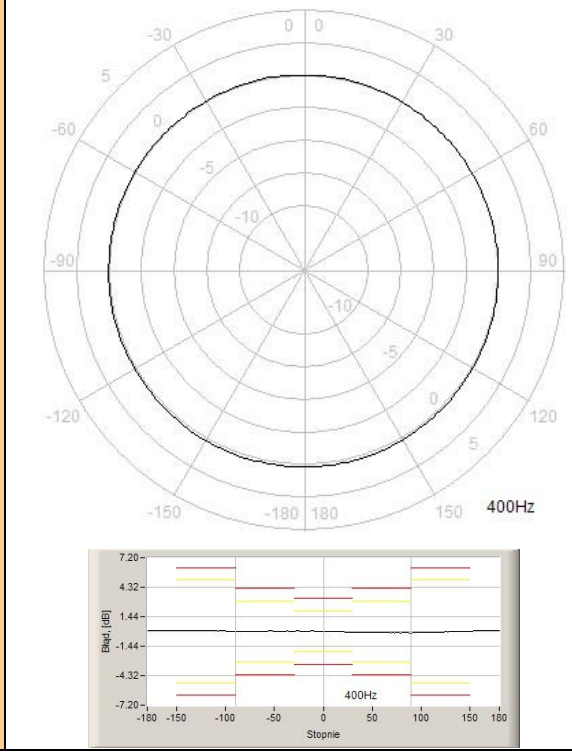
**250 Hz**



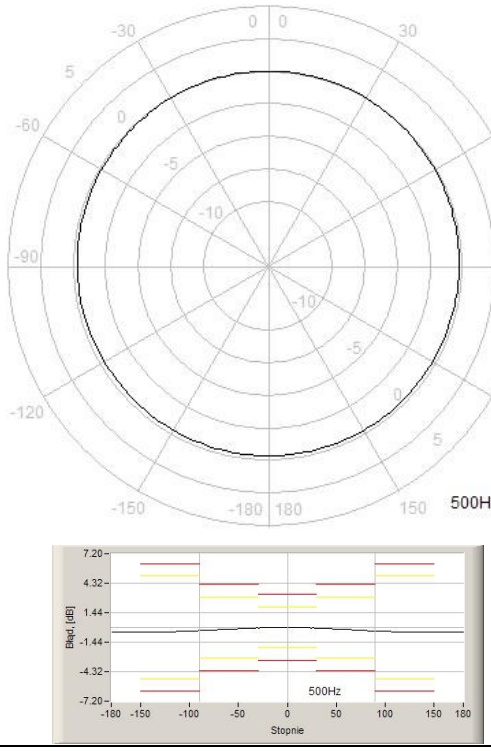

**315 Hz**



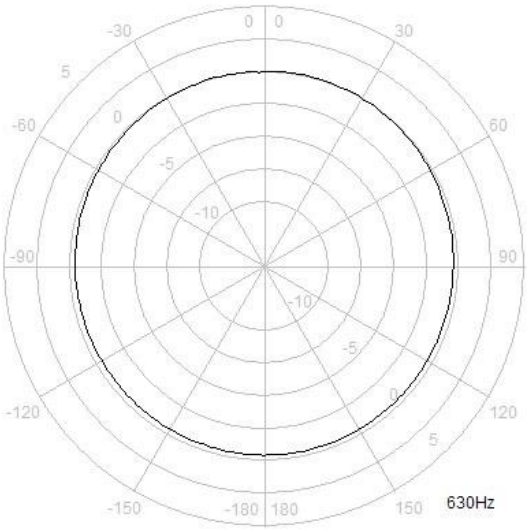

**400 Hz**

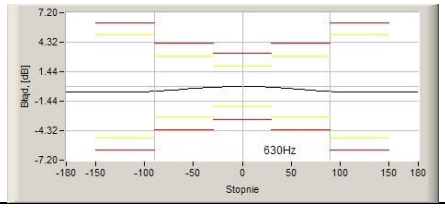



**500 Hz**

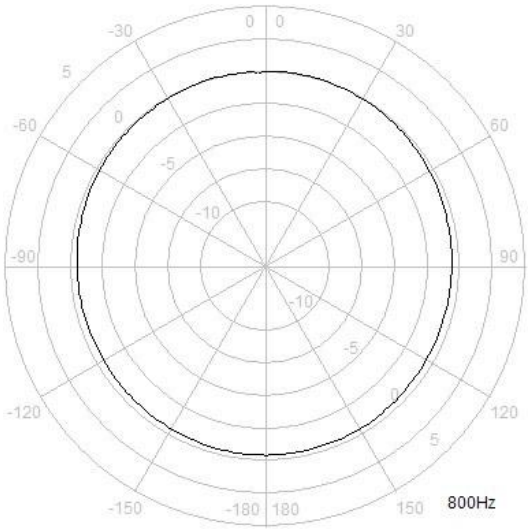


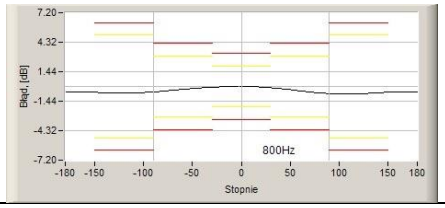
**630 Hz**



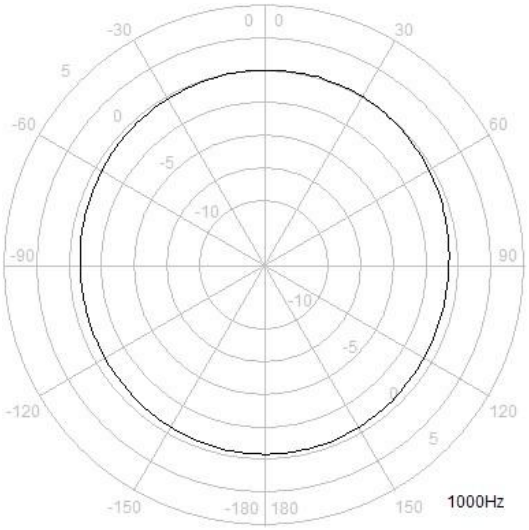



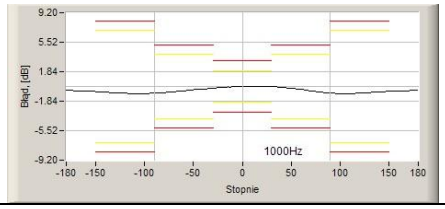

**800 Hz**



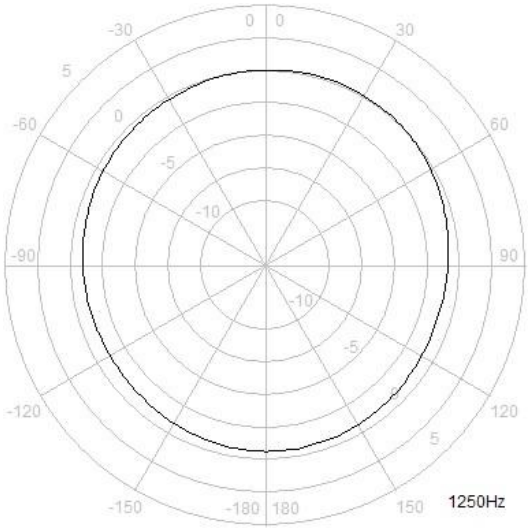



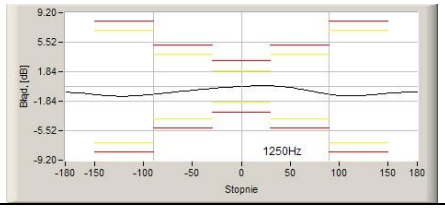

**1000 Hz**



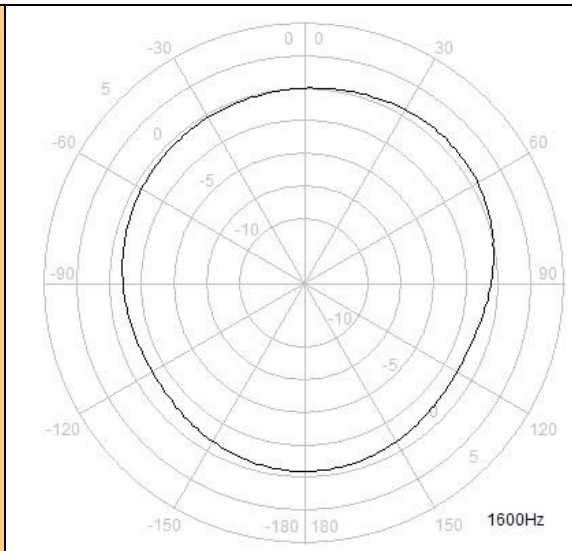



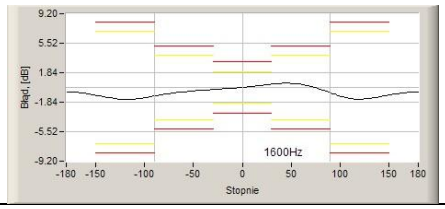

**1250 Hz**



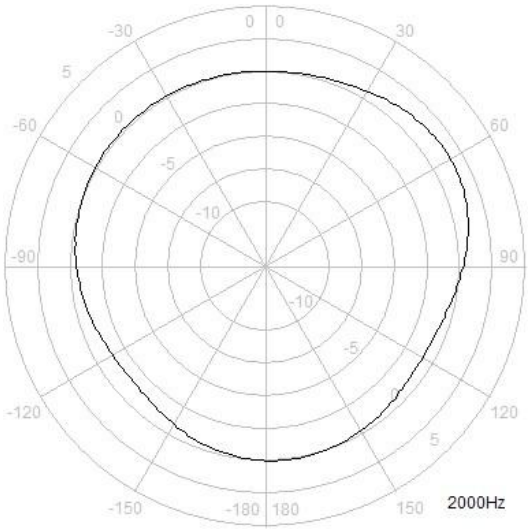



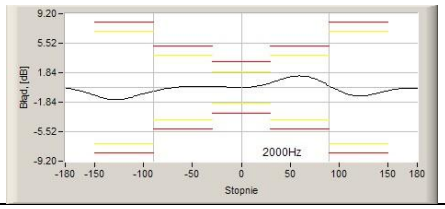
**1600 Hz**



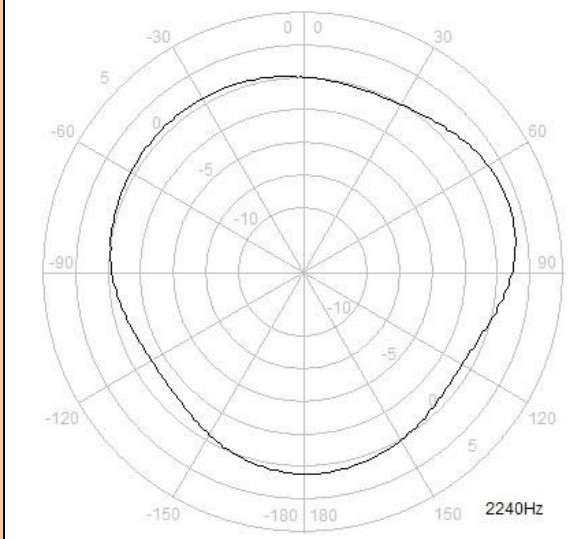



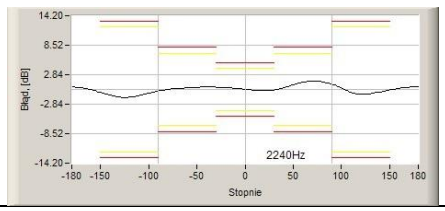

**2000 Hz**



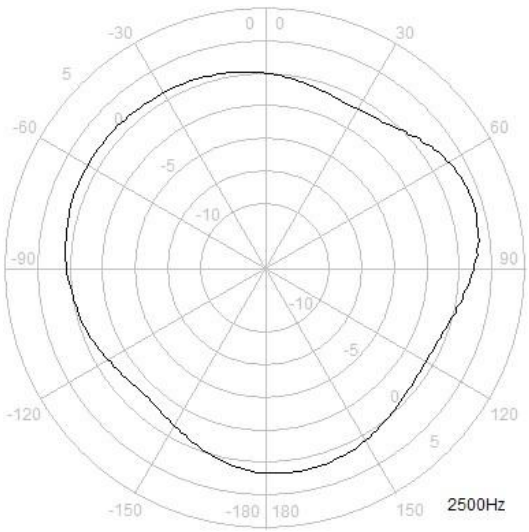



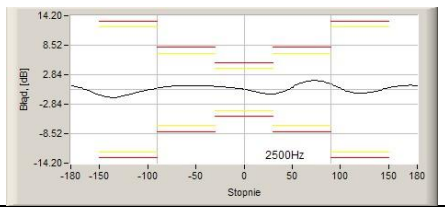

**2240 Hz**



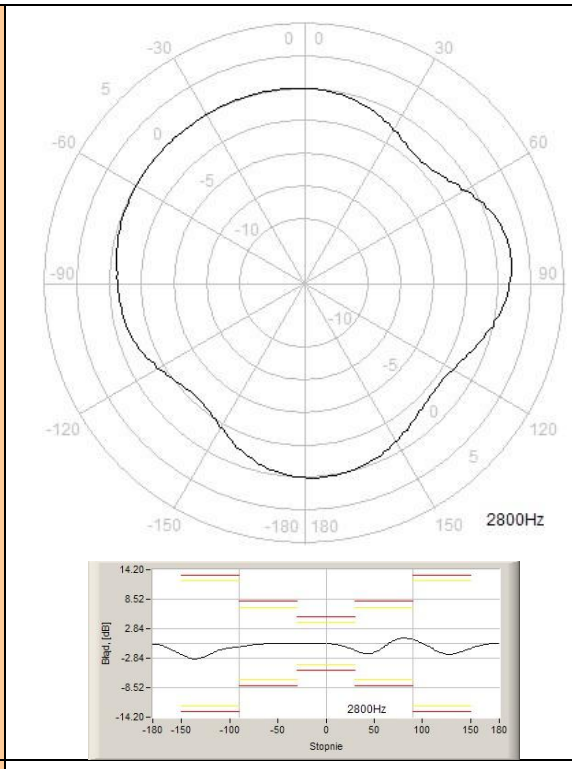




**2500 Hz**

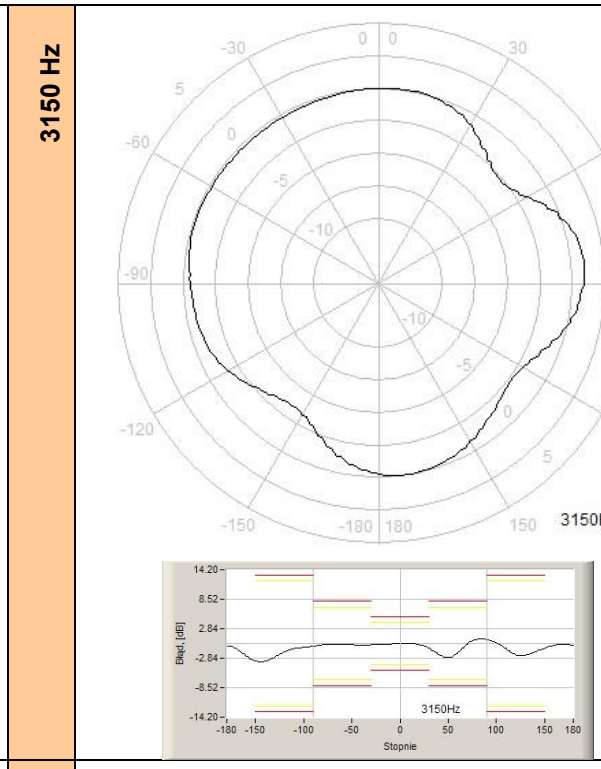


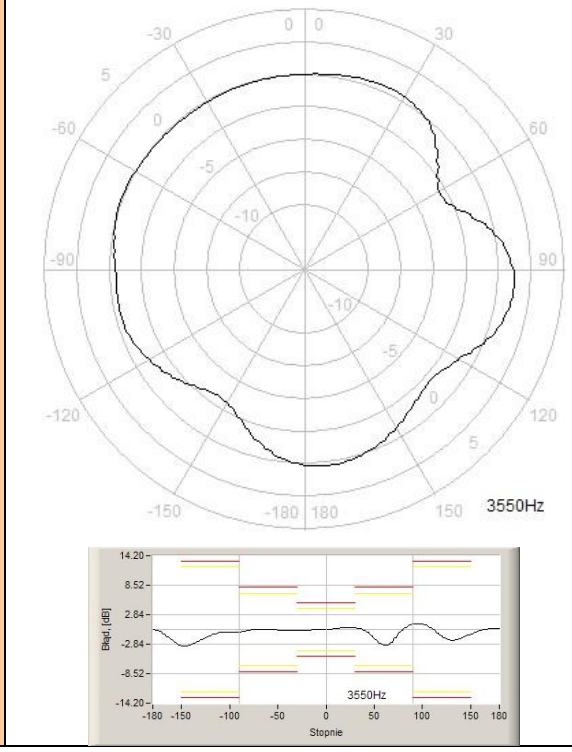
2800 Hz



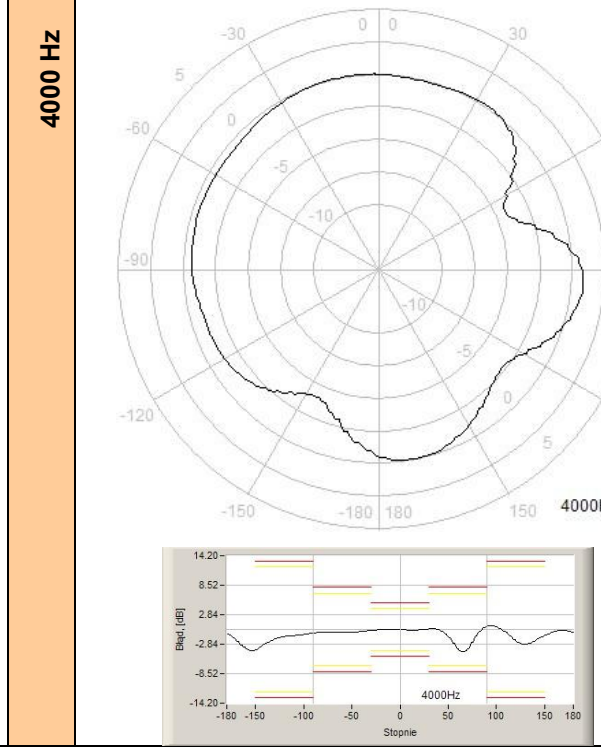

3150 Hz



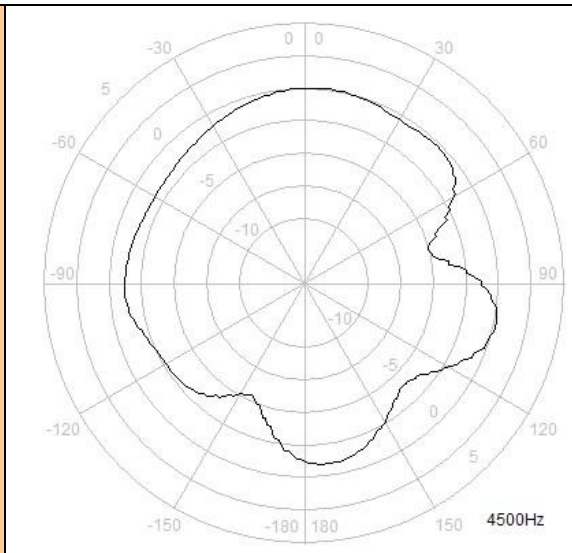

3550 Hz

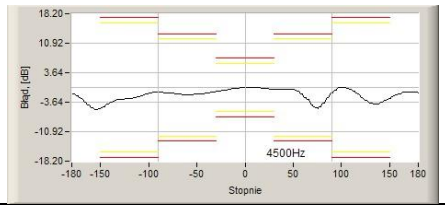



4000 Hz

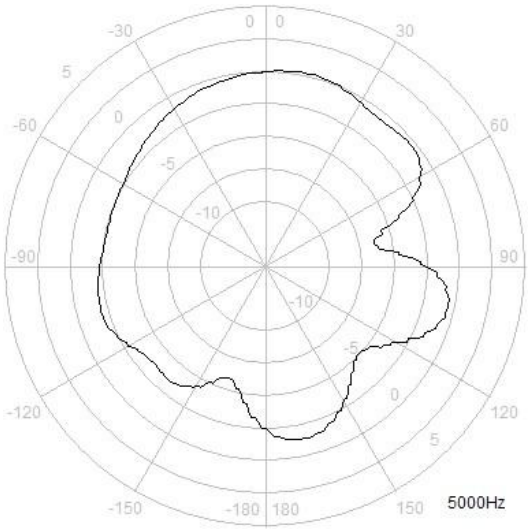


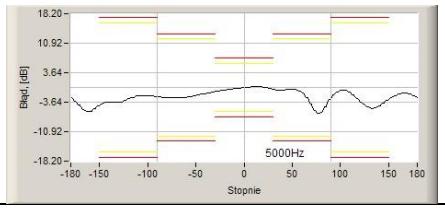
**4500 Hz**



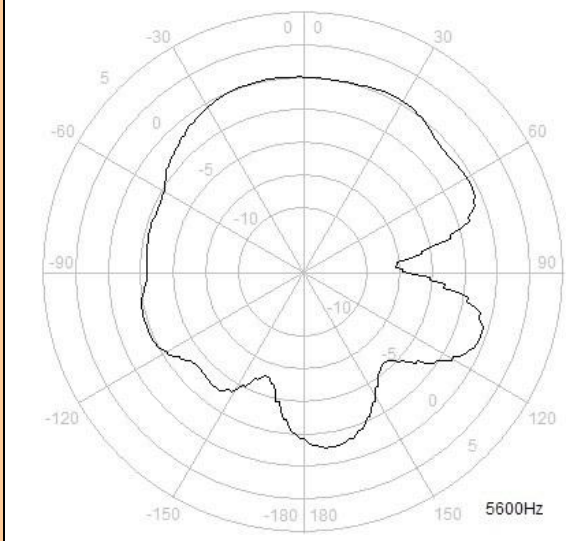



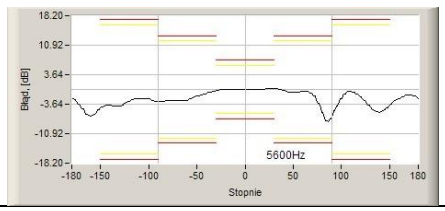

**5000 Hz**



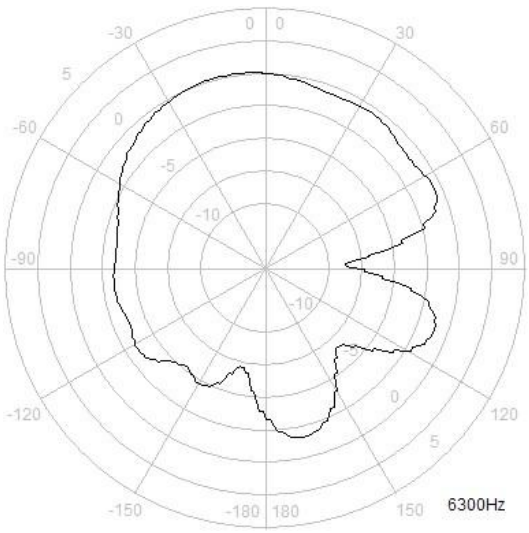



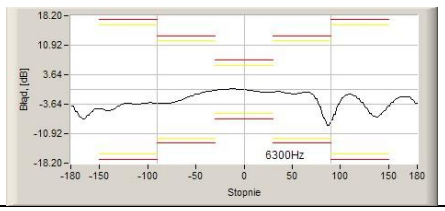

**5600 Hz**



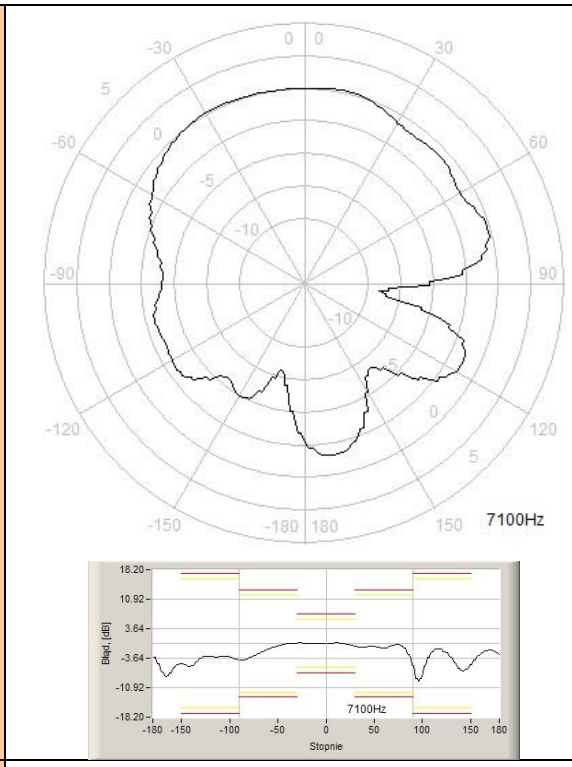




**6300 Hz**

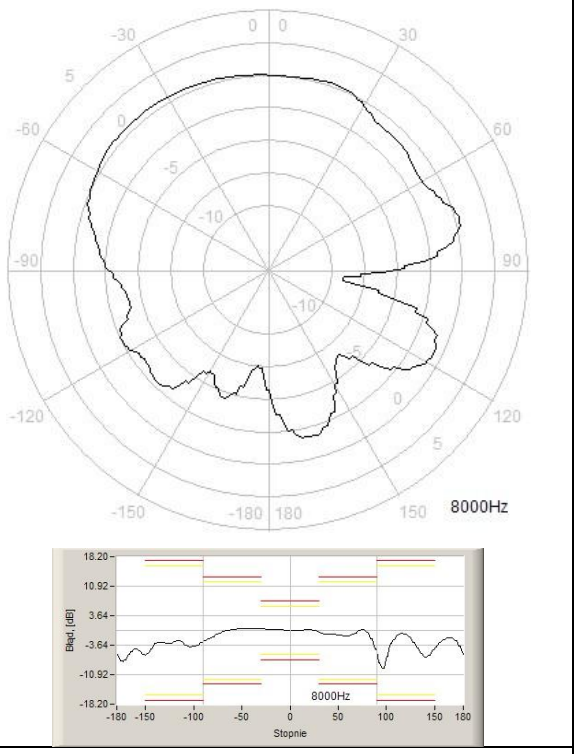


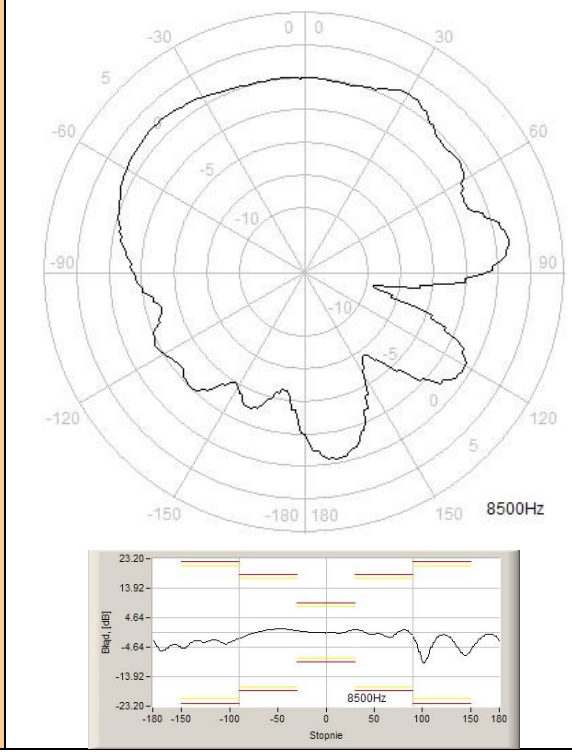
7100 Hz



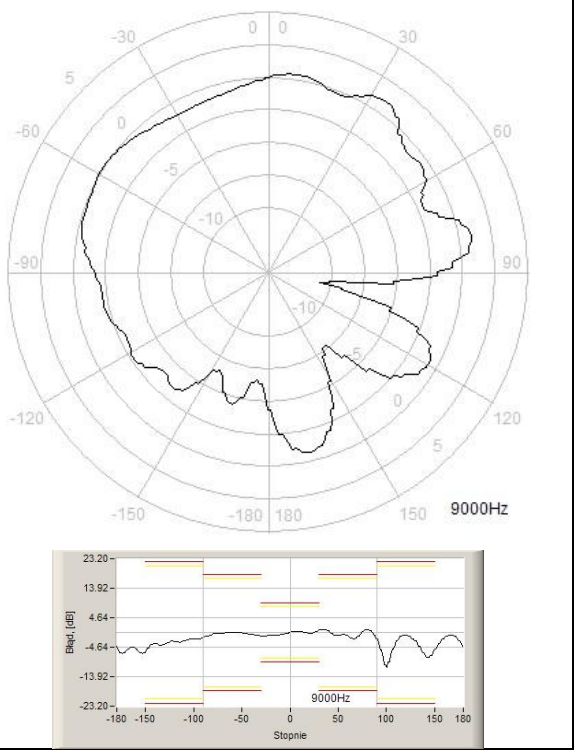

8000 Hz




8500 Hz




9000 Hz



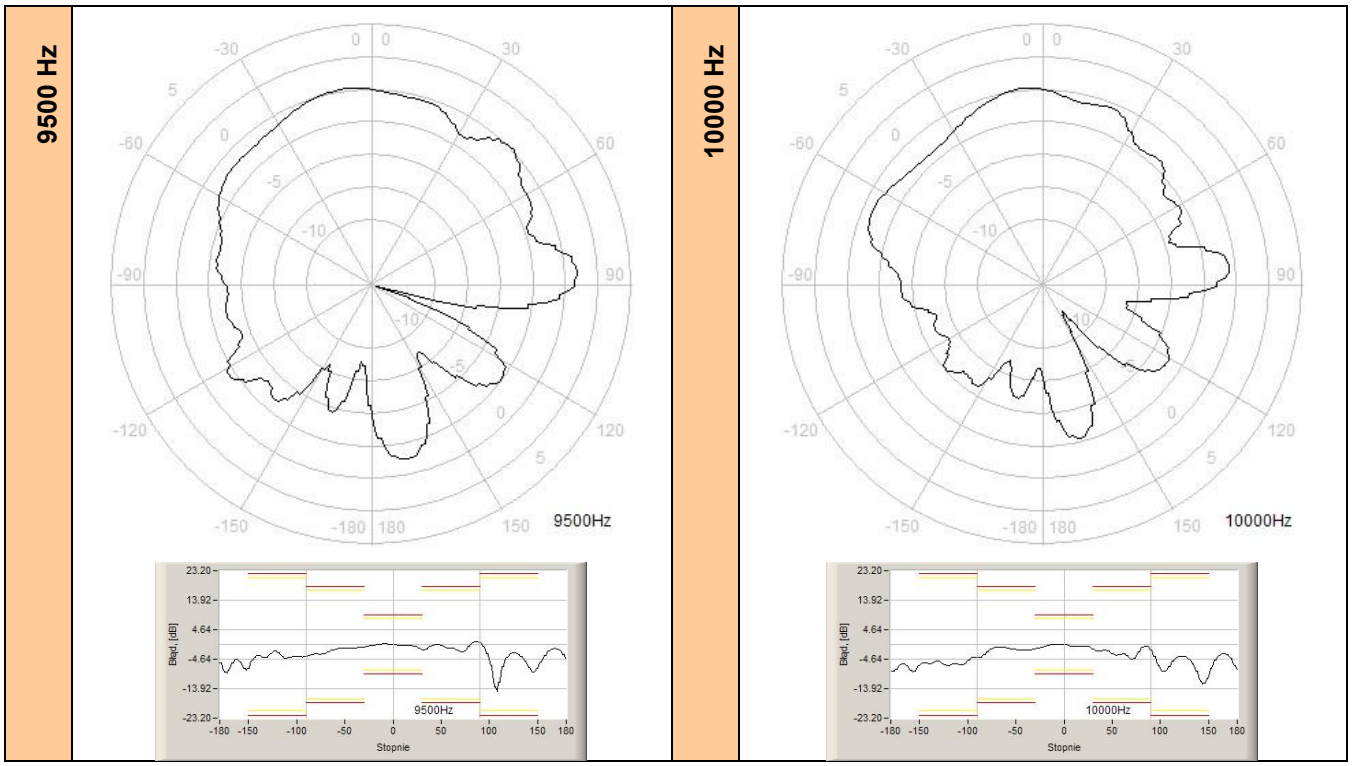



**Table C.6** Directional response for SV 104A with microphone ST 104A and SA 122A windscreen (asymmetrical axis)

| Angle [˚] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| f [Hz] | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
| 630 | -0.0 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.2 | -0.2 |
| 800 | 0.0 | -0.0 | -0.0 | -0.1 | -0.1 | -0.2 | -0.2 | -0.2 | -0.3 |
| 1000 | 0.0 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 |
| 1250 | -0.0 | -0.0 | -0.0 | -0.1 | -0.1 | -0.2 | -0.3 | -0.3 | -0.3 |
| 1600 | 0.0 | -0.0 | -0.1 | -0.1 | -0.2 | -0.3 | -0.4 | -0.4 | -0.5 |
| 2000 | -0.0 | -0.1 | -0.1 | -0.2 | -0.3 | -0.4 | -0.5 | -0.6 | -0.7 |
| 2240 | 0.0 | 0.0 | -0.0 | -0.1 | -0.2 | -0.4 | -0.6 | -0.7 | -0.8 |
| 2500 | 0.1 | 0.1 | 0.1 | 0.1 | -0.1 | -0.3 | -0.6 | -0.8 | -1.0 |
| 2800 | 0.1 | 0.3 | 0.4 | 0.5 | 0.5 | 0.5 | 0.4 | -0.2 | -0.7 |
| 3150 | 0.0 | 0.2 | 0.5 | 1.0 | 1.3 | 1.4 | 1.4 | 1.2 | 0.8 |
| 3550 | -0.2 | -0.3 | -0.3 | 0.3 | 0.8 | 1.3 | 1.6 | 1.6 | 1.5 |
| 4000 | -0.5 | -0.8 | -1.0 | -0.9 | -0.4 | 1.1 | 1.6 | 1.7 | 1.5 |
| 4500 | -0.2 | -0.6 | -1.3 | -1.9 | -2.0 | -1.6 | -0.7 | 1.0 | 1.0 |
| 5000 | 0.0 | -0.2 | -0.9 | -2.1 | -2.7 | -2.7 | -1.5 | 0.8 | 0.9 |
| 5600 | 0.1 | 0.3 | 0.4 | 0.3 | -1.6 | -3.1 | -3.1 | -1.5 | 1.0 |
| 6300 | -0.1 | -0.1 | -0.1 | 0.1 | -1.2 | -3.6 | -4.3 | -3.7 | -0.8 |
| 7100 | 0.1 | -0.2 | -0.4 | -0.5 | -0.5 | -1.5 | -4.2 | -5.1 | -3.8 |
| 8000 | 0.2 | 0.2 | -0.4 | -0.6 | -0.6 | -1.0 | -4.0 | -6.4 | -6.1 |
| 8500 | -0.1 | 0.1 | 0.2 | -0.3 | -0.7 | -0.7 | -1.2 | -5.8 | -7.9 |
| 9000 | -0.4 | -0.7 | -0.7 | -0.6 | -1.1 | -1.1 | -1.2 | -4.3 | -8.9 |
| 9500 | 0.1 | 0.1 | -0.7 | -0.9 | -0.8 | -1.2 | -1.2 | -0.8 | -5.4 |
| 10000 | -0.1 | 0.1 | -0.2 | -1.0 | -1.1 | -1.4 | -1.4 | -0.6 | -4.6 |
| Angle [˚] | | | | | | | | | |
| f [Hz] | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | 140-150 | 150-160 | 160-170 | 170-180 |
| 630 | -0.2 | -0.2 | -0.2 | -0.2 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 |
| 800 | -0.3 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.5 | -0.5 |
| 1000 | -0.1 | -0.1 | -0.1 | -0.0 | -0.0 | 0.0 | 0.1 | 0.1 | 0.1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1250 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.5 | -0.5 | -0.5 | -0.5 |
| 1600 | -0.5 | -0.6 | -0.6 | -0.6 | -0.6 | -0.5 | -0.5 | -0.5 | -0.5 |
| 2000 | -0.7 | -0.7 | -0.7 | -0.7 | -0.7 | -0.6 | -0.6 | -0.5 | -0.5 |
| 2240 | -0.9 | -0.9 | -0.9 | -0.8 | -0.8 | -0.7 | -0.6 | -0.5 | -0.5 |
| 2500 | -1.1 | -1.2 | -1.2 | -1.1 | -1.1 | -0.9 | -0.9 | -0.8 | -0.7 |
| 2800 | -1.1 | -1.4 | -1.4 | -1.4 | -1.4 | -1.1 | -0.9 | -0.7 | -0.6 |
| 3150 | -0.5 | -0.9 | -1.1 | -1.1 | -1.0 | -0.7 | -0.4 | -0.2 | -0.1 |
| 3550 | 0.9 | -0.6 | -1.0 | -1.0 | -0.9 | -0.5 | 0.2 | 0.4 | 0.4 |
| 4000 | 0.9 | -0.6 | -0.8 | -0.8 | -0.7 | 0.2 | 0.5 | 0.7 | 0.7 |
| 4500 | 0.7 | -1.0 | -1.7 | -2.1 | -2.1 | -1.5 | -1.0 | -0.3 | -0.1 |
| 5000 | 0.8 | -0.9 | -2.1 | -2.3 | -2.3 | -1.6 | -0.8 | -0.3 | -0.3 |
| 5600 | 1.1 | 0.9 | -1.3 | -2.1 | -2.1 | -1.6 | -0.8 | -0.2 | 0.2 |
| 6300 | 0.8 | -0.6 | -1.9 | -2.9 | -2.8 | -2.0 | -1.0 | -0.4 | -0.6 |
| 7100 | -1.4 | -0.3 | -2.0 | -3.8 | -4.1 | -3.7 | -2.6 | -1.5 | -1.3 |
| 8000 | -2.3 | -1.0 | -3.1 | -4.8 | -5.1 | -4.4 | -2.7 | -1.6 | -2.5 |
| 8500 | -6.4 | -1.6 | -1.8 | -3.9 | -5.7 | -5.6 | -3.7 | -2.2 | -2.2 |
| 9000 | -7.4 | -2.2 | -2.2 | -5.3 | -6.8 | -6.2 | -4.1 | -2.1 | -3.4 |
| 9500 | -9.3 | -5.8 | -2.0 | -3.5 | -6.6 | -6.8 | -5.3 | -2.6 | -2.8 |
| 10000 | -9.3 | -6.4 | -1.2 | -2.9 | -6.6 | -6.6 | -4.2 | -2.2 | -5.9 |
| Angle [˚] | | | | | | | | | |
| f [Hz] | 180-190 | 190-200 | 200-210 | 210-220 | 220-230 | 230-240 | 240-250 | 250-260 | 260-270 |
| 630 | -0.3 | -0.4 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 |
| 800 | -0.5 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.3 | -0.3 |
| 1000 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| 1250 | -0.5 | -0.5 | -0.5 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.3 |
| 1600 | -0.5 | -0.5 | -0.5 | -0.5 | -0.6 | -0.6 | -0.6 | -0.5 | -0.5 |
| 2000 | -0.5 | -0.5 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 |
| 2240 | -0.5 | -0.6 | -0.6 | -0.7 | -0.8 | -0.9 | -0.9 | -0.9 | -0.9 |
| 2500 | -0.8 | -0.9 | -1.0 | -1.1 | -1.2 | -1.2 | -1.2 | -1.2 | -1.1 |
| 2800 | -0.6 | -0.7 | -1.0 | -1.2 | -1.4 | -1.5 | -1.5 | -1.4 | -1.2 |
| 3150 | -0.2 | -0.6 | -1.0 | -1.4 | -1.5 | -1.5 | -1.4 | -1.1 | -0.8 |
| 3550 | 0.4 | 0.2 | -0.6 | -1.2 | -1.5 | -1.6 | -1.5 | -1.2 | -0.8 |
| 4000 | 0.6 | -0.4 | -1.1 | -1.6 | -1.6 | -1.5 | -1.0 | -0.6 | 0.2 |
| 4500 | -0.4 | -1.2 | -2.2 | -2.9 | -3.0 | -2.7 | -1.9 | -1.2 | -0.8 |
| 5000 | -0.9 | -2.4 | -3.3 | -3.5 | -3.3 | -2.3 | -1.6 | -0.9 | -0.7 |
| 5600 | -0.6 | -2.0 | -3.2 | -3.3 | -2.9 | -1.9 | -1.1 | -0.5 | -0.5 |
| 6300 | -2.0 | -3.7 | -4.1 | -3.9 | -2.7 | -1.8 | -1.3 | -1.2 | -1.0 |
| 7100 | -2.8 | -5.0 | -5.4 | -5.0 | -3.5 | -2.9 | -2.7 | -2.1 | -1.3 |
| 8000 | -4.3 | -5.9 | -5.8 | -4.1 | -3.6 | -3.5 | -2.8 | -1.9 | -2.2 |
| 8500 | -4.3 | -6.5 | -6.4 | -4.3 | -4.2 | -4.0 | -2.6 | -2.4 | -3.0 |
| 9000 | -6.8 | -7.2 | -5.5 | -5.3 | -5.2 | -3.8 | -3.7 | -3.7 | -3.4 |
| 9500 | -7.0 | -8.1 | -6.0 | -5.6 | -5.5 | -3.4 | -3.4 | -3.3 | -4.1 |
| 10000 | -7.7 | -6.6 | -6.1 | -5.8 | -3.3 | -3.3 | -3.2 | -4.1 | -4.0 |
| Angle [˚] | | | | | | | | | |
| f [Hz] | 270-280 | 280-290 | 290-300 | 300-310 | 310-320 | 320-330 | 330-340 | 340-350 | 350-360 |
| 630 | -0.2 | -0.2 | -0.2 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 |
| 800 | -0.2 | -0.2 | -0.2 | -0.1 | -0.1 | -0.1 | -0.0 | -0.0 | 0.0 |
| 1000 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 |
| 1250 | -0.3 | -0.3 | -0.2 | -0.2 | -0.1 | -0.1 | -0.0 | -0.0 | 0.0 |
| 1600 | -0.5 | -0.4 | -0.4 | -0.3 | -0.2 | -0.1 | -0.1 | -0.0 | -0.3 |
| 2000 | -0.5 | -0.4 | -0.4 | -0.3 | -0.2 | -0.1 | -0.1 | -0.0 | -0.3 |
| 2240 | -0.8 | -0.8 | -0.6 | -0.5 | -0.4 | -0.3 | -0.2 | -0.1 | -0.0 |
| 2500 | -1.0 | -0.8 | -0.7 | -0.6 | -0.5 | -0.3 | -0.2 | -0.1 | -0.1 |
| 2800 | -1.0 | -0.8 | -0.7 | -0.5 | -0.4 | -0.3 | -0.2 | -0.1 | -0.1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3150 | -0.4 | -0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | -0.0 |
| 3550 | -0.3 | 0.1 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | -0.5 |
| 4000 | 0.5 | 0.6 | 0.7 | 0.7 | 0.7 | 0.6 | 0.5 | 0.4 | 0.2 |
| 4500 | -0.6 | -0.4 | -0.1 | -0.1 | -0.0 | -0.0 | 0.0 | 0.0 | 0.0 |
| 5000 | -0.5 | -0.2 | -0.2 | -0.2 | -0.3 | -0.3 | -0.2 | -0.2 | -0.1 |
| 5600 | -0.5 | -0.1 | 0.1 | -0.1 | -0.2 | -0.2 | -0.1 | -0.1 | -0.1 |
| 6300 | -0.7 | -0.6 | -0.5 | -0.6 | -0.6 | -0.4 | -0.2 | 0.0 | 0.0 |
| 7100 | -1.3 | -1.5 | -1.7 | -1.7 | -1.6 | -1.3 | -0.9 | -0.5 | -0.2 |
| 8000 | -2.5 | -2.5 | -2.5 | -2.3 | -1.8 | -1.4 | -0.8 | -0.5 | -0.2 |
| 8500 | -3.0 | -2.8 | -2.8 | -2.5 | -1.5 | -0.9 | -0.3 | 0.1 | 0.2 |
| 9000 | -3.5 | -3.4 | -3.0 | -1.9 | -1.2 | -0.5 | -0.1 | 0.1 | 0.1 |
| 9500 | -4.1 | -3.5 | -2.5 | -1.4 | -0.5 | 0.1 | 0.1 | 0.1 | -0.0 |
| 10000 | -2.4 | -1.6 | -0.2 | 0.4 | 0.4 | 0.4 | 0.3 | 0.2 | 0.1 |

# C.2 SPECIFICATION OF THE SV 104A AS 1/1 AND 1/3 OCTAVE ANALYSER

## Statement of performance

The SV 104A instrument operating as **1/1 OCTAVE or 1/3 OCTAVE** sound analyser meets the IEC 61260-1:2014 standard for the pass band filters.

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

## Configuration of the complete analyser

| | |
|---|---|
| **SV 104A** | dosimeter and analyser without microphone |
| **SC 104AT** | microphone electrical adapter |

## Normal operating mode

**SV 104A** in configuration with the **SC 104AT** microphone electrical adapter with following settings for the Microphone compensation: **Microphone Compensation** – disabled, **Free Field** – disabled (see Chapter 4.16).

## Signal input

To obtain a BNC Class electrical input, the microphone must be replaced by an microphone electrical adapter SC 104AT **before turning the instrument on**.

| | |
|---|---|
| **Maximum input voltage** | SV 104A meets the requirements of the EN/IEC 61010-1 category I measurement circuit. The input voltage shall not exceed the limits between 0 V and +3 V |
| **Impedance** | 124 Ω |

## Conformance testing

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

***Note:*** *When the 1/1 octave or 1/3 octave analyser is used with the microphone installed (for acoustic signals), the* ***Microphone Compensation*** *must be enabled* (see Chapter 4.16).

## Linear operating ranges

For the sinusoidal signal and microphone sensitivity 2.5 mV/Pa.

See Table C.1 for details.

| | |
|---|---|
| **Measurement frequency range:** | 20 Hz ÷ 10.0 kHz with the Z filter (-3 dB) |
| **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. 1μ$V_{RMS}$) |
| **Basic accuracy** | < ± 0.1 dB (for the temperature T=+23°C ± 5°C for the sinusoidal signal 114 $dB_{RMS}$ in the bandwidth 20 Hz ÷ 10 kHz with the **Z** input filter |

**Voltage measurement error** in the full temperature range

< ± 0.1 dB when the temperature is from -10°C to +40°C for the sinusoidal signal.

**Overload detector**

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

**Anti-aliasing filter**

Built-in electric anti-aliasing filter ensuring correct sampling of the measured signal.

| | |
|---|---|
| **Pass band (-3 dB)** | 11.3 kHz |
| **Stop band** | 14.4 kHz |
| **Attenuation in the stop band** | > 50 dB |
| **Sampling frequency** | 24 kHz |
| **Analogue to digital converter** | sigma-delta 24 bit |
| **Internal oscillator accuracy** | 0.01% (for f = 1 kHz and T = +23°C) |

## Digital filters

### Weighting filters

**Z** meeting requirements of IEC 61672-1:2013 for the Class 2 "**Z**" filter
**A** meeting requirements of IEC 61672-1:2013 for the Class 2 "**A**" filter
**C** meeting requirements of IEC 61672-1:2013 for the Class 2 "**C**" filter

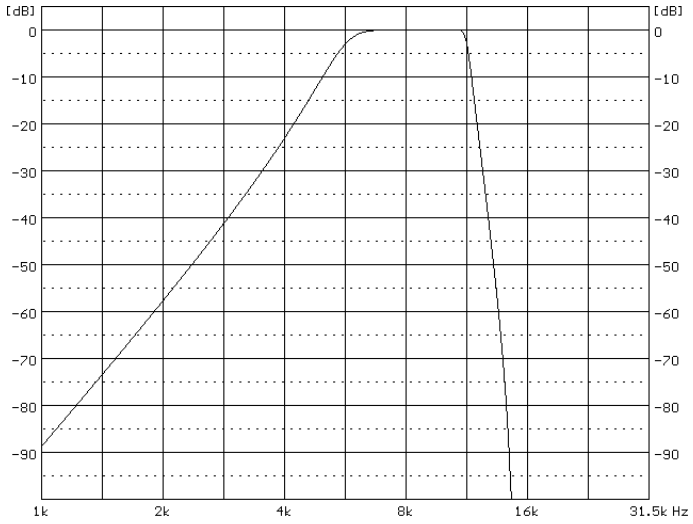
See part for the A and C filters characteristics.

**Noise levels** (measured with the SC 104AT and source impedance **50 Ω**, **Microphone** compensation switched off)

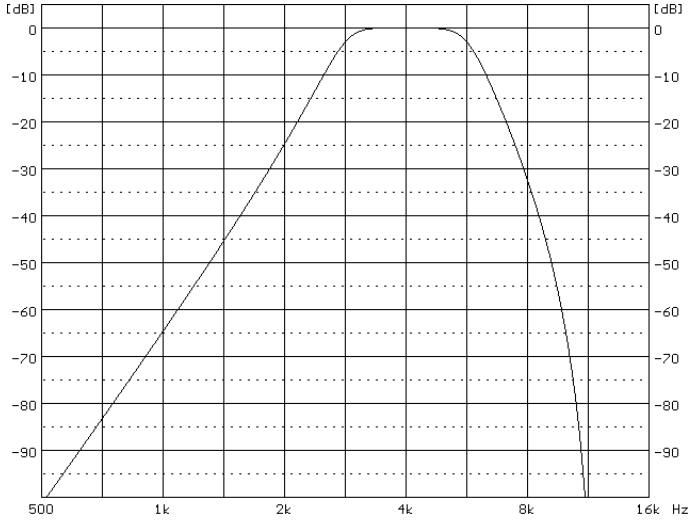
| | |
|---|---|
| "**Z**" weighting | < 398 $\mu V_{RMS}$, (52 dB) |
| "**A**" weighting | < 126 $\mu V_{RMS}$, (42 dB) |
| "**C**" weighting | < 126 $\mu V_{RMS}$, (42 dB) |

## 1/1 octave filters

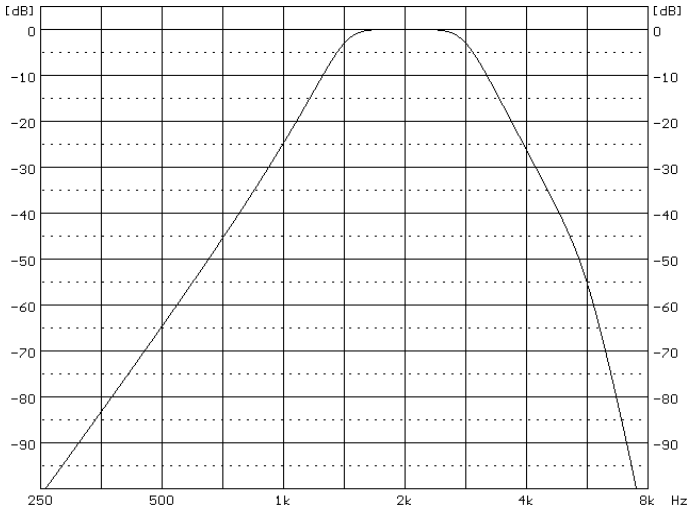
9 filters with centre frequencies from 31.5 Hz to 8 kHz (base 10), meeting IEC 61260-1:2014 for Class 1.



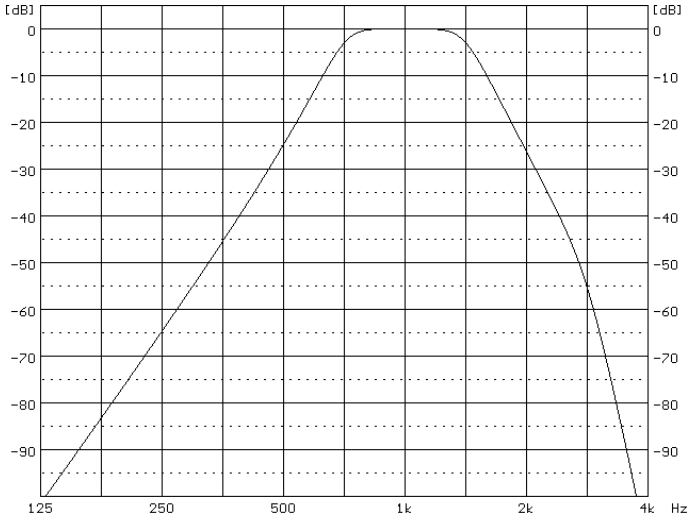

**8.0 kHz 1/1 octave filter**



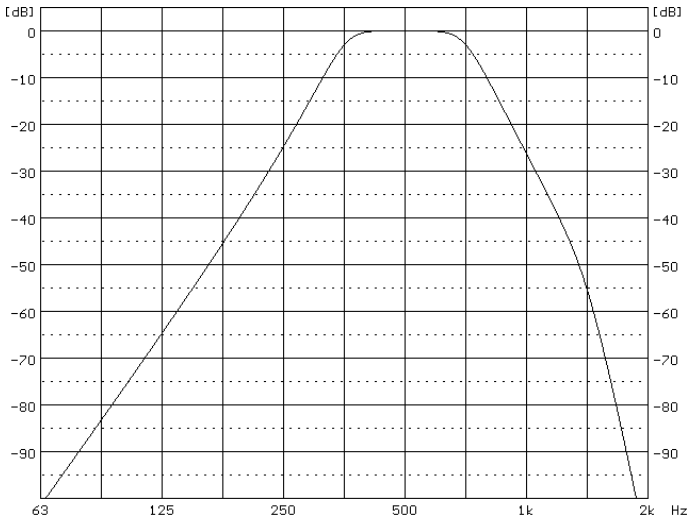

**4.0 kHz 1/1 octave filter**



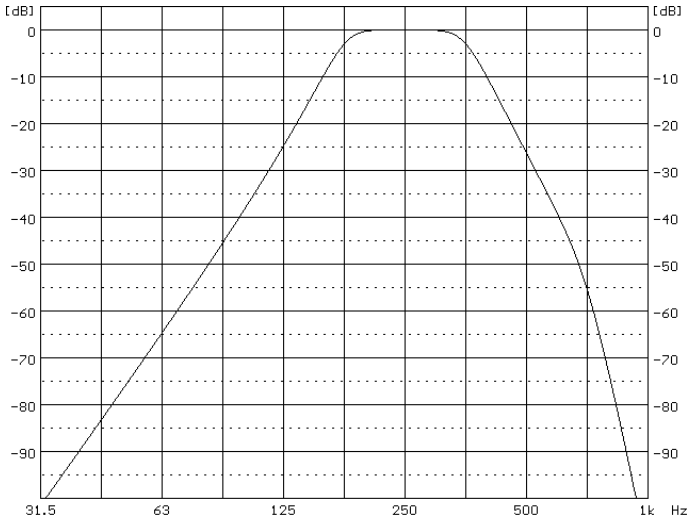

**2.0 kHz 1/1 octave filter**



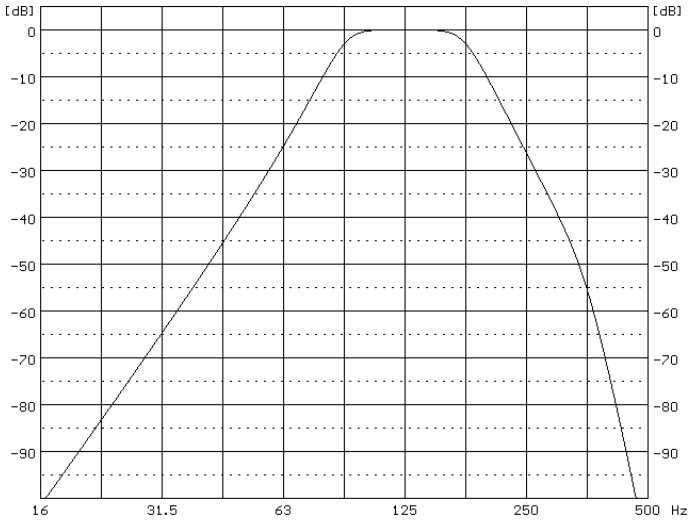

**1.0 kHz 1/1 octave filter**



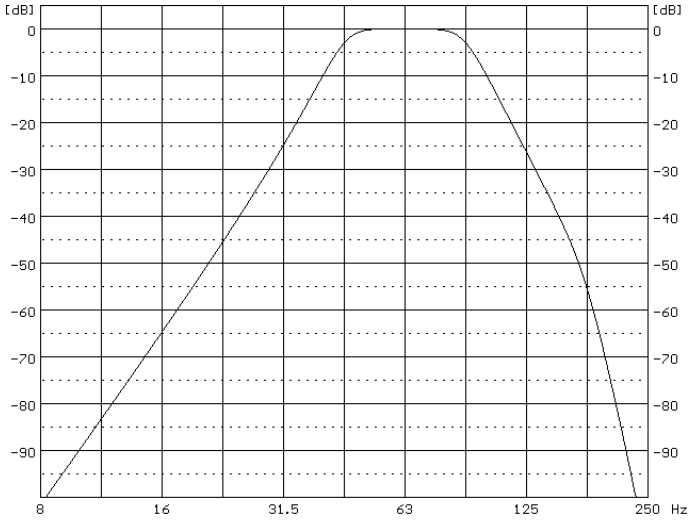

**500 Hz 1/1 octave filter**



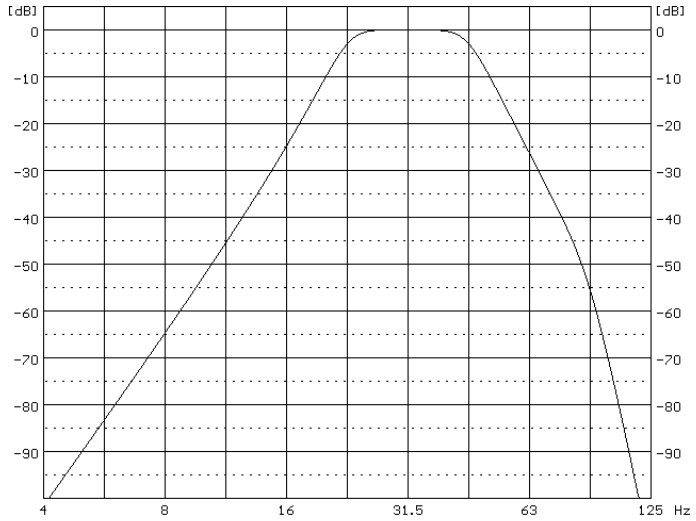

**250 Hz 1/1 octave filter**




**125 Hz 1/1 octave filter**



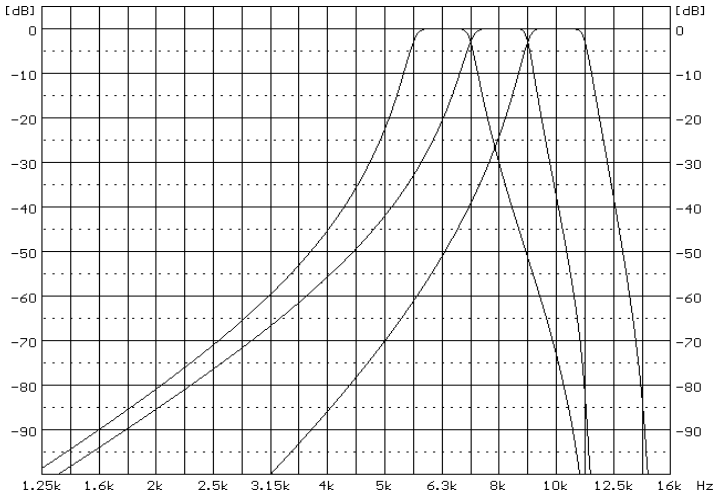

**63.0 Hz 1/1 octave filter**



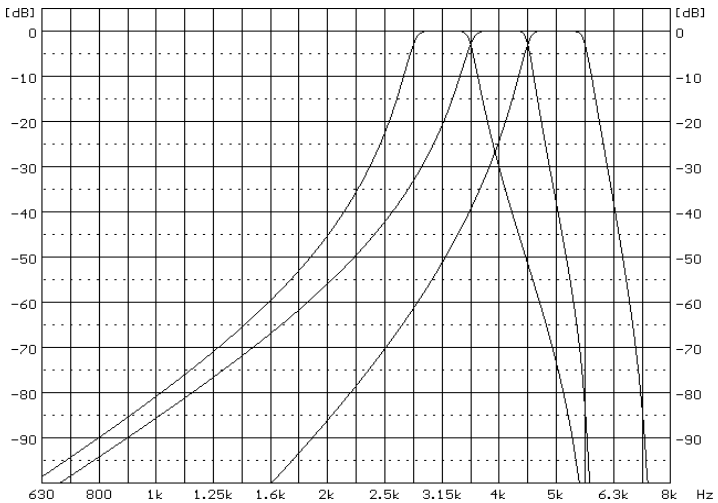

**31.5 Hz 1/1 octave filter**

## 1/3 octave filters

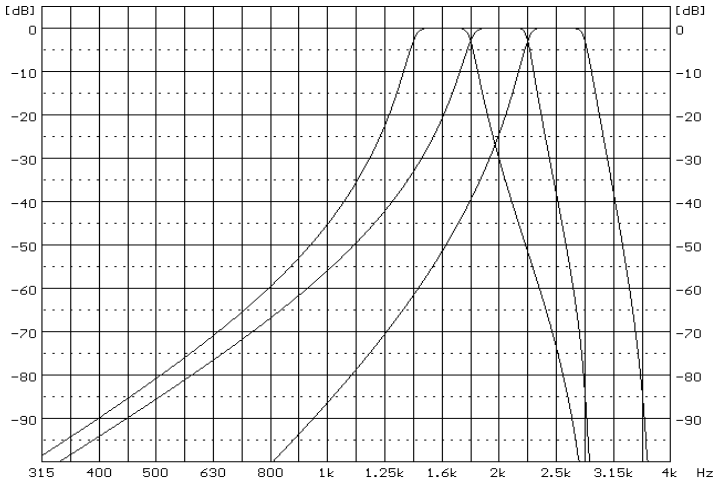
**28** filters with centre frequencies from 20 Hz to 10 kHz (base 10), meeting IEC 61260-1:2014 for Class 1.



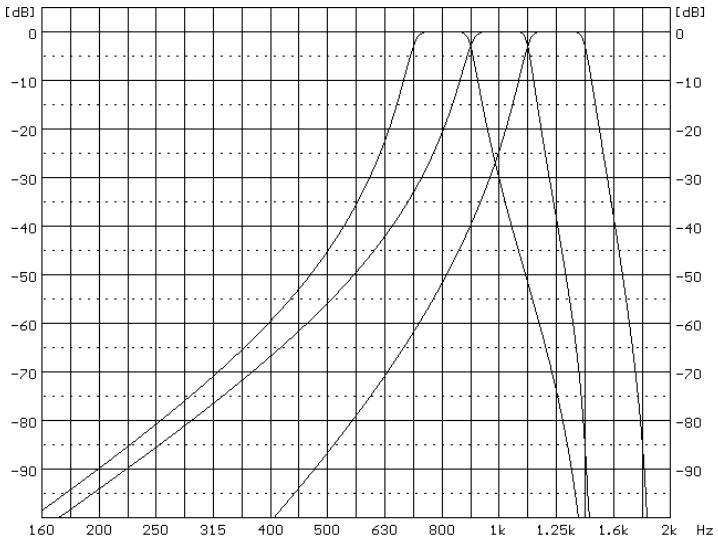

**1/3 octave filters for 8.0 kHz**



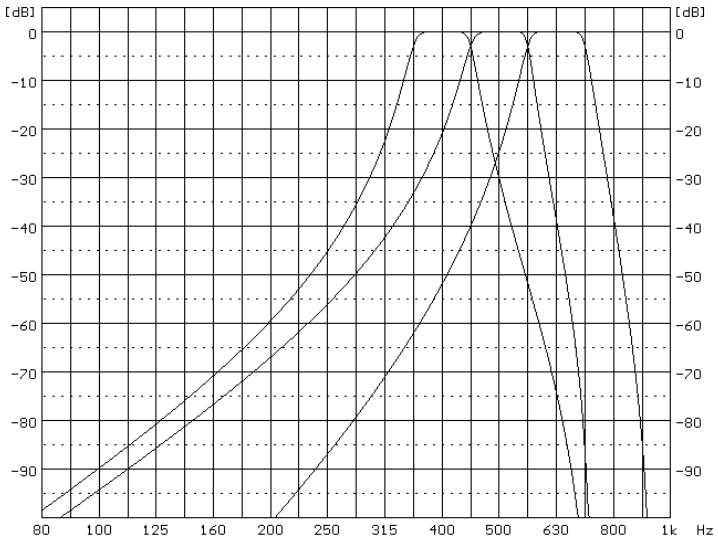

**1/3 octave filters for 4.0 kHz**



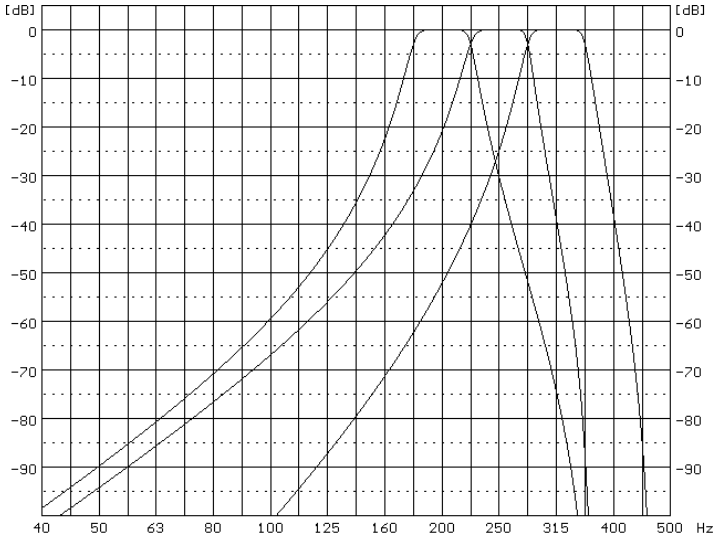

**1/3 octave filters for 2.0 kHz**



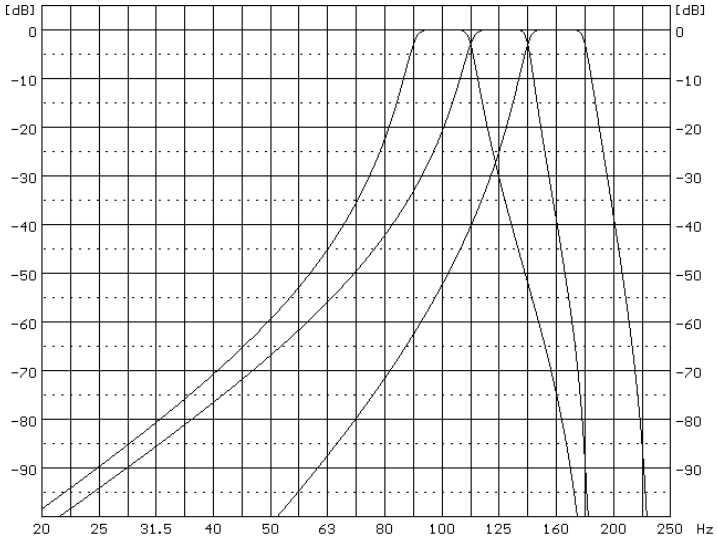

**1/3 octave filters for 1.00 kHz**



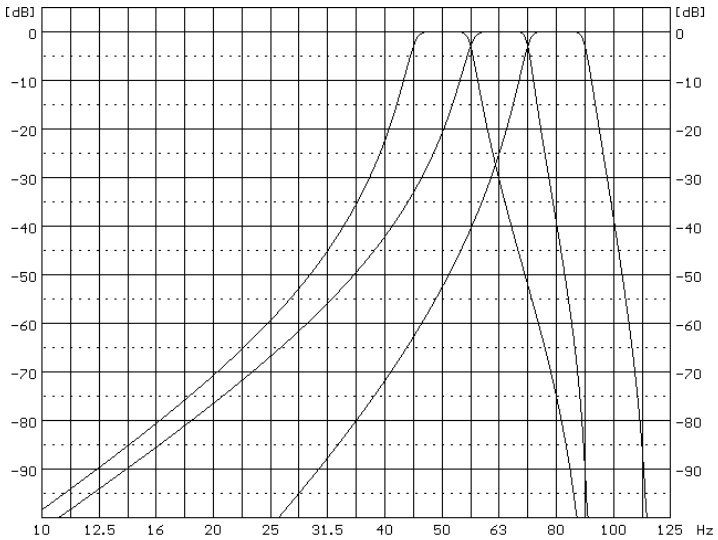

**1/3 octave filters for 500 Hz**



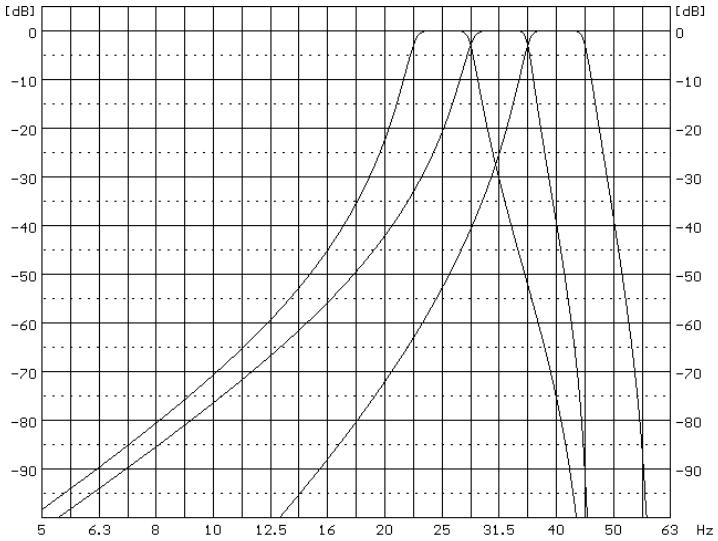

**1/3 octave filters for 250 Hz**



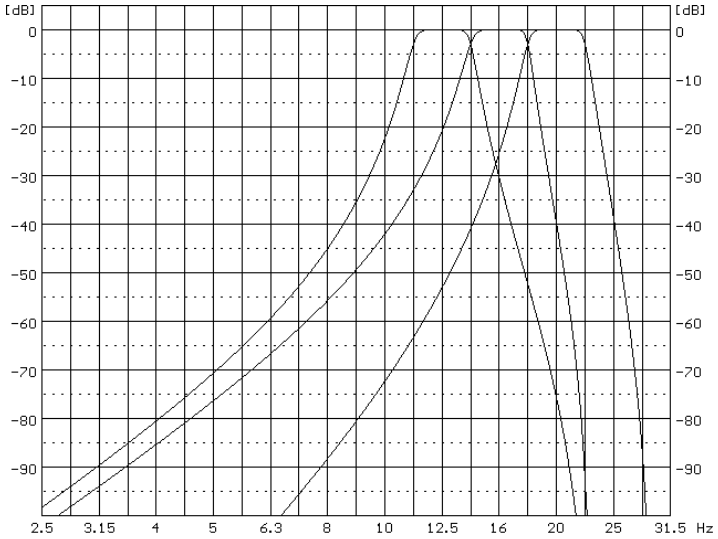

**1/3 octave filters for 125 Hz**




**1/3 octave filters for 63.0 Hz**




**1/3 octave filters for 31.5 Hz**

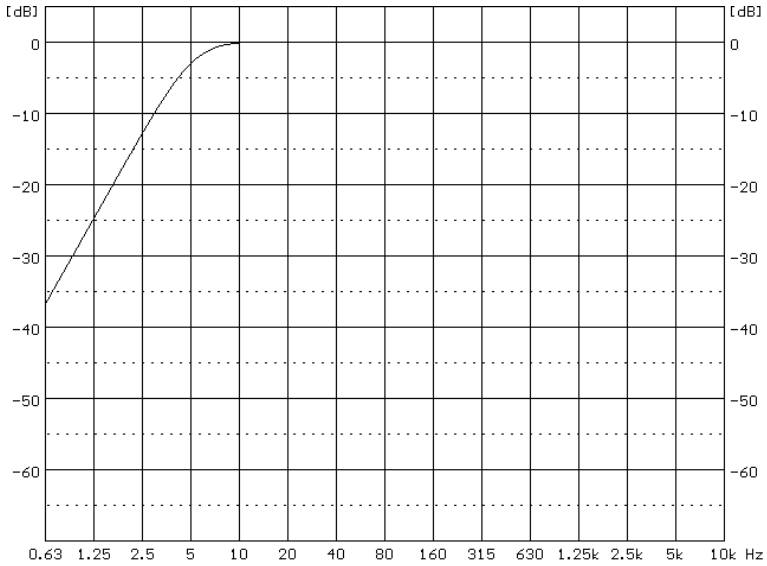



**1/3 octave filters for 16.0 Hz**

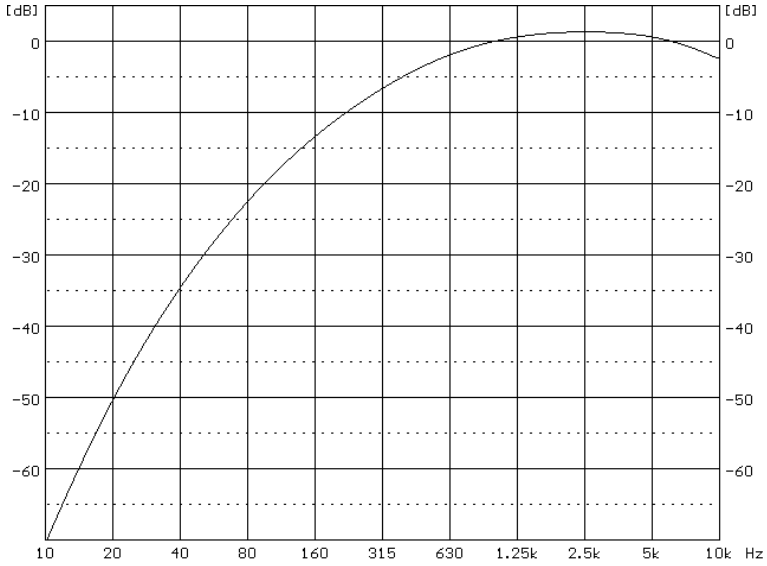
## C.3 FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED DIGITAL FILTERS

**Digital weighting filters** implemented in dose and octave mode

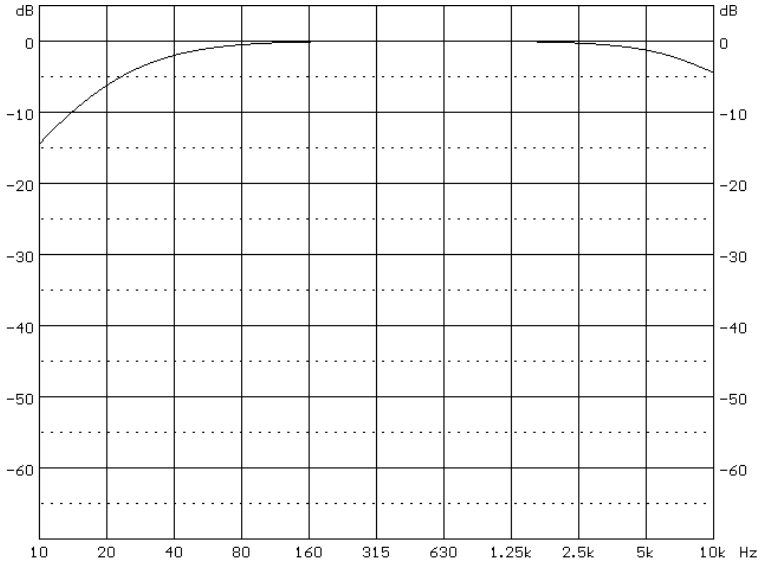
**Z Filter:** Class 2 according to the IEC 61672-1:2013 standard.




**A Filter:** Class 2 according to the IEC 61672-1:2013 standard



**C Filter** Class 2 according to the IEC 61672-1:2013 standard



## C.4 GENERAL SPECIFICATION OF SV 104A

### Signal input

The input of the measured signal (mounting head):

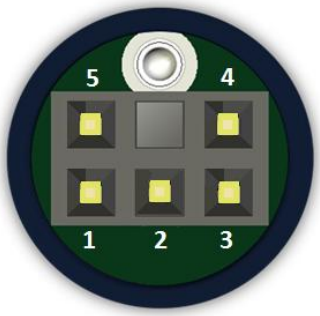



**Figure C.6 ST 104A microphone connector (mounting head outer view)**

**Table C.9.** Pin out of the microphone connector

| Pin Number | Function |
|---|---|
| **1** | "SIGNAL" Input channel 1 *(shorted with chn.2 in dosimeter)* |
| **2** | 2.8V/5mA supply DC voltage |
| **3** | "SIGNAL" Input channel 2 *(shorted with chn.1 in dosimeter)* |
| **4** | TEDS |
| **5** | GND |
| **Chassis** | Ground |

### Power supply

- Instrument is dedicated for the operation from the internal rechargeable battery.
- Power consumption 14 mA[3] under measurement run from 3.7 V internal cells.
- Typical operating time from internal single Li-ion rechargeable batteries is about **48 hours**.
- The recommended charging dock station is: **SB 104B-1, SB 104B-5**.
- Power consumption from the external ⎓6V source is approx. 200 mA at + 20°C (315mA max) under battery charging,
- Power consumption from the USB source is approx. 400 mA at + 20°C (500mA max) under battery charging,
- Internal rechargeable battery is protected against overcurrent and overvoltage conditions. Safety Maximum Charging Current for Li-ion cells used in SV 104A is 725 mA and Maximum Charging Voltage is 4.4 VDC.

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

[3] display off, octave/one-third analysis off

## **Communication Interface** and external Power Connector

The SV 104A electrical interface enables remote control of the instrument and data transfer up to attainable with 6 MHz clock.

### "Client" communication port

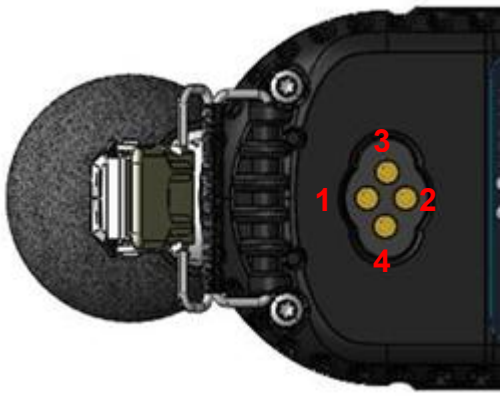



**Figure C.7 Power and Communication Port (external bottom view)**

**Table C.10.**Pin-out of the electrical interface

| Pin number | Function |
|---|---|
| **1** | Power supply: ⎓**6V** ±1.3V |
| **2** | Ground |
| **3** | Receiver |
| **4** | Transmitter |

## USB Interface

The SV 104A micro-USB interface enables remote control of the instrument and data transfer up to attainable with 12 MHz/480MHz clock.

### "Client" micro-USB port


**Figure C.8 Micro USB socket (external view)**

**Table C.11.**Pin-out of the USB-Device connector

| Pin number | Function |
|---|---|
| 1 | VBUS ⎓ **5V** ±0.5V |
| 2 | D- |
| 3 | D+ |
| 4 | ID |
| 5 | GND |
| Shield | Ground |

| | |
|---|---|
| **Real Time Clock** | built-in, accuracy better than 1 minute/month |
| **Weight with the battery** | ~140 g (SV 104A with mounting clips and ST 104A and SA 122A) |
| **Dimensions** | 90x50x31 mm (base: no microphone, no mounting accessories). |

## Environmental parameters

Dedicated for indoor and outdoor use:

| | |
|---|---|
| **Operating temperature range** | -10°C ÷ +50°C |
| **Storing temperature range** | -20°C ÷ +50°C |
| **Charging temperature range** | 0°C ÷ +40°C |
| **Humidity** | ≤ 90% RH in 40°C (uncondensed vapour) |
| **Atmospheric pressure** | 65 kPa ÷ 111.43 kPa |
| **Atmosphere** | air with normal oxygen content, typically 21% v/v |

## WIRELESS BLUETOOTH 4.0 CONNECTIVITY

This dosimeter supports wireless connection via Long-Range Bluetooth® 4.0 (Low energy or Smart). This connectivity is compatible with mobile and PC devices that support Bluetooth® 4.0.

- TX power: up to 8 dBm
- Receiver sensitivity: -98 dBm
- Range: Typically >100m line-of-sight and depending on local RF conditions.

The instrument contains a wireless transmission module, BLE121LR from Bluegiga technologies. Copies of the modules regional approvals certificates may be obtained from Svantek or Bluegiga.

- Declaration ID: D023154, Controller Subsystem Qualified Design ID: 57409

### FCC and IC

This product contains an FCC and Industry Canada certified Bluetooth® Low energy wireless transmission module:-

- **FCC IDENTIFIER:** QOQBLE121LR
- **Industry Canada IC:**5123A-BGTBLE121LR

- Producer: BlueGiga Technologies Inc.
- Model: BLE121LR Bluetooth smart module
- Modular Type: Single Modular

**FCC Statements:**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter meets both portable and mobile limits as demonstrated in the RF Exposure Analysis. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

**IC Statements:**

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

## Compatibility with EU Directives

CE mark indicates compliance with:

- **EMC**, Electro-Magnetic Compatibility Directive 2014/30/EU
- **LVD**, Low Voltage Directive 2014/35/EU
- **RED**, Radio Equipment Directive 2014/53/EU
- **RoHS2**, Restriction of Hazardous Substances in Electrical and Electronic Equipment 2011/65/EU
- **WEEE**, Waste of Electrical and Electronic Equipment 2012/19/EU

## Electromagnetic Compatibility (EMC)

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

1. **For the EMC emissions specification:**

   according to EN 61672-1:2014 (Chapter 5.21) and EN 61672-2:2014 (Chapter 8), applying test methods in accordance with CISPR 22, Clause 10 and CISPR 16-1,

2. **For the EMC immunity specification:**

   according to EN 61672-1:2014 (Chapters 6.5 and 6.6) and EN 61672-2:2014 (Chapter 7.9 and 7.10), applying test methods in accordance with IEC 61000-4-2, IEC 61000-4-3:2002 and IEC 61000-4-8.

***Note:*** *EMC compatibility is guaranteed only with the original accessories supplied by SVANTEK!.*

## Safety

The product described above is compliant with following standards: EN/IEC 61010-1:2010

***Note:*** *The measurement circuit is safety category I according to EN/IEC 61010-1:2010 standard. This measurement equipment should not be used for measurements in categories II, III, IV. The input voltage should be within the 30 V Peak – Peak.*

***Category I equipment:*** *dedicated to measurements performed on circuits not directly connected to mains, such as circuits not derived from mains or protected mains-derived circuits, including low-voltage circuits from power supplies.*

***Note:*** *SV 104A acoustic measurement is contactless.*

The device marked with symbol ⚠, meaning:

ATTENTION, CONSULT ACCOMPANYING DOCUMENTS

**Environmental Ingress Protection:** **IP65** per EN 60529:1991/A2:2013 (IEC 60529:1989/Amd2: 2013). Dust-tight. Protected against water jets. Suitable for outdoor use.

# APPENDIX D DEFINITIONS AND FORMULAE OF MEASURED VALUES

## D.1 BASIC TERMS AND DEFINITIONS

**T** — Current time period of the measurement in seconds.

**$T_1$** — Last second of the measurement.

**$T_e$** — Exposure time in seconds (time period during which a person is exposed to the action of noise). This parameter can be set in the **Exposure Time** setup (**Measurement** menu). The available values are from 1 minute to 12 hours with 1-minute step.

**$T_{8h}$** — Time period equal to 8 hours (28 800 seconds).

**$\tau$** — 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 $\tau$ 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: $\xi$ – variable of integration.

**$r(t)$** — Instantaneous sound pressure depends on the <**RMS Integration**> parameter:

$$r(t) = \begin{cases} p_W(t) & \text{RMS Integration} = \text{Lin} \\ p_{W\tau}(t) & \text{RMS Integration} = \text{Exp} \end{cases}$$

**$p_0$** — Reference value (20 μPa).

**$\log(x)$** — Logarithm of x to the base 10.

**Q** — Exchange rate in decibels is equal to 2, 3, 4, 5 or 6. The value of Q influences the calculations of dose meter results, namely **DOSE**, **D_8h** and **LAV**. The exposure rate equal to 3 complies with ISO R 1999 “Assessment of Occupational Noise Exposure for Hearing Conservation Purposes”, while Q equal to 5 complies with the American “Occupational Safety and Health Act” – OSHA.

**q** Value of q is used in the calculations of **DOSE**, **D_8h** and **LAV** is taken from the formula

$$q = \begin{cases} \frac{Q}{\log 2} & \text{for } Q \neq 3 \\ 10 & \text{for } Q = 3 \end{cases}$$

**$L_T$** Threshold sound level set in the **Threshold Level** via the SUPERVISOR software. The available values are as follows: **None**, **60dB** up to **90dB** in 5 dB steps.

**$L_C$** Criterion sound level set in the **Criterion Level** set via the SUPERVISOR software. The available values are from **60dB** up to **90dB** in 5 dB steps.

**L(t)** Sound level (a function of time) measured with the selected time constant (**IMPULSE**, **FAST** or **SLOW**) and the weighting filter (equal to **A**, **C** or **Z**)

$$L(t) = 20 \log \frac{p_W(t)}{p_0}$$

**$L_d(t)$** Sound level (a function of time), depends on the selected threshold level.

In case the **None** option is selected

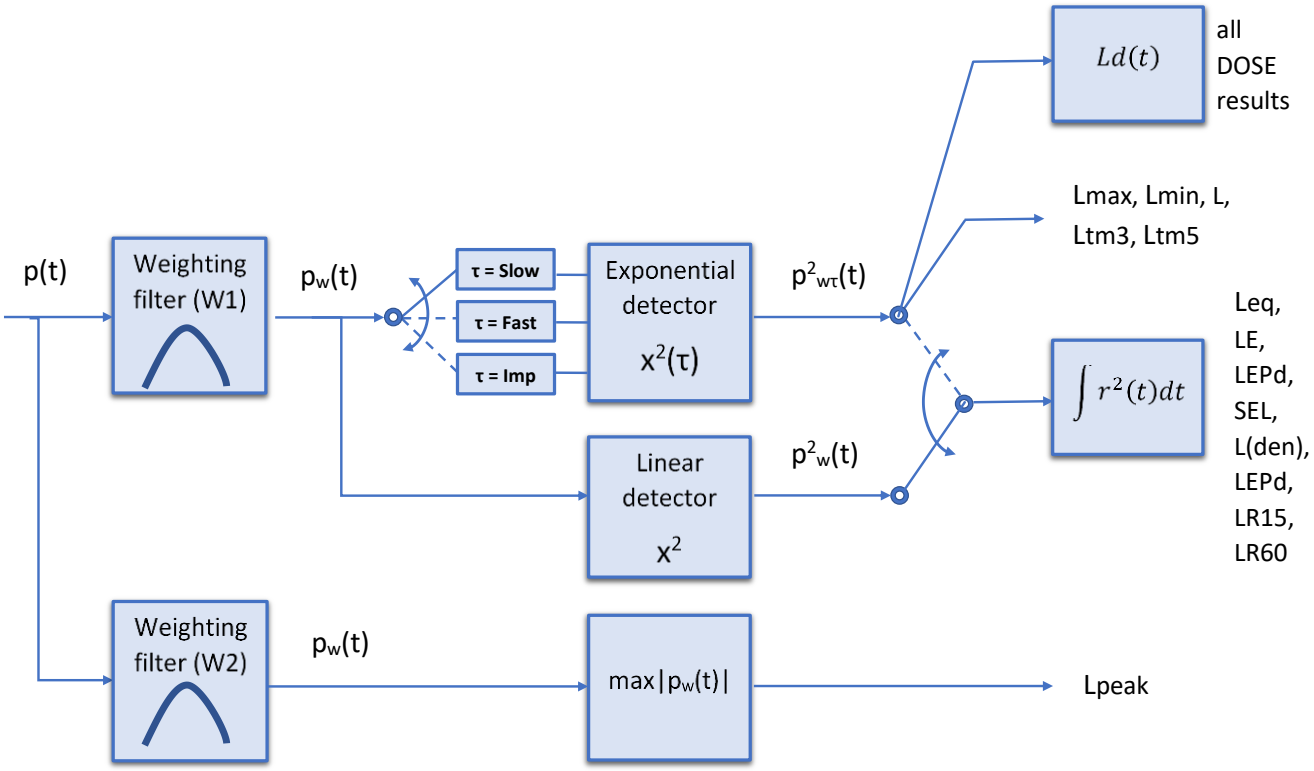
$$L_d(t) = L(t)$$

In other cases (when the **Threshold Level** set via the SUPERVISOR software is not set to none and equal to **60 dB** … or up to **90 dB**)

$$L_d(t) = \begin{cases} L(t) & \text{for } L(t) \geq L_T \\ -\infty & \text{for } L(t) < L_T \end{cases}$$

## D.2 DEFINITIONS AND FORMULAS OF THE SLM FUNCTION RESULTS

The instrument calculates the sound measurement results for three profiles. The calculation flow diagram for one profile is presented below:




**OVL** — Percentage of the overloaded input signal, which occurred during the current time period of the measurement (**T**)

**L(A/C/Z)peak** — Peak sound level expressed in dB, for frequency weightings A, C, Z, symbols are **LApeak**, **LCpeak** and **LZpeak**. Peak sound level is calculated for the given **T**.

$$\mathbf{Peak = 10 \log \left( max_T \frac{p_w^2(t)}{p_0^2} \right)}$$

**L(A/C/Z)(S/F/I) max** — The highest time weighted sound level (**Max**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are **LAFmax**, **LASmax**, **LCFmax**, **LCSmax** etc.

$$\mathbf{Max = 10 \log \left( max_T \frac{p_{w\tau}^2(t)}{p_0^2} \right)}$$

**L(A/C/Z)(S/F/I) min**

The lowest time weighted sound level (**Min**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are **LAFmin**, **LASmin**, **LCFmin**, **LCSmin** etc.

$$\mathbf{Min = 10 \log \left( \min_T \frac{p^2_{W\tau}(t)}{p_0^2} \right)}$$

**L(A/C/Z)(S/F/I)**

Time weighted sound level expressed at observation time, expressed in dB, for frequency weightings A, C, Z and time weightings F, S, I symbols are **LAF**, **LAS**, **LCF**, **LCS** etc.

$$\mathbf{L = 10 \log \left( 1/\tau \frac{p^2_{W\tau}(t)}{p_0^2} \right)}$$

**L(A/C/Z)eq**

Time averaged equivalent continuous sound level (**Leq**) expressed in dB, for frequency weightings A, C, Z symbols are **LAeq**, **LCeq** and **LZeq**. In principle time weighting is not involved in a determination of time averaged sound level. Time-averaged sound level is calculated for current time period of the measurement (**T**).

$$\mathbf{Leq = 10 \log \left( \frac{1}{T} \int_0^T \left( r(t)/p_0 \right)^2 dt \right)}$$

**L(A/C/Z)E**

Sound Exposure Level (**SEL**) expressed in dB, for frequency weightings A, C, Z symbols are **LAE**, **LCE** and **LZE**. **SEL** is essentially the subset of the **Leq** result. Its value is equal to the **Leq** result referred to the integration time equal to one second (so, for the Integration time equal to 1 s, **SEL** is always equal to **Leq**).

$$\mathbf{SEL = 10 \log \left( \int_0^T \left( r(t)/p_0 \right)^2 dt \right) = Leq + 10 \log \frac{T}{1s}}$$

**LEPd**

Daily Personal Noise Exposure is the noise exposure level for a nominal 8-hour working day. The **LEPd** result is calculated on the base of the **LEQ**

$$\mathbf{LEPd = Leq + 10 \log \frac{T_e}{T_{8h}}}$$

**LTM3** and **LTM5** The **LTM3** and **LTM5** results (Takt-Maximal Levels) are calculated according to the German standard TA Lärm.

**Ln**

Statistical level is the certain boundary level surpassed by the temporary noise level values in not more than **nn %** of the observation period

**Example:** Let us assume that **L35** is equal to 76.8 dB. It means that during the measurements the noise level 76.8 dB was exceeded in not more than 35% of the observation period.

## D.3 DEFINITIONS AND FORMULAS OF THE ADDITIONAL DOSIMETER FUNCTION RESULTS

**DOSE**

Quantity of noise received by the worker, expressed as the percentage of the whole day acceptable value.

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

**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: $\Delta t_i$ - time intervals, in which the noise level $L(t) \in \langle L_k, L_k + \Delta L \rangle$ occurs,

$\Delta L$ - 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, $\Delta L$ 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.

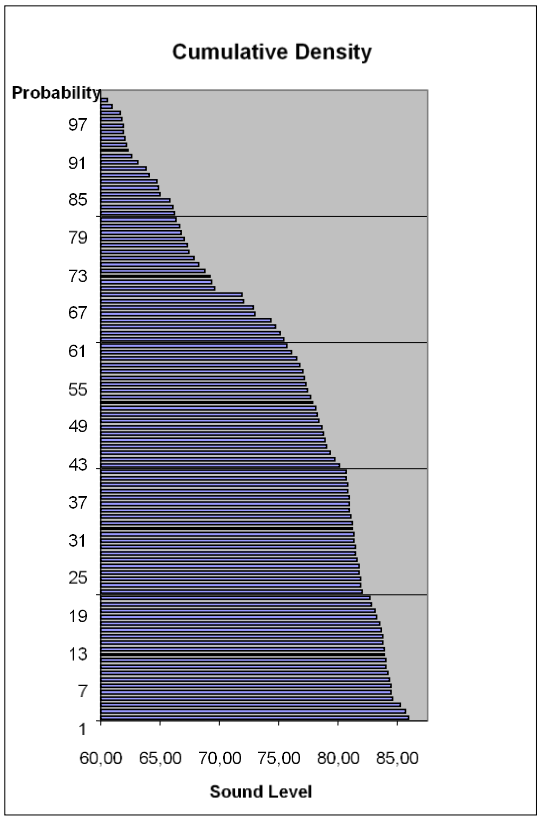
**Example:**

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**