SVANTEK

USER MANUAL

SVAN 977A

SOUND & VIBRATION ANALYSER

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Rev. 5.00

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***Note:** Because of continuous product improvement SVANTEK reserves the right to make changes to product specifications without notice. To download the most up to date User Manual please visit our web site at www.svantek.com. This User Manual presents the firmware revision named 1.34.x (see the **Unit Label** review to check version details).*

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

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1 INTRODUCTION

SVAN 977A is an all-digital, Class 1 Sound & Vibration level meter designed for general acoustic and vibration, environmental noise, occupational health and building acoustic measurements.

Three acoustic or vibration user configurable profiles allow parallel measurements with independently defined frequency filters and RMS detector time constants. Each profile provides significant number of results (like **Spl**, **Leq,** **Sel**, **Ldem**, **LEPd**, **Ltm3**, **LTeq**, **Peak**, **Max** and **Min** as well as ten statistics, two rolling Leq, expected Leq value, standard Leq deviation and noise criterium and noise ratio indexes in case of sound measurements or **RMS**, **Ovl**, **Peak**, **P-P** in case of vibration measurements). Advanced time history logging for each profile provides complete information about the measured signal using the SD-card fitted in the bottom of the meter and can be easy downloaded to any PC using the USB interface and SvanPC++ software.

All required weighting filters: **A**, **B**, **C**, **Z**, **U**, **AU** and **LF** for sound measurements and **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10** and **Wh** for general vibration measurements (like acceleration, velocity and displacement); are available with this instrument.

Using the computational power of its digital signal processor SVAN 977A can, simultaneously to the meter mode, perform the real time **1/1 Octave** or optionally **1/3 Octave** analysis including calculations of statistical levels or can optionally perform **FFT** analysis.

The built-in frequency analyser offers 1/1 octave real-time analysis as a standard feature and 1/3 octave and FFT as optional functions. The frequency analysis is logged together with the time history of sound or vibration meter results.

Time domain waveform signal recording on the SD-card is available as an option and advanced trigger and alarm functions are available in the standard version of this instrument.

For building acoustic applications, SVAN 977A offers Reverberation Time measurements (RT60) option and BA Assistant application for smartphones.

A fast USB 1.1 interface (12 MHz) creates a real-time link for the PC "front-end" application of SVAN 977A. With the use of optional interfaces (RS 232) the instrument can be remotely controlled from the PC with the use of **SvanPC++** software.

SVAN 977A is equipped with **Bluetooth®**[1] v.2.0+EDR module and can be remotely control by the **SvanMOBILE** smartphone application for the Android platform.

Working as a part of **SV 277PRO** monitoring station, equipped with 3G modem, SVAN 977A can transfer measured data via Internet to PC with the use of **SvanPC++_RC** option or via **SvanNET** web service. The instrument can be fully remotely controlled via these interfaces. The instrument has **advanced alarms** features, enables the user notification about exceeded threshold levels by SMS or mails.

The instrument is powered from four AA standard alkaline or rechargeable batteries (i.e. NiMH – a separate charger is required). Powering the instrument from the External DC power source or the USB interface is also possible.

[1] "The *Bluetooth*® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by SVANTEK is under license. Other trademarks and trade names are those of their respective owners.

1.1 SVAN 977A AS SOUND LEVEL METER & ANALYSER

- Noise measurements (**Peak**, **Max**, **Min**, **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, Leq statistics (**Lnn**), expected Leq value (**EX**), standard Leq deviation (**SD**), two rolling Leq (**LR1** and **LR2**), measurement time and overload time % (**OVL**) as well as noise criterium (**NC**) and noise ratio (**NR**) in case of 1/1 Octave option) with Class 1 IEC 61672-1:2013 accuracy in the frequency range 20 Hz to 20 kHz with the SV 7052E microphone.
- Parallel **Impulse**, **Fast** and **Slow** detectors for the measurements with **A**, **B**, **C**, **Z**, **U**, **UA** and **LF** frequency filters.
- Two measurement ranges 25 dB RMS(A) ÷ 123 dB Peak (**Low**) and 35 dB RMS(A) ÷ 140 dB Peak (**High**).
- **1/1 Octave** and optional **1/3 Octave** real time analysis **-** 10 filters with centre frequencies 31.5 Hz ÷ 16 kHz and 31 filters with centre frequencies 20 Hz ÷ 20 kHz, in accordance with Class 1 IEC 61260-1:2014.
- Optional reverberation time **RT60** analysis function for 1/1 octave bands or 1/3 octave bands and three total RMS levels (**A**, **C** and **Z** weighted) in accordance with the ISO 3382 standard.

1.2 SVAN 977A AS VIBRATION LEVEL METER & ANALYSER

- General Vibration measurements (acceleration, velocity and displacement) meeting ISO 20816-1:2016 standard in the frequency range depending on the parameters of the attached accelerometer, i.e. with SV 80 general purpose transducer is equal to 0.5 Hz ÷ 14 kHz.
- Parallel **RMS**, **Max**, **Peak**, **Peak–Peak** measurements.
- **HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10** and **Wh** weighting filters.
- **1/1 Octave** and optional **1/3 Octave** real time analysis - 15 filters with centre frequencies 1 Hz ÷16 kHz, and 45 filters with centre frequencies 0.8 Hz ÷ 20 kHz, Class 1 IEC 61260-1: 2014.
- Optional **RPM** measurement with the use of RPM probe, connected to the **I/O** socket of SVAN 977A.
- Optional **FFT** analysis with the single **Total** overall value, performed with preselected frequency weighting filters and screens.

1.3 GENERAL FEATURES OF SVAN 977A

- Advanced **Data Logger** function including spectrum logging on the micro **SD card**
- 1/1 and 1/3 octave and FFT analyser (1/3 octave and FFT – optionally)
- Time domain waveform signal recording (option)
- Advanced trigger and alarm functions
- **USB 1.1 Client interface** (real time PC "front end" application supported)
- **RS 232** interface
- **Bluetooth®** v.2.0+EDR module
- Integration time programmable up to **24 h**
- Power supply by **four AA** rechargeable or standard batteries
- Handheld, light weight and robust case
- Easy to use with menu driven user interface

1.4 ACCESSORIES INCLUDED

- **SV 7052E** prepolarised ½” microphone with nominal sensitivity 35 mV/Pa
- **SV 12L** microphone preamplifier with IEPE power supply
- **SA 22** foam windscreen
- **SC 16** USB 1.1 cable
- **SA 62** 16 GB memory card - Kingston MicroSD HC Class 4
- **four AA** alkaline batteries
- **SvanPC++** download and viewing software.

1.5 ACCESSORIES AVAILABLE

- **SA 277** microphone outdoor protection kit for the SVAN 977A microphone (microphone, desiccator and cable not included)
- **SA 270D** desiccator for outdoor kit
- **SC 26** extension cable for SV 12L (TNC plug to TNC socket)
- **SV 36** Class 1 sound calibrator: 94/114 dB@1000 Hz
- **SA 17A** external battery pack using 6 x AA batteries
- **SA 143** carrying case for SVAN 977A and accessories (lightweight)
- **SA 79** carrying case for SVAN 977A and accessories (waterproof)
- **SA 47** carrying bag for SVAN 977A and accessories (fabric material)
- **SV 55** interface RS 232 for SVAN 977A
- **SV 80** general purpose vibration accelerometer 100 mV/g (10 mV/ms^{-2})
- **SC 27** coiled cable for accelerometer 2 m
- **SA 27/10-32** mounting magnetic base for accelerometer
- **SA 15** power supply
- **SA 31** external charger for four AA rechargeable batteries
- **SV 58_H** GPS module with USB HOST plug.

1.6 FIRMWARE OPTIONS AVAILABLE

- **SV 977_2** 1/3 octave analysis for SVAN 977A
- **SV 977_4** FFT analysis option for SVAN 977A
- **SV 977_5** RT60 option for SVAN 977A
- **SV 977_8** RPM Rotation measurement option (excluding Laser Tachometer) for SVAN 977A
- **SV 977_15** Time domain waveform signal recording (to the micro SD-card: *.srt or *.wav format) for SVAN 977A

Note: *The software options for the instrument can be purchased at any time as only the introduction of a special unlock code is required for their activation in a specific instrument. Contact your local Svantek distributor for further information and costs for these options.*

2 MANUAL CONTROL OF THE INSTRUMENT

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

2.1 CONTROL KEYS ON THE FRONT PANEL

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

- **<ENTER>**, **<Menu>**, **<Save>**,
- **<ESC>**, **<Cal.>**, **<S/P>**,
- **<Shift>**, [Markers]
- **<Alt>**, [Markers]
- ▲, ◄, ►, ▼
- **<Start/Stop>**.

The name given in (...) brackets denotes the second key function which is available after pressing it in conjunction (or in sequence) with the **<Shift>** key. For the first two keys, the name given in square brackets […] denotes also the third key function which is available after pressing it in conjunction (or in sequence) with the **<Alt>** key.

<Shift> The second function of a key (for example, **<Menu>**) can be used when the **<Shift>** key is pressed together with **<Enter>** or some other keys. This key can be used in two different modes, which can be configured in the **Keyboard** list (*path: <Menu> / Instrument / Keyboard*):

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

<Alt> This key enables choosing the third key function of the **<Save>** and **<Pause>** keys. To select the third function, press the **<Alt>** and the second key together. You can also program one or two finger operations same way as for the **<Shift>** key.

Note: *Changing the "one or two fingers" mode is performed in the* ***Keyboard Settings*** *screen of the* ***Instrument*** *list (see description of the* ***Instrument*** *list).*

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

<Start/Stop> This key starts or stops the measurement. You can set the mode of this key so that to start or stop the measurements you should press **<Start/Stop>** simultaneously with **<Shift>**. This can prevent accidentally starting or stopping a measurement.

<ENTER> This key opens the selected position in the list and confirms selected settings. Some additional functions of this key will be described in the following chapters of this manual.

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

[<Save>] This key (**<Alt> + <ENTER>**) enables saving of measurement results (see description in Chapter 3.5).

<ESC> This key escapes from the lists of parameters, menu lists or other screens and return to the previous screen without saving changes. It acts in an opposite way to the **<ENTER>** key.

(<Cal.>) This key (**<Shift> + <ESC>**) opens the **Calibration** position.

[<S/P>] This key (**<Alt> + <ESC>**) breaks the measurement process temporary or enables saving of the setup file if the instrument is not running the measurement.

◄, ► These keys allow to:

- select a column in a multi column parameter list;
- select a parameter value in an active position (e.g. filter **Z**, **A**, **B** etc., **Start Delay** period: **1s**, **2s**, **3s**, … etc.);
- control a cursor in the **Spectrum**, **Logger** and **Statistics** mode of result presentation;
- select a position of the character in the text editing screen;
- activate/deactivate markers no. 2 and 3
- speed up change numerical values of parameters when pressed and held.

(◄, ►) The ◄ / ► keys pressed together with **<Shift>** allow to:

- change a parameter's value with double step (e.g. **Start Delay** period: form **1s** to **11s**, **21s**, … etc.);
- shift cursor from the first to the last position and back on the plot.

[◄, ►] The ◄ / ► keys pressed together with **<Alt>** allow to:

- select a parameter's value in an active position in the matrix parameter list;
- select a parameter's value in an active position (e.g. filter **Z**, **A**, **B** or **C**, **Start Delay** period: **1s**, **2s**, **3s** … etc.);
- insert or delete a character in the text edition screen.

▲, ▼ These keys allow to:

- select a position in the list;
- select an active field in the result view screen;
- select a character in the text edition screen;
- activate/deactivate markers no. 1 and 4.

(▲,▼) The ▲ / ▼ keys pressed together with **<Shift>** allow to:

- shift a cursor from the first to the last position and back in the menu list;
- change relationship between the Y-axis and X-axis for plots.

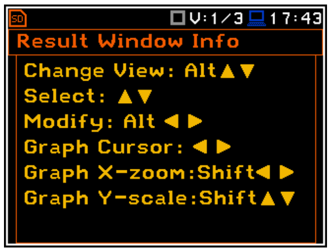
[▲,▼] The ▲ / ▼ keys pressed together with **<Alt>** allow to:

- change a mode of result presentation;
- programme the Real-Time Clock (**RTC**) and **Timer**.

<Markers> The <**Markers>** key (**<Alt>** + **<Shift>**) enables marking the special events, occurring during a measurement (for example, some sound or vibration disturbance). To activate markers, the logger should be switched on (*path: <Menu> / Measurement / Logging / Logger Setup*) and one or more logger results (**Peak**, **Max**, **Min**, **Leq**, **LXY**, **LR1** or **LR2** for sound measurements and **Peak**, **P–P**, **Max** or **RMS** for Vibration measurements) in profiles should be active (*path: <Menu> / Measurement / Logging / Logger Results).*

[Info]

The **<Info>** key (simultaneous pressing the ◄ and ► keys) opens the screen with the help information in the measurement display modes. Press **<ESC>** or **<ENTER>** to exit the Info screen.



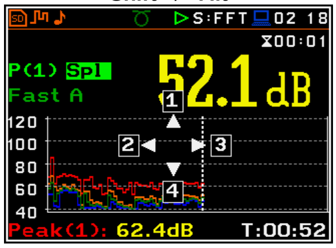
To enter the marker mode, press the **<Shift>** and **<Alt>** keys simultaneously during the measurement. Then four available markers will appear on the screen. To switch on marker no. 1, press the ▲ key (no. 2 - ◄, no. 3 - ► and no. 4 - ▼). Active marker number will be highlighted. To switch off the marker, press the appropriate arrow-key second time.

Markers disappear from the screen after pressing **<Shift>** and **<Alt>**, but their status doesn't change. To continue working with markers, press **<Shift>** and **<Alt>** again.

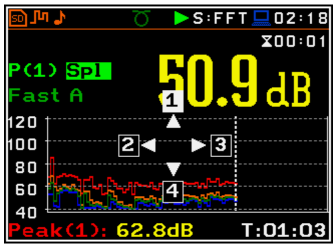
Markers are saved in the logger file (cf. App. B for details) and can be studied with the help of the SvanPC++ software.

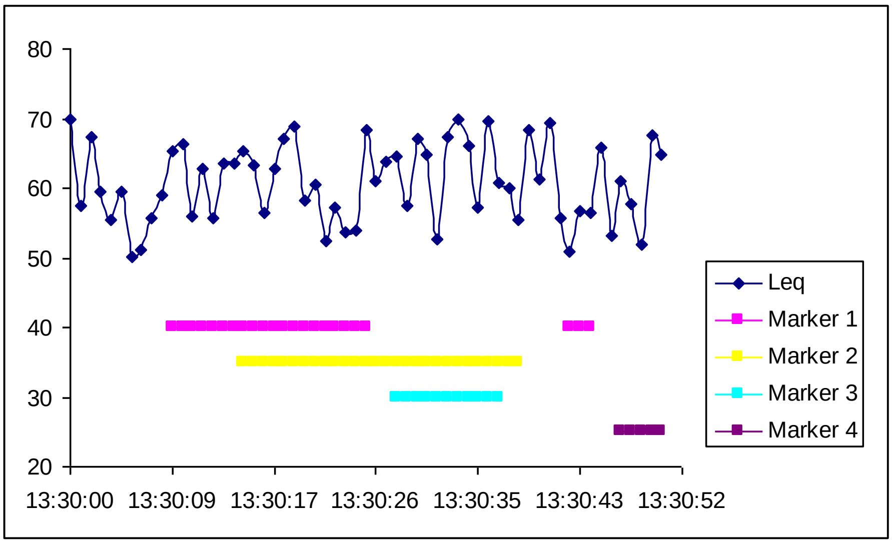
An example presentation of the markers on the time history plot is shown below.

<Shift> / <Alt>



▲





2.2 INPUT AND OUTPUT SOCKETS OF THE INSTRUMENT

Top cover of the instrument

The measurement input is placed in the centre of the instrument's top cover. It is the TNC compatible socket. The **SV 12L** microphone preamplifier has a specially designed matching TNC plug and a locking screw to secure the preamplifier to the meter body. The accelerometers must be connected to the instrument also using the TNC connector. The microphone and accelerometer attaching are described in Chapter 14.3. The full description of the signals connected to the socket is given in Appendix C.

Bottom cover of the instrument

In the bottom cover, there are four sockets, placed from the right to the left as follows: **7-16V**, **Serial**, **USB** and **I/O**.

There is a memory micro SD-card socket (**Memory Card**) under the bottom cover of the instrument and spaces for the 4 x AA batteries.

The **USB** socket is the USB Device 1.1 interface – a serial interface working with 12 MHz clock. Thanks to its speed, it is widely used in all PCs. In the instrument, the standard 4-pin socket is used.

The **Serial** socket is the Serial Port with RS232 data transfer format in TTL logic standard by means of the SV 55 interface. It conforms to the EIA Standard RS 232C and enables remote programming of all instrument functions and transmission to and from the instrument with speed from 300 bit/s to 115200 bit/s.

The additional multi-purpose input/output socket, called **I/O**, is a 3.5 mm jack socket. In case the Analogue Output functionality is selected, the signal from the input of the analogue/digital converter (before any frequency correction) is available on this socket. This signal can be recorded using a magnetic recorder or observed on an oscilloscope. The Digital Input as another functionality that serves as the external trigger to the instrument, while the Digital Output is used to generate the trigger pulse or alarm pulse from the instrument.

You can connect an external DC power 7-16V adapter to the **7-16V** socket located on the bottom cover of the instrument. The current consumption depends on the voltage of the power supplier.

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

All sockets are described in detail in Appendix C for this manual.

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

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

3 GENERAL INFORMATION

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

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

The instrument is equipped with the super contrast OLED color display (320 x 240 pixels), which displays the measurement results and the configuration menu.

3.1 BASIS OF THE INSTRUMENT'S CONTROL

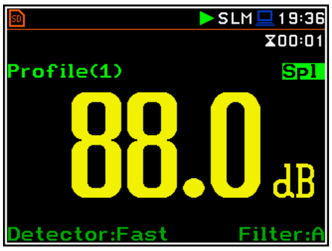
The instrument has two general modes of operation: measurement performance and results preview mode and configuration mode with the use of Menu functionality.

3.1.1 Measurement mode

The measurement results can be viewed in different view modes, the set of which depend on the selected **Measurement Function** and which you can change and activate/deactivate.

Display modes

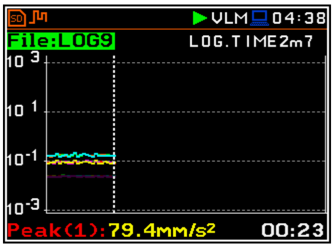
Display modes present some measurement results as well as additional information in the way of icons regarding:

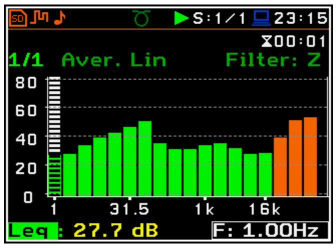


- instrument status: memory, power, real time, Bluetooth, GPS, connection with the modem etc.;
- measurement status: measurement function, measurement elapsed time, measurement start/stop/pause, trigger, logger etc.;
- measurement parameters: measured result, profile number, file name, detector type,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

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

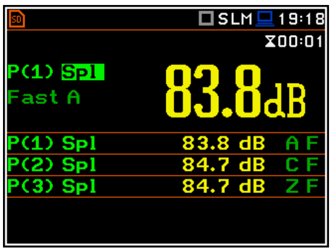
Some views present numerical and some graphical results, like on the right-hand example: time-history plot and spectrum.

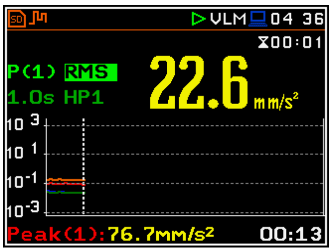




In some views the screen is divided into two parts to show more numerical results in different formats or both numerical and graphical results.

If you are in the measurement mode, you can switch between views using the ▲ / ▼ keys pressed together with **<Shift>**.





All icons are described in Chapter 3.4, other fields and view control functions - in Chapter 6.

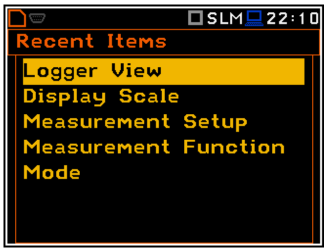
3.1.2 Configuration mode

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

Main menu

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

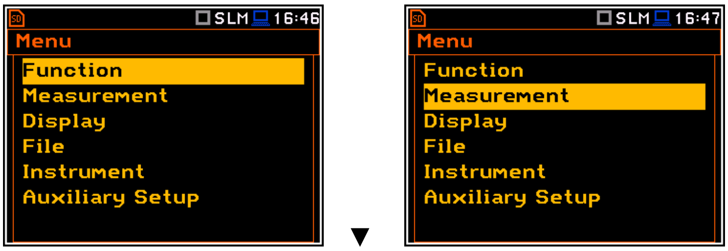
Recent Items list



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

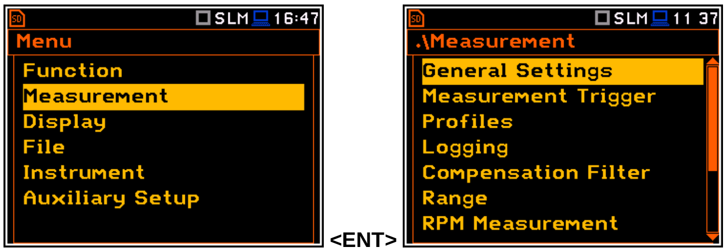
Selecting position

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

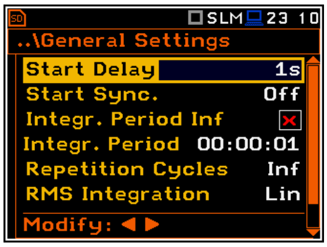


Opening position

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



List of parameters



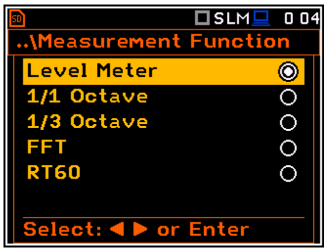
The list of parameters contains parameters the value of which is selected from the available range or set.

- The desired position in a list is accessed with the ▲ / ▼ key.
- Changing value in a selected position is performed with the ◄ / ► key.
- The **<ENTER>** key saves all performed changes in the list of parameters.

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

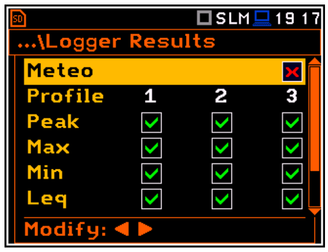
You may change the numerical parameter value with a larger step (usually 10) with the ◄ / ► key pressed together with **<Shift>**.

List of options



The option list consists of different options, from which only one may be selected. The selection of the option is performed in the following way. Highlight the desired option with the ▲ / ▼ key and then press **<ENTER>**. This option becomes active and the list is closed. After re-entering this list again, the last selected option will be marked.

Matrix of parameters

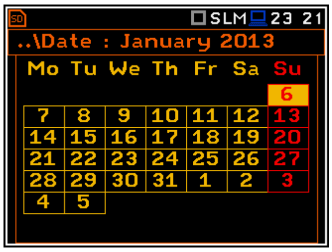


When the list of parameters consists of more than one column you may change:

- column with the ◄ / ► key
- line in the same column with the ▲ / ▼ key
- value in a selected position with the ◄ / ► and **<Alt>** keys
- all values in the same column with the ▲ / ▼ and **<Shift>** keys
- all values in the same line with the ◄ / ► and **<Shift>** keys.

Complex parameters

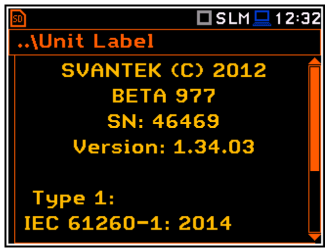
For complex parameters, consisting of more than one value field like **Start Hour** or **Start Date**, you should first select the field and then change the value of this field in accordance with the help information on the bottom of the screen.



In all cases the **<ENTER>** key is used for confirmation of the selection in a position and for closing the opened list of parameters. The list of parameters is closed, ignoring any changes made in it with the **<ESC>** key.

Information screen

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



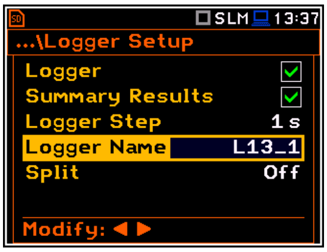
Text editor screen

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

These screens contain help information to guide on how to edit the text.

The edited text is displayed in the upper line and the character, which is displayed inversely may be changed, deleted or a space may be inserted before it.

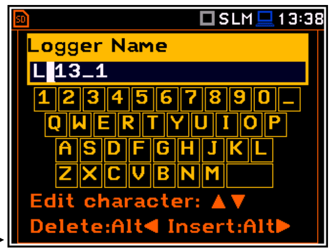
- You can select the position of the character in the edited text with the ◄ / ► key.
- You can insert or delete the position in the edited text with the ◄ / ► key pressed together with **<Alt>**.



▶

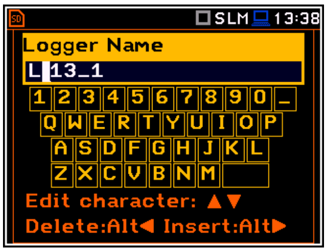
▶

<Alt>/▶

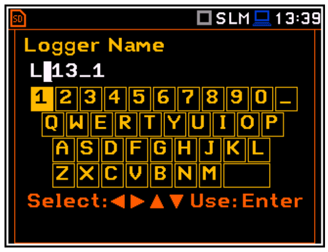


- You can change the character of the selected position using the virtual keyboard with available ASCII characters.

To make a keyboard active, press the ▲ / ▼ key.

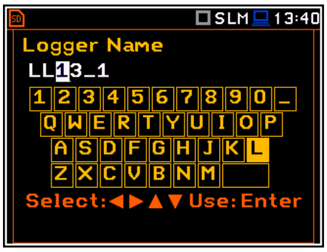


▼



- To insert new character to the cursor position in the edited text, select the character of the virtual keyboard with ◀ / ▶ or ▲ / ▼ key and press **<ENTER>**.

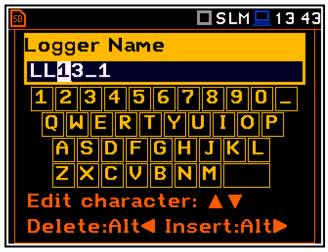
Cursor of the edited text will be shifted to the next right position.



<ENT>

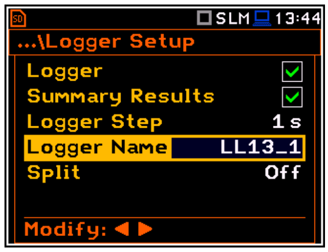
- Exit the virtual keyboard with the ▲ / ▼ key.

▼▼



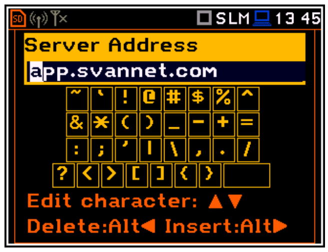
- To confirm changed text, press **<ENTER>**.

<ENT>



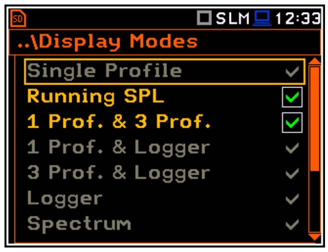
The above example shows the edition of the file name, which may consist only uppercase letters. Some texts can be written with the lowercase letters and use special characters. In such cases, the keyboard can be switched with the ▲ / ▼ key pressed together with **<Shift>**.

<Sh>/▲



Inactive parameters

If some functions or parameters are not available, positions in the menu or lists of parameters linked with this function or parameter became inactive (their colour becomes grey). For example, if ***Logger*** (*path: <Menu> / Measurement / Logging / Logger Setup)* is switched off, the **Logger** view mode is **<u>not</u>** active!



Help information

In most screens, the last line or several lines at the bottom of the screen contain help information. It informs how to select or modify the parameter's value, change the character in the text line etc.

3.2 POWER OF THE INSTRUMENT

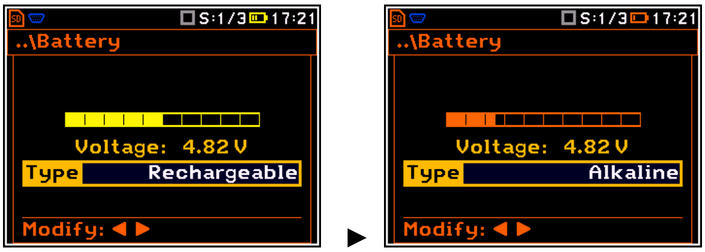
SVAN 977A can be powered by one of the following sources:

- Four AA standard size internal batteries. In case of alkaline type, with a new fully charged set, the instrument can operate more than 12 h (6.0 V / 1.6 Ah). Instead of the ordinary alkaline cells, four AA rechargeable batteries can be used (a separate external charger is required for charging them). In this case, using the best NiMH type, the operation time can be increased up to 16 h (4.8 V / 2.6 Ah)
- External DC power source – 7 V DC÷16 V DC (1.5 W)
- SA 17A external battery pack – operation time > 24 h (option)
- **USB** interface – 500 mA HUB

For each power source, there is a different view presented in the **Battery** screen of the **Instrument** list.

When the instrument is powered from its internal batteries, the “battery” icon is presented on the top line of the display. When the voltage of the batteries is too low for reliable measurements, the icon is red or during attempt to switch the instrument on, the **Low Battery!** message occurs on the display for 2 seconds and the instrument switches itself off. A fully charged set of 4 batteries ensures more than 12 hours of continuous operation of the instrument (with display **Dim** switched on). The battery condition can be checked by means of the **Battery** function. It is also presented continuously on the top line of the display by means of the “battery” icon.

When the instrument is powered from the internal batteries, the **“**battery**”** icon is displayed on the top of the screen and the **Battery** screen presents the battery status scale and battery voltage: **Voltage: x.xxV**. The colour of the battery and the scale reflects the battery capacity: green (>75%), yellow (>25%), red (<25%).

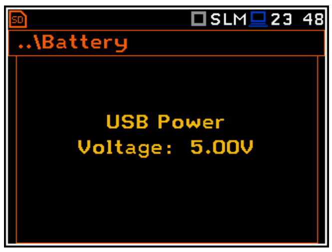


To have right indication of the battery status, select the battery type in the **Type** position: **Alkaline** or **Rechargeable**.

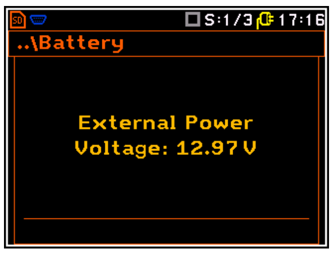
Note: *In the case when “battery” icon is red, it is strongly recommended to use an external power adapter or USB interface as soon as possible to ensure reliable operation. If no suitable external power source is provided the instrument will be switched off automatically after a short time!*

Extension of the internal source of the instrument’s power can be achieved by reducing the brightness of the screen when possible. The settings of **Brightness** and power saver function may be done in the **Screen Setup** screen (*path: <Menu> / Display / Screen Setup)*.

When there is a connection to the USB interface (**USB Device** socket is connected by the cable to a PC), the „USB”icon is presented on the top of the display and in the **Battery** screen there is the message: **USB Power Voltage: x.xxV**.



When there is a connection to the **7–16V** socket the “plug” icon is presented on the top of the display and in the **Battery** screen there is the message: **External Power Voltage: yy.yyV**.



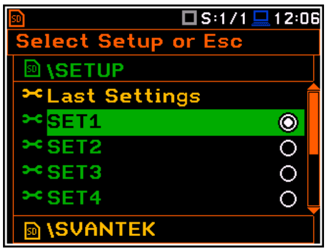
3.3 GETTING STARTED

Turning the instrument on

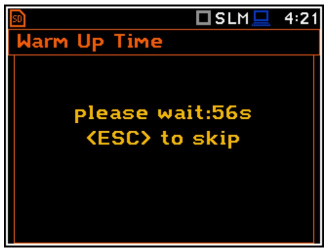
To turn the instrument on, press the **<Alt>** and **<Start/Stop>** keys at the same time.

The instrument goes through the self-test routine after turning on, displaying during this time: manufacturer logo, name of the instrument and the firmware version.

Then it enters the screen with the list of settings from which you can select the required one and confirm the selection with the **<ENTER>** key or skip selecting with the **<ESC>** key.

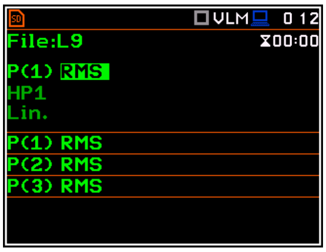


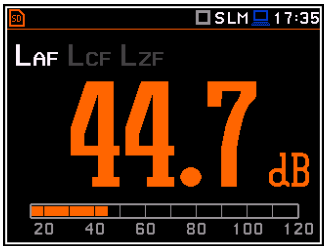
=>



The instrument will warm up for one minute, after which it will enter one of the presentation modes:

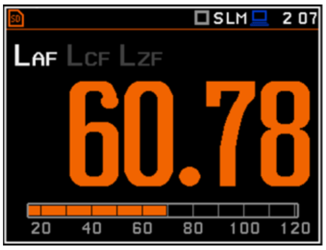
- the last used, just before the unit switch off, in case of Vibration measurements or
- the **Running SPL** view (if it was enabled) or the last used, just before the unit switch off, in case of Sound measurements.



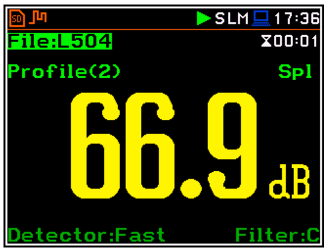


Starting measurements

To start measurements, press the **<Start/Stop**> key. The measurement will be performed with the current instrument settings, which are preserved in the internal memory of the instrument.

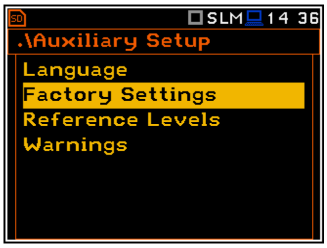


<Start>



Setting default parameters

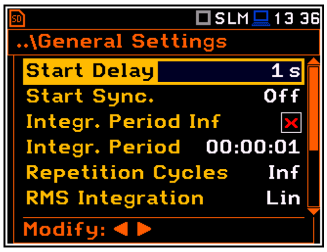
The instrument as sold has default settings which you may change, but always return to them with the use of **Factory Settings** option in the **Auxiliary Setup** menu.

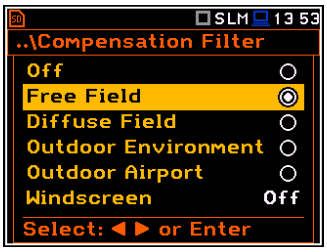


Next chapters of the manual will describe in detail what each parameter means and how to change the instrument settings.

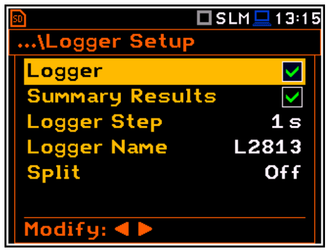
Main default settings

With the default settings, the instrument will measure sound pressure level by three virtual meters, so called profiles (Measurement **Mode: Sound**; **Measurement Function: Level Meter**) with 1 second delay from the **<Start>** key pressure (**Start Delay: 1 s**), 1 second integration time (**Integration Period: 00:00:01**), infinitive repetition till press the **<Stop>** key (**Repetition Cycle: Inf**), linear integration for the RMS base results (**RMS Integration: Lin**), linear integration for statistics (**Statistics: Lin**), daytime limits for Lden calculations (**Day Time Limits: 6-18 h**), time frames for two rolling Leq calculations (**Rolling Time(1): 30 m** and **Rolling Time2: 1 h**), free field compensation (**Compensation Filter: Free Field**), active logging of the selected results with 1 second step (**Logger: On**; **Logger Step: 1 s**; **Logger Results: Peak**, **Max**, **Min** and **Leq** for all profiles) and summary results saving including **Statistics**.





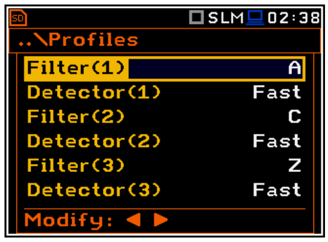
The logger and summary results will be automatically saved in the file with the name defined by the instrument and presented in the **Logger Setup** screen (**Logger Name: Lxxxx**).



Other functions are switched off, like:

- measurement trigger (**Measurement Trigger: Off**),
- logger trigger (**Logger Trigger: Off**),
- wave recording (**Wave Rec.: Off**),
- timer (**Timer: Mode: Off**).

Default profile settings for Sound measurements:

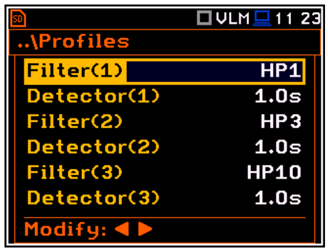


Profile 1 - **A** weighting filter (**Filter(1)=A**), **Fast** RMS detector (**Detector(1)=Fast**);

Profile 2 - **C** weighting filter (**Filter(2)=C**), **Fast** RMS detector (**Detector(2)=Fast**);

Profile 3 - **Z** weighting filter (**Filter(3)=Z**), **Fast** RMS detector (**Detector(3)=Fast**).

Default profiles settings for Vibration measurements:



Profile 1 - **HP1** weighting filter (**Filter(1)=HP1**); **1.0s** RMS detector (**Detector(1)=1.0s**);

Profile 2 - **HP3** weighting filter (**Filter(2)=HP3**), **1.0s** RMS detector (**Detector(2)=1.0s**);

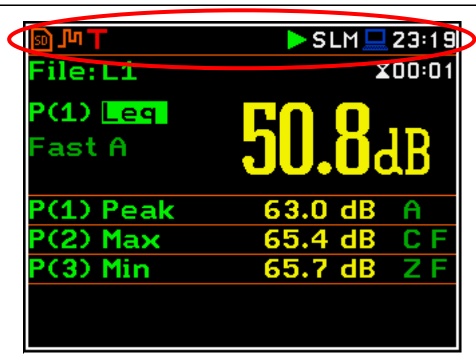
Profile 3 - **HP10** weighting filter (**Filter(3)=HP10**), **1.0s** RMS detector (**Detector(3)=1.0s**).

3.4 Description of Icons

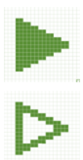
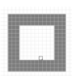
Description of the instrument state

Additional information about the instrument's state is given by means of the row of icons visible in the top of the display.

The type of measurement function and the measurement mode (SLM, VLM, S:1/1 etc.) as well as real time clock (RTC) is also displayed in the same line together with icons.



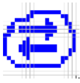
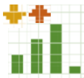
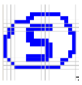
Meanings of the icons are as follows:

	**"measurement"** icon is displayed when the measurement is running, and the icon shape is changing from self to contoured.		**"memory warning"** icon is displayed when <u>there is no</u> inserted micro SD-card.
	**"stop"** icon is displayed when the measurement is stopped.		"**SD-card**" icon is displayed when the micro SD-card memory is inserted.
	**"pause"** icon is displayed when the measurement is paused.		**"RS232"** icon is displayed when the RS232 port is activated.

„USB” icon is displayed when there is a successful USB connection with the PC.	**„logging”** icon is presented when current measurement results are logged into the logger file.
„wave” icon is displayed when the wave recording is active (wave files with extension WAV are saved automatically).	**“Level + trigger”** icon is displayed when the “**Level+**” trigger is waiting for a condition fulfilment. The icon appears alternately with the „measurement”, „logging” or „wave” icons.
„overload” icon is displayed when an overload appears.	**„level-”** icon is displayed when the “**Level-**” trigger is waiting for a condition fulfilment. The icon appears alternately with the „measurement”, „logging” or „wave” icons.
„underrange” icon is displayed when an underrange appears.	**“slope+”** icon is displayed when the “**Slope+**” trigger is waiting for a condition fulfilment. The icon appears alternately with the „measurement”, „logging” or „wave” icons.
“alt” icon is displayed when the **<Alt>** key is pressed.	**“slope–”** icon is displayed when the “**Slope-**” trigger is waiting for a condition fulfilment. The icon appears alternately with the „measurement”, „logging” or „wave” icons.
“shift” icon is displayed when the **<Shift>** key is pressed.	**“trigger”** icon is displayed when other than Level or Slope trigger is waiting for a fulfilment. The icon appears alternately with the „measurement”, „logging” or „wave” icons.
“clock” icon is displayed when the timer is **On**. It is active when the instrument is waiting for the measurement start-up to occur. When the measurement start is close, the icon changes its colour to green and starts blinking.	**“battery”** icon is displayed when the instrument is powered from the internal batteries. The icon corresponds to the status of the batteries (three, two, one or none vertical bars inside the icon). When voltage of batteries is too low, the icon becomes red.
“lightning” icon is displayed when polarisation voltage is 200V.	**“alarm”** icon is displayed when an alarm appears.
„GPS” icon is displayed when GPS is active. Colours of the icon define the state of the GPS: green – active, blue – searching, grey – disconnected.	**“Bluetooth”** icon is displayed when the *Bluetooth*® is switched on. Colours of the icon define the state of the connection: green – connected, grey – disconnected.
“plug” icon is displayed if an external power is connected to the **7-16V** socket**.**	

Icons connected with modem functionality:

or — **“no wireless”** icon is displayed when the **GPRS** function is switched on and there is no cable connection with the modem	or — **“no range”** icon is displayed when the GPRS function is switched on and there is no cable connection with the modem and therefore no range

 or **“wireless”** icon is displayed when the wireless transmission (**GPRS** modem) is active, but there is no connection with Host or SvanNET	 or **“no range”** icon is displayed when the wireless transmission (**GPRS** modem) is active, but the modem is out of range
 or **“host”** icon is displayed if there is connection with Host	 **“range”** icon is displayed if there is GPRS connection and shows the level of the GPRS signal and ways of data transmission.
 **“SvanNET”** icon is displayed if there is connection with SvanNET.	

3.5 DATA SAVING

Memory type

All available measurement results and settings can be stored in the instrument’s memory (micro **SD Card**) as files in the predefined or assigned directories. The measurement files are stored by default in the predefined SVANTEK directory. The setup files are stored in the predefined directory SETUP. Other special files (logs, advanced alarms settings) are stored in the predefined SYSTEM directory. The predefined directories can be reassigned or renamed by the user.

The **SD Card** memory is activated automatically after insertion of the card to the instrument’ card slot.

The instrument current settings are stored in the instrument internal RAM. This file can be downloaded to the PC as **Settings.svt** with the use of SvanPC++ software. It can be edited with the special **Setup file editor** tool of SvanPC++ and uploaded to the instrument’s internal RAM (see *SvanPC++ User Manual*).

The “SD-card” icon is displayed when the micro SD-card is inserted in the memory slot.

If the SD-card is removed from the memory slot the “memory warning” icon appears instead of “SD-card” icon.

The **SD Card** memory is organised as a standard memory with directories and sub-directories (FAT32 file system). It is possible to create and delete the directories from the instrument level.

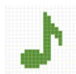
The content of the instrument’s memory can be controlled with the help of the **File Manager** or **Setup Manager** function of the **File** menu.

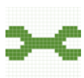
In the **File Manager** or **Setup Manager** screens, data files are described by their file name with an extension (**SVL**, **SVT** or **WAV**) as well as additional icon and size (**2KB** etc.).

 Directory

 New file or directory

 Logger file .SVL

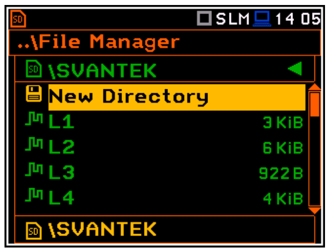
 Wave file .WAV

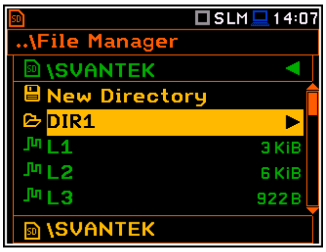
 Setup file .SVT

Managing directories and files

You can manage files saved on the SD card with the help of the **File Manager** or **Setup Manager** in the **File** section (see Chapter 7).

<ENT>



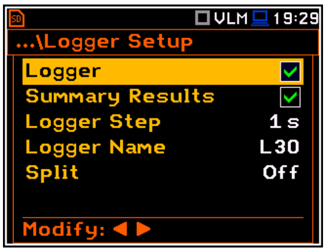


Files are saved in the directory, which was assigned as a working directory. The working directory is displayed in the bottom line of the **File Manager** screen together with the memory icon.

Directories are created manually with the use of **<New Directory>** position.

In more details, **File** menu is described in Chapter 7.

Automatic logger files saving ( )

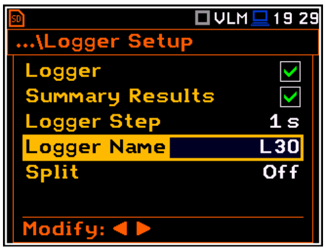


Files which contain the logger data are saved automatically in the **SD Card** memory with an extension .SVL. To enable automatic saving next conditions should be fulfilled:

- SD-card should be inserted and there should be enough space on it.
- The **Logger** (*path: <Menu> / Measurement / Logging / Logger Setup*) should be switched on.

The logger file name is defined automatically using a pattern **LLdd**, where **LL** is the string of letters (so called prefix) and **dd** is a string of digits that forms a number (*path: <Menu> / Measurement / Logging / Logger Setup / Logger Name*). Up to 8 characters can be used to name a file.

The default prefix for the logger files is “**L**”.



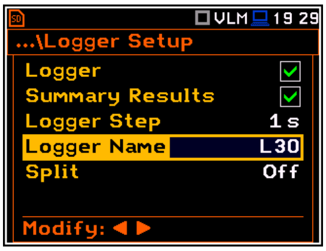
The instrument assigns an individual counter to every prefix of files the instrument has already created and saved in the working directory. This counter is equal to the maximum number in the set of files with the same prefix. For example, if there are files with names: **L0**, **L16** and **L29**, the counter value is 29.

The number of the new automatically created file will have the value of the counter plus one. So, for the above example, new file name will be **L30**.

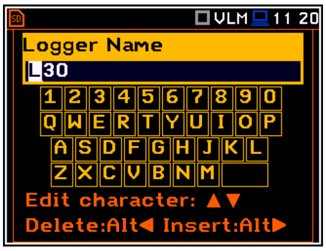
You can change the automatically generated file name in the special screen, which is opened after pressing the ◄ / ► key.

After changing the file name number without changing the prefix and pressing **<ENTER>**, the counter will be adjusted to the new number.

The instrument accepts only that name which number is higher than the counter, assigned to the file’s prefix.

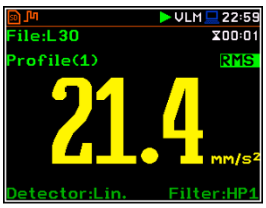


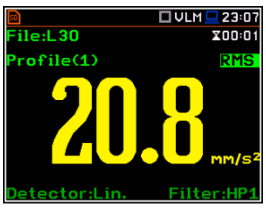
►

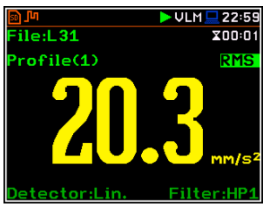


You can change the automatically proposed prefix. In such case the instrument assigns the new counter to the new prefix.

The screens below show the automatic file saving during two subsequent measurements. Before and during the first measurement the file name **L30** is displayed. This file is saved automatically in the SD-card memory after the measurement stop. After start of second measurement the instrument automatically changes the file name to **L31** and this file is saved after stop of the second measurement and so on.

<Start>


<Stop>


<Start>


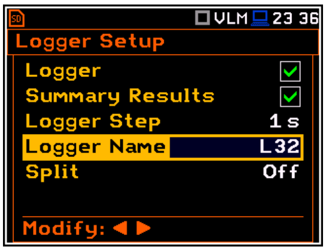
***Note:** During the measurement run with data logging to the logger file, the „logging” icon is displayed.*

You can quickly jump to the directory where files were saved. To do this, make the field with file name active by means of ▲ / ▼ key and press **<ENTER>**.

<ENT>

If you press **<Save>** (**<Alt>+<ENTER>**) after the measurement, the instrument opens the **Logger Setup** screen (*path: <Menu> / Measurement / Logging / Logger Setup*) with the selected **Logger Name** position and the file name with the increased number. Pressing **<ENTER>** will return the instrument to the measurement screen with no results of the previous measurement and new file name in the file field.

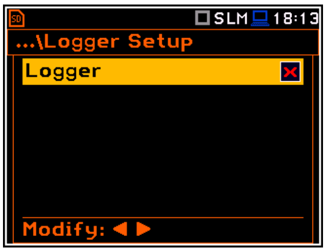
<Save>



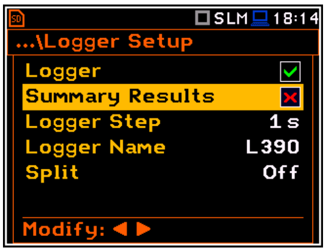
<ENT>

Manual saving of Summary Results

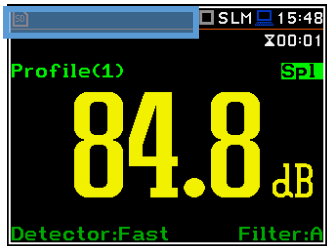
If the **Logger** or the **Summary Results** option is switched off in the **Logger Setup** list (*path: <Menu> / Measurement / Logging / Logger Setup*) the automatic saving of the measurement data (so called Summary Results) is switched off too. In such a case **Summary Results** for the last cycle can be saved only manually.



or



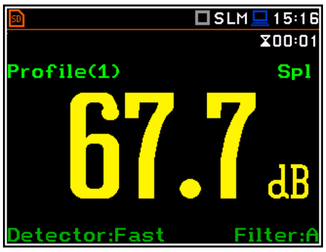
***Note:** If **Logger** is Off, the field with file name in the result view screen will be empty!*



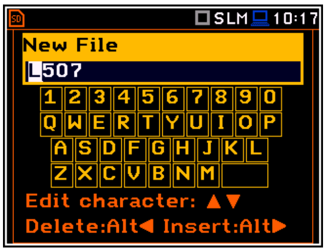
There are two options for saving manually the **Summary Results** data. One option is to press **<Save>** key (**<Alt>+<ENTER>**) right after the measurement stop.

After pressing **<Save>** the **New File** screen appears with the predefined name which has a number increased by one regarding the latest saved with the prefix "**L**". In the **New File** screen, you can enter a new name for the file.

After edition of the automatically proposed name, press **<ENTER>** to confirm.



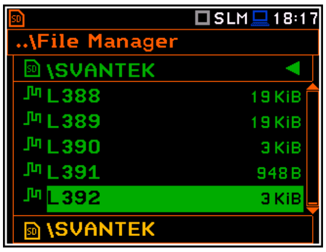
<Save>



File with the proposed or created by you name will be saved in the working directory on the SD-card.

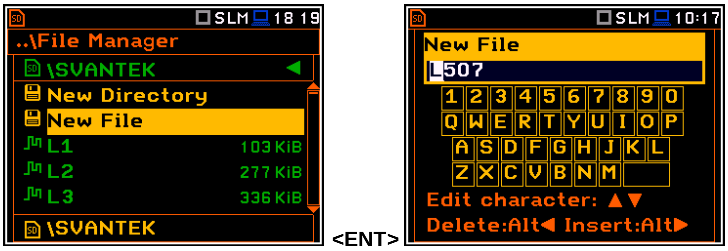
In case of conflict of names, the instrument will save the file with the proposed name.

<ENT>

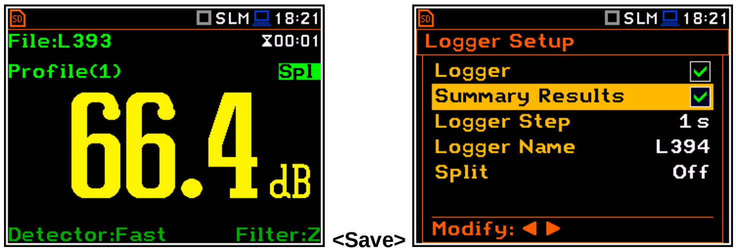


Another option is to open the **File Manager** screen (*path: <Menu> / File / File Manger*), select **New File** and press **<ENTER>**.

After edition of the automatically proposed name, press **<ENTER>** to confirm.



If **Logger** and **Summary Results** are both switched on in the **Logger Setup** list (*path: <Menu> / Measurement / Logging / Logger Setup*) the Logger results and Summary results will be saved automatically in the file with their steps. At the same time, you can manually save only the last Summary Results.



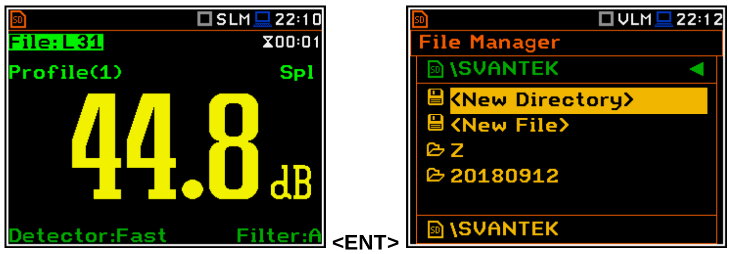
For this, open the **File Manager** after the measurement stop, select **New File** and press **<ENTER>**. The Summary results for the last cycle will be saved in the working directory.

Note: *Manual saving is not possible when the instrument is measuring. If you attempt to save results, the message "**Measurement in progress!**" will be displayed for about 3 seconds.*

Note: *When no measurements were performed and there are no results to save, all the save functions are disabled.*

You can jump from the measurement view to the working directory in the **File Manager**. To do this, make the field with file name active by means of ▲ / ▼ key and press **<ENTER>**.

Here you can change the working directory – see Chapter 7.1.1.

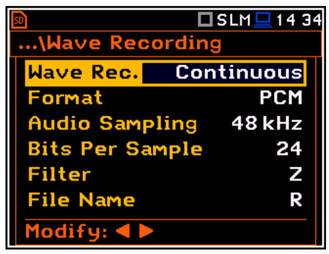


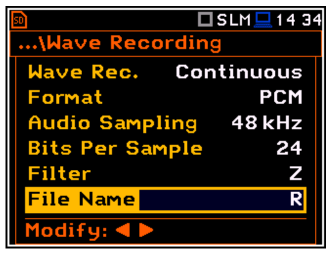
Automatic Wave files saving ( )

Wave files containing signal recording data are also saved automatically in the **SD Card** memory with an extension .WAV. To enable automatic saving next conditions should be fulfilled:

1. SD-card should be inserted and there should be enough space on it.
2. The wave recording should be switched on (*path: <Menu> / Measurement / Logging / Wave Recording / Wave Rec.: Continuous or On Trigger*).

The wave file name is defined automatically using the same rules as for the logger files. The default prefix for the wave files is **R**.





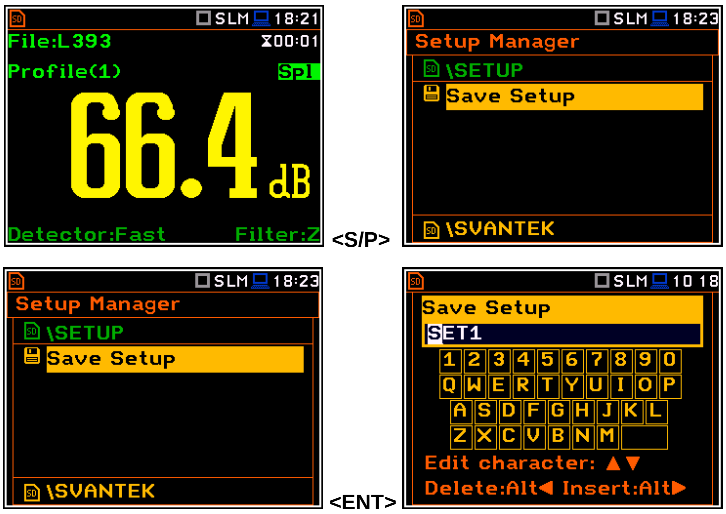
Note: *During the measurement run with recording of the time-domain signal to the wave file the „wave" icon is displayed.*

Note: *The wave files usually are big in size and may use enormous memory space. Since the wave-file name is not displayed on the result view screen, you should remember that wave recording function is active and switch it off always when wave recording is not required.*

Saving setup files ( )

The measurement configuration setup files can be stored in the **SD Card** memory with an extension .SVT manually either by means of **<S/P>** key or by creating the **<New File>** in the **Setup Manager** list.

There is no automatic option for the setup files saving, but the instrument always generates new setup name automatically with default prefix **SET**.



3.6 FILES DOWNLOADING AND UPLOADING

Downloading files

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

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

It is recommended to use the SvanPC++ software, which provides download and upload functions as well as data view and data processing options. In this case, the instrument should be connected to the PC via the SC 56 USB cable.

***Note**: Description of SvanPC++ is given in the “SvanPC++ User Manual”.*

Uploading files

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

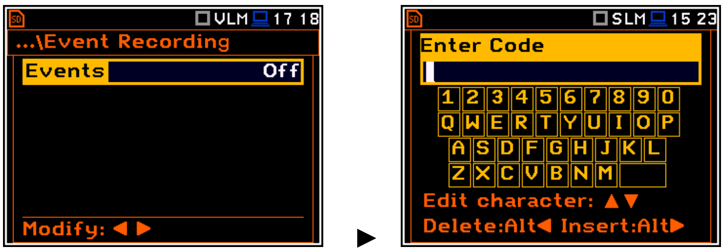
Files can be upload via micro SD-card or via SvanPC++ software.

3.7 ACTIVATION OF OPTIONAL FUNCTIONS

Standard instrument firmware contains all basic functions to perform measurements in accordance with most international standards and methods. For more complex tasks you have the possibility of expanding the basic functions of the instrument with additional functions. These features include 1/1 and 1/3 octave analyser, signal recording and others.

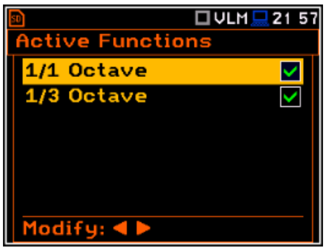
If additional functions were not supplied in the instrument kit and were not unblocked by the supplier, such a task is in responsibility of the user who decides to buy additional functions later.

The optional function should be activated in the moment of the first attempt to use it. For example, if time signal recording (Wave or Event) was blocked, but you purchased this option later, then during the first attempt to switch it on, the instrument requires entering the special code that will unlock this function. Once unlocked option will be available permanently.



Pressing simultaneously **<Shift>** and ◄ keys right after turning on the instrument allows to check and lock back early unlocked options.

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

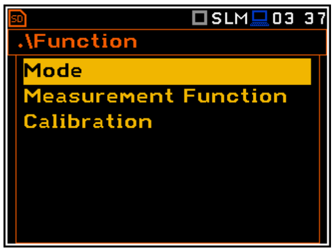


<ENT>

4 FUNCTIONS OF THE INSTRUMENT – Function

In the **Function** section, you can select a measurement mode (**Mode**) which relates to the transducer type, a measurement function (**Measurement Function**) and perform the instrument check or calibration (**Calibration**).

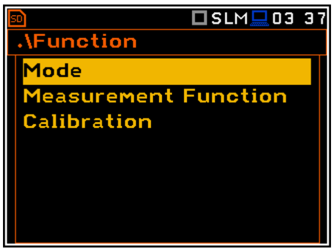
<ENT>



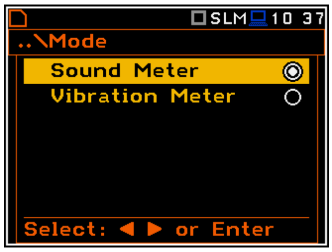
4.1 SELECTING THE INSTRUMENT MODE – MODE

The instrument can work in two modes: **Sound Meter** and **Vibration Meter**.

The **Mode** relates to the type of transducer connected to the instrument: microphone with preamplifier or accelerometer.



<ENT>



***Note:** The instrument doesn't recognize the type of transducer, connected to its input socket. Remember to switch the **Mode** all the time you change the transducer.*

***Note:** In the manual text the Sound mode (or Sound measurements) refers to the **Sound Meter** modes and the appropriate functions dedicated to the measurement and analysis of the acoustic signal: **Level Meter**, **1/1 Octave**, **1/3 Octave**, **FFT** etc.; the Vibration mode (or Vibration measurements) refers to the **Vibration Meter** modes and the appropriate functions dedicated for the measurement and analysis of the vibration signal: **Level Meter**, **1/1 Octave**, **1/3 Octave**, **FFT** etc.*

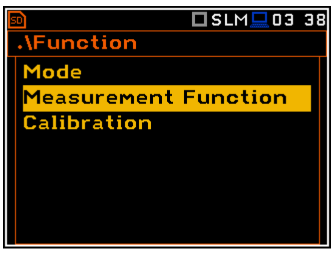
4.2 MEASUREMENT FUNCTIONS OF THE INSTRUMENT - MEASUREMENT FUNCTION

The main function of the instrument is the measurement of Sound pressure or Vibration broad band levels (**Level Meter**). The Sound Level Meter (SLM) meets the standard IEC 61672-1:2013 for Class 1 accuracy and the Vibration Level Meter (VLM) meets the standard ISO 8041-1:2017. The instrument can also be used for medium to the long-term monitoring using the huge capacity data logger in which all measurement results can be stored.

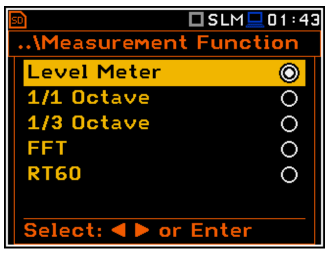
You may also use 1/1 and 1/3 real time octave band or FFT frequency analysis functions. These functions extend the main Level Meter functionality of the instrument, because the selected 1/1 and 1/3 octave or FFT analysis is performed along with all calculations of the broadband Level Meter results.

The instrument offers also the specialized function dedicated for the reverberation time assessments - **RT60**.

To activate a function, open the **Measurement Function** list, select the required function and press **<ENTER>** to confirm selection.



<ENT>



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

***Note**: The type of measurement function and the measurement mode is displayed in the upper line of the screen in the form of abbreviation as presented below:*

- ***SLM*** ***Sound Level Meter***,
- ***S:1/1*** ***Sound 1/1 Octave***,
- ***S:1/3*** ***Sound 1/3 Octave***,
- ***S:FFT*** ***Sound FFT***,
- ***S:RT60*** ***Sound RT60***.
- ***VLM*** ***Vibration Level Meter***,
- ***V:1/1*** ***Vibration 1/1 Octave***,
- ***V:1/3*** ***Vibration 1/3 Octave***,
- ***V:FFT*** ***Vibration FFT***.

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

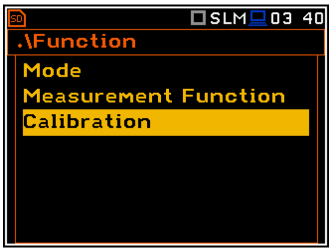
Optional measurement functions that broaden the application of the instrument can be initially supplied and activated by the manufacturer or purchased later and activated by the user.

4.3 INSTRUMENT'S CALIBRATION – CALIBRATION

The instrument is factory calibrated with the supplied microphone and accelerometer for the reference environmental conditions. Because the 'accuracy' of the electronic components can drift so equipment should be calibrated periodically by a competent laboratory. Because the sensitivity of the microphone and accelerometer is a function of the temperature, ambient pressure and humidity and when the absolute sound pressure level value is important, the absolute calibration of the measurement channel should be performed before the measurement. It is also good practice to check the instrument measurement channel before and after measurements.

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

The **Calibration** list comprises positions enabling in-situ system checking and calibration (**System Check**, **Calibr. by Sensitivity**, **Calibr. by Measurement**), checking and erasing calibration records (**Calibration History**, **Clear Calibr. History**), switching on the automatic calibration (**Auto Calibration**) as well as adding the current calibration results to the data files (**Post Calibration**).



<ENT>

Note: *The calibration factor is always added to measurement results and measurement range limits of the **Level Meter**, **1/1 Octave**, **1/3 Octave** and **FFT** functions.*

Note: *The calibration level and the calibration result are expressed in different units depending on the settings of the instrument. The metric or non-metric Vibration units are set in the **Vibration Units** screen (path: <Menu> / Auxiliary Setup / Vibration Units). Additionally, the linear or logarithmic units are set in the **Display Scale** screen (path: <Menu> / Display / Display Scale).*

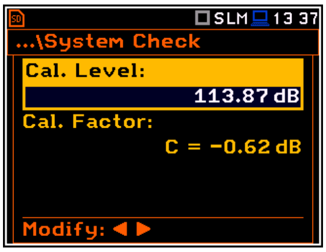
Note: *It is not possible to check and calibrate the instrument during the execution of live measurements. It is possible to open different lists and sub-lists but the positions in these lists are displayed greyed out inversely and so - not accessible. The flashing „measurement" icon on the top line indicates that the instrument is in the measurement process. To check or calibrate the instrument, the current measurement in progress must be finished!*

4.3.1 System Check

ISO 8041-1:2017 standard advises users to perform in-situ checks of measuring instruments. Checking should be carried out immediately before and after the measurement.

1. Select **System Check** in the **Calibration** sub-list and press **<ENTER>**.

2. Set the reference calibration level (**Cal. Level**) – see Appendix C, Chapter C.1, par. Calibration.
3. Attach the sound calibrator to the instrument's microphone or accelerometer to the vibration calibrator.
4. Switch on the calibrator and wait approximately 30 seconds before starting the system check measurement.
5. Start the calibration measurement with the **<Start/Stop>** key.



The measurement starts without delay. If maximal difference between three 1-second consecutive results (Leq(C)) is less than **0.05dB**, the measurement will be stopped. Otherwise the user should stop it manually.

During the system check measurement, the **<ESC>** and **<Pause>** keys do not operate but it is possible to stop the measurement using the **<Start/Stop>** key.

System check is considered as successful if its result (**Cal. Result**) does not differ from the calibration level by more than 0.5 dB.

If system check measurement shows bigger difference than 0.5 dB you should perform **Calibration by Measurement**.

6. Press **<ENTER>** to exit **System Check**.

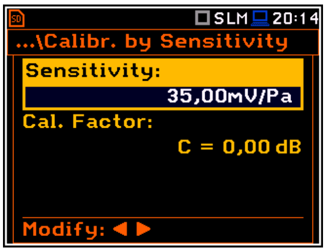
Note: *It is advised to perform the system check of the instrument each time before the measurements begin. If system check gives negative result, then it is necessary to perform calibration.*

4.3.2 Calibration by Sensitivity (Acoustic signal)

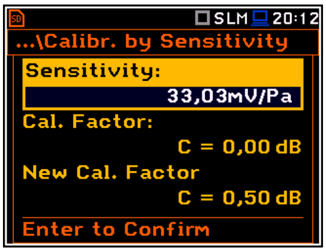
Calibration on the base of the microphone's published sensitivity information can be performed the following way:

1. Select the **Calibr. by Sensitivity** position in the **Calibration** list and press **<ENTER>**.

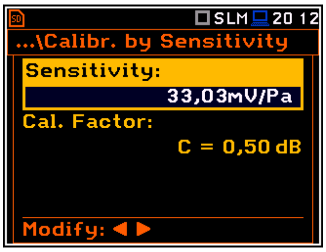
<ENT>

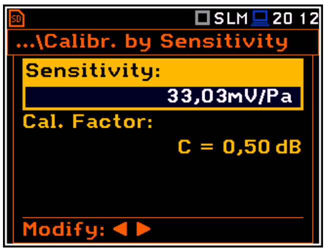


2. Set the **Sensitivity** of the microphone taken from its calibration certificate using the ◄ / ► key and then press **<ENTER>.** The calibration factor (**Cal. Factor**) is calculated every time after pressing the ◄ / ► key, in relation to the nominal value of 35.00 mV/Pa.



<ENT>





For microphones with sensitivity higher than 35.0 mV/Pa the calibration factor will always be negative.

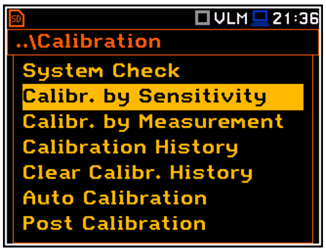
For microphones with sensitivity lower than 35.0 mV/Pa the calibration factor will always be positive.

The lowest available value of the sensitivity that can be introduced is equal to 35.0 μV/Pa (it conforms to the calibration factor equal to 60.0 dB) and the highest value is equal to 35.0 V/Pa (calibration factor is equal to -60.0 dB).

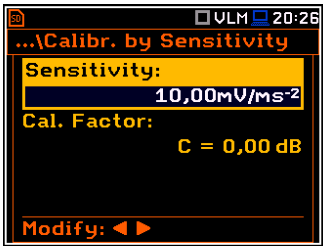
3. To confirm the new calibration factor, press **<ENTER>**, or to return to the **Calibration** list without changes, press **<ESC>**.

4.3.3 Calibration by Sensitivity (Vibration signal)

The calibration by using the accelerometer’s published sensitivity information can be performed in the following way:

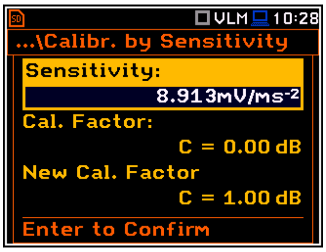


1. Select the **Calibr. by Sensitivity** position in the **Calibration** list and press **<ENTER>**.



2. Set the **Sensitivity** of the accelerometer taken from its calibration certificate using the ◄ / ► key.

The calibration factor (**Cal. Factor**) is calculated every time after pressing the ◄ / ► key, in relation to the nominal value of 10.0 mV/ms^{-2}.



For accelerometers with sensitivity higher than 10.0 mV/ms^{-2} the calibration factor will always be negative.

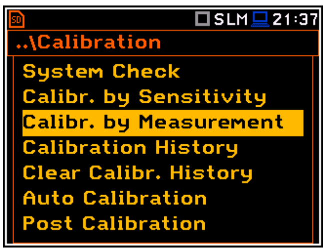
For accelerometers with sensitivity lower than 10.0 mV/ms^{-2} the calibration factor will always be positive.

The lowest available value of the sensitivity that can be introduced is equal to 10.0 $\mu V/ms^{-2}$ (it conforms to the calibration factor equal to 60.0 dB) and the highest value is equal to 10.0 V/ms^{-2} (calibration factor is equal to -60.0 dB).

3. To confirm the new calibration factor, press **<ENTER>**, or to return to the **Calibration** list without changes, press **<ESC>**.

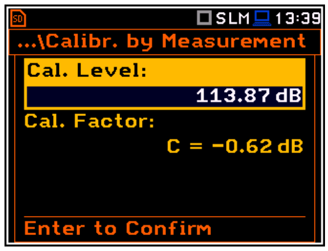
4.3.4 Calibration by Measurement (Acoustic signal)

Calibration by measurement of the acoustic signal can be done in the following way:



1. Select the **Calibr. by Measurement** position in the **Calibration** list and press **<ENTER>**.

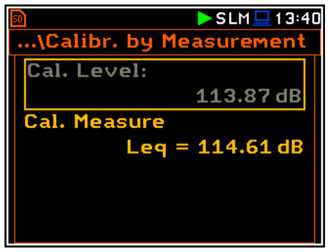
2. Set the reference calibration level (**Cal. Level**) – see Appendix C, Chapter C.1, par. Calibration.
3. Attach the acoustic calibrator SV 36 (or equivalent 114 dB@1000 Hz) carefully over the microphone of the instrument.



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

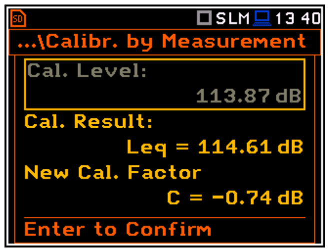
4. Switch on the calibrator (if the used calibrator doesn't have auto run function) and wait approximately 30 seconds for the tone to stabilise before starting the calibration measurement.
5. Start the calibration measurement by pressing the **<Start/Stop>** key.

The instrument performs series of 1-second consecutive measurements displaying levels of the measured calibration signal.



If maximal difference between three 1-second consecutive results (Leq(C)) is less than **0.05dB**, the calibration measurement will be stopped, and the calibration factor calculated. The measurement can be always stopped by the **<Start/Stop>** key.

The **Calibration Result** (measured reference signal without calibration factor correction) and the **New Calibration Factor** (difference between the Calibration Level and the Calibration Result, calculated in dB) are displayed.



6. Press **<ENTER>** to save the new calibration factor (**Enter to Confirm**), or press **<ESC>** to reject it. In both cases the instrument exits the **Calibration by Measurement** screen.

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

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

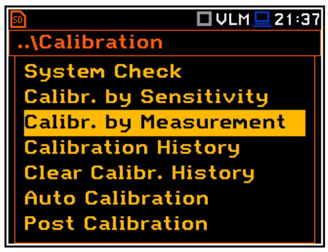
7. Detach the calibrator from the microphone.

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

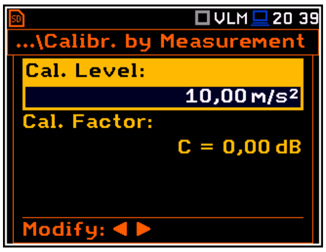
4.3.5 Calibration by Measurement (Vibration signal)

Calibration by measurement of the vibration signal can be done in the following way:

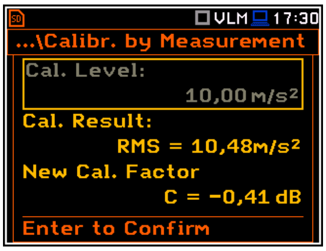
1. Select the **Calibr. by Measurement** position in the **Calibration** list and press **<ENTER>**.
2. Set the calibration level (**Cal. Level**) appropriate to the used calibrator. The default level for calibration in the vibration mode is 10 m/s^2 at 159.2 Hz. Remember to change this level if using an alternative vibration calibration signal source.



3. Attach the instrument's accelerometer to the vibration calibrator using an appropriate or recommended fixing method.
4. Switch on the calibrator and wait approximately 30 seconds before starting the calibration measurement.
5. Start the calibration measurement by pressing the **<Start/Stop>** key.



During the calibration measurement, the level of the measured calibration signal is displayed. If the maximal difference between three 1-second consecutive results (RMS(HP10)) is less than **0.05dB**, the calibration measurement will be stopped, and the calibration factor calculated. The measurement can be always stopped by the **<Start/Stop>** key.



After calibration measurement stop, the **Calibration Result** (the measured reference signal without calibration factor correction) and the **New Calibration Factor** (difference between the Calibration Level and the Calibration Result, calculated in dB) are displayed.

6. Press **<ENTER>** to save the new calibration factor (**Enter to Confirm**), or press **<ESC>** to reject it. In both cases the instrument exits the **Calibration by Measurement** screen.

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

- the accelerometer is not properly attached to the calibrator,
- there are external disturbances,
- the calibrator or the measurement channel (the accelerometer or the instrument itself) are damaged.

7. Detach the accelerometer from the calibrator.

Note: *During the calibration measurement, the external disturbances (vibrations or acoustic noise) should not exceed a value of 1/10 of the level of the calibration level signal being used.*

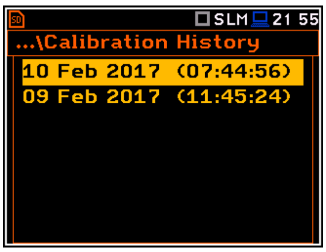
4.3.6 History of performed calibrations – Calibration History

The **Calibration History** screen displays records of performed calibrations.

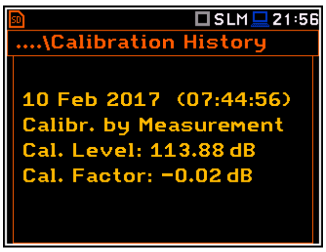
<ENT>

To review the calibration records, select the required line in the **Calibration History** screen and press **<ENTER>**.

The calibration record screen contains the information regarding the performed calibration: date and time of calibration, used calibration method, obtained calibration factor etc.



<ENT>

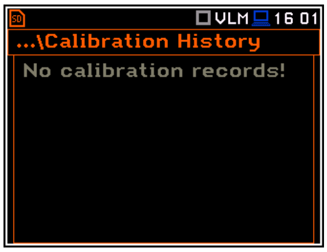


4.3.7 Erasing calibration records - Clear Calibr. History

You can erase all calibration records. To do this, choose the **Clear Calibr. History** position in the **Calibration** list and press **<ENTER>** to perform this operation.

The instrument will request the confirmation of this operation.

After erasing calibration records, the **Calibration History** screen will not contain any previous calibration records. The content of this screen is also cleared after the **Factory Settings** operation (*path: <Menu> / Auxiliary Setup*).



Note: *Acoustic and vibration calibration histories are independent files in the internal instrument's memory and erasing the calibration history in one mode does not erase it in another mode.*

4.3.8 Automatic calibration – Auto Calibration

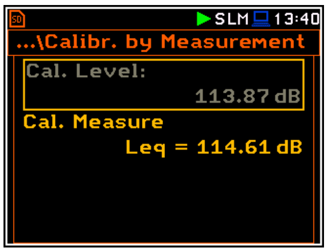
Automatic calibration feature enables calibration of the microphone input as easy as possible with minimum steps.

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

To perform the automatic microphone calibration, follow next steps:

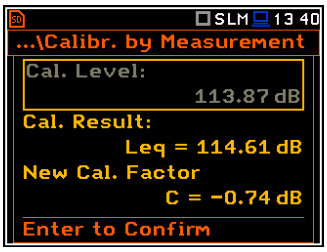
1. Switch on the instrument.
2. Attach the SV 36 (or equivalent 114 dB@1000 Hz) calibrator to the microphone and switch it on (if the used calibrator doesn't have automatic switch-on feature).

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



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

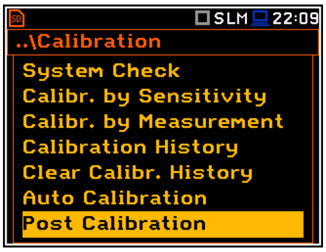
After calibration measurement stop, the **Calibration Result** (the measured reference signal without calibration factor correction) and the **New Calibration Factor** (difference between the Calibration Level and the Calibration Result, calculated in dB) are displayed.



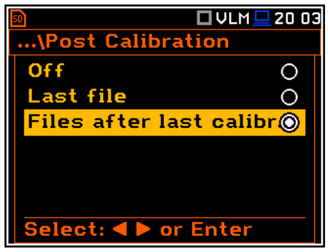
3. Press **<ENTER>** to save the new calibration factor (**Enter to Confirm**), press **<ESC>** to reject it. In both cases the instrument exits the **Calibration by Measurement** screen.
4. Detach the calibrator from the microphone.

4.3.9 Post measurement calibration – Post Calibration

Sometimes it is required to perform so called post-calibration of the instrument. The **Post Calibration** position allows to perform additional calibration after measurement session and add its results to the data file. The **Post Calibration** list includes three options: calibration factor saving disabled (**Off**), calibration factor to be saved in the last created file (**Last file**) or saved in the files created after the previous calibration (**Files after last calibr**).

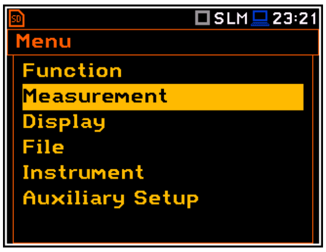


<ENT>



5 CONFIGURING MEASUREMENT PARAMETERS – Measurement

The **Measurement** section groups items of the menu related to configuration of measurement parameters.



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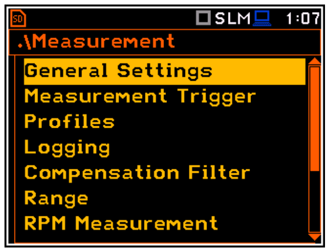


The **Measurement** list contains the following positions:

General Settings allowing to set up general measurement parameters;

Measurement Trigger allowing to set up the measurement trigger;

Profiles allowing to program the profile parameters;

Logging allowing to program the logging function;

Spectrum allowing to set up octave spectrum parameters. This position appears in the **Measurement** list in case of 1/1 or 1/3 octave functions;

FFT allowing to set up spectrum parameters. This position appears in the **Measurement** list in case of **FFT** function;

RT60 allowing to set up RT60 parameters. This position appears in the **Measurement** list in case of **RT60** function;

Compensation Filter allowing to switch on the required microphone compensation filter;

Range allowing to select the correct measurement range;

RPM Measurement allowing to set up the RPM measurements parameters;

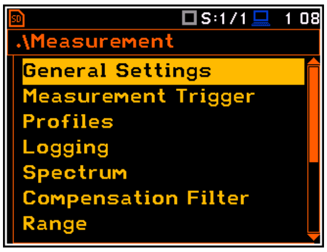
Exposure Time allowing to set the daily exposure time for dose measurements;

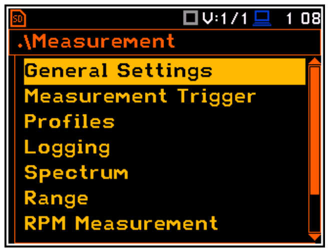
Statistical Levels allowing to define 10 statistical levels;

Timer allowing to programme the internal real-time clock to act as a delayed start timer;

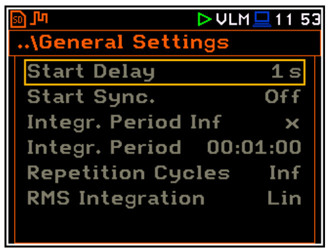
Alarms allowing to check the status of the advanced alarm function. This position appears in the **Measurement** list in the case the ALARM.SVA file is uploaded to the predefined SYSTEM catalogue.

The content of the **Measurement** list depends on settings of **Mode** and **Measurement Function**. Examples for two different modes and measurement functions are presented.



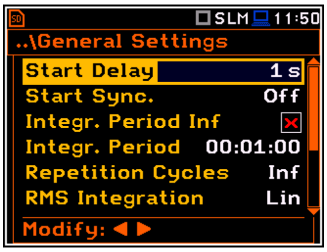


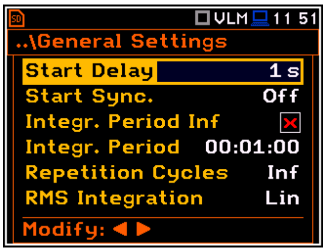
Any parameter in the **Measurement** list can be changed only when the instrument is not currently executing a measurement. The parameters are displayed with grey colour. The blinking „measurement” icon indicates that the instrument is performing a measurement.



5.1 SETTING UP GENERAL MEASUREMENT PARAMETERS - GENERAL SETTINGS

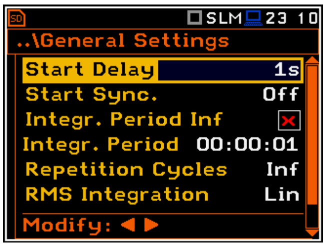
The **General Settings** list allows you to set up general measurement parameters: measurement start delay (**Start Delay**), maximum delay period for the synchronization with RTC (**Start Sync.**), measurement period (**Integration Period**), repetition of measurement cycles (**Repetition Cycles**), RMS detector type (**RMS Integration**), day time hours (**Day Time Limits**) and time window for the **LRm** results (**Rolling Time**).





Delay of measurement start

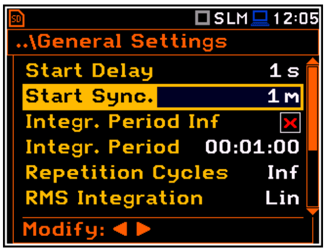
The **Start Delay** parameter defines the delay period from the **<Start/Stop>** keystroke to the real start of the measurement (digital filters of the instrument constantly analyses the input signal even when the measurement is stopped). This delay period can be set from **0 second** to **60 seconds**.



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

Synchronisation of measurement start.

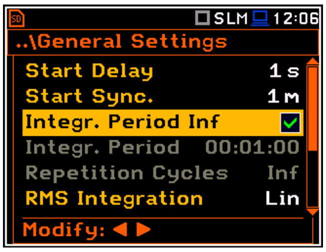
The **Start Sync** parameter defines maximum delay period from the **<Start/Stop>** keystroke to the start of the measurements to allow synchronisation with the instrument's RTC. The **Start Sync.** parameter can be set as: **Off**, **1m**, **15m**, **30m** and **1h**. For example, if **1h** is selected,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



Disabling the measurement period definition

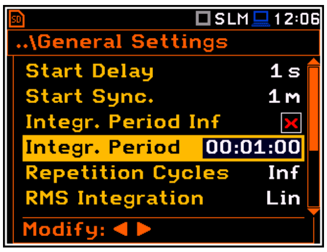
The integration period can be set as infinite or can be defined together with the **Repetition Cycles** number. The **Integr. Period Inf** parameter activates the infinite integration period. In this case the signal will be averaged all the time until the **<Stop>** keystroke.

If the **Integr. Period Inf** parameter is Off, then two next positions become active.

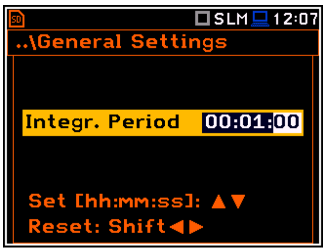


Measurement period

The **Integr. Period** parameter (integration period) defines the period during which the signal is being measured (and for some results integrated) and measured values logged in the result file as **Summary Results**. The integration period can be set in the special screen, which is opened with the ◄ / ► key.



►

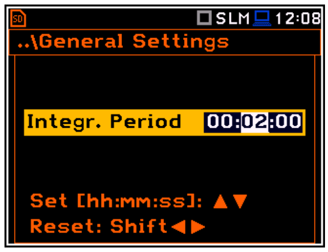


During the **Integration Period**, the instrument performs series of 1-second measurements/integrations, and every second averages 1-second results with the results averaged for n-1 seconds. These averaged results are displayed and renewed every second for the elapsed measurement time (n seconds). In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

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

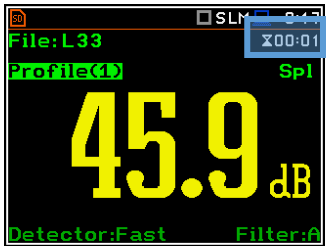
The definitions of the measurement results in which the integration period is used are given in Appendix D.

To set the integration period you should define the required hours, minutes and seconds fields.



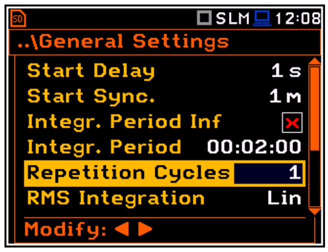
- The appropriate field may be selected with the ◄ / ► key.
- Value of hour, minute and second is changing with the ▲ / ▼ key.

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



Number of measurement repetitions

The **Repetition Cycles** parameter defines the number of measurements (with the measurement period defined by the **Integration Period**) to be performed by the instrument after the **<Start/Stop>** keystroke. The **Repetition Cycles** number values are within the limits [Inf, 1÷1000].



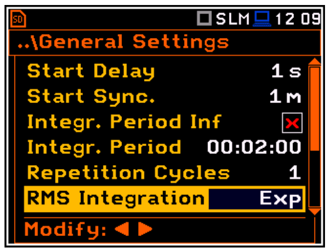
This enables to make a series of measurements without pressing the **<Start>** key and save this series in the file.

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

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

Detector type

The **RMS Integration** parameter defines the detector type for the integration of the RMS based results. Two options are available: linear (**Lin**) and exponential (**Exp**). The formulae used for the **Leq** calculation are given in Appendix D.



For sound measurements, **Leq**, **SEL**, **LEPd**, **Lden** results can be calculated with both detectors, and **Lmax**, **Lmin**, **Spl**, **Ltm3**, **LTeq** results – only with the exponential detector.

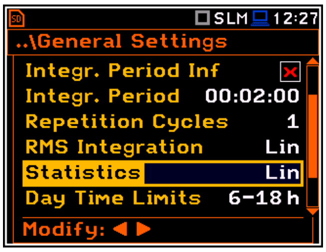
For vibration measurements, **RMS** result can be calculated with both detectors, and **Max** results – only with the exponential detector.

Selecting **Lin** is required for obtaining the true RMS value of the measured signal according to IEC 61672-1:2013. When this option is selected the value of the **Leq**, **SEL**, **LEPd** and **Lden** results do not depend on the detector time constant: **Fast**, **Slow** or **Impulse** (the results are displayed without the indicator of the detectors selected in the profiles). In this case, the indicator **Linear** (or **L**) is displayed during the result presentation.

Selecting **Exp** enables fulfilling the requirements of other standards for time averaged **Leq** measurements. When this option is selected the value of the **Leq**, **SEL**, **LEPd** and **Lden** results depend on the detector time constant (**Slow**, **Fast**, **Impulse**). Results are displayed with the indicator of the detector type selected in the profiles (*path: <Menu> / Measurement / Profiles*).

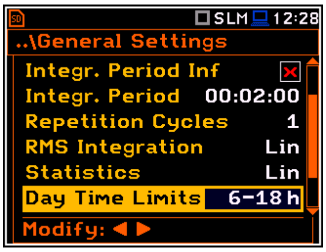
Statistic calculation

The **Statistics** parameter defines the method for calculation of statistical results **Lnn**. Statistics for profiles will be calculated based on RMS results with linear detector (**Lin**) or exponential detector (**Exp**), e.g. **Impulse**, **Fast** or **Slow**, defined in the **Profiles** list, regardless of how main results are measured.

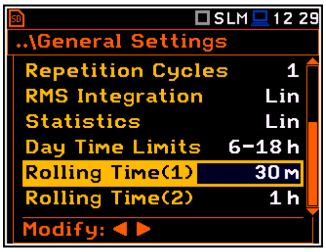


Day time limits

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

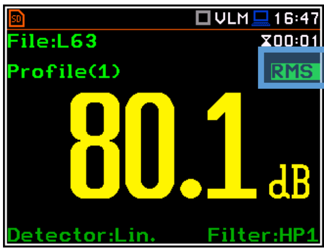


The **Rolling Time(x)** parameter defines „time window” for the "Rolling RMS" calculation. The Rolling Leq are presented as LR+<time window>. For example, if the **Rolling Time** is equal to 30 minutes, the appropriate result will be named as **LR30** and will be calculated each second as Leq of last 30 minutes. If the **Rolling Time** is in seconds, for example is equal to 50s, the result name will have letter "s" (**LR50s**), to make it different from 50 minutes LR result (**LR50**).

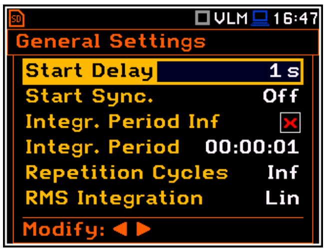


Note: *In case of vibration measurements, positions **Statistics**, **Day Time Limits** and **Rolling Time(x)** are not presented in the **General Settings** list.*

You can easily access the **General Settings** screen during the measurement performance from the result view. It is necessary to enter some result field (for example, **RMS**) with the ▲ / ▼ or ◄ / ► key and press **<ENTER>**.



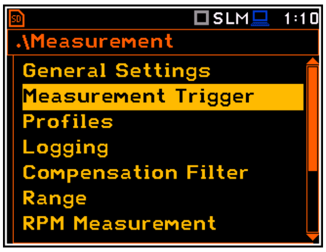
<ENT>



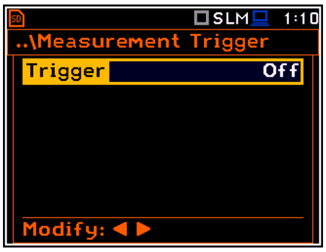
5.2 SETTING UP THE MEASUREMENT TRIGGER – MEASUREMENT TRIGGER

The **Measurement Trigger** list allows you to set up parameters of the measurement trigger, that switches the measurement process in case the trigger condition is met.

The **Measurement Trigger** can be switched **Off** or On by selecting its type in the **Trigger** position.

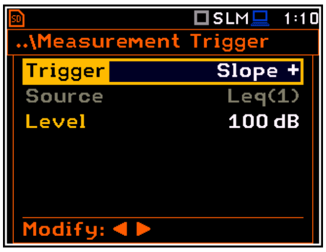


<ENT>



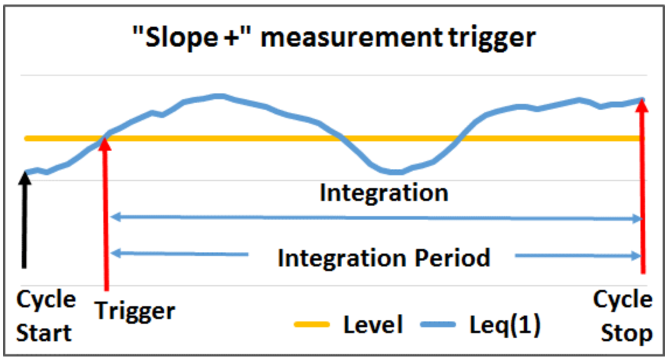
Trigger is switched on if one of its six available modes is selected in the **Trigger** position: **Slope +**, **Slope –**, **Level +**, **Level –**, **Grad +** or **External**. When the trigger is On, additional parameters can be defined: the measurement result that is checked for a trigger condition (**Source**), its threshold level (**Level**) and the speed of its changing (**Gradient**).

Slope type trigger



The **Slope +** trigger starts the measurement/integration with the duration of the **Integration Period** under the condition: rising value of the RMS result (**Source**) integrated during 0,5 ms passes above the threshold level (**Level**).

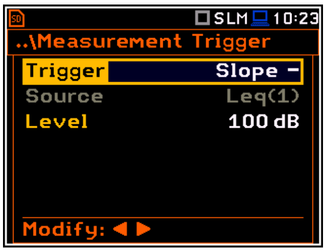
When the new measurement cycle begins (after pressing the **<Start>** key or automatically after the stop of the previous measurement cycle) the instrument checks the trigger condition every 0.5 ms and if condition is met the instrument starts the <u>continuous series</u> of 1-second integrations, the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



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

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

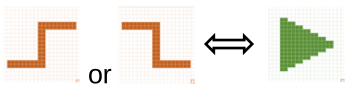
The **Summary Results** are calculated on the base of series of 1-second results measured during each measurement cycle and saved in the results file.



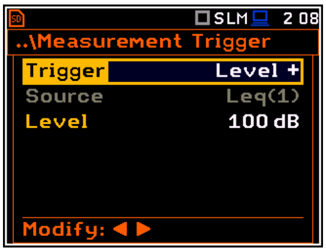
The **Slope -** trigger starts the measurement/integration with the duration of the **Integration Period** under the condition: falling value of the RMS result (**Source**) integrated during 0.5 ms passes below the threshold level (**Level**).

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

Note: *When a measurement is waiting for the slope trigger, the “slope” icon appears alternatively with the „measurement” icon.*



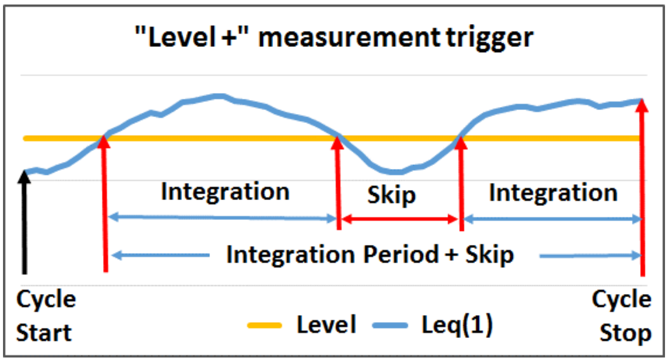
Level type trigger



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

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

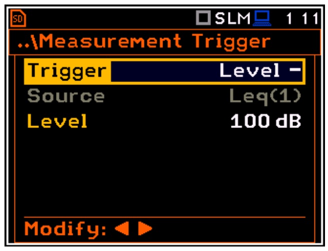
After 1-second integration, the instrument repeats the trigger condition checking every 0.5 ms and starts next 1-second integration if condition is met. Instrument does it as many times as many seconds are within the **Integration Period** and stops the measurement cycle. Therefore, the series of 1-second measurements <u>may not be continuous,</u> as it is in case of the Slope type trigger and the duration of the measurement cycle can be longer than the **Integration Period**.



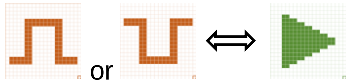
The measurement can be stopped manually at any moment with the **<Stop>** key. The **Summary Results** are calculated on the base of series of 1-second results measured during each measurement cycle and saved in the results file.

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

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

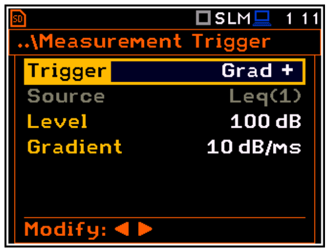


Note: *When a measurement is waiting for the level trigger the "level" icon appears alternatively with the „measurement" icon.*



Gradient type trigger

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

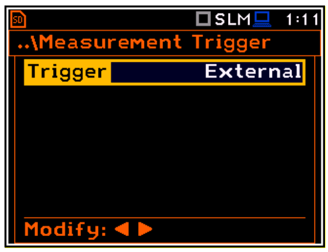


This type of trigger has the same logic as **Level +** trigger, but the trigger condition requires also the gradient threshold level to be exceeded.

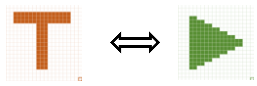
External trigger

When **External** is selected, the measurement is triggering by the external signal on the **I/O** socket. In this case, it is necessary to set up the **I/O Mode** parameter as **Digital In** (*path: <Menu> / Instrument / Multifunction I/O*).

After the measurement/integration start from the external trigger, the measurement/integration will continue for the **Integration Period**.



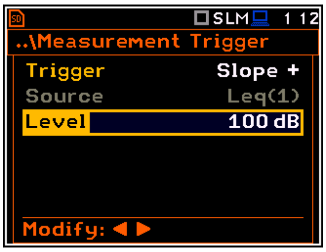
Note: *When a measurement is waiting for the gradient or external trigger the "trigger" icon appears alternatively with the „measurement" icon.*

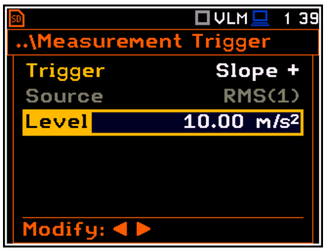


Trigger source

Only one measured result can be used as a trigger source (**Source**) for checking of the trigger condition in the **Level Meter** mode, namely the output signal from the RMS detector coming from the first profile which is denoted here as **Leq(1)** in the sound mode and **RMS(1)** in the vibration mode. This position does not become active (it is not displayed inversely) and the text stated here remains unchanged.

Threshold level



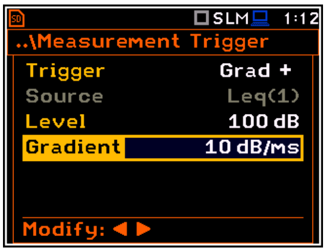


The threshold level for the measurement trigger (**Level**) can be set with 1 dB step in the range from 24 dB to 136 dB in sound modes and from 64dB (1.585mm/s^2) to 176dB (631 m/s^2) in vibration modes.

The instantaneous value of the RMS or LEQ result measured with **Filter** and **Detector** constant selected for the first profile (*path: <Menu> / Measurement / Profiles*) compares with the **Level** value every 0.5 ms.

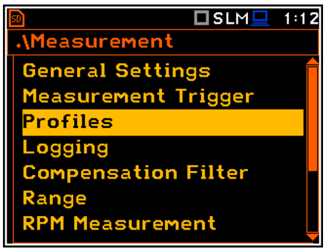
Speed of the triggering signal changing

This position appears when the **Grad+** trigger is chosen. The speed of the Source value changing (**Gradient**) can be set in the range from 1 dB/ms to 100 dB/ms.

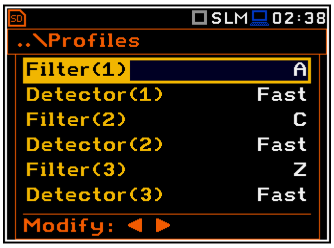


5.3 SETTING PARAMETERS FOR PROFILES – PROFILES

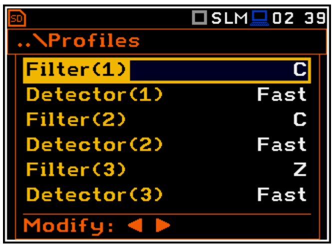
The **Profiles** list enables programming of three virtual level meters (Profiles), which measure the set of results with the same weighting filter (**Filter**) and exponential detector time constant (**Detector**) (see Appendix D).



<ENT>



Weighting filter selection

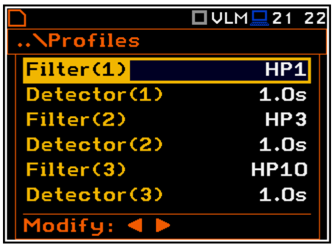


Sound measurements

- **Z** class 1 according to IEC 61672-1:2013,
- **A** class 1 according to IEC 651 and IEC 61672-1:2013,
- **C** class 1 according to IEC 651 and IEC 61672-1:2013,
- **B** class 1 according to IEC 651,
- **U** class 1 according to IEC 61012:1990,
- **AU** class 1 according to IEC 61012:1990 and
- **LF** low frequency (20-200 Hz) Real-Time Band Pass Filter.

Vibration measurements

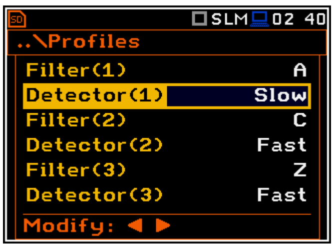
- acceleration measurements: **HP**, **HP1**, **HP3**, **HP10**, **Wh**,
- velocity measurements: **Vel1**, **Vel3**, **Vel10** and **VelMF**,
- displacement measurements: **Dil1**, **Dil3** and **Dil10**.

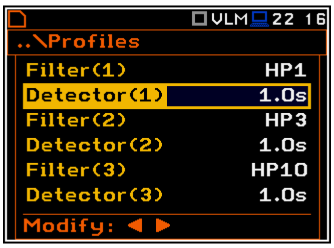


The characteristics of these filters are given in Appendix C.

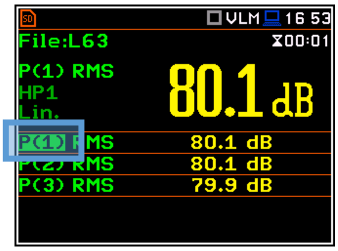
RMS detector selection

Available RMS detectors (time constants): **Impulse**, **Fast** and **Slow** for Sound measurements and **100ms**, **125ms**, **200ms**, **500ms**, **1.0s**, **2.0s**, **5.0s**, **10.0s** for Vibration measurements.

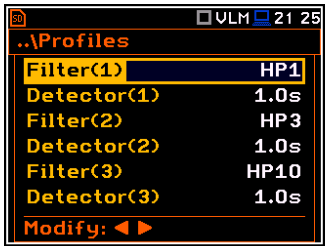




You can easily access the **Profiles** screen from the result view screen. Select some profile field (for example, **P(1)**) with the ▲ / ▼ or ◄ / ► key and press **<ENTER>**.



<ENT>



5.4 DATA LOGGING – LOGGING

Summary Results (**Peak**, **Max**, **Min**, **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, 10 x **Lnn**, **EX**, **SD**, **LR1**, **LR2**, **OVL**, **NC**, **NR** for Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P** for Vibration measurements as well as 1/1 octave, 1/3 octave or FFT spectra and Total results) are measured and saved in the file with the step defined by the **Integration Period** parameter as many times as defined by the **Repetition Cycles** parameter.

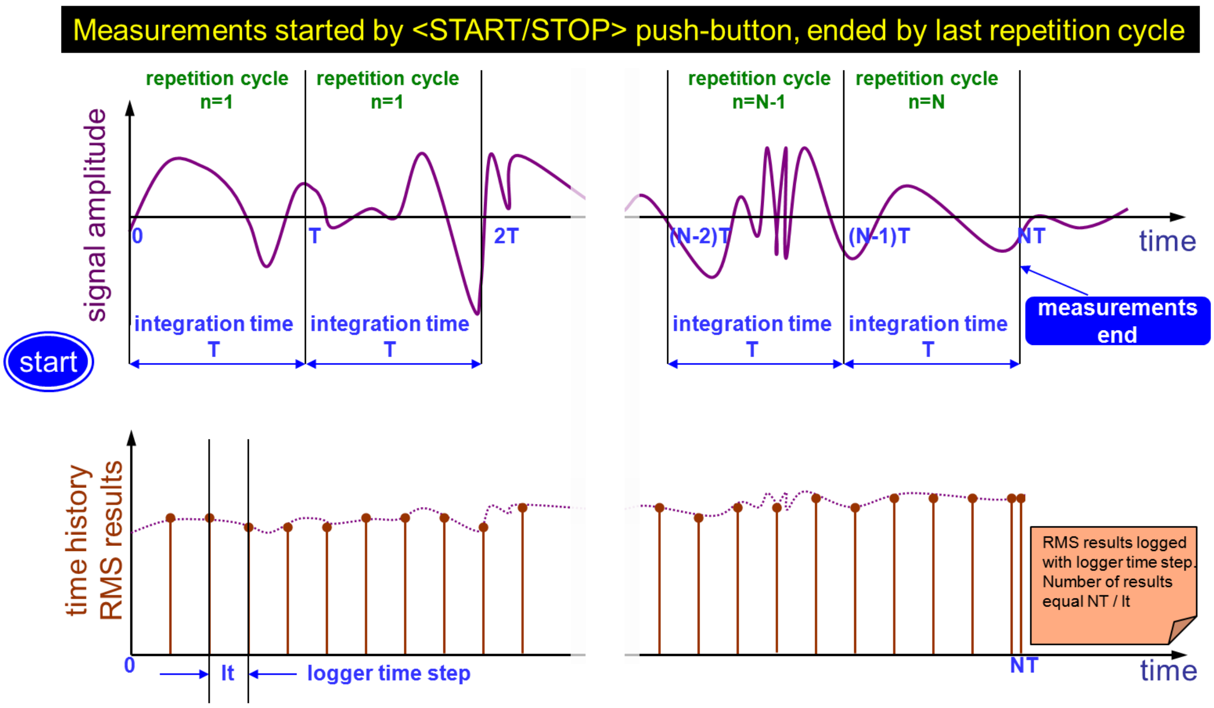
The **Logger** function enables also additional registration of some results with different step defined by the **Logger Step** parameter. Therefore, it is possible to save in parallel two sequences of measured results – one for **Summary Results** and another for so called **Logger Results**.

When the **Logger** is enabled, logger results from three independent profiles (**Peak**, **Max**, **Min**, **Leq**, **LXY**, **LR1** and **LR2** for Sound measurements or **Peak**, **P-P**, **Max** and **RMS** for Vibration measurements as well as 1/1 octave or 1/3 octave and Total results) can be saved simultaneously with time step down to **2ms**. Recording of logger results in the file is stopped after the period, which is equal to **Integration Period** multiplied by **Repetition Cycles** or after pressing the **<Start/Stop>** key or after stopping the measurements remotely.

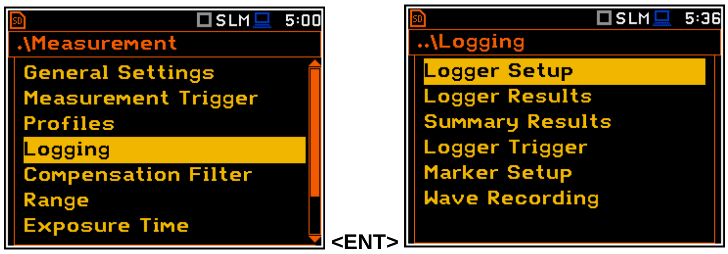
Summary results are saved in the same file with logger results. Blocks of summary results are recorded in the file in the end of every measurement cycle.

The figure below illustrates principles of saving measurement results.

Relations between Integration Period and Logger Step



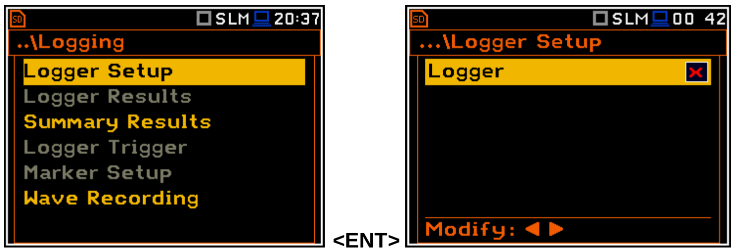
The **Logging** list enables programming the logging functionality - recording of measurement results, markers and time-domain signal (wave). The **Logging** list consists of six positions: **Logger Setup**, **Logger Results**, **Summary Results**, **Logger Trigger**, **Marker Setup** and **Wave Recording**.



5.4.1 Setting logger general parameters – Logger Setup

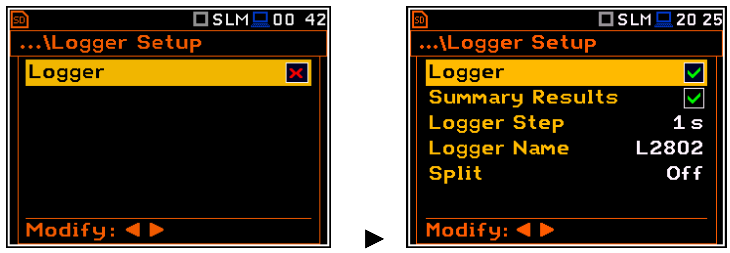
The **Logger Setup** list enables activating the logger function.

If **Logger** is disabled only **Summary Results** and **Wave Recording** positions are accessible in the **Logging** list.



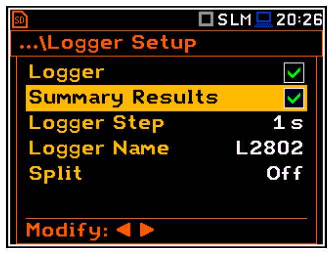
***Note:** If **Logger** is disabled, logger files are not created automatically, and Logger results are not saved!*

The **Logger** position switches on saving logger results, markers, spectra as well as results, obtained from the weather station (**Meteo**), with the interval defined by the **Logger Step** parameter as well as Summary results with the interval defined by the **Integration Period** parameter.

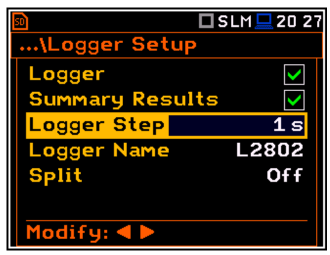


Summary Results saving

The **Summary Results** position enables saving of the summary results including results obtained from the weather station (**Meteo** results), statistics and spectra.

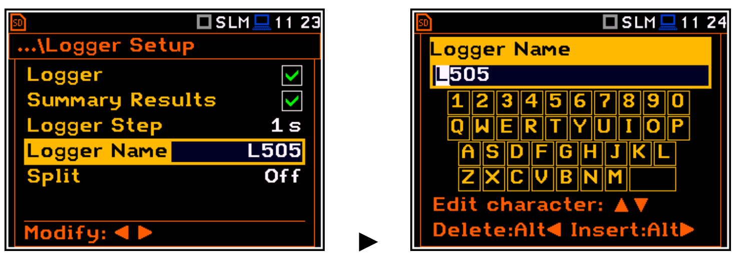


The **Logger Step** defines the period of the **Logger results** measuring and saving in a file. It can be selected from the set: **2 ms**, **5 ms**, **10 ms**, **20 ms**, **50 ms**, **100 ms**, **200 ms**, **500 ms** or from **1 s** to **59 s** with 1-second step or from **1 m** to **59 m** with 1-minute step and up to **1 h**.



Results file name

The **Logger Name** position allows to define the name of the results file, which consists of the prefix and a number. The default logger file prefix is “**L**”. The name can be up to eight characters long. After pressing the ◀ / ▶ key, the special screen with text editor function is opened.



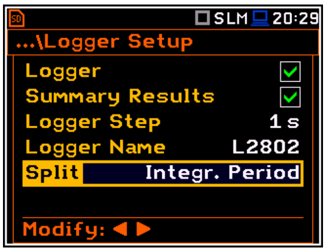
The special warning is displayed in case a file with the edited name already exists in the memory. The instrument waits then for your reaction (any key should be pressed except **<Shift>** or **<Alt>**).

<ENT>

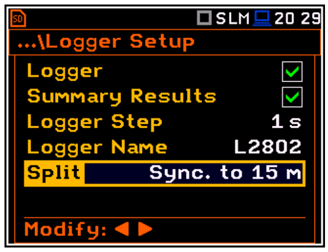
Logger file splitting

The **Split** position allows you to split the logging data registration into separate files. If the **Split** parameter is **Off** the registration of logging data will be continuously performed in one logger file with the name defined in the **Logger Name** position.

In other cases, the registration will be done in separate files. There are several options to start the registration in a new file: after the integration period (**Integr. Period**), or with synchronization to a quarter of an hour (**Sync. to 15m**), with synchronization to a half of an hour (**Sync. to 30m**), with synchronization to an hour (**Sync. to 1h**), or on specified times (**Spec. Time**).



▶



Every time when the split time is achieved the logger file is closed and a new file with the increased by one number in its name is opened for subsequent logging data.

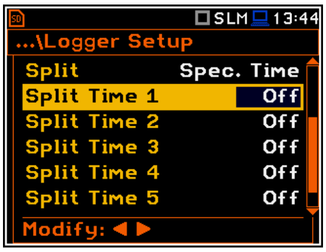
If **Spec. Time** is selected, 6 additional positions appear in the end of the **Logger Setup** list (**Split Time**).

After opening each line, you can define the time of the day when splitting should occur.

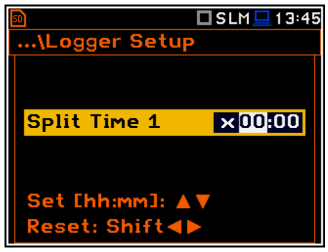
The special screen with time editor is opened after pressing the ► key.

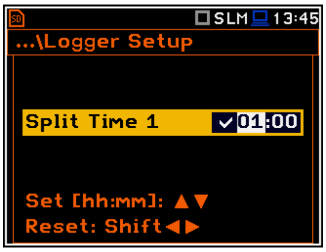
In the time edition line, you may define hour and minute of the split operation and switch on (☑) or off (☒) the current split.

After pressing **<ENTER>** the **Split Time** list will show the active times of the day when the logger will be split.

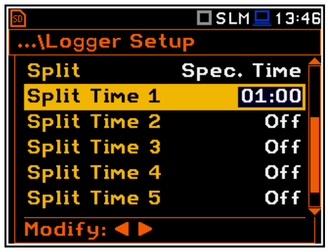


▶



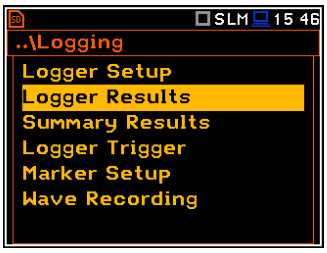


<ENT>

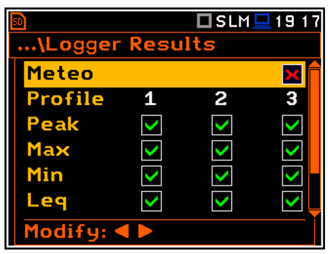


5.4.2 Selecting logger results – Logger Results

The **Logger Results** list allows you to activate results for three independent user defined profiles (**Peak**, **Max**, **Min**, **Leq**, **LXY**, **LR1** and **LR2** for Sound measurements and **Peak**, **P-P**, **Max** and **RMS** for Vibration measurements) and results taken from the weather station (**Meteo**) which will be recorded to the logger file during the measurement period with the **Logger Step**. Activation/ deactivation can be done with the ◄ / ► key pressed together with **<Alt>**. The position is changed with the ◄ / ► or ▲ / ▼ key.



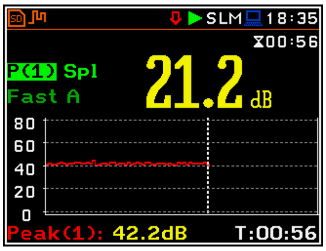
<ENT>



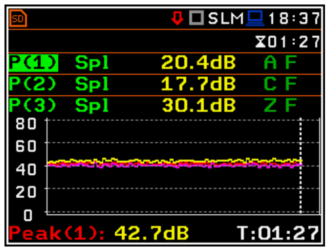
***Note: LXY** is an abbreviation for the L (or Spl) result measured with X filter and Y detector time constant – see Appendix D.*

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

When **Logger** is enabled and results for logging selected, the logger plot will be available in measurement views.

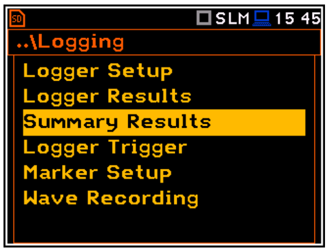


<Alt/▲>

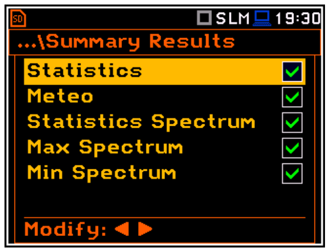


5.4.3 Selecting additional summary results for saving – Summary Results

The **Summary Results** list allows to exclude saving in the file some summary results, like: **Statistics**, **Meteo**, **Statistics Spectrum**, **Max Spectrum** and **Min Spectrum** for Sound measurements and **Meteo**, **Max Spectrum** and **Min Spectrum** for Vibration measurements.



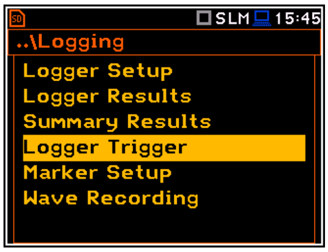
<ENT>



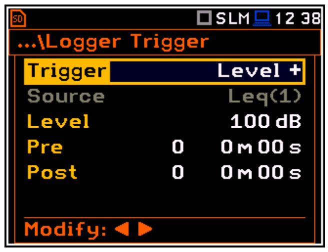
Note: *The* ***Meteo*** *results are transmitted to the instrument from the weather station connected to the monitoring station SV 279 PRO or SV 279 PRIME.*

5.4.4 Triggering the logger results saving – Logger Trigger

In the **Logger Trigger** list, you can configure the way the logger results will be registered in the logger file. **It** is a context list in which: the trigger can be disabled (**Off**) or enabled by selecting its type in the **Trigger** position.



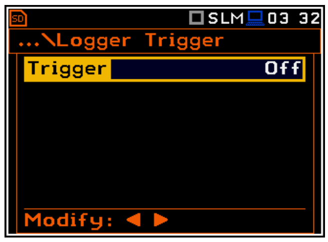
<ENT>



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

Trigger disabling

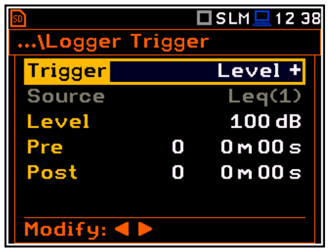
The logger trigger (**Trigger**) can be switched **Off** with the ◄ key. The trigger is switched on if the **Level +** or **Level –** mode is selected with the ► key.

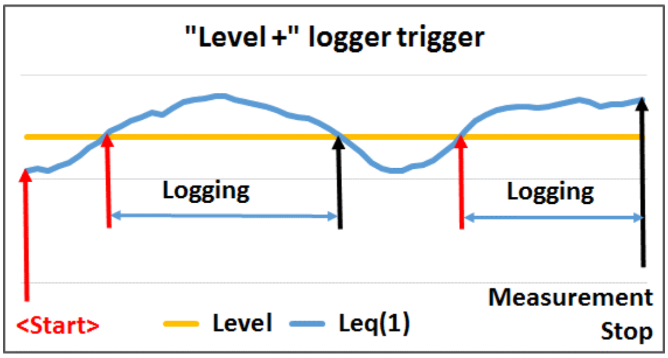


Level type trigger

The **Level +**/**Level -** trigger enables logging of Logger results averaged by the **Logger Step** period under the condition: value of the RMS result (**Source**) averaged by the **Logger Step** period is greater/lower than the threshold level (**Level**). In other cases, the logging is skipped.

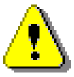
Due to this type of trigger it is possible to separate results related to the high noise level.



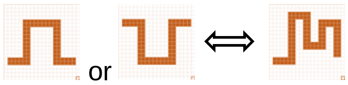


The logging can be done only when the measurement is running (the instrument performs a series of 1-second averages), from the measurement start till the measurement stop.

This means, for example, when the Level measurement trigger is enabled, than when the 1-second measurement(s) is skipped because the measurement trigger condition is not met, logging will also be skipped, even if the Level logger trigger condition is met.



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

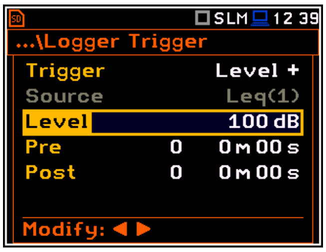


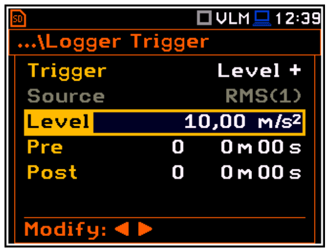
Trigger source

Only one measured result can be used as a trigger source (**Source**) for checking of the trigger condition in the **Level Meter** mode, namely the output signal from the RMS detector coming from the first profile which is denoted here as **Leq(1)** in the sound mode and **RMS(1)** in the vibration mode. This position does not become active (it is not displayed inversely) and the text stated here remains unchanged.

Threshold level

The threshold level for the logger trigger (**Level**) can be set with 1 dB steps in the range from 24 dB to 136 dB in sound mode and from 1mm/s^2 (60 dB) to 10 km/s^2 (200 dB) in vibration mode.



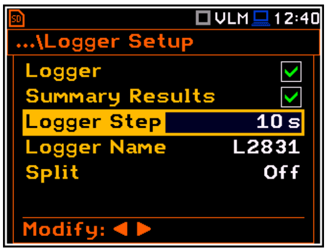


Pre and Post trigger registration

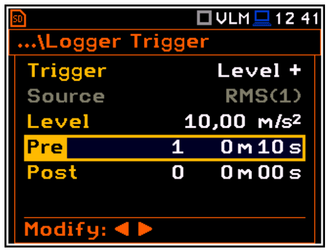
The **Pre** position defines the number of results registered in the logger file before the trigger in the range: 0..50.

The **Post** position defines the number of results registered in the logger file after the trigger in the range: 0..200.

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



=>

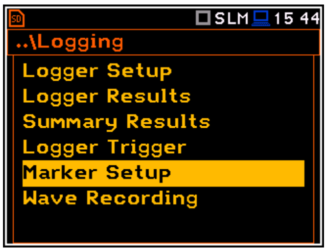


These parameters can perform double role. Firstly, if you wish to collect data right after or before the event that caused triggering of the logging. Secondly, when it is necessary to have continuous logging, but the source is oscillated near the threshold level. The extension of the registration window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

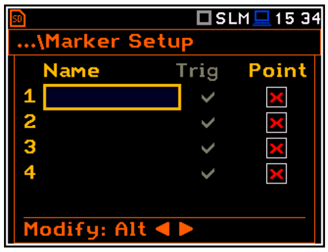
5.4.5 Setting up markers – Marker Setup

Marker is used to mark (or highlight) special events during the measurement such as "airplane flight" and is nothing but an indication of the beginning and end of the block of logger results in which the event occurred. In case of point markers, there is no start and end of the marker, but only one record in the logger file. Markers are activated in the result presentation views by pressing the arrow keys.

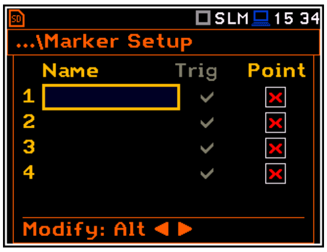
The **Marker Setup** allows to assign a specific name for each marker, select its type (normal or **Point**) and define markers for triggering wave recording (**Trig** column).



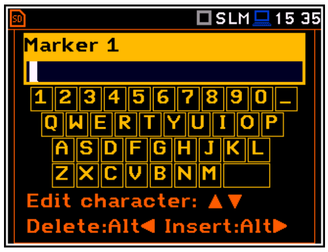
<ENT>



Name edition is performed in a special text editor screen after pressing the ► key together with **<Shift>**.

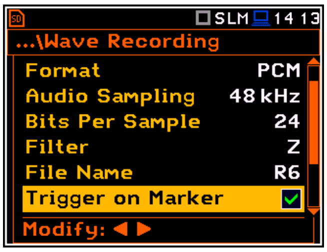


<Sh/►>

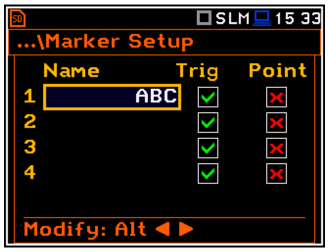


The **Trig** column becomes active only when **Trigger on Marker** *(path: <Menu> / Measurement / Logging / Wave Recording*) is enabled.

Switching on **Trig** for some markers means, that wave recording will be triggered by activating one of these markers.



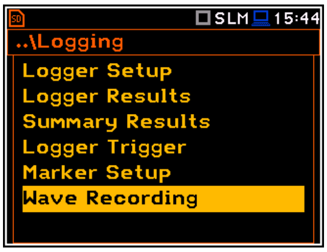
=>



5.4.6 *Wave recording settings – Wave Recording*

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

The **Wave Rec.** parameter, if it is not **Off**, defines a way a recording should be done, continuously during the measurement (**Continuous**) or triggered conditionally (**On Trigger**).

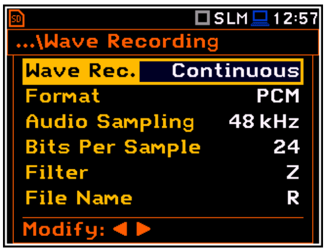


<ENT>

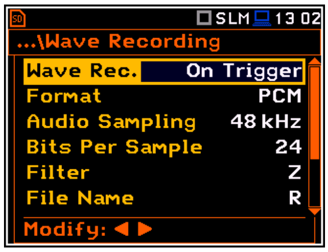
Note: *The* ***Wave Recording*** *function is optional and should be unlocked by entering the activation code in the text editor screen, opened by the ► key. Once unlocked this option will be ready to use permanently.*

The **Format** parameter defines the format of the wave file header: **PCM** or **Extensible**.

The **Audio Sampling** parameter defines the sampling frequency of the wave recording: **12kHz**, **24kHz** or **48kHz**.

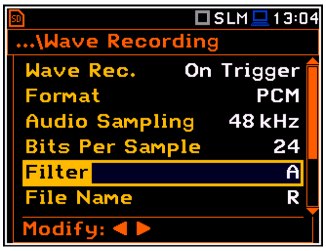


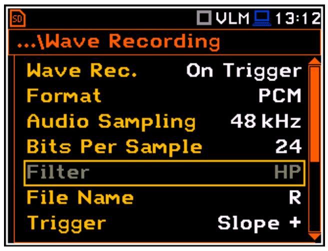
►



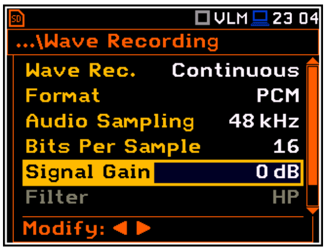
The **Bits Per Sample** parameter defines the number of bits recorded per sample: **16** or **24**.

The **Filter** parameter defines the weighting filter during event signal recording: **A**, **B**, **C**, **Z**, **U**, **AU** or **HP** for the sound signal and **HP** only for the vibration signal.



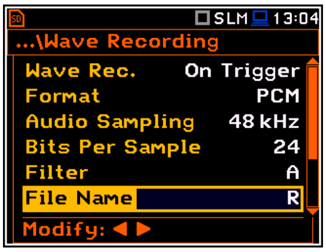


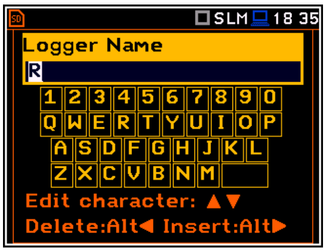
The **Signal Gain** parameter defines the gain of the recorded signal, when 16 bits per sample was selected: **0dB** … **40dB**.



The **File Name** parameter defines the name of the wave file.

You can edit this name in the editor screen, which is opened with the ◄ / ► key.

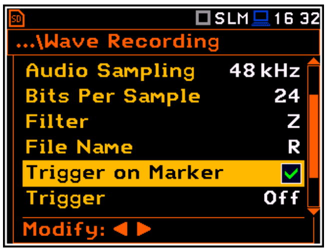




Wave Trigger

When **Trigger on Marker** is switched on, a wave recording will start by initiation of one of the markers. Markers for triggering are defined in the **Markers Setup** screen.

The **Trigger** parameter defines additional wave recording trigger, which can be switched off (**Off**) or switched on by selecting the trigger type: **Slope +**, **Slope -**, **Level +**, **Level –**, **External**, **Integr. Period** and **Int. Period Split**.

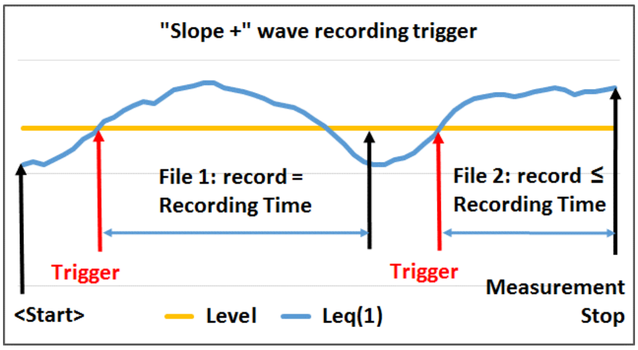


Slope type trigger

The **Slope +** trigger starts recording under the condition: rising value of the RMS result (**Source**) averaged during 0,5 ms passes above the threshold level (**Level**).

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

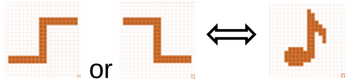
The example shows that between measurement start and stop two records were created. The first record is equal to **Recording Time**, because during this period no second trigger condition has been met. The second recording is stopped by the measurement stop and this record can be shorter than **Recording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



The **Slope -** trigger starts recording under the condition: falling value of the RMS result (**Source**) averaged during 0,5 ms passes below the threshold level (**Level**).

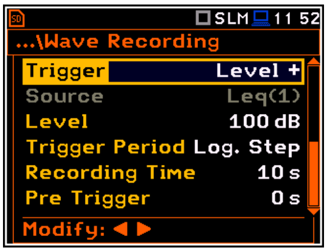
This is a mirrored trigger to **Slope +**.

Note: *When a wave recording is waiting for the slope trigger the "slope" icon appears alternatively with the „wave" icon.*

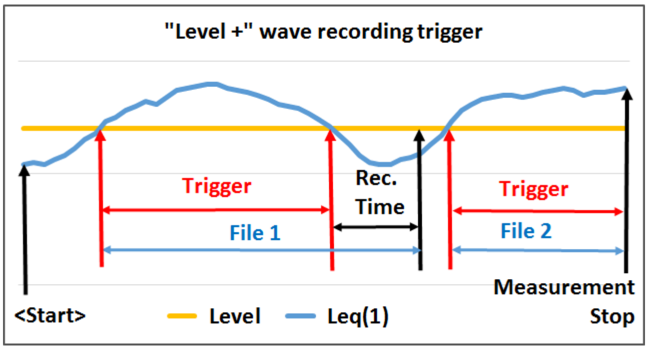


Level type trigger

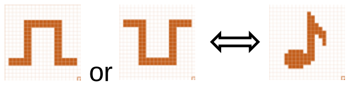
The **Level +**/**Level -** trigger starts recording by **Recording Time** under the condition: value of the RMS result (**Source**) averaged by the 0,5 ms period is greater/lower than the threshold level (**Level**). In other cases, recording doesn't start, but if it has been already started it can be continued until **Recording Time** has elapsed.



If during **Recording Time**, the trigger condition is met recording will be prolonged for another **Recording Time** from the moment of that trigger condition and so on.



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



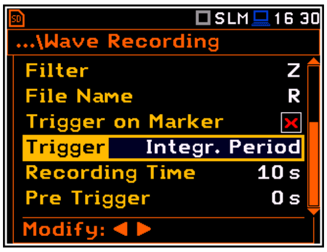
External type trigger

When **External** is selected, recording starts from the external signal on the **I/O** socket. In this case, it is necessary to set up the **I/O Mode** parameter as **Digital In** (*path: <Menu> / Instrument / Multifunction I/O*).

After triggering, recording will last for **Recording Time** and if during this time new external trigger appears the instrument will prolong recording for another **Recording Time**.

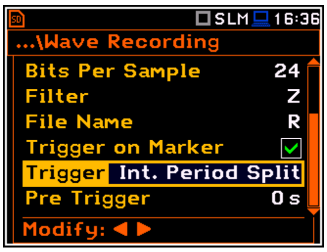
Integr. Period type trigger

When the **Integr. Period** trigger is selected, recording is triggering every time the measurement starts and lasts minimum **Recording Time**. If the triggering condition appears during recording (when **Integration Period** is shorter than **Recording Time**) from this moment recording will be continued for another **Recording Time** and so on.

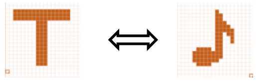


Int. Period Split type trigger

When the **Int. Period Split** trigger is selected, recording is triggering every time the measurement starts and ending after the **Integration Period** time, e.g. the recording time is equal to the **Integration Period** time. In this case the instrument creates a WAV file for every measurement cycle.



Note: *When a wave recording is waiting for the* ***External****,* ***Integration Period*** *or* ***Integration Period Split*** *trigger the "trigger" icon appears alternatively with the „wave" icon.*

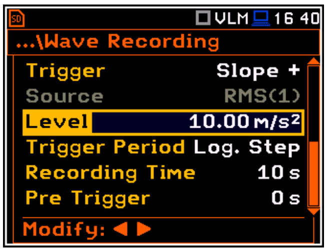


Trigger source

Only one measured result can be used as a trigger source (**Source**) for checking of the trigger condition in the **Level Meter** mode, namely the output signal from the RMS detector coming from the first profile which is denoted here as **Leq(1)** in the sound mode and **RMS(1)** in the vibration mode. This position cannot be changed.

Threshold level

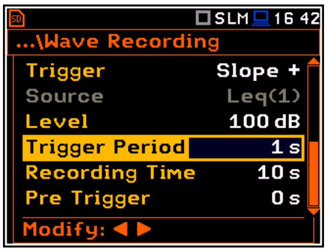
The threshold level for the logger trigger (**Level**) can be set with 1 dB steps in the range from 24 dB to 136 dB in the sound mode and from 1mm/s^2 (60 dB) to 10 km/s^2 (200 dB) in the vibration mode.



An instantaneous value of the RMS or LEQ result calculated with selected **Filter** and **Detector** constant for the first profile (*path: <Menu> / Measurement / Profiles*) compares with the **Level** value with the time interval defined by the **Trigger Period**.

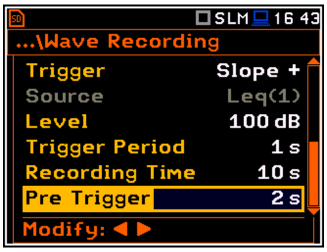
The **Trigger Period** parameter defines the time interval of checking the trigger conditions. This parameter can be set as: **Log. Step** (same as **Logger Step** value), **0.5ms**, **100.0ms** and **1s**.

The **Recording Time** parameter defines the time of signal recording after every trigger. The available values can be selected from **1s** to **8h** or **Inf** (recording will last until measurement stop).



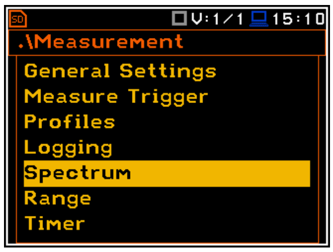
When **Pre Trigger** is higher than 0 then the wave signal starts to be recorded before the trigger. The period of such recording depends on the sample frequency and bits per sample. The pre-trigger periods are:

- for 24 bits per sample: **2s** for 48 kHz, **4s** for 24 kHz and **8s** for 12 kHz.
- for 16 bits per sample: **4s** for 48 kHz, **8s** for 24 kHz and **16s** for 12 kHz.



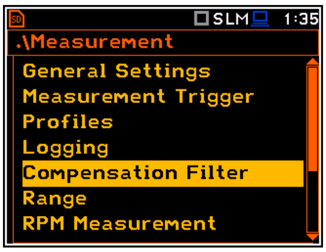
5.5 SETTING SPECTRA – SPECTRUM

The **Spectrum** position appears in the **Measurement** list when the **1/1 Octave**, **1/3 Octave** or **FFT** function is selected in the **Measurement Function** list (*path: <Menu> / Function / Measurement Function*) - see Chapters 10 and 11 for details.

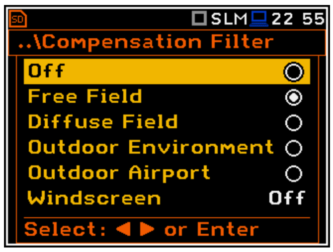


5.6 SELECTING MICROPHONE COMPENSATION FILTERS – COMPENSATION FILTER

The **Compensation Filter** position is available only in the Sound meter modes. It allows you to select the appropriate compensation filter for different measurement applications.



<ENT>



The **Compensation Filter** screen is a list of options: **Off**, **Free Field**, **Diffuse Field**, **Outdoor Environment**, **Outdoor Airport**; and the **Windscreen** parameter.

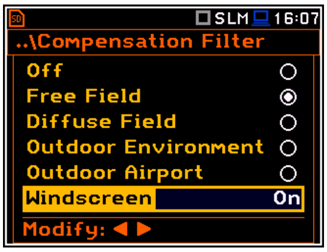
The **Free Field** and **Diffuse Field** filters are intended to compensate sound measurements in the free field conditions or in the diffuse field conditions. The microphone supplied with SVAN 977A (SV 7052E) is designed for sound measurements in the free field conditions. The **Free Field** option means that the correction filter for the diffuse field conditions is switched off. In case of sound measurements performed with the use of specific diffuse field microphone types the option **Diffuse Field** should never be used and the compensation filter should be turned off (**Off** option).

The **Outdoor Environment** and **Outdoor Airport** filters are dedicated for the permanent outdoor monitoring application as a part of the **SV 277** monitoring station. The characteristics of the outdoor filters depend on the application: environmental (the acoustic signal is parallel to the microphone's grid) or airport (the acoustic signal is perpendicular to the microphone's grid).

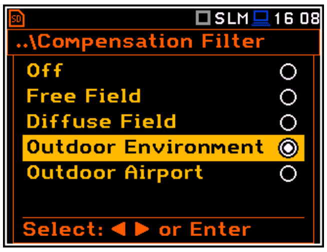
Windscreen filter can be switch **Off**, **On** or set to automatic detection – **Auto**.

The frequency characteristics of all filters are given in Appendix C.

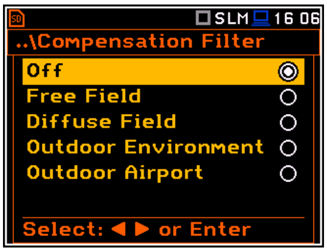
Note: *When using windscreen SA22 the* ***Windscreen*** *compensation filter must be* ***On*** *to ensure good tolerances margin of the SVAN 979 frequency response.*



Note: *For the free filed evaluation with the SA 277 microphone outdoor protection kit the* ***Environment*** *or* ***Airport*** *compensation must be selected.*



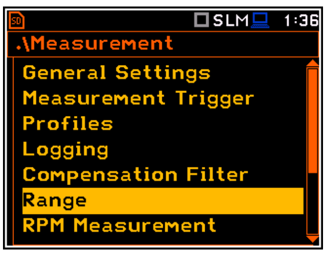
Note: *For the conformance of electrical tests and the acoustic calibrator or coupler evaluation, all compensation filters must be* ***Off****.*



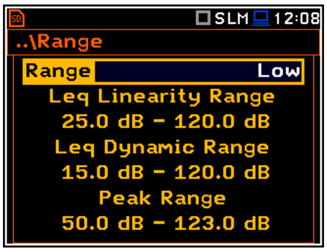
5.7 MEASUREMENT RANGE SELECTION – RANGE

The **Range** position is used for setting the measurement range of the instrument.

The **Range** screen presents for the selected range: Leq linearity range, Leq dynamic range and Peak range for 1 kHz.



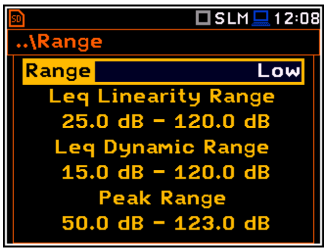
<ENT>



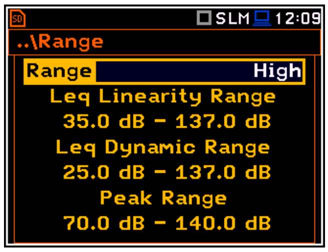
There are two ranges available: **High** and **Low**. The detailed description of the measurement ranges parameters is given in Appendix C.

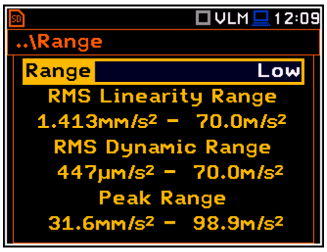
The values of ranges in sound modes depend on the settings in the **Compensation Filer** screen (*path: <Menu> / Measurement / Compensation Filter*) and the calibration factor.

The right-hand screens present the **Range** for the Vibration mode and zero calibration factor.

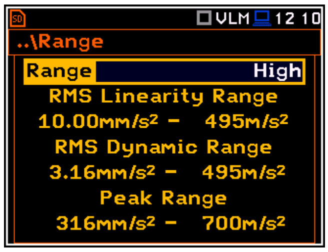


▶



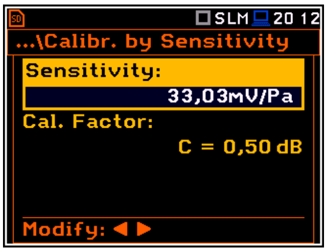


▶

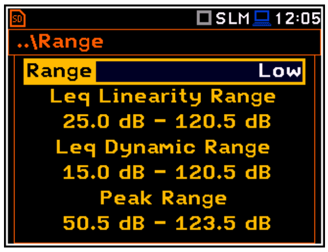


The calibration factor is always added to the upper range level – see example.

For example, if the calibration factor is equal to 0.5 dB, the upper range limits will be increased by 0.5 dB automatically.

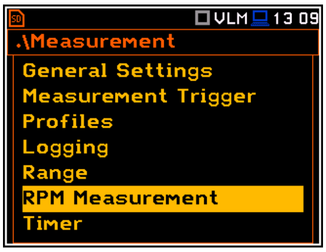


=>

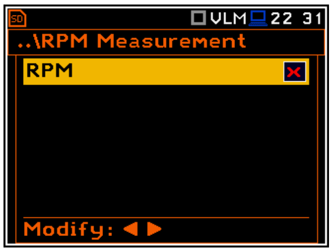


5.8 RPM MEASUREMENT SETTINGS – RPM MEASUREMENT

The **RPM Measurement** position allows to switch on and set measurements of rotational speed, measured by tacho probe.



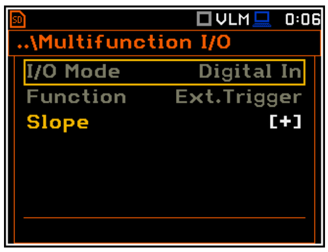
<ENT>



Note: *The **RPM** function is optional and should be unlocked by entering the activation code in the text editor screen, which is opened during first attempt to open this position. Once unlocked this option will be ready to use permanently.*

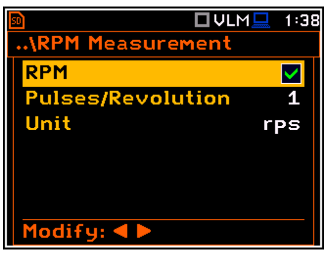
To perform the RPM measurement the RPM probe should be connected to the **I/O** socket and the RPM position in the RPM Measurement screen should be switched on.

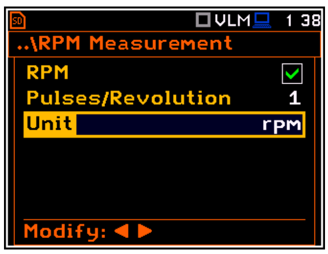
When you switch the **RPM** on the instrument automatically switches the **I/O Mode** to **Digital In** (*path: <Menu> / Instrument / Multifunction I/O / I/O Mode*) and makes it inactive.



The **Pulses/Revolution** parameter defines the number of pulses per one rotation. Available values are in the range: **1**..**360**.

The **Unit** parameter defines units of measure. Two options are available: revolutions per minute (**rpm**) and revolutions per second **(rps**).

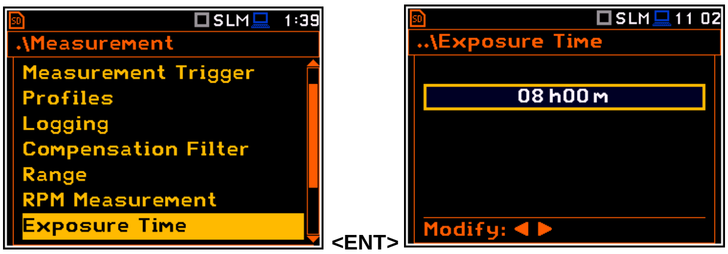




Note: *The RPM results are always registered in the logger file as logger results (with the logger step) and as summary results (with the integration period step).*

5.9 SETTING UP THE EXPOSURE TIME - EXPOSURE TIME

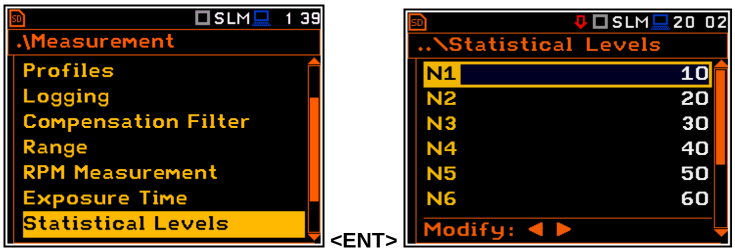
The **Exposure Time** parameter defines the workday exposure time that is used for the calculation of **LEPd** (cf. Appendix D for definitions). This position is available only in the sound mode. The **Exposure Time** values are within the range [00h01, 08h00].



5.10 STATISTICAL LEVELS SETTINGS - STATISTICAL LEVELS

The **Statistical Levels** position is available only in the Sound meter modes.

In the **Statistical Levels** screen, you can define ten statistical levels, named from **N1** to **N10**, to be calculated, displayed and saved in a file as Summary results.

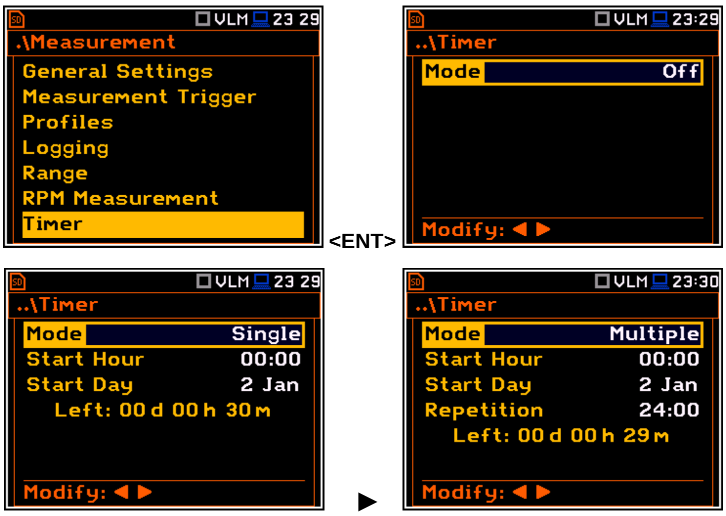


The default statistical levels have following settings: **10**, **20**, **30**, **40**, **50**, **60**, **70**, **80**, **90** and **95**. All values should be within the integer range [1, 99]. Each individual value can be set independently from others.

5.11 PROGRAMMING THE INSTRUMENT'S INTERNAL TIMER – TIMER

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

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



Modes of the timer function

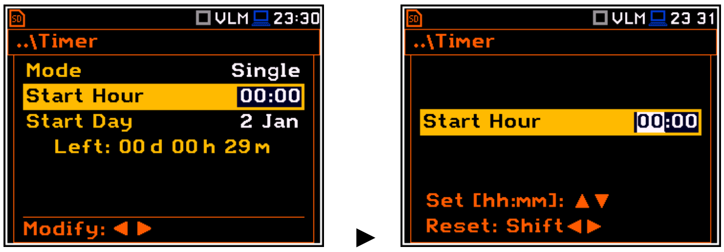
The timer can be switched off (**Off**), switched on only once (**Single**), or switched on many times regularly (**Multiple**) with the period between two consecutive measurements (**Repetition**).

In the case the timer is active (**Single** or **Multiple**) and the instrument is switched on the "clock" icon appears until finishing the programmed measurements.

Time of measurement start

The **Start Hour** position determines the time for the measurement to start. The required hour and minute can be selected in a special screen, which is opened with the ◄ / ► key.

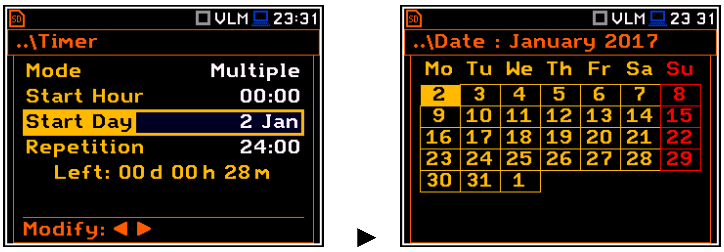
To set hours or minutes, select the left or right field with the ◄ / ► key and then select the proper value with the ▲ / ▼ key and press **<ENTER>** to confirm settings.



Day of measurement start

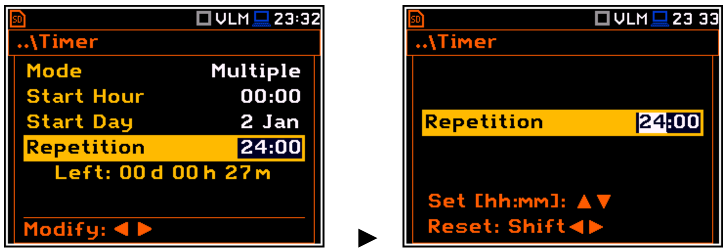
The **Start Day** position determines the date for the measurement to start. The timer can be programmed up to one month ahead. The required date can be selected in a special screen, which is opened with the ◄ / ► key.

To set the date, select its position with the ◄ / ► or ▲ / ▼ key and then press **<ENTER>**.



Period between two consecutive measurement starts

The **Repetition** position is displayed when the **Multiple** mode is selected. This parameter can be programmed in the range from **00:00** up to **96:00**. The required date can be selected in a special screen, which is opened with the ◄ / ► key same way as **Start Hour**.



***Note:** The **Timer** function can be used for multiple measurements (at the programmed day and time with the selected repetition number). The first start of the instrument must be within one month ahead. Make sure that the RTC is configured correctly before setting up the **Timer**.*

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

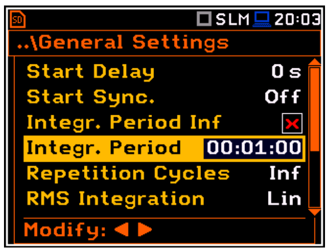
5.11.1 Example of timer execution

Let us assume that the you wish to switch on the instrument on 3rd of December at 20:00, measure noise for 1 minute and save the results in a file named **L2831**.

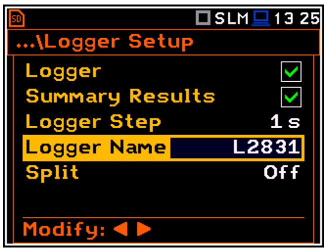
To do this set the **Timer** parameters, set the measurement parameters (*path: <Menu> / Measurement / General Settings*), name the file (*path: <Menu> / Measurement / Logger / Logger Setup*) as on the attached screens and finally – turn off the instrument.

The instrument will be switched on 3rd of December at 19:59 and will be warmed up for the period of 60 seconds decrementing the counter visible on the display by one after each second.

After warming up and the pre-set **Start Delay** time, the measurements will be performed by a period of one minute. Then, results will be saved in the previously named file and finally – the instrument will turn itself off.

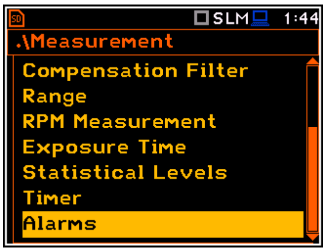


It is recommended to set the **Start Delay** time to 0 seconds for the **Timer** function.

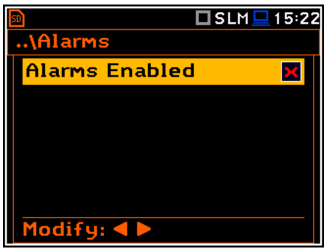


5.12 ADVANCED ALARM FUNCTION - ALARMS

The **Alarms** position appears in the **Measurement** list in the case the advanced alarms configuration file (ALARM.SVA) is uploaded to the predefined SYSTEM catalogue. It opens the screen in which you can enable or disable the advanced alarm function.



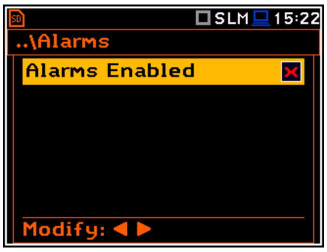
<ENT>



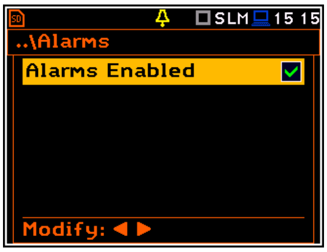
Note: The advanced alarm settings are configured via SvanPC++ or via SvanNET web-service since this function was designed for the SV 277 PRO/PRIM monitoring stations.

If you enable advances alarms, the „alarm" icon appears, and the instrument will generate alarms according to the programmed settings.

The SvanPC++ and SvanNET manuals describe the advanced alarms configuration.



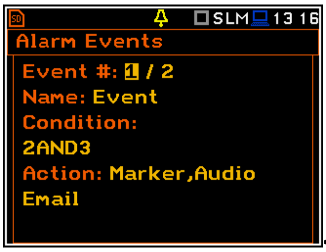
▶



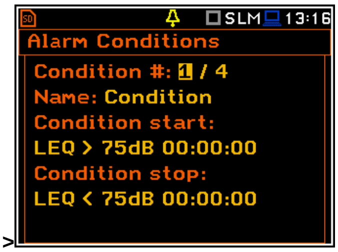
Enabled Alarms settings can be seen in the special measurement views: **Alarm Actions**, **Alarm Events** and **Alarm Conditions**.

These views can be changed with the ▲ / ▼ key pressed together with **<Alt>**.

The event, action and condition record can be changed with the ◄ / ► key pressed together with **<Alt>**.



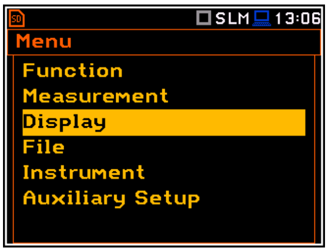
<Alt/▼>



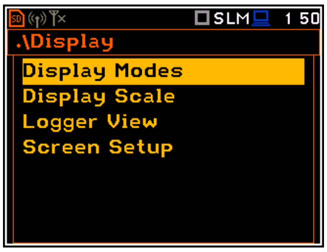
6 CONFIGURING DATA VIEWING – Display

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

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



<ENT>



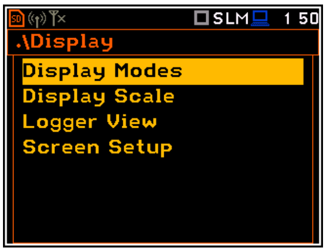
The **Display** section contains following items:

Display Modes	allowing to define active modes of a measurement results presentation;
Display Scale	allowing to adjust the scale in a graphical modes of the measurement results presentation;
Logger View	allowing to select and present results stored in logger files;
Spectrum View	allowing to select spectra to be viewed: instantaneous, averaged, maximum or minimum. This position appears only in spectrum analyser functions;
Spectrum Type	allowing to change the spectrum type presented on the display: acceleration, velocity or displacement. This position appears only in spectrum analyser functions in the Vibration mode;
Screen Setup	allowing to set up the brightness and switch on/off the energy saver function.

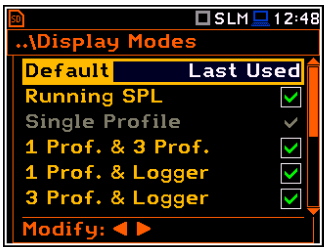
6.1 ACTIVATION OF THE DISPLAY MODES - DISPLAY MODES

The **Single Profile** view (results display mode) is always active and available. Other views can be enabled or disabled in the **Display Modes** screen.

You may change views among those, that were enabled in the **Display Modes** screen.

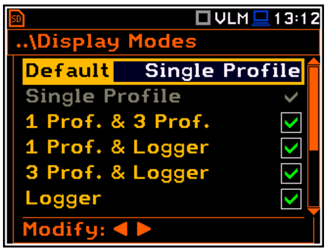


<ENT>



In the **Sound Level Meter** mode, following views are available: **Running SPL**, **Single Profile**, **1 Prof. & 3 Prof**, **1 Prof. & Logger**, **3 Prof. & Logger**, **Logger**, **Statistics**, **Meter Table**, **GPS** and **File Info**.

In the **Vibration Level Meter**, following views are available: **Single Profile**, **1 Prof. & 3 Prof.**, **1 Prof. & Logger**, **3 Prof. & Logger, Logger**, **Meter Table**, **GPS** and **File Info**.

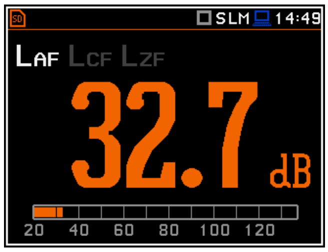


In the **Default** position, you can define which view will be presented after instrument's turn on. If you select **Last Used** the instrument will be switched to the view used before the instrument turning off.

Changing views

Being in the measurement mode you can change the view with the ▲ / ▼ key pressed together with **<Alt>**.

6.1.1 Running SPL view



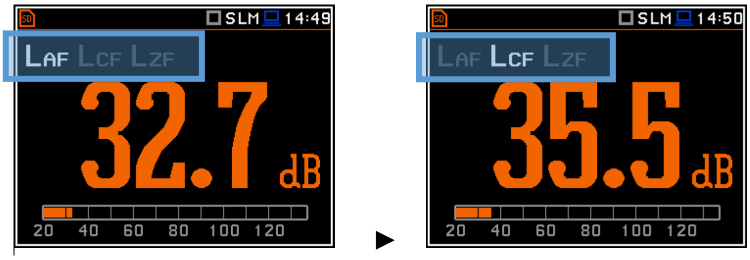
The **Running SPL** view is available in the Sound measurement modes. It shows in a large format one measured result – SPL for the selected profile (Leq with the weighting filter and detector constant defined in the **Profiles** screen for the last second).

This result is not saved in a file and gives just the first assumption of the sound level before the measurement.

The Running SPL view can be enabled and disabled in the **Display** screen.

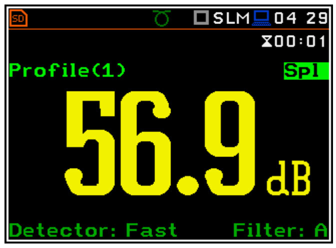
You can hide or open this view with the **<ESC>** key.

You can change the displayed result with the ◄ / ► key.

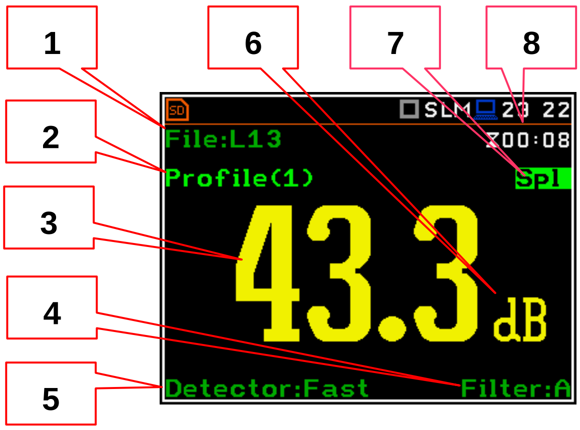


6.1.2 Single Profile view

The **Single Profile** view is always available in all measurement functions. You cannot disable it. In this view, only one measured result is displayed in a large format.



Single Profile view fields

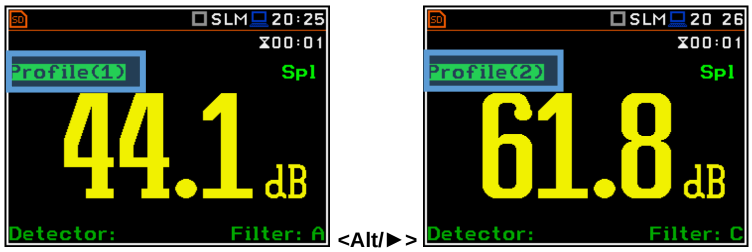


1. Logger file name.
2. Profile number.
3. Value of the measured result.
4. Weighting filter: **Z**, **A**, **C**, **B**, **U**, **UA**, **LF** for Sound measurements or **HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10**, **Wh** for Vibration measurements.
5. Detector type: **Linear** or **Imp.**, **Fast**, **Slow** for Sound measurements and **Linear** or **100 ms**, **125 ms**, **.. 10.0 s** for Vibration measurements.
6. Units of the measured value.
7. Result name: **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, **Lnn**, **EX**, **SD**, **LR1**, **LR2**, **Ovl**, **Peak**, **Max**, **Min** for Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P** for Vibration measurements.
8. Elapsed time, showing the current second of the measurement. The value presented here belongs to the range [**0**, **Integration Period**].

Note: *Detector type for the displayed result depends on settings in **General Settings** and **Profiles** lists (path: <Menu> / Measurement). There is no displayed indication of the detector in case of **Peak**, **P-P** and **Ovl** results (see Appendix D).*

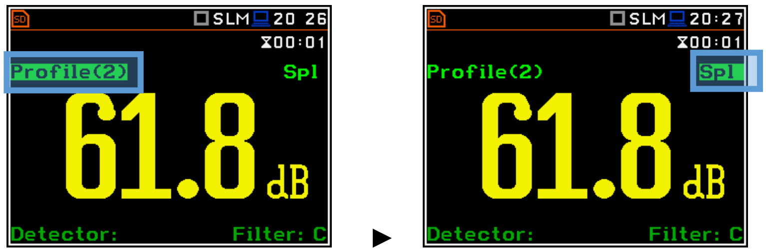
Changing the field content

The content of some fields can be changed with the ◄ / ► key together with **<Alt>**.



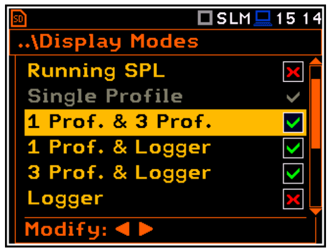
Changing active fields

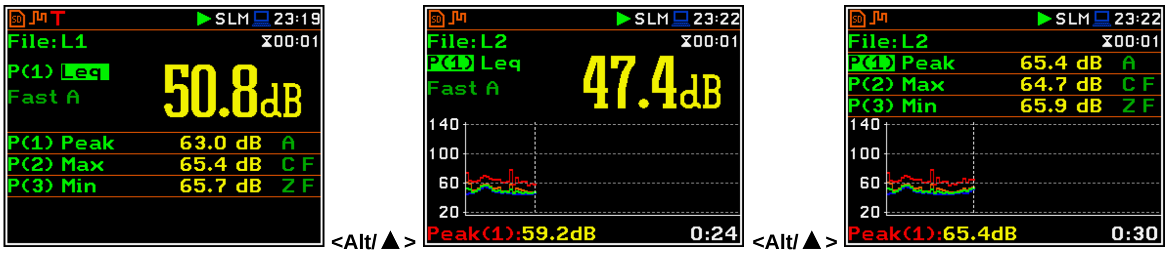
You can change the active field with the ◄ / ► key.



6.1.3 Combined views

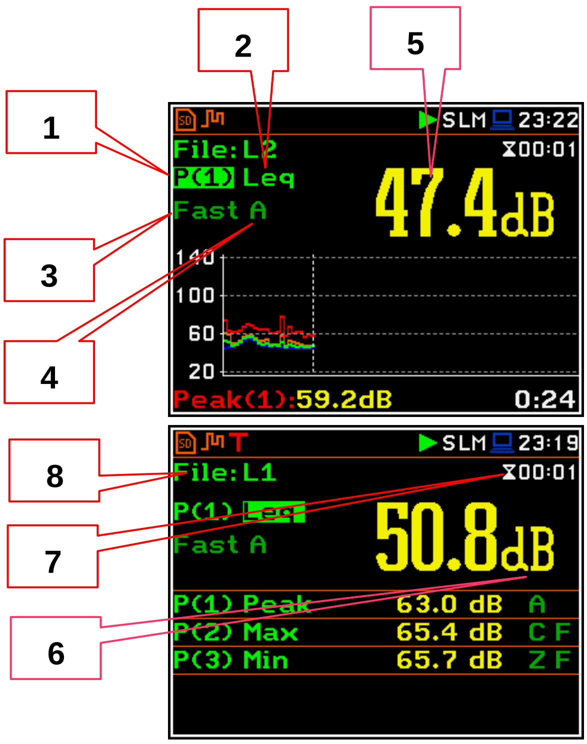
There are three display modes, that combine two views: **1 Prof. & 3 Prof.**, **1 Prof. & Logger**, **3 Prof. & Logger**. These display modes allow you to compare results for profiles and to follow the history of measured results, saved in the logger file.





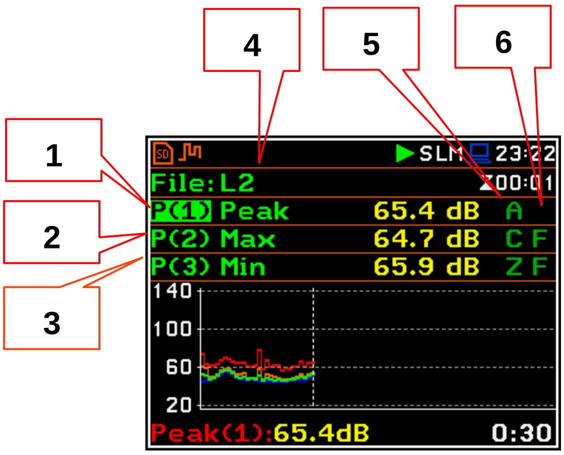
Single Profile view fields

1. Profile number.
2. Result name: **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, **Lnn**, **EX**, **SD**, **LR1**, **LR2**, **Ovl**, **Peak**, **Max**, **Min** for Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P** for Vibration measurements.
3. Detector type: **Linear** or **Imp.**, **Fast**, **Slow** for Sound measurements and **Linear** or **100 ms**, **125 ms**, **.. 10.0 s** for Vibration measurements.
4. Weighting filter: **Z**, **A**, **C**, **B**, **U**, **UA**, **LF** for Sound measurements or **HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10**, **Wh** for Vibration measurements.
5. Value of the measured result.
6. Units of the measured value.
7. Elapsed time, showing the current second of the measurement. The value presented here belongs to the range [**1**, **Integration Period**].
8. File name when **Logger** is enabled (*path: <Menu> / Measurement / Logging / Logger Setup).*

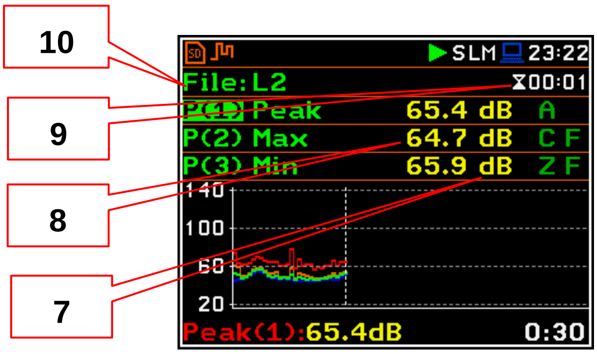


***Note:** Detector type for the displayed result depends on settings in **General Settings** and **Profiles** lists (path: <Menu> / Measurement). There is no displayed indication of the detector in case of **Peak**, **P-P** and **Ovl** results (see Appendix D).*

3 Profiles view fields

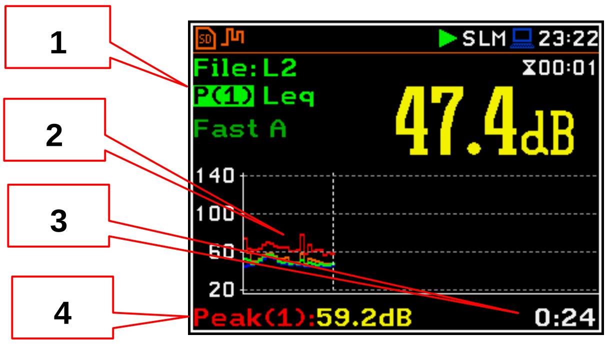


1. Result line for Profile 1.
2. Result line for Profile 2.
3. Result line for Profile 3.
4. Result name: **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, **Lnn**, **EX**, **SD**, **LR1**, **LR2**, **Ovl**, **Peak**, **Max**, **Min** for Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P** for Vibration measurements.
5. Weighting filter: **A**, **B**, **C**, **Z**, **U**, **UA**, **LF** for Sound measurements. For Vibration measurements this field is skipped.
6. Detector type: **L** (Linear) or: **I** (Imp.), **F** (Fast), **S** (Slow) for Sound modes. For Vibration measurements this field is skipped.
7. Units of the measured value.
8. Value of the measured result.
9. Elapsed time, showing the current second of the measurement. The value presented here belongs to the range [**1**, **Integration Period**].
10. File name when **Logger** is enabled (*path: <Menu> / Measurement / Logging / Logger Setup)*.



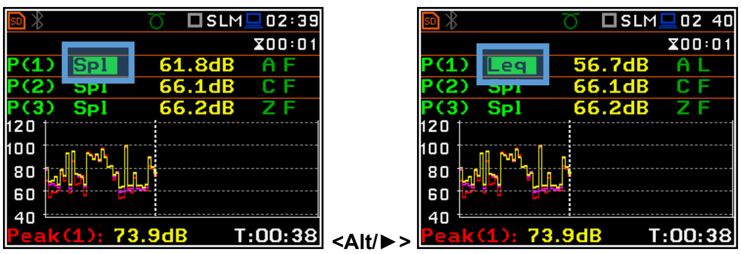
Logger view fields

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



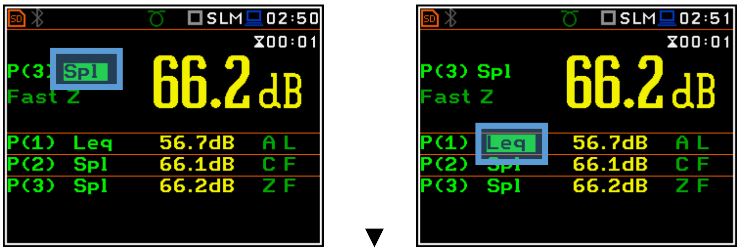
Changing the field content

The content of some fields can be changed with the ◄ / ► key pressed with **<Alt>**.



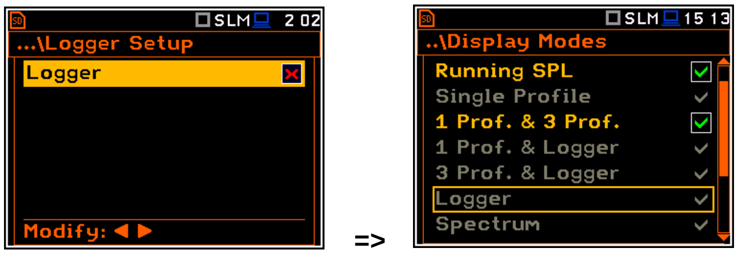
Changing the active fields

You can change the active field with the ▲ / ▼ (vertically) or ◄ / ► (horizontally) key.

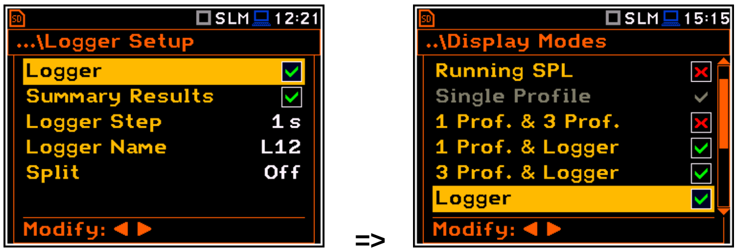


6.1.4 *Logger view*

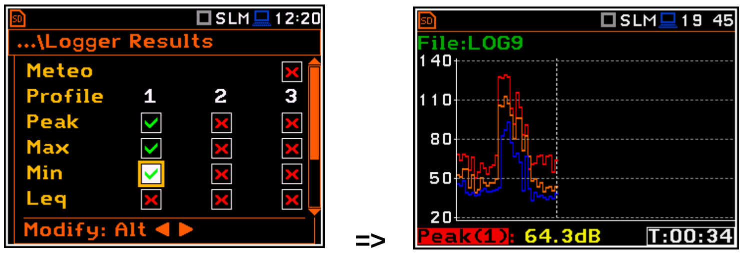
The **Logger** view depends on the settings made in the **Logging** list (*path: <Menu> / Measurement / Logging). If* ***Logger*** *(path: <Menu> / Measurement / Logging / Logger Setup)* is disabled, the **Logger** view mode is <u>not</u> active!



So, to have this view active, enable the **Logger**!

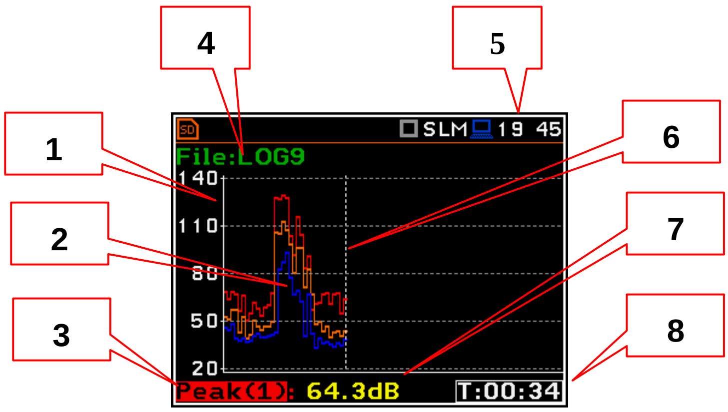


When **Logger** is enabled, and some results have been selected for logging the logger plot can be viewed.

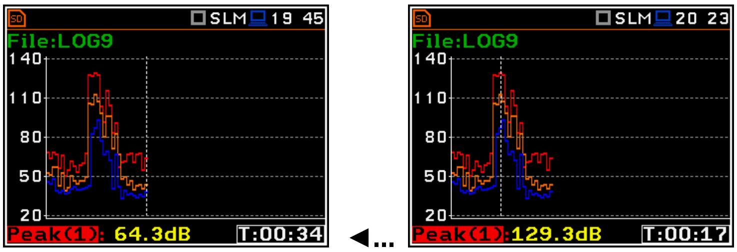


Logger view fields

1. Y-scale
2. Logger plot
3. Name of the logged result and profile number
4. Name of the file
5. Real Time Clock
6. Cursor position
7. Result value for the cursor position
8. Cursor time position



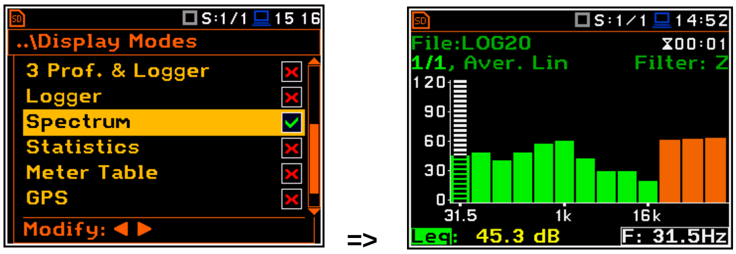
You may change the cursor position with the ◄ / ► key.



6.1.5 Spectrum view

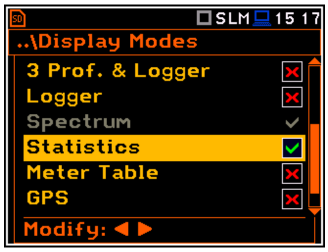
The **Spectrum** position is accessible only in the active **1/1 Octave**, **1/3 Octave** or **FFT** functions.

The spectra views are described in Chapters 10 and 11.



6.1.6 Statistics view

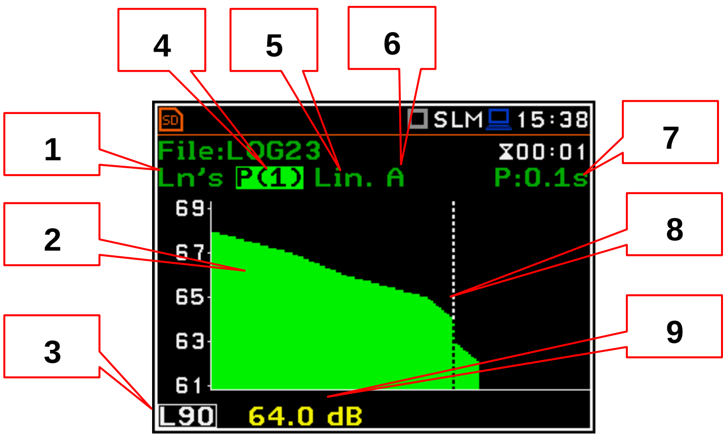
The **Statistics** position is accessible only for Sound measurements.



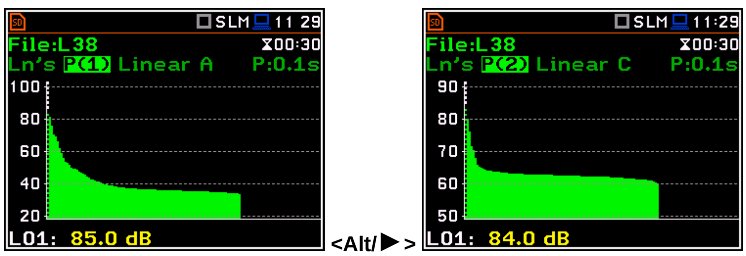
Statistics is the cumulative probability density function of exceeding the noise level during the measurement period. The X axis defines the probability of exceeding the noise level, statistical level **Lnn**, and the axis Y defines the calculated noise level in dB.

Statistics view fields

1. Result name
2. Statistics plot
3. Statistical level (**Lnn** percentile value) for the active cursor position
4. Active profile (P1, P2 or P3)
5. RMS detector (**Lin.** or **Fast**, **Slow**, **Imp.**)
6. Weighting filter (**A**, **B**, **C**, **Z**, **U**, **UA** or **LF**)
7. Sampling interval for the **Lnn** values calculated by the instrument (0.1 s)
8. Cursor position
9. Value of the selected statistical level **Lnn** and units (dB)

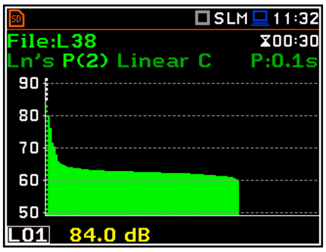


The profile is changed with the ◄ / ► key pressed with **<Alt>**.

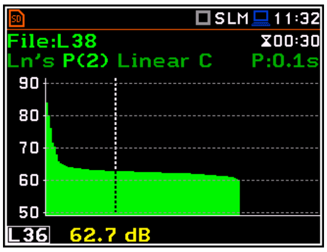


The cursor position is changing with the ◄ / ► key if the field 3 is selected. The statistical level and appropriate value are presented in the line below the plot.

Press the ◄ / ► key with **<Shift>** to go straight to the first or last **Lnn** position on the screen.



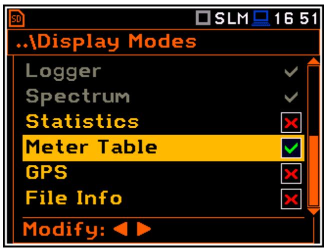
►…



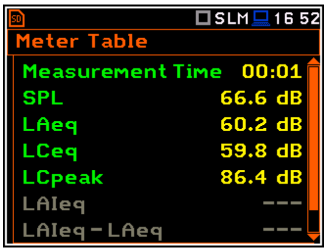
6.1.7 Meter Table view

The Meter Table view displays a list of predefined results with assigned weighting filters and detector type without information about profiles.

If specified in that list result is not measured in any profile, it will be of grey colour and without value (“**---**“).

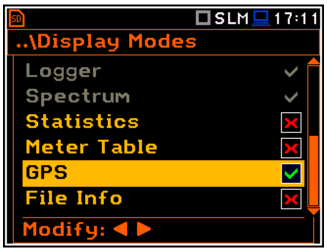


=>

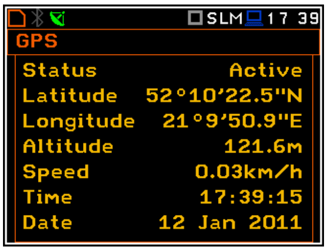


6.1.8 GPS view

When **GPS** is enabled in the **Communication Ports** screen (*path: <Menu> / Instrument / Communication Ports*) it is possible to activate the GPS screen, which shows the GPS status, co-ordinates, etc., transmitted to the instrument from the **SV 58_H** GPS module connected to the **Serial** socket.



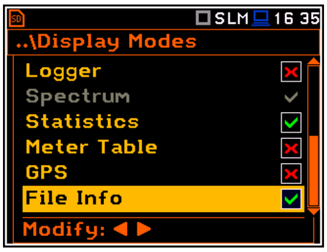
=>



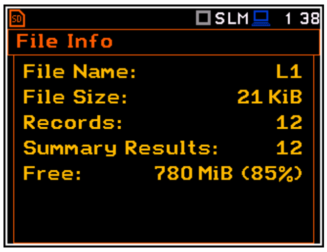
6.1.9 File information view

The **File Info** position enables the additional file information view.

The **File Info** view displays the file name, its size, number of records made with Logger step, number of summary results blocks (records made with Integration period), free memory space etc.

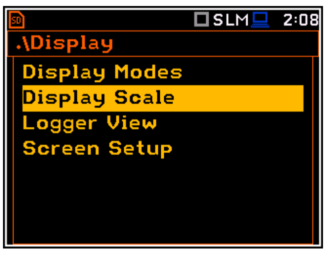


=>

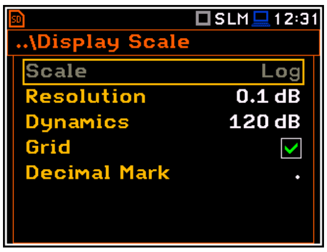


6.2 ADJUSTING PLOT VIEWS - DISPLAY SCALE

The **Display Scale** list of parameters allows to define the result units (absolute or logarithmic), number of digits after decimal point, decimal mark, adjust scale of plots and toggle a grid.



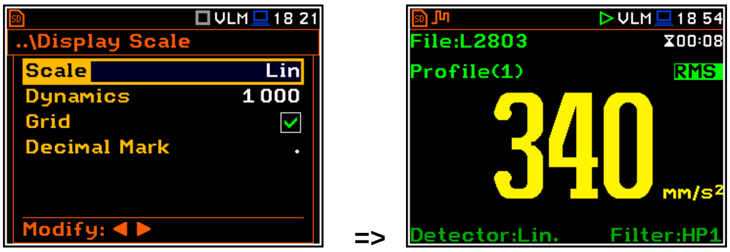
<ENT>



Scale of results presentation

The **Scale** parameter defines results units: linear (**Lin**) or logarithmic (**Log**).

For sound measurements the **Scale** position is not active. All results are always presented in dB.

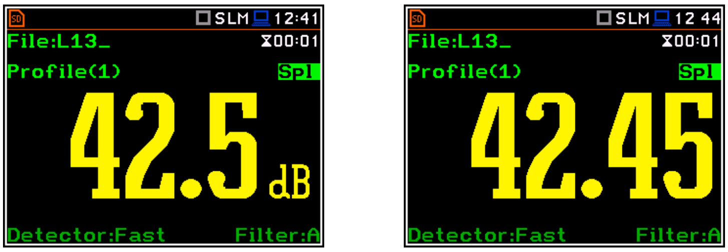


In case of **Log**, the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (results are calculated in relation to the values specified in the **Reference Levels** screen (*path: <Menu> / Auxiliary Setup / Reference Levels*)).

Note: *In Vibration modes, parameters can be presented in **Logarithmic** (dB) or **Linear** (for example, m/s^2) units. It depends on the **Scale** parameter value. For example, 10 m/s^2 can be presented also as 140 dB.*

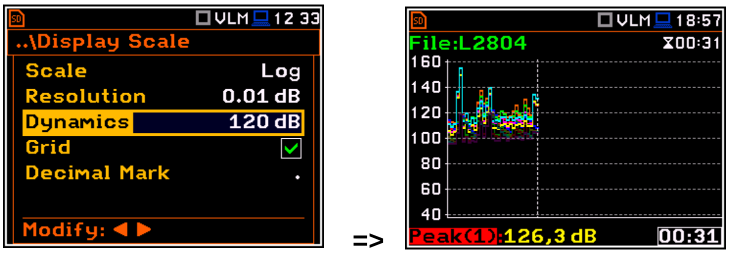
Resolution

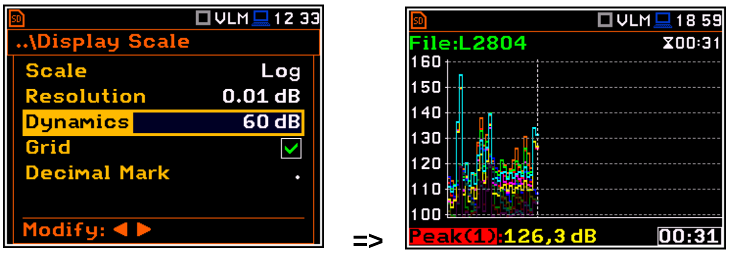
The **Resolution** parameter defines the number of digits after the decimal point in the presented results: one digit after the decimal point (**0.1 dB**) or two digits after the decimal point (**0.01 dB**).



Scaling the vertical axis of the plot

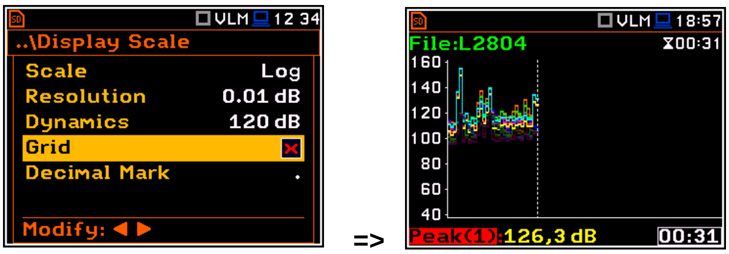
The **Dynamics** parameter defines the dynamic range of the plot Y-axis scale. It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB**, **100dB** and **120dB**.





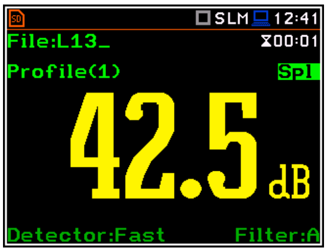
Toggling the grid

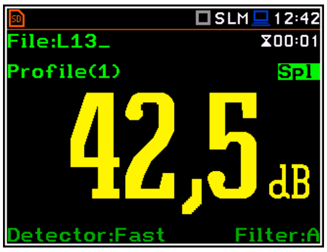
The **Grid** position allows to toggle the horizontal grid lines of the logger or spectrum plot.



Decimal Mark

The **Decimal Mark** position allows to select which decimal mark (point or comma) will be used for data presentation in all presentation modes.



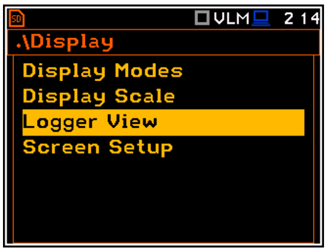


6.3 Adjusting the Logger View - Logger View

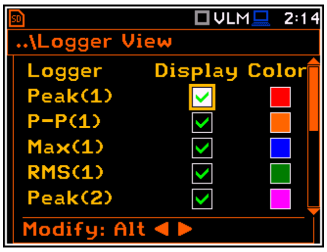
The **Logger View** screen allows to adjust the **Logger** view by choosing logged results to be displayed and colours of their curves.

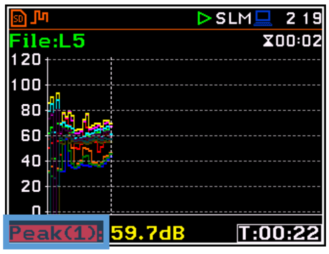
Every logger curve shows the history of one result measured in a profile, like **Peak(1)**. In the **Logger View** screen, you can include or exclude the curve from the logger plot and define the colour of this curve.

The view of the logger screen can be adjusted quickly without stopping the measurement. Highlight the function label in the bottom left hand corner then press **<ENTER>**. The **Logger View** list will be displayed in which you can make necessary adjustments and return to the **Logger** view after confirmation of the performed changes with the **<ENTER>** key.

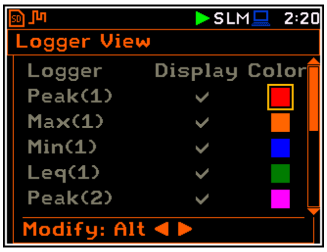


<ENT>



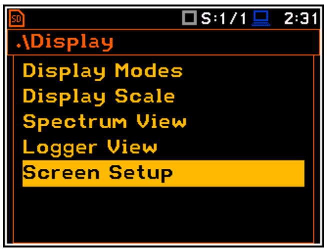


<ENT>

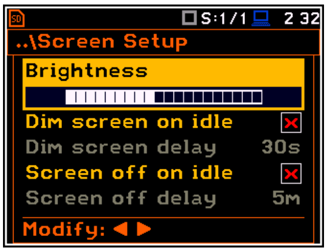


6.4 Setting the Display Brightness and Power Saver - Screen Setup

The **Screen Setup** screen allows to set up the brightness of the display and to toggle the power saver.

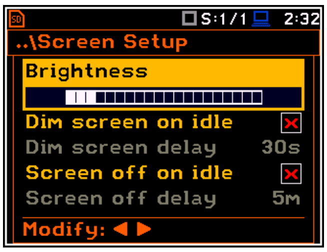


<ENT>



Brightness of the display

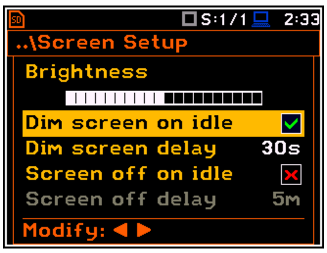
The **Brightness** position allows to set the proper brightness of the display with the ◄ / ► key. You can select 20 different values of this parameter. The new value of brightness level is confirmed after each press of the ◄ / ► key.



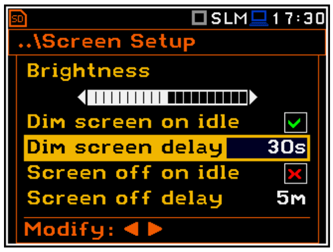
Power saver function

The saving of the internal source of the instrument's power can be achieved by reducing the brightness of the screen when possible.

There are two options for the power saver function. The screen may be switched off (**Screen off on idle**) and/or dimmed (**Dim screen on idle**). When either of these options are set, after a delay from pressing any key, defined by the parameters **Dim screen delay** or **Screen off delay**, the screen is dimmed or switched off. If it has happened, the first press of any key will cause the screen to switch back on again.



Power saver delay



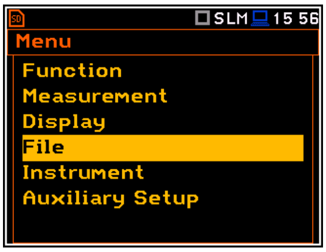
The power saver delay defines the delay period from the last use of any key to the power saver mode. This delay period can be set for **Dim screen on idle** from **5 s** to **60 s** and for **Screen off on idle** from **1 m** to **60 m**. The **<ENTER>** key must be pressed for confirmation of the selection, which then also closes the **Screen Setup** screen.

7 MANAGING FILES – File

The **File** section contains the elements that enable managing data (logger and wave) and setup files saved in the instrument’s memory (micro SD card).

The memory structure and files saving methods are described in Chapter 3.5.

The **File** list contains following items:

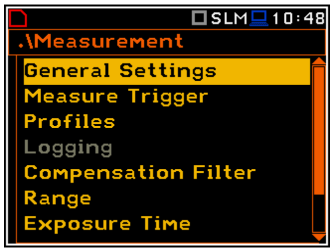


<ENT>

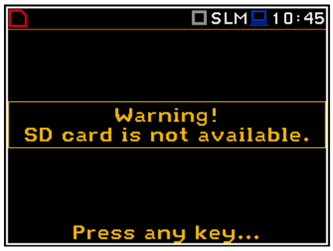
File Manager allowing to manage all files and directories on the SD card,

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

***Note:** Both data and setup files are saving in the SD card memory. So, if there is no SD card in the instrument there is no possibility to create any file. Among other things in this case, the **Logging** position in the **Measurement** list is not available.*



***Note:** Positions in the **File** list are active only when an SD card is inserted into the card slot under the bottom cover of the instrument. If there is no SD card, after your attempt to enter any position in the **File** list, the instrument will generate warning.*



There are three types of files that the instrument generates:

- Logger files with measured data (extension **.SVL**),
- WAV files with time waveform records (extension **.WAV**);
- Setup files with measurement configuration settings (extension **.SVT**).

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

The logger file (.SVL) structure depends on the selected function (**Level Meter**, **1/1 Octave**, **1/3 Octave**, **FFT** or **RT60**) and logging settings and may include:

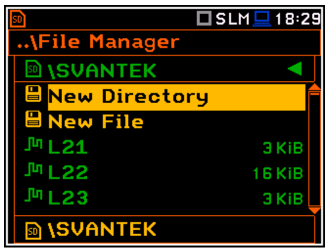
- main results, including results of statistical analysis,
- time histories of measured results,
- marker recordings,
- results of the **1/1 Octave** analysis,
- results of the **1/3 Octave** analysis,
- results of the **FFT** analysis,
- results of the **TR60** analysis.

7.1 MANAGING FILES SAVED IN THE MEMORY – FILE MANAGER

Files are stored in directories, which are organised hierarchically.

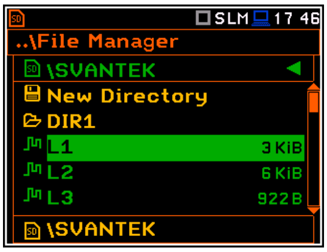
File Manager enables access to all files and directories.

<ENT>

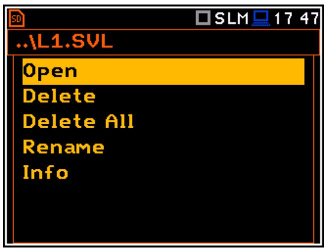


In the **File Manager** screen, you can check the memory content, create new directories and files, select directory for automatic data files saving, rename and delete files and directories.

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



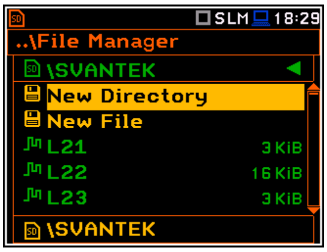
<ENT>



Creating new directory or file

The first two positions of the **File Manager** list are **New Directory** and **New File**, which serve for creation of the new directory or file.

To do this, enter the directory in which the new element will be created, press **<ENTER>** at the **New Directory** or **New File** position and edit the new directory or file name in the text editor screen.



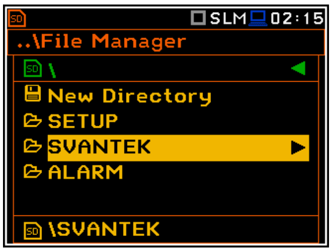
<ENT>

Note: *The **New File** position appears if the measurement was performed.*

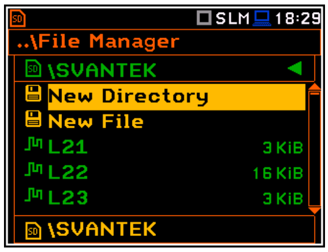
Changing directories

The marked directory can be opened with the ► key.

To return to the upper directory press the ◄ key.



►

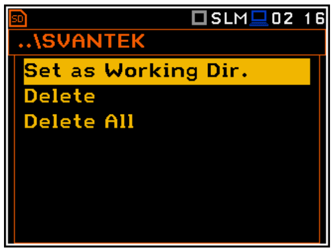


7.1.1 Assigning directory for data files saving – Set as Working Dir.

You can assign a directory for automatic saving of data files. To do this, choose the required directory and press **<ENTER>**. After opening the command list, select **Set as Working Dir.** and press **<ENTER>**.

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

<ENT>

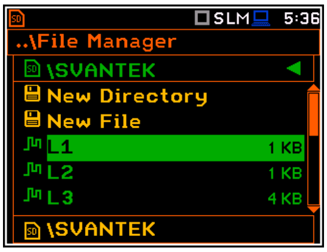


Note: *The working directory name is displayed in the bottom line of the display.*

7.1.2 Opening files/directories – Open

You can open a directory or a logger file. To do this, select the file/directory and press **<ENTER>**. After opening the command list, select the **Open** position and press **<ENTER>**.

The effect of such operation on a directory is similar to the effect of the ► key.



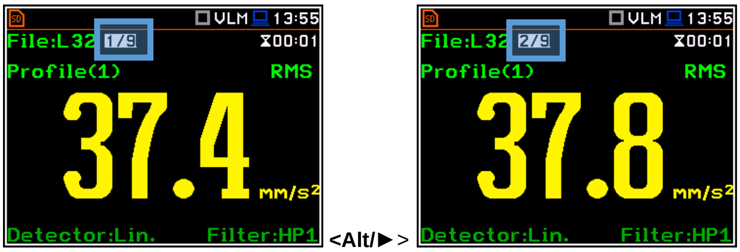
<ENT>

Opening the logger file means that the measurement results saved in this file will be loaded to the instrument's operation memory and may be reviewed on the screen. The results are loaded together with the **Mode** and **Measurement Function** settings, but other measurement settings are as before opening the logger file.

Note: *After loading the logger file, only summary results saved in the logger file as records can be viewed at the display. Each record contains measurement data for one cycle (measured with the* ***Integration Period*** *step).*

The record counter is displayed in the same line with the file name.

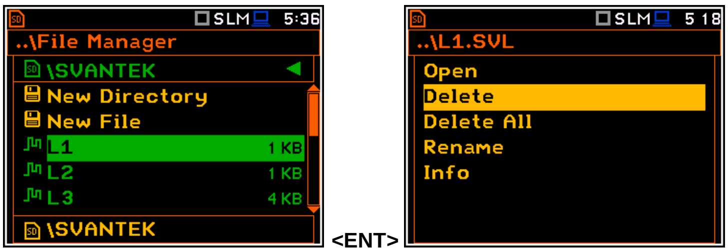
To see next cycle data, select the record counter position with the ▲ / ▼ key and then change the record number with the ◄ / ► key pressed together with **<Alt>**.



7.1.3 Deleting files/directories – Delete

You can delete a file or a directory from the file/directory list. To do this, select the file/directory and press **<ENTER>**. Select the **Delete** position in the command list and press **<ENTER>**. The instrument will ask for confirmation of this action since it cannot be undone once a file/directory has been deleted.

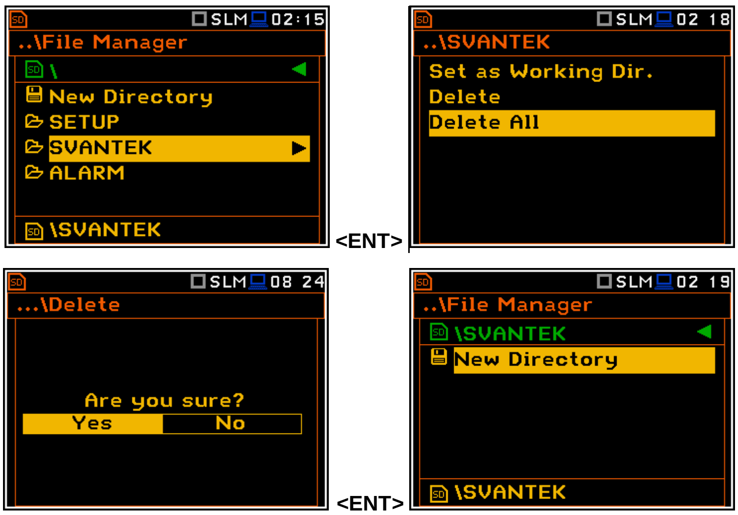
The delete directory command erases all files in this directory and files in all sub-directories.



7.1.4 Erasing all files in a directory – Delete All

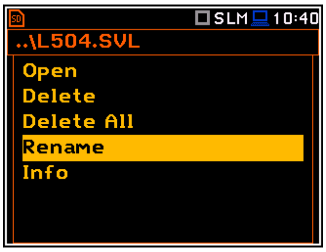
You can delete all elements from the directory. To do this, select the desired directory and open it with the ► key. Then select any file or subdirectory and press **<ENTER>**. Select the **Delete All** position in the command list and press **<ENTER>**. The instrument will ask for confirmation of this action since it cannot be undone once files have been erased.

If the **Delete All** command is performed in a root directory, all files and directories in this root directory will be erased. After this operation three directories will be created as default directories: **SETUP**, **SVANTEK** and **SYSTEM**.

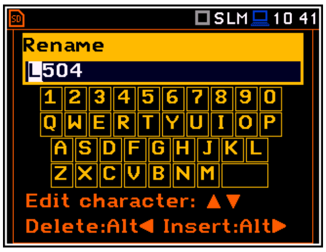


7.1.5 *Renaming files/directories – Rename*

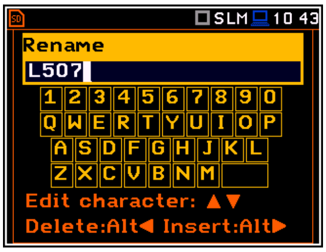
You can rename files or directories. To do this, select the desired file or directory and press **<ENTER>**. Select the **Rename** position in the command list and press **<ENTER>**. The special screen with editor function will be opened.



<ENT>



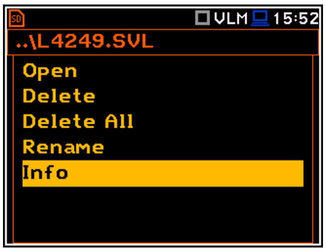
If a file with the new name is already exists in the directory, the warning will be generated and rename command will not be performed. After pressing any key, the instrument will return to the editor screen.



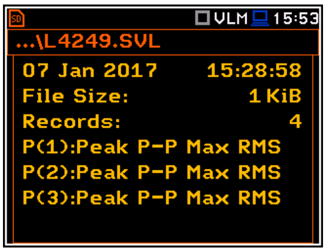
<ENT>

7.1.6 *Viewing information about files/directories – Info*

You can view information about a file or a directory. To do this, select the desired file/directory and press **<ENTER>**. Select the **Info** position in the command list and press **<ENTER>**. The information screen will be opened.



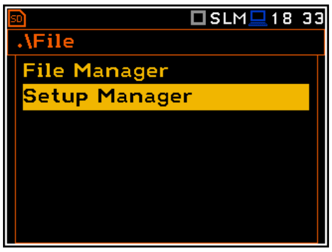
<ENT>



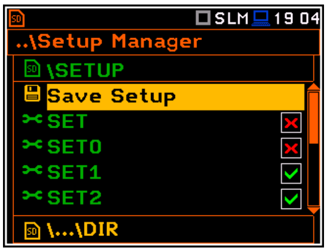
The file **Info** screen contains information about: date and time of file creation, file size, number of records with summary results and results saved with the logger step for three profiles.

7.2 MANAGING THE SETUP FILES – SETUP MANAGER

Setup Manager enables saving new setup files, deleting, renaming or loading them. You can also select the setup files which will be presented on the **Select Setup** screen appeared after turning the instrument on (see Chapter 3.3).



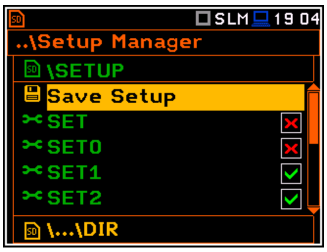
<ENT>



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

Saving setup files

It is possible to save only current instrument's settings. To save current settings in the setup file, press **<ENTER>** on the **Save Setup** position and edit the setup file name in the text editor screen. Up to 8 characters can be used to name a setup file.

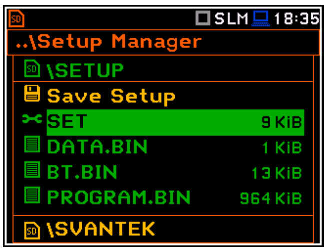


<ENT>

Loading setup files

Loading the setup file means that the settings saved in this file will be loaded to the instrument's flash memory. So, if you press the **<Start/Stop>** key the instrument will start the measurement with the newly loaded settings.

After loading the setup file, the instrument will be reconfigured.



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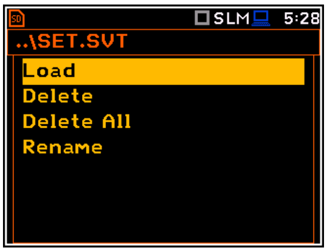
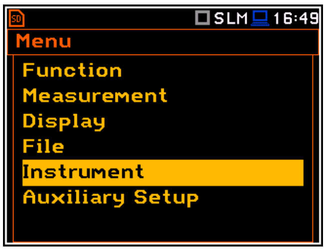


Deleting and renaming setup files

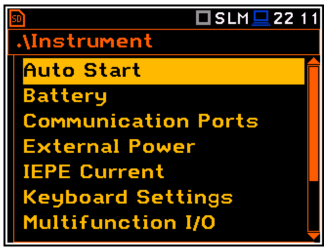
Deleting and renaming setup files is performed in the same way as files from the **File Manager** list.

8 CONFIGURING INSTRUMENT PARAMETERS – Instrument

The **Instrument** section is used for setting the various parameters which are primarily dedicated for controlling of the instrument hardware.



<ENT>

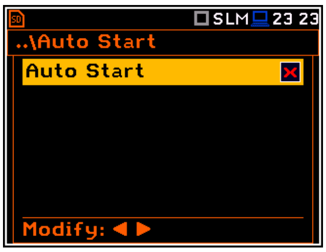


The **Instrument** list contains following positions:

Auto Start	allowing to start the measurement just after turning the instrument on;
Battery	allowing to get information about current power source;
Communication Ports	allowing to select the active port of the instrument;
External Power	allowing to select the minimum voltage of the external source, when the instrument should be switched off automatically;
IEPE Current	allowing to choose correct IEPE current supply for the used microphone and accelerometer;
Keyboard Settings	allowing to set the operating mode of the **<Shift>** and the **<Start/Stop>** keys;
Multifunction I/O	allowing to select the available functionality of the I/O port;
RTC	allowing to set the Real-Time Clock;
Wireless Transfer	allowing to select the network type and configure parameters of data transmission;
Unit Name	allowing to enter the name of the instrument visible by the SvanNET web-service;
Unit Label	allowing to display instrument properties and the standards which the instrument complies with.

8.1. MEASUREMENT AUTO START - AUTO START

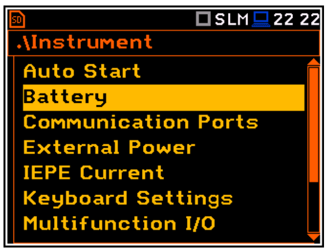
The **Auto Start** position enables the measurement automatic start just after the turning the instrument on without pressing the **<Start>** key.



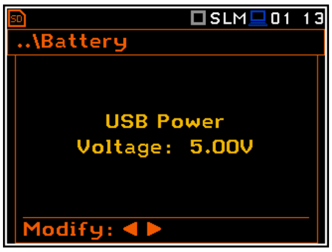
▶

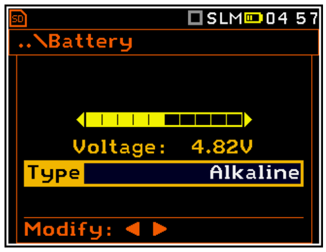
8.2. CHECKING POWER – BATTERY

The **Battery** position allows you to check the power source of the instrument: internal battery condition, source and voltage. The instrument can be powered from an external DC power supply, from the external battery pack, from internal four AA rechargeable or standard alkaline batteries or from an USB interface when its USB Device socket is connected via the SC 16 cable to a PC or other USB power.



When the instrument is powered from a set of internal batteries you should select the correct battery type (**Alkaline** or **Rechargeable**). It is essential for the right detection of the capacity of the battery pack.

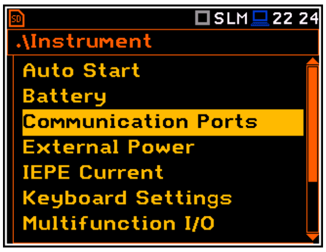




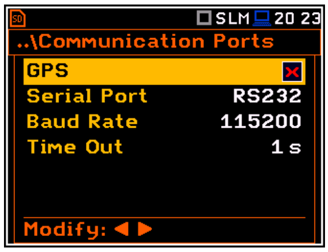
8.3. INTERFACE PARAMETERS SETTINGS - COMMUNICATION PORTS

The **Communication Ports** position enables selecting and programming the communication port(s) of the instrument (**GPS** and/or **Serial Port**).

As a serial port, you can select **RS232** or **Bluetooth**.

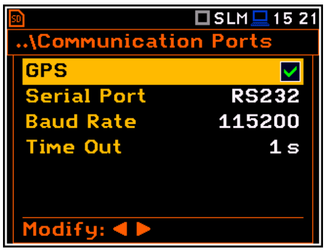


<ENT>

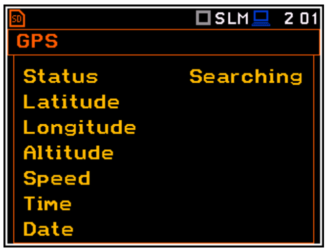


The GPS function works with the external GPS, which is a part of the monitoring station.

If **GPS** is switched on the **GPS** view becomes active (*path: <Menu> / Display / Display Modes*), which shows the GPS status, co-ordinates, velocity and direction.

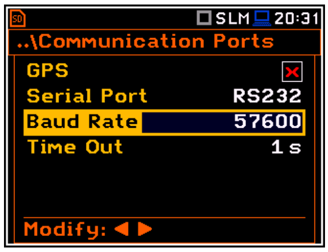


=>



***Note:** The **GPS** results are transmitted to the instrument from the GPS module of the SV 277 PRIME monitoring station.*

For the **RS232** serial port, two parameters should be defined: transmission speed (**Baud Rate: 1200**, **2400**, **4800**, **9600**, **19200**, **38000**, **57600** or **115200** bits/s) and the time limit during which the data transfer should be performed (**Time Out**).

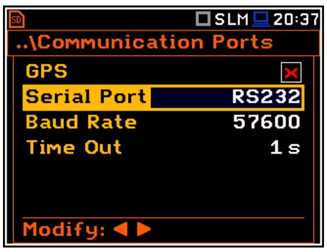


The transmission speed should be the same as in the connected device to ensure successful data transfer.

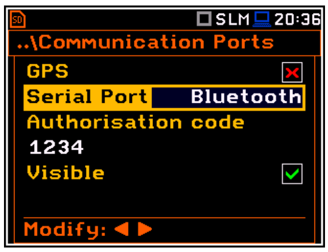
The default value of the **Time Out** parameter is equal to one second, but this may be too short for the printers, which are not fast enough. In such cases, the **Time Out** parameter should be increased.

To use the *Bluetooth®* interface, you should key in the **Authorisation code** to pair another device with the instrument.

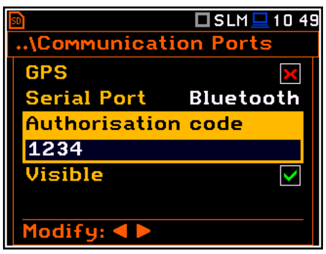
If **Visible** is enabled, the instrument will be visible during searching of Bluetooth units by other devices. The instrument can communicate also with inactive **Visible** parameter.



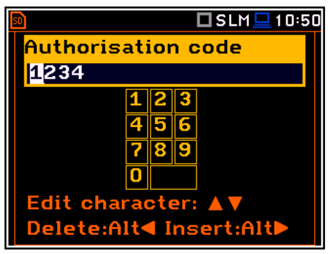
►



Authorisation code can be changed in the text editor screen with a virtual keyboard, which is opened with the ◄ / ► key.

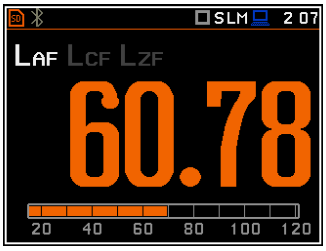


►



When **Bluetooth** is selected, the grey "Bluetooth" icon is displayed while there is no connection with another Bluetooth device.

When devices are paired, the "Bluetooth" icon changes its colour to green.



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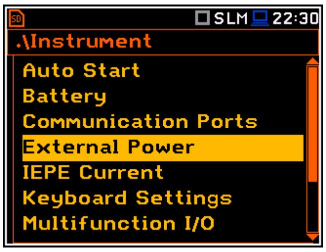
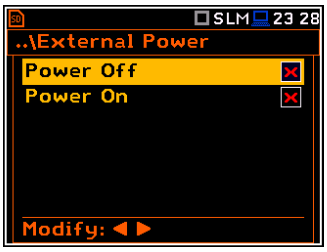
8.4. EXTERNAL POWER SETTINGS- EXTERNAL POWER

The **External Power** position allows to set the minimum voltage of the external DC power source, when the instrument should be switched off automatically (**Power Off**) or the voltage threshold to switch it on (**Power On**) when the voltage of the external DC power source exceeds this level.

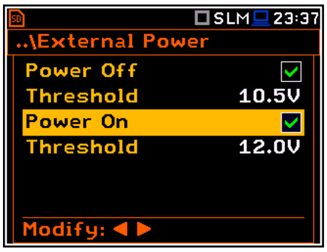


<ENT>



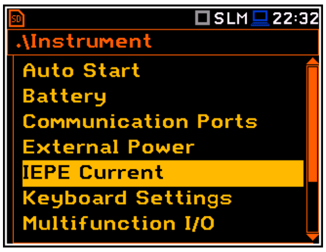
The **Threshold** parameters appear in the screen when **Power Off** and/or **Power On** parameters are enabled.

This screen appears automatically after switching on the instrument when the instrument is connected to the external DC power source.

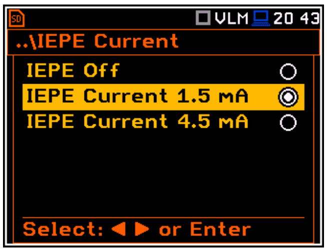


8.5. SELECTING IEPE CURRENT SUPPLY - IEPE CURRENT

The **IEPE Current** position allows to disable IEPE (**IEPE Off**) or to choose the correct IEPE supply current for the used microphone or accelerometer: **IEPE Current 1.5 mA** or **IEPE Current 4.5 mA**.

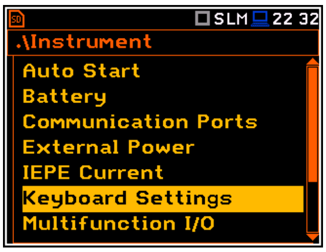


<ENT>



8.6. PROGRAMMING KEYBOARD – KEYBOARD SETTINGS

The **Keyboard Settings** position allows to programme the functionality of the **<Shift>**, **<Alt>** and **<Start/Stop>** keys. The default settings are **Direct** for both items shown on the display screen.



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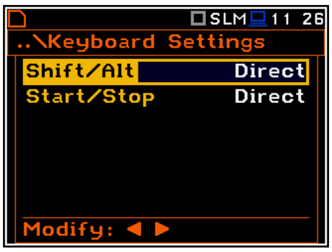


<Shift> / <Alt> key mode

In the **Shift/Alt** position, you can choose between **2nd Fun.** or **Direct**. When the **Direct** option is selected, the **<Shift>** and **<Alt>** keys operate as in a computer keyboard – to achieve the desired result, the second key should be pressed at the same time with **<Shift>/<Alt>**. When the **2nd Fun.** option is selected the **<Shift>/<Alt>** key operates in sequence with the other one - as in smartphones. Due to this you can operate the instrument with one hand.

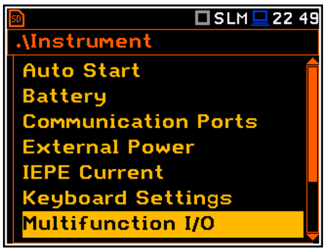
<Start/Stop> key mode

In the **Start/Stop** position, you can choose between **Direct** and **With Shift**. When the **Direct** option is selected, the instrument reacts on each of the **<Start/Stop>** keystroke, starting or stopping the measurement.

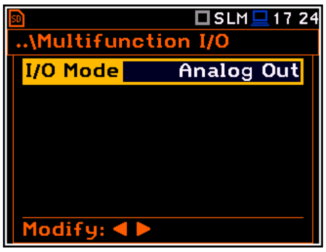
When the **With Shift** option is selected the **<Start/Stop>** key will operate with the **<Shift>** key pressed simultaneously or in sequence. The measurements are started or stopped after pressing both keys.

8.7. Setting parameters of the I/O port - Multifunction I/O

The **Multifunction I/O** position allows to select the available functionality of the **I/O** port (3.5 mm jack socket).



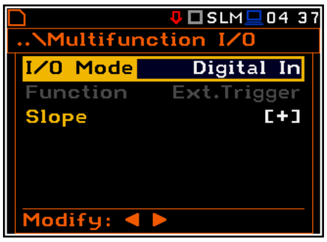
<ENT>



The **I/O** jack socket can be used as (**I/O Mode**):

- output of the analogue signal (**Analog Out**) transmitted from the input of the instrument to its output without any digital processing (i.e. frequency filtering, etc.),
- input of the digital signal (**Digital In**) used as an external trigger to start the measurements. The instrument is acting in this case as so called “slave instrument”,
- output of the digital signal (**Digital Out**) used for triggering other “slave instrument(s)” (the instrument is acting in this case as a “master instrument”), or as a source of any alarm signal in case of certain circumstances occurred during measurements (i.e. the level of the input signal is higher than the user selected trigger alarm threshold).

More detailed description of the **I/O** port is given in Appendix C.



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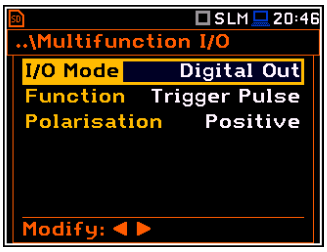
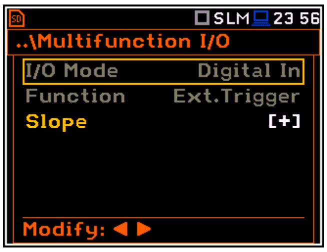
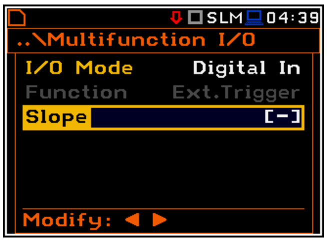


***Note:** If the **RPM** function is enabled (path: <Menu> / Measurement / RPM Measurement) the **Multifunction I/O** is set automatically to **Digital In** mode with the **Ext.Trigger** function.*

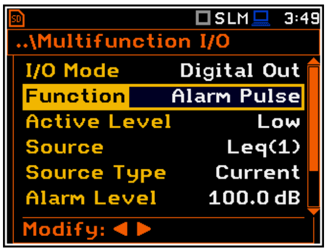


Digital In mode (External trigger function)

In the **Digital In** mode, the signal appeared on the **I/O** socket will be treated as the external trigger if the **External** trigger was chosen (*path: <Menu> / Measurement / Measurement Trigger / Trigger: External* or *<Menu> / Measurement / Logging / Trigger: External*). In the **Digital In** mode the **Function** parameter is set to **Ext.Trigger**. It is possible to select the trigger voltage slope: **[+]** (uprising as default) or **[–]** (falling).

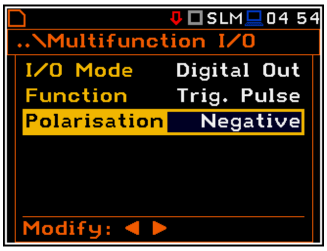


Function of the Digital Out mode



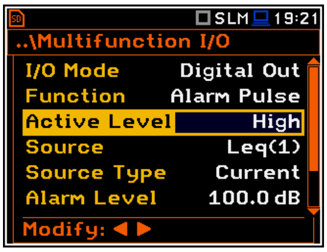
The **Function** position allows to select the function of the digital output of the **I/O** instrument's socket. The socket can be used as a source of the trigger pulse (**Trigger Pulse**) which starts the measurement in another "slave instrument" linked to the "master instrument" or as an alarm signal, which appears there after fulfilment of certain conditions (**Alarm Pulse**).

Polarisation of the digital output trigger pulse



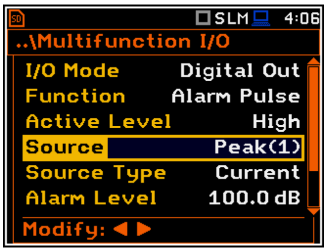
The **Polarisation** parameter defines the output trigger pulse polarisation: **Negative** or **Positive**.

Active level of the alarm pulse



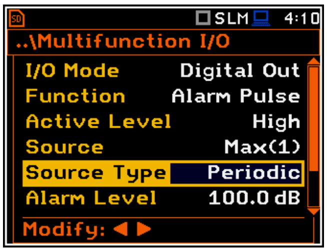
The **Active Level** parameter defines which level of the signal should be treated as a valid one: **Low** or **High** ("negative" or "positive" logic).

Alarm trigger result



The **Source** parameter defines the result, the level of which should be checked for the alarm triggering. If the result level is greater than the threshold level (**Alarm Level**), the instrument will generate an alarm signal on the **I/O** socket. The results from the first profile: **Leq(1)**, **Peak(1)**, **Max(1)** or **Spl(1)** can be selected as an alarm trigger source.

Type of Alarm source

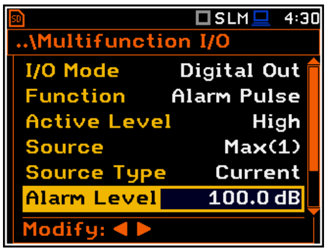


The **Source Type** parameter defines the type of an alarm source: **Current** or **Periodic**.

Current means that the alarm pulse will be generated all the time when the Source result averaged with 1-second step is over the **Alarm Level** value.

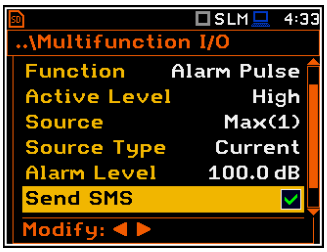
Periodic means that the alarm pulse will be generated all the time when the Source result averaged with Integration Period step is over the **Alarm Level** value.

Alarm trigger threshold level



The **Alarm Level** parameter defines the threshold level for triggering an alarm pulse generation. If the **Source** value is greater than the **Alarm Level**, the instrument will generate the alarm signal with the selected logic. The available levels are within the range [30.0 dB, 140 dB] in the Sound mode and [60.0 dB, 180 dB] in the Vibration mode.

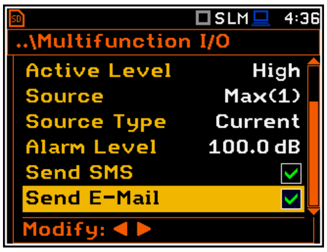
SMS alarm message



When the alarm is generated during the measurement, the SMS message may be sent (**Send SMS**) to the phone number, defined in the **SMS Option** screen (*path: <Menu> / Instrument / Wireless Transfer / SMS Options).*

E-mail alarm message

When the alarm is generated during the measurement the e-mail message may be sent (**Send E-Mail**) to the address, defined in the **E-mail Settings** screen (*path: <Menu> / Instrument / Wireless Transfer / E-mail Settings).*



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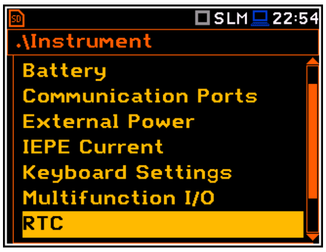
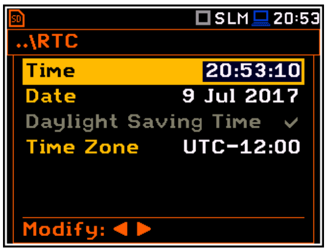
***Note:** SMS and e-mails can be sent in the case the instrument is working with the modem (for example, as a part of SV 277 PRO or SV 277 PRIM monitoring stations).*

8.8. PROGRAMMING THE INSTRUMENT’S INTERNAL REAL TIME CLOCK – RTC

The **RTC** position allows to programme the internal Real Time Clock. This clock is displayed in the upper right corner of the display.



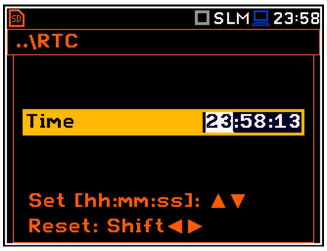
<ENT>



The required time (hour, minute and second) is set in a special screen, which is opened with the ◄ / ► key when the **Time** position is selected.

To set hour, minute or second, select the appropriate field with the ◄ / ► key, select value with the ▲ / ▼ key and press **<ENTER>**.

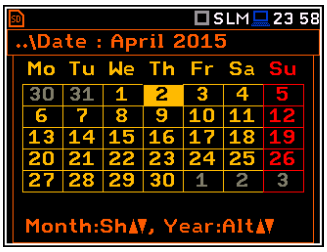
If you exit this screen with **<ESC>** the new time will be also saved.



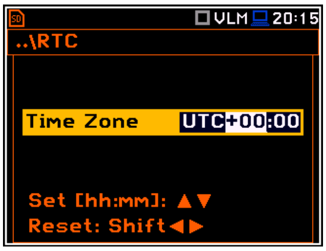
The required date can be selected in a special screen, which is opened with the ◄ / ► key when the **Date** position is selected.

To set the date, select its position in the calendar with the ◄ / ► or ▲ / ▼ key and press **<ENTER>** to confirm the selection.

If you exit this screen with **<ESC>** the new time will be also saved.



Time Zone can be selected in a special screen, which is opened by means of the ◄ / ► key.

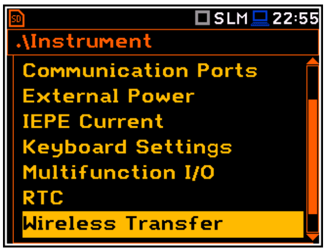


8.9. REMOTE COMMUNICATION SETTINGS - WIRELESS TRANSFER

SVAN 977A instrument is not equipped with the modem and itself cannot assure data transfer via mobile network. However, it can control data transfer via the modem that supports GSM connection with the help of the **Wireless Transfer** functionality. The connection with the external modem is carried out via the USB port.

Such solution is used in the SV 277 PRO and SV 277 PRIM monitoring stations.

The **Wireless Transfer** position allows to select the network type and set the parameters of data transmission.

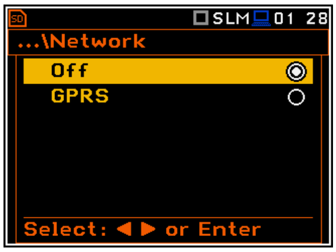


<ENT>

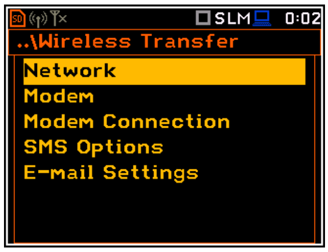
8.9.1. *Selecting network type – Network*

In the **Network** screen you can disable (**Off**) data transfer or enable it selecting **GPRS**.

<ENT>

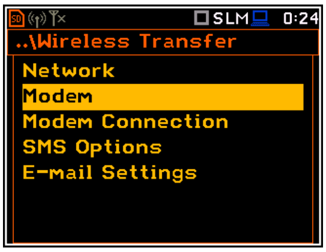


If the **GPRS** network is selected the **Wireless Transfer** screen will have additional positions enabling configuring GPRS connection: **Modem**, **Modem Connection**, **SMS Options** and **E-mail Settings**.

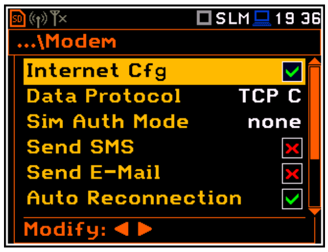


8.9.2. *Configuring modem basic settings – Modem*

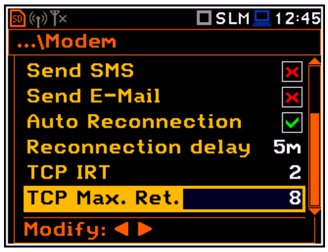
The **Modem** position allows to configure modem and data transmission settings.



<ENT>

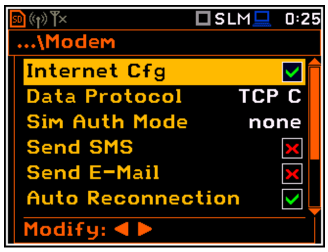


Note: *For connection with the **SvanNET** server, the positions in the **Modem** list should be set on default values as is shown on the screen-shots above and right-hand.*

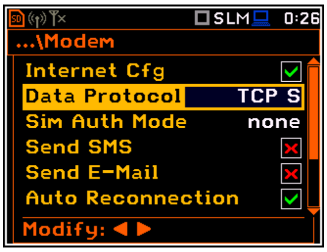


The **Modem** screen contains following parameters:

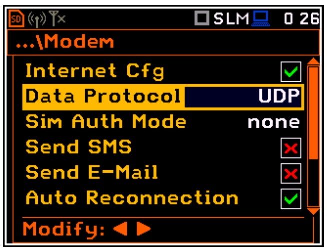
- **Internet Cfg** – if it is switched on, the instrument will automatically configure the modem right after turning on.



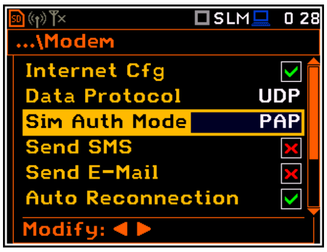
- **Data Protocol** – defines connection type for data exchange. Available types are **TCP S** (server mode), **TCP C** (client mode) and **UDP**.



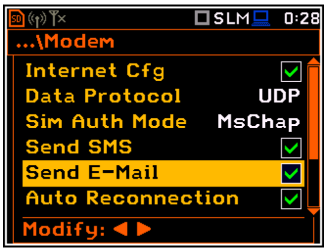
►



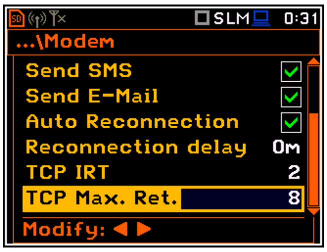
- **Sim Auth Mode** – defines the method of user verification by a SIM card type. Depending on the SIM card, several options are possible, some of them are recognized by the modem:
  - **none** – no verification required.
  - **PAP**
  - **CHAP**
  - **MsChap** – denotes MsChap in version 1.



- **Send SMS** – selecting this option will enable SMS alarm notifications.
- **Send E-Mail** – selecting this option will enable e-mail alarm notifications.
- **Auto Reconnection** – selecting this option will make the device attempt to reconnect the modem in case of errors or sudden disconnection.

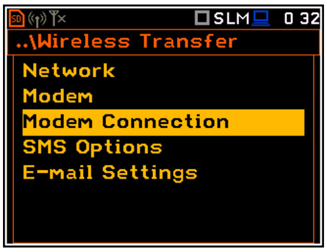


- **Reconnection Delay** – defines time between each reconnection attempts.
- **TCP IRT** - defines TCP Initial Retransmission Timeout. In some cases, extending this timeout may be helpful in case of slow connections, but the default setting is recommended.
- **TCP Max. Ret.** - defines maximum reconnection attempts performed within a simple connection cycle. In some cases, setting higher value may be helpful in case of slow connections, but the default setting is recommended.

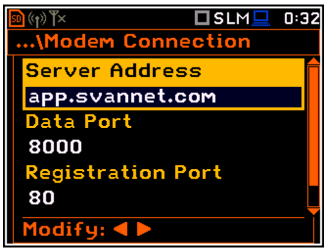


8.9.3. Configuring connections - Modem Connection

The **Modem Connection** position allows to configure several parameters to establish internet connection.



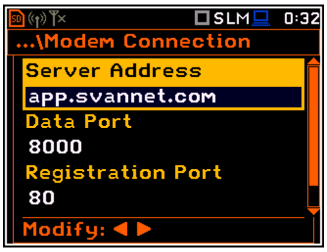
<ENT>

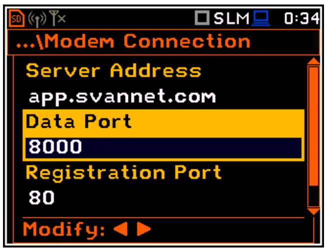


***Note:** For connection with the **SvanNET** server the parameters in the **Modem Connection** list should be set on default values as is shown on the screenshots above and below.*

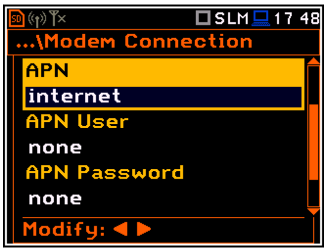
The **Modem Connection** screen contains the following positions:

- **Server Address** – allows to enter up to 32 characters of either IP or domain address, where the registration data will be sent during the registration process (**Data Protocol: TCP S** or **UDP**) or to which the modem will connect to (**Data Protocol: TCP C)**. By default, the server address is **app.svannet.com** and all other settings, presented in this chapter, are default settings, which enabled the connection with the SvanNET server.

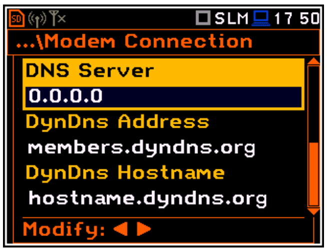




- **Data Port** – allows to enter up to 5 characters for the port number. This number denotes a port on which a communication socket will be configured for data exchange between the remote host and the station.
- **Registration Port** – allows to enter up to 5 characters for the port number. This number denotes a port on which a communication socket will be configured to transmit registration package (Register Mode: On) or exchange Http data (Register Mode: AS or SMT. AS).



- **APN** – allows to enter up to 20 characters of APN name of the SIM card used with the modem.
- **APN User** – allows to enter up to 20 characters of user's name used for verification by the SIM card used with the modem.
- **APN Password** – allows to enter up to 20 characters of password used for verification by the SIM card used with the modem.



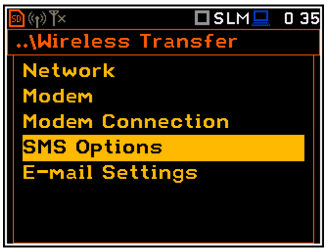
- **DNS Server** – allows to enter up to 15 characters of IP address of DNS server used for establishing connection with the internet. In most cases, leaving the default value of "0.0.0.0" will be sufficient, but some SIM cards may require a specific address to be entered.

- **DynDns Address**, **DynDns Hostname**, **DynDns Login** and **DynDns Password** - allow to define the server and login information when using DynDNS service in case of dynamic IP address.

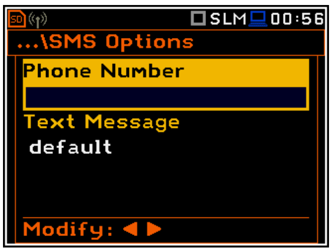
Edition of each position is performed in the special screen with the text editor function, which is opened with the ◄ / ► key.

In the text editor screens, you can switch the keyboard from uppercase letters to lowercase letters and special characters with the ▲ / ▼ key pressed together with **<Shift>**.

8.9.4. Configuring SMS service - SMS Options



The **SMS Options** position allows to configure SMS service used for alarm notification.



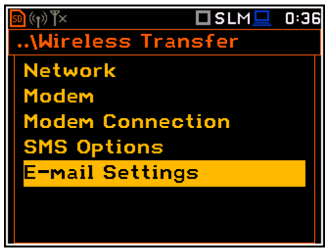
The **SMS Options** screen contains the following positions:

- **Phone Number** – allows to enter up to 20 characters of the phone number where the text messages will be sent.
- **Text Message** – allows to enter up to 20 characters of additional text, which will be appended into a standard alarm message template.

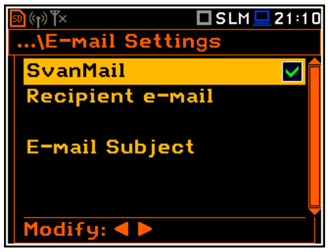
Edition of each position is performing in the special screen with the text editor function, which is opened with the ◄ / ► key.

8.9.5. *Configuring e-mail service - E-mail Settings*

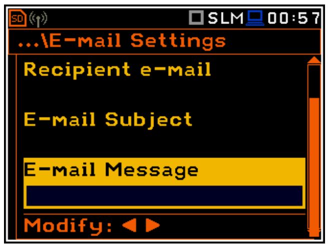
The **E-mail Settings** position allows to configure the e-mail service used for alarm notification.



If the **SvanMail** position is enabled, you should define only positions: **Recipient e-mail**, **E-mail Subject** and **E-mail Message**. The **SvanMail** option allows instruments, compatible with SvanNET, send e-mails without additional parameters, simplifying the process of configuring alarm notifications.

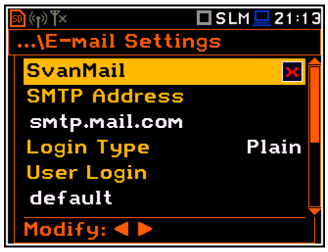


- **Recipient e-mail** – allows to enter up to 48 characters of e-mail address to which the e-mail message will be sent.
- **E-mail Subject** – allows to enter up to 20 characters of the message's subject.
- **E-mail Message** – allows to enter up to 20 characters of additional text which will be appended to standard e-mail message template used for alarm notification.

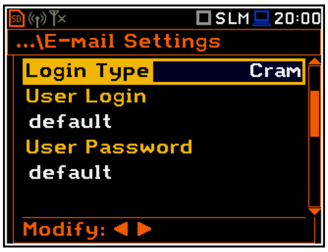


If **SvanMail** position is disabled, you should define some additional positions:

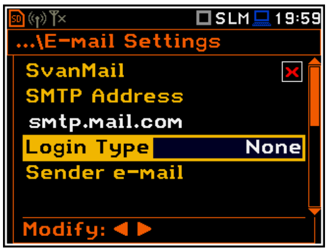
- **SMTP Address** – allows to enter up to 32 characters of SMTP server address which will be used to send e-mail messages.
- **Login Type** – **None**, **Login**, **Plain** or **Cram**. These options define authentication method, which depends on the SMTP server used for sending e-mails. In most cases, **Plain** value is used.



- **User Login** – allows to enter up to 20 characters of user login text for establishing verified connection with SMTP server.
- **User Password** – allows to enter up to 20 characters of user password text for establishing verified connection with SMPT server.

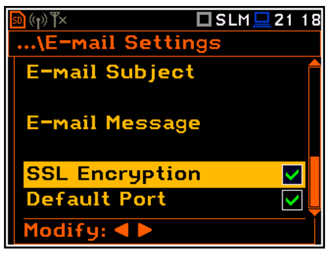


If **Login Type** is **None**, **User Login** and **User Password** positions do not appear in the **E-mail Settings** list. **None** value should be used when SMTP server requires no authentication.

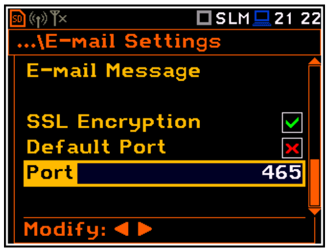


- **Sender e-mail** – allows to enter up to 48 characters of e-mail address from which e-mail message will be sent.

- **SSL Encryption** – when switched on means that the device will attempt to configure the modem to connect to the mail server used the encryption protocol SSL.
- **Default Port** - when switched on means that the device will try to communicate with the mail server on the default port (25 for normal calls, 465 with SSL).



Disabling of **Default Port** will initiate the **Port** position, where the user will be able to define its own port.

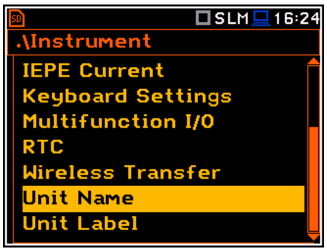


Editing of some positions is performed in the special screen with the text editor function, which is opened after pressing the ◄ / ► key.

8.10. INTRODUCING THE INSTRUMENT NAME - UNIT NAME

The **Unit Name** position allows to edit the instrument's name in the text editor screen.

The instrument name is used in the SvanNET web-service and SvanPC++ software for the instrument simple identification.



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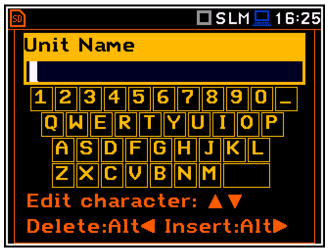
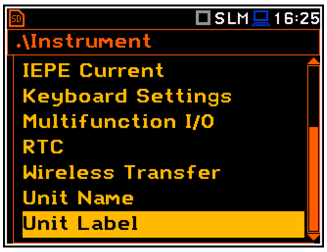


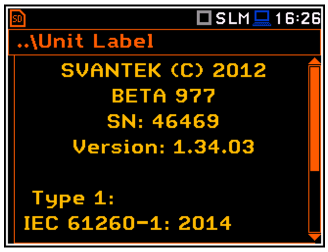
8.11. CHECKING THE INSTRUMENT PROPERTIES - UNIT LABEL

The **Unit Label** position allows to check information about the instrument type, its serial number, the current software version installed and the relevant standards, which the instrument fulfils.

The displayed text is scrolled on the display after pressing the ▲ / ▼ key.



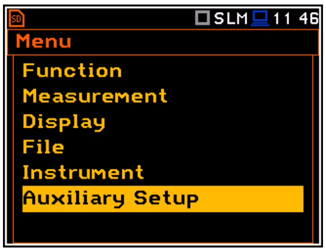
<ENT>



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

9 AUXILIARY SETTINGS – Auxiliary Setup

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



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

Language allowing to select the language of the user interface.

Factory Settings allowing to return to the default, factory settings.

Reference Levels allowing to select reference levels for Vibration measurements.

Vibration Units allowing to select units for Vibration results. This position appears only in Vibration modes.

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

9.1. SELECTING THE USER INTERFACE LANGUAGE – LANGUAGE

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

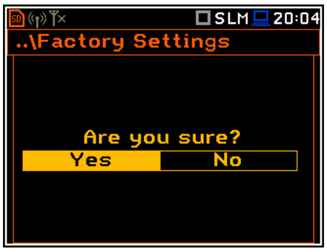
If after turning the instrument on an unknown language interface appears on the display, you can reset the instrument with four **<Shift/ Enter/Alt/Start>** keys pressed together. After this, the instrument will come back to the default setup with the English interface.

<ENT>

9.2. RESTORING THE FACTORY SETTINGS – FACTORY SETTINGS

The **Factory Settings** position allows to restore the default settings of the instrument.

Being on the **Factory Settings** position press **<ENTER>**, select **Yes** in the opened **Factory Settings** screen and press **<ENTER>** to perform the operation. After the restoration process the instrument will inform that "**Settings restored**".

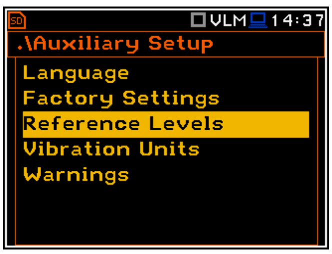


<ENT>

The factory settings can be installed also with four **<Shift/Enter/Alt/Start>** keys pressed together.

9.3. SETTING THE REFERENCE LEVELS - REFERENCE LEVELS

The **Reference Levels** position allows to set reference levels for the measured acceleration (**Acc**), velocity (**Vel**) and displacement (**Dil**) results. For sound measurements it only informs about the default reference sound level. The selected values will be considered during calculations of measurement results expressed in dB (Logarithmic scale).



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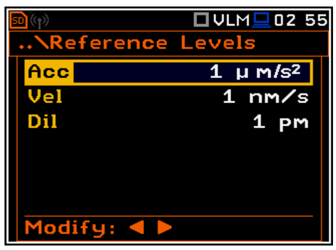


Reference levels for vibration measurements

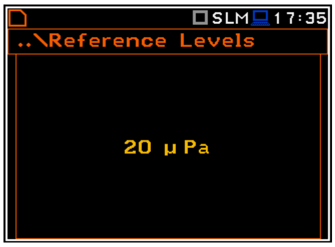
In the **Acc** position you can set the reference level of the acceleration signal in the range: 1 μms^{-2} - 100 μms^{-2}.

In the **Vel** position you can set the reference level of the velocity signal in the range: 1 nms^{-1} - 100 nms^{-1}.

In the **Dil** position you can set the reference level of the displacement signal in the range: 1 pm - 100 pm.

Reference level for sound measurements

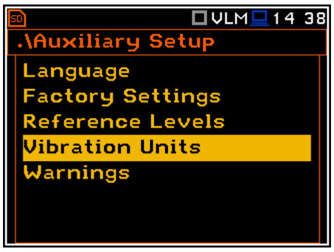
For sound measurements, the **Reference Levels** sub-lists is used to inform only the user that the reference level of the acoustic signal is equal to **20 μPa**.



9.4. SELECTING UNITS FOR VIBRATION RESULTS - VIBRATION UNITS

The **Vibration Units** position allows to select units for Vibration measurements (this position is available only in Vibration modes).

It is possible to select the **Non-Metric** units (e.g. g, ips, mil etc.) or **Metric** units (e.g. m/s^2, m/s, m etc.).



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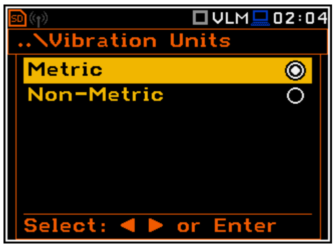
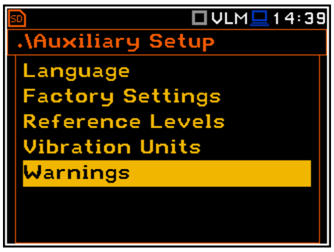


9.5. WARNINGS SETUP – WARNINGS

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

By default, all warnings are enabled.



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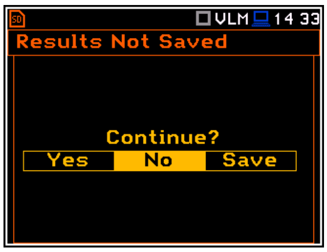
Saving the measurement results in a file

If the **Results Not Saved** warning is enabled, the special confirmation will be displayed after pressing the **<Start/Stop>** key in case results of the previous measurement were not saved.



You should select one of three answers to the question **Continue?**: **Yes**, **No** or **Save**. If **Yes** is chosen, the instrument returns to the active measurement view and starts the new measurement process. If **No** is chosen, the instrument returns to the active measurement view without starting the new measurement process. If **Save** option is chosen, then the measurement results are saved and after saving the instrument returns to the active measurement view and starts the new measurement process.

Checking free space of the memory

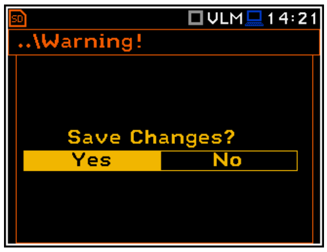
If the **Ext. Disk Free Space** warning is enabled the instrument will verify free space on the SD-card and will generate the warning when the space is lower than **Min Free Space**.

The selected limit should be within the range [**1 MB**, **1024 MB**].

Confirmation of parameters changes

If the **Save Changes** warning is enabled, the instrument asks to confirm whether you want to save changes or not in cases you changed some parameters in the list of parameters but exiting the screen with the **<ESC>** key.

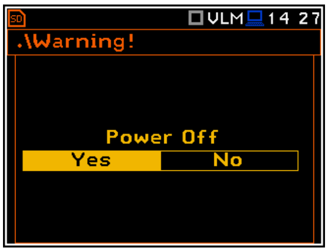
=>



Confirmation of the instrument switching off

If the **Power Off** warning is enabled, the instrument will ask for confirmation before switching off.

=>



Low Battery warning

If the **Low Battery** warning is enabled, the instrument will display the message in the case the internal battery capacity drops below 10%. Warning “Low Battery” will be displayed shortly every 20 seconds.

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

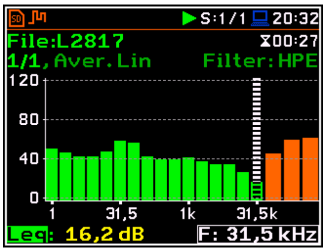
The instrument operates as the 1/1-octave or 1/3-octave analyser in a very similar way to the level meter. Moreover, 1/1-octave or 1/3-octave analysis is performed in parallel with the level meter measurements. All 1/1-octave (with 10/15 centre frequencies from 16 kHz down to 31.5 Hz/1.0 Hz; in base two system for Sound/Vibration measurements) and 1/3-octave (with 31/45 centre frequencies from 20 kHz down to 20 Hz/0,8 Hz; in base two system for Sound/Vibration measurements) digital pass-band filters are working in real-time with the weighting filters (**Z**, **A**, **B** or **C** - for sound measurements; **HP** or **HPE**- for vibration measurements) and the RMS/LEQ detector (**Linear**, **Fast** or **Slow** - for sound measurements; **Linear** - for vibration measurements). This enables a spectrum pre-weighting with one of the selected broadband frequency curves if required for the application such as the provision of hearing protectors during the control of high workplace noise.

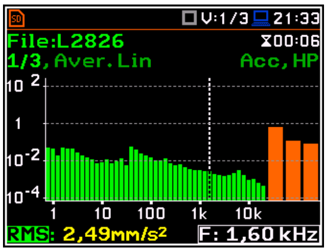
***Note:** TOTAL RMS (LEQ) results are measured with their own weighting filters (**A**, **C** and **Z** - for sound measurements; **HP**, **HP3** and **HP10** – for vibration measurements) regardless of settings made in profiles for the Level Meter measurements**.** Spectra are always linearly averaged. Thus, the **Total** values for **1/1 Octave** or **1/3 Octave** analysis can be different from those obtained for profiles (if **RMS Integration** was set as **Exponential**).*

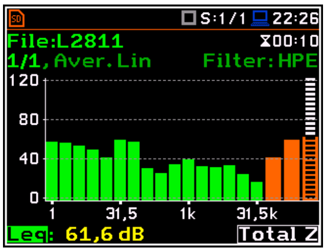
For each octave or one-third octave band, the RMS, Min or Max result is calculated and presented as a bar on the spectrum plot. Spectra can be examined on a display in the **Spectrum** view.

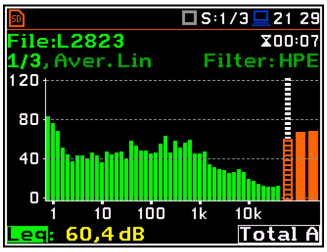
The read-out of spectrum values can be done using a vertical cursor.

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



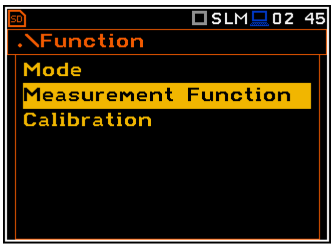




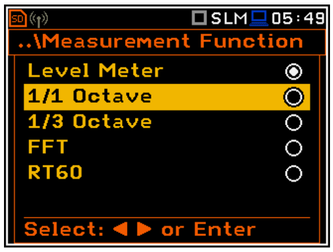


10.1 SELECTING THE 1/1 OCTAVE OR 1/3 OCTAVE FUNCTION

To select the 1/1-octave or 1/3-octave analysis function, open the **Measurement Function** screen, select the **1/1 Octave** or **1/3 Octave** position and press **<ENTER>**.



<ENT>



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

***Note:** It is not possible to change the current function during a running measurement. In this case, the instrument displays for about 2 seconds the message: "Measurement in Progress". To change the current function, the measurement must be stopped!*

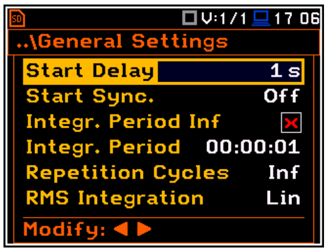
10.2 CONFIGURING 1/1 OR 1/3-OCTAVE ANALYSER

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

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

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

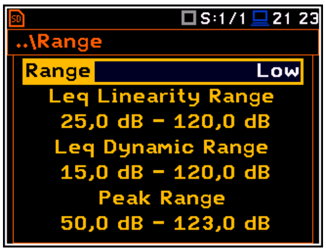
The **Integration Period** and **Repetition Cycles** parameters are defined in the **General Settings** list.

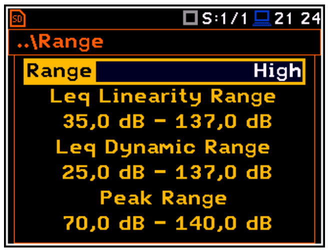


10.2.2 Selecting the measurement range for 1/1 and 1/3-octave analysis - Range

The input range for the **1/1 Octave** or **1/3 Octave** functions can be selected in the **Range** screen: **Low** or **High**.

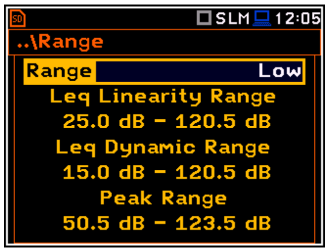
Depending on the settings of the **Scale** parameter (*path: <Menu> / Display / Display Scale*) the range for vibration signal can be presented in absolute or logarithmic units (dB).





The ranges in sound modes depend on the settings in the **Compensation Filer** screen (*path: <Menu> / Measurement / Compensation Filter*).

Note: *The calibration factor is always added to the upper range level. For example, if the calibration factor is equal to 0.5 dB, the upper range will be changed automatically (the upper limit will be increased by 0.5).*

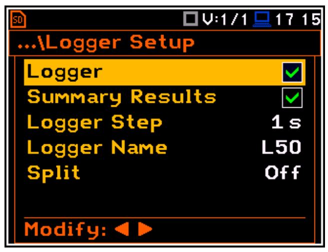


10.2.3 Logging of 1/1-octave and 1/3-octave spectra – Logging

Spectra can be logged in a logger file with two steps: **Integration Period** step and/or **Logger Step**.

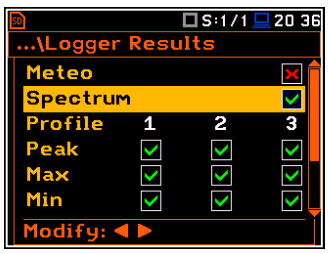
For logging 1/1-octave and 1/3-octave spectra, the **Logger** position must be enabled in the **Logger Setup** screen (*path: <Menu> / Measurement / Logging / Logger Setup*).

If you wish to save spectra together with Summary results, you must enable the **Summary Results** position. 1/1-octave and 1/3-octave spectra will be then logged with the **Integration Period** step.



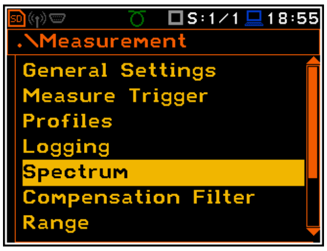
The instrument allows additional logging of 1/1-octave and 1/3-octave spectra in a logger file with the **Logger Step**.

For this, you should enable logging of spectra switching on the **Spectrum** position in the **Logger Results** screen (*path: <Menu> / Measurement / Logging / Logger Results*).

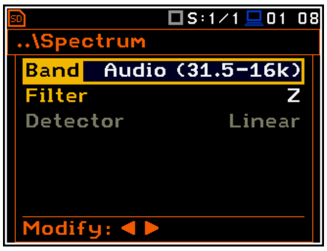


10.2.4 Setting parameters of 1/1-octave and 1/3-octave analysis - Spectrum

For active **1/1 Octave** and **1/3 Octave** functions a context position (**Spectrum**) appears in the **Measurement** list (*path: <Menu> / Measurement / Spectrum)*. In the **Spectrum** screen, you can select the band and the pre-weighting broadband frequency filter (only for sound measurements).



<ENT>

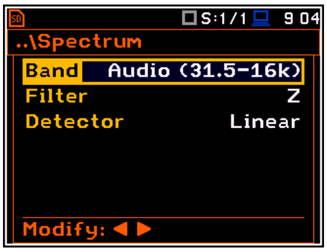


Selection of the band

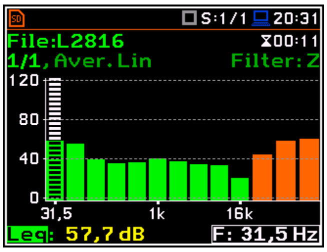
The **Band** parameter defines the band of 1/1-octave or 1/3-octave analysis.

Available bands of the sound analysis are as follows:

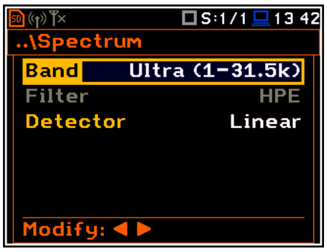
- **1/1 Octave**:
  - **Audio (31.5-16k)** - 10 filters with centre frequencies from 31.5 Hz to 16 kHz



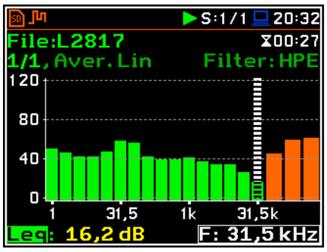
=>



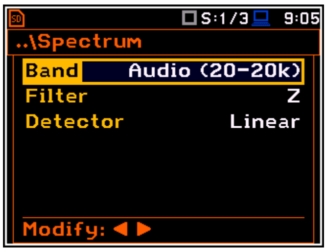
  - **Ultra (1-31.5k)** - 16 filters with centre frequencies from 1 Hz to 31.5 kHz



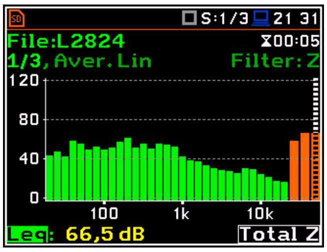
=>



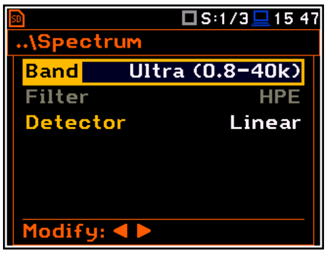
- **1/3 Octave**:
  - **Audio (20-20k)** - 31 filters with centre frequencies from 20 Hz to 20 kHz



=>



  - **Ultra (0.8-40k)** - 48 filters with centre frequencies from 0.8 Hz to 40 kHz



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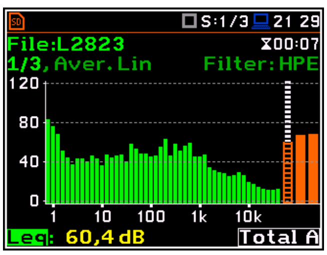
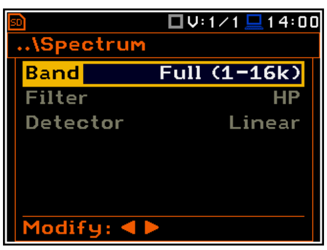
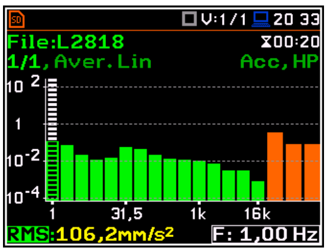


Available bands of the vibration analysis are as follows:

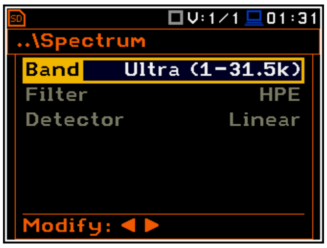
- **1/1 Octave**:
  - **Full (1-16k)** - 15 filters with centre frequencies from 1 Hz to 16 kHz



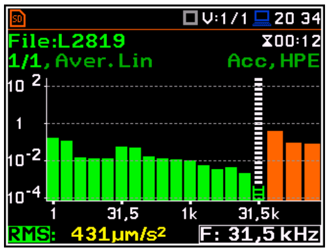
=>



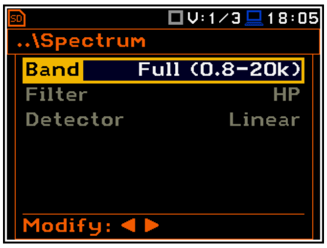
- **Ultra (1-31.5k)** - 16 filters with centre frequencies from 1 Hz to 31.5 kHz



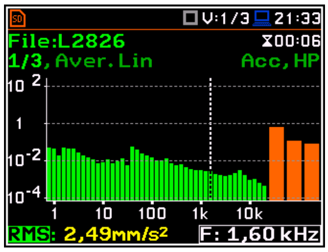
=>



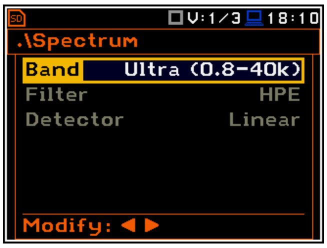
- **1/3 Octave**:
  - **Full (0.8-20k)** - 45 filters with centre frequencies from 0.8 Hz to 20 kHz



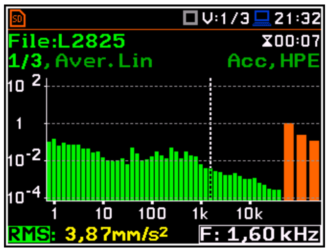
=>



  - **Ultra (0.8-40k)** - 48 filters with centre frequencies from 0.8 Hz to 20 kHz



=>

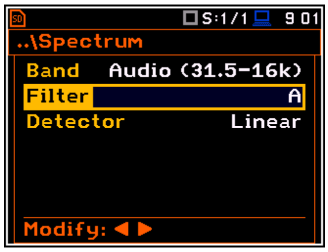


Weighting filter selection

Following pre-weighting filters are available for the **1/1 Octave** and **1/3 Octave** analysis.

For sound analysis with the **Audio** band:

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



For vibration analysis with the **Full** band:

- **HP** - class 1 according to IEC 61672-1:2013.

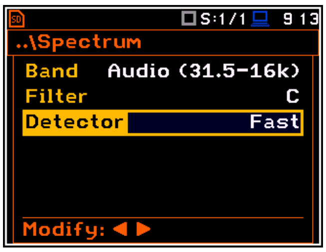
For sound and vibration analysis with the **Ultra** band:

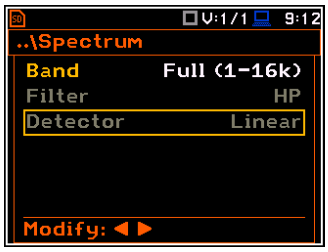
- **HPE** – ultra band filter.

The filter characteristics are given in Appendix C.

RMS detector selection

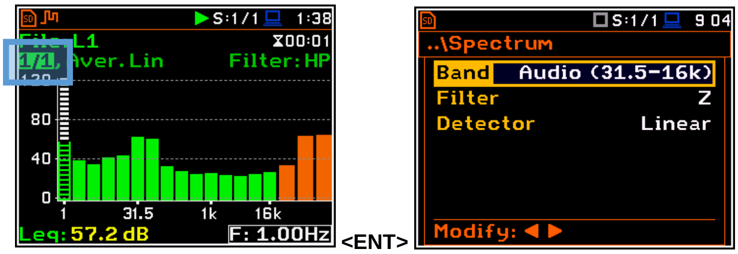
The **Detector** parameter defines the LEQ/RMS detector for the 1/1-octave or 1/3-octave analysis. For Sound measurements, it is possible to select the **Linear**, **Fast** or **Slow** detector. For Vibration measurements, only **Linear** detector is available.





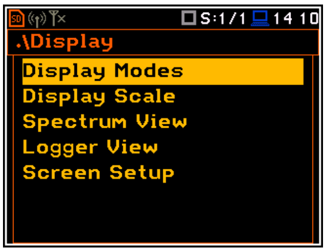
***Note:** The **RMS Detector** type defined in the General Settings screen (path: <Menu> / Measurement / General Settings) is used for the level meter results in three profiles.*

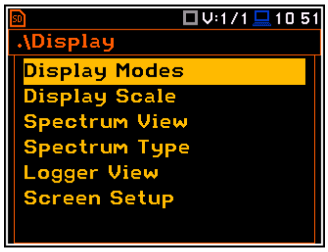
You can easily get into the **Spectrum** screen from the spectrum view. It is necessary to enter the function field (for example **1/1**) with the ▲ / ▼ key and press **<ENTER>**.



10.3 Configuring 1/1 and 1/3 octave spectra views

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





The following positions are used for setting views of 1/1-octave or 1/3-octave results:

Display Modes allowing to switch on the **Spectrum** view;

Display Scale allowing to adjust scales of a spectrum plot and toggle the grid;

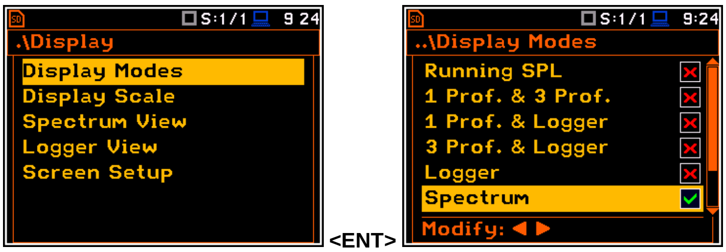
Spectrum View allowing to select spectra to be viewed: instantaneous, averaged, maximum or minimum;

Spectrum Type allowing to change the spectrum type presented on the display: acceleration, velocity or displacement. This position appears in the vibration modes.

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

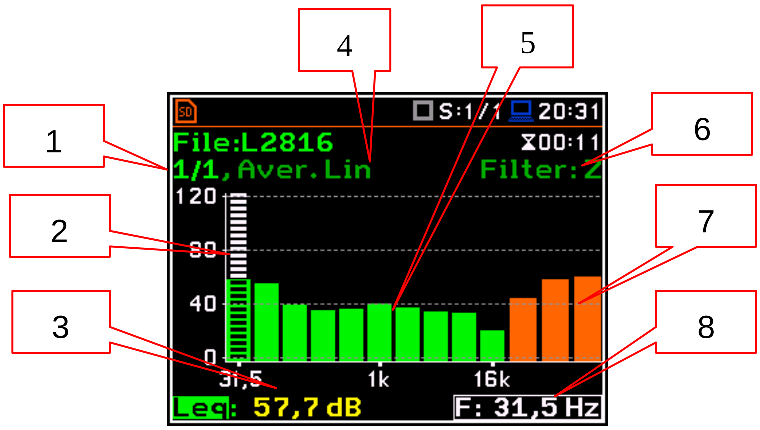
Spectrum plot view

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

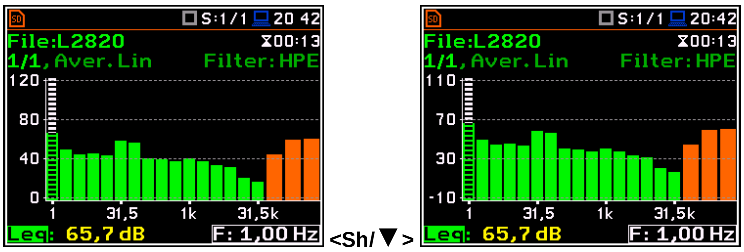


Spectrum view fields

1. Analyser function
2. Cursor position
3. Value of the cursor position
4. Averaging used
5. Spectrum plot
6. Frequency weighting filter
7. Total values
8. Central frequency for the cursor position

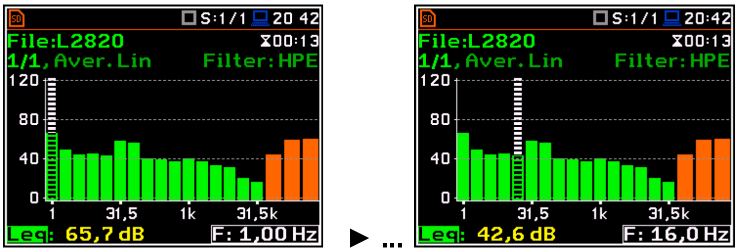


You can shift the Y-axis in the spectrum view with the **<Shift>** and ▲ / ▼ keys pressed together.



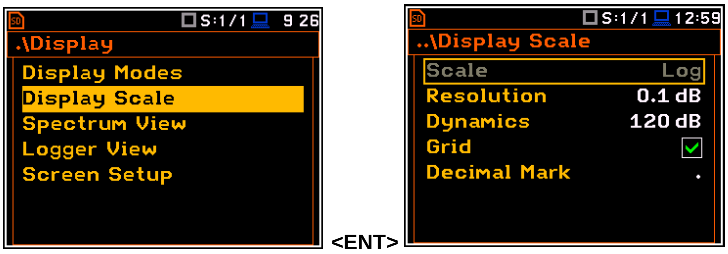
You can change the cursor position with the ◄ / ► key. You can jump to the first or last spectrum line with the **<Shift>** and ◄ / ► keys pressed together.

The band central frequency and the appropriate value are presented in the line below the plot.



10.3.2 Adjusting scales of the spectrum plot – Display Scale

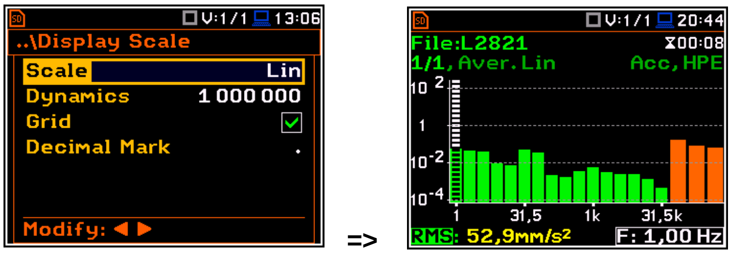
The **Display Scale** screen allows to define the result units (absolute or logarithmic), adjust scale of plots and toggle the grid.



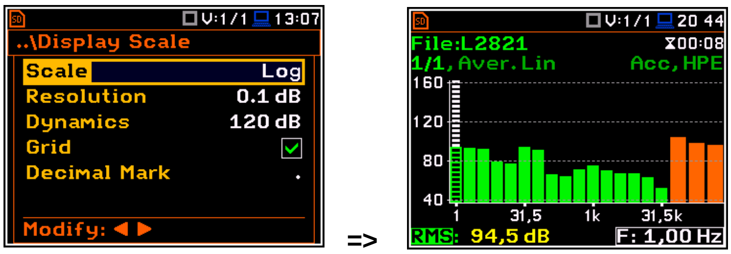
Scale of results presentation

The **Scale** parameter defines results units: linear (**Lin** – m/s^2, m/s etc.) or logarithmic (**Log** - dB).

For sound measurements, the **Scale** position is not active. All results are always presented in dB.



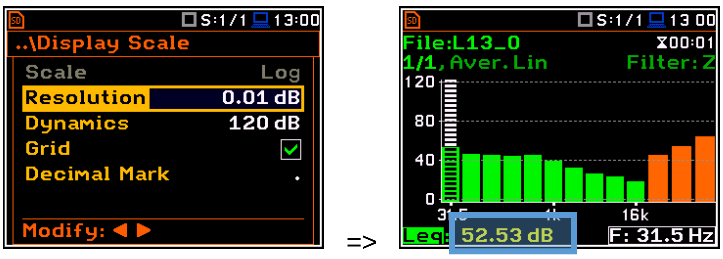
The **Log** option means that the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** screen (*path: <Menu> / Auxiliary Setup / Reference Levels*).



Note: *In Vibration modes, results can be presented in the* ***Logarithmic*** *(dB) or* ***Linear*** *(for example, m/s^2) units. It depends on the* ***Scale*** *parameter value. For example, 10 m/s^2 can be presented also as 140 dB.*

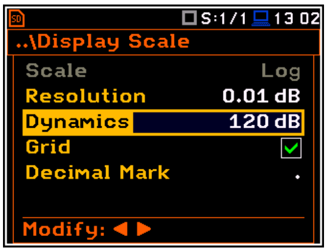
Resolution

The **Resolution** position defines how many digits after point are to be presented in the Leq/RMS value - field 3.

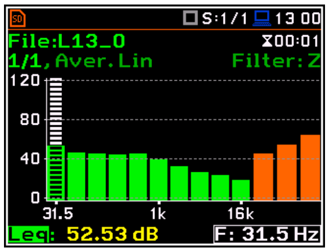


Scaling the vertical axis of the plot

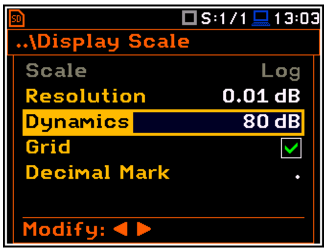
The **Dynamics** parameter defines the dynamic range of the Y-axis scale.



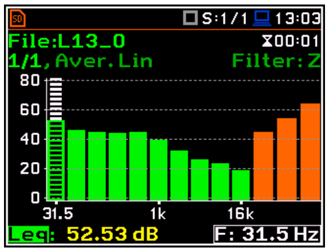
=>



It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB**, **100dB** and **120dB**.

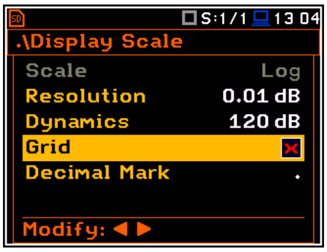


=>

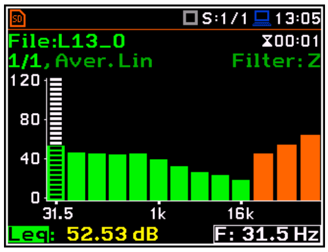


Toggling the grid

The **Grid** position allows to toggle the horizontal grid lines of the logger or spectrum plot.

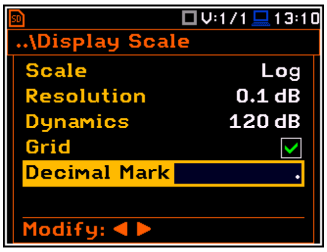


=>

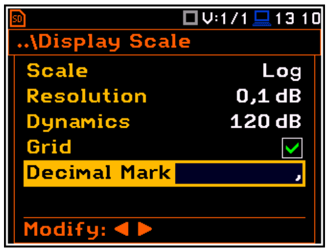


Decimal Mark

The **Decimal Mark** position allows to select which decimal mark (point or comma) will be used for data presentation in all views.

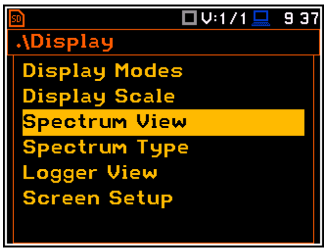


►

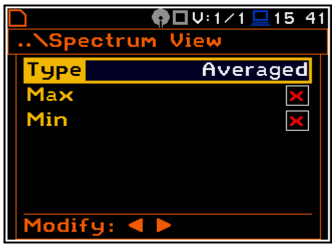


10.3.3 Selecting spectra to be viewed - Spectrum View

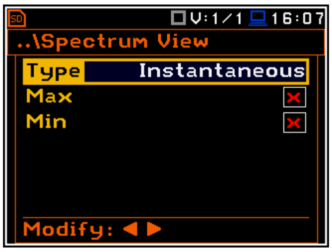
In the **Spectrum View** screen, you can select the different spectra to be viewed in the **Spectrum** display mode: instantaneous, averaged, maximum or minimum.



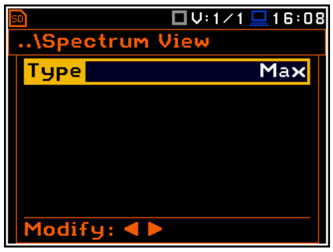
<ENT>



In the **Type** position, you may choose the spectrum type to be presented as a bar plot in the **Spectrum** view: **Averaged**, **Instantaneous**, **Max** or **Min**.

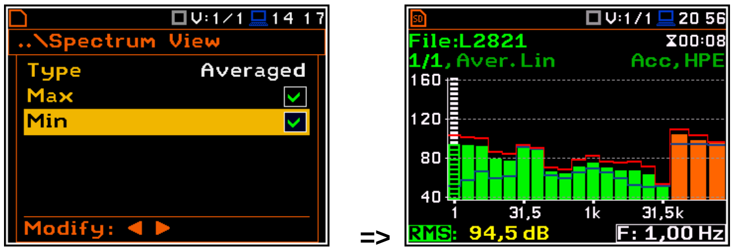


►



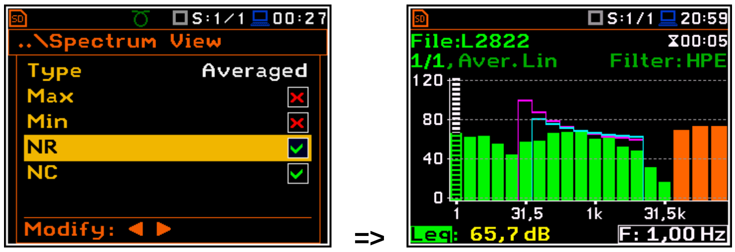
When the **Averaged** or **Instantaneous** spectrum is selected, you can additionally enable presentation of the **Max** and/or **Min** values for each band by switching the **Max** or **Min** parameters on.

The **Max** and **Min** spectrum is presented as a stepped line – accordingly red and blue colour.



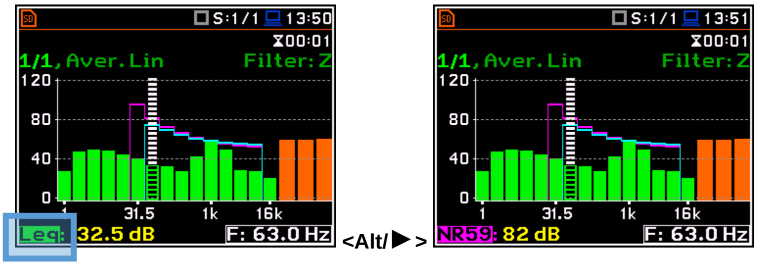
NR and NC results view

In case of 1/1 octave Sound measurements (**S:1/1**) noise rating (**NR**) and noise criterion (**NC**) values can be additionally presented on the same plot as a main spectrum when the **NR** or/and **NC** parameter is enabled.



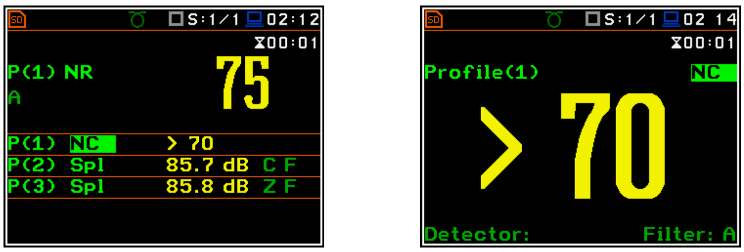
A violet line shows the **NR** results for the octave bands with central frequencies: **31.5Hz**, **63.0Hz**, **125Hz**, **250Hz**, **500Hz**, **1.00kHz**, **2.00kHz**, **4.00kHz** and **8.00kHz**. A blue line shows the **NC** results for the octave bands with central frequencies: **63.0Hz**, **125Hz**, **250Hz**, **500Hz**, **1.00kHz**, **2.00kHz**, **4.00kHz** and **8.00kHz**.

To enable the cursor to read the **Max**, **Min**, **NR** or **NC** values, select the field in the lower left-hand corner of the display with the ▲ / ▼ key. Then select the appropriate value with the ◄ / ► key pressed together with **<Alt>**.

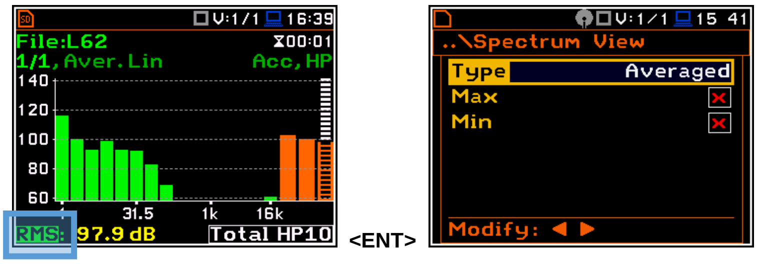


The **NR** or **NC** results can be seen also in the **1 Profile** and/or **3 Profile** modes.

If the **NC** or **NR** result exceeds the maximum value for which the curves are defined (NC=70 or NR=130) then before the displayed result the character (**>**) appears and the highest defined curve is displayed.

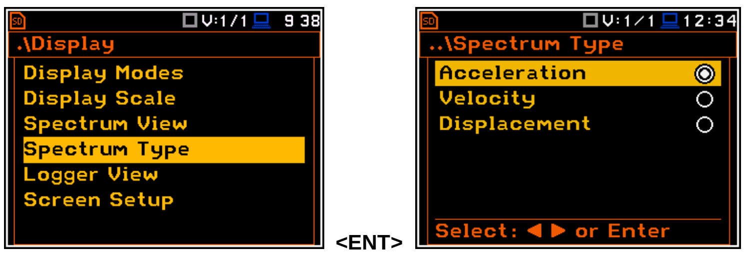


You can easily get into the **Spectrum View** screen from the **Spectrum** view by entering the result field (**Leq**/**RMS**) with the ▲ / ▼ key and pressing **<ENTER>**.



10.3.4 Changing spectrum type in Vibration modes - Spectrum Type

In the **Spectrum Type** screen, which is available only in Vibration modes, you can select the different types of vibration spectra to be presented in the Spectrum view: **Acceleration**, **Velocity** or **Displacement**.

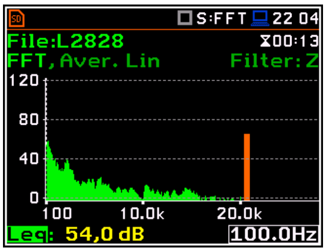


11 FFT ANALYSER

The instrument operates as the FFT analyser in a very similar way to the Level Meter. Moreover, the FFT analysis is performed in parallel with the SLM or VLM measurements.

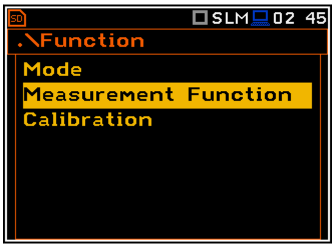
Results of the FFT analysis (spectra) measured with preselected frequency weighting filter and window, are presented in the **Spectrum** view.

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

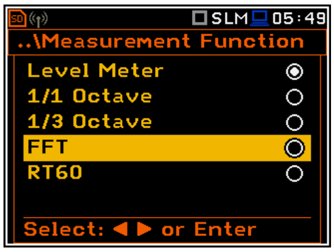


11.1 SELECTING FFT FUNCTION

To select the **FFT** analysis function, open the **Measurement Function** screen, select the **FFT** position and press **<ENTER>**.



<ENT>



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

Note: *It is not possible to change the current function during a running measurement. In this case, the instrument displays for about 2 seconds the message: "Measurement in Progress". To change the current function, the measurement must be stopped!*

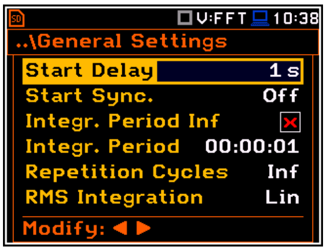
11.2 CONFIGURING FFT ANALYSER

11.2.1 General measurement settings of FFT analysis – General Settings

Execution of the FFT analysis depends on a certain number of the parameters, configured in the **Measurement** section.

FFT spectra are averaged during **Integration Period** and saved as Summary Results the number of times specified by the **Repetition Cycles** parameter.

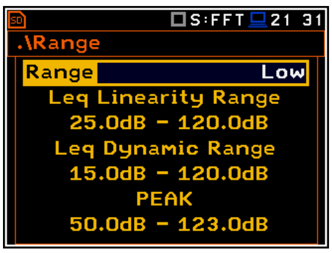
The **Integration Period** and **Repetition Cycles** parameters are defined in the **General Settings** list.



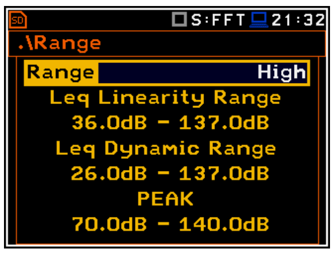
11.2.2 Selecting measurement range for FFT analysis - Range

The input range for the **FFT** function can be selected in the **Range** screen: **Low** or **High**.

Depending on the settings of the **Scale** parameter (*path: <Menu> / Display / Display Scale*) the range for a vibration signal can be presented in absolute or logarithmic units (dB).

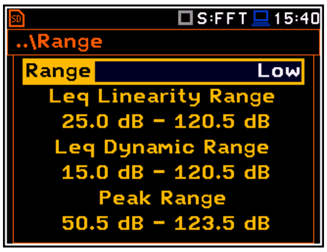


►



Values of ranges in sound modes depend on the settings made in the **Compensation Filer** screen (*path: <Menu> / Measurement / Compensation Filter*).

Note: *The calibration factor is always added to the upper range level. For example, if the calibration factor is equal to 0.5 dB, the upper range will be changed automatically (the upper limit will be increased by 0.5).*



11.2.3 Logging of FFT spectra – Logging

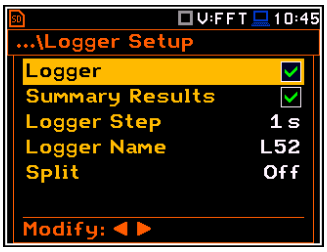
Spectra can be logged in a logger file with two steps: **Integration Period** step and/or **Logger Step**.

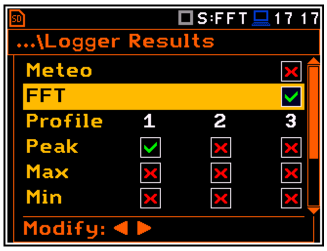
For logging FFT spectra, the **Logger** position must be enabled in the **Logger Setup** screen (*path: <Menu> / Measurement / Logging / Logger Setup*).

If you wish to save spectra together with Summary results, you must enable the **Summary Results** position. FFT spectra will be then logged with the **Integration Period** step.

The instrument allows additional logging of FFT spectra in a logger file with the **Logger Step**.

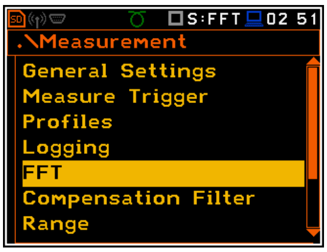
For this, you should enable logging of spectra switching on the **FFT** position in the **Logger Results** screen (*path: <Menu> / Measurement / Logging / Logger Results*).



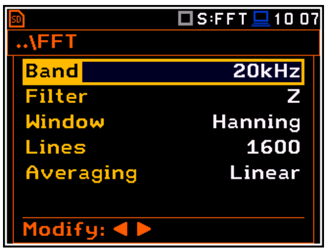


11.2.4 Setting parameters of FFT analysis - FFT

The **FFT** position, which appears in the **Measurement** section after activating the **FFT** function, opens the screen in which you can select parameters of the FFT analysis: frequency band (**Band**), pre-weighting filter (**Filter**), weighting window (**Window**), number of lines (**Lines**) and averaging type (**Averaging**).



<ENT>



The **Band** parameter defines the band for the **FFT** analysis performance: **20 kHz**, **10 kHz**, **5 kHz**, **2.5 kHz**, **1.25 kHz**, **625 Hz**, **312 Hz**, **156 Hz** or **78 Hz**.

The following pre-weighting filters (**Filter**) are available for the **FFT** analysis of sound:

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

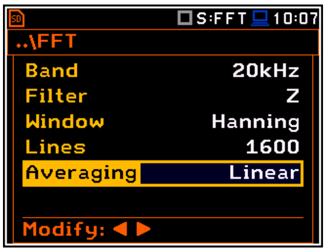
Only one **HP** weighting filter is available for the **FFT** analysis of vibration.

Characteristics of filters are given in Appendix C.

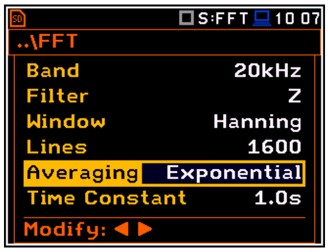
The **Window** parameter defines the weighting window for the **FFT** analysis: **Hanning**, **Rectangle**, **Flat Top** or **Kaiser-Bessel**.

The **Lines** parameter defines the number of lines for the **FFT** analysis: **1600**, **800** or **400**.

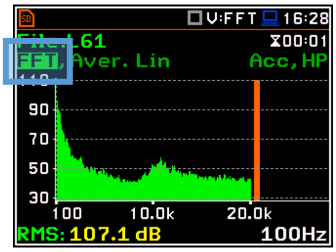
There are two averaging options (**Averaging**): **Linear** and **Exponential**. In case of **Exponential** averaging, the **Time Constant** parameter appears in this screen. You can select: **100ms**, **125ms**, **200ms**, **500ms**, **1.0s**, **2.0s**, **5.0s** or **10.0s**.



▶



You can easily get into the **FFT** screen from the spectrum view. It is necessary to enter the function field (**FFT**) with the ▲ / ▼ key and press **<ENTER>**.

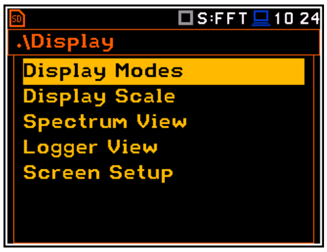


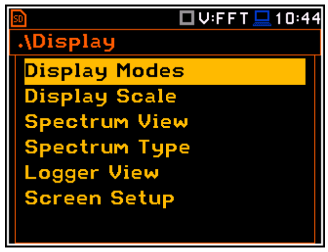
<ENT>

11.3 CONFIGURING FFT SPECTRA VIEW

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

The following positions are used for setting up the presentation of **FFT** results:





Display Modes allowing to switch on the **Spectrum** view;

Display Scale allowing to adjust scales of a spectrum plot and toggle the grid;

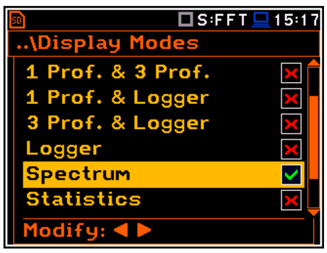
Spectrum View allowing to select spectra to be viewed: instantaneous, averaged, maximum or minimum;

Spectrum Type allowing to change the spectrum type presented on the display in vibration modes: acceleration, velocity or displacement. This position appears in the vibration modes.

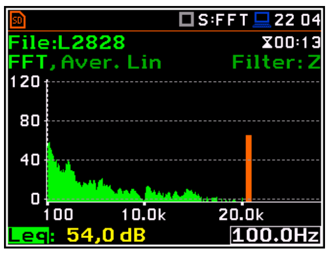
11.3.1 Presentation of FFT spectra

Spectrum plot view

The **Spectrum** position in the **Display Modes** list becomes available for the **FFT** function. It enables/disables the spectrum plot view.

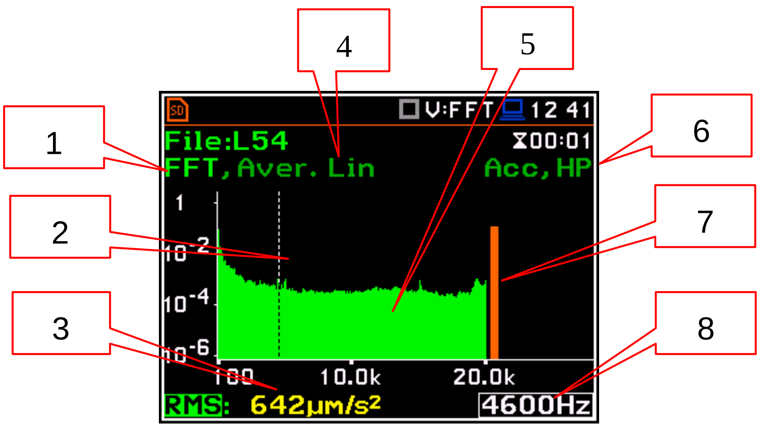


=>

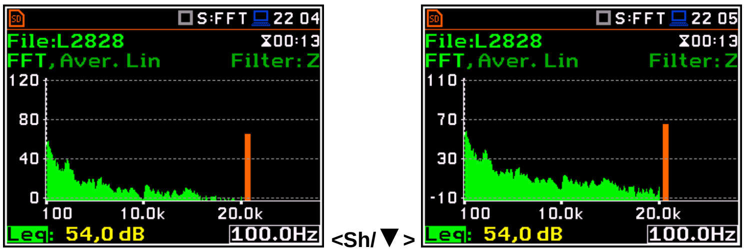


Spectrum view fields

1. Analyser function
2. Cursor position
3. Value for the cursor position
4. Averaging used
5. Spectrum plot
6. Frequency weighting filter
7. Total value
8. Line frequency for the cursor position

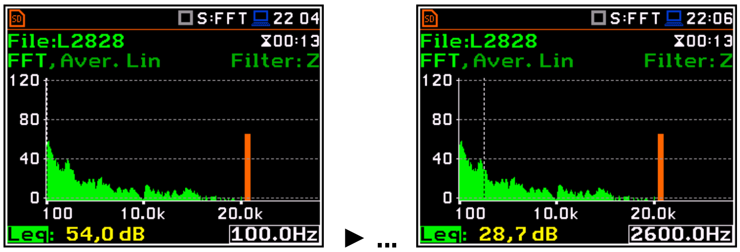


You can shift the Y-axis in the spectrum view with the **<Shift>** and ▲ / ▼ keys pressed together.

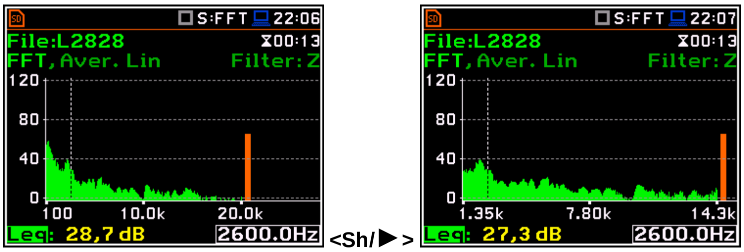


You can change the cursor position with the ◄ / ► key. You can jump to the first or last spectrum line with **<Shift>**.and ◄ / ► keys pressed together.

The frequency and appropriate value are presented in the line below the plot.

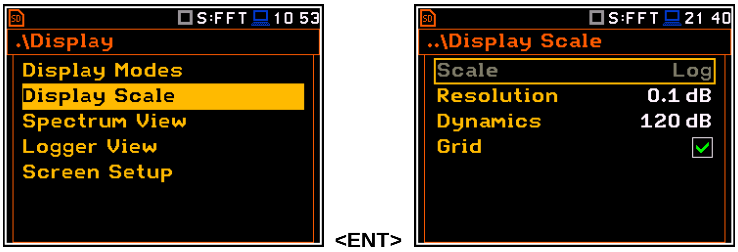


You can zoom in/out the frequency scale at the cursor position with the ◄ / ► key pressed together with **<Shift>**.



11.3.2 Setting up the scale of spectrum plot - Display Scale

The **Display Scale** screen allows to define the result units (absolute or logarithmic), adjust scale of plots and toggle the grid.

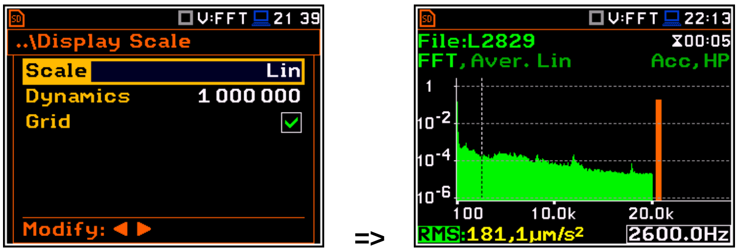


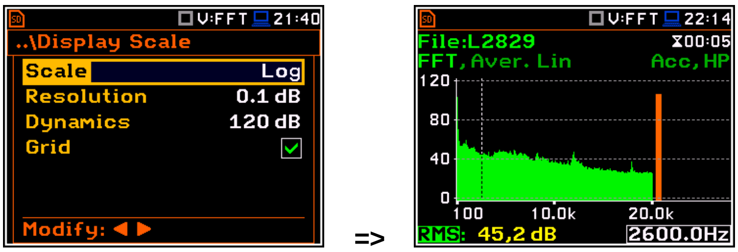
Scale of results presentation

The **Scale** parameter defines results units: linear (**Lin** – m/s^2, m/s etc.) or logarithmic (**Log** - dB).

For sound measurements, the **Scale** position is not active. All results are always presented in dB.

The **Log** option means that the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** screen (*path: <Menu> / Auxiliary Setup / Reference Levels*).

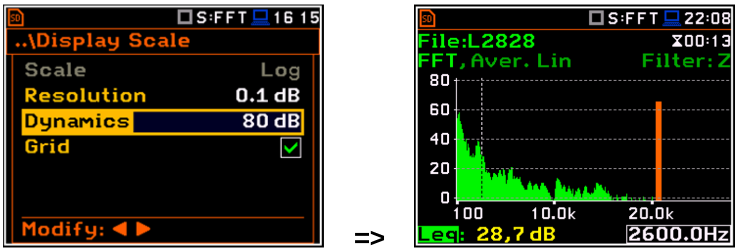




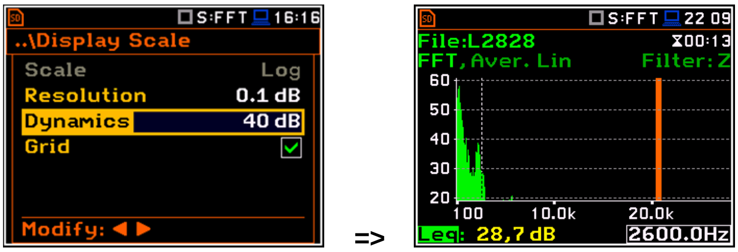
Note: *In Vibration modes, results can be presented in the* ***Logarithmic*** *(dB) or* ***Linear*** *(for example, m/s^2) units. It depends on the* ***Scale*** *parameter value. For example, 10 m/s^2 can be presented also as 140 dB.*

Scaling the vertical axis

The **Dynamics** parameter defines the dynamic range of the Y-axis scale.

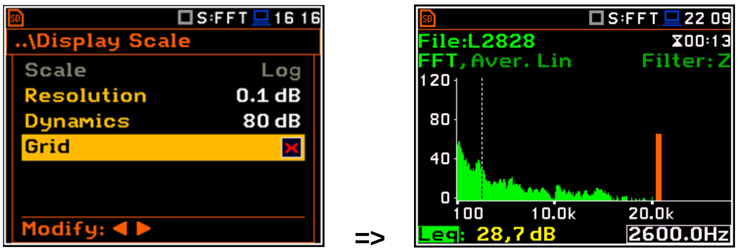


It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB**, **100dB** and **120dB**.



Toggling the grid

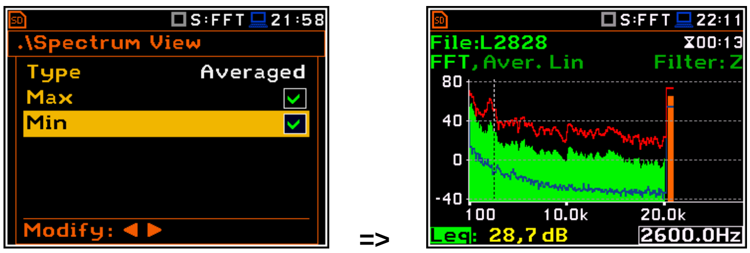
The **Grid** position allows to toggle the horizontal grid lines of the logger or spectrum plot.



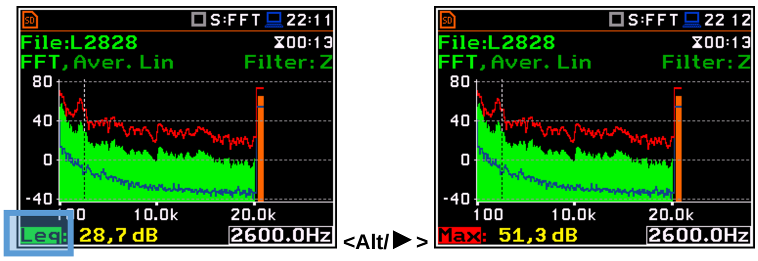
11.3.3 Selection of spectra to be viewed - Spectrum View

In the **Spectrum View** screen, you can select the different spectra to be viewed in the **Spectrum** display mode: **Averaged**, **Instantaneous**, **Max** or **Min**.

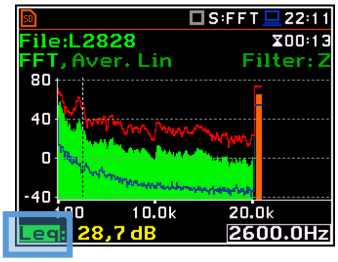
When the **Averaged** or **Instantaneous** spectrum is selected, you can additionally switch on or off the presentation of the **Max** and/or **Min** values by switching the **Max** or **Min** parameters on.



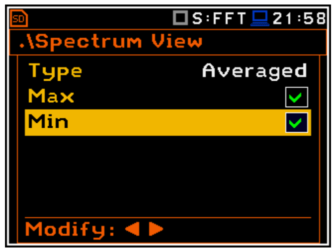
To enable to read the **Max** or **Min** values at the cursor position, select the field in the lower left-hand corner of the display with the ▲ / ▼ key. Then select the appropriate value with the ◄ / ► key pressed together with **<Alt>**.



You can easily get into the **Spectrum View** screen from the **Spectrum** view by entering the result field (**Leq**/**RMS**) with the ▲ / ▼ key and pressing **<ENTER>**.

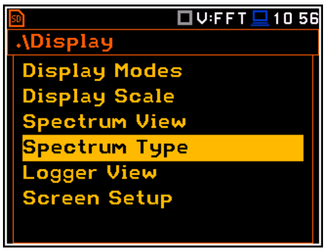


<ENT>

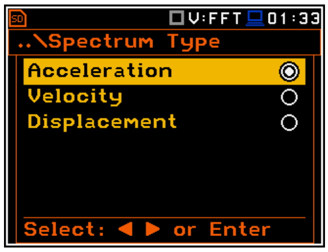


11.3.4 Changing spectrum type in Vibration modes - Spectrum Type

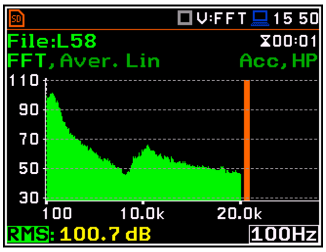
In the **Spectrum Type** screen, which is available only in Vibration modes, you can select the different types of vibration spectra to be presented on the display: **Acceleration**, **Velocity** or **Displacement**.

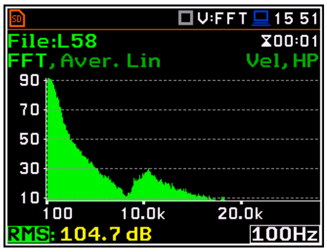


<ENT>



As an example, same spectrum is presented as **Acceleration** and **Velocity**.





12 REVERBERATION TIME MEASUREMENTS - RT60

The **RT60** analysis is an optional function of SVAN 977A, which provides reverberation time calculation for 1/1-octave bands (from 63 Hz to 16 kHz) or 1/3-octave bands (from 50 Hz to 20 kHz) and three total RMS levels (**A**, **C** and **Z** weighted). Whole measurement process and calculations implemented in SVAN 977A fulfil the ISO 3382 standard.

The reverberation time of the room can be obtained with the use of SVAN 977A by two measurement methods: Impulse Response Method (**Impulse**) and Interrupted Noise Method (**Decay**). The selection of the method depends on the type of the used sound source. The **Impulse** method is designed for measurements using the impulse sound source (like pistol shot, petard explosion), whereas the **Decay** method is intended for measurements when room is excited by broad or narrow band sound noise source (usually pink noise). For more details about the measurement and calculation process see Appendix E.

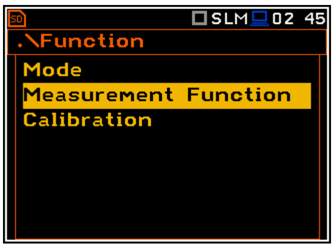
The reverberation time analysis applied in the instrument consists of two parts:

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

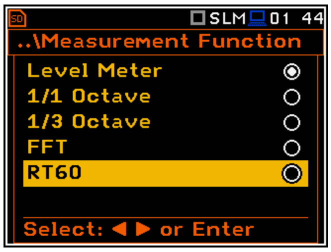
Note: *It is recommended to familiarize with Appendix E before proceeding. This chapter describes only the navigation of the instruments, whereas Appendix E depicts the definitions and describes reverberation time measurements.*

12.1 SELECTING THE RT 60 FUNCTION

To activate the **RT60** analysis function, select the **RT60** position in the **Measurement Function** list and press **<ENTER>**.



<ENT>

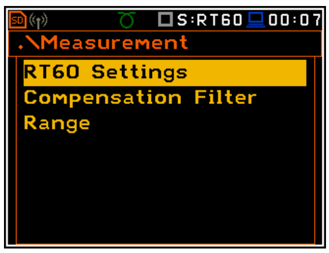


Note: *The* ***RT60*** *function is optional and should be unlocked by entering the activation code in the text editor screen, which is opened after first attempt to select this function. Once unlocked this option will be ready to use permanently.*

Note: *It is not possible to change the current function during running measurements. In this case the instrument displays for about 2 seconds the warning: "Measurement in Progress". To change the current measurement function, the measurement must be stopped!*

12.2 SETTINGS OF THE RT60 ANALYSIS

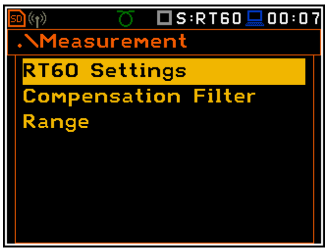
Execution of the **RT60** analysis depends on a certain number of the parameters, which can be set in the different screens of the **Measurement** section: **RT60 Settings**, **Compensation Filter** and **Range**.



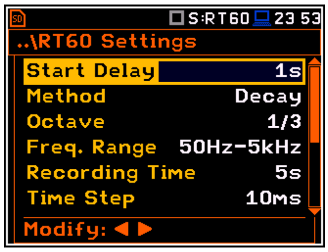
Positions **Compensation Filter** and **Range** are the same as for other instrument's functions (see Chapters 5.6 and 5.7).

The **RT60 Settings** list allows to select the method for **RT60** calculations, define the name of the file, where the registered data will be collected, and other parameters for **RT60** calculations.

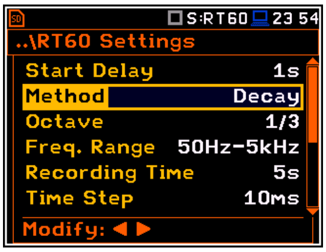
The **Start Delay** parameter defines the delay period from the moment the **<Start/Stop>** key is pressed to the start of the actual measurement.



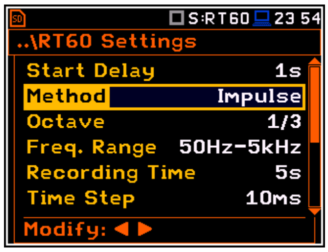
<ENT>



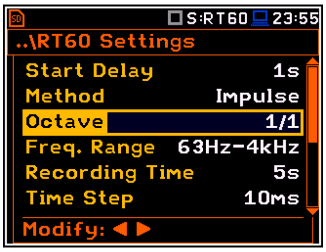
The **Method** parameter allows to choose the method for **RT60** calculations: **Decay** or **Impulse**. Both methods are described in Appendix E.



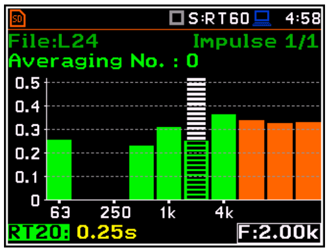
▶



The **Octave** parameter defines for which bands (**1/1** or **1/3**) the **RT60** analysis will be performed.

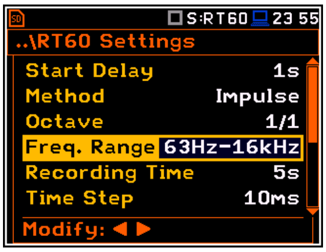


=>

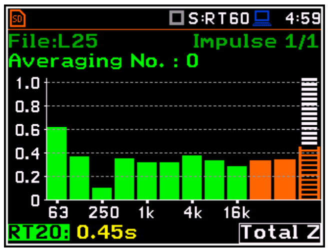


The **Freq. Range** parameter defines the frequency range for 1/1 or 1/3-octave calculations:

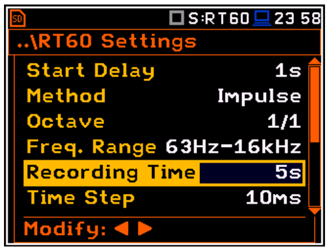
- for 1/1-octave**: 63Hz-4kHz** (7 bands) or **63Hz-16kHz** (9 bands).
- for 1/3-octave: **50Hz-5kHz** (21 bands) or **50Hz-20kHz** (27 bands).



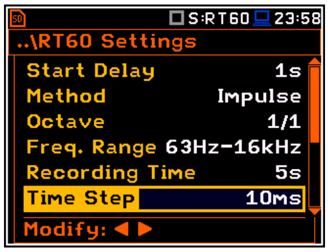
=>



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

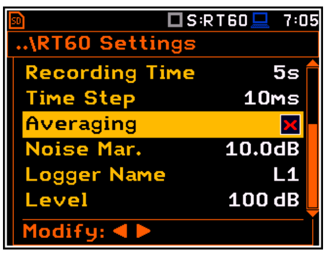


The **Time Step** parameter defines the time-step of data registration (sound pressure level) in the file. The parameter value can be selected from the set: **2**, **5**, **10**, **20**, **50**, **100 ms**.

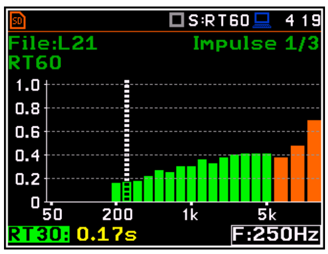


The **Averaging** parameter defines the averaging of the reverberation time results from several measurements.

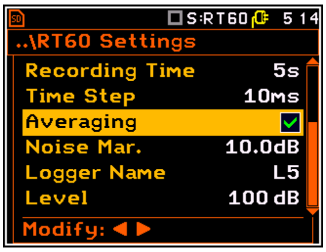
When this option is switched on the **Averaging** position appears on the **RT60** bar plot.



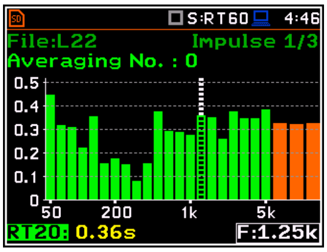
=>



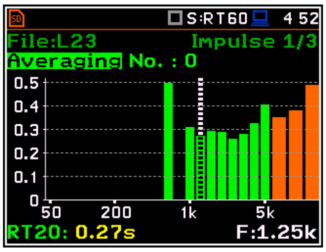
To make averaging of the new results with the results calculated earlier, select the field **Averaging** and press **<ENTER>**, select in the confirmation screen **Yes** and press **<ENTER>** again. In the field **No.: x**, the value **x** will be increased by one and the symbol √ will inform that the results have been averaged.



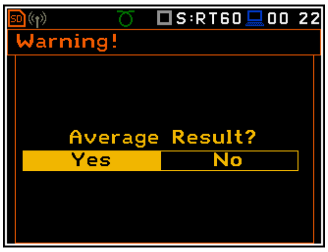
=>



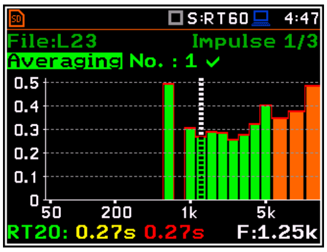
<Start>



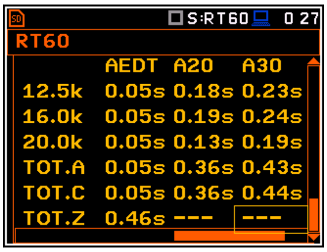
<ENT>



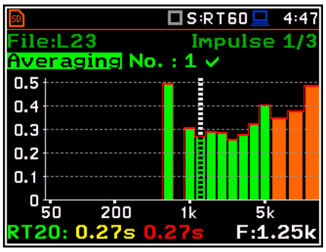
<ENT>



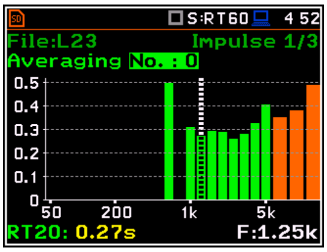
When the averaging is **On** the additional columns appear in the RT60 result table, named: **AEDT**, **A20**, **A30** and **A.User**.



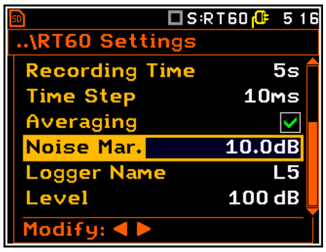
To clear averaging, select the field **No.: x** and press **<ENTER>**, select in the confirmation screen **Yes** and press **<ENTER>** again.



<ENT> .. <ENT>

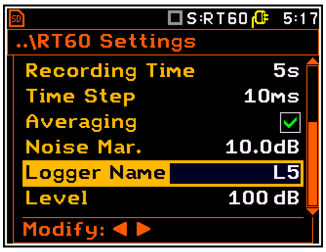


The **Noise Mar.** parameter defines the margin value to the calculated noise level (for more detail see Appendix E). This parameter can be set in the range **0.0 dB ÷ 20.0 dB** with 0.1 dB step (default value is **10.0 dB**).

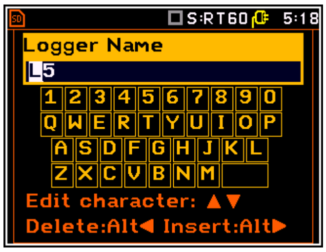


Note: *If the measurement must fulfil the ISO 3382 standard requirements the noise margin is required to be set to 10 dB (or higher).*

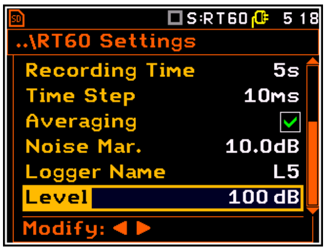
The **Logger Name** position allows to define the name of the logger file in which data of the **RT60** analysis will be recorded. The name can be up to eight characters long. After pressing the ◄ / ► key, the special screen with text editor is opened.



►



The **Level** position defines the threshold level of the sound source for triggering the RT60 measurement. If the measured sound is below the **Level** value, the RT60 measurement will not start. The parameter can be set in the range **24 ÷ 136 dB** with 1 dB step (default value is **100 dB**).



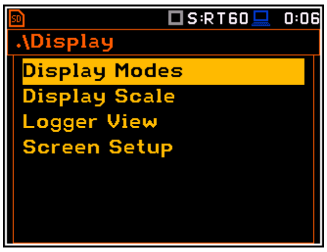
For the **Impulse** method, the source is Leq(1) integrated by 0,5 milliseconds.

For the **Decay** method, the source is Leq(1) integrated by 1 second. It also should be stable within ±0,5 dB for 2 seconds.

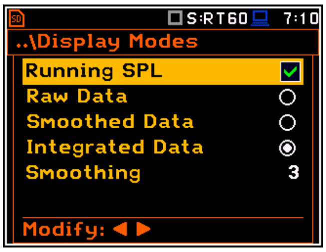
12.3 CONFIGURING RT60 VIEWS

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

The **Display Modes** list allows you to select the type of data displayed during the **RT60** calculations.

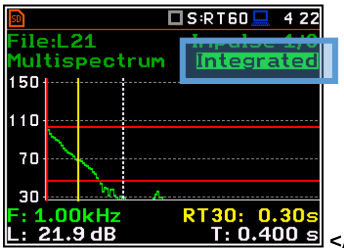


<ENT>

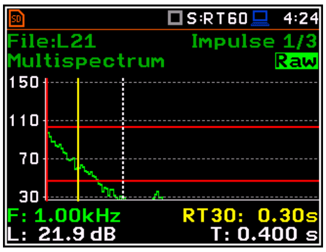


Time data can be viewed as a **Raw Data**, **Smoothed Data** (or **Integrated Data** in case of **Impulse** method).

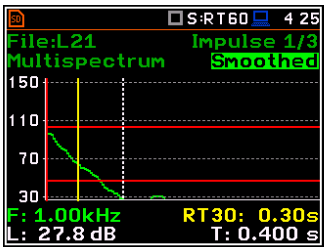
You may also switch between different data view modes during measurement in the presentation mode. For this purpose, it is necessary to select the field with **Raw**, **Smoothed** or **Integrated** text (at the right upper corner of the display) and change its content with the **<Alt>** and ◄ / ► key pressed together.



<Alt/►>

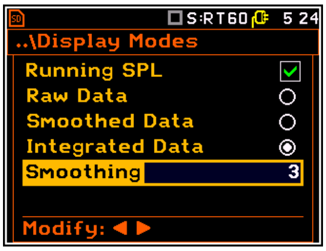


<Alt/►>



The **Smoothing** position allows to set the number of samples, which should be taken into consideration by the smoothing algorithm. The higher is this number the smoother is a graph.

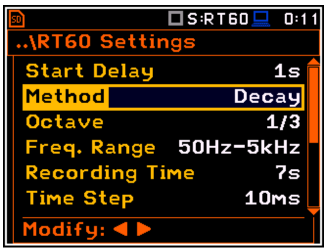
Note: this parameter influences the reverberation time results. The parameter can be set in the range **0** ÷ **15** (default value is **3**).

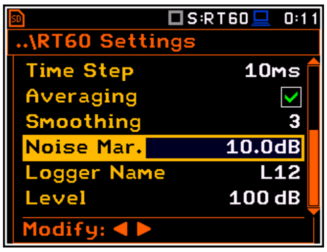


12.4 START RT60 MEASUREMENTS

Measurements with the use of Decay method

1. Set parameters for **Decay** RT60 measurements. Most used setup is presented below.
   - **Method:** Decay
   - **Recording Time:** 7s
   - **Time Step:** 10ms
   - **Averaging:** On
   - **Smoothing:** 3
   - **Noise Mar.:** 10.0dB
   - **Level:** 100dB.

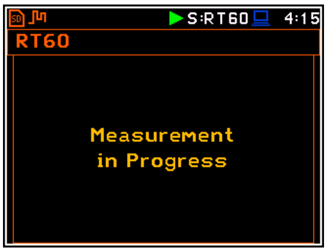




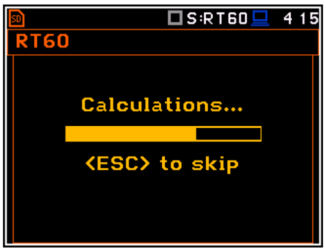
2. Place the sound power source in the measured room (for the sound power source location - see the reverberation time measurement ISO standard).
3. Place the microphone in one of the selected measurement points (for the measurement points location see the reverberation time measurement ISO standard).
4. Switch on the sound power source.

***Note**: The default measurement time of the decay curve registering (**Recording Time**) is 7 seconds. It can be insufficient in some applications. It is recommended to set this value to be at least two times longer than expected reverberation time. For details see Appendix E.*

5. Start the measurement process by pressing the **<Start/Stop>** key. While the instrument is waiting for the trigger condition fulfilment the **Spl** result is displayed.
6. Switch off the sound power source (the source should work enough long to obtain the acoustic field stabilisation). After the trigger condition fulfilment, the instrument starts to collect data.



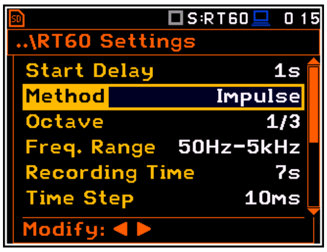
7. After the data recording process ends, the instrument starts the calculation of the reverberation time results. During this process, the messages „Calculations…” and “Reading Logger…” appear.
8. To save results press the **<Save>** key or use the **File** menu option.

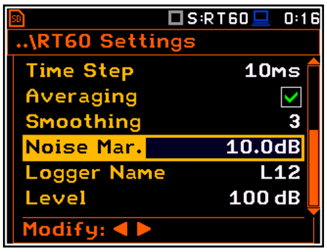


***Note**: It is necessary to switch on the sound source before starting the measurement because of the trigger requirements (for more details see Appendix E). If it is necessary to start the instrument before switching on the sound source it is recommended to use the higher **Start Delay** value.*

Measurements with the use of Impulse method

1. Set parameters for **Impulse** RT60 measurements. Most used setup is presented below.
   - **Method:** **Impulse**
   - **Recording Time:** **7s**
   - **Time Step:** **10ms**
   - **Averaging:** **On**
   - **Smoothing:** **3**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100dB**





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

***Note**: The default measurement time of the decay curve registering (**Recording Time**) is 7 seconds. It can be insufficient in some applications. It is recommended to set this value to be at least two times longer than expected reverberation time. For details see Appendix E.*

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

3. Start the measurement process with the **<Start/Stop>** key. The display indicates that the instrument is waiting for the trigger condition fulfilment.
4. Fire the impulse sound power source. If the trigger condition is fulfilled the instrument starts to collect data.
5. After the data recording process ends, the instrument starts the calculation of the reverberation time results. During this process, the messages „Calculations…” and “Reading Logger…” appear.
6. To save results press the **<Save>** key or use the **File** menu option.

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

12.5 Viewing of RT60 results

The **RT60** measurement results for all 1/1 or 1/3-octave bands and three Total values can be viewed in three different view modes:

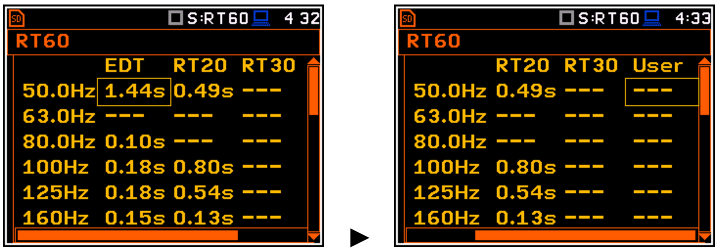
1. Table of **EDT**, **RT20**, **RT30** and **User** results;
2. Bar plot of **EDT**, **RT20**, **RT30** and **User** results;
3. Plot of sound pressure level decay curves.

You may switch between the view modes with the **<Alt>** and ◄ / ► key pressed together.

Table of RT60 results

The table presents the results of reverberation time for different **RT60** results:

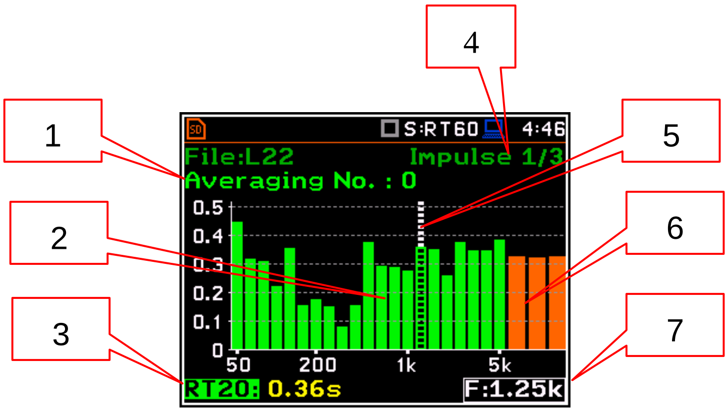
- **EDT** - early decay time;
- **RT20** - reverberation time calculated with 20 dB dynamics;
- **RT30** - reverberation time calculated with 30 dB dynamics;
- **User** - reverberation time, calculated with the user defined dynamics.



Note: *If “**- - -**” text appears in the RT indicator field, it means that for this band with the selected parameters (**Noise Mar.**) the required measurement conditions were not fulfilled to obtain the results (for more details see Appendix E).*

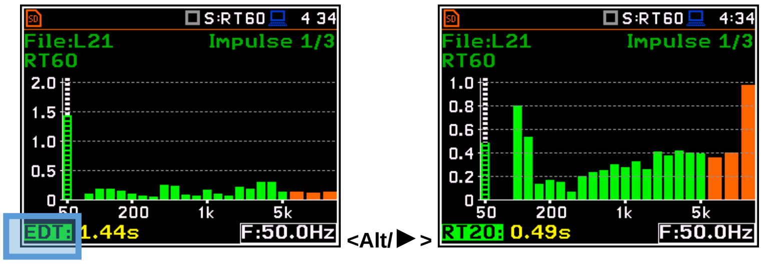
Bar plot of RT60 results

1. Number of averaged results
2. RT 1/3 octave plot
3. Name of the RT result and its value
4. Used **RT60** calculation method
5. Cursor position
6. RT results for Total values
7. Cursor position value (central band frequency)



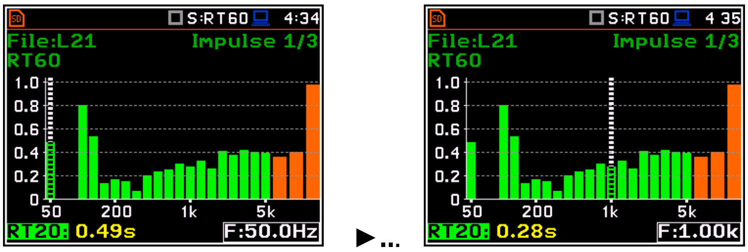
Changing RT result

When the field 3 is active the **RT60** analysis result can be changed with the ◄ / ► key pressed together with **<Alt>**.



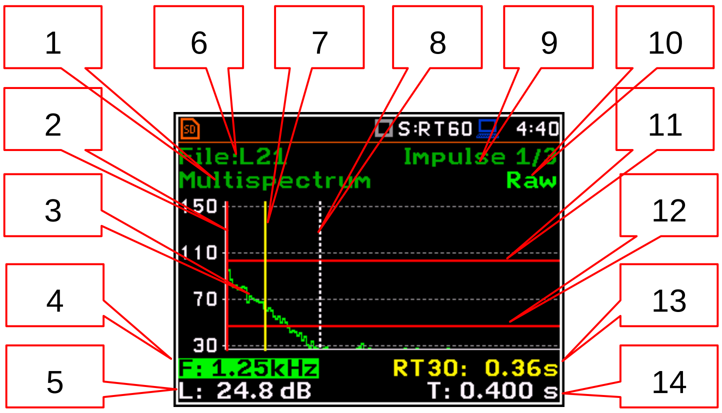
Changing cursor position

You may change the cursor position with the ◄ / ► key.



Sound pressure decay curve plot

1. Logger file content
2. T0 marker position
3. Decay curve plot
4. Central frequency of selected by cursor 1/3 octave band
5. Result value (SPL) for the cursor position
6. Name of the logger file
7. T1 marker position
8. Cursor position
9. RT60 method
10. Type of data displayed: **Raw**, **Smoothed** or **Integrated**



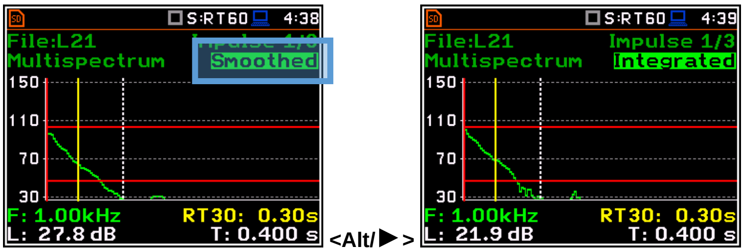
11. Calculated steady upper sound level value
12. Calculated steady lower sound level value
13. RT result (**RT30**, **RT20**, **EDT** and **RT User**) with calculated reverberation time
14. Cursor measurement time position

T0 marker position is used as a starting point to all three (and the **RT User** also) reverberation time calculations.

On the display T1 marker position is labelled (indicator **A7**) as **EDT**, **RT20** or **RT30** according to which the most restricted definition of the RT condition is fulfilled.

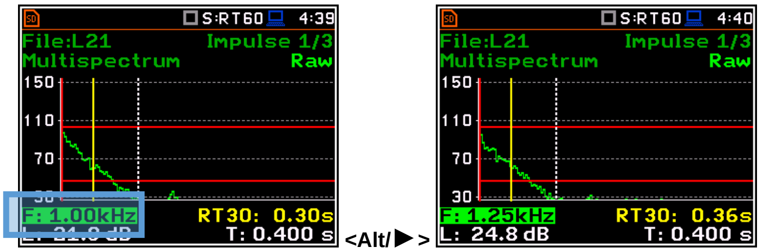
Changing the data type

When the field 9 is active the type of data displayed (**Raw**, **Smoothed** or **Integrated**) can be changed with the ◄ / ► key pressed together with **<Alt>**.



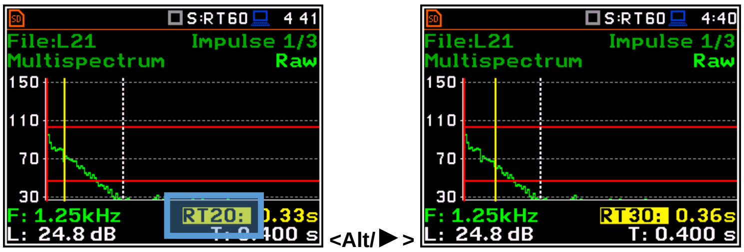
Changing the band

When the field 3 is active the central frequency of the band can be changed with the ◄ / ► key pressed together with **<Alt>**.



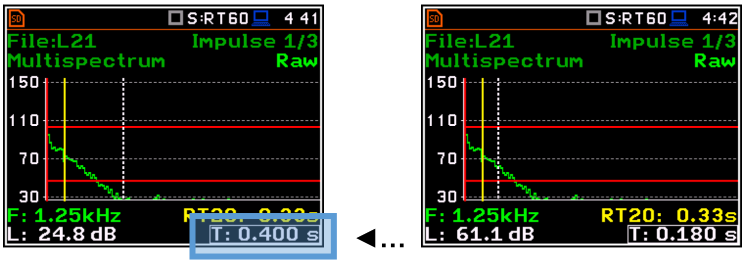
Changing the RT function

When the field 13 is active the **RT60** analysis function can be changed with the ◄ / ► key pressed together with **<Alt>**.



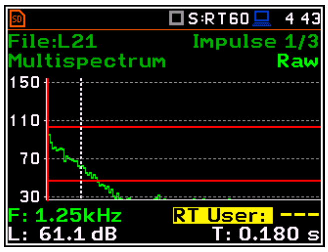
Changing the cursor position

When the field 14 is active you may change the cursor position with the ◄ / ► key.



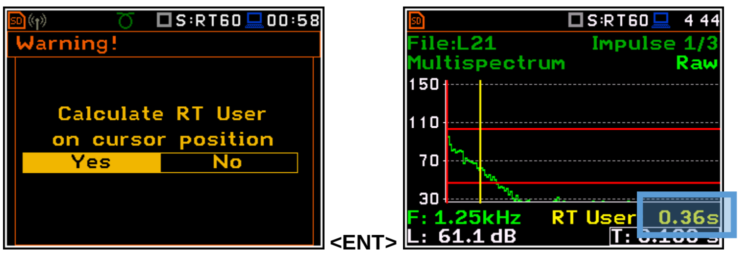
RT User reverberation time calculation

1. Select the band or one of the total levels for user reverberation time calculation process.
2. Set the position of the marker T1.



***Note:** The marker should be located on the right side of the T0 marker but not in the noise background region (for more details see Appendix E).*

3. When the marker position is located press **<ENTER>**, then select **Yes** field and press **<ENTER>** again.
4. The **RT User** result will be calculated and presented in the field 13, as well in the Table and the bar plot.



13 REMOTE CONTROL TOOLS

SVANTEK offers few solutions for data downloading and processing as well as remote control and communication with SVAN 977A depending on the user's needs and capabilities.

The SVAN 977A standard set includes the PC software SvanPC++, which offers remote communication via USB interface and data processing features. You can download this software from the Svantek official web-side.

Another useful software, also available on the Svantek web-side, is the SvanMobile Android smartphone application. This application allows you to control the instrument remotely via Bluetooth®.

When SVAN 977A is a part of the SV 277 PRO/PRIM monitoring station it can be controlled via GSM connection. GSM connection opens wider possibilities for remote communication. There are few communication options via GSM connection, which depend on the Internet access, provided by GSM operators. This access comes with a set of parameters that define the visibility of the SIM card address in the network: public or private, static or dynamic.

First and easiest option is to use the SvanNET web-service, which enables basic features for the user as: instrument performance control, data files downloading and setup files uploading. SvanNET allows usage of all type of SIM cards with a GSM modem regardless of having a public or private IP. The connection over SvanNET allows users to:

- use a mobile phone or tablet to watch real time measurement results,
- download files and reconfigure the station,
- download files and reconfigure the station using the SvanPC++_RC module,
- use the SvanPC++_RC software based on MS Windows® for automatic control of noise monitoring stations, data archiving, automatic web publication, etc.

Another option is to use Remote Communication module for SvanPC++ (SvanPC++_RC), which offers different ways of connections and enables continuous data transfer from the monitoring station to the PC with installed SvanPC++_RC.

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

1. SvanPC++ User Manual
2. SvanMobile User Manual
3. SvanNET User Manual.

14 MAINTENANCE

14.1 POWERING OF THE INSTRUMENT

SVAN 977A can be powered by one of the following sources:

- Four AA standard size internal batteries. In case of alkaline type, with a new fully charged set, the instrument can operate more than 12 h (6.0 V / 1.6 Ah). Instead of the ordinary alkaline cells, four AA rechargeable batteries can be used (a separate external charger is required for charging them). In this case, using the best NiMH type, the operation time can be increased up to 16 h (4.8 V / 2.6 Ah)
- External DC power source – 7 V DC÷16 V DC (1.5 W)
- SA 17A external battery pack – operation time > 24 h (option)
- USB interface – 500 mA HUB

SVAN 977A is delivered with four AA alkaline batteries, but you may also use AA rechargeable batteries.

The “**battery**” icon shows the condition of the internal batteries.

The instrument is not equipped with an internal charger; therefore, the rechargeable batteries can be charged only with the use of optionally provided charger (SA 31) after removal them out of the instrument.

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

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

Powering the instrument from the USB interface is performed by connecting its **USB** socket to the PC or other USB power source via the SC 16 cable.

Powering the instrument from the external 6 x AA battery pack (SA 17A) or DC power source 7 V DC÷16 V DC, 1.5 W (SA 15) is performed via **7–16 V** socket.

When the instrument is powered from the external power source the internal batteries are automatically disconnected. After disconnection from the external power source, the instrument will automatically switch powering to the internal batteries.

Note: *Use only high-quality USB cables, such as* ***SC 16****. Many poor-quality cables do not ensure low resistance of the cable, thus disabling proper operating of the instrument.*

14.2 MEMORY CARD EXTRACTION AND INSERTION

SVAN 977A is delivered with 16 GB micro SD-card - Kingston Industrial (SDCIT/16GBSP).

You may exchange it with the high capacity card (up to 32GB), but before insertion the card must be formatted as FAT32.

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

Note: *If you would like to use card with higher capacity, call to the local distributer for confirmation.*

To extract the memory card from the card-slot, switch off the instrument, unscrew the coin-operated screw and take off the black bottom cover of the instrument.

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

While insertion the SD-card, a click sound indicates that the card is inserted properly. If necessary, use a tool (e.g. pen) to push the card right in.

14.3 TRANSDUCERS

SVAN 977A is equipped with the TNC connector as an input of the measured signal taken from the microphone preamplifier or the vibration transducer.

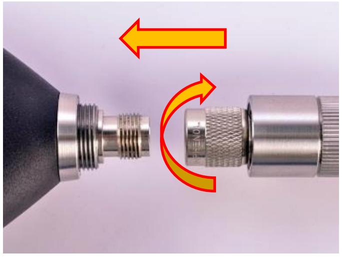
Microphone

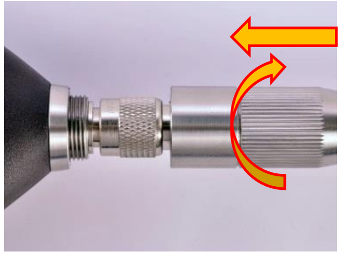
The SVAN 977A set includes prepolarised ½" microphone with nominal sensitivity 35 mV/Pa (SV 7052E) and microphone preamplifier with IEPE power supply (SV 12L).

The microphone is delivered in a special box, and you must screw it onto the preamplifier threads themselves.

When unscrewing the microphone, care must be taken not to drop the microphone. To avoid this, unscrew the microphone so that it ended up in the user's palm.

To connect the preamplifier with the microphone to the instrument, first insert the tip of the preamplifier into the socket and tighten the ring to the first screw thread.





Then move the preamplifier outer sleeve in the direction to the instrument and tighten it to the screw thread.

Note: *Do not disconnect the preamplifier by turning the preamplifier body (turn only rings/collars) because it may damage the preamplifier!*

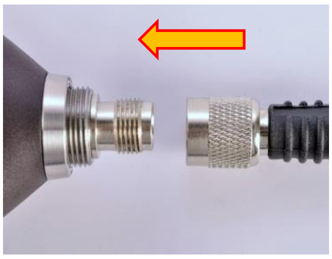
Accelerometer

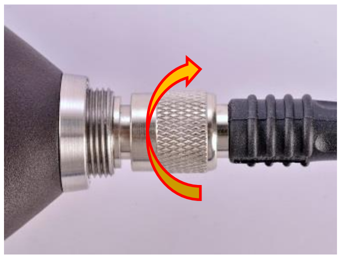
Optionally general-purpose vibration accelerometer 100 mV/g (10 mV/ms^{-2}) (SV 80) with a coiled cable for accelerometer 2 m (SC 27) can be used.

The SV 80 is an industry standard IEPE accelerometer offered for SVAN 977A. It is an ideal choice for walk-around measurement points in the rugged environments of industrial machinery monitoring, such as pumps, motors or fans. The accelerometer is mounted on a vibrating surface with the mounting magnet.

The design of SV 80 features the low electronic noise and wide temperature operating range.

The connection of the accelerometer to the instrument is like the microphone preamplifier, but there is only one ring to be tighten to the first screw thread.





Note: *After connecting the preamplifier or the accelerometer cable to the measurement input, the screw should be tightened to light resistance only. Do not over tighten this connector!*

14.4 RESETTING THE INSTRUMENT

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

- **HARDWARE RESET:** internal hardware reset, no user data is changed. Make sure the battery is not exhausted, and the unit is turned off. Hold down the **<Alt>** and **<Start/Stop>** keys for more than 15 seconds, and then release them. Turn on the instrument as usually.

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

Be aware, that a hardware reset:

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

- will stop measurement run!

14.5 FIRMWARE UPGRADE

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

To update the instrument firmware:

- Unpack the provided firmware package (provided as a suitable compressed file).
- Make sure the unit is turned off.
- Connect SC 16 cable to the computer and SV 977A instrument (USB interface).
- Keeping pressed the **<ENTER>** and ▲ keys switch on the instrument - the following message should appear on the unit's screen: BOOTSTRAP v1.06 (or higher).
- Wait for the message **<USB>** on the unit's screen and start from the PC: **go-usb.bat**.
- The changing number and final message: "..... o.k." should appear on the computer screen.
- Successful firmware update will be indicated by the message: *Program loaded!*
- Switch off the instrument.

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

14.6 PRESERVATION OF INTERNAL BATTERIES

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

14.7 TRANSPORTATION AND STORAGE

For transportation or storage purpose, we recommend using the packaging provided by the manufacturer. In a potentially dirty industrial environment it is advisable to use the carrying case provided by the manufacturer such as the fabric material case (SA 47), lightweight case (SA 143) or waterproof case (SA 79), which ensures excellent mechanical and environmental protection and long-term storage conditions.

14.8 CLEANING

Clean the surface of the instrument with damp soft cloth.

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

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

14.9 TROUBLESHOOTING

- In case your instrument does not respond proceed with hardware reset of the instrument (see Chapter 14.4).
- In case the reset does not help call your Local Authorized Distributor or Svantek Service Office.

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

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

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

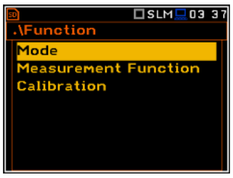
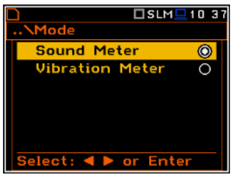
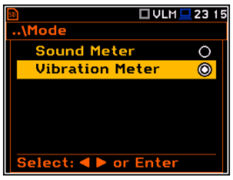
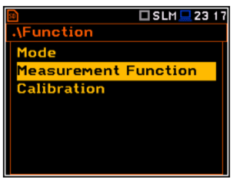
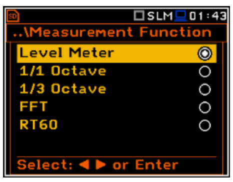
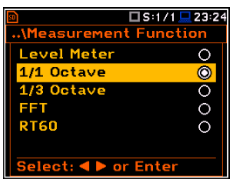
E-mail: office@svantek.com.pl
support@svantek.com.pl

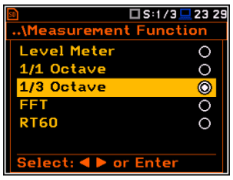
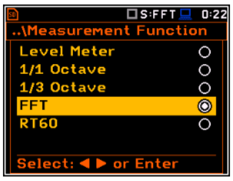
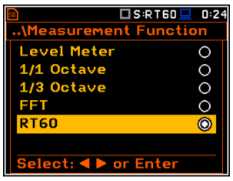
Internet: www.svantek.com

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

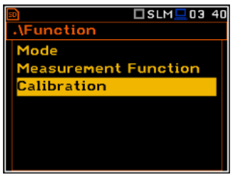
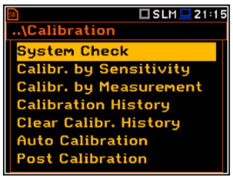
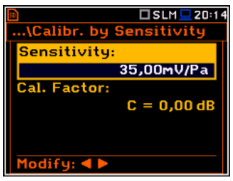
15 GLOSSARY

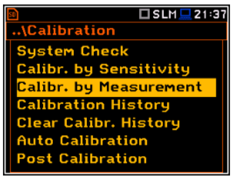
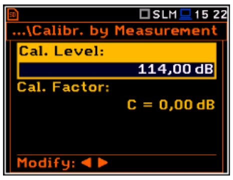
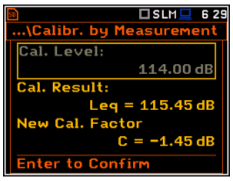
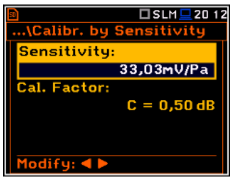
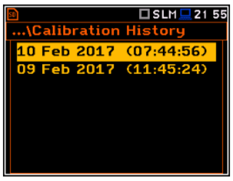
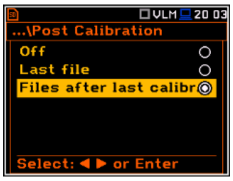
15.1 MODES AND MEASUREMENT FUNCTIONS

Name	***Description***	***Screen***	***Reference***
Function	The menu section enabling selection of the measurement *Mode*, *Measurement Function* and perform *Calibration* of the instrument.		Chapter 4
Mode	Mode of the instrument operation defined by the connected transducer: - noise parameters measurement (*Sound Meter*) or - vibration parameters measurement (*Vibration Meter*).		Chapter 4.1
Sound Meter	Measurement of sound parameters with connected microphone. When *Sound Meter* is selected all abbreviations of the *Measurement Function* start from S letter.		Chapter 4.1
Vibration Meter	Measurement of vibration parameters with connected accelerometer. When *Vibration Meter* is selected all abbreviations of the *Measurement Function* start from V letter.		Chapter 4.1
Measurement Function	Type of calculations the instrument currently performs (its abbreviation in the icon line of the display): - *Level Meter* (SLM or VLM), - *1/1 Octave* (S:1/1 or V:1/1), - *1/3 Octave* (S:1/3 or V:1/3), - *FFT* (S:FFT or V:FFT), - *RT60* (S:RT60).		Chapter 4.2
Level Meter	*Measurement Function* enabling calculation of broad band results (*Summary Results*) and time-history for sound measurements in accordance with Class 1 IEC 61672-1:2013 accuracy or vibration measurements in accordance with ISO 20816-1:2016. All results can be calculated in parallel by three virtual meters (so called profiles) using different weighting filters and LEQ/RMS detectors. When the *Level Meter* function is active the SLM or VLM abbreviation appears in the icon line.		Chapter 4.2
1/1 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/1-octave results for sound or vibration measurements in accordance with Class 1 IEC 61260-1: 2014. 1/1-octave results are presented as a spectrum plot - a function of result vs central band frequency and can be saved as a time-history. When the *1/1 Octave* function is active the S:1/1 or V:1/1 abbreviation appears in the icon line.		Chapter 4.2, 10

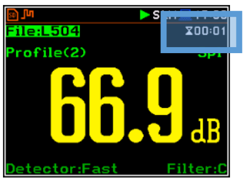
1/3 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/3-octave results for sound or vibration measurements in accordance with Class 1 IEC 61260-1: 2014. 1/3-octave results are presented as a spectrum plot - a function of result vs central band frequency and can be saved as a time-history. When the *1/3 Octave* function is active the S:1/3 or V:1/3 abbreviation appears in the icon line.		Chapter 4.2, 10
FFT	*Measurement Function* enabling calculation of *Level Meter* results and FFT spectrum for sound or vibration measurements. FFT spectrum is calculated based on Fast Fourier Transform algorithm and is presented as a function of signal amplitude vs frequency and can be saved as a time-history. When the *FFT* function is active the S:FFT or V:FFT abbreviation appears in the icon line.		Chapter 4.2, 11
RT60	*Measurement Function* enabling calculation of reverberation time in 1/1-octave bands (from 63Hz to 16kHz) or 1/3-octave bands (from 50 Hz to 20 kHz) including three total RMS levels (A, C and Z weighted). This analysis is used for building acoustic purposes. Depend on the type of the sound source used by the user two methods can be applied: Impulse Response Method and Interrupted Noise Method. Results are presented for 1/1 or 1/3 octave bands. When the *RT60* function is active the S:RT60 abbreviation appears in the icon line.		Chapter 4.3, 12

15.2 CALIBRATION

Name	*Description*	*Screen*	*Reference*
Calibration	Position on the *Function* screen that opens a screen with positions allowing to perform calibration or system check of the instrument: *System Check, Calibration by Sensitivity, Calibration by Measurement, Calibration History, Clear Calibration History, Auto Calibration* and *Post Calibration*.		Chapter 4.3
System Check	Position in the *Calibration* screen allowing to perform system check. ISO 8041 standard advises users to perform in-situ checks of measuring instruments. Checking should be carried out immediately before and after the measurement.		Chapter 4.3.1
Calibration by Sensitivity	Type of calibration with the use of microphone's published sensitivity information. This calibration doesn't perform any calibration measurement and doesn't require any calibrator.		Chapter 4.3.2, 4.3.3
Sensitivity	Transducer's sensitivity, given by the producer, which should be set during the *Calibration by Sensitivity*. For microphones the sensitivity is usually given in mV/Pa and for accelerometers – in mV/ms^{-2}.		Chapter 4.3.2, 4.3.3

Calibration by Measurement	Type of calibration based on the reference signal measurement with the use of a microphone or accelerometer calibrator.		Chapter 4.3.4, 4.3.5
Calibration Level	Level of the reference signal generated by used calibrator.		Chapter 4.3.4, 4.3.5
Calibration Result	Measured by the instrument reference signal level without calibration factor correction.		Chapter 4.3.4, 4.3.5
Calibration Factor	Difference between the reference signal level and the measured level. The calibration factor is always added to the results and measurement range limits.		Chapter 4.3
Calibration History	Records of previously performed calibrations of the instrument. Each record contains information about calibration date and time, calibration type, calibration factor etc.		Chapter 4.3.6
Clear Calibration History	Operation that clears all calibration records.		Chapter 4.3.7
Auto Calibration	Feature that enables automatic calibration when the reference sound or vibration signal is detected by the instrument.		Chapter 4.3.8
Post Calibration	Feature that enables performance of additional calibration in the end of the measurement session and add the new calibration factor to some files already saved in the instrument's memory.		Chapter 4.3.9

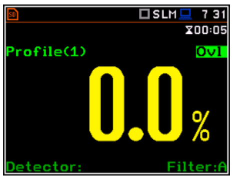
15.3 Definitions of Measured Results

Position	Description	Screen	Reference
Elapsed time	Time from the measurement start, that is displayed in the right upper corner of the display in the format ⌛mm:ss in the range from 00:00 to 59:59, or in the format ⌛hh:mm:ss in the range from 01:00:00 to 99:59:59, or in format ⌛xxxh from 100h to 999h, and ⌛>999h if the		Chapter 6.1

elapsed time exceeds 999 hours. Its maximum value is equal to the *Integration Period* and the elapsed time is zeroed when new measurement cycle starts.

Ovl

Percentage of the overloaded input signal, which occurred within the elapsed measurement time.

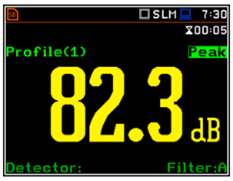


Appendix D D.1.2

Peak

For sound measurements: Peak Sound Level, the greatest instantaneous value of a standard frequency weighted sound pressure level within the elapsed measurement time.

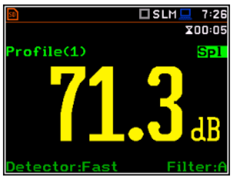
For vibration measurements: the greatest instantaneous value of a standard frequency weighted vibration (acceleration, velocity or displacement) within the elapsed measurement time.



Appendix D D.1.2, D.2.2

Spl

Sound Pressure Level, the maximal value of the frequency and time-weighted sound pressure level at the exponential RMS detector output for the last second.

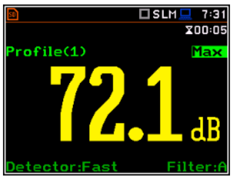


Appendix D D.1.2

Max

For sound measurements: maximal value of the time-weighted sound pressure level at the exponential RMS detector output within the elapsed measurement time. The *Max* result for the 1 second period is equal to the Spl result.

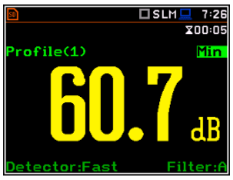
For vibration measurements: maximal value of the time-weighted vibration (acceleration, velocity or displacement) level at the exponential RMS detector output within the elapsed measurement time.



Appendix D D.1.2, D.2.2

Min

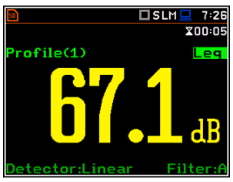
Minimal value of the time-weighted sound pressure level at the exponential RMS detector output within the elapsed measurement time.



Appendix D D.1.2

Leq

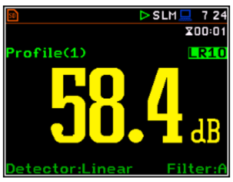
Equivalent continuous sound level, time-averaged sound level for the elapsed measurement time (equivalent sound level).



Appendix D D.1.2

LRm

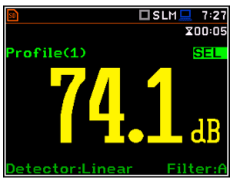
Rolling (sliding) *Leq* screen for the last m minutes of measurement (m x 60 seconds) moving with 1 second step.



Chapter 5.1 Appendix D D.1.2

SEL

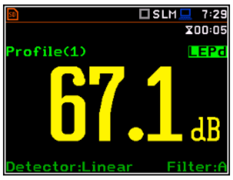
Sound Exposure Level, the constant sound level that has the same amount of energy in one second as the original noise event and is the subset of the *Leq* result so, for the integration time equal to 1 s, *SEL* is always equal to *Leq*.



Appendix D D.1.2

LEPd

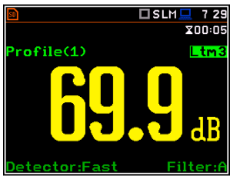
Daily Personal Noise Exposure, the noise exposure level for a nominal 8-hour working day, used for assessing the noise exposure of a worker during a working day. The *LEPd* result is calculated on the base of the *Leq*.



Appendix D D.1.2

Ltm3

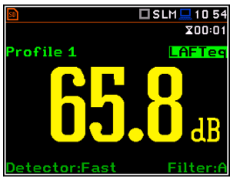
Takt-Maximal Level calculated according to the German standard TA Lärm.



Appendix D D.1.2

LTeq

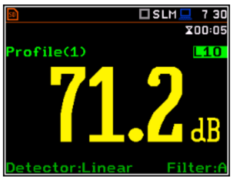
Takt-Maximal Level calculated according to the German standard TA Lärm.



Appendix D D.1.2

Lnn

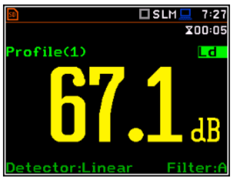
Statistical Noise Levels, the certain boundary level surpassed by the temporary noise level values in not more than nn% of the observation period. *Lnn* are calculated on the base of 100ms Leq results and renewed every second on the display as cumulated statistics over the current measurement time.



Appendix D D.1.2, D.4

L(den)

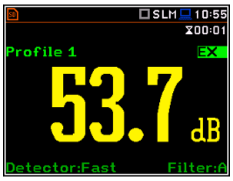
Day-evening-night equivalent level, *Leq*. Sound Level, measured over the 24 hour period, with a 10 dB penalty added to the levels between 23.00 and 07.00 hours and a 5 dB penalty added to the levels between 19.00 and 23.00 hours to reflect people's extra sensitivity to noise during the night and the evening. The instrument displays: Ld, Le, Ln, Lde, Len, Lnd, or Lden depending on the day and night time which the measurement covers. Due to different country requirements, it is possible to shift day time from 7h-19h to 6h-18h.



Appendix D D.1.2

EX

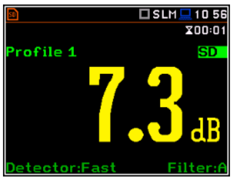
Expected value. Calculated on the basis of 100ms RMS results.



Appendix D D.1.2

SD

Standard deviation. Calculated on the basis of 100ms RMS results.

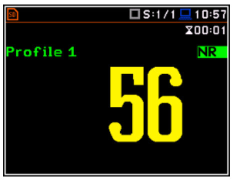


Appendix D D.1.2

NR

Noise Rating, measured noise level that takes into account the frequency content of the noise.

NR is calculated if 1/1 Octave function is active.

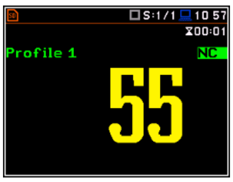


Appendix D D.1.2

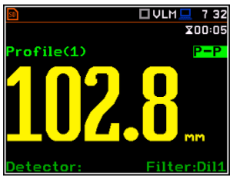
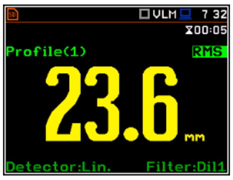
NC

Noise Criterion, measured noise level that takes into account the frequency content of the noise.

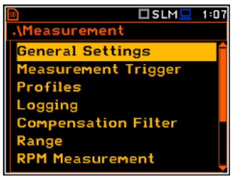
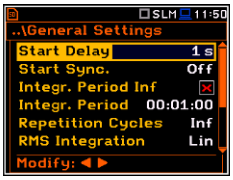
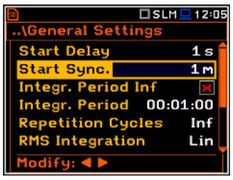
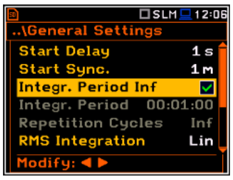
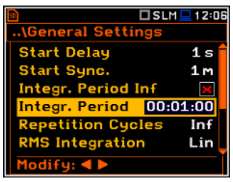
NC is calculated if 1/1 Octave function is active.



Appendix D D.1.2

P–P	Peak-to-peak, the difference between highest and lowest value of the signal within the elapsed measurement time.		Appendix D D.2.2
RMS	Root Mean Square result of the time-weighted vibration (acceleration, velocity or displacement) level within the elapsed measurement time.		Appendix D D.2.2

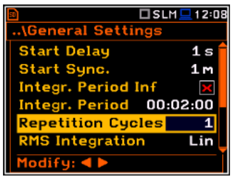
15.4 Measurement parameters

Position	***Description***	***Screen***	***Reference***
Measurement	Section of the Main Menu that enables selecting the measurement parameters in the screens: *General Settings, Measurement Trigger, Profiles, Logging, Spectrum, FFT, RT60 Settings, Compensation Filter, Range, RPM Measurement, Exposure Time, Statistical Levels, Timer* and *Alarms*.		Chapter 5
General Settings	General measurement settings: *Start Delay, Start Sync., Integration Period Inf., Integration Period, Repetition Cycles, RMS Integration, Day Time Limits* and *Rolling Time*.		Chapter 5.1
Start Delay	Delay between pressing the <Start> key and the start of measurement integration.		Chapter 5.1
Start Synch.	Synchronization of the measurement/integration start to the nearest full minute or hour of the instrument real-time clock. It helps to measure in full cycles.		Chapter 5.1
Integr. Period Inf	Infinitive averaging of *Summary Results* that lasts from start of the measurement till its cancellation with the <Stop> key or remotely.		Chapter 5.1
Integration Period	Time of averaging of *Summary Results*: from 1 second to Infinitive. For example, with 8 hours integration period the LEQ result will be averaged for 8 hours. In case of Infinitive, the measurement will last until the user presses the <Stop> key.		Chapter 5.1

Repetition Cycles

Number of measurement/integration repetitions after the <Start> key pressure.

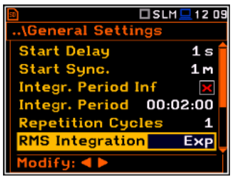
This enables to make a series of measurements without pressing the <Start> key and save this series in the results file.



Chapter 5.1

RMS Integration

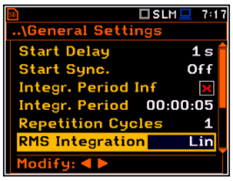
Type of integration of RMS based results (RMS detector): *Linear* or *Exponential*. The IEC 61672-1:2013 standard requires Linear integration, without time weighting, however in some countries old regulation refers to the Exponential RMS integration with standard time weighting: Fast or Slow.



Chapter 5.1

Linear

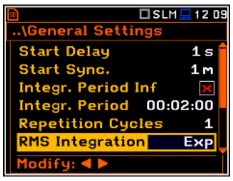
Linear type of integration of RMS based results (RMS detector), without time weighting according to the IEC 61672-1:2013 standard.



Chapter 5.1

Exponential

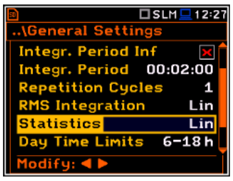
Exponential type of integration of RMS based results (RMS detector), where averaging is a continuous process that weighs current and past data differently. The amount of weight given to past data as compared to current data depends on the exponential time constant. In the exponential averaging, the averaging process continues indefinitely.



Chapter 5.1

Statistics

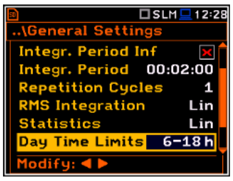
Method for calculation of statistics for RMS results: with linear detector (Lin) or exponential detector (Exp), e.g. Impulse, Fast or Slow time constant.



Chapter 5.1

Day Time Limits

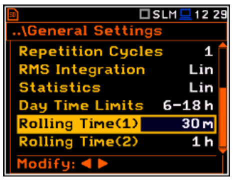
Definition of the day and night periods required by local standards: 6–18h and 7–19h. These limits are used for the calculation of the L(den) function.



Chapter 5.1

Rolling Time

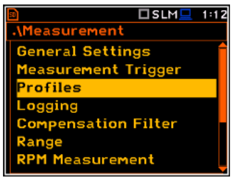
Time frame for the "Rolling Leq" calculation. The Rolling Leq is presented as LR+<time frame>. For example, if the *Rolling Time* is equal to 30 minutes, the appropriate result will be named as LR30 and calculated each second as Leq integrated during last 30 minutes.



Chapter 5.1

Profiles

Virtual broadband level meters, which calculate the set of results with own weighting filter (*Filter*) and exponential detector time constant (*Detector*).



Chapter 5.3

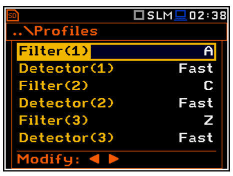
Filter

Weighting filter applied in the profile in accordance with most applicable world standards:

- for sound measurements: Z, A, C, B, U, AU, LF,

- for vibration measurements:

  - acceleration: HP, HP1, HP3, HP10, Wh,
  - velocity: Vel1, Vel3, Vel10 and VelMF,
  - displacement: Dil1, Dil3 and Dil10.

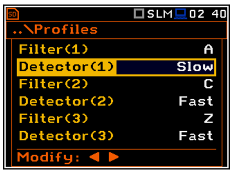


Chapter 5.3
Appendix C
Appendix D

Detector

Exponential RMS detector time constant applied in the profile:

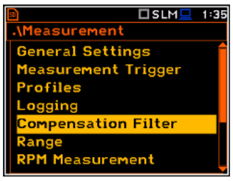
- *Impulse*, *Fast* or *Slow* for sound results like *Leq, Lmax, Lmin, SEL, LEPd, Lden, Spl, Ltm3 and LTeq*;
- from 100ms to 10s for vibration results like *RMS, MAX*.



Chapter 5.3 Appendix D D.1.2

Compensation Filter

Digital filter that compensates some effect: *Free Field*, *Diffuse Field, Outdoor Environment, Outdoor Airport* and *Windscreen*.



Chapter 5.6

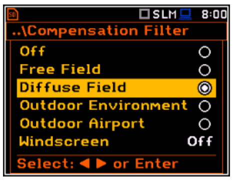
Free Field

Digital filter that compensates the free field effect.

Chapter 5.6

Diffuse Field

Digital filter that compensates the diffuse field effect.



Chapter 5.6

Outdoor Environment

Digital filter that compensates the effect of the SA 277 outdoor microphone protection unit in the free field for the reference acoustic wave incidence angle 90 deg.

Chapter 5.6

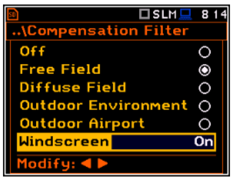
Outdoor Airport

Digital filter that compensates the effect of the SA 277 outdoor microphone protection unit in the free field for the reference acoustic wave incidence angle 0 deg.

Chapter 5.6

Windscreen

Digital filter that compensates the effect of the SA 22 windscreen when Free Field or Diffuse Field options are selected.

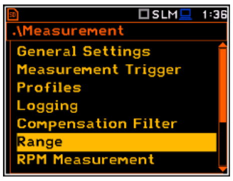


Chapter 5.6

Range

Position that enables selecting the linear operating range for the sinusoidal signal: *Low* or *High*. The calibration factor is always added to the upper range limits.

The ranges depend on the selected *Compensation Filter*.



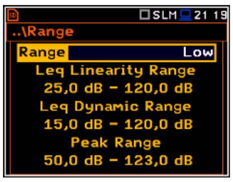
Chapter 5.7

Low

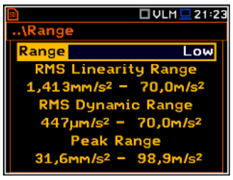
Low linear operating range for the sinusoidal signal.

The calibration factor is always added to the upper range limit.

The range depends on the selected *Compensation Filter*.



Chapter 5.7 Appendix C

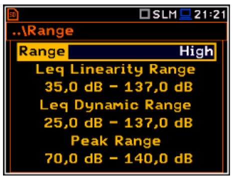


High

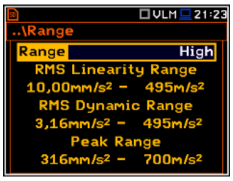
High linear operating range for the sinusoidal signal.

The calibration factor is always added to the upper range limit.

The range depends on the selected *Compensation Filter*.

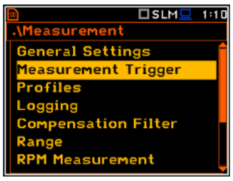


Chapter 5.7 Appendix C



Measurement Trigger

Screen that enables configuring trigger of the measurement/integration process with parameters: *Trigger, Source, Level* and *Gradient*.

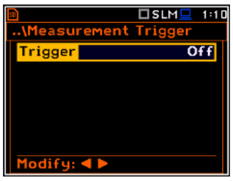


Chapter 5.2

Trigger

Position that switches *Off* or on the measurement trigger by selecting its type: *Slope +, Slope –, Level +, Level –, Grad +* or *External*.

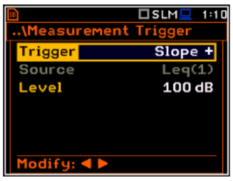
If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „measurement" icon.



Chapter 5.2

Slope +

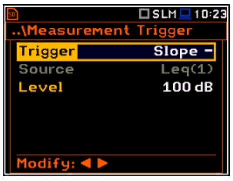
Type of trigger that starts the measurement/integration by the duration of the *Integration Period* under the condition: rising value of the RMS result (*Source*) integrated during 0,5 ms passes above the threshold level (*Level*).



Chapter 5.2

Slope -

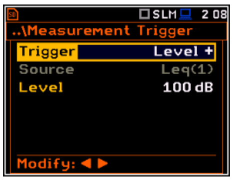
Type of trigger that starts the measurement/integration by the duration of the *Integration Period* under the condition: falling value of the RMS result (*Source*) integrated during 0,5 ms passes below the threshold level (*Level*).



Chapter 5.2

Level +

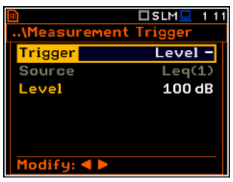
Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0,5 mc. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.



Chapter 5.2

Level -

Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is lower than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0,5 mc. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the



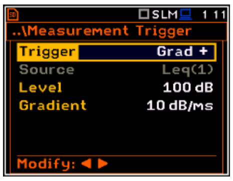
Chapter 5.2

Integration Period consists and stops the measurement cycle.

Grad +

Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold level (*Level*) and the gradient of this Source is greater than the threshold level (*Gradient*). In other cases, the instrument continues checking the trigger condition every 0,5 mc. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.

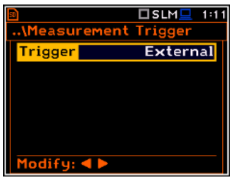
This type of trigger has the same logic as *Level +* trigger, but the trigger condition requires also gradient level to be exceeded.



Chapter 5.2

External

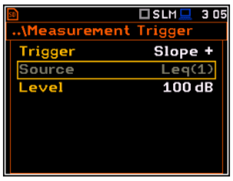
Type of trigger that starts the measurement/integration when the trigger signal appears on the I/O socket of the instrument. After the measurement/ integration start from the trigger, the measurement/integration will continue by the *Integration Period*.



Chapter 5.2

Source

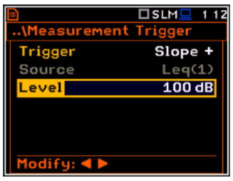
Measured result that is compared with the threshold level (*Level*) for triggering – RMS measured in the first profile: Leq(1) in sound modes and RMS(1) in vibration modes.



Chapter 5.2

Level

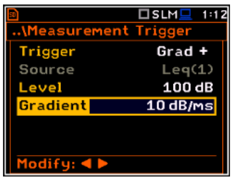
Threshold level of *Source* for triggering condition fulfilment.



Chapter 5.2

Gradient

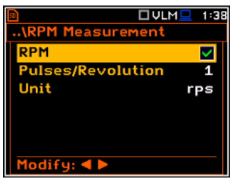
Threshold level of the *Source* gradient for triggering condition fulfilment.



Chapter 5.2

RPM Measurement

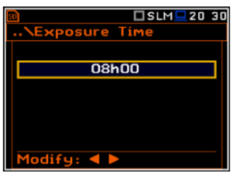
Screen that enables configuring measurement of the rotation per minute/second. To perform the RPM measurement the RPM probe should be connected to the I/O socket.



Chapter 5.8

Exposure Time

Screen that enables setting a duration of worker's exposition to the noise. This duration is considered in LEPd calculations.

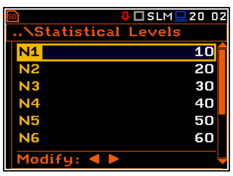


Chapter 5.9

Appendix D D.1.2

Statistical Levels

Screen that enables setting a boundary level (*Lnn*) surpassed by the temporary noise level values in not more than nn**%** of the observation period. The user can define ten statistical levels, named from N1 to N10, to be calculated, displayed and saved in the files together with the main results.



Chapter 5.10

Appendix D D.4

Timer

Screen that enables configuring automatic switching *On* the instrument and performing the measurement on the programmed time with defined setup. Timer can be *Single* or repeatable (*Multiple*).

After every timer cycle, the instrument automatically switches itself off.

Chapter 5.11

Logging

Screen that enables switching the logger function on and setting the main logging parameters: *Logger*, *Summary Results*, *Logger Step*, *Logger Name* and *Split*.

Chapter 5.4

Logger Setup

Screen that enables setting the main logging parameters: *Logger*, *Summary Results*, *Logger Step*, *Logger Name* and *Split*.

Chapter 5.4.1

Logger

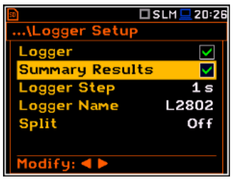
Position in the *Logger Setup* list that switches on or off the *Logging* function.

If *Logger* is switched off only *Wave Recording* is available.

Chapter 5.4.1

Summary Results

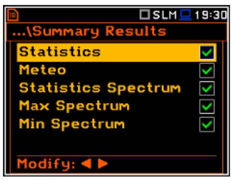
Position in the *Logger Setup* list that switches on or off saving of the summary results measured with the *Integration Period* step: *Spl, Leq, Sel, LEPd, Ltm3, LTeq, 10xLnn, Ovl, Peak, Max, Min, EX, SD, NC, NR, 2xLR* for sound measurements and *RMS, Ovl, Peak, P–P* for vibration measurements. *Summary Results* are measured, displayed and saved in a logger file as records as many times as defined by the *Repetition Cycles* parameter. They are renewed at the display every second when the measurement is running.



Chapter 5.4.1

Summary Results

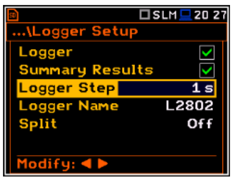
Screen in the Logging list enabling configuring of the *Summary Results* structure which may include also: results from the meteorological station (*Meteo*), *Statistics*, statistics for 1/1 and 1/3 octaves (*Statistics Spectrum*), spectra for max and min results (*Max Spectrum* and *Min Spectrum*).



Chapter 5.4.3

Logger Step

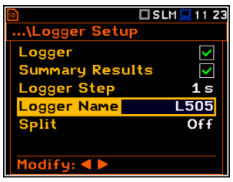
Time of measuring/integrating *Logger Results* and recording them to the logger file (same meaning as *Integration Period* for *Summary Results*). *Logger Step* can be selected from the set: 2 ms, 5ms, 10ms, 20ms, 50ms, 100ms, 200ms, 500ms or from 1 second to 59 seconds with 1-second step or from 1 minute to 59 minutes with 1-minute step and up to 1 hour.



Chapter 5.4.1

Logger Name

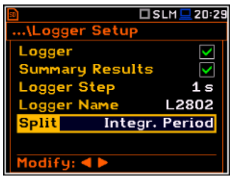
Position in the *Logger Setup* screen that enables defining the name of file in which *Logger Results*, *Summary Results* and *Markers* will be saved.



Chapter 5.4.1

Split

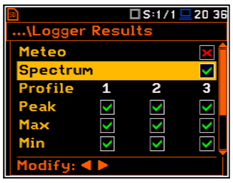
Position in the *Logger Setup* screen that enables saving of the logger records in separate files according to different rules: after the integration period, or every quarter / half an hour / hour, or on specific times of a day.



Chapter [5.4.1]

Logger Results

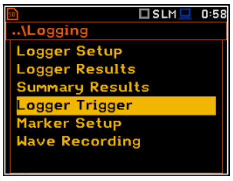
Screen in the *Logging* list enabling selecting results that will be logged to a logger file with *Logger Step* as time-histories: *Peak, Max, Min, Leq, 2xLR* and *LXY* for sound measurements and *Peak, P-P, Max* and *RMS* for vibration measurements as well as the series of results obtained from the weather station (*Meteo*). For the *1/1 Octave* and *1/3 Octave* functions also spectra can be logged.



Chapter [5.4.2]

Logger Trigger

Screen that enables configuring parameters for triggering of *Logger Results* recording to the logger file: *Trigger, Source, Level, Pre* and *Post*.

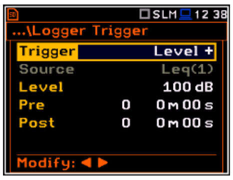


Chapter [5.4.4]

Trigger

Position that switches Off or On the logger trigger by selecting its type: *Level* + or *Level* –.

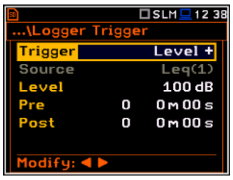
If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „logger" icon.



Chapter [5.4.4]

Level +

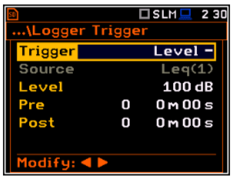
Type of trigger, that starts logging of *Logger Results* under the condition: value of the Leq/RMS result (*Source*) integrated by the *Logger Step* period is greater than the threshold level (*Level*). In other cases, the logging is skipped.



Chapter [5.4.4]

Level -

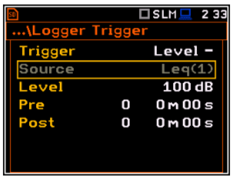
Type of trigger, that starts logging of *Logger Results* under the condition: value of the Leq/RMS result (*Source*) integrated by the *Logger Step* period is lower than the threshold level (*Level*). In other cases, the logging is skipped.



Chapter [5.4.4]

Source

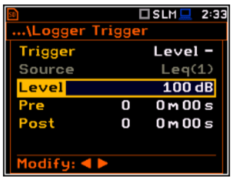
Measured result that is compared with the threshold level (*Level*) for triggering – RMS measured in the first profile: Leq(1) in sound modes and RMS(1) in vibration modes.



Chapter [5.4.4]

Level

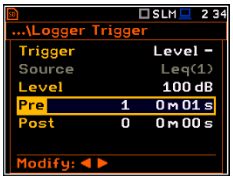
Threshold level of *Source* for triggering condition fulfilment.



Chapter [5.4.4]

Pre

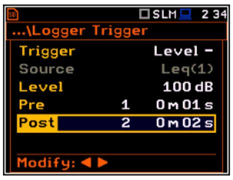
Period of additional logging before triggering condition fulfilment.



Chapter [5.4.4]

Post

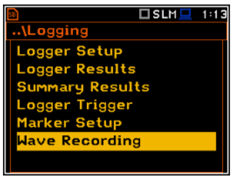
Period of additional logging after triggering condition fulfilment.



Chapter [5.4.4]

Wave Recording

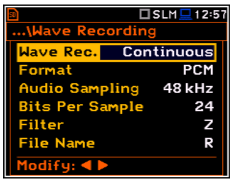
Recording of the waveform signal to a file with the extension WAV. Files WAV are created automatically. Every time a wave recording starts the new WAV file is created and is closed when recording stops.



Chapter [5.4.6]

Wave Rec.

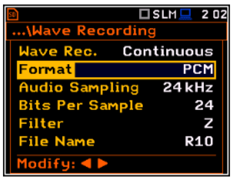
Switching on the wave recording by selecting its type: *Continuous* or *On Trigger*. *Continuous* means that the wave signal will be recorded continuously from the start of the measurement till its end. *On Trigger* recording put additional conditions for triggering and ending of the recording.



Chapter [5.4.6]

Format

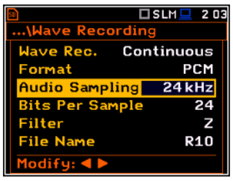
WAV file format: PCM or Extensible. PCM is typical supported by the audio players.



Chapter [5.4.6]

Audio Sampling

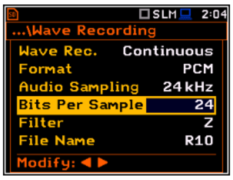
Sampling frequency of the wave recording: 12kHz, 24kHz or 48kHz. The higher sampling corresponds with the better quality of the recorded signal but increases size of the file.



Chapter [5.4.6]

Bits Per Sample

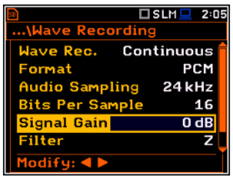
Number of recorded bits per sample: 16 or 24.



Chapter [5.4.6]

Signal Gain

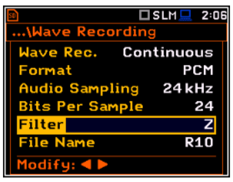
Gain of the recorded signal, when 16 bits per sample was selected: 0dB … 40dB.



Chapter [5.4.6]

Filter

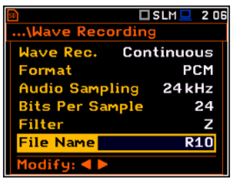
Weighting filter during the wave signal recording: A, B, C or Z for sound and HP for vibration. The Z filter is recommended for audio listening.



Chapter [5.4.6]

File Name

Name of the WAV type file.



Chapter [5.4.6]

Trigger

Parameter that enables switching Off or selecting the trigger type for triggering wave recording: *Slope +*, *Slope –*, *Level +*, *Level –*, *External*, *Integr. Period* and *Int. Period Split*.

If the instrument is waiting for the trigger condition, which is checked with *Trigger Period* intervals, the appropriate trigger icon is flashing on the display alternatively with the „note” icon.

Chapter 5.4.6

Slope +

Type of trigger that starts the wave recording for *Recording Time* under the condition: rising value of the Leq/RMS result (*Source*) integrated during *Trigger Period* passes above the threshold level (*Level*).

Chapter 5.4.6

Slope -

Type of trigger that starts the wave recording for *Recording Time* under the condition: falling value of the Leq/RMS result (*Source*) integrated during *Trigger Period* passes below the threshold level (*Level*).

Chapter 5.4.6

Level +

Type of trigger that starts the wave recording for *Recording Time* under the condition: value of the Leq/RMS result (*Source*) integrated during *Trigger Period* is greater than the threshold level (*Level*).

Chapter 5.4.6

Level -

Type of trigger that starts the wave recording for *Recording Time* under the condition: value of the Leq/RMS result (*Source*) integrated during *Trigger Period* is lower than the threshold level (*Level*).

Chapter 5.4.6

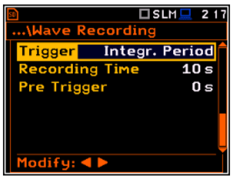
External

Type of trigger that starts the wave recording for *Recording Time* when the triggering signal appears on the I/O socket of the instrument.

Chapter 5.4.6

Integr. Period

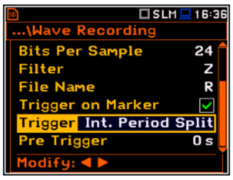
Type of trigger, enabling the wave recording start for *Recording Time* every time the measurement starts. If *Integration Period* is shorter than *Recording Time,* the wave recording will be continued for additional *Recording Time*.



Chapter 5.4.6

Int. Period Split

Type of trigger, enabling the wave recording start for *Integration Period* every time the measurement starts.



Chapter 5.4.6

Source

Measured result that is compared with the threshold level for triggering (*Level*) measured in the first profile: Leq(1) in the sound mode and RMS(1) in the vibration mode.

Chapter 5.4.6

Level — Threshold level of the trigger condition.

Chapter 5.4.6

Trigger Period — Time interval of checking the triggering conditions. This parameter can be set as: Log. Step (same as *Logger Step* value), 0.5ms, 100.0ms and 1s.

Chapter 5.4.6

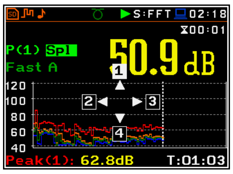
Recording Time — Time of signal recording after meeting every trigger condition. The available values can be selected from 1s to 8h or Infinite. Recording stops after *Recording Time* or earlier if the measurement is stopped manually.

Chapter 5.4.6

Pre Trigger — Period of signal recording before the first trigger condition fulfilment. The length of pre-recording depends on sampling rate.

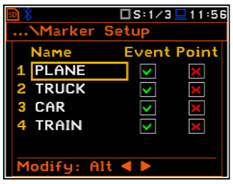
Chapter 5.4.6

Marker — Marker is used to mark (or highlight) special point or event during the measurement. For example, for an airplane flight it can be marked the beginning and end of the block of logger results in which this event occurred. In case of point markers there is only one record (start) in the logger file. Markers are activated in the result presentation screen by pressing the arrow keys.



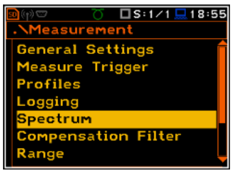
Chapter 2.1

Marker Setup — Position in the Menu that enables to set up the markers – name them and define them as Event or Point type.



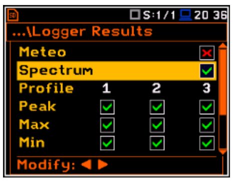
Chapter 5.4.5

Spectrum — Screen that enables setting the *1/1 Octave, 1/3 Octave* spectrum parameters: *Band*, *Filter* and *Detector*.



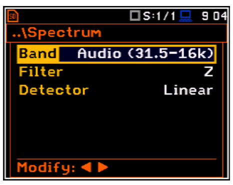
Chapter 10.2.4

Spectrum — Position in the *Logger Results* screen that switches on / off spectra saving as a time-history in a logger file.



Chapter 10.2.3

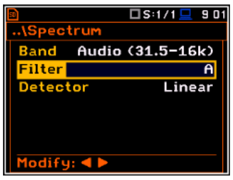
Band — Frequency range of 1/1 or 1/3 spectrum. Depending on the function and mode of the instrument the frequency range can be selected for sound measurements: *Audio (31.5-16k), Ultra (1-31.5k)* for *1/1 Octave* and *Audio (20-20k), Ultra (0.8-40k)* for *1/3 Octave*; and for vibration measurements: *Full (1-16k), Ultra (1-31.5k)* for *1/1 Octave* and *Full (0.8-20k), Ultra (0.8-40k)* for *1/3 Octave*.



Chapter 10.2.4

Filter

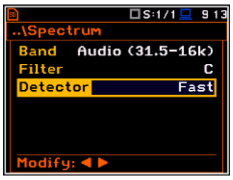
Weighting filters for the *1/1 Octave* and *1/3 Octave* analysis: *A, B, C, Z* for sound analysis with *Audio* band, *HP* for vibration analysis with *Full* band and *HPE* for sound and vibration analysis with *Ultra* band.



Chapter [10.2.4](#)

Detector

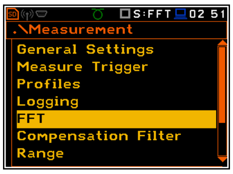
Type of integration of RMS based results for *1/1 Octave* and *1/3 Octave* analysis: *Linear, Fast or Slow* for sound measurements and *Linear* for vibration measurements.



Chapter [10.2.4](#)

FFT

Screen that enables setting the FFT spectrum parameters: *Band*, *Filter*, *Screen*, *Lines* and *Averaging*.



Chapter [11.2.4](#)

Band

Frequency band in which the FFT analysis is performed: *20 kHz, 10 kHz, 5 kHz, 2.5 kHz, 1.25 kHz, 625 Hz, 312 Hz, 156 Hz* and *78 Hz*.

Chapter [11.2.4](#)

Filter

Weighting filters used during the FFT analysis: A, C, B, Z in the sound mode and HP in the vibration mode.

Chapter [11.2.4](#)

Window

Weighting window for the FFT analysis: *Hanning, Rectangle, Flat Top* or *Kaiser-Bessel*.

Chapter [11.2.4](#)

Lines

Number of lines in the FFT spectrum: *1600, 800* or *400*.

Chapter [11.2.4](#)

Averaging

Averaging used in the FFT analysis: *Linear* or *Exponential*.

Chapter [11.2.4](#)

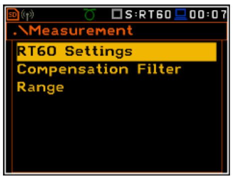
Time Constant

Time constant used in the exponential averaging of FFT spectra.

Chapter [11.2.4](#)

RT60 Settings

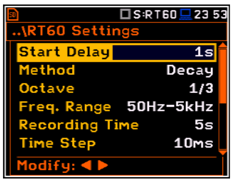
Screen that enables setting the reverberation time measurement parameters: *Start Delay, Method, Octave, Freq. Range, Recording Time, Time Step, Averaging, Noise Mar., Logger Name* and *Level*.



Chapter 12.2 Appendix E

Start Delay

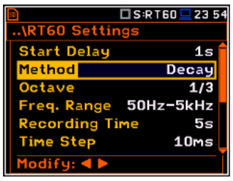
Delay between pressing the <Start> key and the start of measurement integration.



Chapter 12.2

Method

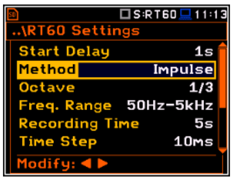
Method of the RT60 calculation: *Decay* (Interrupted Noise Method) or *Impulse* (Impulse Response Method). The selection of the method depends on the used type of the sound source.



Chapter 12.2 Appendix E

Impulse

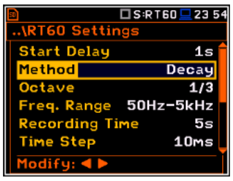
Method of RT60 calculation that uses the impulse sound source (like pistol shot, petard explosion).



Chapter 12.2 Appendix E

Decay

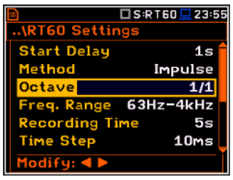
Method of RT60 calculation intended for measurements when room is excited by broad or narrow band sound noise source (usually pink noise).



Chapter 12.2 Appendix E

Octave

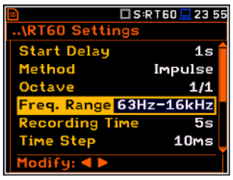
Type of spectrum (1/1-octave or 1/3-octave) based on which the RT60 analysis is performed.



Chapter 12.2 Appendix E

Freq. Range

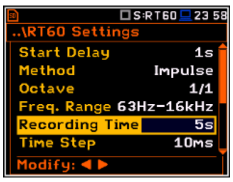
Frequency range for RT60 calculations: *63Hz-4kHz* (7 bands) and *63Hz-16kHz* (9 bands) for 1/1-octave; *50Hz-5kHz* (21 bands) and *50Hz-20kHz* (27 bands) for 1/3 octave.



Chapter 12.2 Appendix E

Recording Time

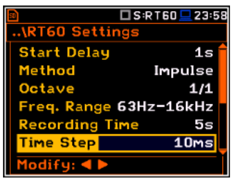
Time of measurement data (sound pressure level decay curve) registration during RT60 calculations: *1s .. 30 s*.



Chapter 12.2 Appendix E

Time Step

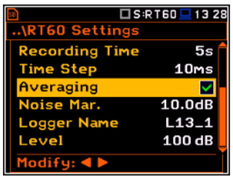
Time-step of data registration (sound pressure level) in the file during RT60 calculations: *2, 5, 10, 20, 50, 100 ms*.



Chapter 12.2 Appendix E

Averaging

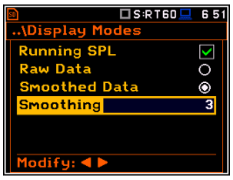
Process of averaging of the reverberation time results from several measurements during RT60 calculations.



Chapter [12.2](#) Appendix E

Smoothing

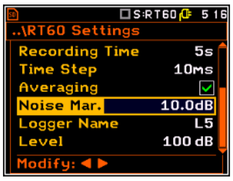
Process of smoothing of the raw reverberation time results. This is used for better visualization of the RT60 results. The value of this parameter means number of samples taken into consideration by the smoothing algorithm. The higher is this number the smoother is a graph.



Chapter [12.2](#) Appendix E

Noise Mar.

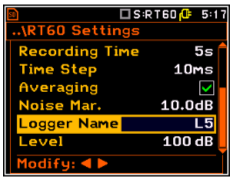
Margin value to the calculated noise level for RT60 calculations: *0 ÷ 20 dB*.



Chapter [12.2](#) Appendix E

Logger Name

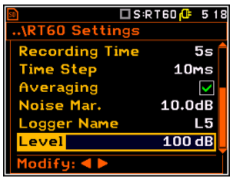
Name of the Logger file in which data of the RT60 analysis will be recorded.



Chapter [12.2](#)

Level

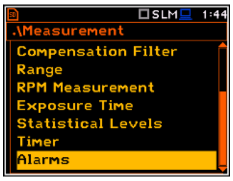
Threshold level of the sound source for triggering the RT60 measurement. If the measured sound is below the *Level* value, the RT60 measurement will not start.



Chapter [12.2](#) Appendix E

Alarms

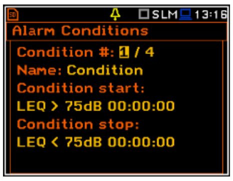
Instrument's function, enabling alarm setting, generation and alerting. The alarm setting can be done through the SvanPC++ software. If *Alarms* were defined the they can be seen in the instrument's screens. Some terms, used in the SvanPC++ software, are presented below:



Chapter [5.12](#)

Alarm Conditions

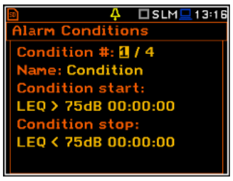
List of alarm conditions. Alarm condition can be a *Threshold* or *Time* type.



Chapter [5.12](#)

Threshold

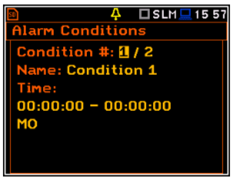
Alarm condition type. Alarm is generated if the selected result (*Leq, Lpeak, Lmax, Lmin* or sliding *Leq* for screens of 15 or 60 minutes) exceeds the threshold level.



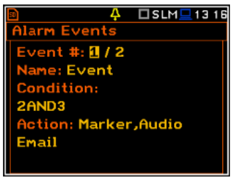
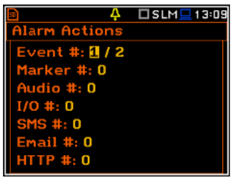
Chapter [5.12](#)

Time

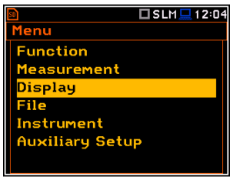
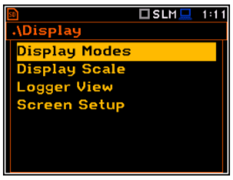
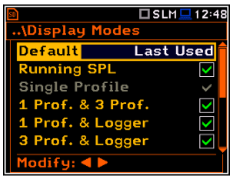
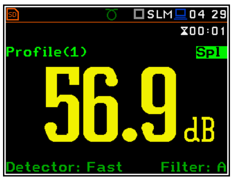
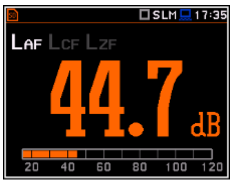
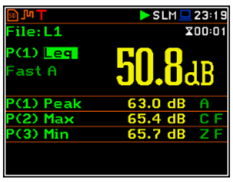
Alarm condition type. Alarm is generated in the selected days of the week and during the defined time period.



Chapter [5.12](#)

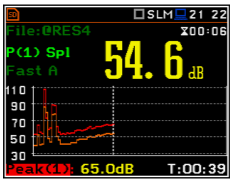
Event	Event that generates alarm based on combination of *Threshold* and *Time* conditions. For each event, a different type of *Action* can be set.		Chapter 5.12
Action	Type of action in case of alarm: marker, audio, external I/O, SMS text message, or e-mail.		Chapter 5.12

15.5 DISPLAY PARAMETERS

Name	*Description*	*Screen*	*Reference*
Display	Section of the Main Menu that enables setting of the measurement views.		Chapter 6
Display Mode	Mode of measurement results presentation/view. Modes can be activated in the *Display Modes* screen.		Chapter 6.1
Default view	Mode of measurement results view that will be presented after instrument's turn on.		Chapter 6.1
Single Profile view	Mode of the one result view. This mode is always available and cannot be disabled in most functions: *Level Meter*, *1/1 Octave*, *1/3 Octave* and *FFT*.		Chapter 6.1.2
Running SPL view	Mode of the running SLP result view in Sound measurement modes. This mode is used for the noise level estimation before the measurement start.		Chapter 3.3
1 Prof. & 3 Prof. view	Mode of presentation of one result in the upper part of the screen and three results in the lower part of the screen.		Chapter 6.1.3

1 Prof. & Logger view

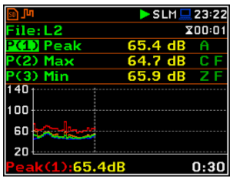
Mode of presentation of one result in the upper part of the screen and time history (logger) results in the lower part of the screen.



Chapter [6.1.3](#)

3 Prof. & Logger view

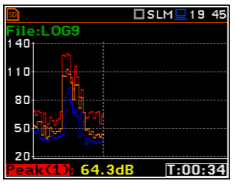
Mode of presentation of three results in the upper part of the screen and time history (logger) results in the lower part of the screen.



Chapter [6.1.3](#), [6.1](#)

Logger view

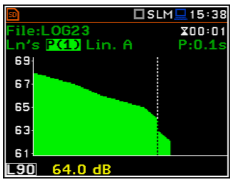
Mode of presentation of time-history (logger) results.



Chapter [6.1.4](#)

Statistics view

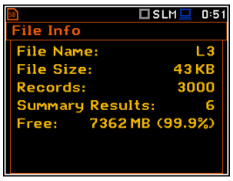
Mode of presentation of statistics of sound results.



Chapter [6.1.6](#)

File Info view

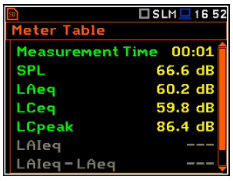
Presentation of information regarding file: name, size, number of records, etc.



Chapter [6.1.9](#)

Meter Table view

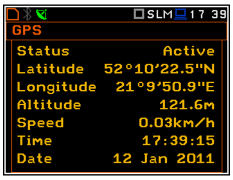
List of predefined results with assigned weighting filters and detector type.



Chapter [6.1.7](#)

GPS view

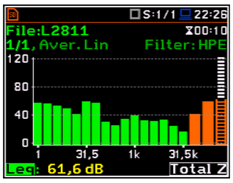
Presentation of GPS information: *Status, Latitude, Longitude, Altitude, Speed, Time* and *Date*.



Chapter [6.1.8](#)

Spectrum view

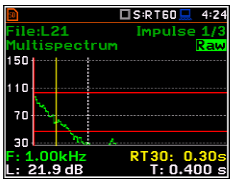
Mode of presentation of different spectra: *1/1 Octave*, *1/3 Octave* and *FFT*.



Chapter [6.1.5](#), [10.3](#), [11.3](#)

Raw Data view

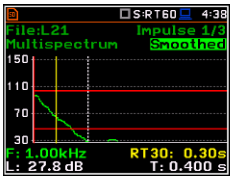
Presentation of decay curve of *Leq* results for 1/1 or 1/3-octave bands, integrated within *Time Step* interval.



Chapter [12.5](#)

Smoothed Data view

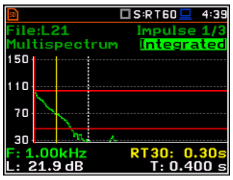
Presentation of smoothed decay curve of *Leq* results for 1/1 or 1/3-octave bands.



Chapter 12.5

Integrated Data view

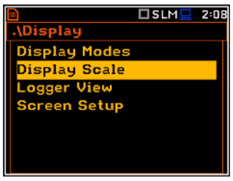
Presentation of the integrated raw decay curve (Schroeder curve).



Chapter 12.5

Display Scale

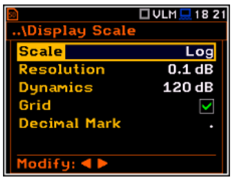
Screen that enables setting parameters of results presentation: *Scale*, *Resolution*, *Dynamics*, *Grid* and *Decimal Mark*.



Chapter 6.2

Scale

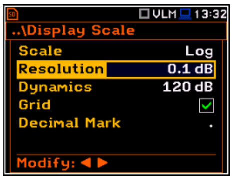
Scale and units of results presentation: linear (Lin) or logarithmic (Log). In case of Lin, results are presented in absolute units and the Y-scale of the time history or spectrum plot is linear. In case of Log, results are presented in logarithmic units (dB) and the Y-scale of the time history or spectrum plot is logarithmic. Sound measurement results are presented always in logarithmic units (dB).



Chapter 6.2

Resolution

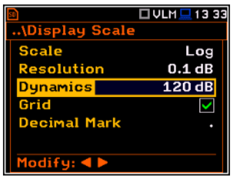
Number of digits after the decimal point of the results presentation: one digit after the decimal point (*0.1 dB*) or two digits after the decimal point (*0.01 dB*).



Chapter 6.2

Dynamics

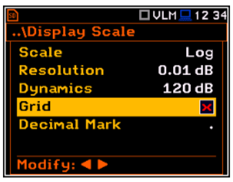
Range of the plot scale: *10dB, 20dB, 40dB, 80dB, 100dB* and *120dB*.



Chapter 6.2

Grid

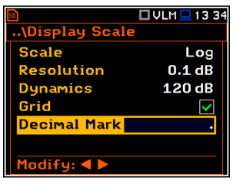
Grid swither on or off during the time history or spectrum presentation.



Chapter 6.2

Decimal Mark

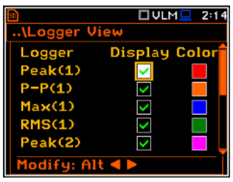
Parameter that defines which decimal mark (point or comma) will be used for data presentation in all presentation modes.



Chapter 6.2

Logger View

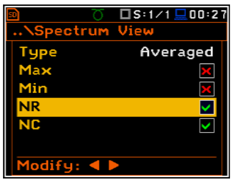
Screen that enables selecting of time-history results, which will be presented on the display and colours of their plots.



Chapter 6.3

Spectrum View

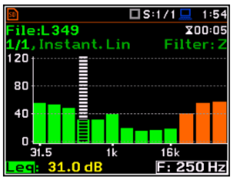
Screen that enables selecting of types of spectra for displaying: *Averaged*, *Instantaneous*, *Max*, *Min, NR* and *NC*.



Chapter 10.3.3, 11.3.3

Instantaneous

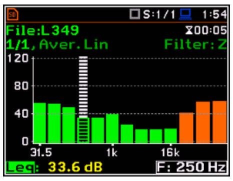
Spectrum of instantaneous Leq results for the *1/1-octave* or *1/3-octave* bands.



Chapter 10.3.3, 11.3.3

Averaged

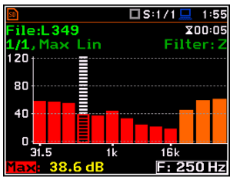
Spectrum of averaged Leq results for the *1/1-octave* or *1/3-octave* bands.



Chapter 10.3.3, 11.3.3

Max

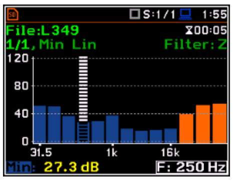
Spectrum of Max results for the *1/1-octave* or *1/-octave* bands.



Chapter 10.3.3, 11.3.3

Min

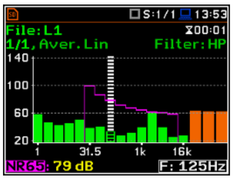
Spectrum of Min results for the *1/1-octave* or *1/3-octave* bands.



Chapter 10.3.3, 11.3.3

NR

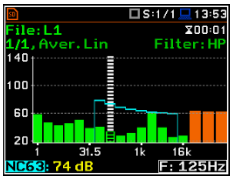
Noise rating values for 1/1-octave sound measurements.



Chapter 10.3.3

NC

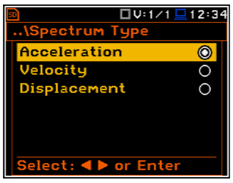
Noise criterion values for 1/1-octave sound measurements.



Chapter 10.3.3

Spectrum Type

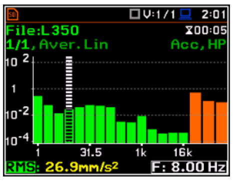
Screen that enables selecting of types of spectra for displaying during vibration measurement: *Acceleration*, *Velocity* or *Displacement*.



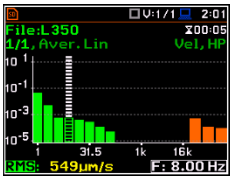
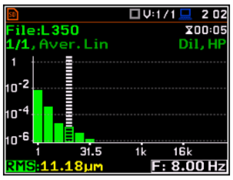
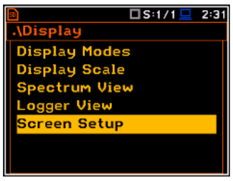
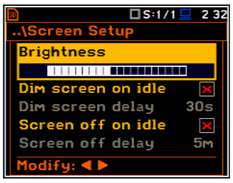
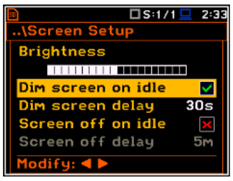
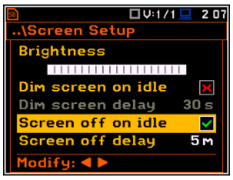
Chapter 10.3.4, 11.3.4

Acceleration

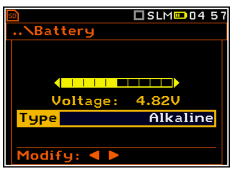
Acceleration spectrum which is displayed if it has been selected in the *Spectrum Type* screen.



Chapter 10.3.4, 11.3.4

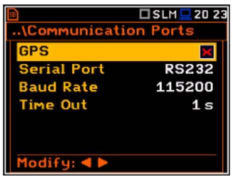
Velocity	Velocity spectrum which is displayed if it has been selected in the *Spectrum Type* screen.		Chapter 10.3.4, 11.3.4
Displacement	Displacement spectrum which is displayed if it has been selected in the *Spectrum Type* screen.		Chapter 6.4
Screen Setup	Screen that enables setting screen brightness and power saving.		Chapter 6.4
Brightness	Brightness of the instrument display. Is setting up in the *Screen Setup* screen.		Chapter 6.4
Dim screen on idle	Screen dimming in no activity after certain delay. Is setting up in the *Screen Setup* screen.		Chapter 6.4
Screen off on idle	Screen switching off in no activity after certain delay. Is setting up in the *Screen Setup* screen.		Chapter 6.4

15.6 Instrument Parameters

Name	*Description*	*Screen*	*Reference*
Instrument	Section in the Main Menu that enables setting the hardware components of the instrument in the screens: *Auto Start, Battery, Communication Ports, External Power, IEPE Current, Keyboard Settings, Multifunction I/O, RTC, Wireless Transfer, Unit Name* and *Unit Label.*		Chapter 8
Auto Start	Instrument function that enables the measurement start right after the instrument is turning on without pressing the <Start> key.		Chapter 8.1
Battery	Screen allowing to check the instrument power source status.		Chapter 8.2

Communication Ports

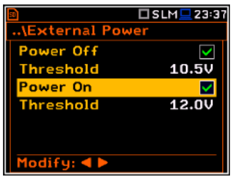
Screen that enables configuring the instrument communication ports: *GPS and Serial Port – RS232* or *Bluetooth*.



Chapter 8.3

External Power

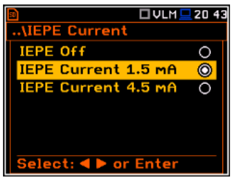
Screen that enables configuring automatic instrument switching on or off in case the voltage of the external DC power exceeds or becomes lower than the threshold level.



Chapter 8.4

IEPE Current

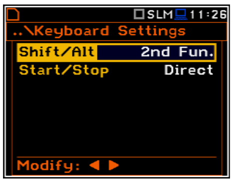
Screen enabling setting the supply current of the microphone or accelerometer: *Off, 1.5mA* or *4.5mA*.



Chapter 8.5

Keyboard Settings

Screen that enables setting the Shift, Alt, Start, Stop keys functionality.

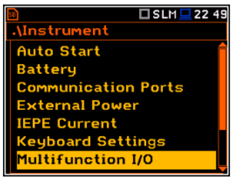


Chapter 8.6

Multifunction I/O

Screen that enables configuring the instrument's I/O port parameters: *I/O Mode, Function, Slope*, *Polarisation, Active Level, Source, Source Type, Alarm Level, Send SMS* and *Send E-Mail*.

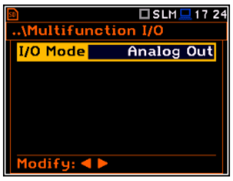
Detailed description of the I/O port is given in Appendix C.



Chapter 8.7 Appendix C

I/O Mode

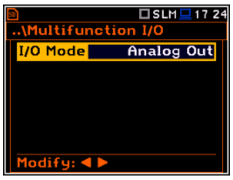
Mode of the I/O port: *Analog Out*, *Digital In*, *Digital Out*.



Chapter 8.7 Appendix C

Analog Out

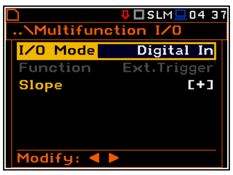
Mode of the I/O port when analogue signal is transmitted from the input of the instrument to its output without any digital processing (i.e. frequency filtering).



Chapter 8.7 Appendix C

Digital In

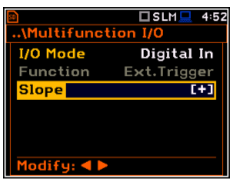
Mode of the I/O port when external digital signal is used as an external trigger to start measurements. The instrument is acting in this case as so called "slave instrument".



Chapter 8.7 Appendix C

Slope

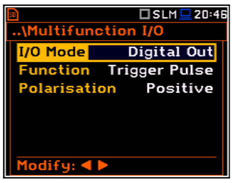
Trigger voltage slope defined for the *Digital In* I/O mode: [+] (uprising as default) or [–] (falling).



Chapter 8.7 Appendix C

Digital Out

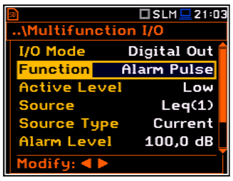
Mode of the I/O port when digital signal is used for triggering other “slave instrument(s)” (the instrument is acting in this case as a “master instrument”), or as a source of alarm signal.



Chapter [8.7](#) Appendix C

Function

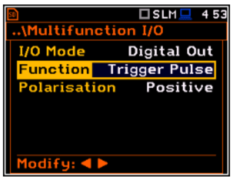
Functionality of the *Digital Out* I/O mode: *Trigger Pulse* or *Alarm Pulse*.



Chapter [8.7](#) Appendix C

Trigger Pulse

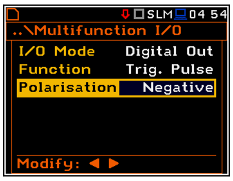
Functionality of the *Digital Out* I/O mode when digital signal used for triggering other “slave instrument(s)” (the instrument is acting in this case as a “master instrument”). One additional parameter is used for this functionality of the *Digital Out* I/O mode: *Polarisation.*



Chapter [8.7](#) Appendix C

Polarisation

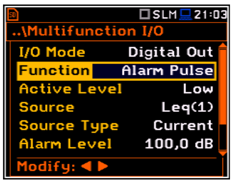
Parameter of the *Digital Out* I/O mode defining which polarisation of the signal (*Negative* or *Positive*) will be applied to the output trigger pulse.



Chapter [8.7](#) Appendix C

Alarm Pulse

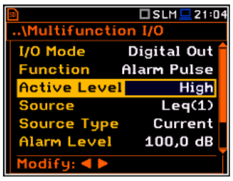
Functionality of the *Digital Out* I/O mode when digital signal is used as a source of alarm signal in case of certain circumstances occurred during measurements (i.e. the level of the input signal was higher than a user selected trigger alarm setting). A set of additional parameters are used for this functionality of the *Digital Out* I/O mode: *Active Level, Source, Source Type, Alarm Level, Send SMS* and *Send E-mail*.



Chapter [8.7](#) Appendix C

Active Level

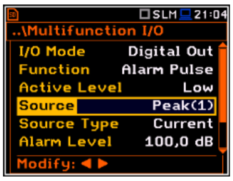
Parameter, when *Alarm Pulse* is selected as a function of the *Digital Out* I/O mode, defining the level of the signal, treated as an alarm: *Low* (0 V) or *High* (3 V).



Chapter [8.7](#) Appendix C

Source

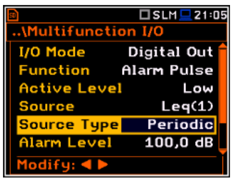
Parameter, when *Alarm Pulse* is selected as a function of the *Digital Out* I/O mode, defining the measured result, the level of which should be checked for alarm generation. The measurement results from the first profile: *Peak(1), Spl(1), Max(1)* or *Leq(1)* can be used.



Chapter [8.7](#)

Source Type

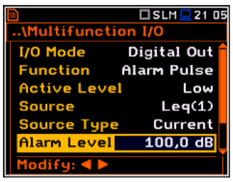
Parameter, when *Alarm Pulse* is selected as a function of the *Digital Out* I/O mode, defining the type of *Source*: *Current* (measured with 1 second step) or *Periodic* (measured with *Integration Period* step).



Chapter [8.7](#)

Alarm Level

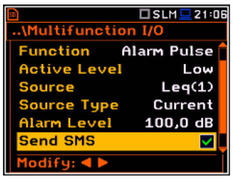
Parameter, when *Alarm Pulse* is selected as a function of the *Digital Out* I/O mode, defining the threshold level of the result to be monitored during the measurement. If the result is greater than the alarm level, the instrument will generate the alarm signal in the selected logic.



Chapter [8.7](#)

Send SMS

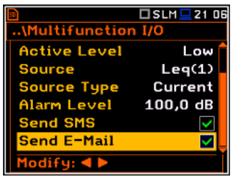
Activation of alarm SMS sending via *Wireless Transfer* when *Alarm Pulse* is selected as a function of the *Digital Out* I/O mode.



Chapter [8.7](#)

Send E-Mail

Activation of alarm e-mail sending via *Wireless Transfer* when *Alarm Pulse* is selected as a function of the *Digital Out* I/O mode.



Chapter [8.7](#)

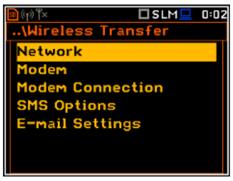
RTC

Screen that enables programming the instrument's real-time clock. This clock is displayed in the upper right corner of the display.

Chapter [8.8](#)

Wireless Transfer

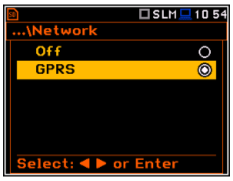
Screen that enables configuring data transfer control via external modem supporting 3G connection through additional screens: *Network, Modem, Modem Connection, SMS Options* and *E-mail Settings*.



Chapter [8.9](#)

Network

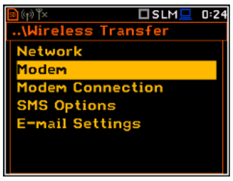
Screen that enables selecting the wireless network option: *Off* or *GPRS*.



Chapter [8.9.1](#)

Modem

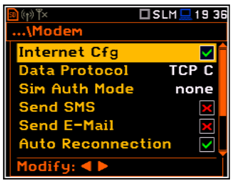
Screen that enables configuring the modem basic settings: *Internet Cfg, Data Protocol, Sim Auth Mode, Send SMS, Send E-Mail, Auto Reconnection, Reconnection Delay, TCP IRT* and *TCP Max. Ret.*



Chapter [8.9.2](#)

Internet Cfg

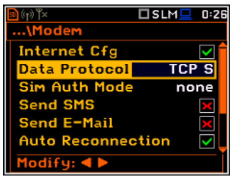
Parameter of the *Modem* screen enabling automatic modem configuration after switching the instrument on.



Chapter [8.9.2](#)

Data Protocol

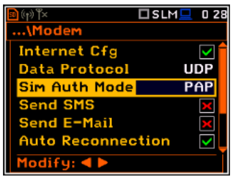
Parameter of the *Modem* screen defining the connection type for data exchange: *TCP S* (server mode), *TCP C* (client mode) or *UDP*.



Chapter [8.9.2](#)

Sim Auth Mode

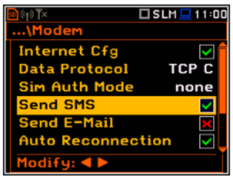
Parameter of the *Modem* screen defining the method of user verification by SIM card. Depending on the SIM card, several options are possible, some of them are recognized by the modem: *none* – no verification required, *PAP, CHAP, MsChap*.



Chapter [8.9.2](#)

Send SMS

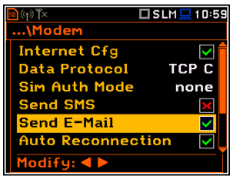
Parameter of the *Modem* screen switching on the SMS alarm notification.



Chapter [8.9.2](#)

Send E-Mail

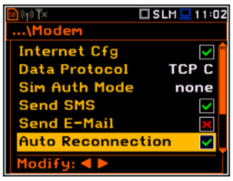
Parameter of the *Modem* screen switching on the e-mail alarm notification.



Chapter [8.9.2](#)

Auto Reconnection

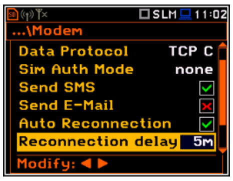
Parameter of the *Modem* screen switching on the device attempting to reconnect the modem in case of errors or sudden disconnection.



Chapter [8.9.2](#)

Reconnection Delay

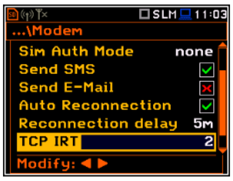
Parameter of the *Modem* screen defining period between each reconnection attempts.



Chapter [8.9.2](#)

TCP IRT

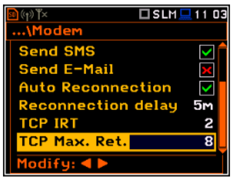
Parameter of the *Modem* screen defining TCP Initial Retransmission Timeout.



Chapter [8.9.2](#)

TCP Max. Ret.

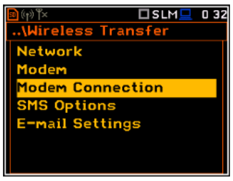
Parameter of the *Modem* screen defining maximum reconnection attempts performed within a simple connection cycle.



Chapter [8.9.2](#)

Modem Connection

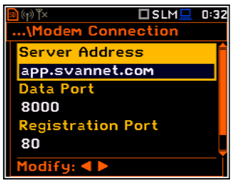
Screen that enables configuring supporting options required by 3G modem to establish internet connection: *Server Address, Data Port, Registration Port, APN, APN User, APN Password, DNS Server, DynDns Address, DynDns Hostname, DynDns Login* and *DynDns Password*.



Chapter [8.9.3](#)

Server Address

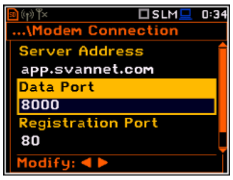
Parameter of the *Modem Connection* screen defining either IP or domain address, where the registration data will be sent during registration process (*Data Protocol: TCP S* or *UDP*) or to which the modem will be connected to (*Data Protocol: TCP C*). By default, the server address is app.svannet.com.



Chapter [8.9.3](#)

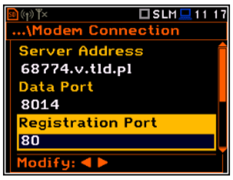
Data Port

Parameter of the *Modem Connection* screen defining the port number that denotes a port on which a communication socket will be configured for data exchange between the remote host and the station.



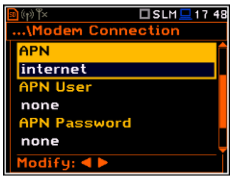
Chapter [8.9.3](#)

Registration Port Parameter of the *Modem Connection* screen defining the port number that denotes a port on which a communication socket will be configured to transmit registration package (*Register Mode: On*) or exchange Http data (*Register Mode: AS* or *SMT. AS*).



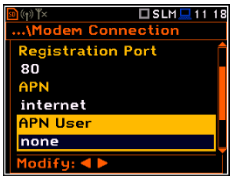
Chapter 8.9.3

APN Parameter of the *Modem Connection* screen defining the APN name of the SIM card used with the modem.



Chapter 8.9.3

APN User Parameter of the *Modem Connection* screen defining the user name used for verification by the SIM card of the modem.

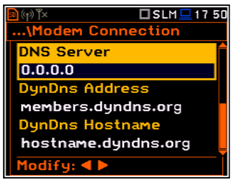


Chapter 8.9.3

APN Password Parameter of the *Modem Connection* screen defining the password used for verification by the SIM card of the modem.

Chapter 8.9.3

DNS Server Parameter of the *Modem Connection* screen defining the IP address of DNS server used for establishing connection with the internet. In most cases, leaving the default value of “0.0.0.0” will be sufficient, but some SIM cards may require a specific address.

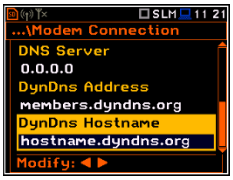


Chapter 8.9.3

DynDns Address Parameter of the *Modem Connection* screen defining the server address when using DynDNS service in case of dynamic IP address.

Chapter 8.9.3

DynDns Hostname Parameter of the *Modem Connection* screen defining the server hostname address when using DynDNS service in case of dynamic IP address.



Chapter 8.9.3

DynDns Login Parameter of the *Modem Connection* screen defining the login when using DynDNS service in case of dynamic IP address.

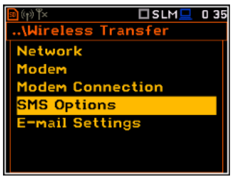
Chapter 8.9.3

DynDns Password Parameter of the *Modem Connection* screen defining the password when using DynDNS service in case of dynamic IP address.

Chapter 8.9.3

SMS Option

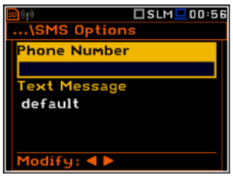
Screen that enables configuring SMS service used for alarm notification: *Phone Number* and *Text Message*.



Chapter 8.9.4

Phone Number

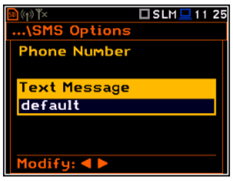
Parameter of the *SMS Option* screen defining the phone number where the text messages will be sent.



Chapter 8.9.4

Text Message

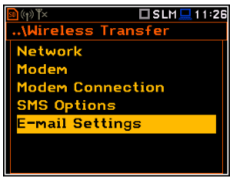
Parameter of the *SMS Option* screen defining additional text, which will be appended into a standard alarm message template.



Chapter 8.9.4

E-mail Settings

Screen that enables configuring parameters of the E-mail service used for alarm notification: *SvanMail, SMTP Address, Login Type, User Login, User Password, Sender e-mail, Recipient e-mail, E-mail Subject, E-mail Message, SSL Encryption, Default Port and Port*.



Chapter 8.9.5

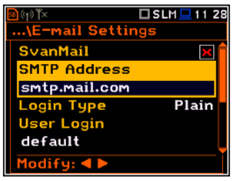
SvanMail

Parameter of the *E-mail Settings* screen switching the option that allows sending e-mails without additional parameters, simplifying the process of configuring alarm notifications.

Chapter 8.9.5

SMTP Address

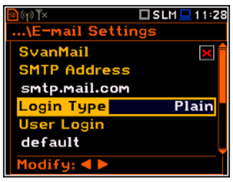
Parameter of the *E-mail Settings* screen defining SMTP server address used for sending e-mail messages.



Chapter 8.9.5

Login Type

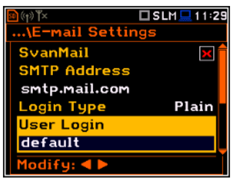
Parameter of the *E-mail Settings* screen defining authentication method, which depends on the SMTP server used for sending e-mails: *None, Login, Plain* or *Cram*.



Chapter 8.9.5

User Login

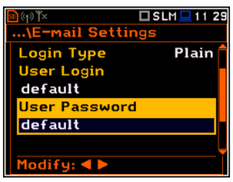
Parameter of the *E-mail Settings* screen defining user login used to establish verified connection with SMTP server.



Chapter 8.9.5

User Password

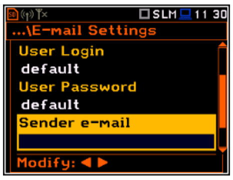
Parameter of the *E-mail Settings* screen defining user password used to establish verified connection with SMPT server.



Chapter 8.9.5

Sender e-mail

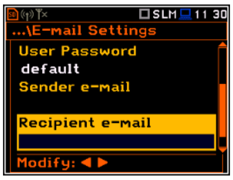
Parameter of the *E-mail Settings* screen defining e-mail address from which the e-mail message will be sent.



Chapter [8.9.5]

Recipient e-mail

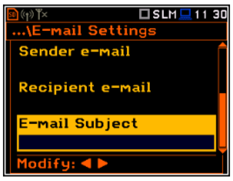
Parameter of the *E-mail Settings* screen defining e-mail address to which the e-mail message will be sent.



Chapter [8.9.5]

E-mail Subject

Parameter of the *E-mail Settings* screen defining e-mail message's subject.



Chapter [8.9.5]

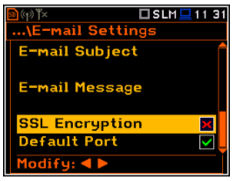
E-mail Message

Parameter of the *E-mail Settings* screen defining additional text which will be appended to the standard e-mail message template used for alarm notification.

Chapter [8.9.5]

SSL Encryption

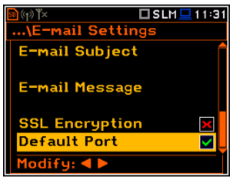
Parameter of the *E-mail Settings* screen switching on the option enabling attempt to configure the modem for connecting to the mail server used the encryption protocol SSL.



Chapter [8.9.5]

Default Port

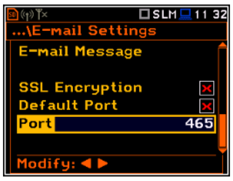
Parameter of the *E-mail Settings* screen switching on the option enabling attempt to communicate with the mail server on the default port (25 for normal calls, 465 with SSL).



Chapter [8.9.5]

Port

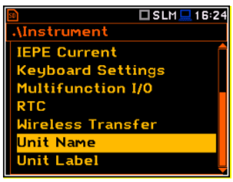
Parameter of the *E-mail Settings* screen defining user's own port.



Chapter [8.9.5]

Unit Name

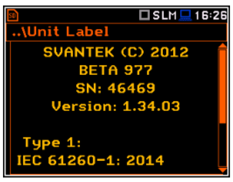
Screen that enables editing of the instrument name visible by the SvanNET web-service.



Chapter [8.10]

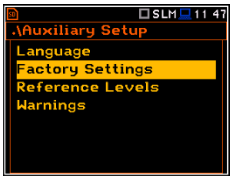
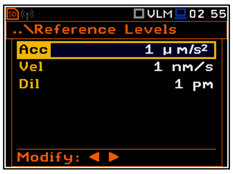
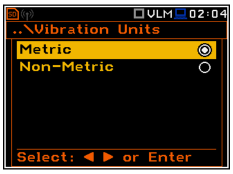
Unit Label

Screen that displays information about the instrument type, its serial number, the current software version installed and the relevant standards, which the instrument fulfils.



Chapter [8.11]

15.7 AUXILIARY PARAMETERS

Name	*Description*	*Screen*	*Reference*
Auxiliary Setup	Section in the Main Menu that enables customizing the instrument interface to specific user requirements in the screens: *Language, Factory Settings, Reference Levels, Vibration Units* and *Warnings*.		Chapter 9
Language	Selection of the user interface language.		Chapter 9.1
Factory Settings	Restoration of the default settings of the instrument.		Chapter 9.2
Reference Levels	Screen that enables defining reference levels of the vibration signal for acceleration (Acc), velocity (Vel) and displacement (Dil).		Chapter 9.3
Vibration Units	Screen that enables selecting units for vibration measurements.		Chapter 9.4
Warnings	Screen that enables activating warning messages, which are to be displayed during the normal operation of the instrument.		Chapter 9.5

APPENDIX A. REMOTE CONTROL

The USB 1.1 interface is the serial one working with 12 MHz clock. Its speed is relatively high, and it ensures the common usage of USB in all produced nowadays Personal Computers.

The RS 232 interface is also available but as an option. In order to activate this option, the user has to buy a special cable with a programmed processor. This interface complies with CCIT V.24 standard. Practically all Personal Computers can be linked to the instrument by means of this interface. The maximum available transmission speed is equal to 115200 bits/sec.

Note: *For reliable operation of the RS 232, proper synchronisation of the transmission by* ***CTS*** *and* ***RTS*** *lines (according to their definitions) is required.*

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

- bi-directional data transmission,
- remote control of the instrument.

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

1. send "the function code",
2. send an appropriate data file

or

3. receive a data file.

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

#1 input / output of the control setting codes,
#2 read out of the main measurement results,
#3 read out of the measurement results in **1/x OCTAVE** or **FFT** mode,
#7 special control functions,
#D read / write the data files from the external memory (SD-card).

A.1. 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;

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

A.2. FUNCTION #2 – READ OUT OF THE MAIN MEASUREMENT RESULTS

#2 function enables one to read out the current measurement results from the selected profile.
#2 function has the formats defined as follows:

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

or

#2 [,<aver>] ,<rot>;

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:

- **0** – means “all profiles”, i.e. results from the all profiles will be sent (default value),
- **1, 2 or 3** – one of the profile, i.e. only results from the given profile will be sent;

<rot> – rotation results:

- **rpm** – all rotations results will be sent (unit of the results wil be [rpm]),
- **rps** – all rotations results will be sent (unit of the results wil be [rps]);

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

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

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

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

In case of <profile> = 0 the instrument sends results in the format defined as follows:

#2 [,<aver>],1,Xc,(...),2,Xc,(...),3,Xc,(...),;

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

If no results are available, the instrument will send:

#2,?;

The codes of results in the case of **Sound Meter** mode are defined as follows:

C number of measurement cycle;
V overload flag (c equals to 0 or 1);
T time of the measurement cycle (c – value in seconds);
P **Peak** value (c – the value in dB);
M **Max** value (c – the value in dB);
N **Min** value (c – the value in dB);
S **Spl** result (c – the value in dB);
R **Leq** result (c – the value in dB).
U **SEL** result (c – the value in dB);
B(k) **Lden** result (c – the value in dB); k – flag determining the kind of the result:
k = 1 – **Ld** result,
k = 2 – **Le** result,
k = 3 – **Lde** result,
k = 4 – **Ln** result,
k = 5 – **Lnd** result,
k = 6 – **Len** result,
k = 7 – **Lden** result;
I **LEPd** result (c – the value in dB).
Y **Ltm3** result (c – the value in dB);
Z **LTeq** result (c – the value in dB);
g **LR1** (rolling Leq 1st) result (c – the value in dB);
h **LR2** (rolling Leq 2nd) result (c – the value in dB);
L(nn) statistic levels (c – the value in dB);
O **NR** result (c equal to 131 means that NR result exceeds the maximum value for which is defined – i.e. 130);
K **NC** result (c equal to 14 or 71 means that NR result exceeds the minimum or maximum value for which is defined – i.e. 15 or 70 respectively);

The codes of results in the case of **VLM** mode are defined as follows:

C number of measurement cycle;
V overload flag (c equals to 0 or 1);
T time of the measurement cycle (ccc – value in seconds);
P **Peak** value (c – the value in dB);
Q **P–P** value (c – the value in dB);
M **Max** value (c – the value in dB);
R **RMS** value (c – the value in dB);

Example: After sending to the instrument the string:

#2,a,1,C?,V?,T?,P?,M?,R?;

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

#2,a,1,C5,V0,T60,P125.41,M117.60,R105.43;

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

A.3. FUNCTION #3 – READ OUT OF THE MEASUREMENT RESULTS IN 1/X OCTAVE OR FFT MODE

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

#3 function format is defined as follows:

#3; – displayed spectrum

#3,A; – averaged spectrum

#3,I; – instantaneous spectrum

#3,M; – max spectrum

#3,N; – min spectrum

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”

D6 = 0 means that "spectrum is not averaged"
= 1 means that "spectrum is averaged"

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

D0 to D4 reserved bits

Note: *The measurement result is coded in binary form as dB•100 (e.g. 34.52 dB is sent as binary number 3452).*

A.4. FUNCTION #7 – SPECIAL CONTROL FUNCTIONS

Function **#7** 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,BS;

Get battery state.

Response format:

#7,BS,x,y;

where:

x – battery state in [%].
y = 0 – battery power,
y = -1 – external supply power,
y = -2 – USB power.

#7,BV;

Get battery voltage.
Response format:
#7,BV,x.xx;
where:
x.xx – battery voltage in [V].

#7,UV;

Get USB voltage.
Response format:
#7,UV,x.xx;
where:
x.xx – USB voltage in [V].

#7,RZ;

Get state of the Remote Control mode.
Response format:
#7,RZ,x;
where:
x = 0 – Off,
x = 1 – On.

#7,RZ,x;

Set state of the Remote Control mode.
where:
x = 0 – Off,
x = 1 – On.
Response format:
#7,RZ;

#7,MC;

Get compensation filter.
Response format:
#7,MC,x;
where:
x = 0 – Off,
x = 1 – Free Field,
x = 2 – Diffuse Field,
x = 3 – Outdoor Environment,
x = 4 – Outdoor Airport.

#7,MC,x;

Set compensation filter.

where:

x = 0 – Off,
x = 1 – Free Field,
x = 2 – Diffuse Field,
x = 3 – Outdoor Environment,
x = 4 – Outdoor Airport.

Response format:

#7,MC;

#7,WD;

Get windscreen compensation filter.

Response format:

#7,WD,x;

where:

x = 0 – Off,
x = 1 – On.

#7,WD,x;

Set windscreen compensation filter.

where:

x = 0 – Off,
x = 1 – On.

Response format:

#7,WD;

#7,DL;

Get day time limits.

Response format:

#7,DL,x;

where:

x = 0 – day time limits is equal to 6h-18h,
x = 1 – day time limits is equal to 7h-19h.

#7,DL,x;

Set day time limits.

where:

x = 0 – day time limits is equal to 6h-18h,
x = 1 – day time limits is equal to 7h-19h.

Response format:

#7,DL;

#7,SE;

Get detector for statistical analysis.

Response format:

#7,SE,x;

where:

x = 0 – linear detector,

x = 1 – exponential detector.

#7,SE,x;

Set detector for statistical analysis.

where:

x = 0 – linear detector,

x = 1 – exponential detector.

Response format:

#7,SE;

#7,SL;

Get statistical levels.

Response format:

#7,SL,x1,x2,x3,x4,x5,x6,x7,x8,x9,x10;

where:

x1..x10 – statistical levels.

#7,SL,n,xn;

Set statistical level.

where:

n – statistical level index (1..10),

xn – statistical level of index **n** (1..99).

Response format:

#7,SL;

#7,LR;

Get Rolling Leq time values.

Response format:

#7,LR,x1[m],x2[m];

where:

x1 – rolling time 1st value (1..59 if seconds, 1m..60m if minutes),

x2 – rolling time 2nd value (1..59 if seconds, 1m..60m if minutes)

#7,LR,n,xn;

Set Rolling Leq time value.

where:

n – result index (1 or 2),

xn – rolling time nth value (1..60 if seconds, 1m..60m if minutes).

Response format:

#7,LR;

#7,FS;

Get file system version.

Response format:

#7,FS,x.xx;

where:

x.xx – file system version number.

#7,PI;

Get internal microcontroller firmware version.

Response format:

#7,PI,x.xx;

where:

x.xx – internal microcontroller firmware version number.

#7,VH;

Get hardboot program version.

Response format:

#7,VH,x.xx;

where:

x.xx – hardboot program version number.

#7,VB;

Get bootstrap program version.

Response format:

#7,VB,x.xx;

where:

x.xx – bootstrap program version number.

#7,IE;

Get IEPE current.

Response format:

#7,IE,x;

where:

x = 0 – IEPE is Off,
x = 1 – 1.5 mA,
x = 2 – 4.5 mA.

#7,IE,x;

Set IEPE current.

where:

x = 0 – IEPE is Off,
x = 1 – 1.5 mA,
x = 2 – 4.5 mA.

Response format:

#7,IE;

#7,RT;

Get current real time clock settings.

Response format:

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

where:

hh:mm:ss – time,
DD/MM/YYYY – date.

#7,RT,hh,mm;

Set current real time clock settings without seconds;

where:

hh:mm – time (seconds are reset),

Response format:

#7,RT;

#7,RT,hh,mm,ss;

Set current real time clock settings with seconds;

where:

hh:mm:ss – time,

Response format:

#7,RT;

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

Set current real time clock and date settings;

where:

hh:mm:ss – time,

DD/MM/YYYY – date.

Response format:

#7,RT;

#7,TZ;

Get **Time Zone**.

Response format:

#7,TZ,m;

where:

m – Time Zone in minutes,

#7,TZ,m;

Set **Time Zone**.

where:

m – Time Zone in minutes (from -720 to 840 with step equal to 15).

Response format:

#7,TZ;

#7,TP;

Get temperature.

Response format:

#7,TP,xx.x;

where:

xx.x – temperature in [˚C].

#7,US;

Get unit subtype.

Response format:

#7,US,x;

where:

x – subtype number.

#7,CS;

Clear current setup (factory settings).

Response format:

#7,CS;

#7,WS;

Get state of the **"Results Not Saved"** warning.

Response format:

#7,WS,x;

where:

x = 0 – warning disabled,

x = 1 – warning enabled.

#7,WS,x;

Set state of the **"Results Not Saved"** warning.

where:

x = 0 – warning disabled,

x = 1 – warning enabled.

Response format:

#7,WS;

#7,WF;

Get state of the **"Ext. Disk Free Space"** warning.

Response format:

#7,WF,x;

where:

x = 0 – warning disabled,

x = 1 – warning enabled.

#7,WF,x;

Set state of the **"Ext. Disk Free Space"** warning.

Response format:

#7,WF;

where:

x = 0 – warning disabled,

x = 1 – warning enabled.

#7,WM;

Get **"Min Free Space"** value for the **"Ext. Disk Free Space"** warning.

Response format:

#7,WM,x;

where:

x – min. free space in [MB].

#7,WM,x;

Set **”Min Free Space”** value for the **”Ext. Disk Free Space”** warning.

where:

x – min. free space in [MB].

Response format:

#7,WM;

#7,LB;

Get the name of the last logger filename.

Response format:

#7,LB,name;

where:

name – last logger filename.

#7,FT;

Get SD-card fat type.

Response format:

#7,FT,x;

where:

x = -1 – SD-card is not available,

x = 1 – FAT16,

x = 2 – FAT32,

x = 3 – FAT12.

#7,NS;

Get SD-card number of sectors (sector = 512 bytes).

Response format:

#7,NS,x;

where:

x – number of sectors (in case of **x = -1** SD-card is not available).

#7,NF;

Get SD-card number of free sectors (sector = 512 bytes).

Response format:

#7,NF,x;

where:

x – number of free sectors (in case of **x = -1** SD-card is not available).

#7,PO;

Power off the instrument.

Response format:

#7,PO;

#7,CM,n;

Get parameters of the **nth Logger Marker**.

Response format:

#7,CM,n,”<name>”,e,p;

#7, CM,n,”<name>”,e,p;

Set parameters of the **nth Logger Marker**.

Response format:

#7,CM;

where:

n – number of marker (1..4),

<name> – name of marker (10 ASCII characters),

e = 0 – Event Trigger inactive on this marker,

e = 1 – Event Trigger active on this marker,

p = 0 – block-type marker,

p = 1 – point-type marker.

#7,MR;

Get activity of all **Logger Markers**.

Response format:

#7,MR,a1,a2,a3,a4;

where:

a1 – activity of the 1st marker (0 or 1),

a2 – activity of the 2nd marker (0 or 1),

a3 – activity of the 3rd marker (0 or 1),

a4 – activity of the 4th marker (0 or 1).

#7,MR,n;

Get activity of the **nth Logger Marker**.

Response format:

#7,MR,n,a;

where:

n – number of marker (1..4),

a – activity of the **nth** marker (0 or 1).

#7,MR,n,a;

Set activity of the **nth Logger Marker**.

Response format:

#7,MR;

where:

n – number of marker (1..4),

a – activity of the **nth** marker (0 or 1).

#7,EV;

Get external supply voltage.

Response format:

#7,EV,x.xx;

where:

x.xx – external supply voltage in [V].

#7,EP;

Get states of the **External Power** functionality.

Response format:

#7,EP,x,V_{Off},y,V_{On};

#7,EP,x,V_{Off},y,V_{On};

Set states of the **External Power** functionality.

Response format:

#7,EP;

where:

x = 0 – Power Off functionality disabled,

x = 1 – Power Off functionality enabled (the instrument will be switched-off after reaching the threshold level **V_{Off}**),

V_{Off} – switch-off threshold level in [V] (from 6.0 to 14.5),

y = 0 – Power On functionality disabled,

y = 1 – Power On functionality enabled (the instrument will be switched-on after reaching the threshold level **V_{On}**),

V_{On} – switch-on threshold in [V] (from 6.5 to 15.0).

note:

if (**x = 1)** and (**y = 1**) then (**V_{On}–V_{Off}**) must be greater then or equal to 0.5V.

#7,BT;

Get state of the **Bluetooth** interface.

Response format:

#7,BT,x;

#7,BT,x;

Set state of the **Bluetooth** interface.

Response format:

#7,BT;

where:

x = 0 – Bluetooth disabled,

x = 1 – Bluetooth enabled.

#7,BR;

Get **Bluetooth** version.

Response format:

#7,BR,x.xx;

where:

x.xx – Bluetooth version number.

#7,AC;

Get state of the **Auto Calibration** functionality.

Response format:

#7,AC,x;

#7,AC,x;

Set state of the **Auto Calibration** functionality.

Response format:

#7,AC;

where:

x = 0 – Auto Calibration disabled,

x = 1 – Auto Calibration enabled.

A.5. FUNCTION #D – READ / WRITE THE DATA FILES FROM THE EXTERNAL MEMORY (SD-CARD)

<disk>	logical disk number: 0 – SD-card,
<address>	directory address (cluster numer)
<count>	directory size in bytes
<offsetB>	offset the first byte to read (an even number).
<nB>	number of bytes to read (an even number)
<data>	binary data.

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 can not be executed

4) #D,r,<disk>,<address>,<offsetB>,<nB>; function enables the user to read the file

Response:

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

A.6. CONTROL SETTING CODES

The control setting codes used in the SVAN 977A instrument are given in the table below.

Table A.1. Control setting codes

Group name	Group code	Code description
Unit type	**U**	`U977` (read only)
Serial number	**N**	`Nxxxx` (read only)
Software version	**W**	`Wx.xx.x` x.xx.x - revision number (read only)
Calibration factor	**Q**	`Qn.nn` n.nn - calibration factor in dB
Meter mode	**Z**	`Z0` - **Vibration Meter** `Z1` - **Sound Meter**
Direct Input	**V**	`V0` - **Off** `V1` - **On**
Measurement function	**M**	`M1` - **Level Meter** `M2` - **1/1 Octave** `M3` - **1/3 Octave** `M6` - **FFT**
Range	**R**	`R1` - **Low** `R2` - **High**
Filter type in profile n in **SLM** mode	**F**	`F1:n` **Z** filter for profile n `F2:n` **A** filter for profile n `F3:n` **C** filter for profile n `F5:n` **B** filter for profile n
Detector type in profile n in **SLM** mode	**C**	`C0:n` - **Impulse** detector in profile n `C1:n` - **Fast** detector in profile n `C2:n` - **Slow** detector in profile n
Logger type in profile n in **SLM** mode	**B**	Bx:n - x - sum of the following flags flags: `1` - logger with **Peak** values in profile n `2` - logger with **Max** values in profile n `4` - logger with **Min** values in profile n `8` - logger with **RMS** values in profile n

Group name	Group code	Code description
Filter type in profile n in **VLM** mode	**I**	`I0:n` **HP** filter for profile n `I1:n` **HP1** filter for profile n `I2:n` **HP3** filter for profile n `I3:n` **HP10** filter for profile n `I4:n` **Vel11** filter for profile n `I5:n` **Vel3** filter for profile n `I6:n` **Vel10** filter for profile n `I7:n` **VelMF** filter for profile n `I8:n` **Dil1** filter for profile n `I9:n` **Dil3** filter for profile n `I10:n` **Dil10** filter for profile n `I21:n` **Wh** filter for profile n
Detector type in profile n in **VLM** mode	**E**	`E0:n` - **100ms** detector in profile n `E1:n` - **125ms** detector in profile n `E2:n` - **200ms** detector in profile n `E3:n` - **500ms** detector in profile n `E4:n` - **1.0s** detector in profile n `E5:n` - **2.0s** detector in profile n `E6:n` - **5.0s** detector in profile n `E7:n` - **10.0s** detector in profile n
Logger type in profile n in **VLM** mode	**G**	`Gx:n` - x - sum of the following flags: `1` - logger with **Peak** values in profile n `2` - logger with **P–P** values in profile n `4` - logger with **Max** values in profile n `8` - logger with **RMS** values in profile n
Delay in the start of measurement	**Y**	`Ynn` nn delay given in seconds (0 ÷ 60)
Start Synchronization	**u**	`u0` Off `u1` Sync. to full minute `u15` Sync. to the full 15 minutes `u30` Sync. to the full 30 minutes `u60` Sync. to a full hour
Integration period	**D**	`D0` - infinity (measurement finished by pressing the **<STOP>** push-button or remotely by sending S0 control code) `Dnns` nn number in seconds `Dnnm` nn number in minutes `Dnnh` nn number in hours
Repetition of the measurement cycles (RepCycle)	**K**	`K0` - infinity (measurement finished by pressing the **<STOP>** push-button or remotely - by sending S0 control code) .... `Knnnn` - nnnn number of repetitions ∈(1 ÷ 1000)

Group name	Group code	Code description
Leq / **RMS** detector type	**L**	L0 - **Linear** L1 - **Exponential**
Spectrum Band	**A**	A0 - **Full** A1 - **Audio** A2 - **Ultra**
Filter type in **1/x OCTAVE** or **FFT** analysis in **SLM** mode (for Audio band only)	**f**	f1 - **Z** filter f2 - **A** filter f3 - **C** filter f5 - **B** filter
Detector type in **1/x OCTAVE** analysis in **SLM** mode (for Audio band only)	**XXB**	XXB0 – Linear XXB1 – Fast XXB2 – Slow
Storing the results of **1/x OCTAVE** analysis in logger's file in **SLM** mode	**b**	b0 - switched Off b8 - logger with **Leq** spectrum
Filter type in **1/x OCTAVE** or **FFT** analysis in **VLM** mode	**i**	i0 - **HP** filter
Storing the results of **1/x OCTAVE** analysis in logger's file in **VLM** mode	**g**	g0 - switched off g8 - logger with **RMS** spectrum
Averaging in **FFT** analysis	**a**	a0 - **Linear** a1 - **Exponential**
Time Constant for exponential averaging in **FFT** analysis	**j**	j100 - **100ms** j125 - **125ms** j200 - **200ms** j500 - **500ms** j1000 - **1.0s** j2000 - **2.0s** j5000 - **5.0s** j10000 - **10.0s**
FFT analysis band	**r**	r1 - **20 kHz** r2 - **10 kHz** r3 - **5 kHz** r4 - **2.5 kHz** r5 - **1.25 kHz** r6 - **625 Hz** r7 - **312 Hz** r8 - **156 Hz** r9 - **78 Hz**

Group name	Group code	Code description
Screen in **FFT** analysis	**w**	`w0` - **Hanning** `w1` - **Rectangle** `w2` - **Flat Top** `w3` - **Kaiser-Bessel**
FFT lines	**y**	`y0` - **1600** `y1` - **800** `y2` - **400**
Storing the results of **FFT** analysis in logger's file	**q**	`q0` - switched off `q8` - logger with **RMS** spectrum
Logger	**T**	`T0` - switched **Off** `T1` - switched **On**
Logger Summary Results	**XXE**	`XXE0` - switched **Off** `XXE1` - switched **On**
Logger Meteo	**p**	`p0` - switched **Off** `p1` - switched **On**
Logger step	**d**	`dn` n = number in milliseconds ∊(**2**, **5**, **10**, **20**, **25**, **50**, **100**, **200**, **500**, **1000**) `dns` n = number in seconds ∊(1 ÷ 60) `dnm` n = number in minutes ∊(1 ÷ 60)
Logger Split Mode	**XA**	`XA0` Off `XA-1` Sync to the Integration Period `XA15` Sync. to the full 15 minutes `XA30` Sync. to the full 30 minutes `XA60` Sync. to a full hour `XA1440` Sync. at the Specified Time
Specified Time for Logger Splitting	**XD**	`XDn:p` n = -1 (switched off) n = 0..1439 (time in minutes) p = 1..6 (specified time number)
State of the instrument (Stop or Start)	**S**	`S0` - **STOP** `S1` - **START**
Exposure Time	**e**	`en` - n = time in minutes ∊ (1 ÷ 480)
Measure Triggering mode	**m**	`m0` - switched off (**OFF**) `m1` - **Slope +** `m2` - **Slope –** `m3` - **Level +** `m4` - **Level –** `m6` - **Grad +** `m7` - **External**

Group name	Group code	Code description
Source of the measure triggering signal	**s**	`s0` - **RMS**
Measure Triggering level in **SLM** mode	**l**	`lx` - x = level in dB ∈(24 ÷ 136)
Measure Triggering gradient in **SLM** mode	**O**	`Ox` - x = gradient in dB/ms ∈(1 ÷ 100)
Measure Triggering level in **VLM** mode	**n**	`nx` - x = level in dB ∈(60 ÷ 200)
Measure Triggering gradient in **VLM** mode	**k**	`kx` - x = gradient in dB/ms ∈(1 ÷ 100)
Logger Triggering mode	**XT**	`XT0` - switched off `XT3` - **Level +** `XT4` - **Level –**
Logger Triggering level in **SLM** mode	**XL**	`XLx` - x = level in dB ∈(24 ÷ 136)
Logger Triggering level in **VLM** mode	**Xy**	`Xyx` - x = level in dB ∈(60 ÷ 200)
Logger Triggering Number of records taken into account before the fulfilment of the triggering condition	**XQ**	`XQx` - x = number of records saved in logger before the fulfilment of the triggering condition; nn ∈(0 ÷ 50)
Logger Triggering Number of records taken into account after the fulfilment of the triggering condition	**Xq**	`Xqx` - x = number of records saved in logger after the fulfilment of the triggering condition; nn ∈(0 ÷ 200)
RPM Measurement	**Xr**	`Xr0` - switched **Off** `Xr1` - switched **On**
RPM Pulse	**Xp**	`Xpn` - n = Pulses/Revolution (1 ÷ 360)
RPM Unit	**Xu**	`Xu0` - rps `Xu1` - rpm
Reference Level ACC	**Xa**	`Xax` - x = reference level ∈(1 ÷ 100) in μm/s^2
Reference Level VEL	**Xv**	`Xvx` - x = reference level ∈(1 ÷ 100) in nm/s
Reference Level DIL	**Xd**	`Xdx` - x = reference level ∈(1 ÷ 100) in pm
External IO Mode	**Xx**	`Xx0` - **Analog Out** `Xx1` - **Digital In** `Xx2` - **Digital Out** `Xx3` - **Analog In**
External IO Function	**Xz**	`Xz0` - **Trigger Pulse** `Xz1` - **Alarm Pulse**
External IO Active Level	**Xc**	`Xc0` - **Low** `Xc1` - **High**

Group name	Group code	Code description
External IO Source	**Xs**	Xs0 - **Leq(1) / RMS(1)** Xs1 - **Peak(1)** Xs2 - **Max(1)** Xs3 - **Spl(1) / P–P(1)**
Extended IO Source Type	**Xt**	Xt0 - **Current** Xt1 - **Periodic**
External IO Alarm Level	**Xn**	Xnx - x = alarm level in dB multiple by 10 ∊ (300 ÷ 1400)
External IO Polar	**Xg**	Xg0 - **Positive** Xg1 - **Negative**
External IO Slope	**Xh**	Xh0 - **Slope +** Xh1 - **Slope -**
GPRS Mode	**Xk**	Xk0 - switched off Xk1 - switched on
Internet Configure (GPRS)	**Xo**	Xo0 - switched off Xo1 - switched on
Registration Mode (GPRS)	**Xw**	Xw0 - switched off Xw1 - normal (Connection Request Packets) Xw2 - AS (Address Server registration) Xw3 - Smart AS (Address Server registration – only if necessary)
Data Protocol (GPRS)	**XB**	XB0 - TCP Server XB1 - TCP Client XB2 - UDP
Auth Mode (GPRS)	**XF**	XF0 - none XF1 - PAP XF2 - CHAP XF3 - MsChapV1
Automatic Reconnection (GPRS)	**XG**	XG0 - switched off XG1 - switched on
Reconnection Delay (GPRS)	**XH**	XHxxs - xx number of seconds between reconnection attempts (1 ÷ 59) XHxxm - xx number of minutes between reconnection attempts (1 ÷ 60)
Modem Alphabet	**XXA**	XXA0 - Off XXA1 - On
Server Address (GPRS)	**XI**	XIxxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, '.', '-' and '_')

Group name	Group code	Code description
Data Port (GPRS)	**XJ**	XJxxxxx - xxxxx up to 5 decimal characters (0 ÷ 65535)
Registration Port (GPRS)	**XK**	XKxxxxx - xxxxx up to 5 decimal characters (0 ÷ 65535)
APN (GPRS)	**XN**	XNxxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, '.', '-' and '_')
APN User (GPRS)	**XO**	XOxxxxx - up to 20 characters (permitted characters: 0-9, a-z, A-Z)
APN Password (GPRS)	**XU**	XUxxxxx - up to 20 characters (permitted characters: 0-9, a-z, A-Z)
DNS Server (GPRS)	**XV**	XVxxxxx -xxxxx up to 15 characters (permitted characters: 0-9 and '.')
Phone Number (GPRS)	**XXa**	XXaxxxxx - xxxxx up to 15 characters (permitted '+',0-9)
Text Message (GPRS)	**XXb**	XXbxxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, '.', '-' and '_')
Send SMS (GPRS)	**XXc**	XXc0 - Off XXc1 - On
Send e-mail (GPRS)	**XXk**	XXk0 - Off XXk1 - On
E-mail SMTP Address (GPRS)	**XXd**	XXdxxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, '.')
E-mail SMTP User (GPRS)	**XXe**	XXexxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, A-Z)
E-mail SMTP Password (GPRS)	**XXf**	XXfxxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, A-Z)
E-mail Sender (GPRS)	**XXg**	XXgxxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, '.', '@')
E-mail Recipient (GPRS)	**XXh**	XXhxxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, '.', '@')
E-mail Subject (GPRS)	**XXi**	XXixxxxx - xxxxx up to 20 characters (permitted characters: a-z, A-Z, 0-9, '.', ',', ':', ';', '!', '?')
E-mail Message (GPRS)	**XXj**	XXjxxxxx - xxxxx up to 20 characters (permitted characters: a-z, A-Z, 0-9, '.', ',', ':', ';', '!', '?')

APPENDIX B. DATA FILE STRUCTURES (firmware revision 1.21)

B.1. GENERAL STRUCTURE OF THE SVAN 977 FILES

Each file containing data from the SVAN 977 instrument consists of several groups of words. In case of SVAN 977, there are two different types of files containing:

- the results stored in the file in the instrument's logger (see Chapter B.2)
- setup data (see Chapter B.3).

Each file has the following elements:

- SvanPC file header (cf. Table B.1.1)
- file header (cf. Table B.1.2)
- unit and internal software specification (cf. Table B.1.3)
- calibration settings (cf. Table B.1.4)
- user's text (a header) stored together with the measurement data (cf. Table B.1.5)
- parameters and global settings, common for all profiles (cf. Table B.1.6)
- parameters for measurement trigger (cf. Table B.1.7)
- parameters for logger trigger (cf. Table B.1.8)
- parameters for Time-domain signal recording (cf. Table B.1.9)
- parameters for Wave-file recording (cf. Table B.1.10)
- extended I/O parameters (cf. Table B.1.11)
- special settings for profiles (cf. Table B.1.12, Table B.1.13)
- RTF parameters (cf. Table B.1.14)
- marker parameters (cf. Table B.1.15)
- header of the statistical analysis (cf. Table B.1.16)
- header of the 1/x Octave analysis (cf. Table B.1.17)
- header of the statistical analysis performed in 1/x Octave mode (cf. Table B.1.18)
- header of the FFT analysis (cf. Table B.1.19)
- RT60 parameters (cf. Table B.1.20)
- header of the logger file (cf. Table B.1.21)
- contents of the file from the logger (cf. Table B.1.22)

Other elements of the file structure are not obligatory for each file type stated above. They depend on the configuration of the instrument**.** These elements are as follows:

- main results (saved in Summary Results Record) (cf. Table B.1.23, Table B.1.24)
- statistical levels (saved in Summary Results Record) (cf. Table B.1.25)
- 1/x Octave analysis results (saved in Summary Results Record) (cf. Table B.1.26)
- FFT analysis results (saved in Summary Results Record) (cf. Table B.1.27)
- results of the statistical analysis in profiles (saved in Summary Results Record) (cf. Table B.1.28)
- results of the statistical analysis in performed in 1/x Octave mode (saved in Summary Results Record) (cf. Table B.1.29)
- RPM results (saved in Summary Results Record) (cf. Table B.1.30)
- METEO data (saved in Summary Results Record) (cf. Table B.1.31)
- RT60 results (cf. Table B.1.32)
- RT60 averaged results (cf. Table B.1.33)
- settings of the instrument saved in the setup file (cf. Table B.1.34)
- setup file end marker (cf. Table B.1.35)

Note: *if any 16-bit result value is equal to -12288 (hex:d000) it means that the result is undefined.*

Below, all file structure groups are described separately in 0 – 0. 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"	text
3		0x001A	0x001A value
4..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
6	CurrentDate	file creation date (cf. App. B.4)
7	CurrentTime	file creation time (cf. App. B.4)
8..13		reserved
…		…

Table B.1.3 Unit and software specification

Word number	Name	Comment
0	0xnn02	[02, nn=specification's length]
1	UnitSubtype	subtype of the unit: 1 - SVAN 977
2	UnitType	type of the unit: 977
3..4	UnitNumber	unit number
5	SoftwareVersion	software version (e.g. 123 means software version 1.23)
6	SoftwareSubversion	software subversion
7	SoftwareBetaSubVer	reserved (software beta subversion)
8	SoftwareIssueDate	software issue date
9	FileSysVersion	file system version (e.g. 123 means file system version 1.23)
…		…

Table B.1.4 Calibration settings

Word number	Name	Comment
0	0xnn47	[47, nn=header's length]
1	PreCalibrType	type of calibration performed prior to measurement: 0 - none 1 - **BY MEASUREMENT** 2 - **BY SENSITIVITY** 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	PostCalibrType	type of calibration performed after the measurement: 0 - none 1 - **BY MEASUREMENT** 2 - **BY SENSITIVITY** 3 - **FACTORY CALIBRATION** 0xFFFF - **Calibration not performed**
6	PostCalibrDate	date of calibration performed after the measurement (cf. App. B.4)
7	PostCalibrTime	time of calibration performed after the measurement (cf. App. B.4)
8	PostCalibrFactor	factor (*100 dB) of calibration performed after the measurement
…	…	…

Table B.1.5 USER's text

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

Table B.1.6 Parameters and global settings

Word number	Name	Comment
0	0xnn04	[04, nn=block's length]
1	MeasureStartDate	measure start date (cf. App. B.4)
2	MeasureStartTime	measure start time (cf. App. B.4)
3	DeviceMode	device mode: 0 – **Vibration Level Meter** / Analyser (VLM) 1 – **Sound Level Meter** / Analyser (SLM)
4	DeviceFunction	device function: 1 – **LEVEL METER**, 2 – **1/1 OCTAVE** analyser, 3 – **1/3 OCTAVE** analyser, 6 – **FFT** analyser, 8 – **RT60** analyser
5	MeasureInput	measurement input type: 2 – **Microphone** 5 – **Accelerometer**

Word number	Name	Comment
6	Range	measurement range: 1 – **LOW** 2 – **HIGH**
7	StatDet	**SLM** mode: detector's type for statistical analysis: 0 – Linear, 1 – Exponential **VLM** mode: reserved
8	RepCycle	repetition cycle: 0 – infinity nnnn – number of repetitions (1..1000)
9	NofProf	number of profiles: 3
10	StartDelay	start delay time specified in seconds: 0 ÷ 60
11..12	IntTimeSec	integration time specified in seconds
13	StartSync	Synchronization the start of measurement with RTC 0 – switched off. -1 – synchronization to **1 sec**. 1 – synchronization to **1 min**. 15 – synchronization to **15 min**. 30 – synchronization to **30 min**. 60 – synchronization to **1 hour**.
14	LeqInt	detector's type in the RMS/LEQ function: 0 – Linear, 1 – Exponential
15	SpectrumBuff	**1/x OCTAVE** logger (sum of the following flags): 8 – LEQ/RMS spectrum **FFT** logger (sum of the following flags): 8 – averaged FFT spectrum in other cases: reserved
16	MainResBuff	Summary results. Contents defined as a sum of: 0 – none 1 – Main Results 2 – Spectrum 4 – Spectrum Max 8 – Spectrum Min 16 – Spectrum Peak 32 – Statistical levels 64 – Statistical analysis in profiles 128 – Statistical analysis in 1/x OCTAVE mode 256 – RPM 512 – Meteo

Word number	Name	Comment
17	R3	**SLM** mode: exposure time: 1..720 (in minutes) **VLM** mode: reserved
18	R4	**SLM** mode: rolling time(1) in seconds **VLM** mode: reference level for acceleration in 0.01 dB re 1.0 μm/s²
19	R5	**SLM** mode: rolling time(2) in seconds **VLM** mode: reference level for velocity in 0.01 dB re 1.0 nm/s
20	R6	**SLM** mode: reserved **VLM** mode: reference level for displacement in 0.01 dB re 1.0 pm
21	RPM_On	**RPM** measurement: 0 – Off 1 – on
22	RPM_Pulse	**RPM** pulse: 1÷360
23	Windscreen	**SLM** mode: 0 – Off, 1 – On, **VLM** mode: reserved
24	Compensation Filter	**SLM** mode: compensating filter for microphones: 0 – Off, 1 – Free Field, 2 – Diffuse Field, 3 – Outdoor Environment, 4 – Outdoor Airport **VLM** mode: reserved
25	VoltageInput	Voltage input: 0 – Off 1 – On
26	CurrentIEPE	IEPE current 0 – Off 1 – 1.5 mA 2 – 4.5 mA
27	SplitMode	Logger files splitting mode: 0 - off. -1 - The file is created for each measurement cycle. 15 - The file is created every 15 min synchronized to RTC. 30 - The file is created every 30 min synchronized to RTC. 60 - The file is created every 1 hour synchronized to RTC. 1440 - The file is created on the specified times.
28	SplitTime[1]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.

Word number	Name	Comment
29	SplitTime[2]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
30	SplitTime[3]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
31	SplitTime[4]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
32	SplitTime[5]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
33	SplitTime[6]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
…		

Table B.1.7 MEASUREMENT TRIGGER parameters

Word number	Name	Comment
0	0xnn2B	[2B, nn=block's length]
1	TriggerMode	trigger mode: 0 – Off, 1 – measurement on trigger **SLOPE+** 2 – measurement on trigger **SLOPE–** 3 – measurement on trigger **LEVEL+** 4 – measurement on trigger **LEVEL–** 6 – measurement on trigger **GRAD+** 7 – measurement on **External** trigger
2	TriggerSource	source of the triggering signal: 0 – **LEQ/RMS(1)** the **LEQ/RMS** result from the first profile
3	TriggerLevel	level of triggering (*100 dB)
4	TriggerGrad	gradient of triggering [dB/ms]
5		reserved
6		reserved
7	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Table B.1.21) 5 – 0.5ms
…		

Table B.1.8 LOGGER TRIGGER parameters

Word number	Name	Comment
0	0xnn2C	[2C, nn=block's length]
1	TriggerMode	trigger mode: 0 – Off, 3 – logging on trigger **LEVEL+**, 4 – logging on trigger **LEVEL–**
2	TriggerSource	source of the triggering signal: 0 – **LEQ/RMS(1)** the **LEQ/RMS** result from the first profile
3	TriggerLev	level of triggering (*100 dB)
4		reserved
5	TriggerPre	number of the records taken into account before the fulfilment of the triggering condition (0 .. 50)
6	TriggerPost	number of the records taken into account after the fulfilment of the triggering condition (0 .. 200)
7	TriggerStep	trigger period given in 0.1 ms. If zero, Step is equal to logger time-step (cf. Table B.1.21)
…		

Table B.1.9 Time-domain signal recording parameters

Word number	Name	Comment
0	0xnn31	[31, nn=block's length]
1	RecordingMode	mode: 0 – Off, 1 – Continuous, 2 – On Trigger
2	TriggerMode	trigger mode: 0 - Off, 1 - recording on trigger **SLOPE+** 2 - recording on trigger **SLOPE–** 3 - recording on trigger **LEVEL+** 4 - recording on trigger **LEVEL–** 6 - recording on trigger **GRAD+** 7 - recording on **External** trigger 10 - recording on **Integration Period** trigger
3	TriggerSource	source of the triggering signal: 0 - **LEQ(1)** the **LEQ** result from the first profile
4	TriggerLevel	level of triggering (*100 dB)
5	TriggerGrad	gradient of triggering [dB/ms]
6	TriggerPre	pretrigger time given in 10ms
7		reserved
8	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Table B.1.21) 0 - logger time-step 5 - 0.5 ms 1000 - 100 ms 10000 - 1 s

Word number	Name	Comment
9	TriggerSampling	sampling frequency given in 10Hz
10	TriggerRecTime	recording time of single data block: 0 - recording to the end of measurement 1..28800 (sec)
11	TriggerFilter	filter type: 0 – **HP**, 1 – **Z**, 2 – **A**, 3 – **C**, 5 – **B**
12	BitsPerSample	bits/sample: 16 or 24
13	TriggerOnMarker	0 – Off 1 – On
14		reserved
…		

Table B.1.10 Wave-file recording parameters

Word number	Name	Comment
0	0xnn2D	[2D, nn=block's length]
1	RecordingMode	trigger mode: 0 - **Off**, 1 - recording whole measurement 2 - on trigger
2	TriggerMode	trigger mode: 0 - **Off**, 1 - recording on trigger **SLOPE+** 2 - recording on trigger **SLOPE–** 3 - recording on trigger **LEVEL+** 4 - recording on trigger **LEVEL–** 6 - recording on trigger **GRAD+** 7 - recording on **External** trigger 10 - recording on **Integration Period** trigger
3	TriggerSource	source of the triggering signal: 0 - **LEQ(1)** the **LEQ** result from the first profile
4	TriggerLevel	level of triggering (*100 dB)
5	TriggerGrad	gradient of triggering [dB/ms]
6	TriggerPre	pretrigger time given in 10ms
7		reserved
8	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Table B.1.21) 0 - logger time-step 5 - 0.5 ms 1000 - 100 ms 10000 - 1 s
9	TriggerSampling	sampling frequency given in 10Hz

Word number	Name	Comment
10	TriggerRecTime	recording time of single data block: 0 - recording to the end of measurement 1..28800 (sec)
11	TriggerFilter	filter type: 0 – **HP**, 1 – **Z**, 2 – **A**, 3 – **C**, 5 – **B**
12	BitsPerSample	bits/sample: 16 or 24
13		reserved
14	RecTimeLimit	maximum recording time specified in minutes
…		

Table B.1.11 Extended I/O parameters

Word number	Name	Comment
0	0xnn2E	[2E, nn=block's length]
1	Mode	mode: 0 – **ANALOG OUT**, 1 – **DIGITAL IN**, 2 – **DIGITAL OUT**, 3 – **ANALOG IN**
2	Function	in case of **DIGITAL IN**: 0 – **EXTERNAL TRIGGER** in case of **DIGITAL OUT**: 0 – **TRIG. PULSE**, 1 – **ALARM PULSE** in other cases: reserved
3	ActiveLevel	in case of **DIGITAL OUT** and **ALARM PULSE**: 0 – **LOW**, 1 – **HIGH** in other cases: reserved
4	Source	Source in case of **DIGITAL OUT** and **ALARM PULSE**: 0 – **Leq(1) / RMS(1)**, 1 – **Peak(1)**, 2 – **Max(1)**, 3 – **Spl(1) / P_P(1)** in other cases: reserved
5	SourceType	Source type in case of **DIGITAL OUT** and **ALARM PULSE**: 0 – **CURRENT**, 1 – **PERIODIC** in other cases: reserved

Word number	Name	Comment
6	AlarmLevel	in case of **DIGITAL OUT** and **ALARM PULSE**: level (*10 dB) in other cases: reserved
7	Polarisation/Slope	in case of **DIGITAL OUT** and **TRIG. PULSE**: Polarisation: 0 – **POSITIVE**, 1 – **NEGATIVE** in case of **DIGITAL IN**: Slope: 0 – **POSITIVE**, 1 – **NEGATIVE** in other cases: reserved
…		

Table B.1.12 Special settings for profiles in the case of SLM mode

Word number	Name	Comment
0	0xnn05	[**05** = id, nn = block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm06	[**06** = id, mm = sub-block's length]
3	DetectorP[1]	detector type in the 1st profile: 0 – **IMPULSE**, 1 – **FAST**, 2 – **SLOW**
4	FilterP[1]	filter type in the 1st profile: 1 – **Z**, 2 – **A**, 3 – **C**, 5 – **B**
5	BufferP[1]	logger contents in the 1st profile defined as a sum of: 0 – none, 1 – **Peak**, 2 – **Max**, 4 – **Min**, 8 – **Leq,** 16 – **LR1,** 32 – **LR2**
6		reserved
7	ProfileFlags[1]	flags in the 1st profile
8	0xmm06	[**06** = id, mm = sub-block's length]
9	DetectorP[2]	detector type in the 2nd profile: 0 – **IMPULSE**, 1 – **FAST**, 2 – **SLOW**

Word number	Name	Comment
10	FilterP[2]	filter type in the 2nd profile: 1 – **Z**, 2 – **A**, 3 – **C**, 5 – **B**
11	BufferP[2]	logger contents in the 2nd profile defined as a sum of: 0 – none, 1 – **Peak**, 2 – **Max**, 4 – **Min**, 8 – **Leq,** 16 – **LR1,** 32 – **LR2**
12		reserved
13	ProfileFlags[2]	flags in the 2nd profile
14	0xmm06	[**06** = id, mm = sub-block's length]
15	DetectorP[3]	detector type in the 3rd profile: 0 – **IMPULSE**, 1 – **FAST**, 2 – **SLOW**
16	FilterP[3]	filter type in the 3rd profile: 1 – **Z**, 2 – **A**, 3 – **C**, 5 – **B**
17	BufferP[3]	logger contents in the 3rd profile defined as a sum of: 0 – none, 1 – **Peak**, 2 – **Max**, 4 – **Min**, 8 – **Leq,** 16 – **LR1,** 32 – **LR2**
18		reserved
19	ProfileFlags[3]	flags in the 3rd profile
…	…	…

Table B.1.13 Special settings for profiles in the case of VLM mode

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

Word number	Name	Comment
3	DetectorP[1]	detector type in the 1st profile: 0 - **100 ms**, 1 - **125 ms**, 2 - **200 ms**, 3 - **500 ms**, 4 - **1 s**, 5 - **2 s**, 6 - **5 s**, 7 - **10 s**
4	FilterP[1]	filter type in the 1st profile: 0 - **HP**, 1 - **HP1**, 2 - **HP3**, 3 - **HP10**, 4 - **Vel1**, 5 - **Vel3**, 6 - **Vel10**, 7 - **VelMF**, 8 - **Dil1**, 9 - **Dil3**, 10 - **Dil10**, 21 - **Wh**
5	BufferP[1]	logger contents in the 1st profile defined as a sum of: 0 – none, 1 – **Peak**, 2 – **P–P**, 4 – **Max**, 8 – **RMS**
6		reserved
7	ProfileFlags[1]	flags in the 1st profile
8	0xmm06	[**06** = id, mm = sub-block's length]
9	DetectorP[2]	detector type in the 2nd profile: 0 - **100 ms**, 1 - **125 ms**, 2 - **200 ms**, 3 - **500 ms**, 4 - **1 s**, 5 - **2 s**, 6 - **5 s**, 7 - **10 s**
10	FilterP[2]	filter type in the 2nd profile: 0 - **HP**, 1 - **HP1**, 2 - **HP3**, 3 - **HP10**, 4 - **Vel1**, 5 - **Vel3**, 6 - **Vel10**, 7 - **VelMF**, 8 - **Dil1**, 9 - **Dil3**, 10 - **Dil10**, 21 - **Wh**
11	BufferP[2]	logger contents in the 2nd profile defined as a sum of: 0 – none, 1 – **Peak**, 2 – **P–P**, 4 – **Max**, 8 – **RMS**
12		reserved
13	ProfileFlags[2]	flags in the 2nd profile
14	0xmm06	[**06** = id, mm = sub-block's length]
15	DetectorP[3]	detector type in the 3rd profile: 0 - **100 ms**, 1 - **125 ms**, 2 - **200 ms**, 3 - **500 ms**, 4 - **1 s**, 5 - **2 s**, 6 - **5 s**, 7 - **10 s**
16	FilterP[3]	filter type in the 3rd profile: 0 - **HP**, 1 - **HP1**, 2 - **HP3**, 3 - **HP10**, 4 - **Vel1**, 5 - **Vel3**, 6 - **Vel10**, 7 - **VelMF**, 8 - **Dil1**, 9 - **Dil3**, 10 - **Dil10**, 21 - **Wh**
17	BufferP[3]	logger contents in the 3rd profile defined as a sum of: 0 – none, 1 – **Peak**, 2 – **P–P**, 4 – **Max**, 8 – **RMS**
18		reserved

Word number	Name	Comment
19	ProfileFlags[3]	flags in the 3rd profile
…	…	…

Table B.1.14 RTF parameters

Word number	Name	Comment
0	0xnn21	[**21** = id, nn = block's length]
1	Type [1]	type of 1st user filter: 0 - **HIGHPASS**, 1 - **LOWPASS**, 2 - **BANDPASS**
2	Rank [1]	rank of 1st user filter: in the case of **BANDPASS**: 4 in other cases: 2
3÷4	Lower pole [1]	
5÷6	Upper pole [1]	
7	Type [2]	type of 2nd user filter: 0 - **HIGHPASS**, 1 - **LOWPASS**, 2 - **BANDPASS**
8	Rank [2]	rank of 2nd user filter: in the case of **BANDPASS**: 4 in other cases: 2
9÷10	Lower pole [2]	
11÷12	Upper pole [2]	
13	Type [3]	type of 3rd user filter: 0 - **HIGHPASS**, 1 - **LOWPASS**, 2 - **BANDPASS**
14	Rank [3]	rank of 3rd user filter: in the case of **BANDPASS**: 4 in other cases: 2
15÷16	Lower pole [3]	
17÷18	Upper pole [3]	
…	…	…

Table B.1.15 Marker parameters

Word number	Name	Comment
0	0x0043	[**43** = id, 00 = block's length in the second word]
1	BlockLength	Block's length
2	MarkerCount	Number of markers
3..7	MarkerName[1]	Name of 1st marker (10 characters length)
8	MarkerEvt[1]	1st marker event: 0 – Off 1 – On
9	MarkerPoint[1]	1st marker point: 0 – Off 1 – On

Word number	Name	Comment
10..14	MarkerName[2]	Name of 2nd marker (10 characters length)
15	MarkerEvt[2]	2nd marker event: 0 – Off 1 – On
16	MarkerPoint[2]	2nd marker point: 0 – Off 1 – On
17..21	MarkerName[3]	Name of 3rd marker (10 characters length)
22	MarkerEvt[3]	3rd marker event: 0 – Off 1 – On
23	MarkerPoint[3]	3rd marker point: 0 – Off 1 – On
24..28	MarkerName[4]	Name of 4th marker (10 characters length)
29	MarkerEvt[4]	4th marker event: 0 – Off 1 – On
30	MarkerPoint[4]	4th marker point: 0 – Off 1 – On
…	…	…

Table B.1.16 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 (*100 dB) in the first profile
5	ClassWidth[1]	class width (*100 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 (*100 dB) in the second profile
9	ClassWidth[2]	class width (*100 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 (*100 dB) in the third profile
13	ClassWidth[3]	class width (*100 dB) in the third profile
…	…	…

Table B.1.17 Header of the 1/x Octave analysis

Word number	Name	Comment
0	0x004A	[**4A** = id, 00 = block's length in the second word]
1	BlockLength	block length
2	0x0101	[used_profile, profile's mask]
3	SystemBase	2 or 10
4	OctaveDivider	1 – 1/1 OCTAVE, 3 – 1/3 OCTAVE, 6 – 1/6 OCTAVE, (not implemented) 12 – 1/12 OCTAVE (not implemented)
5	FirstFreqIndex	Index of the first octave filter: In case of **FULL or ULTRA BAND:** -10 – 1/1 OCTAVE (1.00 Hz), -31 – 1/3 OCTAVE (0.80 Hz) In case of **AUDIO BAND:** -5 – 1/1 OCTAVE (31.5 Hz), -17 – 1/3 OCTAVE (20.0 Hz) Exact midband frequency: $\mathbf{f = 1000 \cdot G^{i/b}}$ [Hz] if **b** is an odd number $\mathbf{f = 1000 \cdot G^{(2i+1)/(2b)}}$ [Hz] if **b** is an even number where: G = 2 – in the case of SystemBase = 2 G = $10^{0.3}$ – in the case of SystemBase = 10 i – filter index b – OctaveDivider
6	NOct	number of octave filters
7	NTot	number of **TOTAL** values
8	SpectrumFilter	Spectrum filter: 0 – HP, 1 – Z, 2 – A, 3 – C, 5 – B
9	SpectrumRMSDetector	spectrum RMS detector type: 0 – LINEAR, 1 – FAST, 2 – SLOW
10	SpectrumBand	spectrum band: 0 – FULL, 1 – AUDIO
...	...	...

Table B.1.18 Header of the statistical analysis performed in 1/x Octave mode

Word number	Name	Comment
0	0xnn13	[**13** = id, nn = block's length]
1	NofHist	number of histograms (number of **1/x OCTAVE** filters and **TOTAL** value)
2	NofClasses	number of classes in the histogram (120)
3	BottomClass	bottom class boundary (*100 dB)
4	ClassWidth	class width (*100 dB)
...	...	...

Table B.1.19 Header of the FFT analysis

Word number	Name	Comment
0	0x0051	[**51** = id, 00 = block's length in the second word]
1	BlockLength	block length
2	0x0101	[used_profile, profile's mask]
3		reserved
4	Zoom	zoom flag
5..6	CentralFreq	central frequency in [mHz] (in case of Zoom = 1)
7..8	FreqResM	frequency resolution (integer mantissa)
9	FreqResExp2	frequency resolution (binary exponent) **note:** frequency resolution is calculated from the formula: $\Delta F[Hz] = FreqResM * 2^{FreqResExp2}$
10	N	number of FFT spectrum lines
11	T	number of TOTAL values
12	Band	band of the FFT analysis (values in hertz are approximate): 0 – 40 kHz, 1 – 20 kHz, 2 – 10 kHz, 3 – 5 kHz, 4 – 2.5 kHz, 5 – 1.25 kHz, 6 – 625 Hz, 7 – 312 Hz, 8 – 156 Hz, 9 – 78 Hz
13	Screen	screen function: 0 – HANNING, 1 – RECTANGLE, 2 – FLAT TOP, 3 – KAISER–BESSEL
14	ScreenFactor	screen correction factor (in 0.01dB)
15	Averaging	type of averaging: 0 – LINEAR 1 – EXPONENTIAL
16	TimeConst	time constant in [ms] (in case of Averaging = 1)
17	Filter	filter: 0 – HP, 1 – Z, 2 – A, 3 – C, 5 – B
18	InstFreq	instantaneous FFT spectrum frequency in [Hz]
…	…	…

Table B.1.20 RT60 parameters

Word number	Name	Comment
0	0xnn1A	[**1A** = id, nn = block's length]
1	RT60SaveMode	type of results in block 1B: 1 - results, 2 - averaged results
2	RT60Method_p	calculation method: 1 - **DECAY**, 2 - **IMPULSE**
3	RT60Spectrum	type of spectrum: 1 - **1/1 OCTAVE**, 2 - **1/3 OCTAVE**
4	buff_step_p	logger time step in milliseconds
5	ResponseTime_p	1÷30
6		reserved
7	DispSmooth	0÷15
8	NoiseMargin	0÷20 (*10dB)
9	RT60Averaging	0 - Off, 1 - On
10	RT60MeasureNo	averaging number
…	…	…

Table B.1.21 Header of the logger file

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 **note:** The current logger time step in seconds can be obtained from the formula: T = BuffTSec + BuffTMillisec / 1000
3,4	BuffLength	logger length (bytes)
5,6	RecsInBuff	number of records in the logger
7,8	RecsInObserv	number of records in the observation period equal to: number of records in the logger + number of records not saved
9,10	AudioRecords	number of audio records in the logger
11	MStUnitNumber	monitoring station unit number (ignored if 0xFFFF)
12	MStUnitType	type of the monitoring station: 211 (SV 211) or 210 (SV 210) (ignored if 0xFFFF)
13	MStSoftwareVersion	monitoring station software version (ignored if 0xFFFF)
14,15	MStIntTimeSec	integration period of meteo results in seconds (ignored if 0xFFFFFFFF)
16,17	SummaryResCnt	number of Summary Results in the logger
…	…	…

Table B.1.22 Contents of the logger file

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

Table B.1.23 Main results in SLM mode (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	**Peak** value in the 1st profile (*100 dB)
6	Result[1][2]	**SEL** value in the 1st profile (*100 dB)
7	Result[1][3]	**Max** value in the 1st profile (*100 dB)
8	Result[1][4]	**Min** value in the 1st profile (*100 dB)
9	Result[1][5]	**Spl** value in the 1st profile (*100 dB)
10	Result[1][6]	**Leq** value in the 1st profile (*100 dB)
11	Result[1][7]	**Lden** value in the 1st profile (*100 dB)
12	Result[1][8]	**Ltm3** value in the 1st profile (*100 dB)
13	Result[1][9]	**LTeq** value in the 1st profile (*100 dB)
14	Result[1][10]	**LR1** value in the 1st profile (*100 dB)
15	Result[1][11]	**LR2** value in the 1st profile (*100 dB)
16	Result[1][12]	reserved
17	UnderRes[1]	under-range value in the 1st profile
18	ResultsFlags[1]	results flags: b1 - if set to 1: overload occurred b5,b4,b3: type of the result **Lden** 000 – **Lden** result is not available 001 – **Ld** result 010 – **Le** result 011 – **Lde** result 100 – **Ln** result 101 – **Lnd** result 110 – **Len** result 111 – **Lden** result
19	0xmm08	[08, mm=sub-block's length]
20..21	OVL	overload time
22	Result[2][1]	**Peak** value in the 2nd profile (*100 dB)
23	Result[2][2]	**SEL** value in the 2nd profile (*100 dB)
24	Result[2][3]	**Max** value in the 2nd profile (*100 dB)
25	Result[2][4]	**Min** value in the 2nd profile (*100 dB)
26	Result[2][5]	**Spl** value in the 2nd profile (*100 dB)
27	Result[2][6]	**Leq** value in the 2nd profile (*100 dB)
28	Result[2][7]	**Lden** value in the 2nd profile (*100 dB)

Word number	Name	Comment
29	Result[2][8]	**Ltm3** value in the 2nd profile (*100 dB)
30	Result[2][9]	**LTeq** value in the 2nd profile (*100 dB)
31	Result[2][10]	**LR1** value in the 2nd profile (*100 dB)
32	Result[2][11]	**LR2** value in the 2nd profile (*100 dB)
33	Result[2][12]	reserved
34	UnderRes[2]	under-range value in the 2nd profile
35	ResultsFlags[2]	flags word for measurement cycle (cf. Table B.1.23 [18])
36	0xmm08	[08, mm=sub-block's length]
37..38		reserved
39	Result[3][1]	**Peak** value in the 3rd profile (*100 dB)
40	Result[3][2]	**SEL** value in the 3rd profile (*100 dB)
41	Result[3][3]	**Max** value in the 3rd profile (*100 dB)
42	Result[3][4]	**Min** value in the 3rd profile (*100 dB)
43	Result[3][5]	**Spl** value in the 3rd profile (*100 dB)
44	Result[3][6]	**Leq** value in the 3rd profile (*100 dB)
45	Result[3][7]	**Lden** value in the 3rd profile (*100 dB)
46	Result[3][8]	**Ltm3** value in the 3rd profile (*100 dB)
47	Result[3][9]	**LTeq** value in the 3rd profile (*100 dB)
48	Result[3][10]	**LR1** value in the 3rd profile (*100 dB)
49	Result[3][11]	**LR2** value in the 3rd profile (*100 dB)
50	Result[3][12]	reserved
51	UnderRes[3]	under-range value in the 3rd profile
52	ResultsFlags[3]	flags word for measurement cycle (cf. Table B.1.23 [18])
53	ResExtra[1]	**LeqLF** value in 0.01 dB
…	…	…

Table B.1.24 Main results in VLM mode (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	**Peak** value in the 1st profile (*100 dB)
6	Result[1][2]	**P-P** value in the 1st profile (*100 dB)
7	Result[1][3]	**Max** value in the 1st profile (*100 dB)
8	Result[1][4]	reserved
9	Result[1][5]	reserved
10	Result[1][6]	**RMS** value in the 1st profile (*100 dB)
11	Result[1][7]	reserved

Word number	Name	Comment
12	Result[1][8]	reserved
13	Result[1][9]	reserved
14	Result[1][10]	reserved
15	Result[1][11]	reserved
16	Result[1][12]	reserved
17	UnderRes[1]	under-range value in the 1st profile
18	ResultsFlags[1]	results flags: b1 - if set to 1: overload occurred
19	0xmm08	[08, mm=sub-block's length]
20..21	OVL	overload time
22	Result[2][1]	**Peak** value in the 2nd profile (*100 dB)
23	Result[2][2]	**P-P** value in the 2nd profile (*100 dB)
24	Result[2][3]	**Max** value in the 2nd profile (*100 dB)
25	Result[2][4]	reserved
26	Result[2][5]	reserved
27	Result[2][6]	**RMS** value in the 2nd profile (*100 dB)
28	Result[2][7]	reserved
29	Result[2][8]	reserved
30	Result[2][9]	reserved
31	Result[2][10]	reserved
32	Result[2][11]	reserved
33	Result[2][12]	reserved
34	UnderRes[2]	under-range value in the 2nd profile
35	ResultsFlags[2]	flags word for measurement cycle (cf. Table B.1.24 [18])
36	0xmm08	[08, mm=sub-block's length]
37..38		reserved
39	Result[3][1]	**Peak** value in the 3rd profile (*100 dB)
40	Result[3][2]	**P-P** value in the 3rd profile (*100 dB)
41	Result[3][3]	**Max** value in the 3rd profile (*100 dB)
42	Result[3][4]	reserved
43	Result[3][5]	reserved
44	Result[3][6]	**RMS** value in the 3rd profile (*100 dB)
45	Result[3][7]	reserved
46	Result[3][8]	reserved
47	Result[3][9]	reserved
48	Result[3][10]	reserved
49	Result[3][11]	reserved
50	Result[3][12]	reserved
51	UnderRes[3]	under-range value in the 3rd profile
52	ResultsFlags[3]	flags word for measurement cycle (cf. Table B.1.24 [18])
…	…	…

Table B.1.25 Statistical levels (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn17	[17, nn=block's length]
1	0xpprr	[pp=used_profile, rr=profile's mask]
2	N_stat_level	number of statistical levels = N
3+i*(pp+1)	nn[i]	number of the **Lnn** statistics; i=0..N-1
3+i*(pp+1)+p	**Lnn**[i,p]	value of the **Lnn** statistics for profile p (p=1..pp) (*100 dB)
…	…	…

Table B.1.26 1/x Octave analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn4B, 0xnn4C, 0xnn4D	[block_id, nn=block_length] 0xnn**4B** - averaged spectrum results, 0xnn**4C** - min. spectrum results, 0xnn**4D** - max. spectrum results
1	0x0101	[used_profile, profile's mask]
2÷(2+i-1)	Octave[i]	1/x Octave[i] value (*100 dB); i=1÷(NOct+NTot)
…	…	…

Table B.1.27 FFT analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0x0052, 0x0053, 0x0054	[block_id, nn=00] 0x00**52** - averaged FFT results, 0x00**53** - min. FFT results, 0x00**54** - max. FFT results
1	BlockLength	block length
2	0x0101	[used_profile, profile's mask]
3..4	N	number of spectra per averaging
5÷…	FFT[i]	values of i th FFT line and Total results (*100 dB);
…	…	…

Table B.1.28 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.1.29 Results of the statistical analysis performed in 1/x Octave mode (saved in Summary Results Record)

Word number	Name	Comment
0	0x0114	[**14** = id, 01 = number of the histogram]
1	Sub-blockLength	2 * NofClasses + 2 (242)
2÷3	Histogram[1][1]	first counter for the first **1/x OCTAVE** filter
4÷5	Histogram[1][2]	second counter for the first **1/x OCTAVE** filter
...	...	...
0	0x0214	[**14** = id, 02 = number of the histogram]
1	Sub-blockLength	2 * NofClasses + 2 (242)
2÷3	Histogram[2][1]	first counter for the second **1/x OCTAVE** filter
4÷5	Histogram[2][2]	second counter for the second **1/x OCTAVE** filter
...	...	...
...	...	...
0	0xnn14	[**14** = id, nn = NofHist = number of the last histogram]
1	Sub-blockLength	2 * NofClasses + 2 (242)
2÷3	Histogram[nn][1]	first counter for the last **1/x OCTAVE** filter
4÷5	Histogram[nn][2]	second counter for the last **1/x OCTAVE** filter
...	...	...

Table B.1.30 RPM results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn1F	[**1F** = id, nn = block’s length]
1	Rpm[0]	RPM[0]
2	Rpm [1]	RPM[1]
3	RpmMax [0]	RPM Max[0]
4	RpmMax[1]	RPM Max[1]

5	RpmMin[0]	RPM Min[0]
6	RpmMin [1]	RPM Min[1]
…	…	…

Table B.1.31 METEO data (saved in Summary Results Record)

Word number	Name	Comment
0	0x002A	[**2A** = id, 00 = block's length in the second word]
1	BlockLength	block length
2	UnitNumber	unit number
3	UnitType	type of the unit: 211 or 210 (SV 211 or SV 210)
4	SoftwareVersion	software version
5..6	IntTimeSec	integration time speci_ed in seconds
7	Temperature	temperature [*10 °C]
8	Pressure	pressure [hPa]
9	Humidity	humidity [*10 %]
10	AvgWindSpeed	average wind speed [*10 m/s]
11	WindDirection	wind direction for max wind speed [°] (0xFFFF if direction is unavailable)
12	MaxWindSpeed	max wind speed [*10 m/s] (ignored if WindDirection is unavailable)
13..14	WindDirTotalPuffs	wind direction distribution vector number of total wind puffs
15	NofWindDir	wind direction distribution vector number of elements
16 .. 16+NofWindDir-1	WindDir[i]	WindDir[i] value [*10 %]
16+NofWindDir	NofWindMax	max wind speed distribution vector number of elements
17+NofWindDir ... 17+NofWindDir+ NofWindMax-1	WindMax[i]	WindMax[i] value [*10 m/s]
17+NofWindDir+ NofWindMax	NofWindAvg	avg wind speed distribution vector number of elements
18+NofWindDir+ NofWindMax ... 18+NofWindDir+ NofWindMax+ NofWindAvg-1	WindAvg[i]	WindAvg[i] value [*10 m/s]
18+NofWindDir+ NofWindMax+ NofWindAvg	RainDetection	rain detection flag
...	...	...

Table B.1.32 RT60 results

Word number	Name	Comment
0	0x001B	[**1B** = id, 00 = block's length in the second word]
1	BlockLength	7 + ((N2_rt60_freq-N1_rt60_freq+1)+N_max_total)*9)
2	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz) = 80
3	NTer	
4	NTotal	
5	N1_rt60_freq	
6	N2_rt60_freq	
7+i	calculated[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
8+i	edt[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
9+i	rt_20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
10+i	rt_30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
11+i	rt_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
12+i	cor_edt[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
13+i	cor_rt_20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
14+i	cor_rt_30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
15+i	cor_rt_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
…	…	…

Table B.1.33 RT60 averaged results

Word number	Name	Comment
0	0x001C	[**1C** = id, 00 = block's length in the second word]
1	BlockLength	7 + ((N2_rt60_freq-N1_rt60_freq+1)+N_max_total)*9)
2	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz) = 80
3	NTer	Number of **1/3 OCTAVE** values
4	NTotal	Number of **TOTAL** values
5	N1_rt60_freq	First frequency
6	N2_rt60_freq	Last frequency
7+i		reserved
8+i	edt[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
9+i	rt_20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
10+i	rt_30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
11+i	rt_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
12+i	cor_edt[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1

Word number	Name	Comment
13+i	cor_rt_20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
14+i	cor_rt_30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
15+i	cor_rt_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
…	…	…

Table B.1.34 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.1.35 SETUP file end marker

Word number	Name	Comment
0	0xFFFF	end marker

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

SvanPC file header (cf. Table B.1.1);
File header (cf. Table B.1.2);
Unit and internal software specification (cf. Table B.1.3);
Calibration settings (cf. Table B.1.4);
USER'S text (cf. Table B.1.5);
Parameters and global settings (cf. Table B.1.6);
MEASUREMENT TRIGGER settings (cf. Table B.1.7);
LOGGER TRIGGER settings (cf. Table B.1.8);
Time-domain signal recording parameters (cf. Table B.1.9);
Wave-file recording parameters (cf. Table B.1.10);
Extended I/O parameters (cf. Table B.1.11);
Special settings for profiles (cf. Table B.1.12, Table B.1.13);
RTF parameters (cf. Table B.1.14);
Marker parameters (cf. Table B.1.15);
Header of the statistical analysis (cf. Table B.1.16);
Header of the 1/x OCTAVE analysis (cf. Table B.1.17);
Header of the statistical analysis performed in 1/x OCTAVE mode (cf. Table B.1.18);
Header of the FFT analysis (cf. Table B.1.19);
RT60 parameters (cf. Table B.1.20);
Header of the logger file (cf. Table B.1.21);
Contents of the logger file (cf. Table B.1.22);

RT60 results block (cf. Table B.1.32);
RT60 averaged results block (cf. Table B.1.33).

B.2.1. The contents of the logger file

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

B.2.1.1. Record with the results

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

1. flag record

<flags> - b0: 1- the overload detected, 0 - the overload not detected

2. results of the measurement from the first profile if the corresponding **LOGGER** position was active (BufferP [1] in 0 or 0); up to six words are written:

SLM mode:
<result1> - **Peak** result, depending on the value of BufferP[1] (cf. Table B.1.12)
<result2> - **Max** result, depending on the value of BufferP[1] (cf. Table B.1.12)
<result3> - **Min** result, depending on the value of BufferP[1] (cf. Table B.1.12)
<result4> - **Leq** result, depending on the value of BufferP[1] (cf. Table B.1.12)
<result5> - **LR1** result, depending on the value of BufferP[1] (cf. Table B.1.12)
<result6> - **LR2** result, depending on the value of BufferP[1] (cf. Table B.1.12)

VLM mode:
<result1> - **Peak** result, depending on the value of BufferP[1] (cf. Table B.1.13)
<result2> - **P-P** result, depending on the value of BufferP[1] (cf. Table B.1.13)
<result3> - **Max** result, depending on the value of BufferP[1] (cf. Table B.1.13)
<result4> - **RMS** result, depending on the value of BufferP[1] (cf. Table B.1.13)

3. results of the measurement from the second profile if the corresponding **LOGGER** position was active (BufferP [2] in Table B.1.12 or Table B.1.13); up to six words are written:

SLM mode:
<result1> - **Peak** result, depending on the value of BufferP[2] (cf. Table B.1.12)
<result2> - **Max** result, depending on the value of BufferP[2] (cf. Table B.1.12)
<result3> - **Min** result, depending on the value of BufferP[2] (cf. Table B.1.12)
<result4> - **Leq** result, depending on the value of BufferP[2] (cf. Table B.1.12)
<result5> - **LR1** result, depending on the value of BufferP[2] (cf. Table B.1.12)
<result6> - **LR2** result, depending on the value of BufferP[2] (cf. Table B.1.12)

VLM mode:
<result1> - **Peak** result, depending on the value of BufferP[2] (cf. Table B.1.13)
<result2> - **P-P** result, depending on the value of BufferP[2] (cf. Table B.1.13)
<result3> - **Max** result, depending on the value of BufferP[2] (cf. Table B.1.13)
<result4> - **RMS** result, depending on the value of BufferP[2] (cf. Table B.1.13)

(4) results of the measurement from the third profile if the corresponding **LOGGER** position was active (BufferP [3] in Table B.1.12 or Table B.1.13); up to six words are written:

SLM mode:

<result1> - **Peak** result, depending on the value of BufferP[3] (cf. Table B.1.12)

<result2> - **Max** result, depending on the value of BufferP[3] (cf. Table B.1.12)

<result3> - **Min** result, depending on the value of BufferP[3] (cf. Table B.1.12)

<result4> - **Leq** result, depending on the value of BufferP[3] (cf. Table B.1.12)

<result5> - **LR1** result, depending on the value of BufferP[3] (cf. Table B.1.12)

<result6> - **LR2** result, depending on the value of BufferP[3] (cf. Table B.1.12)

VLM mode:

<result1> - **Peak** result, depending on the value of BufferP[3] (cf. Table B.1.13)
<result2> - **P-P** result, depending on the value of BufferP[3] (cf. Table B.1.13)
<result3> - **Max** result, depending on the value of BufferP[3] (cf. Table B.1.13)
<result4> - **RMS** result, depending on the value of BufferP[3] (cf. Table B.1.13)

(5) RPM result if the corresponding **LOGGER** position was active (RPM_On in Table B.1.6) written as two words:

<wordL><wordH>

WYK_OKR_OBR = 64
m = ((wordH > & 0x007f)<<16) | ((wordL & 0x7fff)<<1)
w = ((wordH >> 8) & 0x007f)-23-WYK_OKR_OBR
d = m*2 ^{w}
RPS = 1/d
RPM = 60/d

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

<Octave[1]> <Octave[2]> ... <Octave[Noct+NTot]>

where:
Octave[i] - the result of **1/x OCTAVE** analysis (*100 dB);
i = 1..NOct+NTot   (cf. Table B.1.17)

(7) results of FFT analysis if FFT analysis was selected as the measurement function and the **LOGGER** was active (SpectrumBuff in Table B.1.6); the sequence of words is written:

<FFT[0]> <FFT[2]> ... <FFT[N+T]>

where:
FFT[i] - the result of FFT analysis (*100 dB);
i = 0..(N+T)   (cf. Table B.1.19)

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 HS and HE headers are set to zero)
D Summary Data:
- Main results (cf. Table B.1.23, Table B.1.24),
- Statistical levels (cf. Table B.1.25)
- 1/x Octave analysis results (optional, cf. Table B.1.26)
- FFT analysis results (optional, cf. Table B.1.27)

- The results of the statistical analysis in profiles (optional, cf. Table B.1.28)
- The results of the statistical analysis performed in 1/x OCTAVE mode (optional, cf. Table B.1.29)
- The RPM results (optional, cf. Table B.1.30)

L length of the block (field is optional and occurs only when b7..b0 in HS and HE headers are set to zero)

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

The HEADER format is as follows:

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

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:
0 - HS
1 - HE
b10 - 0
b9 - 1
b8 - 1
b15÷b8 – HS (0xC3), HE (0xCB)
b7÷b0 – length of the block (if zero length of the block is saved in additional word L)

B.2.1.8. Record with METEO data

Word number	Name	Comment
0	0xC1nn	nn= size of records
1	Temperature	temperature [*10 °C]
2	Pressure	pressure [hPa]
3	Humidity	humidity [*10 %]
4	AvgWindSpeed	average wind speed [*10 m/s]
5	WindDirection	wind direction for max wind speed [°] (0xFFFF if direction is unavailable)
6	MaxWindSpeed	max wind speed [*10 m/s] (ignored if WindDirection is unavailable)
7..8	WindDirTotalPuffs	wind direction distribution vector number of total wind puffs
9	RainDetection	rain detection flag
…	…	…
…	0xC9nn	nn = size of records

B.2.1.9. 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. Table B.1.1)
File header (cf. Table B.1.2)
Unit and software specification (cf. Table B.1.3)
SETUP DATA (cf. Table B.1.34)
File-end-marker (cf. Table B.1.35)

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)*2;                    /* 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 SVAN 977A AS A SOUND LEVEL METER

C.1.1 Specification of SVAN 977A as SLM in the standard configuration

SVAN 977A working as the SLM with all listed below accessories meets requirements of the IEC 61672:2013 for the Class 1 instruments.

The configuration of the complete SLM and its normal mode of operation

SVAN 977A	sound & vibration analyser
SV 12L	microphone preamplifier
A.C.O. 7052E	measuring prepolarized free-field microphone (1/2", nominal sensitivity 35 mV/Pa, polarization 0 V)
SV 36	Class 1 sound calibrator: 94/114 dB@1000 Hz, B&K 4231 (or equivalent)

Accessories included in SVAN 977A instrument set

SC 16	USB cable
SA 22	windscreen

Accessories available:

SV 55	RS 232 interface for SVAN 977A
SA 277	outdoor protection unit
SC 26	extension cable for SV 12L (TNC plug to TNC socket)
SA 15	power supply unit

Measured quantities

The measured quantities in the sound meter mode are: **PEAK**, **SPL**, **MAX**, **MIN**, **LEQ**, **Leq**, **SEL**, **Ltm3**, **LTeq**, **Lden**, **LEPd**, **Lnn**.
Definitions for parameters are given in Appendix D.

Additional functions

Overload indication	see Chapter 3 or Appendix A
Under-range indication	see Chapter 3 or Appendix A
Battery state indication	see Chapter 3

Conformance testing

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

Mounting for acoustical tests	The microphone must be mounted on the preamplifier.
Electrical substitute for the microphone	To obtain a BNC Class electrical input, the microphone must be replaced by an electrical microphone impedance ST 02 with the serial capacitance 18 pF ± 10%.

Note: *For the conformance of electrical tests, the Microphone Compensation must be set to “Off”! (path: <Menu> / Measurement / Compensation Filter).*

Note: *For the conformance tests with B&K4226 multifrequency calibrator, the Microphone Compensation must be set to “On”! (path: <Menu> / Measurement / Compensation Filter).*

Note: *For the conformance of acoustical tests, the Microphone Compensation must be set to “Free Field” and the Windscreen position must be set to “Off”! (path: <Menu> / Measurement / Compensation Filter).*

If the case of Windscreen testing the Windscreen position must be set to “On”.

Periodical test upper frequency 8 kHz

Linear Operating Ranges

Two measuring ranges are available: “LOW” and "HIGH".

The starting point at which tests of level linearity shall begin is 94.0 dB for the frequencies specifies below.

Table C.1.1. Linear operating range: “LOW” for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**
31,5 Hz	25	80	25	103	25	117	30	120	25	80	25	103	25	117	28	83	50	120
500 Hz	25	116	25	119	25	120	30	120	25	116	25	119	25	120	28	119	50	123
1 kHz	25	120	25	120	25	120	30	120	25	120	25	120	25	120	28	123	50	123
4 kHz	25	121	25	119	25	119	30	120	25	121	25	119	25	119	28	124	50	123
8 kHz	25	119	25	117	25	117	30	120	25	119	25	117	25	117	28	122	50	120
12.5 kHz	25	115	25	114	25	114	30	120	25	115	25	114	25	114	28	118	50	117

Table C.1.2. Linear operating range: „HIGH“ (primary level range) for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**	**from**	**to**
31,5 Hz	35	97	35	120	35	134	40	137	35	97	35	120	35	134	38	100	60	137
500 Hz	35	133	35	136	35	137	40	137	35	133	35	136	35	137	38	136	60	140
1 kHz	35	137	35	137	35	137	40	137	35	137	35	137	35	137	38	140	60	140
4 kHz	35	138	35	136	35	136	40	137	35	138	35	136	35	136	38	141	60	139
8 kHz	35	136	35	134	35	134	40	137	35	136	35	134	35	134	38	139	60	137
12.5 kHz	35	132	35	131	35	131	40	137	35	132	35	131	35	131	38	135	60	134

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

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

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

Measuring ranges

Reference measuring range of the acoustic pressure Low

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

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

Weighting filters (see part C.3)

- **Z** meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “**Z**“ filter
- **A** meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 “**A**” filter
- **B** meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 “**B**” filter
- **C** meeting requirements of the IEC 651 and IEC 61672-1:2013 standard for the Class 1 “**C**” filter

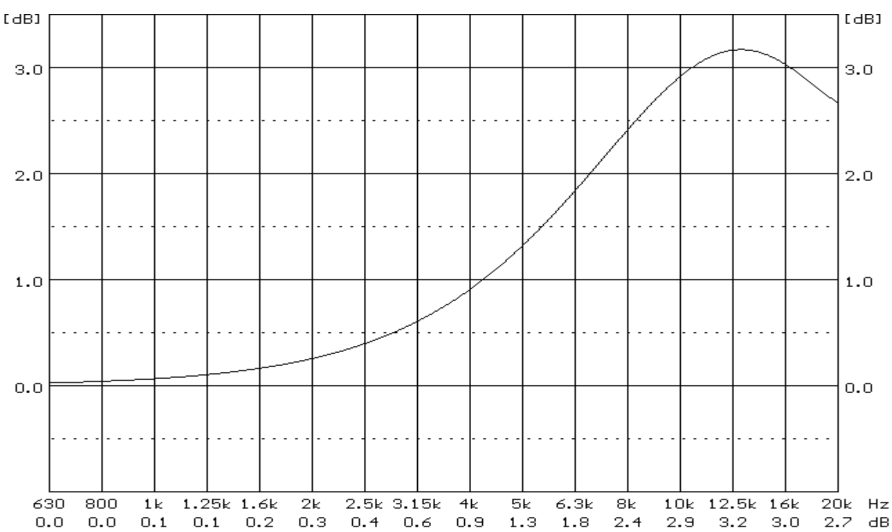
Table C.1.3. Self-generated noise for different weighting filters

	Electrical *)			Acoustical compensated		
Range / Weighting filter	A	C	Z	A	C	Z
Low	< 12 dB	< 12 dB	< 17 dB	< 15 dB	< 15 dB	< 20 dB
High	< 22 dB	< 22 dB	< 26 dB	< 25 dB	< 25 dB	< 30 dB

*) measured with the **ST 02** microphone equivalent impedance **18 pF ± 10%**

Special filters

- **Diffuse field – compensation filter** filter improving the complete instrument frequency response in the diffuse acoustic field (see below)
- **Windscreen – compensation filter** filter improving the instrument frequency response in the free acoustic field when windscreen SA22 is mounted on the microphone (see C.1.2)



SVAN 977A diffuse field compensation filter

Note: *Using special filters might change the frequency response and measuring ranges of SVAN 977A. Please check the below given specification.*

Linear operating ranges for LEQ measurements with Diffuse Filter

Table C.1.4. Linear operating range for the “Diffuse” filter: “LOW” for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31,5 Hz	26	80	26	103	26	117	32	120	26	80	26	103	26	117	29	83	50	120
500 Hz	26	116	26	119	26	120	32	120	26	116	26	119	26	120	29	119	50	123
1 kHz	26	120	26	120	26	120	32	120	26	120	26	120	26	120	29	123	50	123
4 kHz	26	121	26	119	26	119	32	120	26	121	26	119	26	119	29	124	50	123
8 kHz	26	119	26	117	26	117	32	120	26	119	26	117	26	117	29	123	50	120
12.5 kHz	26	115	26	114	26	114	32	120	26	115	26	114	26	114	29	118	50	117

Table C.1.5. Linear operating range for the “Diffuse” filter: „HIGH“ (primary level range) for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31,5 Hz	36	97	36	120	36	134	42	137	36	97	36	120	36	134	39	100	60	137
500 Hz	36	133	36	136	36	137	42	137	36	133	36	136	36	137	39	136	60	140
1 kHz	36	137	36	137	36	137	42	137	36	137	36	137	36	137	39	140	60	140
4 kHz	36	138	36	136	36	136	42	137	36	138	36	136	36	136	39	141	60	139
8 kHz	36	136	36	134	36	134	42	137	36	136	36	134	36	134	39	139	60	137
12.5 kHz	36	132	36	131	36	131	42	137	36	132	36	131	36	131	39	136	60	134

Linear operating ranges with the SA 22 windscreen

See Chapter C.1.2.

RMS detector

- Digital — “True RMS“ with Peak detection,
- Resolution — 0.1 dB
- Range — 327.7 dB
- Crest Factor — unlimited (for signals in 20 kHz band).

Overload detector

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

Underrange detector

The instrument has the built-in underrange detector. The “underrange” indication appears when the minimum value of the RMS detector output goes below the specified lower linear operating range.

Time weighting characteristics (Exponential averaging)

Slow “**S**“ according to IEC 61672 Class 1, Equivalent Time Constant 1000 ms
Fast “**F**” according to IEC 61672 Class 1, Equivalent Time Constant 125 ms
Impulse “**I**” according to IEC 60804 Class 1, Equivalent Time Constant 35 ms, Hold Time 1500 s

Reference conditions

- Class of the acoustic field — Free field
- Reference acoustic pressure — 114.0 dB (related to 20 μPa)
- Reference frequency — 1000 Hz
- Reference temperature — +20°C
- Reference relative humidity — 65 %
- Reference static pressure — 1013 hPa
- Reference incidence direction — perpendicular to the microphone diaphragm.

Calibration

Acoustical **-** with the SV 36 sound calibrator (or equivalent):

- Calibration level for the pressure field — 114.0 dB (equal to the calibrator pressure level - see calibration chart of the used calibrator)
- Calibration level for the free field and 0 deg incidence angle — 113.87 dB (equal to the calibration level for the pressure field minus free field correction of A.C.O. 7052E at 1000 Hz – see Table C.1.7)

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

ACO 7052E — prepolarized free-field ½” condenser microphone
Nominal sensitivity — 35 mV/Pa (corresponding to -29 dBV/Pa re 1 V/Pa)
Capacitance — 17 pF.

Note: *Maximum level of sound pressure level, which can be affect the microphone without destruction the microphone: 155 dB.*

Table C.1.6. ACO 7052E free field correction for electrostatic actuator (0 deg incidence angle)

Frequency [Hz]	20	25	31,5	40	50	63	80	100	125	160	200	250	315	400	500	630	800
Correction factors [dB]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.07

Frequency [Hz]	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
Correction factors [dB]	0.1	0.13	0.24	0.34	0.48	0.72	1.1	1.55	2.24	3.06	4.37	5.94	7.86	10.57

Table C.1.7. ACO 7052E free field correction for B&K 4226 calibrator (0 deg incidence angle)

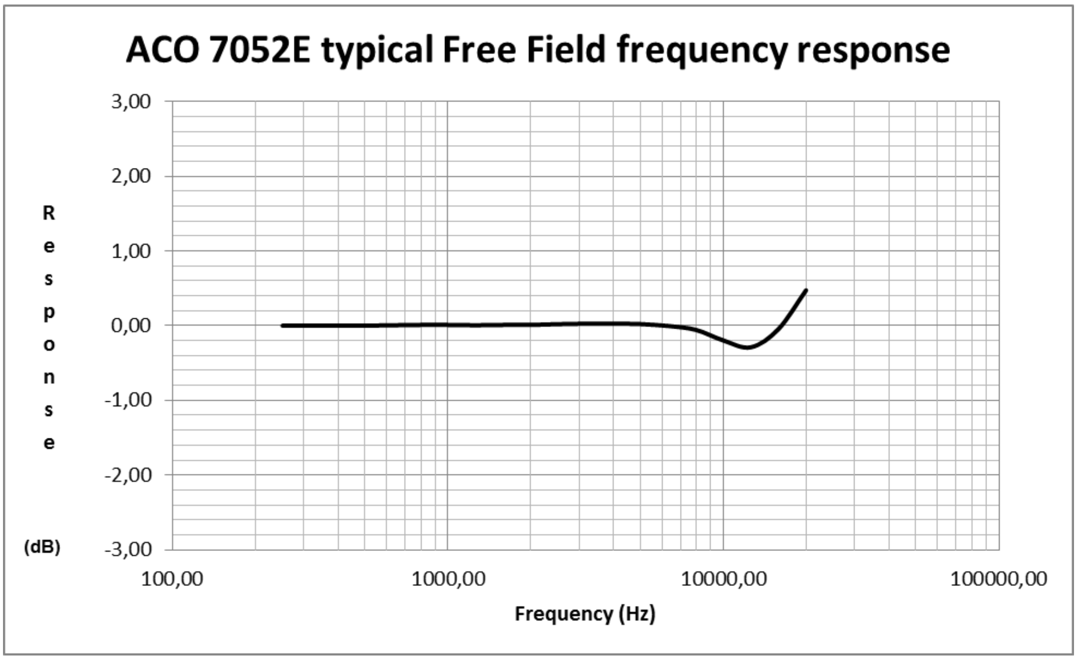
Frequency [Hz]	250	500	1000	2000	4000	8000	12500	16000	20000
Correction factors [dB]	0.0	0.06	0.13	0.58	1.65	4.24	7.29	9.17	10.95

Typical Free Field frequency response of the microphone

Table C.1.8. ACO 7052E free field response (0 deg incidence angle) - measured

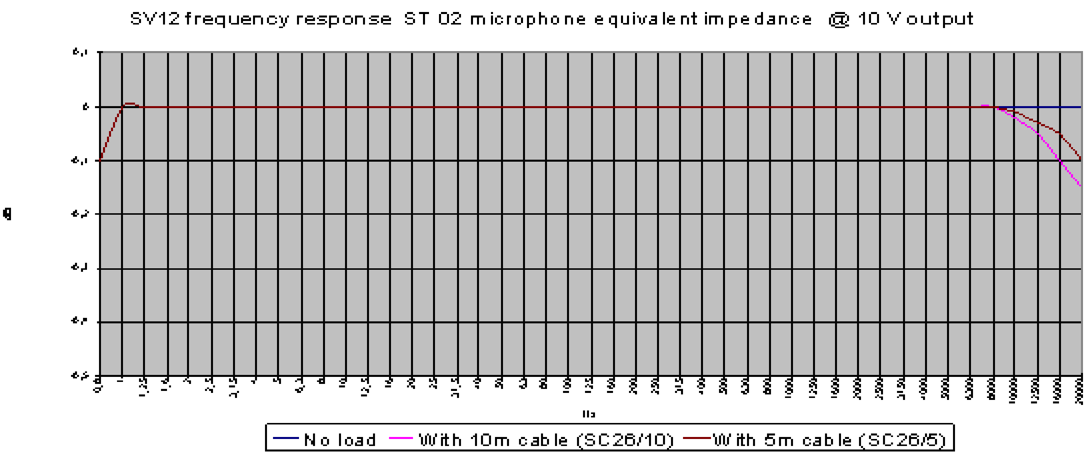
Correction factors [dB]	Frequency [Hz]															
	20	**25**	**31,5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.01	0.01	0.01

Correction factors [dB]	Frequency [Hz]													
	1000	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**12500**	**16000**	**20000**
	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.02	0.0	-0.06	-0.2	-0.29	-0.05	0.47



Preamplifier

SV 12L nominal preamplifier attenuation: 0.7 dB;
IEPE Type – power supply 1.5 mA@30 V



SV12L typical frequency response

Maximum peak voltage	30 V Peak-Peak (Maximum peak voltage of input sinusoidal signal, which can be lead to the SLM without destruction the meter)
Warm-up time	1 min. (for 0.1 dB accuracy)
Nominal delay	less than 3 seconds (between operating of the "Reset- Button" and beginning of a new measurement)
Typical stabilization time after change in environmental conditions by 20°C	1 hour
Time shift after completion of a measurement, before a measurement is shown	< 1 sec

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

Environmental, electrostatic and radio frequency criteria

Effect of humidity	< 0.5 dB (for 30%<RH<90% at 40°C and 1000 Hz)
Effect of magnetic field	< 15 dB (A) or < 25 dB (Z) (for 80 A/m and 50 Hz)
Effect of radio frequency fields	< +/-0.5 dB @ 74 dB and 10V/m electromagnetic field

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

The greatest susceptibility is achieved when the SLM is placed parallel to the radio frequency field. In addition, if there is an extension cable, the greatest susceptibility is achieved when the SLM and cable is placed along field and the cable is coil as solenoid.

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

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

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

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

Effect of Vibration

1. For mechanical vibrations with an acceleration of 1 m/s² vertically to the membrane of the microphone for the frequencies 31,5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz and 1000 Hz increases the low level of the linear operation range to 70dB for the frequency weighting “A”.
2. For mechanical vibrations with an acceleration of 1 m/s² parallel to the membrane of the microphone for the frequencies 31,5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 630 Hz, 800 Hz and 1000 Hz increases the low level of the linear operation range to 65dB for the frequency weighting "A".

Test conditions:

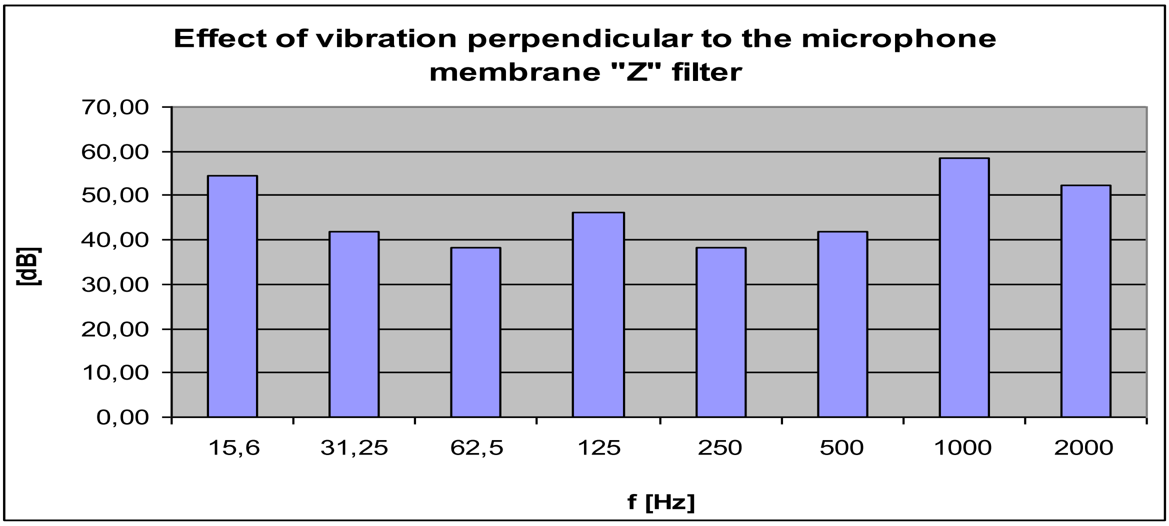
SVAN 977A with microphone and preamplifier is mounted on the shaker.
Ref 1. Vibration is applied in a direction perpendicular to the plane of the microphone diaphragm.
Ref 2. Vibration is applied in a direction parallel to the plane of the microphone diaphragm.

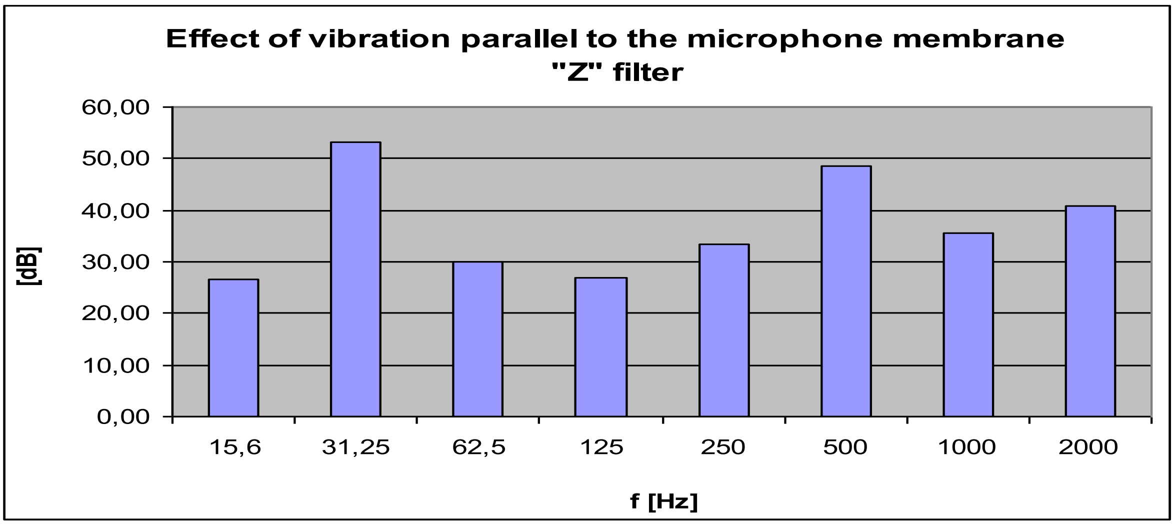
Table C.1.9. Typical effect of vibration perpendicular to the plane of microphone diaphragm

f (Hz)	15.6	31.25	62.5	125	250	500	1000	2000
Typical effect of vibration [dB]	54.6	41.9	38.2	46.2	38.3	42.0	58.6	52.4

Table C.1.10. Typical effect of vibration parallel to the plane of microphone diaphragm

f (Hz)	15.6	31.25	62.5	125	250	500	1000	2000
Typical effect of vibration [dB]	26.5	53.1	30.1	27.0	33.3	48.6	35.6	40.7





Frequency response of SVAN 977A

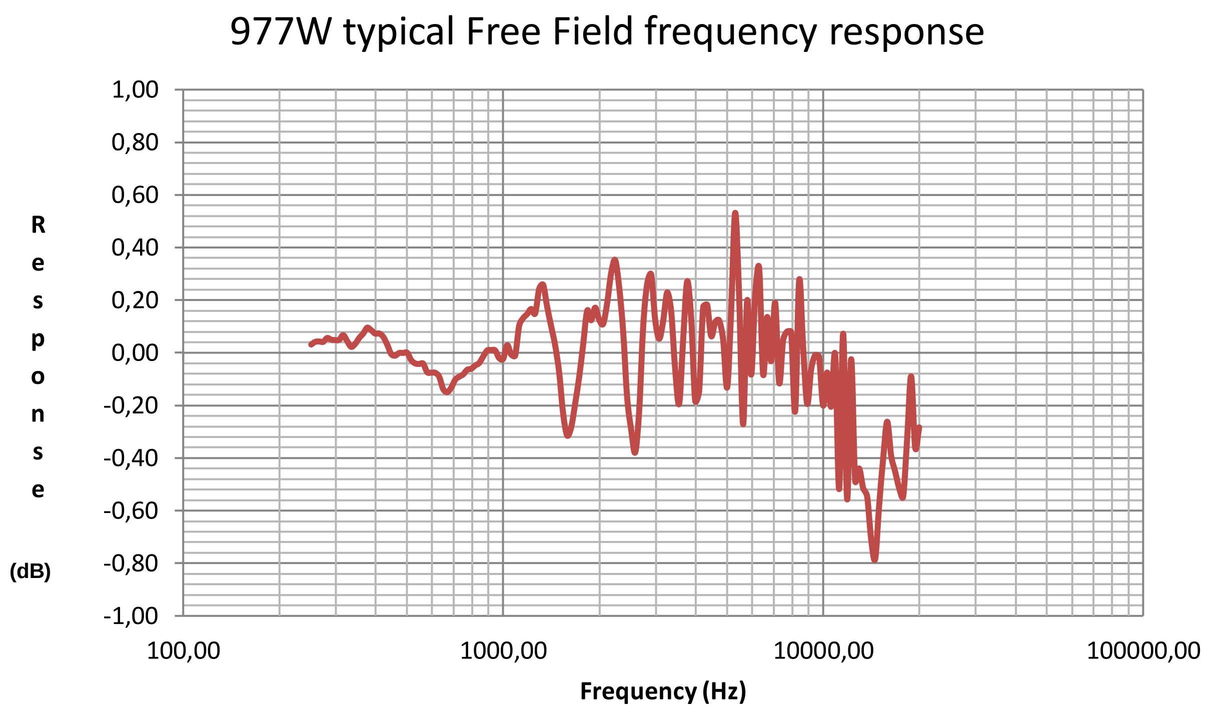


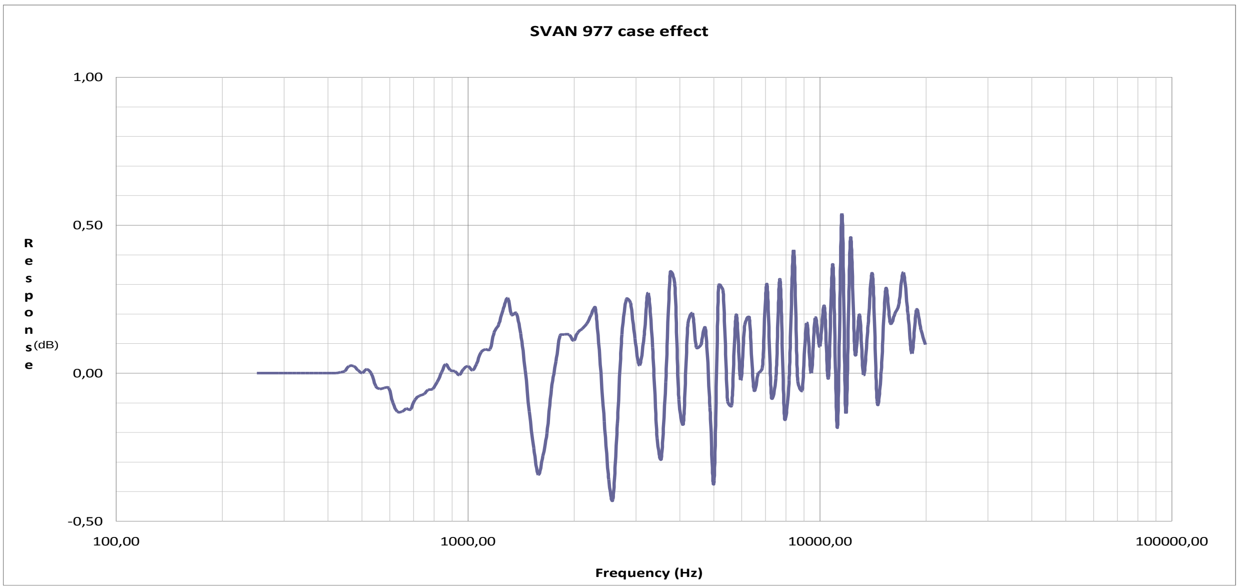
Table C.1.11. SVAN 977A typical free field frequency response

Frequency [Hz}	SVAN 977A frequency response [dB]	Frequency [Hz}	SVAN 977A frequency response [dB]	Frequency [Hz}	SVAN 977A frequency response [dB]
251,19	0,03	**1090,18**	-0,01	**4731,51**	0,12
258,52	0,04	**1122,02**	0,10	**4869,68**	0,05
266,07	0,04	**1154,78**	0,13	**5011,87**	-0,13
273,84	0,04	**1188,50**	0,15	**5158,22**	0,16
281,84	0,06	**1223,21**	0,17	**5308,84**	0,53
290,07	0,05	**1258,93**	0,15	**5463,87**	0,21
298,54	0,05	**1295,69**	0,24	**5623,41**	-0,27
307,26	0,05	**1333,52**	0,26	**5787,62**	0,20
316,23	0,07	**1372,46**	0,17	**5956,62**	-0,08
325,46	0,04	**1412,54**	0,10	**6130,56**	0,22
334,97	0,02	**1453,78**	0,03	**6309,57**	0,32
344,75	0,03	**1496,24**	-0,08	**6493,82**	-0,08
354,81	0,06	**1539,93**	-0,23	**6683,44**	0,14
365,17	0,07	**1584,89**	-0,31	**6878,60**	-0,03
375,84	0,10	**1631,17**	-0,28	**7079,46**	0,19
386,81	0,09	**1678,80**	-0,19	**7286,18**	-0,11
398,11	0,07	**1727,83**	-0,09	**7498,94**	0,05
409,73	0,07	**1778,28**	0,03	**7717,92**	0,08
421,70	0,06	**1830,21**	0,16	**7943,28**	0,08
434,01	0,03	**1883,65**	0,12	**8175,23**	-0,22
446,68	0,00	**1938,65**	0,17	**8413,95**	0,28
459,73	-0,01	**1995,26**	0,13	**8659,64**	0,02
473,15	0,00	**2053,53**	0,11	**8912,51**	-0,19

486,97	0,00	**2113,49**	0,19	**9172,76**	-0,06
501,19	0,00	**2175,20**	0,30	**9440,61**	-0,01
515,82	-0,03	**2238,72**	0,35	**9776,28**	-0,02
530,88	-0,04	**2304,09**	0,25	**10000,00**	-0,20
546,39	-0,04	**2371,37**	0,08	**10292,01**	-0,08
562,34	-0,04	**2440,62**	-0,17	**10592,54**	-0,20
578,76	-0,07	**2511,89**	-0,29	**10901,84**	-0,01
595,66	-0,08	**2585,23**	-0,38	**11220,18**	-0,52
613,06	-0,08	**2660,73**	-0,22	**11547,82**	0,07
630,96	-0,09	**2738,42**	0,10	**11885,02**	-0,56
649,38	-0,14	**2818,38**	0,26	**12232,07**	-0,02
668,34	-0,15	**2900,68**	0,30	**12589,25**	-0,49
687,86	-0,13	**2985,38**	0,13	**12956,87**	-0,44
707,95	-0,10	**3072,56**	0,05	**13335,21**	-0,51
728,62	-0,09	**3162,28**	0,12	**13724,61**	-0,55
749,89	-0,08	**3254,62**	0,23	**14125,38**	-0,71
771,79	-0,06	**3349,65**	0,16	**14537,84**	-0,78
794,33	-0,06	**3447,47**	-0,06	**14962,36**	-0,58
817,52	-0,05	**3548,13**	-0,19	**15399,27**	-0,40
841,40	-0,04	**3651,74**	0,05	**15848,93**	-0,26
865,96	-0,01	**3758,37**	0,27	**16311,73**	-0,39
891,25	0,01	**3868,12**	0,13	**16788,04**	-0,45
917,28	0,01	**3981,07**	-0,18	**17278,26**	-0,51
944,06	0,01	**4097,32**	-0,14	**17782,79**	-0,55
977,63	-0,02	**4216,97**	0,17	**18302,06**	-0,33
1000,00	-0,02	**4340,10**	0,18	**18836,49**	-0,09
1029,20	0,03	**4466,84**	0,06	**19386,53**	-0,36
1059,25	-0,01	**4597,27**	0,12	**19952,62**	-0,28

Case effect

Effect of reflections and diffraction of the acoustic plane wave from the case of SVAN 977A ("case effect").



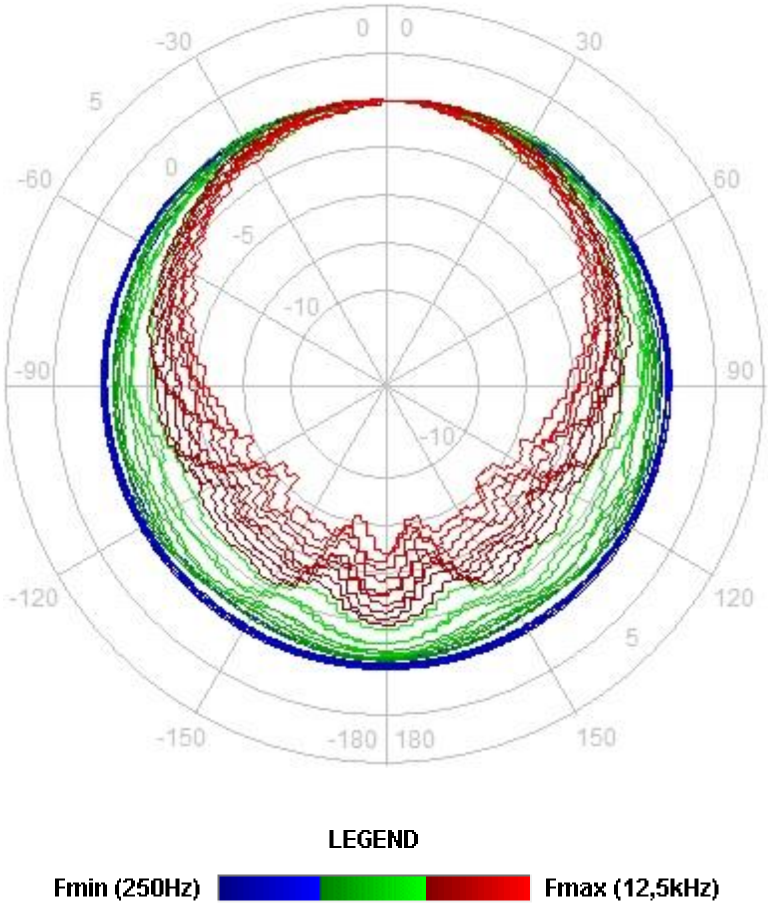
SVAN 977A case effect

Table C.1.12. SVAN 977A "Case effect"

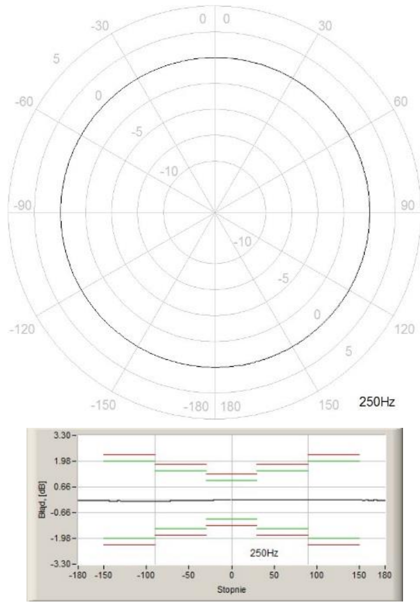
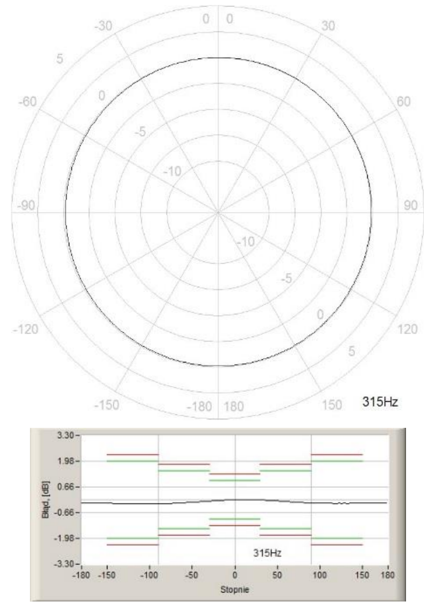
Frequency [Hz}	Case effect [dB]	Frequency [Hz}	Case effect [dB]	Frequency [Hz}	Case effect [dB]
251,19	0,00	**1090,18**	0,07	**4731,51**	0,15
258,52	0,00	**1122,02**	0,08	**4869,68**	-0,12
266,07	0,00	**1154,78**	0,08	**5011,87**	-0,36
273,84	0,00	**1188,50**	0,14	**5158,22**	0,30
281,84	0,00	**1223,21**	0,16	**5308,84**	0,28
290,07	0,00	**1258,93**	0,21	**5463,87**	-0,10
298,54	0,00	**1295,69**	0,25	**5623,41**	-0,11
307,26	0,00	**1333,52**	0,20	**5787,62**	0,20
316,23	0,00	**1372,46**	0,20	**5956,62**	-0,02
325,46	0,00	**1412,54**	0,13	**6130,56**	0,16
334,97	0,00	**1453,78**	0,01	**6309,57**	0,19
344,75	0,00	**1496,24**	-0,13	**6493,82**	-0,05
354,81	0,00	**1539,93**	-0,25	**6683,44**	0,00
365,17	0,00	**1584,89**	-0,34	**6878,60**	0,02
375,84	0,00	**1631,17**	-0,28	**7079,46**	0,30
386,81	0,00	**1678,80**	-0,20	**7286,18**	-0,08
398,11	0,00	**1727,83**	-0,05	**7498,94**	-0,02
409,73	0,00	**1778,28**	0,04	**7717,92**	0,32
421,70	0,00	**1830,21**	0,13	**7943,28**	-0,15
434,01	0,00	**1883,65**	0,13	**8175,23**	-0,02
446,68	0,01	**1938,65**	0,13	**8413,95**	0,42
459,73	0,02	**1995,26**	0,11	**8659,64**	-0,03
473,15	0,02	**2053,53**	0,14	**8912,51**	-0,06
486,97	0,01	**2113,49**	0,15	**9172,76**	0,17
501,19	0,00	**2175,20**	0,17	**9440,61**	0,00
515,82	0,01	**2238,72**	0,20	**9776,28**	0,19
530,88	0,00	**2304,09**	0,22	**10000,00**	0,09
546,39	-0,04	**2371,37**	0,05	**10292,01**	0,23
562,34	-0,05	**2440,62**	-0,16	**10592,54**	-0,02
578,76	-0,05	**2511,89**	-0,36	**10901,84**	0,37
595,66	-0,05	**2585,23**	-0,43	**11220,18**	-0,18
613,06	-0,10	**2660,73**	-0,17	**11547,82**	0,54
630,96	-0,13	**2738,42**	0,13	**11885,02**	-0,14
649,38	-0,13	**2818,38**	0,25	**12232,07**	0,46
668,34	-0,12	**2900,68**	0,24	**12589,25**	0,07
687,86	-0,12	**2985,38**	0,12	**12956,87**	0,20
707,95	-0,09	**3072,56**	0,03	**13335,21**	-0,01
728,62	-0,08	**3162,28**	0,12	**13724,61**	0,16
749,89	-0,07	**3254,62**	0,27	**14125,38**	0,33
771,79	-0,06	**3349,65**	0,09	**14537,84**	-0,10
794,33	-0,05	**3447,47**	-0,22	**14962,36**	0,01
817,52	-0,03	**3548,13**	-0,29	**15399,27**	0,28
841,40	0,00	**3651,74**	-0,03	**15848,93**	0,17
865,96	0,03	**3758,37**	0,34	**16311,73**	0,20
891,25	0,01	**3868,12**	0,30	**16788,04**	0,23
917,28	0,01	**3981,07**	-0,09	**17278,26**	0,34
944,06	-0,01	**4097,32**	-0,17	**17782,79**	0,20
977,63	0,01	**4216,97**	0,17	**18302,06**	0,07
1000,00	0,02	**4340,10**	0,20	**18836,49**	0,21
1029,20	0,01	**4466,84**	0,09	**19386,53**	0,15
1059,25	0,03	**4597,27**	0,10	**19952,62**	0,10

Directional characteristics of SVAN 977A

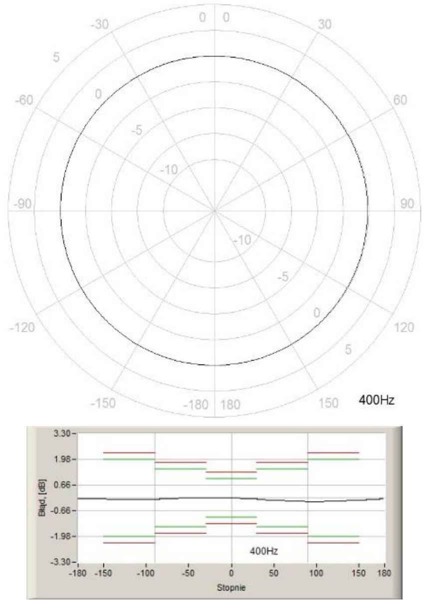
Directional response for SLM Class **SVAN 977A** with microphone **ACO 7052E** and preamplifier **SV 12L** for specified frequencies:



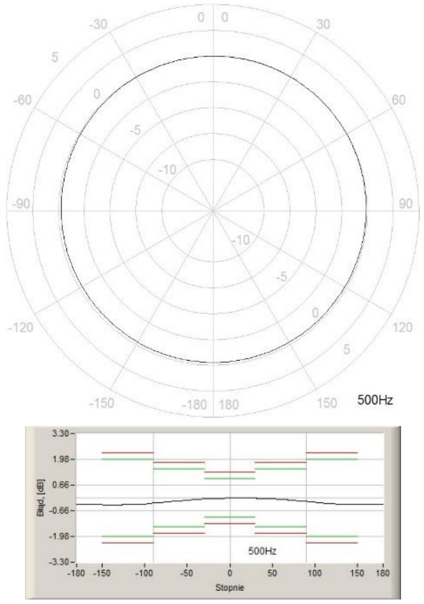
The round charts show the directional characteristic and the charts below shows the errors for angles.

250 Hz		**315 Hz**	

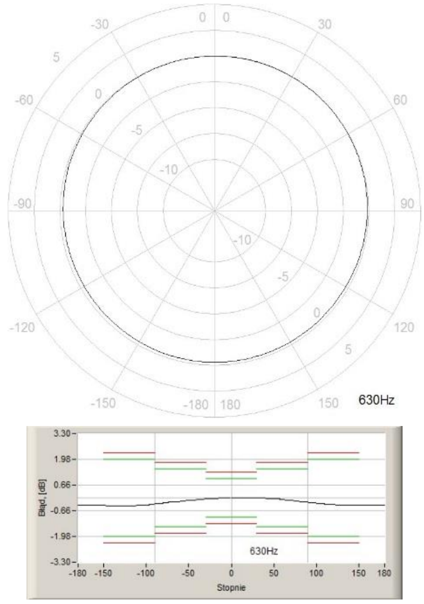
400 Hz



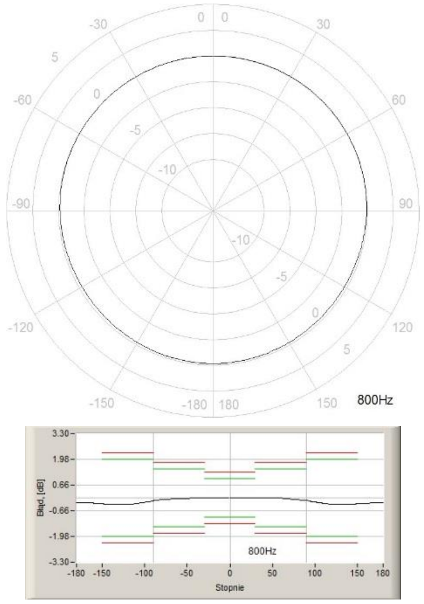
500 Hz



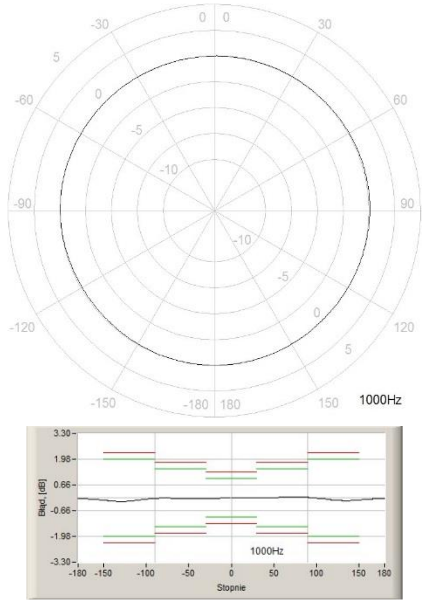
630 Hz



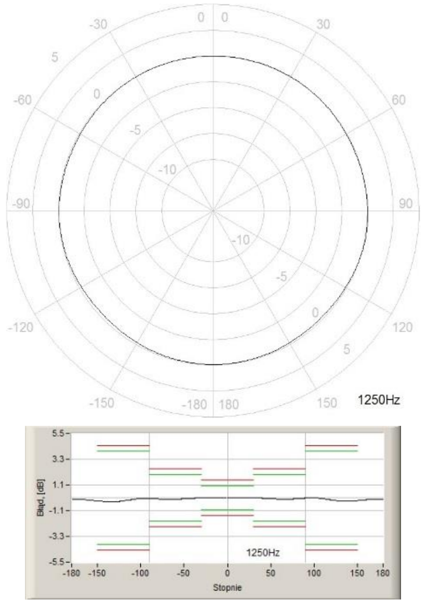
800 Hz



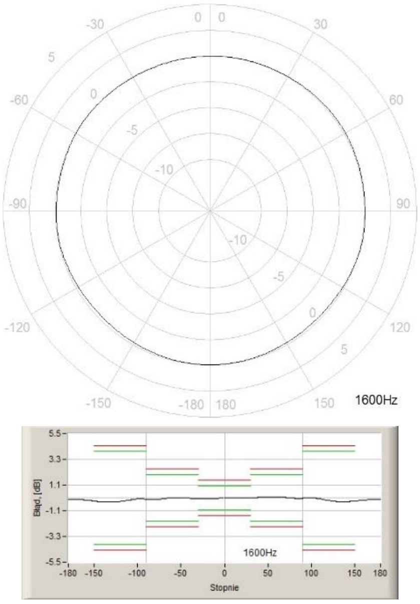
1000 Hz



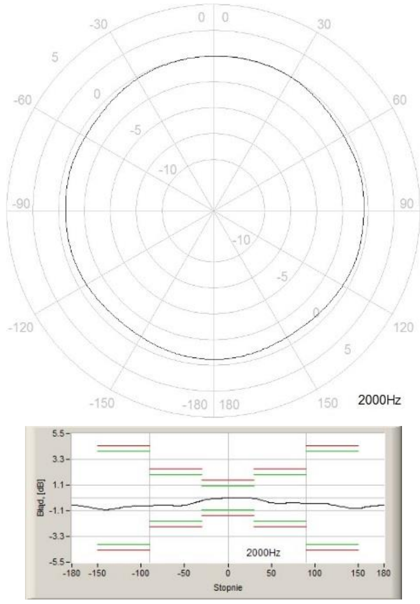
1250 Hz



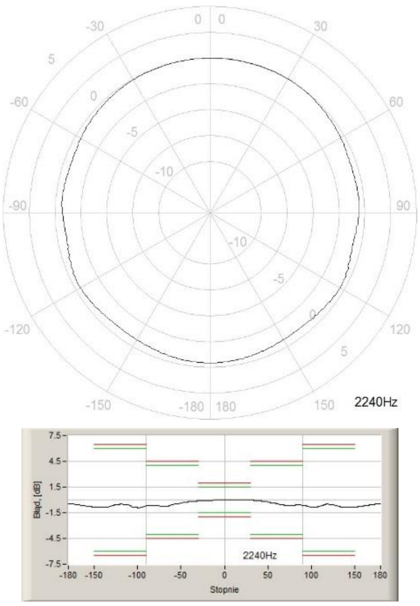
1600 Hz



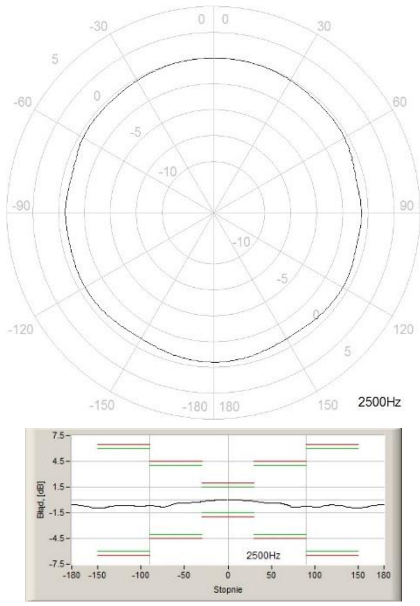
2000 Hz



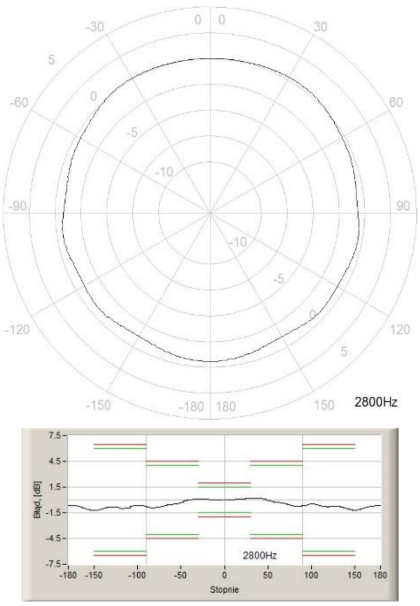
2240 Hz



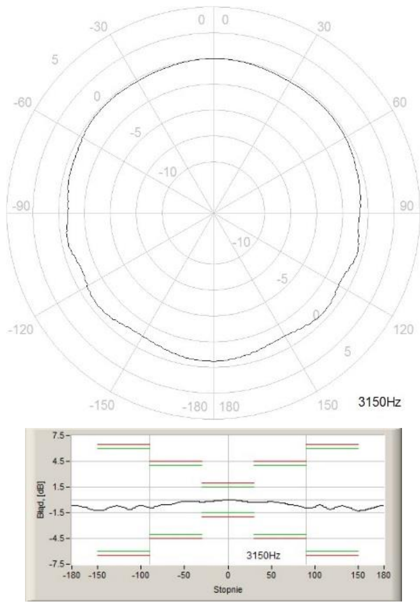
2500 Hz

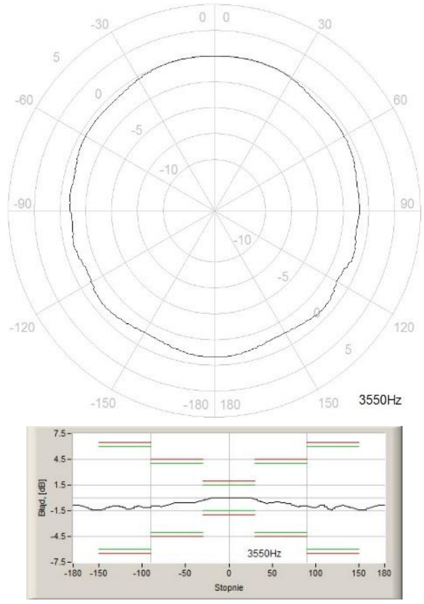
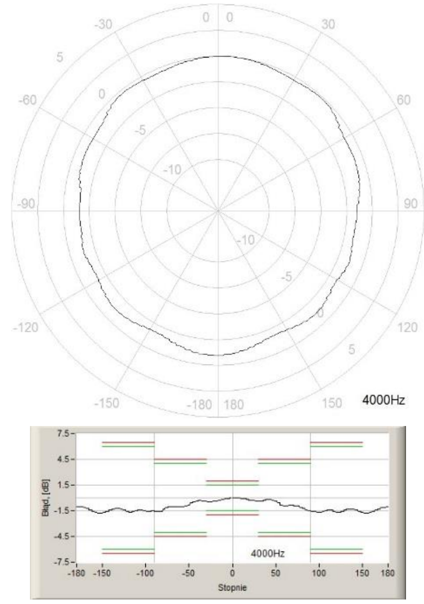
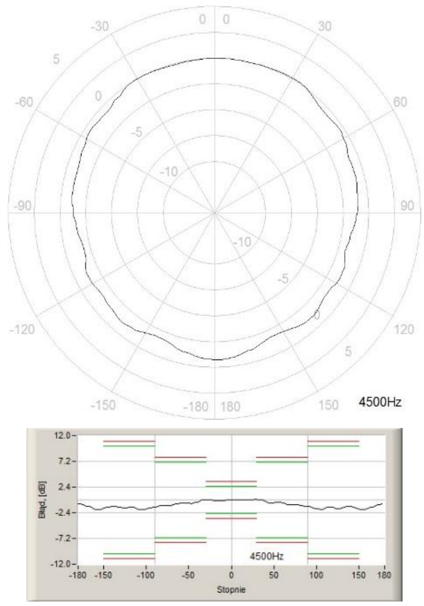
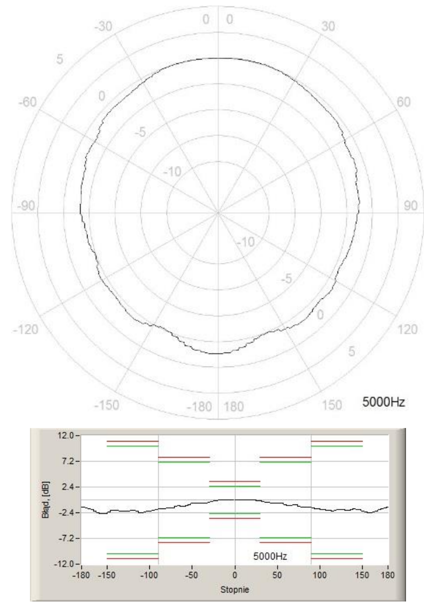
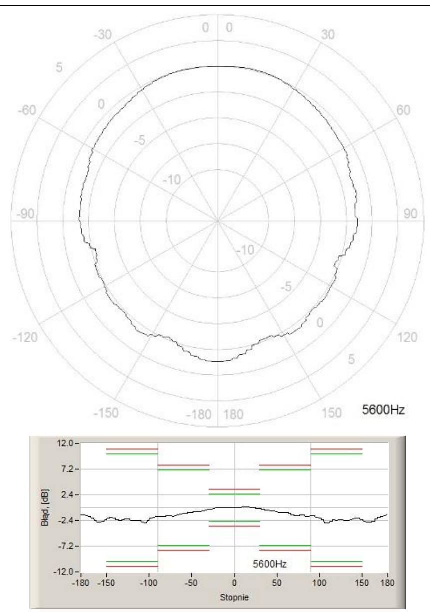
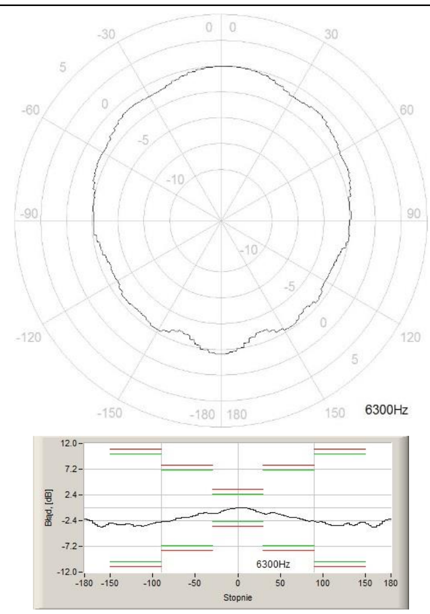


2800 Hz

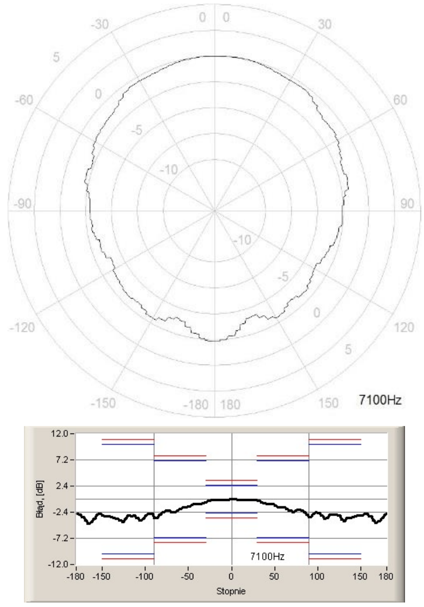


3150 Hz

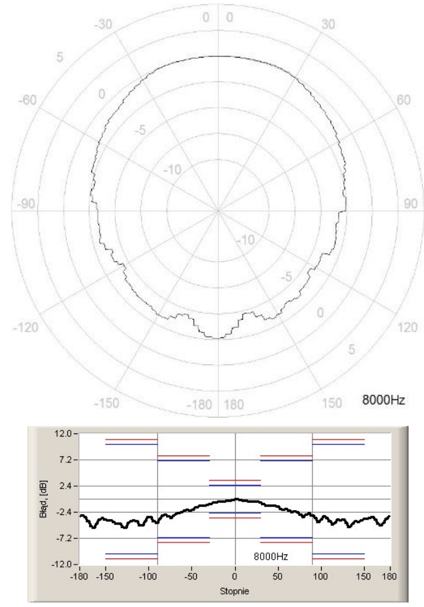


3550 Hz		**4000 Hz**	
4500 Hz		**5000 Hz**	
5600 Hz		**6300 Hz**	

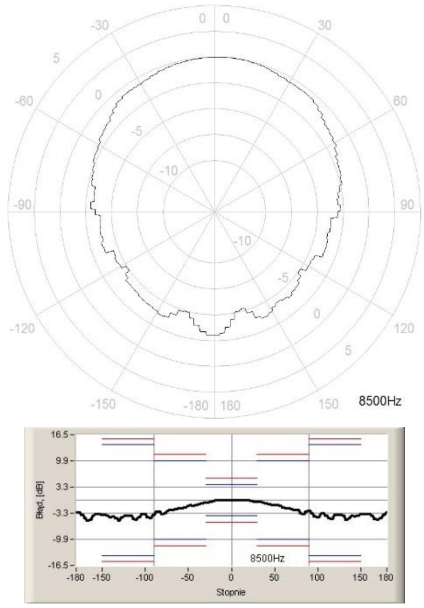
7100 Hz



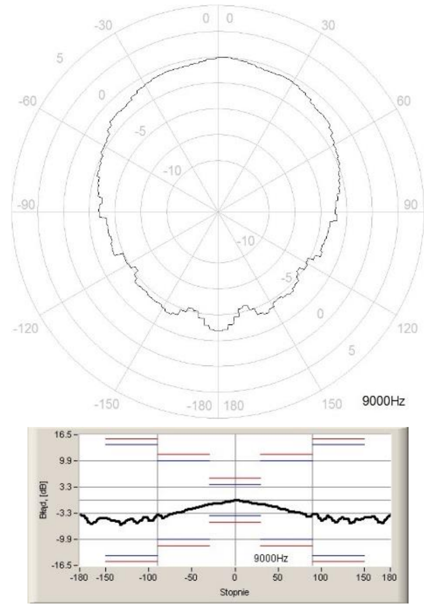
8000 Hz



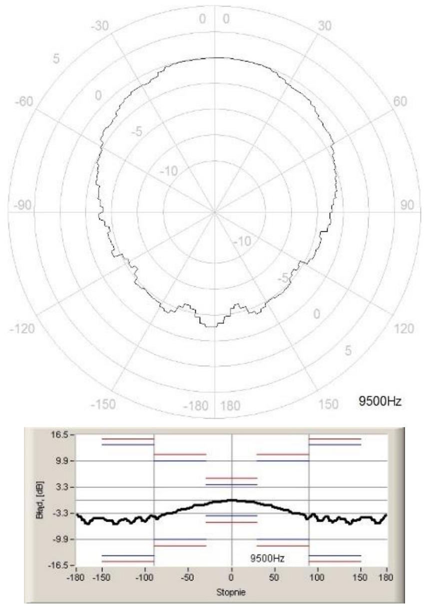
8500 Hz



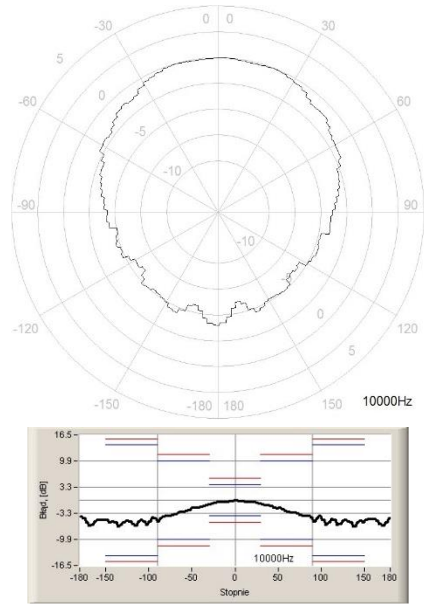
9000 Hz



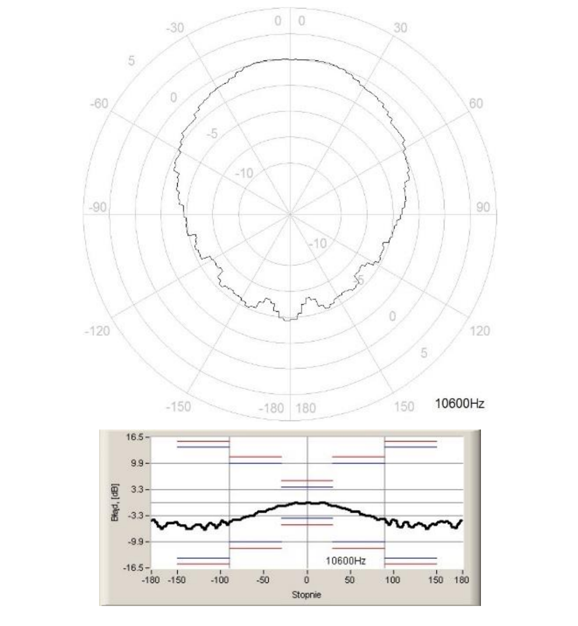
9500 Hz



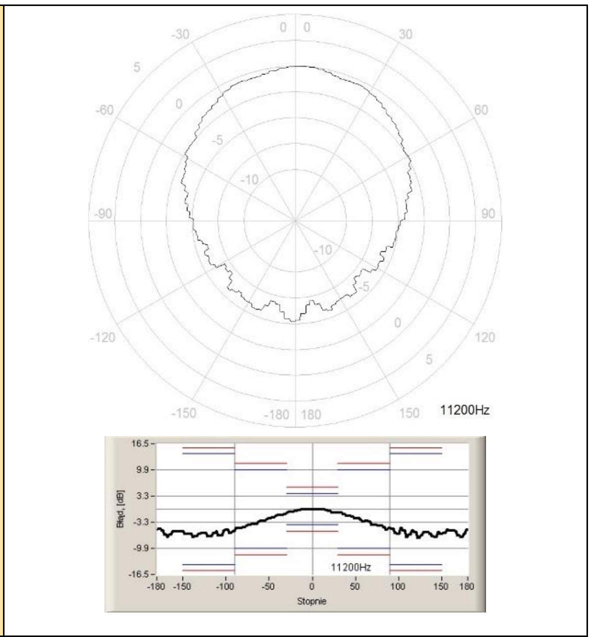
10000 Hz



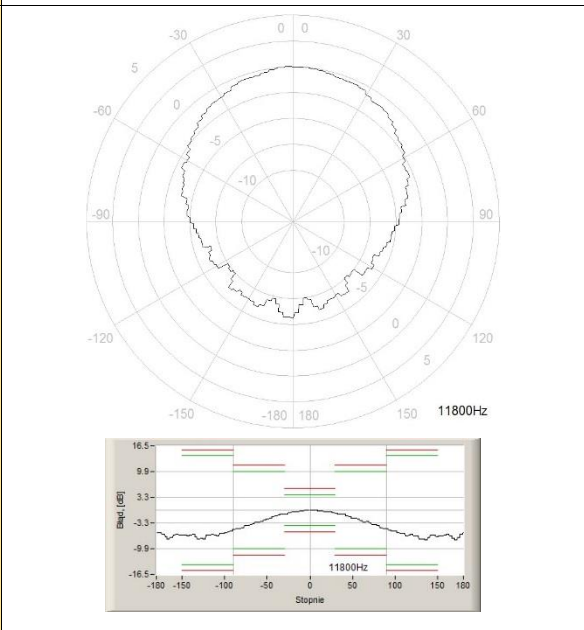
10600 Hz



11200 Hz



11800 Hz



12500 Hz

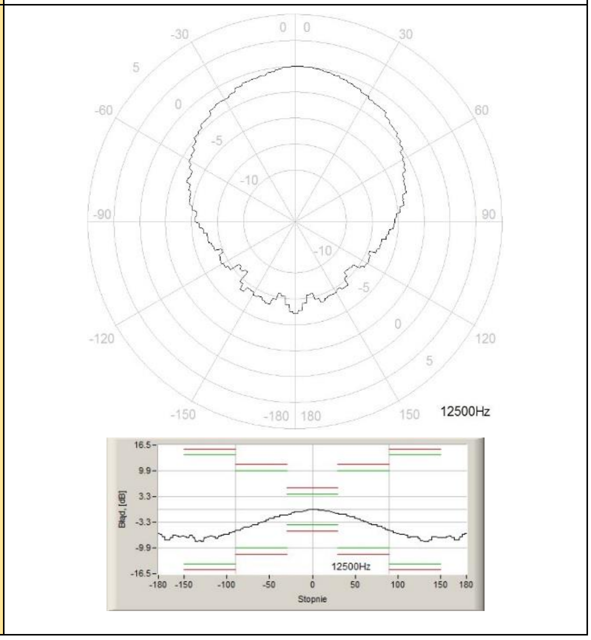


Table C.1.13. Directional response for SVAN 977A with microphone ACO 7052E

	Angle [°]									
f [Hz]	**0-10**	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**	**80-90**	**90-100**
250	0	0	0,01	0,01	0,01	0	0	-0,01	-0,01	-0,01
315	0	0	0,01	-0,02	-0,04	-0,06	-0,09	-0,11	-0,14	-0,16
400	0	-0,02	-0,04	-0,06	-0,09	-0,12	-0,14	-0,16	-0,18	-0,19
500	0	0	0	-0,01	-0,03	-0,06	-0,08	-0,11	-0,15	-0,18
630	0	0	0	-0,01	-0,02	-0,05	-0,09	-0,13	-0,19	-0,23
800	0	0,01	0,01	0	0	-0,01	-0,02	-0,05	-0,09	-0,14
1000	0	0,01	0,01	0,01	0,01	0,02	0,04	0,05	0,05	0,05
1250	0	0	0	-0,01	-0,04	-0,08	-0,12	-0,13	-0,12	-0,08
1600	0	0	0	0,01	0,04	0,08	0,1	0,09	-0,03	-0,04
2000	0	0,02	0,02	-0,05	-0,2	-0,39	-0,48	-0,48	-0,42	-0,48
2240	0	0	0	-0,01	-0,08	-0,28	-0,46	-0,63	-0,65	-0,61
2500	0	-0,02	-0,07	-0,19	-0,31	-0,35	-0,41	-0,69	-0,86	-0,86
2800	0	0,04	0,11	0,2	0,22	0,2	-0,32	-0,48	-0,73	-0,77

3150	0	-0,08	-0,22	-0,3	-0,3	-0,26	-0,33	-0,53	-0,66	-0,9
3550	0	0,03	0,03	-0,22	-0,56	-0,61	-0,54	-0,7	-1	-1
4000	0	-0,06	-0,25	-0,37	-0,37	-0,4	-0,9	-0,91	-1,08	-1,51
4500	0	-0,03	-0,04	0,08	-0,39	-0,58	-0,61	-0,96	-1,02	-1,25
5000	0	0,03	0,03	-0,22	-0,47	-0,55	-0,83	-1	-1,34	-1,52
5600	0	0,08	0,09	-0,22	-0,49	-0,74	-0,88	-1,47	-1,47	-1,67
6300	0	-0,07	-0,47	-1,12	-1,15	-1,23	-1,8	-1,89	-2,46	-2,57
7100	0	-0,02	-0,21	-0,41	-0,5	-1,26	-1,27	-1,94	-1,98	-2,66
8000	0	0	0,06	-0,11	-0,61	-1,06	-1,5	-2,06	-2,55	-3,32
8500	0	-0,03	-0,21	-0,51	-0,56	-1,21	-1,6	-2,22	-2,69	-3,12
9000	0	-0,2	-0,55	-0,57	-1,13	-1,25	-2,07	-2,52	-3,08	-3,7
9500	0	-0,06	-0,1	-0,72	-0,81	-1,45	-2,04	-2,67	-2,99	-3,84
10000	0	-0,14	-0,19	-0,44	-1,19	-1,4	-1,96	-2,76	-3,21	-3,95
10600	0	0,09	0,1	-0,74	-1,03	-1,84	-2,16	-2,98	-3,72	-4,37
11200	0	-0,13	-0,54	-0,72	-1,39	-1,95	-2,49	-3,18	-4,16	-4,82
11800	0	-0,14	-0,42	-0,84	-1,11	-1,99	-2,67	-3,27	-3,99	-4,77
12500	0	-0,13	-0,49	-0,99	-1,64	-2,21	-3,07	-3,86	-4,4	-5,4

f [Hz]	100-110	110-120	120-130	130-140	140-150	150-160	160-170	170-180	180-190	190-200
250	-0,01	-0,01	-0,01	-0,01	-0,02	-0,02	-0,03	-0,03	-0,04	-0,05
315	-0,18	-0,18	-0,19	-0,19	-0,19	-0,18	-0,18	-0,17	-0,17	-0,17
400	-0,19	-0,19	-0,18	-0,18	-0,16	-0,14	-0,11	-0,09	-0,08	-0,06
500	-0,22	-0,28	-0,28	-0,31	-0,32	-0,33	-0,33	-0,33	-0,34	-0,34
630	-0,27	-0,31	-0,34	-0,36	-0,36	-0,37	-0,36	-0,36	-0,36	-0,37
800	-0,21	-0,29	-0,32	-0,34	-0,34	-0,33	-0,3	-0,27	-0,25	-0,25
1000	0,02	-0,06	-0,13	-0,16	-0,16	-0,14	-0,11	-0,08	-0,06	-0,06
1250	-0,02	-0,09	-0,2	-0,28	-0,3	-0,3	-0,24	-0,17	-0,13	-0,15
1600	-0,02	-0,1	-0,22	-0,31	-0,32	-0,32	-0,28	-0,2	-0,14	-0,14
2000	-0,5	-0,49	-0,59	-0,74	-0,87	-0,89	-0,88	-0,79	-0,66	-0,69
2240	-0,86	-0,88	-0,73	-0,66	-0,86	-0,88	-0,82	-0,67	-0,54	-0,56
2500	-0,81	-0,84	-0,69	-0,7	-0,88	-0,95	-0,94	-0,8	-0,63	-0,62
2800	-0,7	-0,65	-0,81	-0,79	-0,9	-1,18	-1,18	-0,97	-0,73	-0,76
3150	-0,96	-0,86	-1,1	-1,02	-0,97	-1,27	-1,27	-1,11	-0,81	-0,73
3550	-1,15	-1,14	-1,36	-1,25	-1,14	-1,39	-1,4	-1,26	-0,97	-0,95
4000	-1,66	-1,67	-1,7	-1,7	-1,4	-1,72	-1,81	-1,73	-1,3	-1,14
4500	-1,66	-1,86	-1,41	-1,62	-1,31	-1,8	-1,8	-1,28	-0,85	-1,21
5000	-1,77	-2,02	-2,11	-1,99	-1,99	-2,06	-2,45	-2,45	-1,81	-1,58
5600	-1,97	-2,9	-2,9	-2,36	-2,44	-2,22	-2,73	-2,72	-1,86	-1,72
6300	-2,69	-3,3	-3,37	-3,37	-3,28	-3,13	-3,61	-3,61	-2,56	-2,78
7100	-2,86	-3,45	-3,86	-3,82	-3,66	-3,66	-4,19	-4,15	-2,79	-3
8000	-3,49	-3,4	-4,11	-4,47	-3,97	-3,92	-4,1	-4,74	-3,61	-3,68
8500	-3,87	-3,87	-4,52	-5,01	-4,29	-4,38	-4,71	-5,25	-4,48	-3,88
9000	-4,18	-4,4	-5,2	-5,45	-4,76	-4,8	-5,03	-5,58	-4,71	-4,6
9500	-4,57	-4,57	-5,44	-5,55	-5,33	-4,98	-4,93	-5,83	-5,55	-4,73
10000	-4,11	-4,85	-5,04	-5,83	-5,83	-5,26	-5,19	-6,13	-5,61	-5,31
10600	-4,93	-5,59	-5,6	-6,51	-6,42	-5,87	-5,73	-6,77	-6,21	-6,24
11200	-5,18	-6,21	-6,21	-6,98	-7,07	-6,32	-6,26	-7,18	-6,78	-6,77
11800	-5,43	-6,08	-6,55	-7,52	-7,64	-6,8	-6,69	-7,55	-7,55	-6,88
12500	-6,1	-6,67	-7,29	-8,15	-8,18	-7,32	-7,15	-7,89	-7,82	-7,75

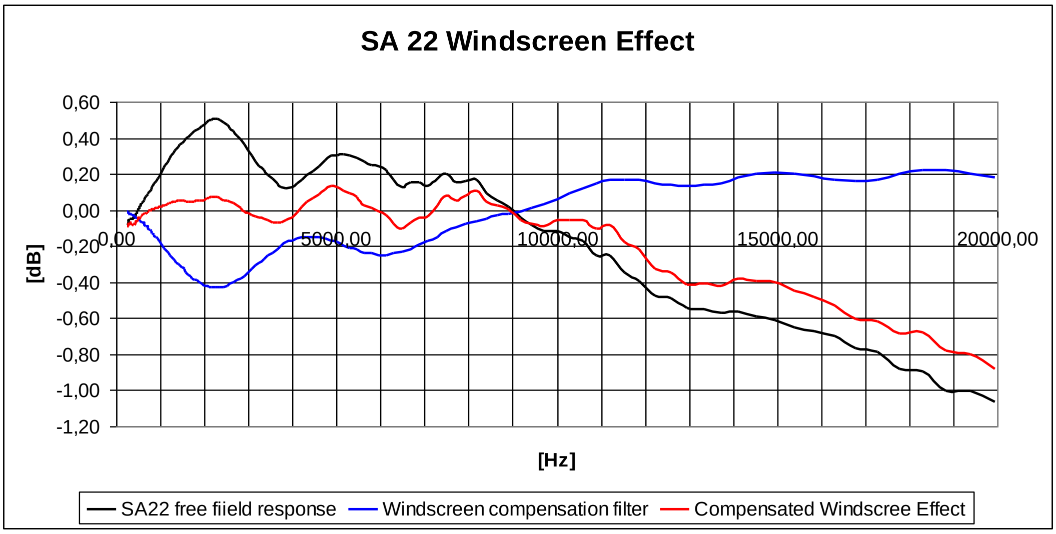
f [Hz]	200-210	210-220	220-230	230-240	240-250	250-260	260-270	270-280	280-290	290-300
250	-0,05	-0,05	-0,07	-0,07	-0,08	-0,08	-0,08	-0,08	-0,08	-0,07
315	-0,18	-0,18	-0,19	-0,2	-0,21	-0,22	-0,22	-0,22	-0,21	-0,19
400	-0,06	-0,06	-0,07	-0,08	-0,08	-0,09	-0,09	-0,08	-0,07	-0,06
500	-0,35	-0,35	-0,36	-0,36	-0,36	-0,35	-0,33	-0,31	-0,26	-0,23
630	-0,38	-0,39	-0,41	-0,41	-0,41	-0,41	-0,39	-0,36	-0,3	-0,25
800	-0,27	-0,3	-0,33	-0,34	-0,34	-0,32	-0,29	-0,21	-0,14	-0,09

1000	-0,09	-0,13	-0,17	-0,19	-0,19	-0,17	-0,13	-0,07	-0,03	-0,03
1250	-0,2	-0,27	-0,33	-0,34	-0,33	-0,27	-0,16	-0,07	-0,12	-0,15
1600	-0,19	-0,3	-0,35	-0,36	-0,35	-0,28	-0,18	-0,11	-0,13	-0,12
2000	-0,82	-0,95	-1	-1	-0,92	-0,79	-0,7	-0,68	-0,68	-0,61
2240	-0,71	-0,84	-0,87	-0,85	-0,67	-0,7	-0,91	-0,91	-0,69	-0,74
2500	-0,85	-0,97	-0,97	-0,86	-0,68	-0,7	-0,76	-0,75	-0,78	-0,82
2800	-1,02	-1,23	-1,23	-1,06	-0,95	-0,99	-0,9	-0,79	-0,93	-0,88
3150	-0,99	-1,24	-1,26	-0,97	-0,82	-1,1	-0,95	-0,93	-0,93	-0,67
3550	-1,28	-1,44	-1,39	-1,16	-1,17	-1,34	-1,11	-1,16	-0,97	-1
4000	-1,55	-1,81	-1,72	-1,3	-1,66	-1,66	-1,62	-1,62	-1,59	-1,35
4500	-1,76	-1,79	-1,3	-1,51	-1,55	-1,75	-1,87	-1,57	-1,13	-1,09
5000	-2,33	-2,62	-2,24	-2,17	-2,17	-2,43	-2,43	-2,12	-1,64	-1,51
5600	-2,63	-2,74	-1,97	-2,34	-2,34	-2,44	-2,83	-1,94	-1,64	-1,61
6300	-3,62	-3,62	-3,14	-3,18	-3,41	-3,45	-3,31	-2,84	-2,62	-2,53
7100	-4,04	-3,78	-3,45	-3,46	-3,9	-3,96	-3,48	-3,06	-2,87	-2,45
8000	-4,51	-4,33	-3,68	-3,86	-4,47	-4,47	-3,49	-3,38	-3,2	-2,75
8500	-4,96	-4,34	-4,05	-4,2	-4,94	-4,49	-3,83	-3,88	-3,44	-3,19
9000	-5,32	-4,86	-4,47	-4,6	-5,37	-4,93	-4,35	-4,21	-3,69	-3,14
9500	-5,66	-5,28	-4,92	-5,19	-5,71	-5,42	-4,68	-4,68	-4,13	-3,55
10000	-5,75	-4,94	-5,27	-5,38	-5,97	-5,75	-5,07	-5,07	-4,26	-3,57
10600	-6,53	-5,65	-5,78	-6,51	-6,51	-6,26	-5,67	-4,94	-4,71	-4,05
11200	-6,93	-5,93	-6,29	-7,07	-7,07	-6,1	-6,16	-5,4	-5,15	-4,26
11800	-7,34	-6,38	-6,58	-7,49	-7,49	-6,47	-6,66	-5,75	-5,05	-4,49
12500	-7,94	-7,11	-7,17	-8,31	-8,24	-7,41	-6,78	-6,42	-5,45	-4,63

f [Hz]	300-310	310-320	320-330	330-340	340-350	350-360				
250	-0,06	-0,06	-0,06	-0,05	-0,03	-0,02				
315	-0,18	-0,15	-0,12	-0,1	-0,07	-0,04				
400	-0,04	-0,02	-0,01	0,02	0,02	0,02				
500	-0,19	-0,15	-0,12	-0,09	-0,06	-0,03				
630	-0,22	-0,16	-0,12	-0,09	-0,06	-0,04				
800	-0,05	-0,04	-0,04	-0,02	-0,01	0				
1000	-0,05	-0,05	-0,05	-0,05	-0,05	-0,03				
1250	-0,15	-0,13	-0,09	-0,05	-0,02	-0,01				
1600	-0,06	0,02	-0,04	-0,07	-0,08	-0,07				
2000	-0,68	-0,68	-0,6	-0,39	-0,21	-0,1				
2240	-0,74	-0,57	-0,37	-0,22	-0,12	-0,06				
2500	-0,74	-0,38	-0,34	-0,32	-0,21	-0,06				
2800	-0,63	-0,49	-0,24	0,11	0,11	0,05				
3150	-0,56	-0,36	-0,18	-0,24	-0,24	-0,17				
3550	-0,73	-0,55	-0,58	-0,55	-0,26	-0,03				
4000	-1,02	-1,02	-0,81	-0,41	-0,46	-0,36				
4500	-0,82	-0,67	-0,72	-0,21	-0,12	-0,13				
5000	-1,27	-1,2	-0,66	-0,66	-0,44	-0,04				
5600	-1,56	-1,03	-0,86	-0,7	-0,23	-0,06				
6300	-1,89	-1,8	-1,29	-1,09	-1,1	-0,67				
7100	-2,29	-1,61	-1,39	-0,89	-0,47	-0,36				
8000	-2,1	-1,66	-1,2	-0,83	-0,36	-0,03				
8500	-2,48	-2,04	-1,56	-0,83	-0,62	-0,36				
9000	-2,72	-2,25	-1,41	-1,32	-0,76	-0,56				
9500	-2,91	-2,29	-1,77	-1,15	-0,92	-0,17				
10000	-2,98	-2,13	-1,55	-1,29	-0,52	-0,13				
10600	-2,93	-2,5	-1,95	-1,31	-0,88	-0,32				
11200	-3,33	-2,51	-2,06	-1,42	-0,74	-0,59				
11800	-3,68	-3,16	-2,24	-1,44	-1,1	-0,47				
12500	-3,99	-3,22	-2,36	-1,92	-1,4	-0,72				

C.1.2 Effect of the SA 22 windscreen

Note: *For the conformance of acoustical tests, the Microphone Compensation must be set to "Free Field" and Windscreen must be set to "Off"! (path: <Menu> / Measurement / Compensation Filter).*



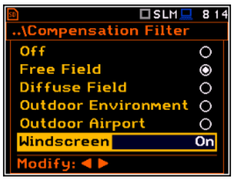
Windscreen SA22 free field response and compensated effect

Table C.1.14. SVAN 977A effect of the SA 22 windscreen

Frequency [Hz]	SA 22 Free Field [dB]	Compen-sation filter [dB]	SA 22 Effect Compen-sated [dB]	Frequency [Hz]	SA 22 Free Field [dB]	Compen-sation filter [dB]	SA 22 Effect Compen-sated [dB]
251,19	-0,08	-0,01	-0,09	**2304,09**	0,50	-0,43	0,07
258,52	-0,08	-0,01	-0,09	**2371,37**	0,50	-0,43	0,07
266,07	-0,08	-0,01	-0,09	**2440,62**	0,48	-0,43	0,05
273,84	-0,07	-0,02	-0,09	**2511,89**	0,47	-0,42	0,05
281,84	-0,07	-0,02	-0,09	**2585,23**	0,45	-0,41	0,04
290,07	-0,06	-0,02	-0,08	**2660,73**	0,44	-0,4	0,04
298,54	-0,06	-0,02	-0,08	**2738,42**	0,41	-0,39	0,02
307,26	-0,05	-0,02	-0,07	**2818,38**	0,39	-0,38	0,01
316,23	-0,05	-0,02	-0,07	**2900,68**	0,36	-0,37	-0,01
325,46	-0,05	-0,02	-0,07	**2985,38**	0,33	-0,35	-0,02
334,97	-0,05	-0,02	-0,07	**3072,56**	0,30	-0,33	-0,03
344,75	-0,05	-0,02	-0,07	**3162,28**	0,27	-0,31	-0,04
354,81	-0,05	-0,03	-0,08	**3254,62**	0,24	-0,29	-0,05
365,17	-0,05	-0,03	-0,08	**3349,65**	0,22	-0,27	-0,05
375,84	-0,05	-0,03	-0,08	**3447,47**	0,20	-0,25	-0,05
386,81	-0,05	-0,03	-0,08	**3548,13**	0,17	-0,24	-0,07
398,11	-0,05	-0,03	-0,08	**3651,74**	0,15	-0,22	-0,07
409,73	-0,05	-0,03	-0,08	**3758,37**	0,13	-0,2	-0,07
421,70	-0,04	-0,04	-0,08	**3868,12**	0,12	-0,18	-0,06
434,01	-0,03	-0,04	-0,07	**3981,07**	0,13	-0,17	-0,04
446,68	-0,03	-0,04	-0,07	**4097,32**	0,15	-0,16	-0,01
459,73	-0,02	-0,04	-0,06	**4216,97**	0,17	-0,15	0,02
473,15	-0,01	-0,05	-0,06	**4340,10**	0,19	-0,15	0,04
486,97	-0,01	-0,05	-0,06	**4466,84**	0,21	-0,15	0,06
501,19	0,00	-0,05	-0,05	**4597,27**	0,24	-0,15	0,09
515,82	0,01	-0,05	-0,04	**4731,51**	0,27	-0,16	0,11
530,88	0,01	-0,06	-0,05	**4869,68**	0,30	-0,17	0,13

546,39	0,02	-0,06	-0,04	**5011,87**	0,31	-0,18	0,13
562,34	0,03	-0,06	-0,03	**5158,22**	0,31	-0,2	0,11
578,76	0,03	-0,07	-0,04	**5308,84**	0,30	-0,21	0,09
595,66	0,04	-0,07	-0,03	**5463,87**	0,29	-0,22	0,07
613,06	0,05	-0,07	-0,02	**5623,41**	0,27	-0,24	0,03
630,96	0,05	-0,08	-0,03	**5787,62**	0,25	-0,24	0,01
649,38	0,06	-0,08	-0,02	**5956,62**	0,24	-0,25	-0,01
668,34	0,07	-0,09	-0,02	**6130,56**	0,22	-0,25	-0,03
687,86	0,08	-0,09	-0,01	**6309,57**	0,17	-0,24	-0,07
707,95	0,08	-0,1	-0,02	**6493,82**	0,12	-0,23	-0,11
728,62	0,09	-0,1	-0,01	**6683,44**	0,15	-0,22	-0,07
749,89	0,10	-0,11	-0,01	**6878,60**	0,15	-0,19	-0,04
771,79	0,11	-0,11	0,00	**7079,46**	0,14	-0,17	-0,03
794,33	0,12	-0,12	0,00	**7286,18**	0,17	-0,15	0,02
817,52	0,12	-0,13	-0,01	**7498,94**	0,20	-0,12	0,08
841,40	0,13	-0,13	0,00	**7717,92**	0,15	-0,1	0,05
865,96	0,14	-0,14	0,00	**7943,28**	0,16	-0,08	0,08
891,25	0,15	-0,15	0,00	**8175,23**	0,17	-0,06	0,11
917,28	0,16	-0,15	0,01	**8413,95**	0,09	-0,05	0,04
944,06	0,17	-0,16	0,01	**8659,64**	0,05	-0,03	0,02
977,63	0,18	-0,17	0,01	**8912,51**	0,02	-0,02	0,00
1000,00	0,19	-0,18	0,01	**9172,76**	-0,04	-0,01	-0,05
1029,20	0,21	-0,19	0,02	**9440,61**	-0,09	0,01	-0,08
1059,25	0,22	-0,2	0,02	**9776,28**	-0,12	0,03	-0,09
1090,18	0,23	-0,21	0,02	**10000,00**	-0,12	0,06	-0,06
1122,02	0,25	-0,22	0,03	**10292,01**	-0,15	0,09	-0,06
1154,78	0,26	-0,23	0,03	**10592,54**	-0,17	0,12	-0,05
1188,50	0,28	-0,24	0,04	**10901,84**	-0,25	0,15	-0,10
1223,21	0,29	-0,25	0,04	**11220,18**	-0,25	0,17	-0,08
1258,93	0,30	-0,26	0,04	**11547,82**	-0,35	0,17	-0,18
1295,69	0,31	-0,27	0,04	**11885,02**	-0,39	0,17	-0,22
1333,52	0,33	-0,28	0,05	**12232,07**	-0,47	0,15	-0,32
1372,46	0,34	-0,29	0,05	**12589,25**	-0,49	0,14	-0,35
1412,54	0,35	-0,3	0,05	**12956,87**	-0,54	0,13	-0,41
1453,78	0,36	-0,31	0,05	**13335,21**	-0,55	0,14	-0,41
1496,24	0,37	-0,32	0,05	**13724,61**	-0,57	0,15	-0,42
1539,93	0,38	-0,33	0,05	**14125,38**	-0,56	0,18	-0,38
1584,89	0,39	-0,35	0,04	**14537,84**	-0,59	0,2	-0,39
1631,17	0,40	-0,36	0,04	**14962,36**	-0,61	0,21	-0,40
1678,80	0,41	-0,37	0,04	**15399,27**	-0,65	0,2	-0,45
1727,83	0,42	-0,38	0,04	**15848,93**	-0,67	0,19	-0,48
1778,28	0,43	-0,39	0,05	**16311,73**	-0,70	0,17	-0,53
1830,21	0,44	-0,40	0,05	**16788,04**	-0,77	0,16	-0,61
1883,65	0,45	-0,40	0,05	**17278,26**	-0,79	0,17	-0,62
1938,65	0,46	-0,41	0,05	**17782,79**	-0,88	0,2	-0,68
1995,26	0,47	-0,42	0,06	**18302,06**	-0,90	0,22	-0,68
2053,53	0,48	-0,42	0,06	**18836,49**	-1,00	0,22	-0,78
2113,49	0,50	-0,43	0,07	**19386,53**	-1,00	0,2	-0,80
2175,20	0,50	-0,43	0,07	**19952,62**	-1,06	0,18	-0,88
2238,72	0,50	-0,43	0,07				

Note: *When using windscreen SA22 the "Windscreen" compensation filter must be "On" to ensure good tolerances margin of the SVAN 977A frequency response.*



C.1.3 Effect of the SA 277 Outdoor Protection Unit

See Chapter C.7 for the details related to using of the SA 277 Outdoor Protection Unit.

C.2. SPECIFICATION OF SVAN 977A AS A VIBRATION LEVEL METER

The configuration of the complete VLM and its normal mode of operation

SVAN 977A	sound & vibration analyser
SV 80	10mV/m/s2, IEPE accelerometer (see C.6 for details)
SC 27	coiled cable for accelerometer 2 m

Accessories included in SVAN 977A instrument set

SC 16	USB 1.1 cable

Accessories available

SV 55	RS 232 interface for SVAN 95x instrument series
SC 61	TNC to BNC integrated connector
SC 27	TNC (plug) to TNC (plug) 2 m coil cable
SA 17A	external battery pack
SA 27	permanent magnet
SA 15	power supply unit
SV 110	vibration calibrator (or equivalent)

Measured quantities

The measured quantities in the vibration meter mode are: **RMS**, **PEAK**, **P–P** and **MAX**.

Definitions for mentioned parameters are given in Appendix D.

Mounting for vibration tests

The accelerometer can be connected with the VLM using proper cable provided by the manufacturer.

The accelerometer can be mounted on the plate in various ways:

- using threaded stud onto a flat, smooth surface,
- using thin layer of bees-wax for sticking the accelerometer into the plate,
- using mica washer and isolates stud, where the body of accelerometer should be electrically isolated from the measuring object,
- using permanent magnet.

Values of the measured acceleration

Linear operating ranges for the acceleration (with the SV 80 sensitivity equal to 10mV/ms^{-2} accelerometer.

Two ranges with the nominal values: **100 ms^{-2}** (**LOW**), (140 dB, related to 10^{-6} ms^{-2}).
352 ms^{-2} (**HIGH**) (151 dB related to 10^{-6} ms^{-2}).

- Linear measurement with the **Wh** filter:
  from 0.003 ms^{-2} to 352 ms^{-2} (the sinusoidal signal RMS)
  from 0.03 ms^{-2} to 500 ms^{-2} (PEAK)

Table C.2.1 Linear operating ranges with the **Wh** filter

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 3.16 mms^{-2} (70 dB)	to 100 ms^{-2} (140 dB)
HIGH	from 31.6 mms^{-2} (100 dB)	to 352 ms^{-2} (151 dB)

- Linear measurement with the **HP, HP1**, **HP3** and **HP10** filters:
  from 0.01 ms^{-2} to 352 ms^{-2} (the sinusoidal signal RMS)
  from 0.1 ms^{-2} to 500 ms^{-2} (PEAK)

Table C.2.2 Linear operating ranges with the **HP**, **HP1**, **HP3** and **HP10** filters

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 0.01 ms^{-2} (80.0 dB)	to 100 ms^{-2} (140.0 dB)
HIGH	from 0.1 ms^{-2} (100.0 dB)	to 352 ms^{-2} (151.0 dB)

- Linear measurement with the **Vel1** filter:
  from 0.002 ms^{-1} to 56 ms^{-1} (the sinusoidal signal RMS)
  from 0.02 ms^{-1} to 79 ms^{-1} (PEAK)

Table C.2.3 Linear operating ranges with the **Vel1** filter

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 2 mms^{-1}	to 15.9 ms^{-1}
HIGH	from 20 mms^{-1}	to 56 ms^{-1}

- Linear measurement with the **Vel3** filter:
  from 0.001 ms^{-1} to 26.5 ms^{-1} (the sinusoidal signal RMS)
  from 0.01 ms^{-1} to 37.4 ms^{-1} (PEAK)

Table C.2.4 Linear operating ranges with the **Vel3** filter

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 1 mms^{-1}	to 5.3 ms^{-1}
HIGH	from 10 mms^{-1}	to 26.5 ms^{-1}

- Linear measurement with the **Vel10** and **MFVel** filters:
  from 0.001 ms^{-1} to 5.6 ms^{-1} (the sinusoidal signal RMS)
  from 0.01 ms^{-1} to 7.9 ms^{-1} (PEAK)

Table C.2.5 Linear operating ranges with the **Vel10** filter

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 1 mms^{-1}	to 1.59 ms^{-1}
HIGH	from 10 ms^{-1}	to 5.6 ms^{-1}

- Linear measurement with the **Dil1** filter
  from 32 um to 8.9 m (the sinusoidal signal RMS)
  from 320 um to 12.6 m (PEAK)

Table C.2.6 Linear operating ranges with the **Dil1** filter

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 32 μm	to 2.53 m
HIGH	from 320 μm	to 8.9 m

- Linear measurement with the **Dil3** filter
  from 10 um to 3 m (the sinusoidal signal RMS)
  from 100 um to 4.2 m (PEAK)

Table C.2.7 Linear operating ranges with the **Dil3** filter

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 10 μm	to 4 cm
HIGH	from 100 μm	to 300 cm

- Linear measurement with the **Dil10** filter
  from 1.6 μm to 47 cm (the sinusoidal signal RMS)
  from 16 μm to 67 cm (PEAK)

Table C.2.8 Linear operating ranges with the **Dil10** filter

Range (RMS)	**Linear operating ranges (RMS)** With the SV80 (10 mV/ms^{-2}) accelerometer sensitivity @ 79.58 Hz Measured at the reference environmental conditions	
LOW	from 1.6 μm	to 6 cm
HIGH	from 16 μm	to 47 cm

Note: *In the measurement of the signal with the* ***crest factor n > 1.41 the upper linear operating range for the RMS value is reduced****. Its value can be calculated from the equation:* $\boldsymbol{A_n = A + 10 - 20\log(n / \sqrt{2})}$ *[m], where* ***A*** *is the given range for the sinusoidal signal. E.g. for* ***n = 10*** *and* ***A*** *=* ***180*** *the value of* $\boldsymbol{A_{10}}$ *is equal to* ***= 173 dB****.*

Frequency range

For the acceleration measurement (+/- 10%)	1 Hz ÷ 5 kHz (in the linear measurements with the **HP** or **HP1** filter)

Note: *With the application of another vibration transducer, the frequency range given above for the* ***HP*** *filter can be different (i.e. wider).*

See Chapter C.4 for the **Wh** and **VelMF** filters characteristics

Basic error for the acceleration measurement < ± 0.5 dB

Calibration

Direct: by the measurement of the standard signal generated by the external vibration calibrator.

Indirect: by the declaration of the transducer's sensitivity (according to the calibration chart).

Note: *Calibration procedure is given in Chapter 4 of the Manual.*

Accelerometer input

Connector	TNC
Impedance	40 kΩ / 100 pF (typical)
Vibration transducers powering	IEPE type, 28 V / 1.5 mA current source

Range of the measured voltage

Range LOW	1 V_{RMS} (120 dB related to 1 μV_{RMS})
Range HIGH	7 V_{RMS} (137 dB related to 1 μV_{RMS})

Maximum input voltage

SVAN 977A is the instrument with the **II** security class according to the international standard IEC 348.

The input voltage should be within the 30 V Peak – Peak

RMS detector (Linear averaging)

- **Digital** “True RMS“ with Peak detection
- **Resolution** 0.1 dB
- **Range** 327.7 dB
- **Crest Factor** unlimited for signals within 40 kHz band.

Overload detector

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

Underrange detector

The instrument has the built-in underrange detector. The “underrange” indication appears when the minimum value of the RMS detector output goes below the specified lower linear operating range.

Analogue/Digital conversion 24 bits resolution.

Antialiasing filter

Built-in antialiasing filter (eighth-order elliptic type) ensuring correct sampling of the measured signal.

Pass band(-1 dB)	22.200 kHz or 44.4 kHz
Pass band(-3 dB)	23.520 kHz or 47.0 kHz
Stop band	26.256 kHz or 52.53 kHz
Attenuation in the stop band	> 100 dB.

Reference conditions

- Reference frequency 79.58 Hz
- Reference temperature +23°C
- Reference relative humidity 50 %
- Reference range HIGH.

Pre-heating time 1 minute (for 0.1 dB accuracy).

Typical stabilization time after change in environmental conditions is 1 minute.

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

Digital filters

High-pass filters

- **HP** (see Chapter C.5 for the filter characteristics)
- **HP1** (see Chapter C.5 for the filter characteristics)
- **HP3** (see Chapter C.5 for the filter characteristics)
- **HP10** (see Chapter C.5 for the filter characteristics)

Frequency weighting filters (filter includes Band Limiting filter).

(Conforms to ISO 8041:2005, see Chapter C.5 for the frequency response characteristics)

- **Wh** from 0.8 Hz to 4000 Hz

Integrating filters (see Chapter C.5 for the frequency response characteristics):

- **Vel1** from 0.2 Hz to 4100 Hz
- **Vel3** from 0.2 Hz to 4100 Hz
- **Vel10** from 0.2 Hz to 4100 Hz
- **Dil1** from 0.1 Hz to 260 Hz
- **Dil3** from 0.2 Hz to 510 Hz
- **Dil10** from 1 Hz to 2050 Hz

Special filter

Filter for the evaluation of the machinery condition:

- **VelMF** from 0.2 Hz to 4100 Hz; conforms to the ISO 10816 standard (see Chapter C.5 for the frequency response characteristics)

Environmental, electrostatic and radio frequency criteria

Note: *In the measurement conditions with the strong electromagnetic disturbances (e.g. near the high-voltage transmission lines) the lower measurement limit can be drastically shifted as the result of the external field influence on the measurement cables. In such cases, the careful shielding of the measurement cables is strongly recommended. It is worth to underline that the estimation of the external influence can be performed in-site by the observations of the measurement signal spectrum.*

Effect of humidity **< 0.5 dB** (for 30% < RH < 90% at 40°C and 1000 Hz)

Effect of radio frequency fields (meets requirements of the ISO 8041:2005)

The greatest susceptibility (the least immunity) is achieved when in the VLM the **HP1** filter is selected and the RMS measurements are considered.

The greatest susceptibility is achieved when the VLM and accelerometer with cable is placed along field and the cable is coil as solenoid.

Effect of electrostatic discharge (meets requirements of the ISO 8041:2005)

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

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

Operating range	from -10°C to + 50°C
Storage and Transportation	from -20°C to + 60°C
Effect of temperature	< 0.5 dB (from -10°C to + 50°C)
Operating range	from -10°C to + 50°C
Storage	from -20°C to + 60°C

Effect of Vibration < 0.1 dB (measured at the instrument vibration 1m/s2 in the 2 kHz band)

C.3. SPECIFICATION OF SVAN 977A AS 1/1 OCTAVE AND 1/3 OCTAVE ANALYSER

SVAN 977A can operate as 1/1-octave or 1/3-octave analyser conforming to the international IEC 61260-1:2014 standard for the pass band filters.

Note: *Simultaneously to the frequency analysis SVAN 977A operates as Sound Level Meter! See Chapters C.1 for specification.*

Signal input

- SV12L preamplifier throughout ST02 adapter
- Maximum input voltage: SVAN 977A meets the requirements IEC 348 for the 2^{nd} class device. The input voltage shall not exceed the limits between -15 V and +15 V.
- Impedance: 10 GΩ / 2 pF.

Linear Operating Ranges

Two measuring ranges are available: “LOW” and "HIGH"

Table C.3.1 Linear operating range

Range	**Linear operating range** (with 10 dB margin from noise) (**RMS** for the sinusoidal signal at reference conditions @ 1 kHz, 0.0 dB calibration factor)	
LOW	from 9 μV_{RMS} “A”-weighting	to 0.99 V_{RMS} “A”-weighting
LOW	from 9 μV_{RMS} “B”-weighting	to 0.99 V_{RMS} “B”-weighting
LOW	from 9 μV_{RMS} “C”-weighting	to 0.99 V_{RMS} “C”-weighting
LOW	from 22 μV_{RMS} “Z”-weighting	to 0.99 V_{RMS} “Z”-weighting
HIGH	from 22 μV_{RMS} “A”-weighting	to 4.96 V_{RMS} “A”-weighting
HIGH	from 22 μV_{RMS} “B”-weighting	to 4.96 V_{RMS} “B”-weighting
HIGH	from 22 μV_{RMS} “C”-weighting	to 4.96 V_{RMS} “C”-weighting
HIGH	from 56 μV_{RMS} “Z”-weighting	to 4.96 V_{RMS} “Z”-weighting

Table C.3.2 Peak for the sinusoidal signal 1 kHz, at reference conditions

Peak for the sinusoidal signal **1 kHz**, at reference conditions @ 1 kHz (0.0 dB calibration factor)	
Range	**Max Peak value**
LOW	1.4 V “A”–weighting
LOW	1.4 V “B”–weighting
LOW	1.4 V “C”-weighting
LOW	1.4 V “Z”-weighting
HIGH	7 V “A”-weighting
HIGH	7 V “B”–weighting
HIGH	7 V “C”-weighting
HIGH	7 V “Z”-weighting

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

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

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

Measuring frequency range	10 Hz ÷ 22.4 kHz with the **Z** filter (-3 dB)
Measuring frequency range	1Hz ÷ 44.4 kHz with the **HP1** filter (-3 dB)

***Note:** When another vibration transducer is used, the frequency range given above for the HP filter can be different.*

Maximum peak voltage	30 V Peak-Peak (Maximum peak voltage of input sinusoidal signal, which can be applied to the SLM without destruction the meter)

RMS detector

• Digital	“True RMS“ with Peak detection
• Resolution	0.1 dB
• Range	327.7 dB
• Crest Factor	unlimited (for signals in 20 kHz band)

Reference conditions

• Reference frequency	1000 Hz
• Reference level	114 dB
• Reference temperature	+20°C
• Reference relative humidity	65%

Calibration (electrical)

Calibration level	0.5 V_{RMS}
Basic accuracy	< ± 0.2 dB (for the temperature T=+23°C ± 5°C for sinusoidal signal 120 dB_{RMS} in the band 10 Hz ÷ 20 kHz with the **HP** input filter)

Measurement error in the full temperature range

< ± 0.1 dB (when the temperature is from -10°C to +50°C for the sinusoidal signal 120 dB_{RMS} in the band 10 Hz ÷ 20 kHz with the **Z** input filter)

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”

Warm-up time	1 min. (for 0.1 dB accuracy).
Effect of humidity	< 0.5 dB (for 30%<RH<90% at 40°C re Reference conditions)

Effect of magnetic field	< 15 dB (A) or < 25 dB (Z) (for 80 A/m and 50 Hz)
Effect of Vibration	< 0.1 dB (from 20 Hz to 1000 Hz at 1 m/s^2)

Antialiasing filter

Built-in antialiasing filter. Second-order analogue filter, passive Class, combined with on-chip FIR digital filter of the analogue-to-digital converter, ensuring correct sampling of the measured signal.

Pass band (-1 dB)	22.200 kHz or 44.4 kHz
Pass band (-3 dB)	23.520 kHz or 47.0 kHz
Stop band	26.256 kHz or 52.53 kHz
Attenuation in the stop band	> 80 dB.

Sampling frequency	48 kHz or 96 kHz (internal only).
Analogue to digital converter	1 x 24 bit
Reference range	LOW
Input attenuator accuracy	± 0.1 dB (for f = 1 kHz and T = +23°C)
Internal oscillator accuracy	0.01 % (for f = 1 kHz and T = +23°C)

Digital Filters

Weighting filters

- A meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “A” filter
- C meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “C” filter
- Z meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “Z“ filter
- B meeting IEC651 for the Class 1 filter

See Chapter C.3 for the A, C, B and Z filters characteristics.

Noise voltage measured with SV12L preamplifier, equivalent impedance-adapter Class of ST02 and 50 Ω input impedance, 20kHz Bandwidth.

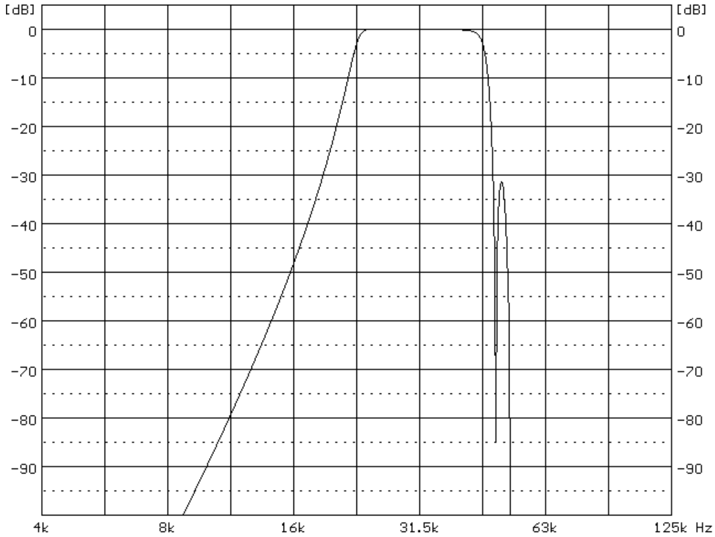
Range Low

• ”A” weighting	< 2.8 μV_{RMS}
• “B” weighting	< 2.8 μV_{RMS}
• ”C” weighting	< 2.8 μV_{RMS}
• ”Z” weighting	< 7 μV_{RMS}.

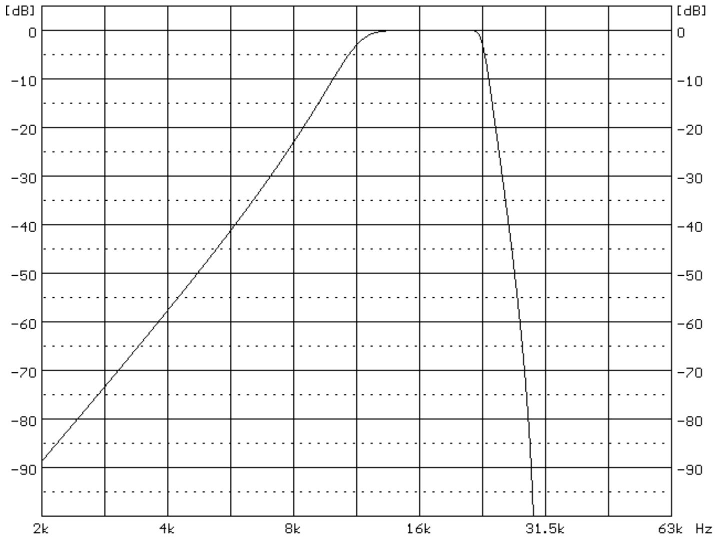
Range High

• ”A” weighting	< 7 μV_{RMS}
• “B” weighting	< 7 μV_{RMS}
• ”C” weighting	< 7 μV_{RMS}.
• ”Z” weighting	< 17.6 μV_{RMS}

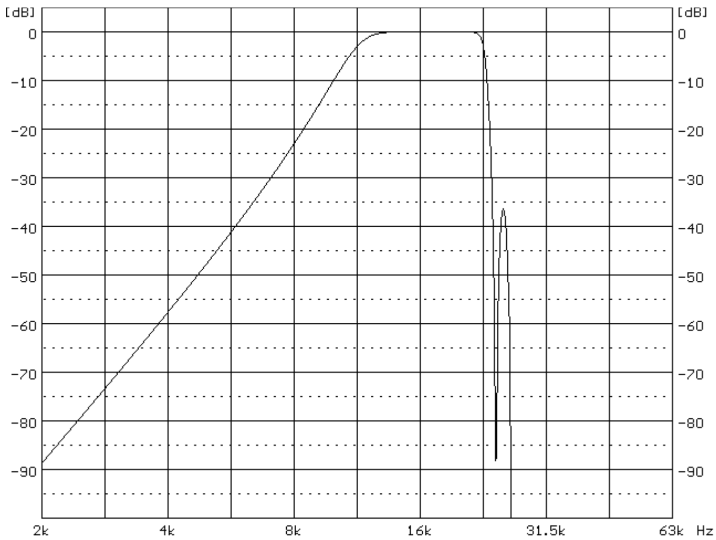
1/1 Octave filters 16 filters with centre frequencies from 1 Hz to 31.5 kHz (base 10), meeting IEC 61260-1:2014 standard for Class 1



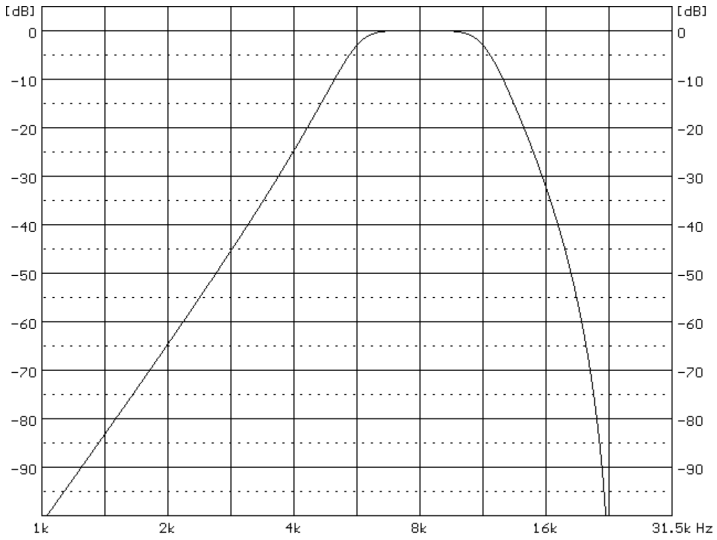
31.5 kHz 1/1 octave filter



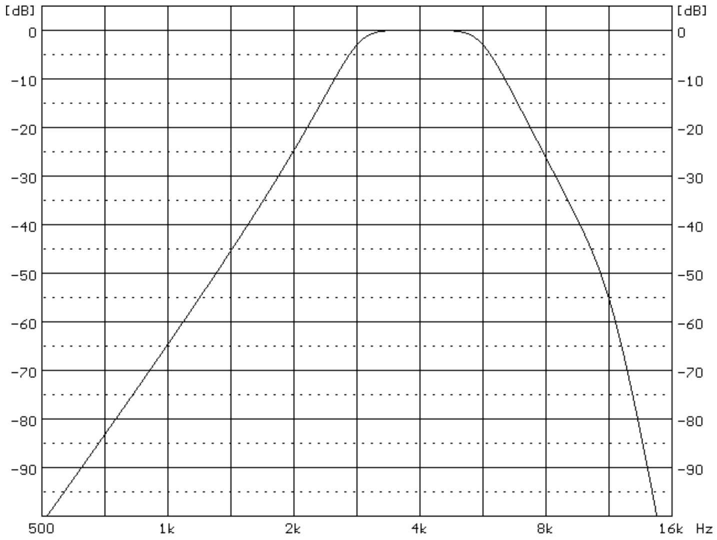
16.0 kHz 1/1 octave filter (Ultra band)



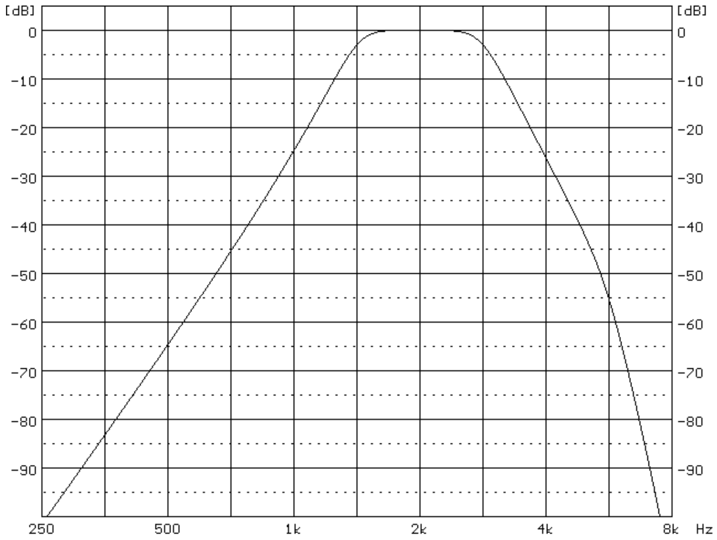
16.0 kHz 1/1 octave filter (Audio/Full band)



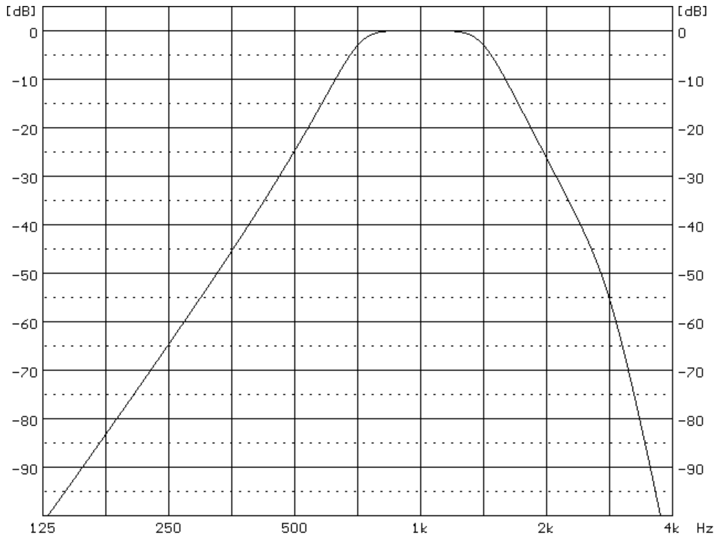
8.0 kHz 1/1 octave filter



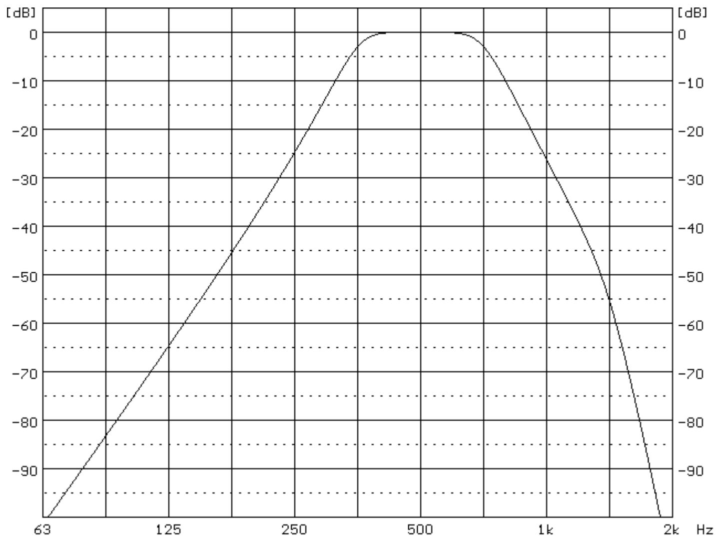
4.0 kHz 1/1 octave filter



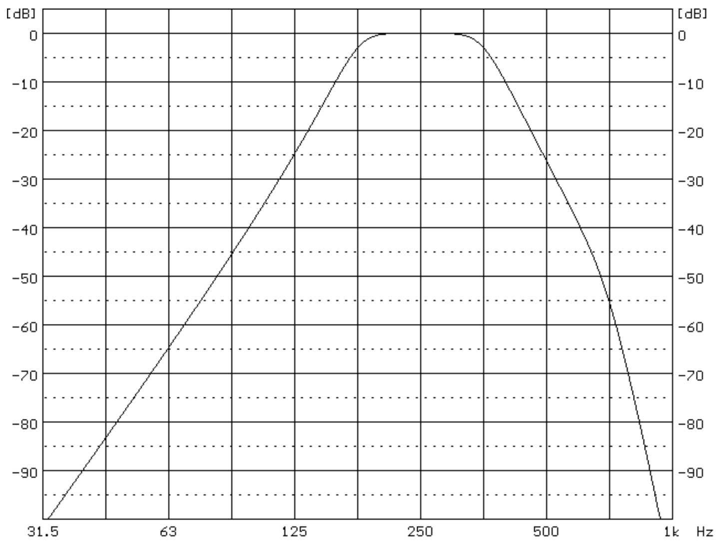
2.0 kHz 1/1 octave filter



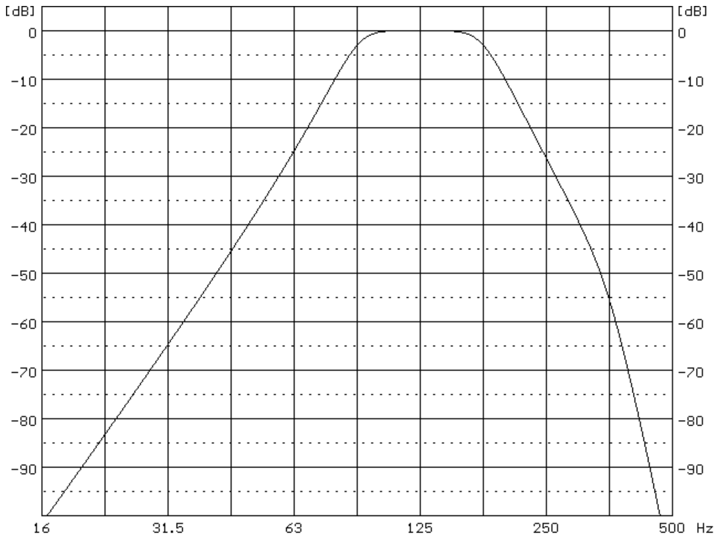
1.0 kHz 1/1 octave filter



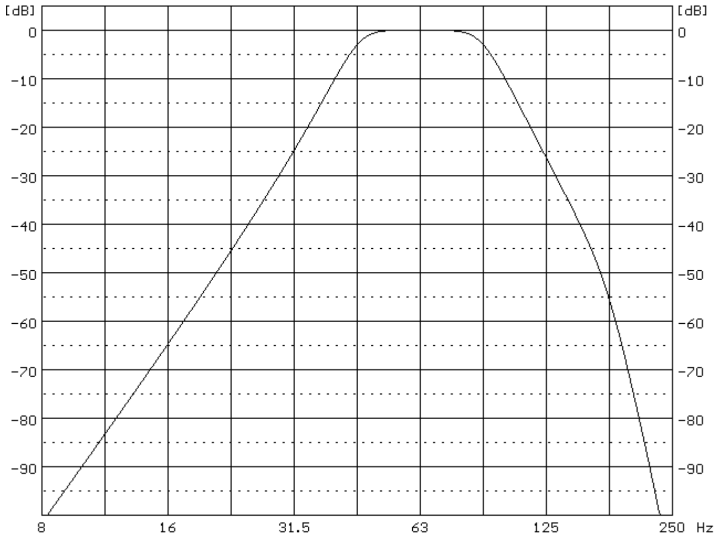
500 Hz 1/1 octave filter



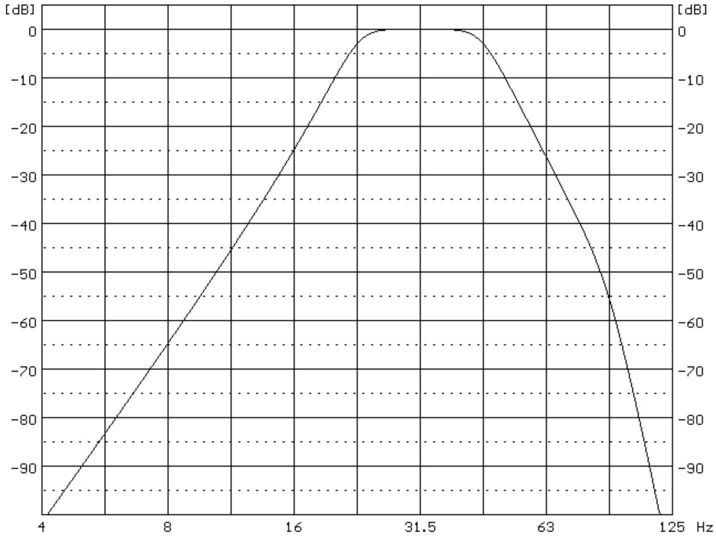
250 Hz 1/1 octave filter



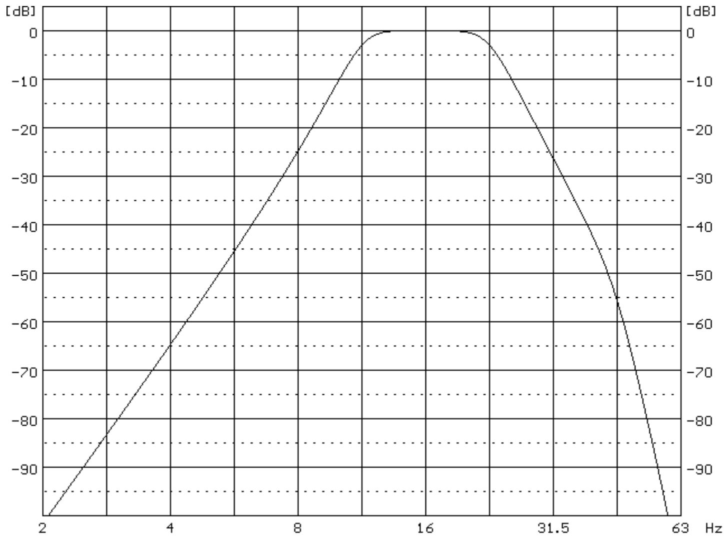
125 Hz 1/1 octave filter



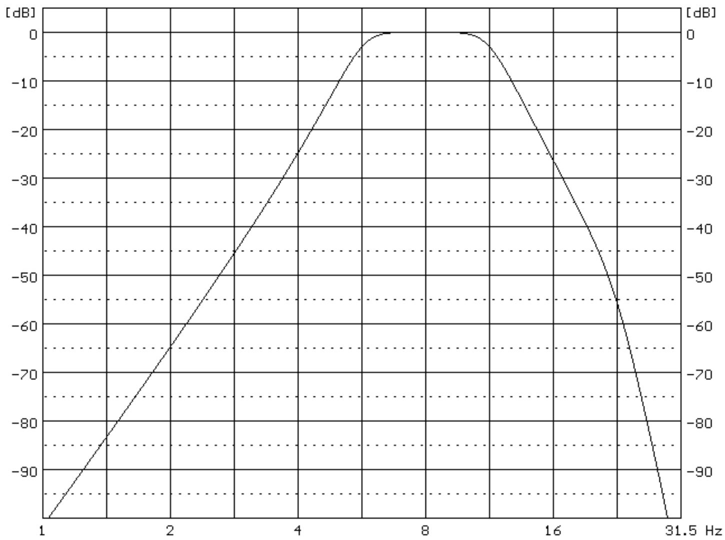
63.0 Hz 1/1 octave filter



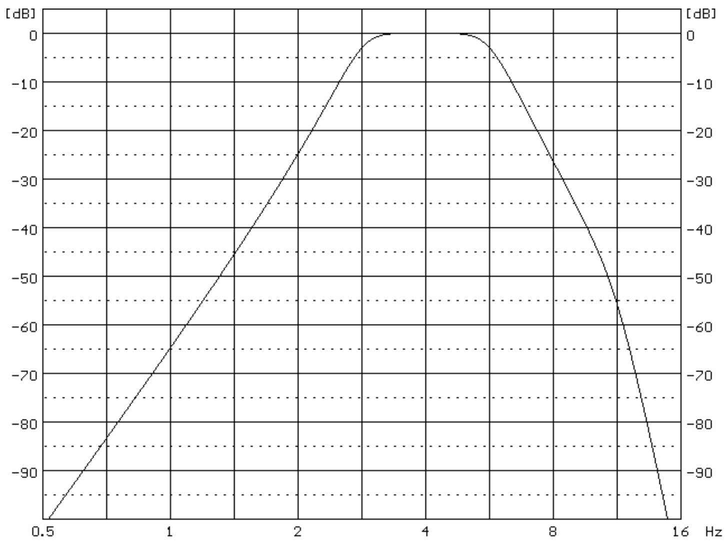
31.5 Hz 1/1 octave filter



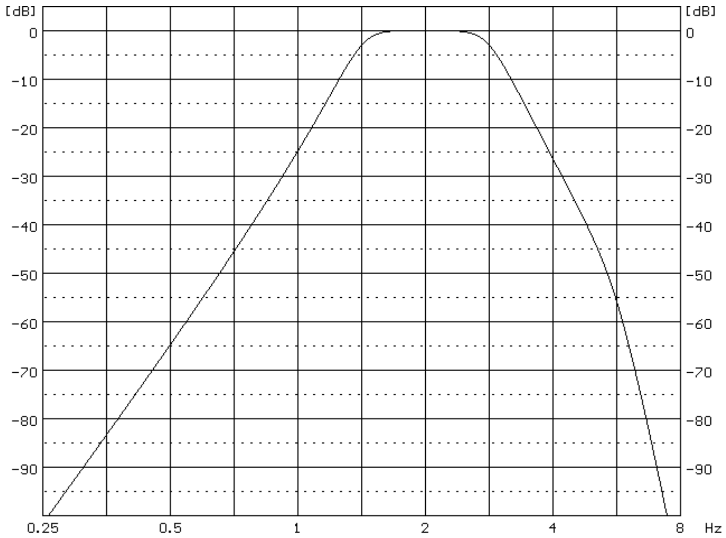
16.0 Hz 1/1 octave filter



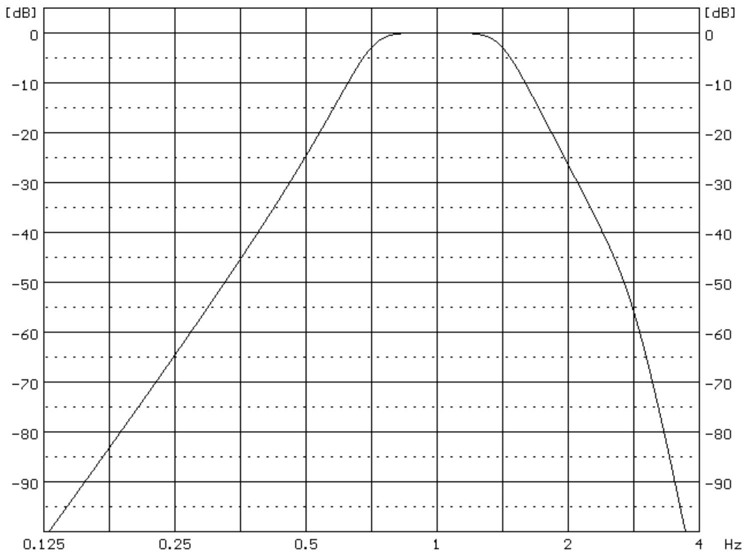
8.00 Hz 1/1 octave filter



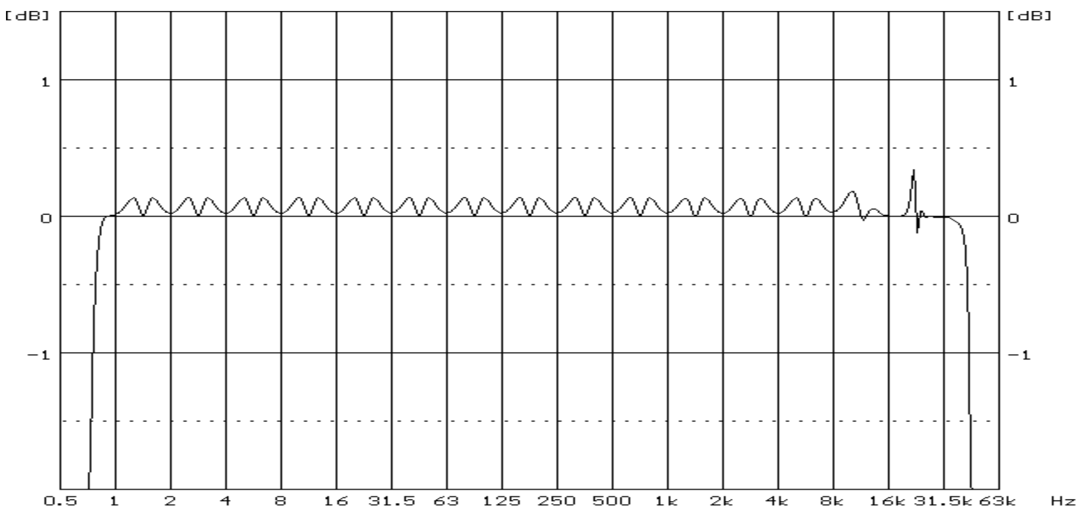
4.00 Hz 1/1 octave filter



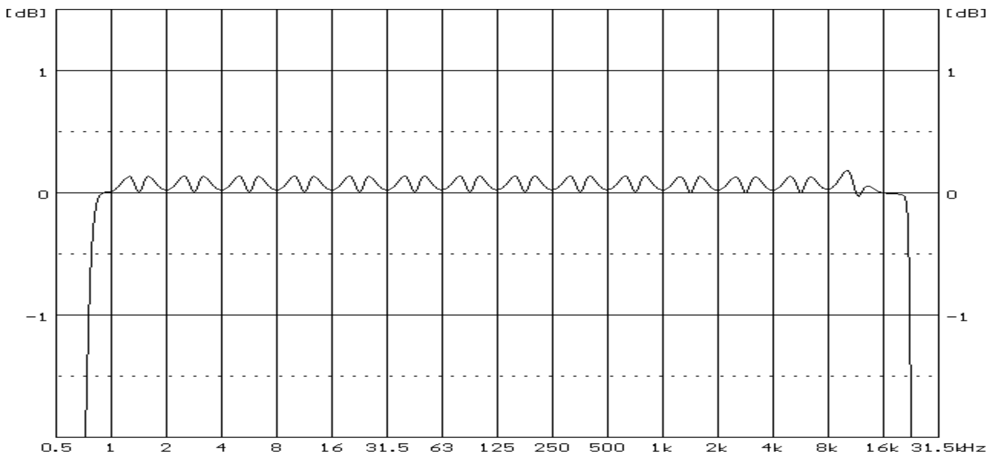
2.00 Hz 1/1 octave filter



1.00 Hz 1/1 octave filter



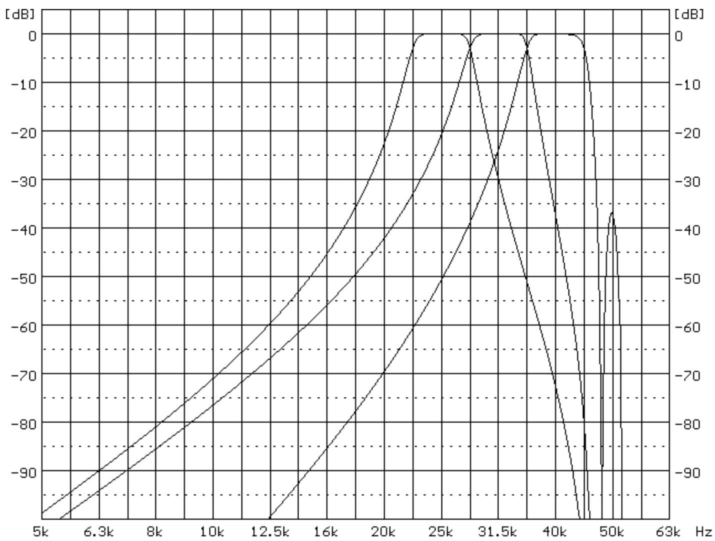
Summary curve of the Ultra Band



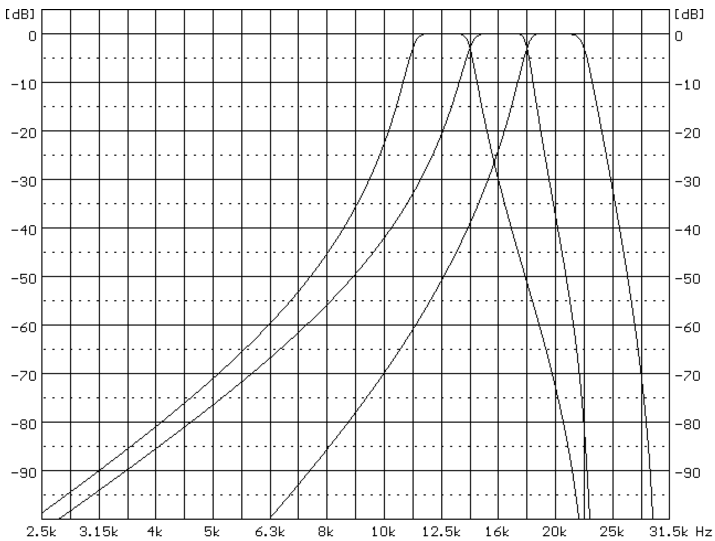
Summary curve of the Audio/Full Band

1/3 Octave filters

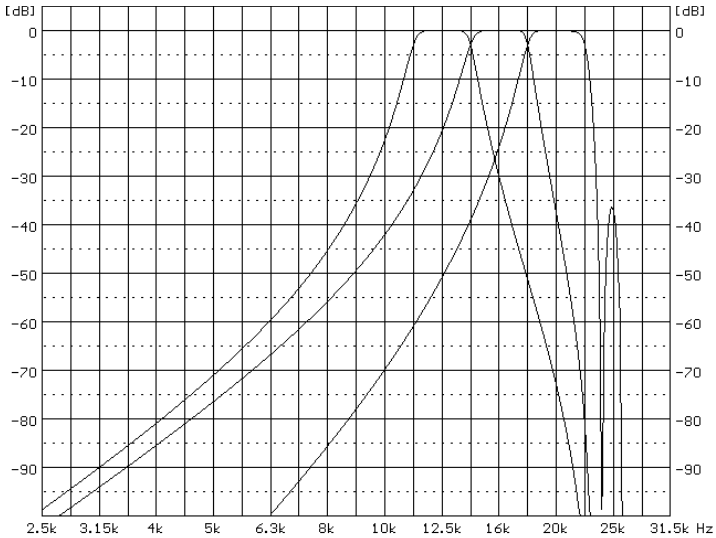
48 filters with centre frequencies from 0.8 Hz to 40 kHz (base 10), meeting IEC 61260-1:2014 standard for Class 1



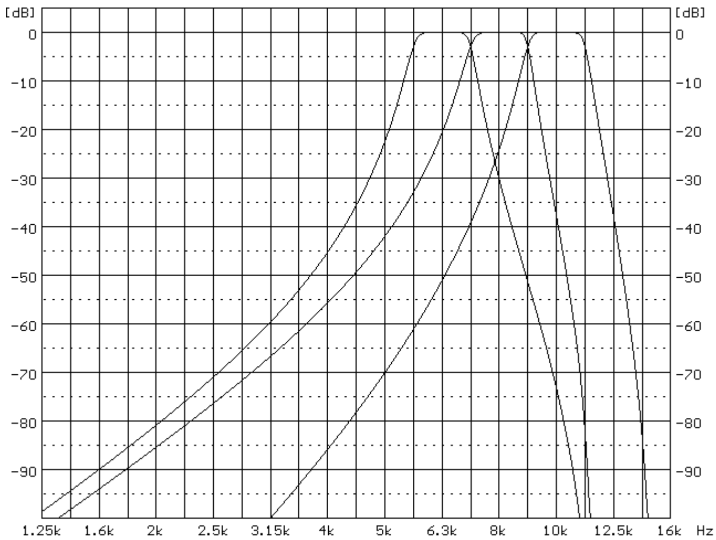
1/3 octave filters for 31.5 kHz 1/1 octave filter



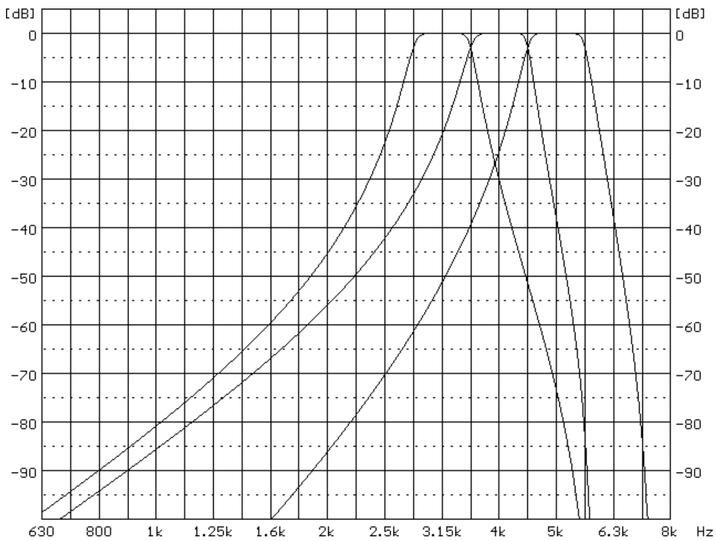
1/3 octave filters for 16.0 kHz 1/1 octave filter (Ultra band)



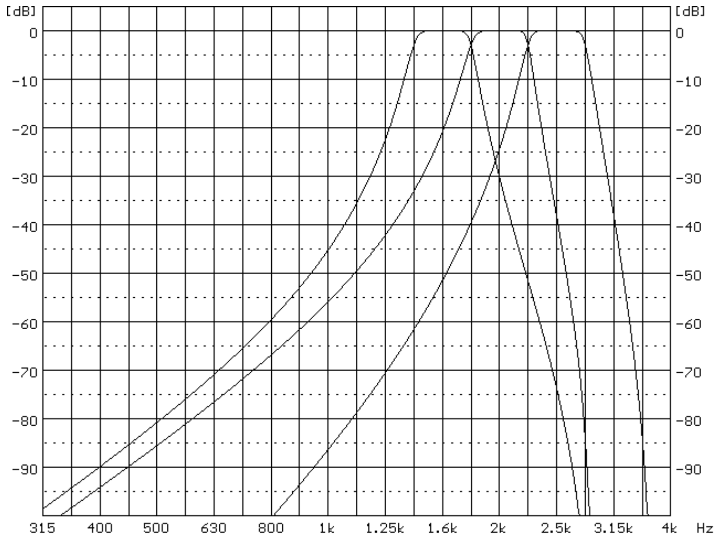
1/3 octave filters for 16.0 kHz 1/1 octave filter (Audio/Full band)



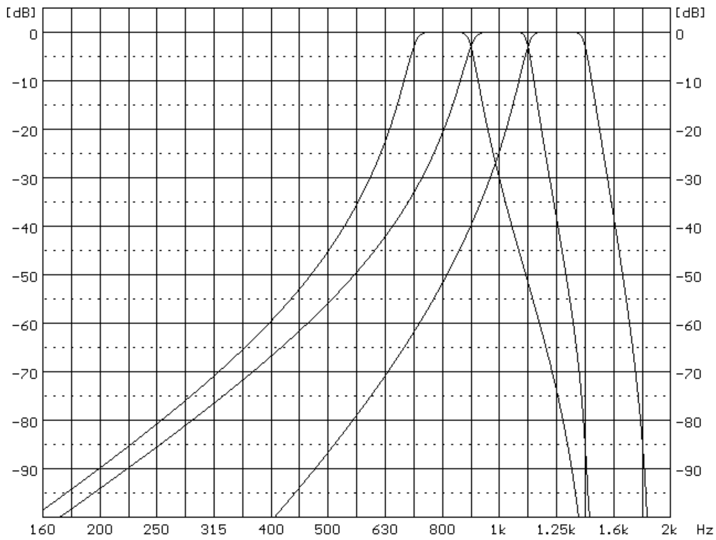
1/3 octave filters for 8.0 kHz 1/1 octave filter



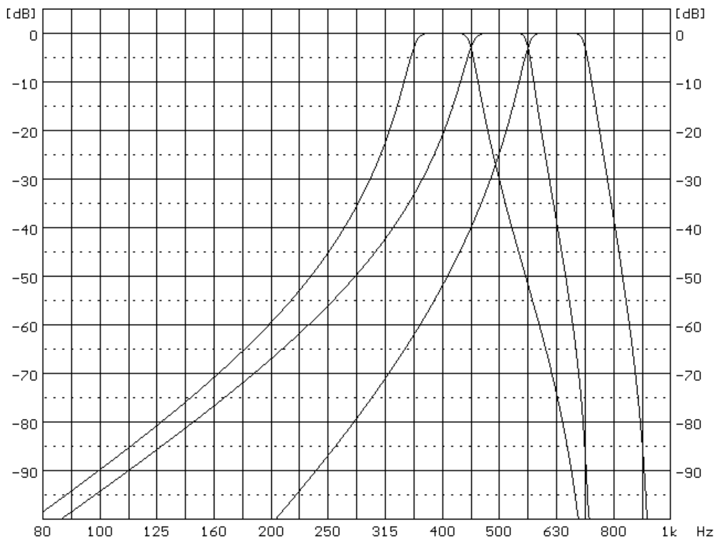
1/3 octave filters for 4.0 kHz 1/1 octave filter



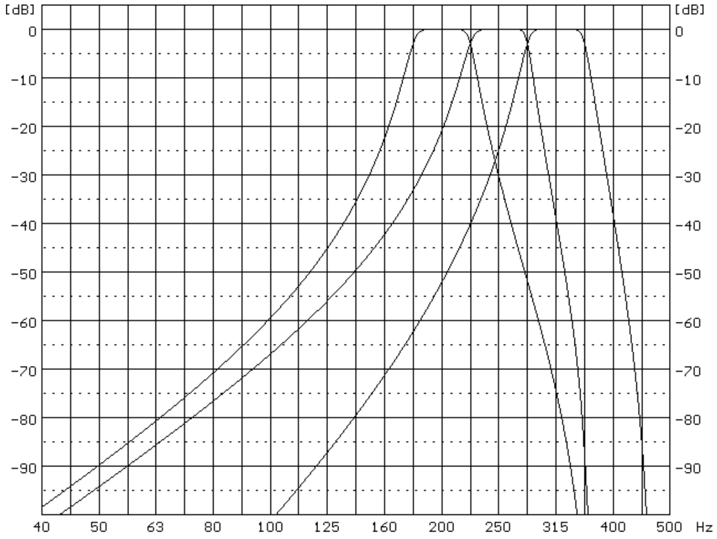
1/3 octave filters for 2.0 kHz 1/1 octave filter



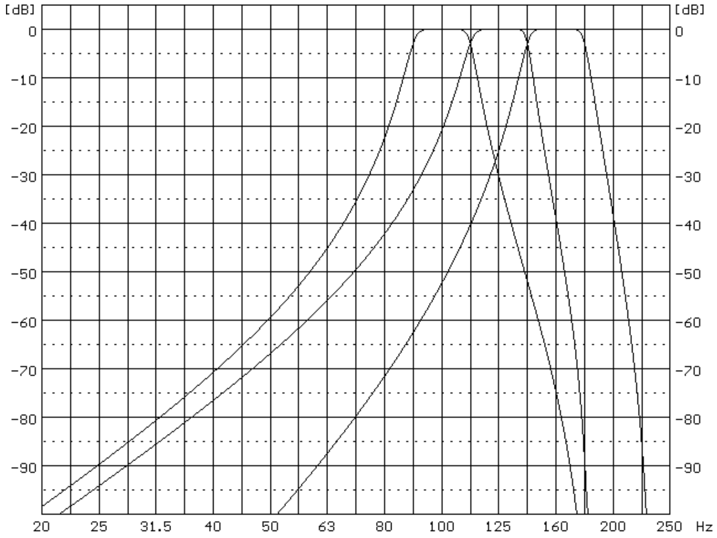
1/3 octave filters for 1.00 kHz 1/1 octave filter



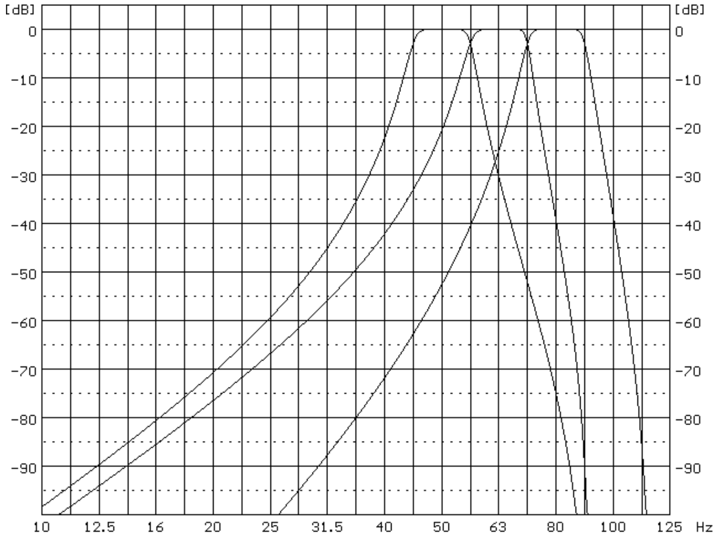
1/3 octave filters for 500 Hz 1/1 octave filter



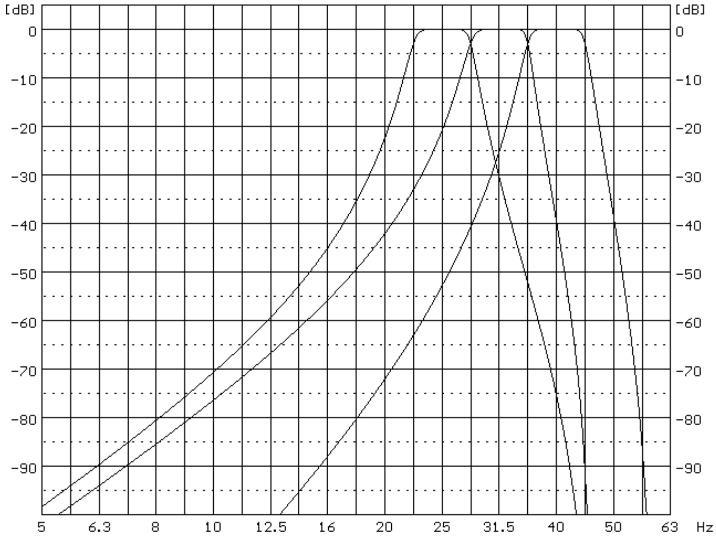
1/3 octave filters for 250 Hz 1/1 octave filter



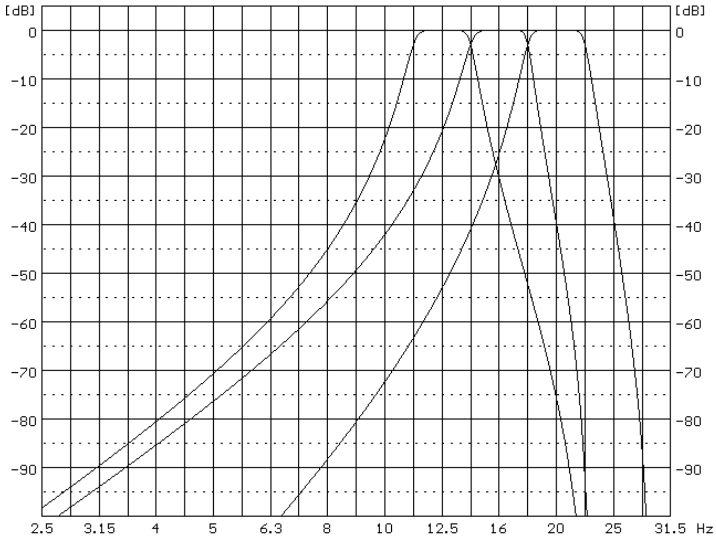
1/3 octave filters for 125 Hz 1/1 octave filter



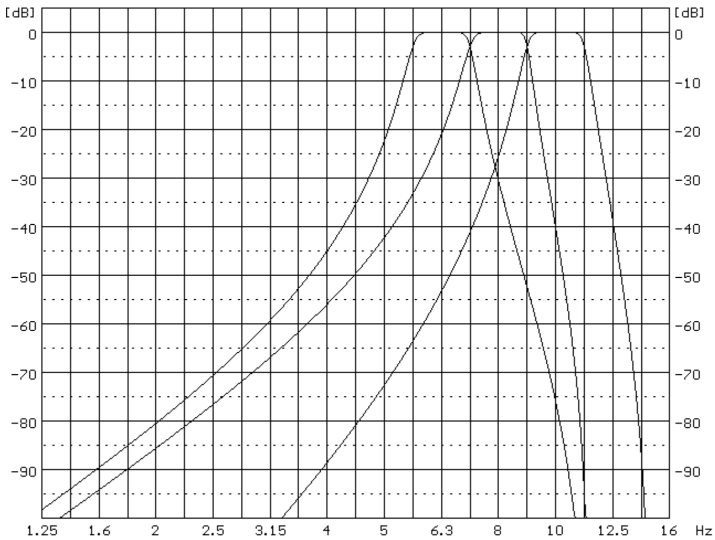
1/3 octave filters for 63.0 Hz 1/1 octave filter



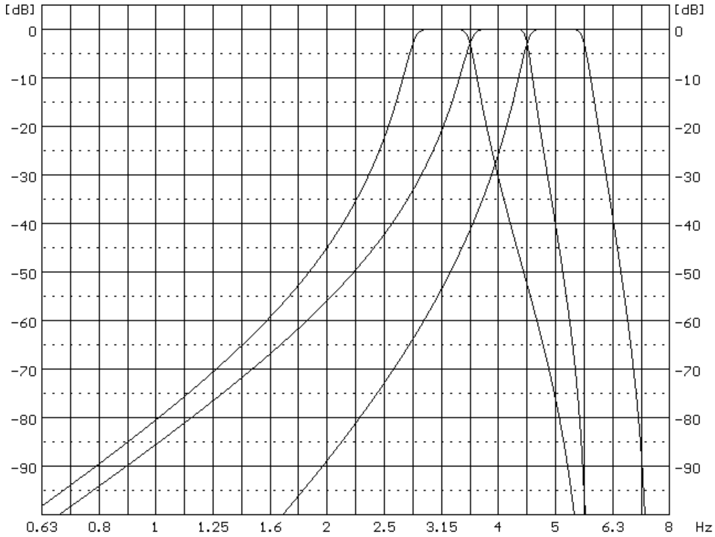
1/3 octave filters for 31.5 Hz 1/1 octave filter



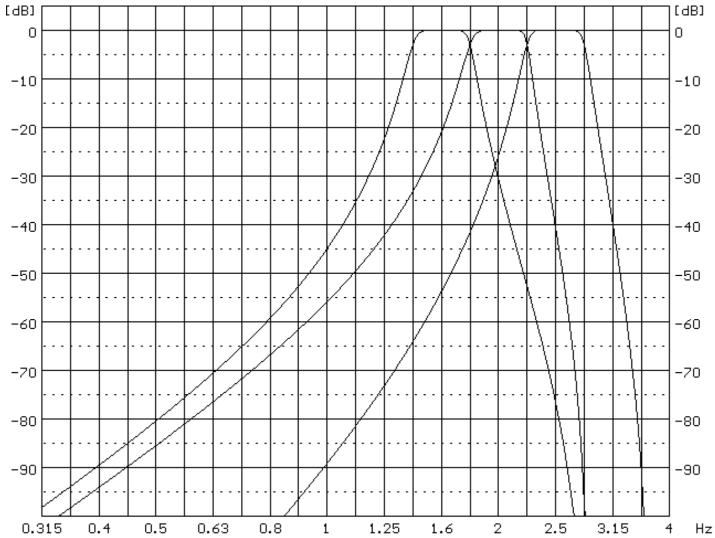
1/3 octave filters for 16.0 Hz 1/1 octave filter



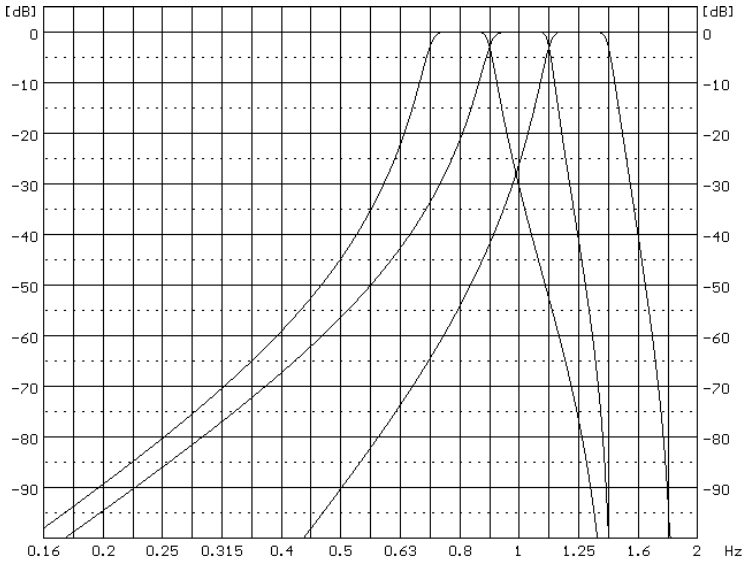
1/3 octave filters for 8.00 Hz 1/1 octave filter



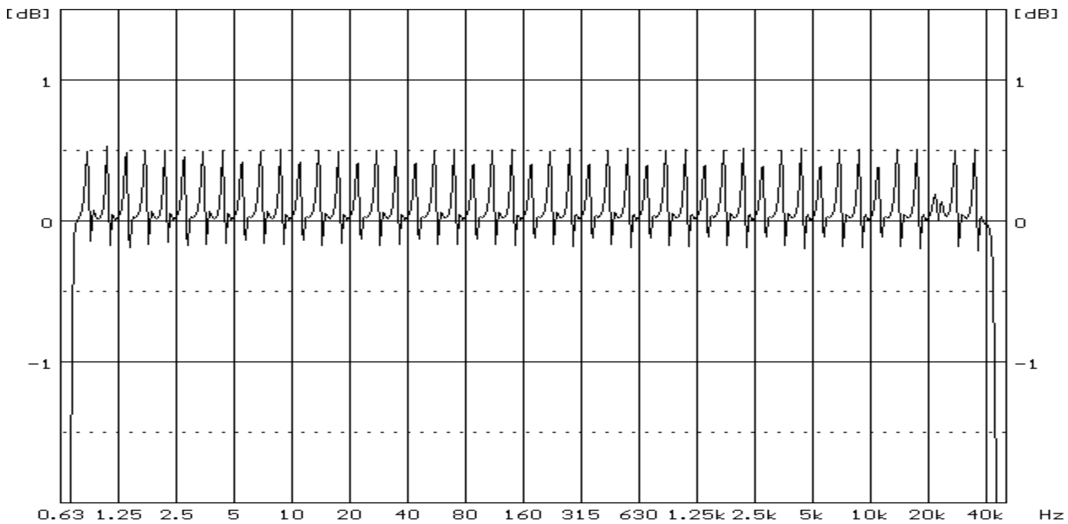
1/3 octave filters for 4.00 Hz 1/1 octave filter



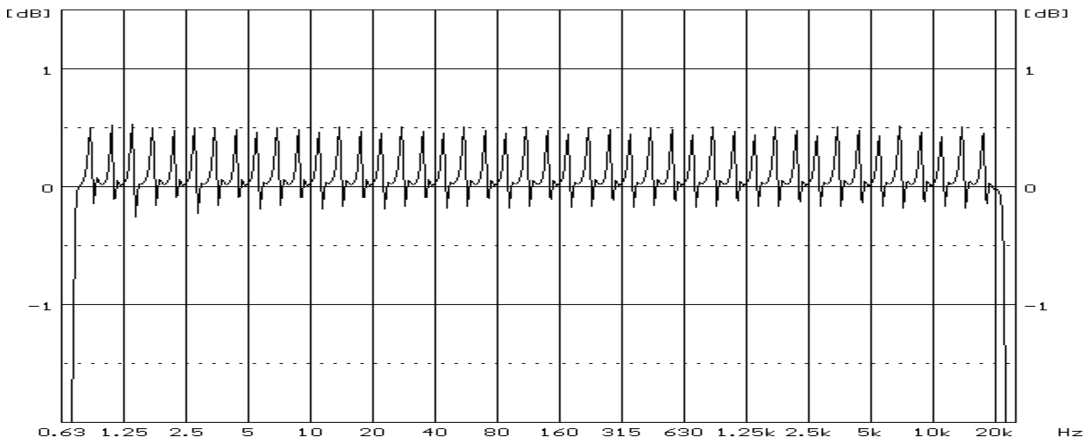
1/3 octave filters for 2.00 Hz 1/1 octave filter



1/3 octave filters for 1.00 Hz 1/1 octave filter



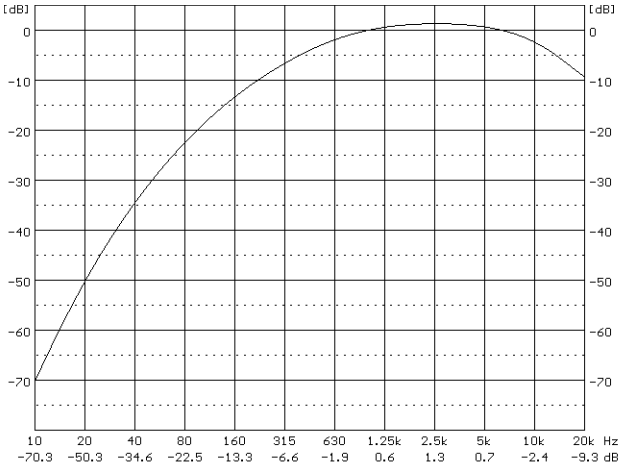
Summary curve of the Ultra Band



Summary curve of the Audio/Full Band

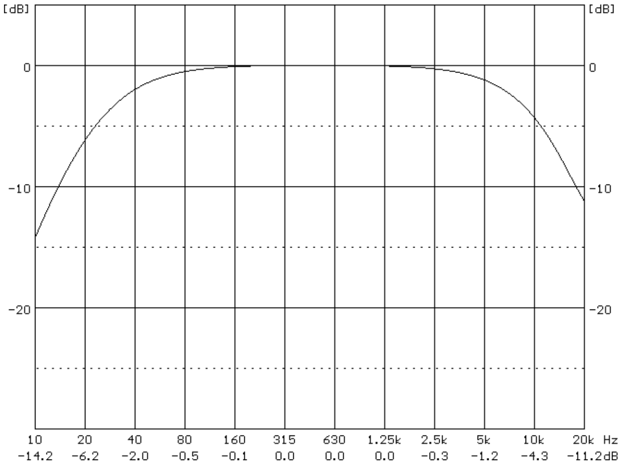
C.4. FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED BROADBAND DIGITAL FILTERS

"A" filter Class 1 according to IEC 651 and IEC 61672-1:2013



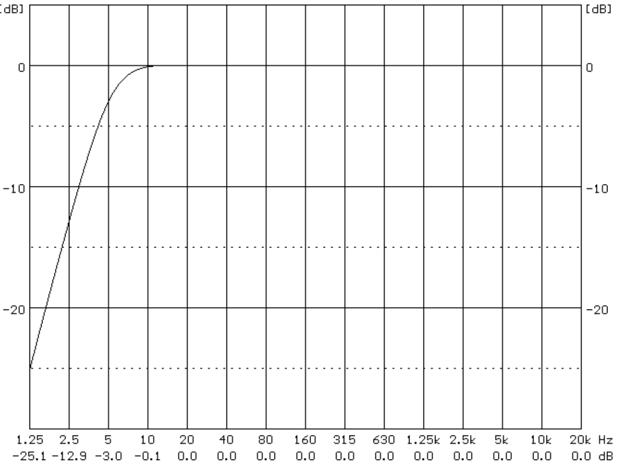
"A" filter characteristics

"C" filter Class 1 according to IEC 651 and IEC 61672-1:2013



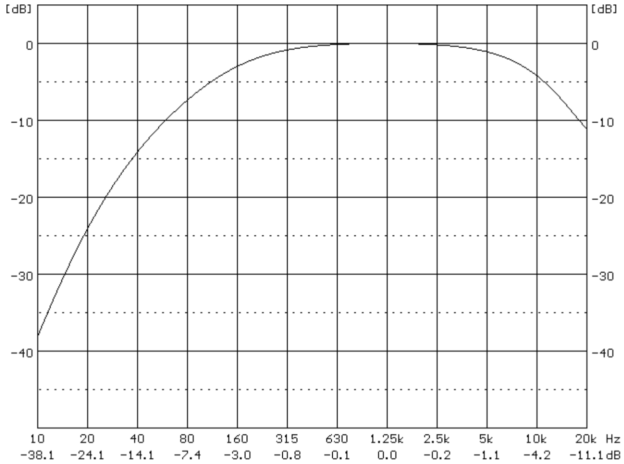
"C" filter characteristics

"Z" filter Class 1 according to IEC 61672-1:2013



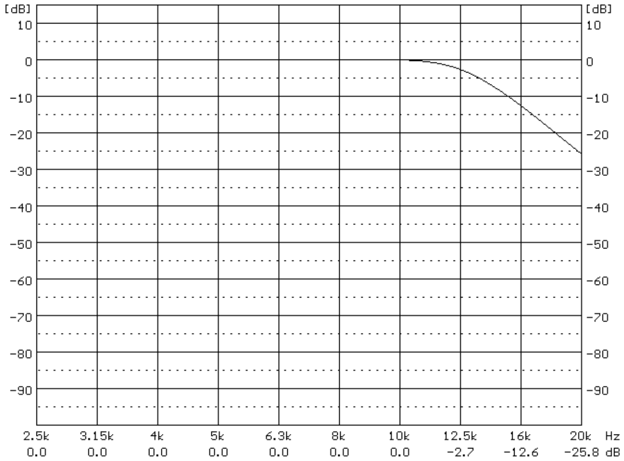
"Z" filter characteristics

"B" filter Class 1 according to IEC 651



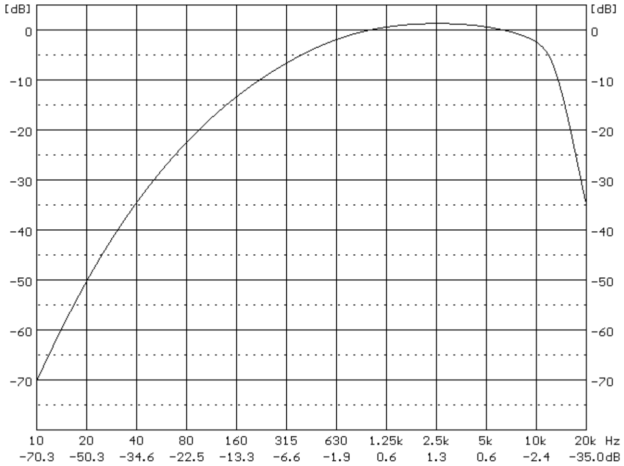
"B" filter characteristics

"U" filter Class 1 according to IEC 61012:1990



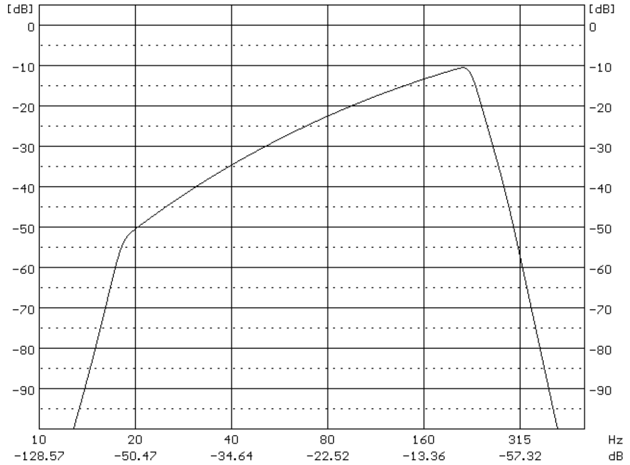
"U" filter characteristics

"AU" filter Class 1 according to IEC 61012:1990



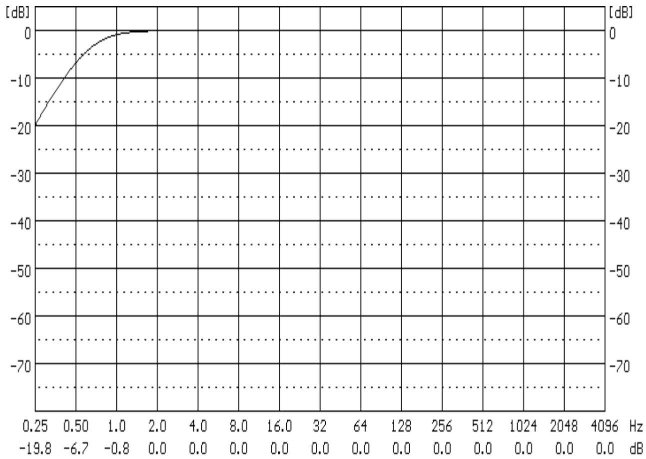
"AU" filter characteristics

“LF” filter according to EPA-93-F105-02-104 Low Frequency Noise Control Regulations



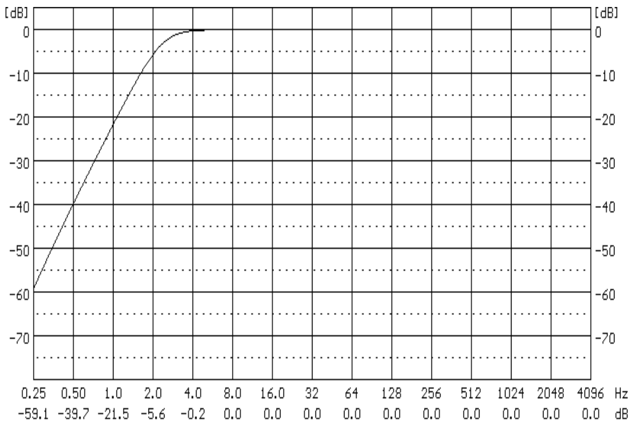
“LF” filter characteristic

“**HP1**” **filter** is used for the acceleration measurements (the vibration signal) in the frequency range from 1 Hz to 20 kHz.



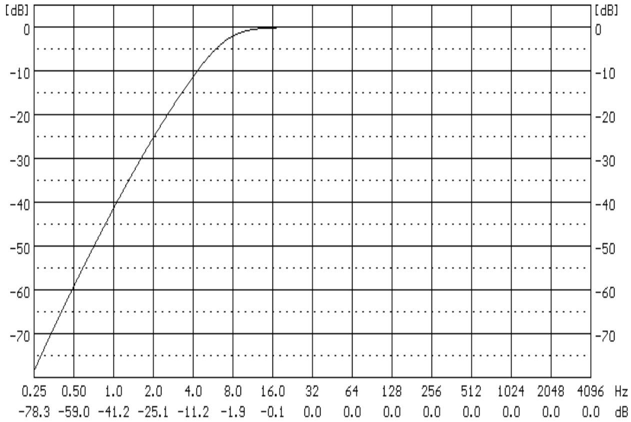
“HP1´ filter characteristics

“**HP3” filter** is used for the acceleration measurements (the vibration signal) in the frequency range from 3.5 Hz to 20 kHz



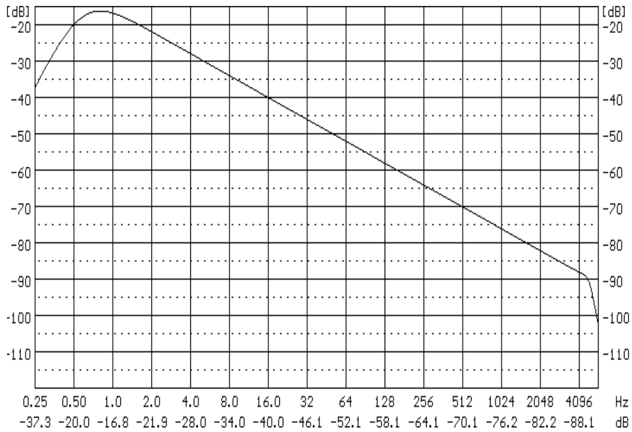
”HP3” filter characteristics

“HP10” filter is used for the acceleration measurements (the vibration signal) in the frequency range from 10 Hz to 20 kHz



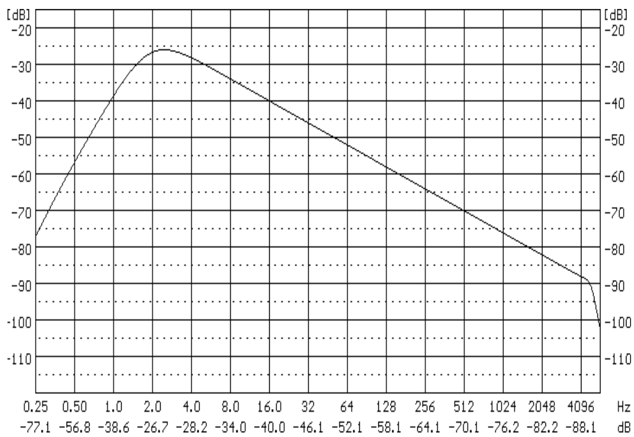
“HP10” filter characteristics

“**Vel1” filter** is used for the velocity measurements (the vibration signal) in the frequency range from 1 Hz to 20 kHz



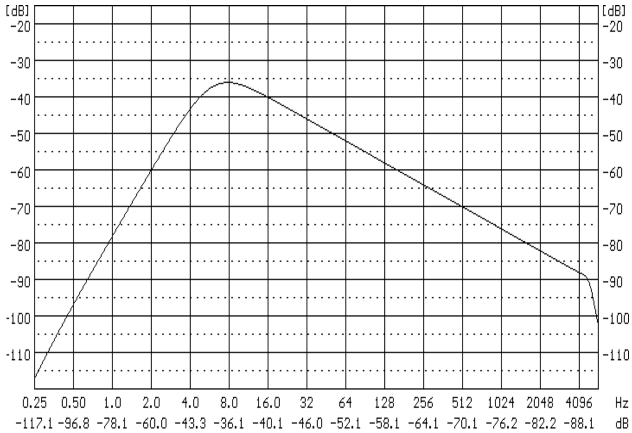
“Vel1” filter characteristics

“**Vel3” filter** is used for the velocity measurements in the frequency range from 1 Hz to 20 kHz



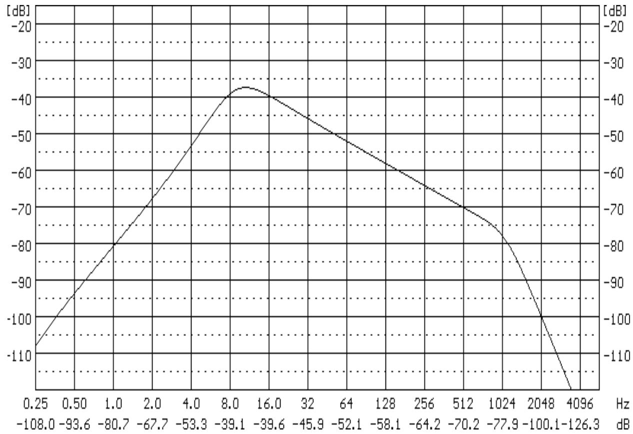
“Vel3” filter characteristics

“**Vel10” filter** is used for the velocity measurements in the frequency range from 1 Hz to 20 kHz



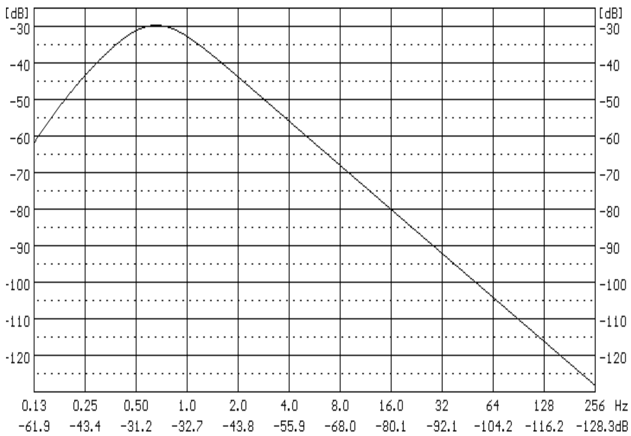
“Vel10” filter characteristics

“**VelMF” filter** is used for the evaluation of the state of the machines. This filter is used for the measurements in the frequency range from 10 Hz to 1000 Hz and conforms ISO 10816



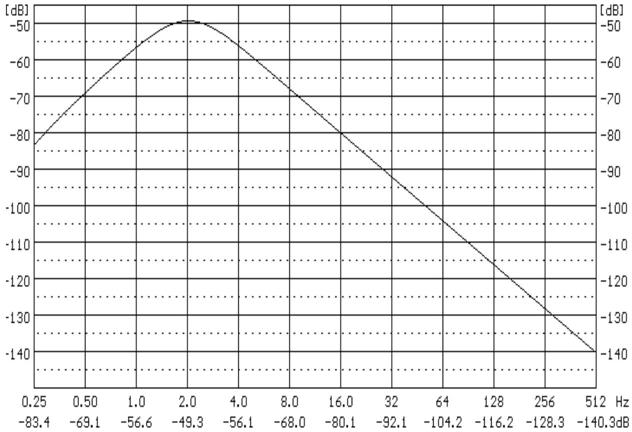
“VelMF” filter characteristics

“**Dil1” filter** is used for the displacement measurements in the frequency range [1 Hz to 20 kHz].



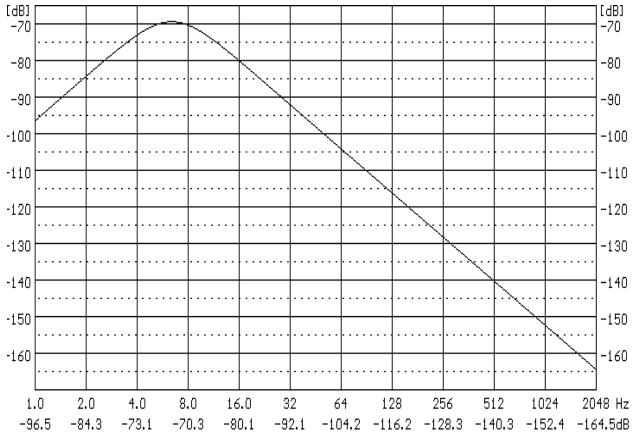
“Dil1” filter characteristics

“**Dil3” filter** is used for the displacement measurements in the frequency range [1 Hz to 20 kHz]



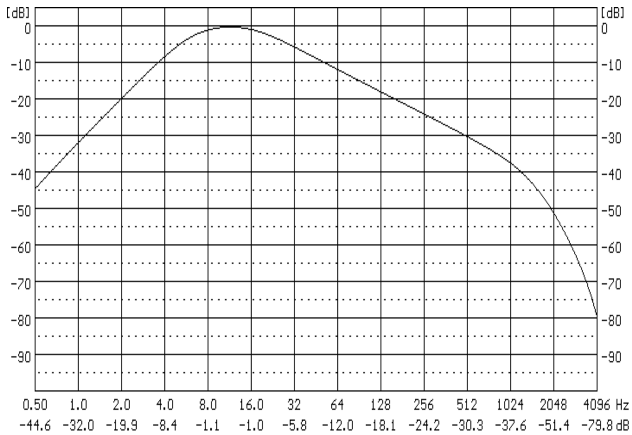
“Dil3” filter characteristics

“**Dil10” filter** is used for the displacement measurements in the frequency range [1 Hz to 20 kHz]



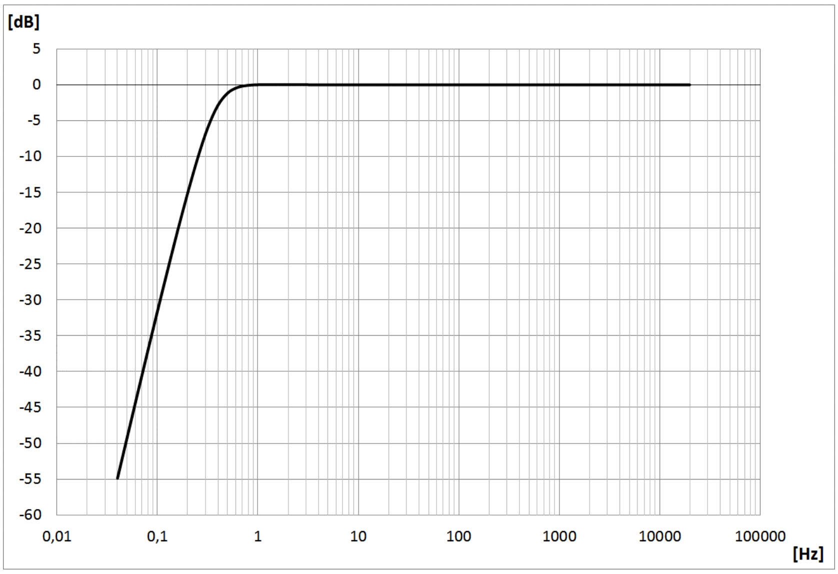
“Dil10” filter characteristics

“**Wh” filter** is used for the assessment of the influence of the vibration signal on the human body. It conforms ISO 5349 and ISO 8041-1:2017



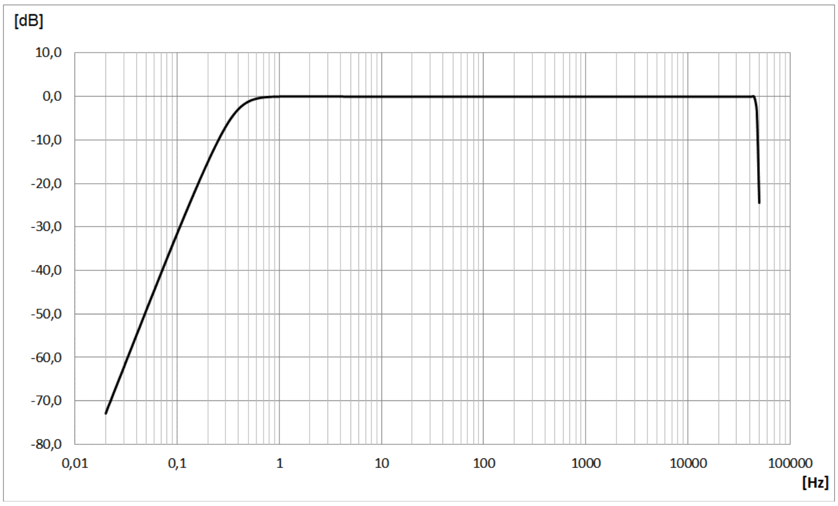
“Wh” filter characteristics

"**HP" filter** is a High-Pass filter



"HP" filter characteristics

"**HPE" filter** is a High-Pass filter for the **Ultra** frequency band



"HPE" filter characteristics

C.5. MISCELLANEOUS SPECIFICATION OF SVAN 977A

Display

Super contrast OLED color display (320 x 240 pixels).

Memory

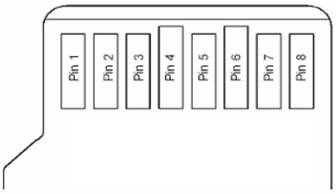
2 MB RAM memory.

4 MB flash memory allocated to the program.

Memory card

Typical Micro SD or Micro SDHC cards can be used. Supported for up to 128 GB (provided that card was formatted as FAT32).

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



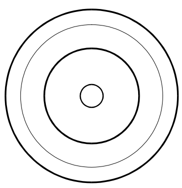
MicroSD contact pad assignment - outer view

Table C.5.1. Pin out of the MicroSD contact

Pin No.	Name	Description
1	DAT2	Data Line [Bit 2]
2	CD/DAT3	Card Detect / Data Line [Bit 3]
3	CMD	Command / Response
4	V_{DD}	Supply voltage
5	CLK	Clock
6	V_{SS}	Supply voltage ground
7	DAT0	Data Line [Bit 0]
8	DAT1	Data Line [Bit 1]

Signal input

The input of the measured signal (taken form the microphone preamplifier or the vibration transducer):



TNC connector (external view)

Table C.5.2. Pin out of the TNC connector

Pin number	TNC
Central	Input
Shield	Ground

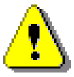
Power supply

Instrument is dedicated for the operation from the internal replaceable battery.

Power consumption from the 6V source is approx. **130 mA (at + 20°C)**

So, typical operating time from 4 x AA alkaline batteries will be about **12 hours**.

SVAN 977A can be also powered from the AA Type rechargeable batteries.



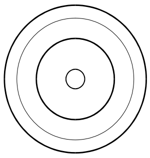
Note: *For the temperatures below 0℃ operating time can decree (depending on the batteries)!*

Instrument can be also powered from the external source (e.g. SA 17A or car battery) with the DC Voltage from 7 V to 16 V.

Voltage ripple should not exceed ± 5%.

External Power requirement is voltage dependent:

for 7 V - 110 mA DC,
for 15.5 V - 60 mA DC.

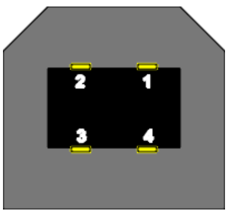


Power Supply connector 5.5 / 2.1 mm (external view)

Table C.5.3. Pin out of the power supply connector

Internal Pin	5.5/2.1
Shield	Ground
1	+ 7 V ÷ 16 V

USB Device port



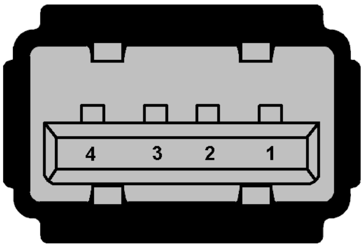
USB socket (external view)

Table C.5.4. Pin-out of the USB-Device connector

Pin number	USB
1	Vbus
2	D-
3	D+
4	GND
Shield	Ground

Serial port

SVAN 977A Serial Port provides data transfer using RS232 data format but in TTL logic standard



Serial Port socket (external view)

Table C.5.5. Pin-out of the Serial Port (USB-Host connector)

Pin number	USB
1	Vbus
2	TxD
3	RxD
4	GND
Shield	Ground

RS 232 interface (optional)

The RS 232 interface option for SVAN 977A is provided by means of the **SV 55** interface. It conforms to the EIA Standard RS 232C. It enables the user to program remotely all instrument functions and the transmissions to and from the meter with the speed from 1200 bit/s to 115200 bit/s.

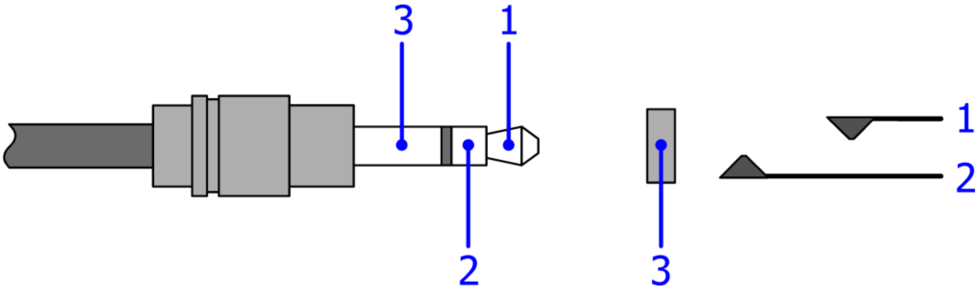
The SV 55 must be connected to the SVAN 977A Serial Port

The SV 55 - DB 09 F - pin female connector pin-out is given below.

Table C.5.6. SV 55 interface description

PC RS 232, 9 - pin connector Signal name	SV 55 connector (DB 09 F) Pin number
1 – LSD	1 (not connected)
2 – RXD	3
3 – TXD	2
4 – DTR	6 connected to pin 4
5 – GND	5
6 – DSR	4 connected to pin 6
7 – RTS	8
8 – CTS	7
9 – GND	9 (not connected)

I/O – User programmable Analogue Outputs, Digital Input / Output connector



3.5 mm Mini Stereo Jack type (cable plug and instrument socket are shown)

Table C.5.7. Pin out of the 3.5 mm Mini Stereo Jack

Pin Number	Function
1	Analog Output
2	Digital Input / Output (*)
Chassis (3)	Ground

*depending on instrument set-up

The user may set-up the I/O mode in the screen <***Menu> / Instrument / Multifunction I/O***:

1. **I/O Mode: Analog Out**. When this option is selected, the measured signal from the selected channel is fed to the terminal [1] of the **I/O** connector. Output voltage, frequency band and the output impedance are following:
   a) Output Voltage:
   The output voltage is equal to 1.0 V_{RMS} (± 5 %) at:
   - 120 dB indication of the instrument, on measurement range "L"
   - 137 dB, indication of the instrument, on measurement range "H", when calibration factor is set to 0.0 dB.

   b) Frequency Band (-3 dB): 0.02 Hz ÷ 40 kHz.
   c) Output Impedance: 51 Ω / 5%
2. **I/O Mode: Analog In** – future feature.
3. **I/O Mode: Digital In**. When the **Ext. Trigger** function is activated, the external triggering of the instrument may be provided. To do that the user should select **Trigger: External** (*path: <Menu> / Measurement / Measurement Trigger*). The external signal for triggering is specified as follows:
   a) Trigger voltage threshold level is set to +1 V.
   b) Trigger voltage slope (*path: <Menu> / Measurement / Measurement Trigger*) set by the user as **Slope [+]** (uprising as default) or **Slope [–]** (falling, auxiliary).
   c) Minimal duration of the trigger impulse: 10 μsec.
   d) 100 μsec. release time after previous measurement is necessary before next trigger.
   e) Recommended trigger voltage should not exceed ± 5 V.
   f) Input impedance in the **Digital In** mode – ca. 10 kΩ / 100 pF, ESD type safety.
   g) When the instrument is switched-off in the **Digital In** mode, the voltage impulse on the pin [1] will be able to switch-on the instrument, however in this case the minimal duration of the trigger impulse of 100 msec is necessary, with uprising voltage slope.

4. **I/O Mode: Digital Out**. Two different functions are available in this mode:
   4.1. **Function: Trigger Pulse**. When this function is selected, the terminal [1] is set as output, which enables one to trigger another instrument (one instrument or more with trigger inputs connected together in parallel), output trigger impulse meets specification given below:
      a) trigger impulse is generated before every measurement,
      b) output voltage range from 0 V or 3 V,
      c) triggering slope: rising or falling,
      d) output impedance: 51 Ω,
      e) duration of the impulse: ca. 30 μsec.
   4.2. **Function: Alarm Pulse**. When this function is selected, the terminal [1] is set as an output, which changes its output level, when current result of measurement exceeds user-programmable threshold level. In this case the terminal [1] output operates as an output of analogue comparator with user-programmable threshold. This feature enables one to control an external device as alarm-indicator or similar:
      a) electrical specification of this output are as follows: 0 V to 3 V voltage range, 51 Ω output impedance,
      b) output produces a voltage level (not impulse),
      c) **Active Level** setting may be selected by the user in menu as **Low** or **High**. When **High** is selected, the output alternates from 0 V to 3 V till measurement result is greater than threshold value,
      d) **Source** setting selects source of measurement result to be compared with the threshold value. One of three results sources may be selected **Leq(1)**, **Peak(1)**, **Max(1)**, **Spl(1)**,
      e) **Source Type** setting selects **Current** or **Periodic,** according to last result became of settled **Integr. Period** *(path: <Menu> / Measurement / General Settings),*
      f) **Level** enables setting-up the threshold value.

Real Time Clock

Built-in real time. Accuracy better than 1 minute/month. Additional built-in CR1220 battery provides power to the RTC for a minimum of 2 years (typically 10 years).

Wireless Bluetooth®[2] 2.1+EDR Module (Enhanced Data Rates)

This instrument supports wireless connection via Fully Qualified Bluetooth system v2.1 + EDR Module, CE and FCC. This connectivity is compatible with mobile and PC devices that support Bluetooth® 2.1.

The instrument contains a wireless transmission module, WT12 from Bluegiga technologies. Copies of the modules regional approvals certificates may be obtained from Svantek or Bluegiga.

- Bluetooth version: 2.0
- Operating frequency range: 2.402 – 2.480 GHz
- Transmit power (max): 3 dBm
- Sensitivity: -86 dBm
- Channels: 40
- Modulation: GFSK
- Internal antenna gain: 0.5 dBi
- Range: typically >30m line-of-sight and depending on local RF conditions.

[2] "The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by SVANTEK is under license. Other trademarks and trade names are those of their respective owners.

FCC and IC

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

- **FCC ID:** QOQWT12
- **Industry Canada ID:** 5123A-BGTWT12A
- Producer: Silicon Laboratories
- Model: WT12 Bluetooth Module

FCC Statements:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Operation is subject to the following two conditions:

- This device may not cause interference and
- This device must accept any interference, including interference that may cause undesired operation of the device.

Weight with the battery	600 g (without accelerometer).
Dimensions	39x79x305 mm (with microphone and preamplifier).

Environmental parameters

- Working temperature range -10°C ÷ +50°C
- Storing temperature range -20°C ÷ +50°C (-30°C ÷ +60°C without batteries)
- Humidity 90% RH in 40°C (uncondensed vapour)

Compliance with EU Directives

CE mark indicates compliance with RED Directive 2014/53/EU (see DECLARATION OF CONFORMITY):

- Art 3.1a: Safety
- Art 3.1b: Electromagnetic Compatibility
- Art 3.2: Radio.

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

C.6. SPECIFICATION OF SV 80 ACCELEROMETER

Performance

Number of axis 1
Sensitivity (± 5 %) ....10 mV/(ms^{-2}) ~ 100 mV/g
Measurement range ....0.01 ms^{-2}RMS ÷ 500 ms^{-2} Peak
Frequency response (by design guideline, ± 3 dB) ....0.5 Hz ÷ 14 000 Hz
Linearity ....± 1 %
Residual noise (1 Hz, 24°C) ....30 µg RMS
Residual noise (1 Hz to 25 kHz, 24°C) ....300 µg RMS
Transverse response sensitivity (20 Hz, 50 m/s2) ....< 5 %
Resonant frequency ....25 kHz

Electrical

Electrical grounding ....Isolated from machine grounding
Isolation (Case to Shield) ....> 100 MΩ
Capacitance to ground (Nominal) ....70 pF
Supply current ....2 mA ÷ 10 mA
Supply voltage ....22 V ÷ 28 V
Bias voltage ....+12 VDC
Output impedance (Nominal) ....50 Ω
Charge / discharge time constant (start-up time)...............................< 1 sec. typ.

Environmental

Maximum vibration (shock survival) ....50 000 ms^{-2} Peak
Thermal sensitivity coefficient ....0.07 %/° C F.S.
Operating temperature range ....from -55 °C to +120 °C
Operating temperature range (recommended) ....from -10 °C to +50 °C
Humidity / Enclosure ....IP67, epoxy sealed

Physical

Connector...TNC socket, top radially mounted
Material housing & connector..Stainless steel
Dimensions..drawing above
Mounting thread...10-32 UNF 2B
Weight..40 grams

Accessories

Mounting stud 10-32 to M5 (included)
SA 27/10-32...Mounting magnet base (optional)
SC 27..Coil cable TNC plug – TNC plug, 2 meters (optional)

C.7. USING OF THE SA 277 OUTDOOR MICROPHONE PROTECTION UNIT

The **SA 277** outdoor protection unit protects the SVAN 977A preamplifier and microphone from weather conditions. The use of the outdoor kit requires an extension cable between the instrument and its preamplifier (**SC 277**). The SA 277 is made of lightweight materials and is easy to install on a tripod. This solution is recommended for short term and semi-permanent outdoor noise measurements.

The outdoor microphone kit has ¾" screw on its bottom which enables the use of standard tripods or other user specific mountings.

As an option the user may use desiccator - Silikogel. The desiccator absorbs moisture commonly contained in the air. The desiccator should be regenerated after some period of use, when it changes colour to red, by drying it for 3 hours in a temperature of 150°C. The colour of the silica gel is visible through the hole on the top of the desiccator

***Note**: See also SA 277 Assembly Guide to learn how to assemble and disassemble the microphone's outdoor protection.*

***Note:** Using SA 277 changes the frequency response and measuring ranges of SVAN 977A. Please check the below given specification.*

Depending on the measurement task SA 277 can be used in two operational modes:

1. With reference incidence angle 90 deg – so called "environmental mode"
2. With reference incidence angle 0 deg – so called "airport mode"

The wave incidence angle is oriented to the microphone membrane surface. 0 deg means direction orthogonal to the membrane surface. 90 deg means direction parallel to the membrane surface.

Frequency response of SVAN 977A with SA 277 outdoor protection unit is compensated by means of two digital filters:

- **Environmental** compensation filter improving the complete instrument frequency response in the free field for the reference acoustic wave incidence angle 90 deg
- **Airport** compensation filter improving the complete instrument frequency response in the free field for the reference acoustic wave incidence angle 0 deg

***Note:** For the conformance of acoustical tests with SA 277, the Microphone Compensation must be set to "Outdoor Environment" or "Outdoor Airport"! (path: <Menu> / Measurement / Compensation Filter).*

Linear Operating Ranges with the **Environmental** filter

Table C.7.1 Self-generated noise for different weighting filters

Weighting filter / Range	Electrical *)			Acoustical compensated		
	A	C	Z	A	C	Z
Low	< 15 dB	< 15 dB	< 20 dB	< 16 dB	< 16 dB	< 21 dB
High	< 26 dB	< 26 dB	< 31 dB	< 27 dB	< 27 dB	< 31 dB

*) measured with the **ST 02** microphone equivalent impedance 18 pF +/-10%

The starting point at which tests of level linearity shall begin is 94.0 dB for the frequencies specifies below.

Table C.7.2 Linear operating range: “LOW” with the **Environmental** filter for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31,5 Hz	26	80	26	103	26	117	31	120	26	80	26	103	26	117	29	83	51	120
500 Hz	26	116	26	119	26	120	31	120	26	116	26	119	26	120	29	119	50	123
1 kHz	26	120	26	120	26	120	31	120	26	120	26	120	26	120	29	123	50	123
4 kHz	26	121	26	119	26	119	31	120	26	121	26	119	26	119	29	124	50	123
8 kHz	26	119	26	117	26	117	31	120	26	119	26	117	26	117	29	122	50	120
12.5 kHz	26	115	26	114	26	114	31	120	26	115	26	114	26	114	29	118	50	117

Table C.7.3 Linear operating range: “HIGH” with the **Environmental** filter for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31,5 Hz	37	97	37	120	37	134	41	137	37	97	37	120	37	134	40	100	64	137
500 Hz	37	133	37	136	37	137	41	137	37	133	37	136	37	137	40	136	60	140
1 kHz	37	137	37	137	37	137	41	137	37	137	37	137	37	137	40	140	60	140
4 kHz	37	138	37	136	37	136	41	137	37	138	37	136	37	136	40	141	60	139
8 kHz	37	136	37	134	37	134	41	137	37	136	37	134	37	134	40	139	60	137
12.5 kHz	37	132	37	131	37	131	41	137	37	132	37	131	37	131	40	135	60	134

Microphone response for **90 deg** incidence angle

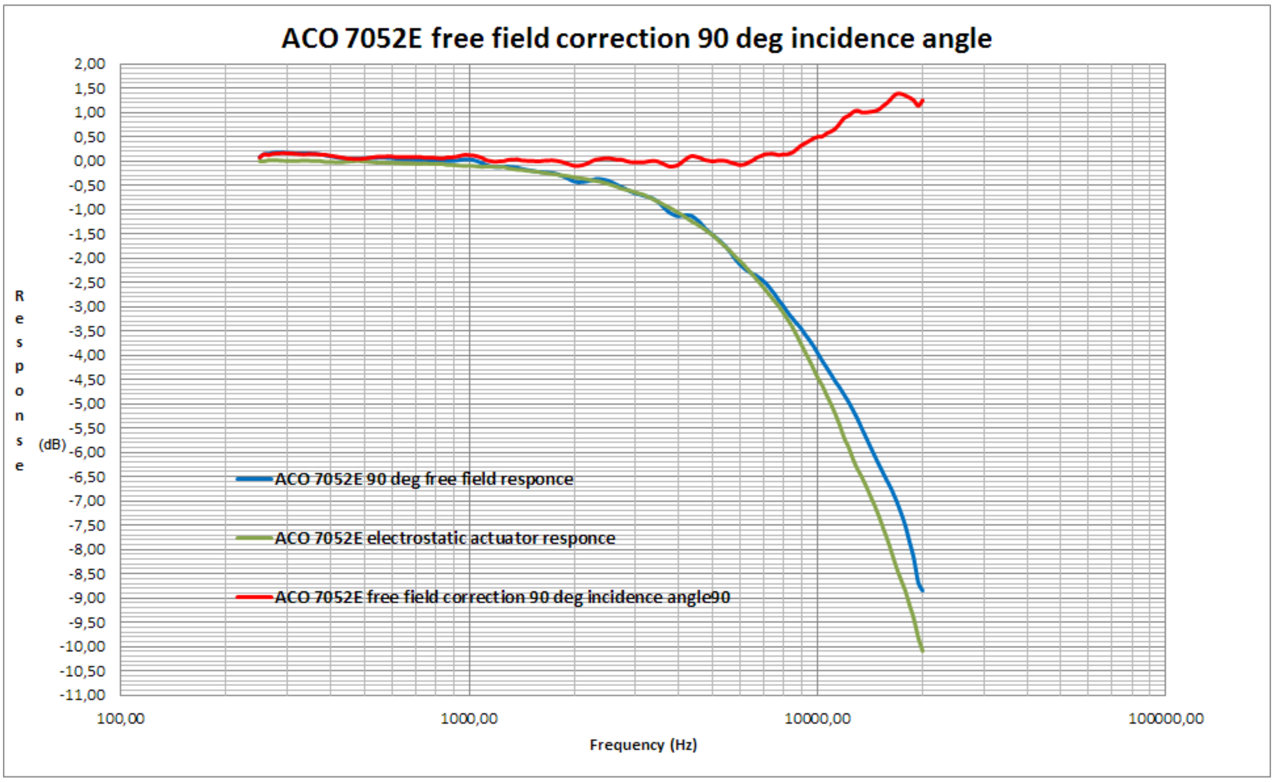


Table C.7.4 ACO 7052E free field correction (**90 deg** incidence angle)

f [Hz]	ACO 7052E Actuator to Free Field correction for 90 deg incidence angle	ACO 7052E Typical electrostatic actuator response	ACO 7052E Free Field response for 90 deg incidence angle
251.19	0.08	0.00	0.08
258.52	0.15	0.00	0.15
266.07	0.14	0.02	0.15
273.84	0.16	0.02	0.18
281.84	0.17	0.02	0.18
290.07	0.17	0.01	0.18
298.54	0.17	0.01	0.18
307.26	0.17	0.00	0.17
316.23	0.16	0.01	0.17
325.46	0.16	0.01	0.16
334.97	0.15	0.02	0.16
344.75	0.15	0.01	0.16
354.81	0.15	0.01	0.16
365.17	0.15	0.00	0.15
375.84	0.14	0.00	0.14
386.81	0.14	-0.01	0.13
398.11	0.12	-0.01	0.11
409.73	0.11	-0.02	0.09
421.70	0.10	-0.02	0.08
434.01	0.08	-0.02	0.06
446.68	0.06	-0.01	0.06
459.73	0.06	0.00	0.06

f [Hz]	ACO 7052E Actuator to Free Field correction for 90 deg incidence angle	ACO 7052E Typical electrostatic actuator response	ACO 7052E Free Field response for 90 deg incidence angle
473.15	0.05	0.00	0.06
486.97	0.06	0.00	0.06
501.19	0.06	0.00	0.06
515.82	0.08	-0.01	0.06
530.88	0.09	-0.02	0.07
546.39	0.10	-0.03	0.07
562.34	0.10	-0.03	0.07
578.76	0.11	-0.03	0.07
595.66	0.10	-0.04	0.07
613.06	0.10	-0.04	0.06
630.96	0.09	-0.04	0.05
649.38	0.10	-0.05	0.05
668.34	0.09	-0.04	0.05
687.86	0.09	-0.05	0.04
707.95	0.09	-0.05	0.04
728.62	0.09	-0.05	0.04
749.89	0.08	-0.05	0.03
771.79	0.08	-0.06	0.03
794.33	0.08	-0.06	0.02
817.52	0.07	-0.05	0.01
841.40	0.07	-0.06	0.01
865.96	0.08	-0.08	0.01
891.25	0.09	-0.08	0.01
917.28	0.10	-0.08	0.02
944.06	0.12	-0.09	0.03
971.63	0.14	-0.09	0.04
1000.00	0.13	-0.09	0.04
1029.20	0.13	-0.10	0.03
1059.25	0.11	-0.11	0.00
1090.18	0.08	-0.12	-0.04
1122.02	0.03	-0.11	-0.08
1154.78	0.01	-0.11	-0.10
1188.50	0.00	-0.11	-0.12
1223.21	0.01	-0.12	-0.11
1258.93	0.01	-0.12	-0.11
1295.69	0.04	-0.15	-0.11
1333.52	0.04	-0.16	-0.12
1372.46	0.05	-0.17	-0.13
1412.54	0.02	-0.18	-0.15
1453.78	0.02	-0.19	-0.17
1496.24	0.01	-0.20	-0.19
1539.93	0.01	-0.21	-0.20
1584.89	0.00	-0.22	-0.22
1631.17	0.02	-0.24	-0.22
1678.80	0.02	-0.25	-0.23
1727.83	0.02	-0.26	-0.24
1778.28	0.02	-0.27	-0.26

f [Hz]	ACO 7052E Actuator to Free Field correction for 90 deg incidence angle	ACO 7052E Typical electrostatic actuator response	ACO 7052E Free Field response for 90 deg incidence angle
1830.21	0.00	-0.29	-0.29
1883.65	-0.03	-0.30	-0.32
1938.65	-0.06	-0.31	-0.37
1995.26	-0.08	-0.33	-0.41
2053.53	-0.09	-0.34	-0.43
2113.49	-0.07	-0.35	-0.43
2175.20	-0.04	-0.37	-0.41
2238.72	0.00	-0.39	-0.39
2304.09	0.04	-0.41	-0.37
2371.37	0.05	-0.42	-0.37
2440.62	0.07	-0.44	-0.38
2511.89	0.07	-0.47	-0.40
2585.23	0.06	-0.50	-0.44
2660.73	0.04	-0.53	-0.49
2738.42	0.04	-0.57	-0.53
2818.38	0.01	-0.59	-0.58
2900.68	-0.01	-0.61	-0.62
2985.38	-0.02	-0.64	-0.65
3072.56	-0.01	-0.67	-0.68
3162.28	-0.01	-0.69	-0.70
3254.62	0.00	-0.73	-0.73
3349.65	0.01	-0.78	-0.76
3447.47	0.01	-0.82	-0.81
3548.13	-0.03	-0.86	-0.89
3651.74	-0.07	-0.91	-0.98
3758.37	-0.10	-0.96	-1.06
3868.12	-0.09	-1.01	-1.10
3981.07	-0.07	-1.06	-1.13
4097.32	0.00	-1.12	-1.11
4216.97	0.07	-1.18	-1.11
4340.10	0.11	-1.24	-1.12
4466.84	0.10	-1.29	-1.18
4597.27	0.08	-1.34	-1.26
4731.51	0.03	-1.40	-1.37
4869.68	0.02	-1.47	-1.45
5011.87	0.00	-1.53	-1.53
5158.22	0.02	-1.62	-1.60
5308.84	0.02	-1.70	-1.68
5463.87	0.01	-1.78	-1.77
5623.41	-0.02	-1.87	-1.89
5787.62	-0.04	-1.96	-2.01
5956.62	-0.07	-2.04	-2.11
6130.56	-0.06	-2.14	-2.20
6309.57	-0.02	-2.24	-2.26
6493.82	0.02	-2.34	-2.32
6683.44	0.08	-2.44	-2.36
6878.60	0.12	-2.55	-2.43

f [Hz]	ACO 7052E Actuator to Free Field correction for 90 deg incidence angle	ACO 7052E Typical electrostatic actuator response	ACO 7052E Free Field response for 90 deg incidence angle
7079.46	0.15	-2.66	-2.51
7286.18	0.16	-2.77	-2.61
7498.94	0.16	-2.88	-2.73
7717.92	0.13	-2.99	-2.86
7943.28	0.15	-3.12	-2.97
8175.23	0.15	-3.26	-3.10
8413.95	0.18	-3.40	-3.22
8659.64	0.24	-3.57	-3.33
8912.51	0.32	-3.75	-3.42
9172.76	0.37	-3.93	-3.56
9440.61	0.42	-4.10	-3.68
9716.28	0.48	-4.29	-3.81
10000.00	0.51	-4.47	-3.96
10292.01	0.51	-4.63	-4.11
10592.54	0.58	-4.83	-4.25
10901.84	0.62	-5.01	-4.39
11220.18	0.68	-5.21	-4.54
11547.82	0.78	-5.44	-4.66
11885.02	0.90	-5.70	-4.81
12232.07	0.94	-5.89	-4.95
12589.25	1.01	-6.13	-5.12
12956.87	1.05	-6.34	-5.29
13335.21	1.01	-6.50	-5.49
13724.61	1.01	-6.69	-5.68
14125.38	1.02	-6.90	-5.88
14537.84	1.04	-7.10	-6.06
14962.36	1.07	-7.32	-6.25
15399.27	1.15	-7.58	-6.43
15848.93	1.22	-7.82	-6.61
16311.73	1.31	-8.09	-6.78
16788.04	1.39	-8.38	-6.99
17278.26	1.39	-8.62	-7.23
17782.79	1.36	-8.85	-7.49
18302.06	1.31	-9.15	-7.84
18836.49	1.25	-9.44	-8.18
19386.53	1.15	-9.82	-8.67
19952.62	1.26	-10.10	-8.84

Free Field Frequency response of SVAN 977A with SA 277 (**90 deg** incidence angle)

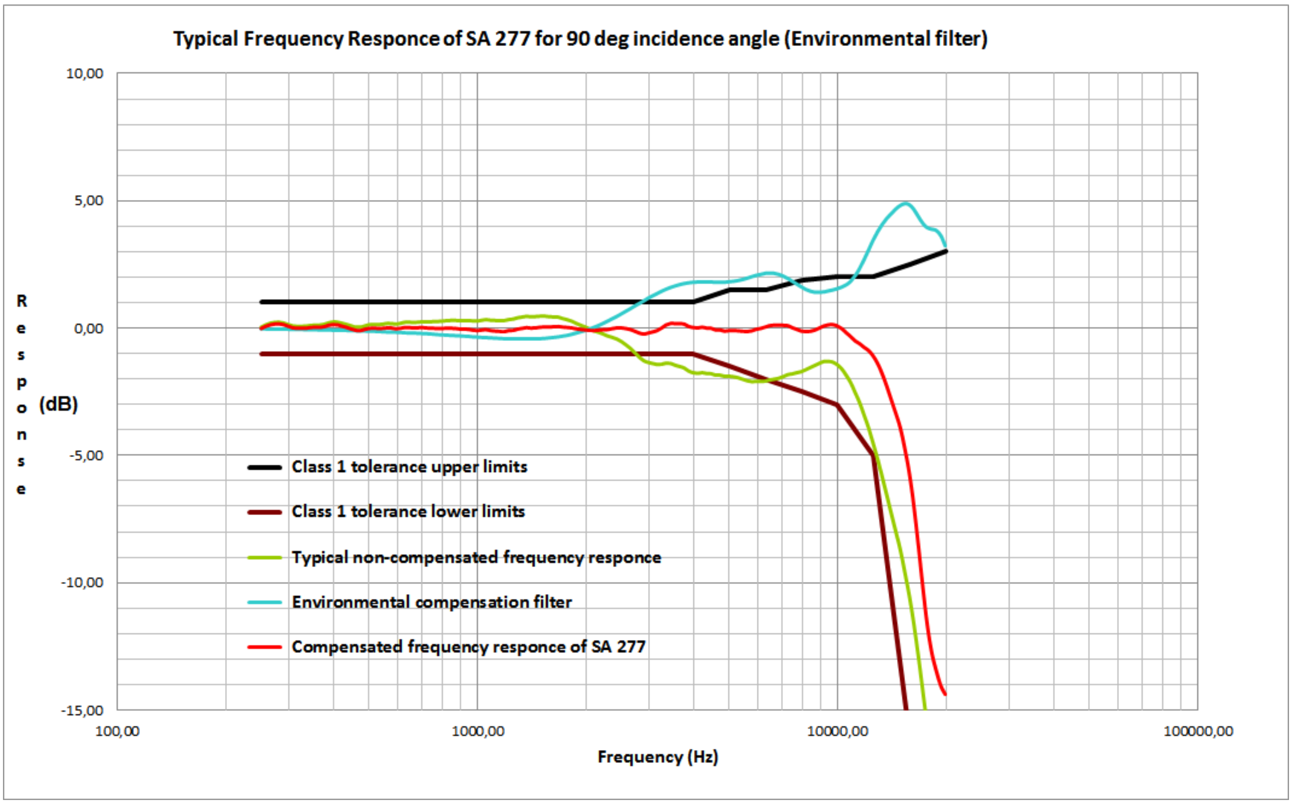


Table C.7.6 SVAN 977A with SA 277 frequency response for 90 deg incidence angle

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 90 deg incidence angle	Compensation filter “Environmental”	Typical compensated frequency response of SVAN 977W with SA 277 for 90 deg incidence angle (Environmental)
251.19	0.03	-0.03	-0.04
258.52	0.12	-0.03	0.06
266.07	0.19	-0.04	0.08
273.84	0.22	-0.04	0.12
281.84	0.23	-0.04	0.14
290.07	0.20	-0.04	0.15
298.54	0.14	-0.04	0.15
307.26	0.08	-0.05	0.10
316.23	0.07	-0.05	0.06
325.46	0.07	-0.05	0.02
334.97	0.08	-0.06	-0.03
344.75	0.10	-0.06	-0.07
354.81	0.12	-0.06	-0.06
365.17	0.12	-0.07	-0.06
375.84	0.15	-0.07	-0.02
386.81	0.20	-0.07	0.03
398.11	0.24	-0.08	0.05
409.73	0.23	-0.08	0.05
421.70	0.18	-0.09	0.04
434.01	0.14	-0.09	0.05
446.68	0.08	-0.10	0.03

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 90 deg incidence angle	Compensation filter "Environmental"	Typical compensated frequency response of SVAN 977W with SA 277 for 90 deg incidence angle (Environmental)
459.73	0.03	-0.10	0.02
473.15	0.03	-0.11	0.00
486.97	0.08	-0.11	-0.01
501.19	0.13	-0.12	-0.03
515.82	0.14	-0.12	-0.05
530.88	0.13	-0.13	-0.08
546.39	0.15	-0.14	-0.09
562.34	0.18	-0.15	-0.10
578.76	0.17	-0.15	-0.12
595.66	0.15	-0.16	-0.14
613.06	0.18	-0.17	-0.13
630.96	0.23	-0.18	-0.11
649.38	0.23	-0.19	-0.12
668.34	0.22	-0.19	-0.12
687.86	0.23	-0.20	-0.12
707.95	0.25	-0.21	-0.13
728.62	0.24	-0.22	-0.14
749.89	0.25	-0.23	-0.13
771.79	0.26	-0.25	-0.11
794.33	0.26	-0.26	-0.09
817.52	0.29	-0.27	-0.08
841.40	0.30	-0.28	-0.10
865.96	0.30	-0.29	-0.12
891.25	0.29	-0.30	-0.13
917.28	0.29	-0.31	-0.11
944.06	0.29	-0.32	-0.13
971.63	0.28	-0.34	-0.14
1000.00	0.27	-0.35	-0.14
1029.20	0.30	-0.36	-0.16
1059.25	0.33	-0.37	-0.28
1090.18	0.30	-0.38	-0.35
1122.02	0.29	-0.39	-0.40
1154.78	0.29	-0.40	-0.45
1188.50	0.29	-0.41	-0.41
1223.21	0.33	-0.41	-0.35
1258.93	0.35	-0.42	-0.33
1295.69	0.40	-0.42	-0.26
1333.52	0.43	-0.42	-0.26
1372.46	0.46	-0.42	-0.30
1412.54	0.44	-0.42	-0.30
1453.78	0.45	-0.42	-0.27
1496.24	0.46	-0.41	-0.30
1539.93	0.47	-0.40	-0.27
1584.89	0.44	-0.38	-0.27
1631.17	0.43	-0.36	-0.27
1678.80	0.42	-0.34	-0.27
1727.83	0.37	-0.31	-0.26

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 90 deg incidence angle	Compensation filter "Environmental"	Typical compensated frequency response of SVAN 977W with SA 277 for 90 deg incidence angle (Environmental)
1778.28	0.33	-0.28	-0.22
1830.21	0.27	-0.24	-0.25
1883.65	0.18	-0.19	-0.32
1938.65	0.11	-0.14	-0.38
1995.26	0.04	-0.09	-0.40
2053.53	-0.04	-0.03	-0.47
2113.49	-0.11	0.04	-0.46
2175.20	-0.17	0.11	-0.33
2238.72	-0.24	0.19	-0.24
2304.09	-0.32	0.28	-0.17
2371.37	-0.37	0.37	-0.08
2440.62	-0.43	0.46	-0.03
2511.89	-0.53	0.56	-0.04
2585.23	-0.66	0.66	-0.04
2660.73	-0.79	0.76	-0.09
2738.42	-0.97	0.87	-0.18
2818.38	-1.14	0.97	-0.23
2900.68	-1.28	1.07	-0.28
2985.38	-1.35	1.18	-0.30
3072.56	-1.40	1.27	-0.23
3162.28	-1.43	1.36	-0.18
3254.62	-1.42	1.45	-0.07
3349.65	-1.38	1.53	0.05
3447.47	-1.40	1.60	0.03
3548.13	-1.47	1.66	-0.01
3651.74	-1.51	1.71	-0.08
3758.37	-1.57	1.75	-0.22
3868.12	-1.70	1.78	-0.27
3981.07	-1.76	1.80	-0.18
4097.32	-1.78	1.81	-0.03
4216.97	-1.75	1.81	0.01
4340.10	-1.79	1.81	0.08
4466.84	-1.79	1.81	0.01
4597.27	-1.85	1.80	-0.07
4731.51	-1.85	1.80	-0.20
4869.68	-1.90	1.80	-0.20
5011.87	-1.89	1.82	-0.18
5158.22	-1.92	1.84	-0.14
5308.84	-1.96	1.87	-0.15
5463.87	-2.01	1.91	-0.20
5623.41	-2.07	1.96	-0.24
5787.62	-2.11	2.02	-0.21
5956.62	-2.10	2.07	-0.16
6130.56	-2.10	2.11	-0.10
6309.57	-2.09	2.15	0.04
6493.82	-2.04	2.16	0.14
6683.44	-2.01	2.15	0.25

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 90 deg incidence angle	Compensation filter “Environmental”	Typical compensated frequency response of SVAN 977W with SA 277 for 90 deg incidence angle (Environmental)
6878.60	-1.98	2.11	0.26
7079.46	-1.91	2.04	0.29
7286.18	-1.83	1.95	0.26
7498.94	-1.80	1.84	0.23
7717.92	-1.76	1.73	0.09
7943.28	-1.72	1.62	0.04
8175.23	-1.64	1.52	-0.04
8413.95	-1.55	1.45	-0.03
8659.64	-1.47	1.41	-0.09
8912.51	-1.39	1.41	-0.03
9172.76	-1.32	1.42	-0.01
9440.61	-1.31	1.46	-0.06
9716.28	-1.34	1.50	-0.22
10000.00	-1.45	1.55	-0.36
10292.01	-1.61	1.61	-0.61
10592.54	-1.86	1.70	-1.00
10901.84	-2.15	1.84	-1.33
11220.18	-2.55	2.06	-1.64
11547.82	-2.94	2.35	-1.90
11885.02	-3.44	2.70	-2.19
12232.07	-3.95	3.08	-2.28
12589.25	-4.54	3.46	-2.44
12956.87	-5.18	3.79	-2.68
13335.21	-5.85	4.07	-3.06
13724.61	-6.57	4.30	-3.27
14125.38	-7.29	4.49	-3.79
14537.84	-8.00	4.67	-4.14
14962.36	-8.71	4.81	-4.66
15399.27	-9.58	4.88	-5.34
15848.93	-10.51	4.84	-6.43
16311.73	-11.60	4.66	-7.51
16788.04	-12.87	4.38	-8.73
17278.26	-14.26	4.11	-9.83
17782.79	-15.58	3.94	-10.57
18302.06	-16.62	3.88	-10.90
18836.49	-17.28	3.83	-11.09
19386.53	-17.67	3.63	-11.54
19952.62	-17.61	3.23	-11.90

Case effect of SA 277 (**90 deg** incidence angle)

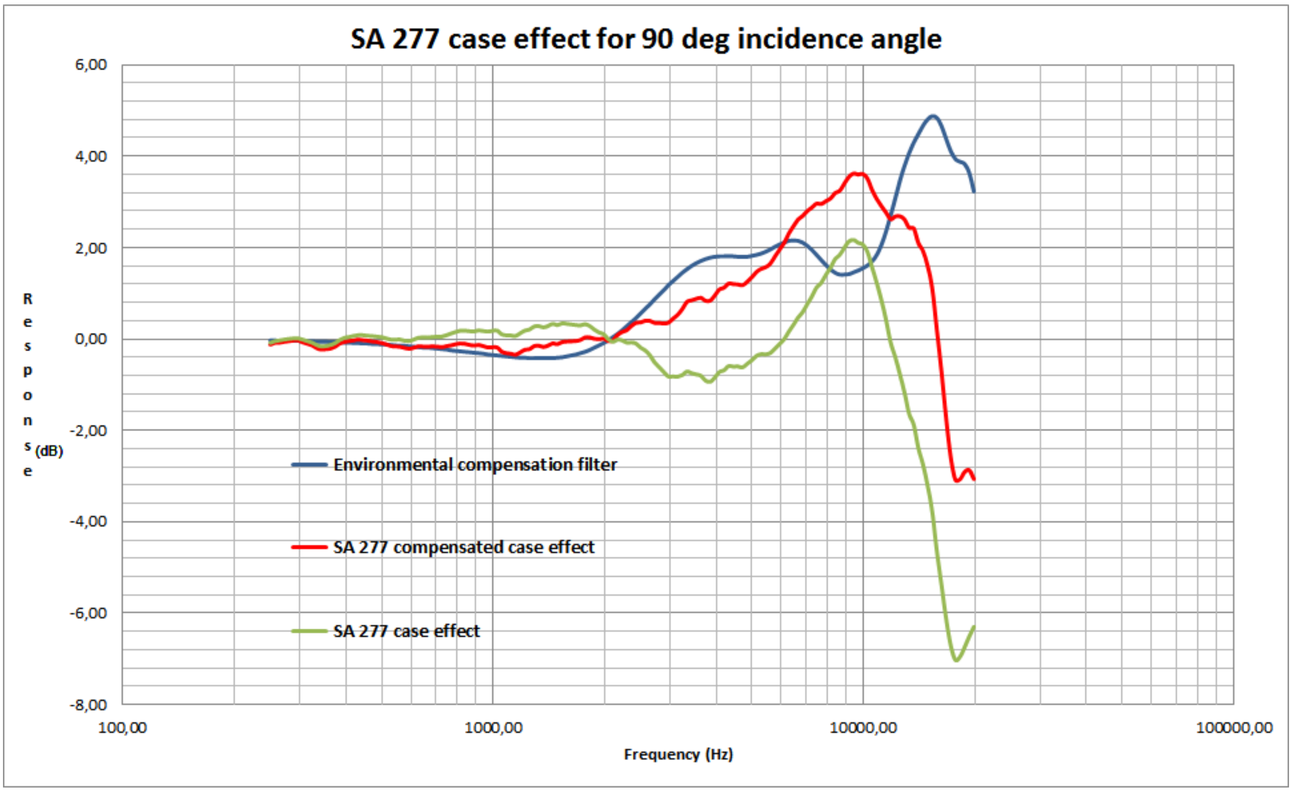


Table C.7.5 ACO 7052E frequency response and SA 277 case effect (**90 deg** incidence angle)

f [Hz]	Case effect of SA 277 for 90 deg incidence angle	Compensation filter "Environmental"	Compensated case effect for 90 deg incidence angle (Environmental)
251.19	-0.09	-0.03	-0.12
258.52	-0.06	-0.03	-0.09
266.07	-0.04	-0.04	-0.08
273.84	-0.02	-0.04	-0.06
281.84	-0.01	-0.04	-0.05
290.07	0.01	-0.04	-0.03
298.54	0.01	-0.04	-0.03
307.26	-0.02	-0.05	-0.07
316.23	-0.06	-0.05	-0.11
325.46	-0.09	-0.05	-0.14
334.97	-0.14	-0.06	-0.20
344.75	-0.17	-0.06	-0.23
354.81	-0.16	-0.06	-0.22
365.17	-0.14	-0.07	-0.21
375.84	-0.10	-0.07	-0.17
386.81	-0.03	-0.07	-0.10
398.11	0.02	-0.08	-0.06
409.73	0.04	-0.08	-0.04

f [Hz]	Case effect of SA 277 for 90 deg incidence angle	Compensation filter "Environmental"	Compensated case effect for 90 deg incidence angle (Environmental)
421.70	0.06	-0.09	-0.03
434.01	0.08	-0.09	-0.01
446.68	0.07	-0.10	-0.03
459.73	0.06	-0.10	-0.04
473.15	0.06	-0.11	-0.05
486.97	0.05	-0.11	-0.06
501.19	0.03	-0.12	-0.09
515.82	0.00	-0.12	-0.12
530.88	-0.02	-0.13	-0.15
546.39	-0.02	-0.14	-0.16
562.34	-0.02	-0.15	-0.17
578.76	-0.04	-0.15	-0.19
595.66	-0.05	-0.16	-0.21
613.06	-0.02	-0.17	-0.19
630.96	0.02	-0.18	-0.16
649.38	0.02	-0.19	-0.17
668.34	0.02	-0.19	-0.17
687.86	0.04	-0.20	-0.16
707.95	0.04	-0.21	-0.17
728.62	0.04	-0.22	-0.18
749.89	0.07	-0.23	-0.16
771.79	0.11	-0.25	-0.14
794.33	0.15	-0.26	-0.11
817.52	0.17	-0.27	-0.10
841.40	0.17	-0.28	-0.11
865.96	0.16	-0.29	-0.13
891.25	0.16	-0.30	-0.14
917.28	0.18	-0.31	-0.13
944.06	0.16	-0.32	-0.16
971.63	0.15	-0.34	-0.19
1000.00	0.17	-0.35	-0.18
1029.20	0.18	-0.36	-0.18
1059.25	0.09	-0.37	-0.28
1090.18	0.07	-0.38	-0.31
1122.02	0.07	-0.39	-0.32
1154.78	0.06	-0.40	-0.34
1188.50	0.12	-0.41	-0.29
1223.21	0.18	-0.41	-0.23
1258.93	0.20	-0.42	-0.22
1295.69	0.27	-0.42	-0.15
1333.52	0.27	-0.42	-0.15
1372.46	0.25	-0.42	-0.17
1412.54	0.28	-0.42	-0.14
1453.78	0.32	-0.42	-0.10
1496.24	0.30	-0.41	-0.11
1539.93	0.33	-0.40	-0.07
1584.89	0.32	-0.38	-0.06

f [Hz]	Case effect of SA 277 for 90 deg incidence angle	Compensation filter "Environmental"	Compensated case effect for 90 deg incidence angle (Environmental)
1631.17	0.31	-0.36	-0.05
1678.80	0.30	-0.34	-0.04
1727.83	0.29	-0.31	-0.02
1778.28	0.31	-0.28	0.03
1830.21	0.27	-0.24	0.03
1883.65	0.20	-0.19	0.01
1938.65	0.13	-0.14	-0.01
1995.26	0.10	-0.09	0.01
2053.53	-0.01	-0.03	-0.04
2113.49	-0.07	0.04	-0.03
2175.20	-0.02	0.11	0.09
2238.72	-0.04	0.19	0.15
2304.09	-0.09	0.28	0.19
2371.37	-0.08	0.37	0.29
2440.62	-0.11	0.46	0.35
2511.89	-0.20	0.56	0.36
2585.23	-0.26	0.66	0.40
2660.73	-0.36	0.76	0.40
2738.42	-0.52	0.87	0.35
2818.38	-0.62	0.97	0.35
2900.68	-0.73	1.07	0.34
2985.38	-0.83	1.18	0.35
3072.56	-0.82	1.27	0.45
3162.28	-0.83	1.36	0.53
3254.62	-0.80	1.45	0.65
3349.65	-0.72	1.53	0.81
3447.47	-0.75	1.60	0.85
3548.13	-0.78	1.66	0.88
3651.74	-0.81	1.71	0.90
3758.37	-0.91	1.75	0.84
3868.12	-0.94	1.78	0.84
3981.07	-0.85	1.80	0.95
4097.32	-0.73	1.81	1.08
4216.97	-0.69	1.81	1.12
4340.10	-0.60	1.81	1.21
4466.84	-0.61	1.81	1.20
4597.27	-0.61	1.80	1.19
4731.51	-0.63	1.80	1.17
4869.68	-0.55	1.80	1.25
5011.87	-0.47	1.82	1.35
5158.22	-0.38	1.84	1.46
5308.84	-0.34	1.87	1.53
5463.87	-0.34	1.91	1.57
5623.41	-0.32	1.96	1.64
5787.62	-0.22	2.02	1.80
5956.62	-0.12	2.07	1.95
6130.56	-0.01	2.11	2.10

f [Hz]	Case effect of SA 277 for 90 deg incidence angle	Compensation filter “Environmental”	Compensated case effect for 90 deg incidence angle (Environmental)
6309.57	0.15	2.15	2.30
6493.82	0.30	2.16	2.46
6683.44	0.46	2.15	2.61
6878.60	0.58	2.11	2.69
7079.46	0.76	2.04	2.80
7286.18	0.92	1.95	2.87
7498.94	1.12	1.84	2.96
7717.92	1.22	1.73	2.95
7943.28	1.39	1.62	3.01
8175.23	1.55	1.52	3.07
8413.95	1.74	1.45	3.19
8659.64	1.83	1.41	3.24
8912.51	1.98	1.41	3.39
9172.76	2.12	1.42	3.54
9440.61	2.15	1.46	3.61
9716.28	2.09	1.50	3.59
10000.00	2.05	1.55	3.60
10292.01	1.89	1.61	3.50
10592.54	1.55	1.70	3.25
10901.84	1.22	1.84	3.06
11220.18	0.84	2.06	2.90
11547.82	0.41	2.35	2.76
11885.02	-0.08	2.70	2.62
12232.07	-0.41	3.08	2.67
12589.25	-0.78	3.46	2.68
12956.87	-1.18	3.79	2.61
13335.21	-1.64	4.07	2.43
13724.61	-1.89	4.30	2.41
14125.38	-2.40	4.49	2.09
14537.84	-2.75	4.67	1.92
14962.36	-3.22	4.81	1.59
15399.27	-3.79	4.88	1.09
15848.93	-4.66	4.84	0.18
16311.73	-5.38	4.66	-0.72
16788.04	-6.12	4.38	-1.74
17278.26	-6.71	4.11	-2.60
17782.79	-7.02	3.94	-3.08
18302.06	-6.94	3.88	-3.06
18836.49	-6.73	3.83	-2.90
19386.53	-6.50	3.63	-2.87
19952.62	-6.29	3.23	-3.06

Linear Operating Ranges with the **Airport** filter

Table C.7.7 Self-generated noise for different weighting filters

Range \ Weighting filter	Electrical *)			Acoustical compensated		
	A	C	Z	A	C	Z
Low	< 15 dB	< 14 dB	< 20 dB	< 16 dB	< 16 dB	< 22 dB
High	< 26 dB	< 25 dB	< 32 dB	< 26 dB	< 26 dB	< 32 dB

*) measured with the **ST 02** microphone equivalent impedance 18 pF +/-10%

Table C.7.8 Linear operating range: "LOW" with the **Airport** filter for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	From	to	from	to	from	to
31,5 Hz	26	80	26	103	26	117	32	120	26	80	26	103	26	117	29	83	50	120
500 Hz	26	116	26	119	26	120	32	120	26	116	26	119	26	120	29	119	50	123
1 kHz	26	120	26	120	26	120	32	120	26	120	26	120	26	120	29	123	50	123
4 kHz	26	121	26	119	26	119	32	120	26	121	26	119	26	119	29	124	50	123
8 kHz	26	119	26	117	26	117	32	120	26	119	26	117	26	117	29	123	50	120
12.5 kHz	26	115	26	114	26	114	32	120	26	115	26	114	26	114	29	118	50	117

Table C.7.9 Linear operating range: "HIGH" with the **Airport** filter for the sinusoidal signal and microphone sensitivity 35 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31,5 Hz	36	97	36	120	36	134	42	137	36	97	36	120	36	134	39	100	60	137
500 Hz	36	133	36	136	36	137	42	137	36	133	36	136	36	137	39	136	60	140
1 kHz	36	137	36	137	36	137	42	137	36	137	36	137	36	137	39	140	60	140
4 kHz	36	138	36	136	36	136	42	137	36	138	36	136	36	136	39	141	60	139
8 kHz	36	136	36	134	36	134	42	137	36	136	36	134	36	134	39	139	60	137
12.5 kHz	36	132	36	131	36	131	42	137	36	132	36	131	36	131	39	136	60	134

Free Field Frequency response of SVAN 977A with SA 277 (**0 deg** incidence angle)

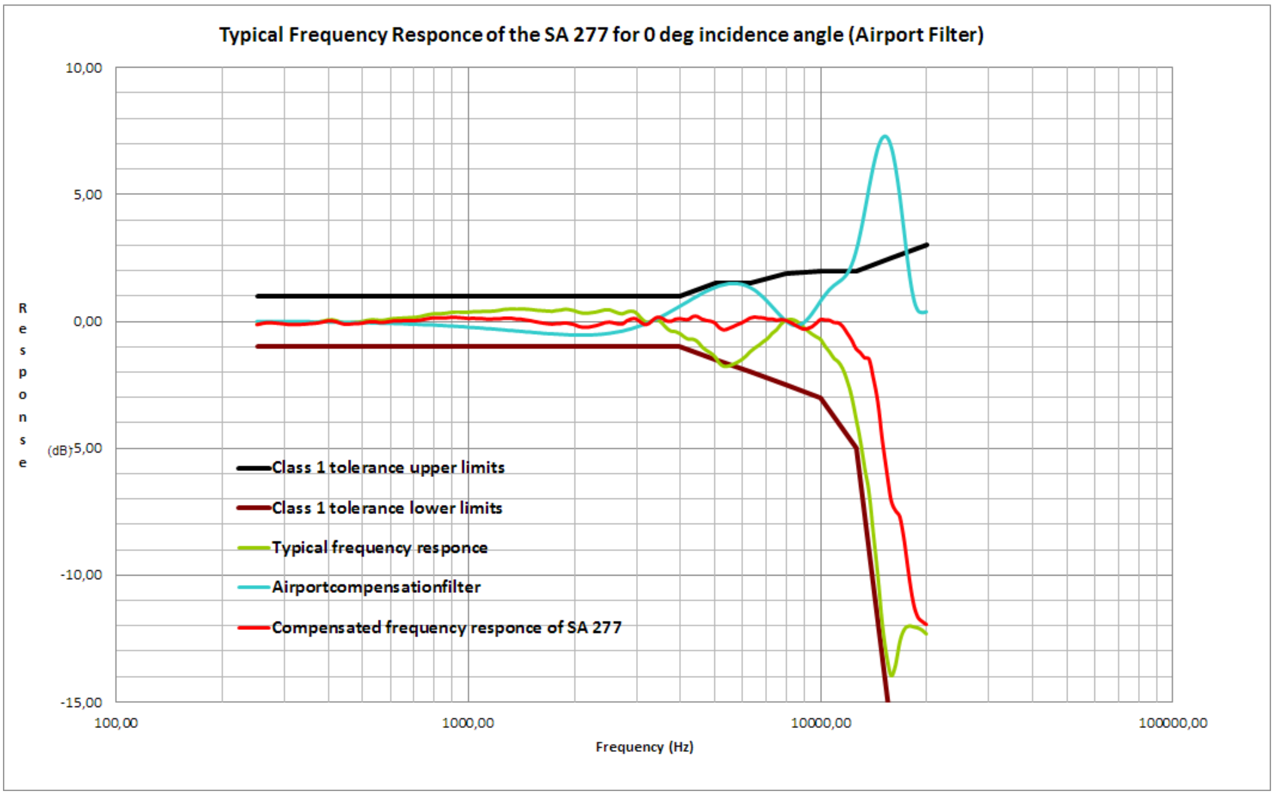


Table C.7.11 SVAN 977A with SA 277 frequency response (**0 deg** incidence angle)

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle	Compensation filter "Airport"	Typical compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle (Airport)
251.19	-0.10	-0.02	-0.12
258.52	-0.06	-0.02	-0.08
266.07	-0.03	-0.02	-0.05
273.84	-0.02	-0.02	-0.04
281.84	-0.03	-0.02	-0.05
290.07	-0.05	-0.02	-0.07
298.54	-0.07	-0.02	-0.09
307.26	-0.08	-0.03	-0.11
316.23	-0.09	-0.03	-0.12
325.46	-0.09	-0.03	-0.12
334.97	-0.08	-0.03	-0.11
344.75	-0.07	-0.03	-0.10
354.81	-0.05	-0.03	-0.08
365.17	-0.03	-0.04	-0.07
375.84	-0.01	-0.04	-0.05
386.81	0.03	-0.04	-0.01
398.11	0.06	-0.04	0.02
409.73	0.07	-0.05	0.02
421.70	0.04	-0.05	-0.01
434.01	-0.02	-0.05	-0.07
446.68	-0.05	-0.06	-0.11

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle	Compensation filter “Airport”	Typical compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle (Airport)
459.73	-0.04	-0.06	-0.10
473.15	-0.02	-0.06	-0.08
486.97	-0.01	-0.07	-0.08
501.19	0.01	-0.07	-0.06
515.82	0.05	-0.07	-0.02
530.88	0.08	-0.08	0.00
546.39	0.07	-0.08	-0.01
562.34	0.05	-0.09	-0.04
578.76	0.06	-0.09	-0.03
595.66	0.10	-0.10	0.00
613.06	0.12	-0.10	0.02
630.96	0.13	-0.11	0.02
649.38	0.14	-0.11	0.03
668.34	0.15	-0.12	0.03
687.86	0.16	-0.13	0.03
707.95	0.17	-0.13	0.04
728.62	0.20	-0.14	0.06
749.89	0.24	-0.15	0.09
771.79	0.28	-0.16	0.12
794.33	0.31	-0.16	0.15
817.52	0.31	-0.17	0.14
841.40	0.32	-0.18	0.14
865.96	0.33	-0.19	0.14
891.25	0.36	-0.20	0.16
917.28	0.37	-0.21	0.16
944.06	0.37	-0.22	0.15
971.63	0.37	-0.23	0.14
1000.00	0.37	-0.25	0.12
1029.20	0.39	-0.26	0.13
1059.25	0.39	-0.27	0.12
1090.18	0.40	-0.28	0.12
1122.02	0.40	-0.30	0.10
1154.78	0.41	-0.31	0.10
1188.50	0.42	-0.32	0.10
1223.21	0.44	-0.34	0.10
1258.93	0.48	-0.35	0.13
1295.69	0.49	-0.37	0.12
1333.52	0.50	-0.38	0.12
1372.46	0.49	-0.40	0.09
1412.54	0.50	-0.41	0.09
1453.78	0.49	-0.43	0.06
1496.24	0.48	-0.44	0.04
1539.93	0.46	-0.46	0.00
1584.89	0.44	-0.47	-0.03
1631.17	0.43	-0.49	-0.06
1678.80	0.42	-0.50	-0.08
1727.83	0.41	-0.51	-0.10

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle	Compensation filter “Airport”	Typical compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle (Airport)
1778.28	0.44	-0.52	-0.08
1830.21	0.45	-0.53	-0.08
1883.65	0.49	-0.54	-0.05
1938.65	0.47	-0.55	-0.08
1995.26	0.43	-0.55	-0.12
2053.53	0.37	-0.56	-0.19
2113.49	0.33	-0.56	-0.23
2175.20	0.33	-0.56	-0.23
2238.72	0.35	-0.55	-0.20
2304.09	0.38	-0.54	-0.16
2371.37	0.42	-0.53	-0.11
2440.62	0.47	-0.51	-0.04
2511.89	0.47	-0.49	-0.02
2585.23	0.40	-0.46	-0.06
2660.73	0.34	-0.43	-0.09
2738.42	0.31	-0.40	-0.09
2818.38	0.38	-0.35	0.03
2900.68	0.41	-0.31	0.10
2985.38	0.36	-0.25	0.11
3072.56	0.18	-0.19	-0.01
3162.28	0.01	-0.13	-0.12
3254.62	-0.02	-0.06	-0.08
3349.65	0.06	0.02	0.08
3447.47	0.08	0.10	0.18
3548.13	-0.06	0.19	0.13
3651.74	-0.25	0.28	0.03
3758.37	-0.37	0.38	0.01
3868.12	-0.39	0.48	0.09
3981.07	-0.47	0.58	0.11
4097.32	-0.60	0.68	0.08
4216.97	-0.69	0.78	0.09
4340.10	-0.69	0.89	0.20
4466.84	-0.78	0.98	0.20
4597.27	-0.98	1.08	0.10
4731.51	-1.13	1.17	0.04
4869.68	-1.23	1.25	0.02
5011.87	-1.38	1.32	-0.06
5158.22	-1.63	1.39	-0.24
5308.84	-1.76	1.43	-0.33
5463.87	-1.75	1.47	-0.28
5623.41	-1.69	1.48	-0.21
5787.62	-1.61	1.48	-0.13
5956.62	-1.50	1.45	-0.05
6130.56	-1.36	1.40	0.04
6309.57	-1.18	1.32	0.14
6493.82	-1.04	1.22	0.18
6683.44	-0.93	1.08	0.15

f [Hz]	Typical non-compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle	Compensation filter "Airport"	Typical compensated frequency response of SVAN 977A with SA 277 for 0 deg incidence angle (Airport)
6878.60	-0.78	0.93	0.15
7079.46	-0.66	0.75	0.09
7286.18	-0.46	0.56	0.10
7498.94	-0.32	0.37	0.05
7717.92	-0.10	0.18	0.08
7943.28	0.04	0.01	0.05
8175.23	0.09	-0.11	-0.02
8413.95	0.06	-0.18	-0.12
8659.64	-0.04	-0.17	-0.21
8912.51	-0.20	-0.09	-0.29
9172.76	-0.35	0.07	-0.28
9440.61	-0.49	0.28	-0.21
9716.28	-0.60	0.53	-0.07
10000.00	-0.71	0.79	0.08
10292.01	-0.97	1.03	0.06
10592.54	-1.19	1.24	0.05
10901.84	-1.44	1.40	-0.04
11220.18	-1.58	1.53	-0.05
11547.82	-1.85	1.66	-0.19
11885.02	-2.31	1.86	-0.45
12232.07	-2.92	2.20	-0.72
12589.25	-3.78	2.72	-1.06
12956.87	-4.67	3.45	-1.22
13335.21	-5.76	4.33	-1.43
13724.61	-6.75	5.27	-1.48
14125.38	-8.40	6.14	-2.26
14537.84	-10.02	6.83	-3.19
14962.36	-11.90	7.23	-4.67
15399.27	-13.18	7.27	-5.91
15848.93	-13.94	6.89	-7.05
16311.73	-13.53	6.08	-7.45
16788.04	-12.59	4.89	-7.70
17278.26	-12.12	3.46	-8.66
17782.79	-11.99	2.04	-9.95
18302.06	-12.01	0.97	-11.04
18836.49	-12.06	0.43	-11.63
19386.53	-12.14	0.33	-11.81
19952.62	-12.29	0.36	-11.93

Case effect of SA 277 (**0 deg** incidence angle)

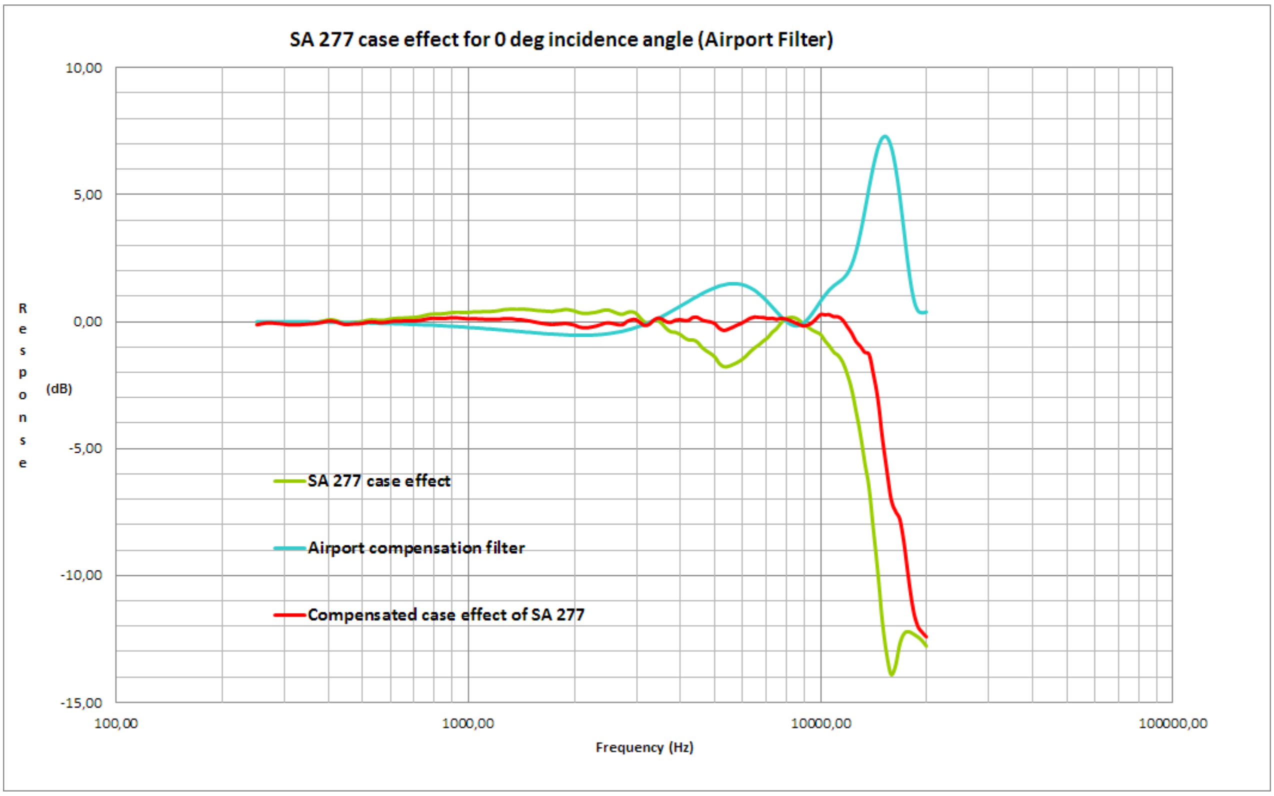


Table C.7.10 SA 277 case effect (**0 deg** incidence angle)

f [Hz]	Case effect of SA 277 for 0 deg incidence angle	Compensation filter “Airport”	Compensated case effect of SA 277 for 0 deg incidence angle (Airport)
251.19	-0.10	-0.02	-0.12
258.52	-0.06	-0.02	-0.08
266.07	-0.03	-0.02	-0.05
273.84	-0.02	-0.02	-0.04
281.84	-0.03	-0.02	-0.05
290.07	-0.05	-0.02	-0.07
298.54	-0.07	-0.02	-0.09
307.26	-0.08	-0.03	-0.11
316.23	-0.09	-0.03	-0.12
325.46	-0.09	-0.03	-0.12
334.97	-0.08	-0.03	-0.11
344.75	-0.07	-0.03	-0.10
354.81	-0.05	-0.03	-0.08
365.17	-0.03	-0.04	-0.07
375.84	-0.01	-0.04	-0.05
386.81	0.03	-0.04	-0.01
398.11	0.06	-0.04	0.02
409.73	0.07	-0.05	0.02
421.70	0.04	-0.05	-0.01
434.01	-0.02	-0.05	-0.07

f [Hz]	Case effect of SA 277 for 0 deg incidence angle	Compensation filter “Airport”	Compensated case effect of SA 277 for 0 deg incidence angle (Airport)
446.68	-0.05	-0.06	-0.11
459.73	-0.04	-0.06	-0.10
473.15	-0.02	-0.06	-0.08
486.97	-0.01	-0.07	-0.08
501.19	0.01	-0.07	-0.06
515.82	0.05	-0.07	-0.02
530.88	0.08	-0.08	0.00
546.39	0.07	-0.08	-0.01
562.34	0.05	-0.09	-0.04
578.76	0.06	-0.09	-0.03
595.66	0.10	-0.10	0.00
613.06	0.12	-0.10	0.02
630.96	0.13	-0.11	0.02
649.38	0.14	-0.11	0.03
668.34	0.15	-0.12	0.03
687.86	0.16	-0.13	0.03
707.95	0.17	-0.13	0.04
728.62	0.20	-0.14	0.06
749.89	0.24	-0.15	0.09
771.79	0.28	-0.16	0.12
794.33	0.30	-0.16	0.14
817.52	0.30	-0.17	0.13
841.40	0.31	-0.18	0.13
865.96	0.32	-0.19	0.13
891.25	0.35	-0.20	0.15
917.28	0.36	-0.21	0.15
944.06	0.36	-0.22	0.14
971.63	0.36	-0.23	0.13
1000.00	0.36	-0.25	0.11
1029.20	0.38	-0.26	0.12
1059.25	0.38	-0.27	0.11
1090.18	0.39	-0.28	0.11
1122.02	0.39	-0.30	0.09
1154.78	0.40	-0.31	0.09
1188.50	0.41	-0.32	0.09
1223.21	0.43	-0.34	0.09
1258.93	0.47	-0.35	0.12
1295.69	0.48	-0.37	0.11
1333.52	0.49	-0.38	0.11
1372.46	0.48	-0.40	0.08
1412.54	0.49	-0.41	0.08
1453.78	0.48	-0.43	0.05
1496.24	0.47	-0.44	0.03
1539.93	0.45	-0.46	-0.01
1584.89	0.43	-0.47	-0.04
1631.17	0.42	-0.49	-0.07

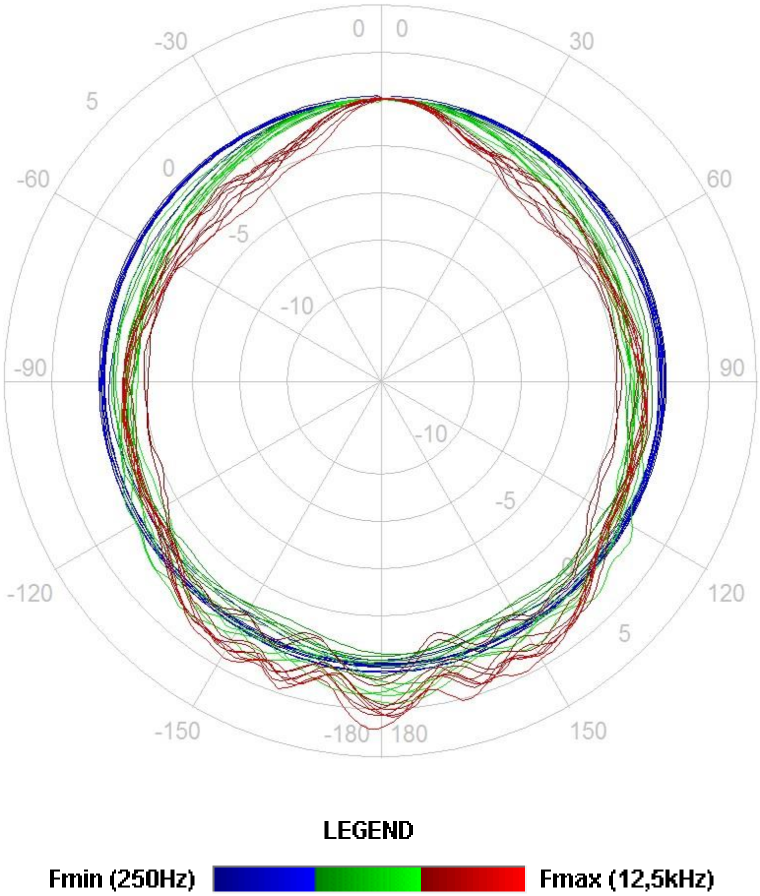
f [Hz]	Case effect of SA 277 for 0 deg incidence angle	Compensation filter “Airport”	Compensated case effect of SA 277 for 0 deg incidence angle (Airport)
1678.80	0.41	-0.50	-0.09
1727.83	0.40	-0.51	-0.11
1778.28	0.43	-0.52	-0.09
1830.21	0.44	-0.53	-0.09
1883.65	0.48	-0.54	-0.06
1938.65	0.46	-0.55	-0.09
1995.26	0.42	-0.55	-0.13
2053.53	0.36	-0.56	-0.20
2113.49	0.32	-0.56	-0.24
2175.20	0.32	-0.56	-0.24
2238.72	0.34	-0.55	-0.21
2304.09	0.37	-0.54	-0.17
2371.37	0.41	-0.53	-0.12
2440.62	0.46	-0.51	-0.05
2511.89	0.45	-0.49	-0.04
2585.23	0.38	-0.46	-0.08
2660.73	0.32	-0.43	-0.11
2738.42	0.29	-0.40	-0.11
2818.38	0.36	-0.35	0.01
2900.68	0.39	-0.31	0.08
2985.38	0.33	-0.25	0.08
3072.56	0.15	-0.19	-0.04
3162.28	-0.02	-0.13	-0.15
3254.62	-0.05	-0.06	-0.11
3349.65	0.03	0.02	0.05
3447.47	0.05	0.10	0.15
3548.13	-0.09	0.19	0.10
3651.74	-0.28	0.28	0.00
3758.37	-0.40	0.38	-0.02
3868.12	-0.42	0.48	0.06
3981.07	-0.50	0.58	0.08
4097.32	-0.63	0.68	0.05
4216.97	-0.72	0.78	0.06
4340.10	-0.72	0.89	0.17
4466.84	-0.80	0.98	0.18
4597.27	-1.01	1.08	0.07
4731.51	-1.15	1.17	0.02
4869.68	-1.26	1.25	-0.01
5011.87	-1.40	1.32	-0.08
5158.22	-1.65	1.39	-0.26
5308.84	-1.77	1.43	-0.34
5463.87	-1.76	1.47	-0.29
5623.41	-1.70	1.48	-0.22
5787.62	-1.61	1.48	-0.13
5956.62	-1.51	1.45	-0.06
6130.56	-1.36	1.40	0.04

f [Hz]	Case effect of SA 277 for 0 deg incidence angle	Compensation filter "Airport"	Compensated case effect of SA 277 for 0 deg incidence angle (Airport)
6309.57	-1.18	1.32	0.14
6493.82	-1.03	1.22	0.19
6683.44	-0.91	1.08	0.17
6878.60	-0.76	0.93	0.17
7079.46	-0.63	0.75	0.12
7286.18	-0.42	0.56	0.14
7498.94	-0.27	0.37	0.10
7717.92	-0.05	0.18	0.13
7943.28	0.10	0.01	0.11
8175.23	0.16	-0.11	0.05
8413.95	0.16	-0.18	-0.02
8659.64	0.07	-0.17	-0.10
8912.51	-0.07	-0.09	-0.16
9172.76	-0.20	0.07	-0.13
9440.61	-0.32	0.28	-0.04
9716.28	-0.41	0.53	0.12
10000.00	-0.51	0.79	0.28
10292.01	-0.76	1.03	0.27
10592.54	-0.96	1.24	0.28
10901.84	-1.20	1.40	0.20
11220.18	-1.34	1.53	0.19
11547.82	-1.59	1.66	0.07
11885.02	-2.04	1.86	-0.18
12232.07	-2.64	2.20	-0.44
12589.25	-3.49	2.72	-0.77
12956.87	-4.41	3.45	-0.96
13335.21	-5.53	4.33	-1.20
13724.61	-6.55	5.27	-1.28
14125.38	-8.23	6.14	-2.09
14537.84	-9.88	6.83	-3.05
14962.36	-11.79	7.23	-4.56
15399.27	-13.10	7.27	-5.83
15848.93	-13.89	6.89	-7.00
16311.73	-13.55	6.08	-7.47
16788.04	-12.67	4.89	-7.78
17278.26	-12.26	3.46	-8.80
17782.79	-12.20	2.04	-10.16
18302.06	-12.29	0.97	-11.32
18836.49	-12.40	0.43	-11.97
19386.53	-12.55	0.33	-12.22
19952.62	-12.76	0.36	-12.40

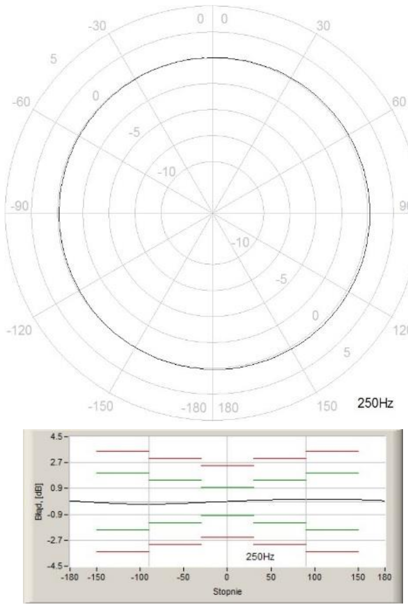
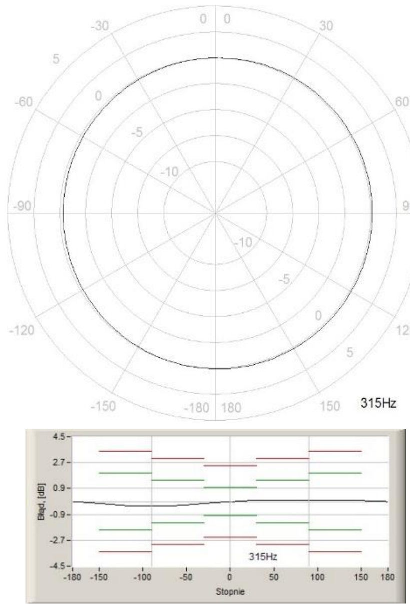
Free Field Directional characteristics of SVAN 977A with SA 277

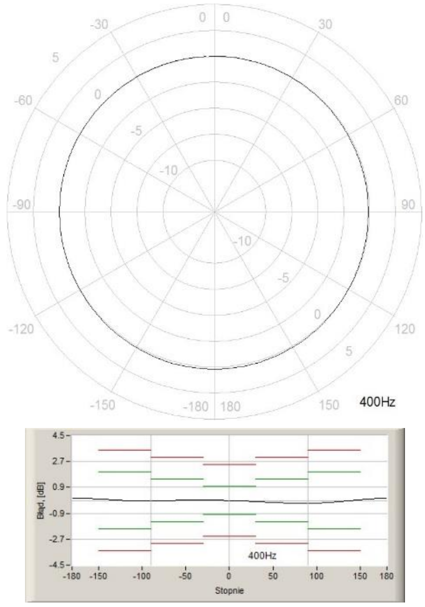
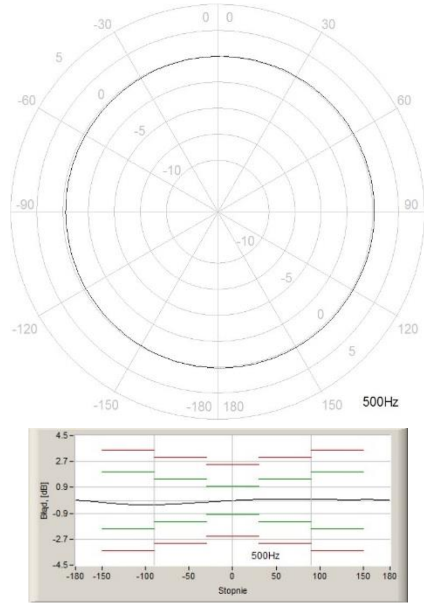
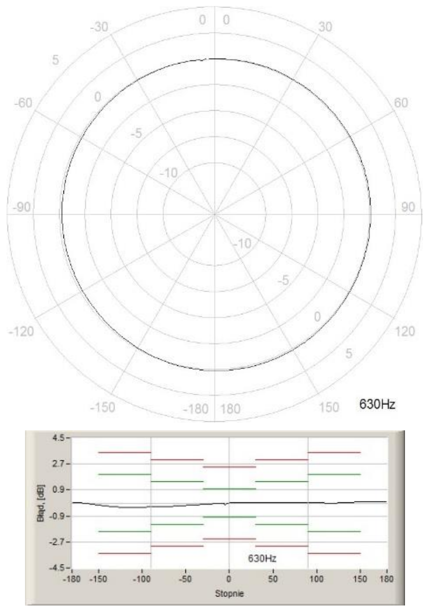
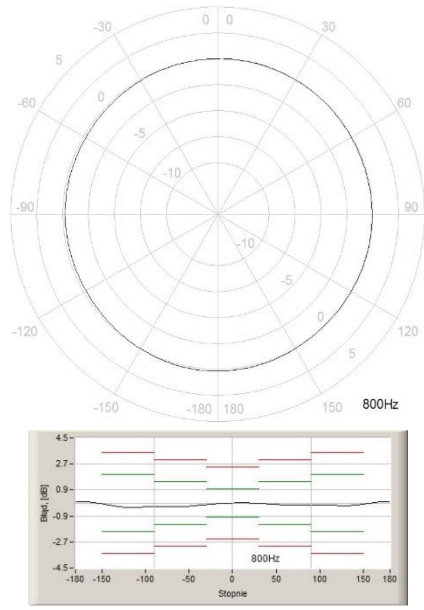
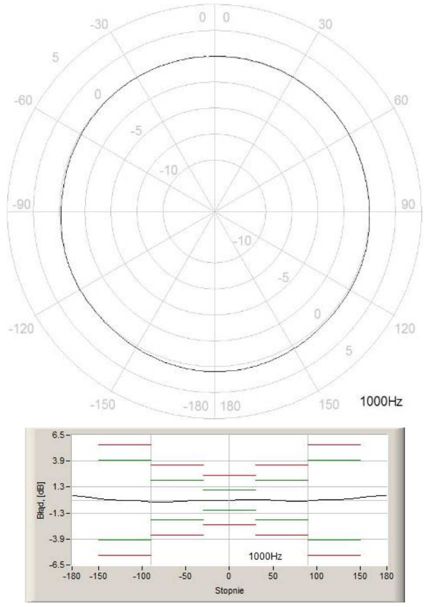
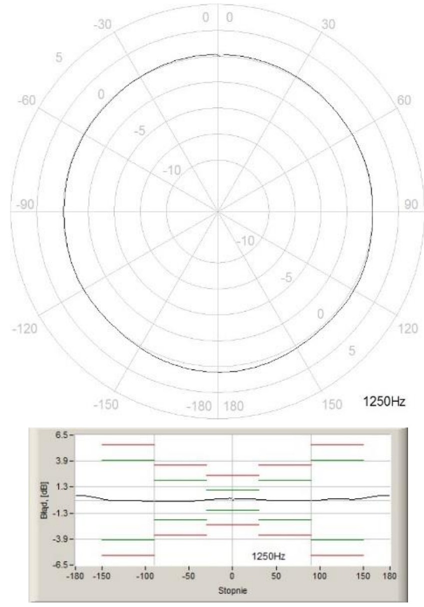
Directional response for SLM Class SVAN 977A with microphone ACO 7052E, preamplifier SV 12L and outdoor microphone kit SA 277 for specified frequencies:

Total directional characteristics

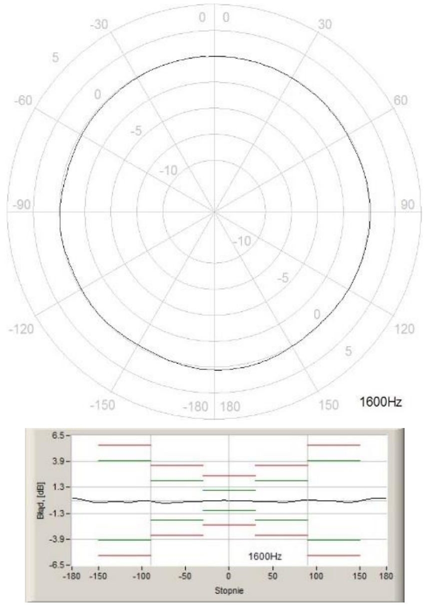


The round charts show the directional characteristic and the charts below shows the errors for particular angles.

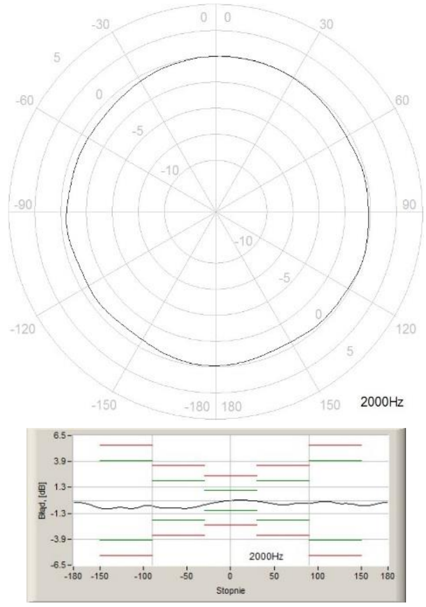
250 Hz		**315 Hz**	

400 Hz		**500 Hz**	
630 Hz		**800 Hz**	
1000 Hz		**1250 Hz**	

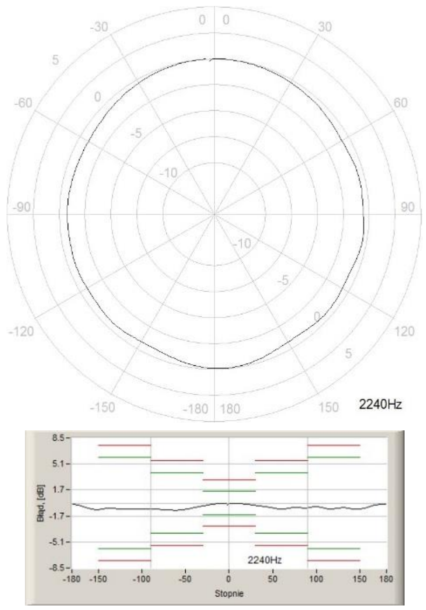
1600 Hz



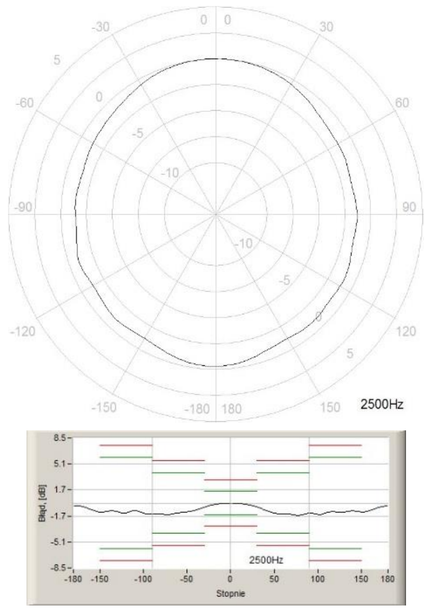
2000 Hz



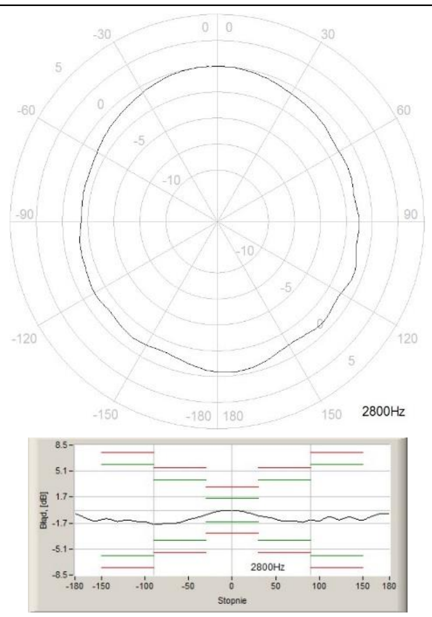
2240 Hz



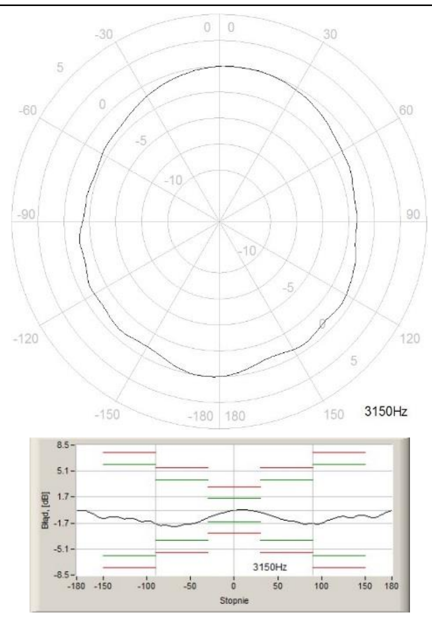
2500 Hz

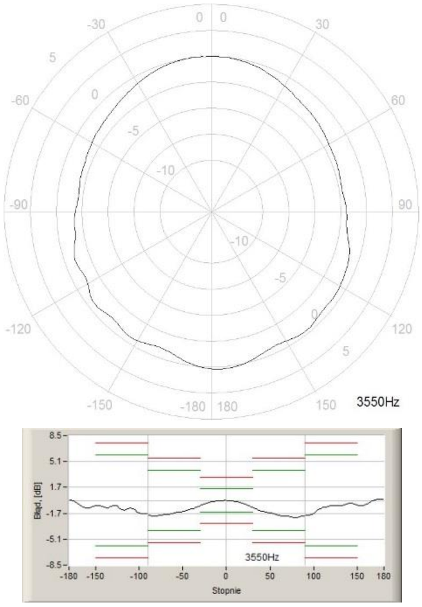
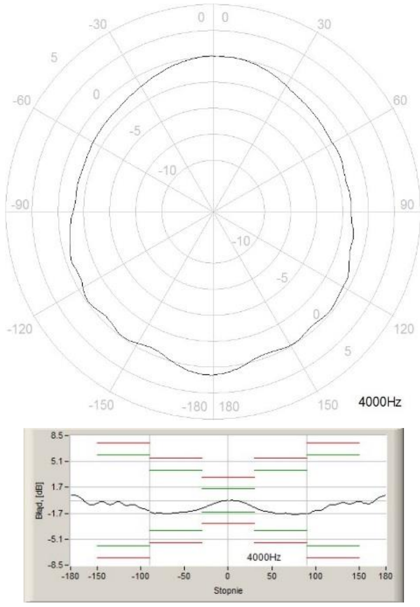
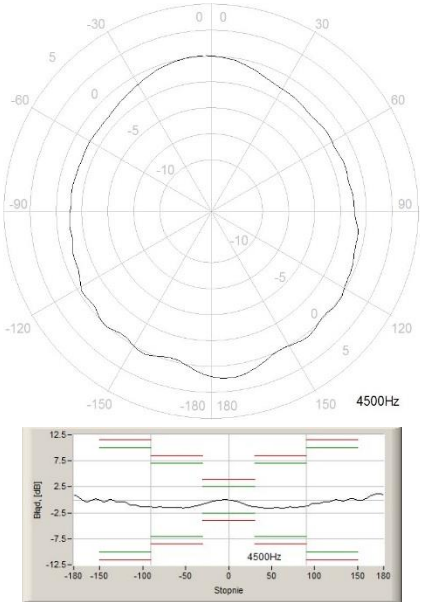
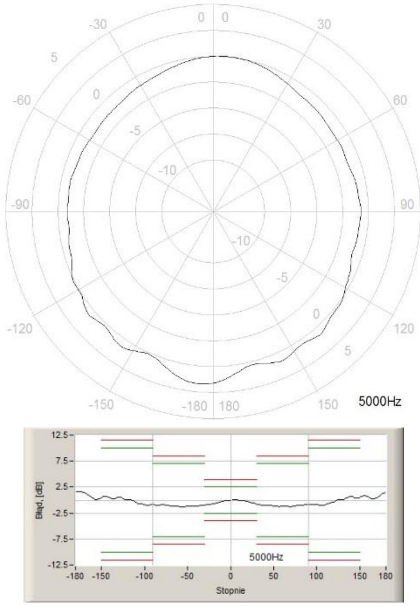
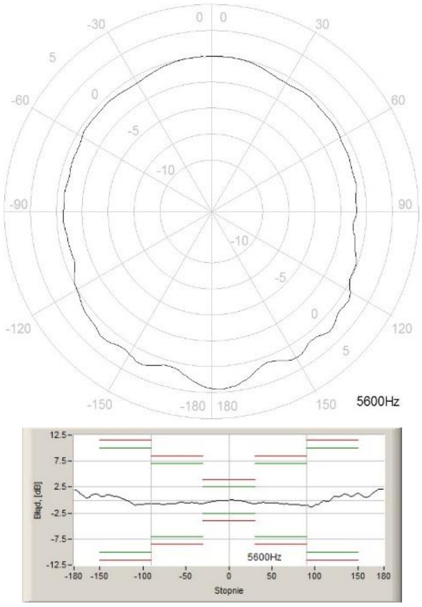
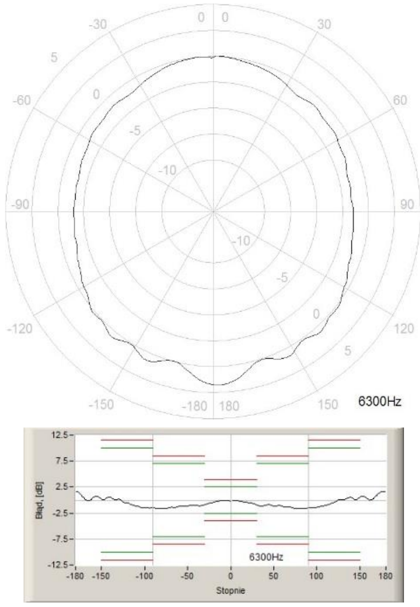


2800 Hz

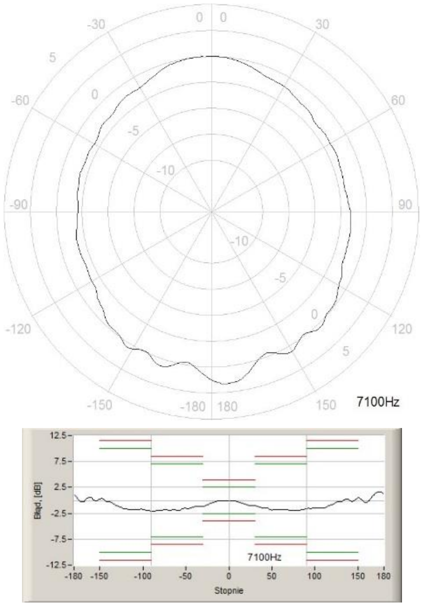


3150 Hz

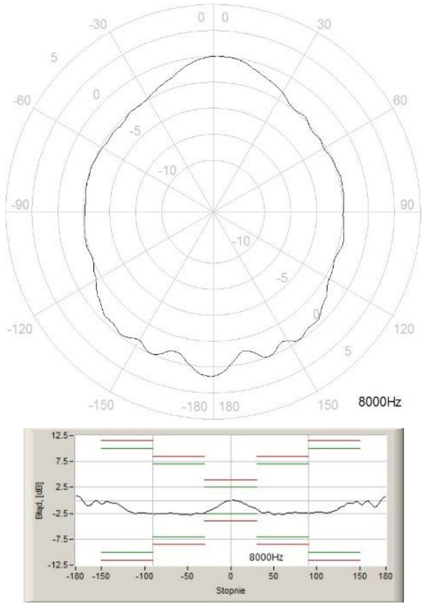


3550 Hz		**4000 Hz**	
4500 Hz		**5000 Hz**	
5600 Hz		**6300 Hz**	

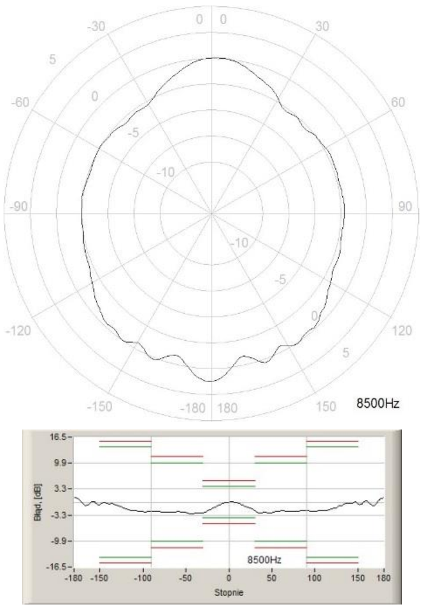
7100 Hz



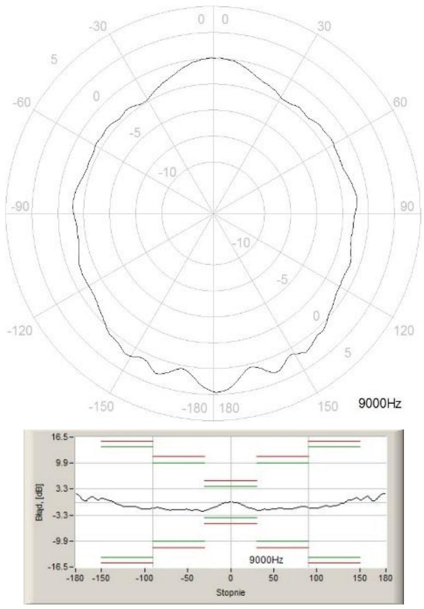
8000 Hz



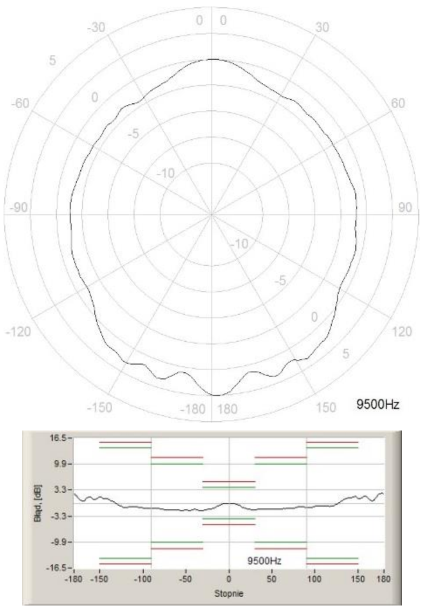
8500 Hz



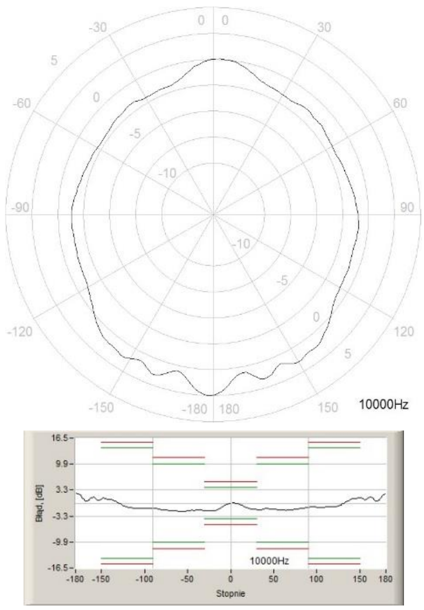
9000 Hz



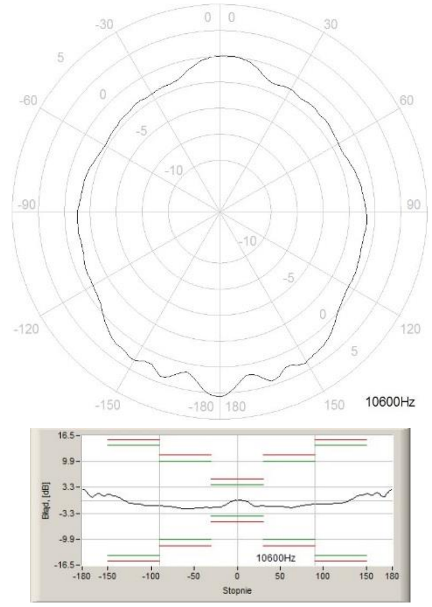
9500 Hz



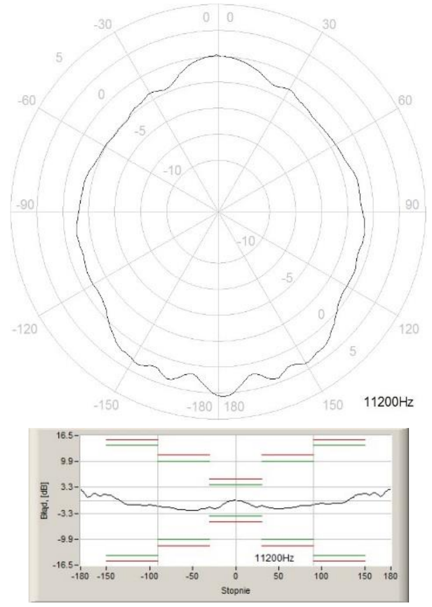
10000 Hz



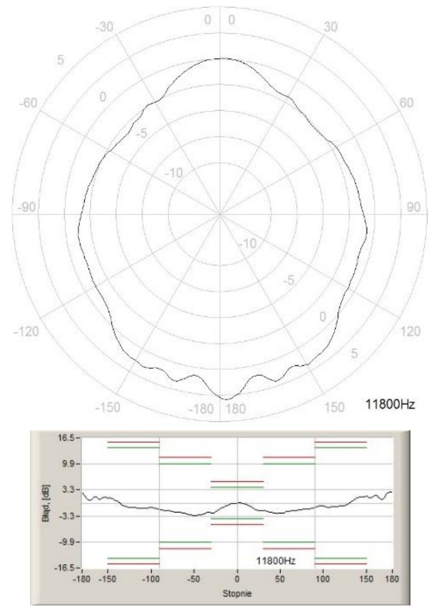
10600 Hz



11200 Hz



11800 Hz



12500 Hz

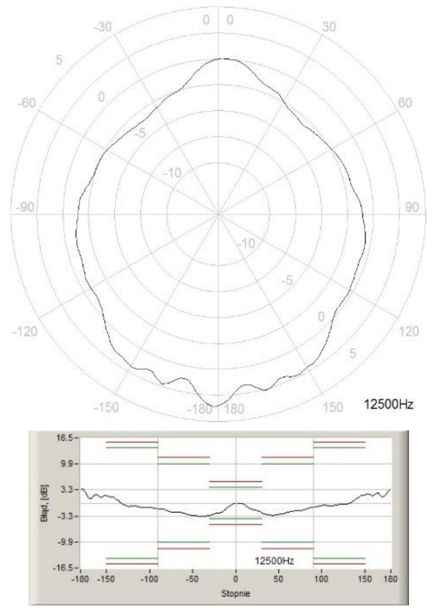


Table C.7.12 Directional response for SVAN 977A with microphone ACO 7052E, preamplifier SV 12L and outdoor protection unit SA 277

f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
250	0,03	0,06	0,08	0,1	0,12	0,13	0,14	0,15	0,16	0,16
315	-0,04	0,07	0,08	0,1	0,11	0,11	0,11	0,11	0,1	0,09
400	-0,02	-0,04	-0,07	-0,11	-0,14	-0,16	-0,18	-0,19	-0,2	-0,19
500	0,03	0,05	0,07	0,08	0,1	0,1	0,1	0,1	0,1	0,09
630	0,03	0,04	0,04	0,05	0,05	0,05	0,06	0,06	0,06	0,04
800	0	-0,01	-0,04	-0,08	-0,12	-0,15	-0,17	-0,17	-0,15	-0,13
1000	0	0,01	0,01	0,02	0,01	-0,05	-0,1	-0,13	-0,13	-0,09
1250	-0,01	-0,06	-0,12	-0,19	-0,23	-0,23	-0,21	-0,2	-0,22	-0,21
1600	-0,02	-0,06	-0,09	-0,12	-0,14	-0,17	-0,18	-0,15	0,04	0,04
2000	-0,01	-0,03	-0,12	-0,27	-0,42	-0,46	-0,45	-0,31	-0,31	-0,26
2240	0,22	0,18	-0,08	-0,23	-0,42	-0,57	-0,57	-0,43	-0,44	-0,4
2500	-0,09	-0,31	-0,59	-1,12	-1,37	-1,41	-1,56	-1,61	-1,45	-1,53
2800	-0,09	-0,37	-0,73	-0,93	-1,2	-1,46	-1,47	-1,6	-1,6	-1,45

3150	0,03	-0,13	-0,35	-0,77	-1,14	-1,4	-1,61	-1,83	-1,82	-1,85
3550	-0,13	-0,39	-0,89	-1,38	-1,62	-1,94	-2,07	-2,29	-2,29	-1,98
4000	-0,14	-0,49	-1,1	-1,42	-1,67	-1,76	-1,79	-1,92	-1,78	-1,67
4500	-0,33	-0,83	-1,37	-1,51	-1,72	-1,6	-1,66	-1,52	-1,47	-1,29
5000	-0,1	-0,38	-0,87	-1,06	-1,22	-1,27	-1,3	-1,2	-1	-0,95
5600	-0,03	-0,26	-0,69	-0,71	-0,62	-0,68	-0,81	-0,96	-1,15	-1,46
6300	-0,29	-0,52	-1,06	-1,23	-1,21	-1,41	-1,51	-1,78	-1,78	-1,57
7100	-0,16	-0,77	-1,02	-1,5	-1,95	-1,95	-1,89	-2,08	-2	-1,63
8000	-0,47	-1,19	-1,95	-2,5	-2,86	-2,92	-2,64	-2,48	-2,6	-2,61
8500	-0,18	-1,01	-1,86	-2,89	-2,97	-2,6	-2,43	-2,44	-2,4	-2,37
9000	-0,59	-1,54	-2,26	-2,26	-2,14	-1,85	-1,97	-1,6	-1,57	-1,7
9500	-0,25	-1,28	-1,68	-1,72	-1,71	-1,71	-1,6	-1,43	-1,12	-1,22
10000	-0,68	-1,5	-1,73	-1,8	-1,71	-2,01	-2,01	-1,69	-1,32	-1,14
10600	-0,08	-1,35	-1,7	-1,68	-1,71	-1,79	-1,99	-1,53	-1,32	-0,95
11200	-0,69	-1,67	-1,8	-1,98	-2,24	-2,07	-2,04	-1,4	-1,33	-0,93
11800	-0,22	-1,46	-2,05	-2,53	-2,81	-2,76	-2,14	-1,92	-1,54	-1,28
12500	-0,8	-1,85	-2,66	-3,3	-3,29	-2,74	-2,23	-2,01	-1,27	-1,03

f [Hz]	100-110	110-120	120-130	130-140	140-150	150-160	160-170	170-180	180-190	190-200
250	0,16	0,16	0,16	0,15	0,14	0,13	0,11	0,08	0,05	0,02
315	0,09	0,08	0,08	0,07	0,07	0,06	0,04	0,02	-0,05	-0,1
400	-0,18	-0,16	-0,11	-0,06	0,04	0,08	0,12	0,13	0,14	0,13
500	0,07	0,06	0,05	0,05	0,06	0,06	0,05	0,03	-0,03	-0,09
630	0,03	0,01	0,02	0,05	0,08	0,1	0,1	0,09	0,07	-0,05
800	-0,16	-0,19	-0,19	-0,19	-0,13	-0,05	0,08	0,1	0,1	0,07
1000	0,04	0,06	0,07	0,13	0,22	0,35	0,4	0,43	0,42	0,38
1250	-0,14	-0,03	-0,07	-0,09	-0,06	0,21	0,31	0,32	0,31	0,23
1600	-0,04	-0,06	-0,14	-0,19	-0,18	0,12	0,22	0,24	0,22	0,12
2000	-0,13	-0,33	-0,34	-0,43	-0,57	-0,57	-0,42	-0,26	-0,28	-0,55
2240	-0,41	-0,57	-0,54	-0,5	-0,62	-0,61	-0,25	0,08	-0,08	-0,45
2500	-1,51	-1,2	-1,24	-1,1	-1,2	-1,19	-0,84	-0,45	-0,55	-1
2800	-1,45	-1,23	-1,3	-1,02	-1,32	-1,32	-0,79	-0,48	-0,81	-1,35
3150	-1,5	-1,12	-1,05	-1,04	-0,79	-1,05	-0,92	-0,28	-0,17	-0,8
3550	-1,68	-1,03	-0,72	-0,72	-0,56	-0,76	-0,54	0,16	-0,19	-1,05
4000	-1,37	-0,83	-0,48	-0,53	-0,31	-0,49	0,36	0,71	0,7	-0,64
4500	-0,78	-0,56	-0,17	-0,29	0,26	-0,17	0,99	1,14	1,02	-0,42
5000	-1,13	-0,65	0,2	0,74	0,69	0,86	0,76	1,65	1,67	1,18
5600	-0,86	-0,37	0,92	1,33	1,29	1,39	1,53	2,16	2,14	1,03
6300	-1,3	-1,06	0,21	0,62	0,82	0,81	1,37	1,76	1,55	0,8
7100	-1,6	-1,55	-0,89	0,43	0,47	0,65	1,27	1,67	1,33	0,77
8000	-2,55	-2,53	-1,57	-0,86	-1,14	-0,9	-1,45	0,9	0,87	-1,28
8500	-2,38	-2,18	-1,73	-0,95	-0,6	-0,9	-1,08	1,2	1,28	-1,08
9000	-1,58	-1,25	-1,1	0,56	1,3	1,63	1,61	2,26	1,76	1,52
9500	-0,95	-1,01	-0,81	1,47	1,94	2	1,59	2,6	2,56	1,89
10000	-1,23	-1,15	-0,88	1,33	1,61	1,83	1,56	2,54	2,49	1,64
10600	-1,08	-0,93	-0,82	0,73	1,54	2,01	2,23	2,55	2,86	1,95
11200	-1,1	-0,79	-0,67	1,68	2,15	2,23	1,74	2,91	2,38	2,08
11800	-1,18	-1	-0,96	1,06	1,67	2,17	2,18	2,97	2,79	1,84
12500	-0,73	-0,76	-0,48	1,36	2,19	2,78	2,78	3,63	3,34	2,53

f [Hz]	200-210	210-220	220-230	230-240	240-250	250-260	260-270	270-280	280-290	290-300
250	-0,05	-0,08	-0,11	-0,14	-0,16	-0,18	-0,18	-0,18	-0,17	-0,16
315	-0,15	-0,19	-0,25	-0,29	-0,31	-0,33	-0,34	-0,34	-0,33	-0,3
400	0,12	0,09	0,06	0,03	-0,02	-0,03	-0,03	-0,03	-0,02	-0,01
500	-0,14	-0,2	-0,25	-0,29	-0,31	-0,31	-0,31	-0,3	-0,28	-0,25
630	-0,12	-0,19	-0,26	-0,29	-0,29	-0,29	-0,28	-0,26	-0,25	-0,23
800	-0,08	-0,19	-0,28	-0,32	-0,32	-0,3	-0,27	-0,26	-0,27	-0,27

1000	0,26	0,15	0,05	0	-0,01	-0,08	-0,16	-0,21	-0,21	-0,19
1250	-0,08	-0,22	-0,23	-0,22	-0,2	-0,28	-0,3	-0,3	-0,27	-0,27
1600	-0,22	-0,22	-0,18	-0,15	-0,2	-0,17	-0,05	-0,22	-0,28	-0,27
2000	-0,85	-0,89	-0,85	-0,84	-0,86	-0,75	-0,63	-0,78	-0,77	-0,8
2240	-0,66	-0,65	-0,48	-0,61	-0,6	-0,59	-0,6	-0,61	-0,71	-0,74
2500	-1,23	-1,22	-1,19	-1,33	-1,2	-1,43	-1,49	-1,49	-1,52	-1,43
2800	-1,45	-1,26	-1,46	-1,5	-1,44	-1,52	-1,8	-1,88	-1,78	-1,78
3150	-1,12	-1,1	-1,12	-1,2	-1,5	-1,54	-1,87	-2,05	-2,21	-2,2
3550	-1,07	-0,81	-1,03	-1,11	-1,36	-1,46	-1,73	-2,1	-2,07	-1,9
4000	-0,64	-0,44	-0,62	-0,73	-0,77	-1,1	-1,59	-1,71	-1,75	-1,71
4500	-0,23	-0,43	-0,32	-0,57	-1,1	-1,37	-1,42	-1,5	-1,56	-1,57
5000	0,66	0,81	0,66	0,61	-0,73	-0,98	-1,06	-1,01	-1,13	-1,32
5600	1,27	1,02	1,18	0,68	-0,95	-1,04	-0,91	-0,8	-0,92	-0,82
6300	0,81	0,67	0,28	-0,62	-1,2	-1,55	-1,64	-1,72	-1,67	-1,45
7100	0,69	0,54	-0,91	-1,79	-1,93	-1,79	-2	-2,22	-2	-2,02
8000	-0,93	-0,77	-1,26	-2,17	-2,7	-2,41	-2,79	-2,7	-2,62	-2,79
8500	-0,75	-0,96	-0,8	-1,72	-2,26	-2,34	-2,6	-2,48	-2,71	-2,68
9000	1,16	0,66	-0,7	-1,31	-1,29	-1,94	-1,79	-1,86	-2,18	-2,17
9500	1,66	1,81	1,38	-1,23	-1,23	-1,21	-1,45	-1,42	-1,69	-1,93
10000	1,45	1,33	0,59	-1,19	-1,4	-1,52	-1,41	-1,82	-2,04	-2,27
10600	2,06	1,8	1,3	-0,97	-1,06	-1,41	-1,39	-1,62	-1,87	-2,21
11200	1,93	1,43	-1,01	-1,13	-1,45	-1,41	-1,68	-1,82	-2,21	-2,56
11800	1,71	1,36	-0,62	-1,2	-1,41	-1,43	-1,48	-2,03	-2,4	-2,62
12500	2,32	1,75	0,81	-0,92	-1,24	-1,21	-1,56	-2,22	-2,56	-2,88
f [Hz]	**300-310**	**310-320**	**320-330**	**330-340**	**340-350**	**350-360**				
250	-0,14	-0,12	-0,09	-0,07	-0,04	-0,01				
315	-0,26	-0,23	-0,17	-0,13	-0,08	-0,03				
400	0,01	0,02	0,02	0,02	0,02	0,01				
500	-0,22	-0,18	-0,15	-0,11	-0,07	-0,03				
630	-0,2	-0,17	-0,13	-0,09	-0,05	-0,14				
800	-0,26	-0,22	-0,16	-0,1	-0,05	-0,03				
1000	-0,14	-0,1	-0,06	-0,04	-0,02	-0,01				
1250	-0,27	-0,26	-0,2	-0,12	-0,06	-0,16				
1600	-0,2	-0,16	-0,12	-0,09	-0,04	0,01				
2000	-0,83	-0,79	-0,62	-0,38	-0,22	-0,08				
2240	-0,74	-0,63	-0,39	-0,17	0,13	0,21				
2500	-1,25	-1,15	-0,79	-0,47	-0,18	-0,02				
2800	-1,63	-1,27	-0,98	-0,61	-0,31	-0,06				
3150	-1,86	-1,81	-1,31	-0,91	-0,5	-0,17				
3550	-1,73	-1,51	-1,2	-0,75	-0,32	-0,1				
4000	-1,59	-1,5	-1,31	-0,91	-0,44	-0,12				
4500	-1,59	-1,59	-1,33	-0,92	-0,39	-0,09				
5000	-1,32	-1,23	-1,13	-0,91	-0,58	-0,23				
5600	-0,7	-0,54	-0,68	-0,68	-0,33	-0,09				
6300	-1,2	-1,1	-1,13	-0,73	-0,27	-0,2				
7100	-2,05	-1,63	-1,22	-1,2	-0,67	-0,1				
8000	-2,86	-2,87	-2,58	-2,13	-1,37	-0,47				
8500	-2,71	-3,07	-2,92	-2,89	-1,74	-0,86				
9000	-2,08	-2,3	-2,47	-1,94	-1,27	-0,28				
9500	-2,07	-1,96	-2,07	-1,9	-1,53	-0,62				
10000	-2,27	-1,96	-2,05	-1,97	-1,87	-0,76				
10600	-2,36	-2,21	-2,01	-1,95	-1,82	-0,88				
11200	-2,71	-2,75	-2,25	-2,23	-1,35	-0,27				
11800	-3,28	-3,4	-3,04	-2,67	-1,69	-0,53				
12500	-3,17	-3,58	-3,47	-3,03	-2,47	-0,73				

C.8. Declaration of Conformity

SVANTEK

INSTRUMENTATION FOR SOUND & VIBRATION MEASUREMENTS AND ANALYSIS

ISO 9001 ZETOM-CERT

EU Declaration of Conformity

No. SVAN 977A-CE-EN/09/2019

Manufacturer:	**SVANTEK Sp. z o. o**
Address:	Strzyglowska 81 04-872 Warszawa Poland
Kind of product:	SOUND AND VIBRATION ANALYESER
Type:	**SVAN 977A**
Directive:	**Radio Equipment Directive (RED) 2014/53/EU**
Standards: Art 3.1a: Safety	EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
Art 3.1b: EMC	ETSI EN 301 489-1 V2.1.1 ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU Draft ETSI EN 301 489-19 V2.1.1 ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation, and timing data; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU Final draft ETSI EN 301 489-17 V3.1.1 (2016-11) ElectroMagnetic Compatibility (EMC)standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU EN 61672-1:2013 Electroacoustics - Sound level meters - Part 1: Specifications EN 61000-4-2:2009 Electromagnetic compatibility (EMC)–Part 4–2: Testing and measuring techniques– Electrostatic discharge immunity test EN 61000-4-8:2010 Elec-tro-mag-netic compatibility (EMC) — Part 4 - 8: Testing and measurement techniques — Power frequency magnetic field immunity test EN 61000-4-20:2010 Electromagnetic compatibility (EMC). Testing and measurement techniques. Emission and immunity testing in transverse electromagnetic (TEM) waveguides

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Registered in the Warsaw District Court, XII Economic Department Initial Capital 100 000 PLN

SVANTEK

INSTRUMENTATION FOR SOUND & VIBRATION
MEASUREMENTS AND ANALYSIS

ISO 9001
ZETOM-CERT

EU Declaration of Conformity

No. SVAN 977A-CE-EN/09/2019

Art 3.2: Radio	ETSI EN 300 328 V2.1.1 Wideband transmission systems;Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
	ETSI EN 303 413 V1.1.1 Satellite Earth Stations and Systems (SES);Global Navigation Satellite System (GNSS) receivers; Radio equipment operating in the 1 164 MHz to 1 300 MHz and 1 559 MHz to 1 610 MHz frequency bands; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

I, the undersigned, representing the manufacturer, declare in sole responsibility, that the product specified above, to which this declaration relates, conforms to the above mentioned Directives and Standards:

Place of issue: **Warsaw, Poland**

Date of issue: 19.09.2019

Wiesław Barwicz, General Manager ....

(signature)

APPENDIX D. DEFINITIONS AND FORMULAE OF MEASURED VALUES

D.1. SOUND LEVEL METER

D.1.1 Basic terms and definitions (SLM mode)

T current time period of the measurement in seconds.

T_1 the last second of the measurement.

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

T_{8h} time period equal to 8 hours (28 800 seconds).

τ exponential time constant in seconds for the giving time-weighting. Three time constant 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**, **Z**, **U**, **AU** or **LF**).

$p_W(t)$ instantaneous frequency-weighted sound pressure with the weighting filter **W**. Sound pressure is expressed in pascals (Pa).

$p_{W\tau}(t)$ instantaneous frequency and time-weighted sound pressure with the weighting filter **W** and time constant τ calculated from the equation:

$$p_{W\tau}(t) = \sqrt{\frac{1}{\tau}\int_{-\infty}^{t} p_W^2(\xi)\, e^{-(t-\xi)/\tau}\, d\xi}$$

where: ξ – variable of integration.

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

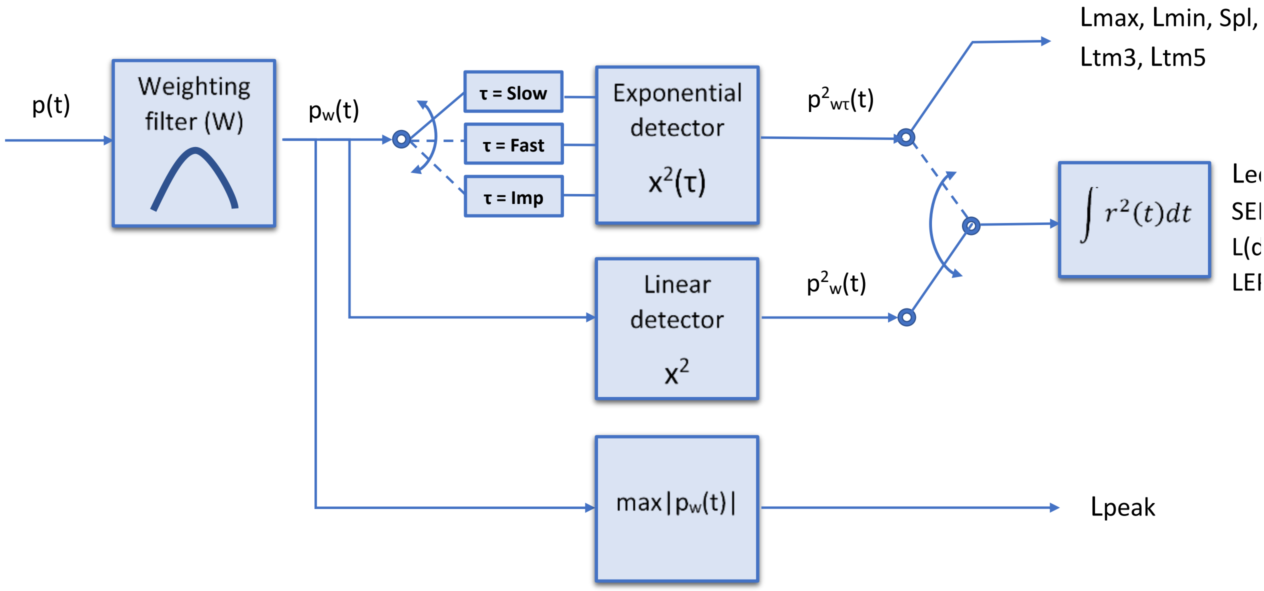
$$r(t) = \begin{cases} p_W(t) & \text{RMS Integration} = \text{Lin} \\ p_{W\tau}(t) & \text{RMS Integration} = \text{Exp} \end{cases}$$

p_0 the reference value (20 μPa).

$\log(x)$ represents the logarithm of x to the base 10.

D.1.2 Definitions and formulas of SLM results

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



Ovl

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

Lpeak

Peak sound level is calculated for the given **T**

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

Spl or **LXY**

Maximal value of the frequency and time-weighted sound pressure level for the last second of the measurement

$$\mathbf{Spl = 10\log\left(\max_{T_1} \frac{p_{w\tau}^2(t)}{p_0^2}\right)}$$

Lmax

Maximal value of the time-weighted sound pressure level for current time period of the measurement (**T**). The **Max** result for the 1 second period is equal to the value of the **Spl** result

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

Lmin

Minimal value of the time-weighted sound pressure level for current time period of the measurement (**T**)

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

Leq

(equivalent sound level)

Time-averaged sound level for current time period of the measurement (**T**)

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

LRm

m-minutes running Leq is the rolling (sliding) Leq screen for the last **m** minutes of measurement (**m** x 60 seconds) moving with 1 second step

$$LRm = 10\log\left(\frac{1}{m \times 60s}\int_{T-900}^{T}\left(r(t)/p_0\right)^2 dt\right)$$

Note: *if the current time period of the measurement is less then* ***m*** *minutes then* ***LRm*** *result is undefined.*

SEL

Sound Exposure Level 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**)

$$SEL = 10\log\left(\int_{0}^{T}\left(r(t)/p_0\right)^2 dt\right) = Leq + 10\log\frac{T}{1s}$$

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**

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

Ltm3 and **LTeq**

The **Ltm3** and **LTeq** results (Takt-Maximal Levels) are calculated according to the German standard TA Lärm.

Lnn

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

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

L(den)

Only one result from: **Ld**, **Le**, **Ln**, **Lde**, **Len**, **Lnd**, and **Lden** is available in the instrument. It depends on the day and night time in which the measurement was performed. Day and night time depend on the <**Day Time Limits**> option (**6h-18h** or **7h-19h**).

If **<6h-18h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 6 am and ends at 6 pm,
T_e (evening-time) starts from 6 pm and ends at 10 pm,
T_n (night-time) starts at 10 pm and ends at 6 am.

If **<7h-19h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 7 am and ends at 7 pm,
T_e (evening-time) starts from 7 pm and ends at 11 pm,
T_n (night-time) starts at 11 pm and ends at 7 am.

Ld

Ld is calculated for: $T_d \neq 0$, $T_e = 0$, $T_n = 0$.

$$Ld = 10\log\left(\frac{1}{T_d}\int_{T_d}\left(r_w(t)/p_0\right)^2 dt\right)$$

Le — **Le** is calculated for: $\mathbf{T_d} = 0$, $\mathbf{T_e} \neq 0$, $\mathbf{T_n} = 0$.

$$Le = 5\ dB + 10 \log \left(\frac{1}{T_e} \int_{T_e} (r_w(t)/p_0)^2 dt \right)$$

Ln — **Ln** is calculated for: $\mathbf{T_d} = 0$, $\mathbf{T_e} = 0$, $\mathbf{T_n} \neq 0$.

$$Ln = 10\ dB + 10 \log \left(\frac{1}{T_n} \int_{T_n} (r_w(t)/p_0)^2 dt \right)$$

Lde — **Lde** is calculated for: $\mathbf{T_d} \neq 0$, $\mathbf{T_e} \neq 0$, $\mathbf{T_n} = 0$.

$$Lde = 10 \log \left[\frac{1}{12+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} \right) \right]$$

Len — **Len** is calculated for: $\mathbf{T_d} = 0$, $\mathbf{T_e} \neq 0$, $\mathbf{T_n} \neq 0$.

$$Len = 10 \log \left[\frac{1}{4+8} \left(4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

Lnd — **Lnd** is calculated for: $\mathbf{T_d} \neq 0$, $\mathbf{T_e} = 0$, $\mathbf{T_n} \neq 0$.

$$Lnd = 10 \log \left[\frac{1}{8+12} \left(8 \cdot 10^{Ln/10} + 12 \cdot 10^{Ld/10} \right) \right]$$

Lden — **Lden** is calculated for: $\mathbf{T_d} \neq 0$, $\mathbf{T_e} \neq 0$, $\mathbf{T_n} \neq 0$.

$$Lden = 10 \log \left[\frac{1}{12+8+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

EX — Expected value. Calculated on the basis of 100ms RMS results.

SD — Standard deviation. Calculated on the basis of 100ms RMS results.

NR — Noise Rating, measured noise level that takes into account the frequency content of the noise.

NR is calculated if 1/1 Octave function is active.

To calculate the NR value, the noise level in each 1/1 octave band (from 31.5Hz to 8kHz) is compared to the “NR curves” for each corresponding band. The NR curve number which applies to each frequency band is the highest numerical value that is not exceeded in that band. The overall NR value is the highest of the individual NR values for the frequency bands.

NC — Noise Criterion, measured noise level that takes into account the frequency content of the noise.

NC is calculated if 1/1 Octave function is active.

To calculate the NC value, the noise level in each 1/1 octave band (from 63Hz to 8kHz) is compared to the “NC curves” for each corresponding band. The NC curve number which applies to each frequency band is the lowest numerical value that is not exceeded by each individual frequency band. The overall NC value is the highest of the individual NC values for the frequency bands.

D.2. VIBRATION LEVEL METER

D.2.1 *Basic terms and definitions (VLM mode)*

T current time period of the measurement in seconds.

τ exponential time constant in seconds for the giving time-weighting. The following time constants are available: **100 ms**, **125 ms**, **200 ms**, **500 ms**, **1.0 s**, **2.0 s**, **5.0 s**, **10.0 s.**

W frequency-weighting filter (**HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10**, or **Wh**).

$a_w(t)$ instantaneous frequency-weighted signal with the weighting filter **W**.

$a_{w\tau}(t)$ instantaneous frequency and time-weighted signal with the weighting filter **W** and time constant τ calculated from the equation:

$$a_{w\tau}(t) = \sqrt{\frac{1}{\tau}\int_{-\infty}^{t} a_w^2(\xi)\, e^{-(t-\xi)/\tau}\, d\xi}\ ,$$

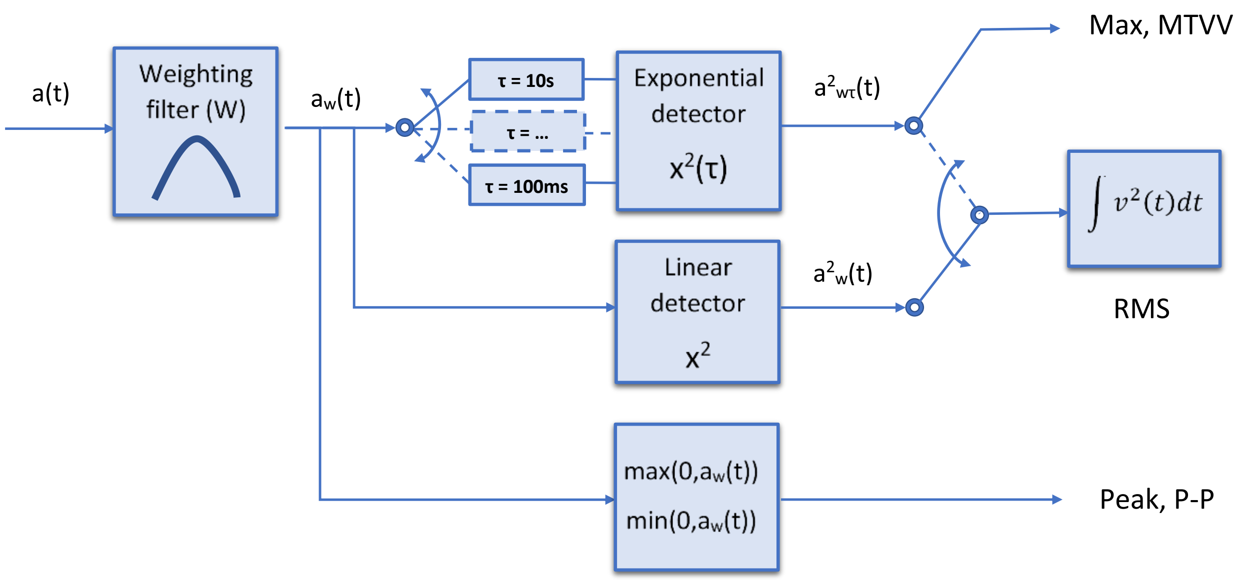
where: ξ – variable of integration.

$v(t)$ instantaneous vibration signal depends on the <**RMS Integration**> parameter:

$$v(t) = \begin{cases} a_w(t) & \textbf{RMS Integration} = \textbf{Lin} \\ a_{w\tau}(t) & \textbf{RMS Integration} = \textbf{Exp} \end{cases}$$

D.2.2 *Definitions and formulas of the VLM result*

The instrument calculates the vibration 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**)

Peak Maximum absolute value of the signal calculated for the given **T**

$$\mathbf{Peak} = \mathbf{max}_T \left| \mathbf{a_w(t)} \right|$$

P–P Peak-to-peak (**P-P**) result is the difference between highest and lowest value of the signal calculated for the given **T**

$$\mathbf{P-P} = \mathbf{max}_T(\mathbf{0}, \mathbf{a_w(t)}) - \mathbf{min}_T(\mathbf{0}, \mathbf{a_w(t)})$$

Max Maximal value of the time-weighted signal for current time period of the measurement (**T**)

$$\mathbf{Max} = \mathbf{max}_T(\mathbf{a}_{w\tau}(\mathbf{t}))$$

RMS **RMS** (root mean square) result for current time period of the measurement (**T**)

$$\mathbf{RMS} = \sqrt{\frac{1}{T}\int_0^T v^2(t)\,dt}$$

D.3. STATISTICAL LEVELS – LNN DEFINITION

The noise level **L(t)** is the continuous random variable. The probability that the temporary noise level **L(t)** belongs to the interval $\langle L_k, L_k + \Delta L \rangle$ is called the class density and it can be expressed by the equation:

$$P_k\left[L_k \le L(t) \le L_k + \Delta L\right] = \sum_{i=1}^{n} \Delta t_i \Big/ P$$

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

ΔL - so-called class interval or distribution class of the series,

P - total observation period.

In case when the class interval approaches infinity, the probability of **L(t)** tends to the probability of L_k. In practice, ΔL value is strictly determined and it depends mainly on the dynamics of the measurements performed in the instrument. There are 120 classes in the instrument and the width of each class is equal to 1 dB. The histogram is the set of the class density values calculated for all classes.

The statistical distribution function, which determines the probability (expressed in %) of the noise occurrence on the level equal or less than $L_k + \Delta L$ is given by the formulae:

$$P\left[L(t) \le L_j\right] = \sum_{k=1}^{j} P_k(L)$$

The cumulative density function, expressed by the equation:

$$P\left[L(t) > L_j\right] = 1 - P\left[L(t) \le L_j\right]$$

is directly used to determine so-called statistical levels **LN%** or position parameters of the distribution.

The **LN%** is the certain boundary level surpassed by the temporary noise level values in not more than **N%** of the observation period.

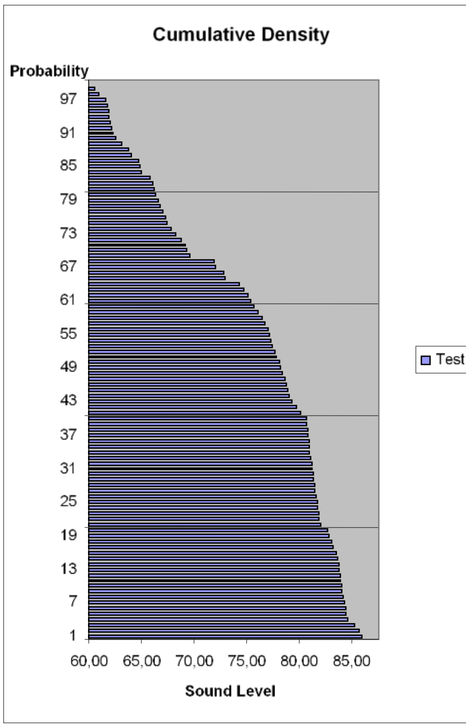
Example:

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

APPENDIX E. REVERBERATION TIME CALCULATIONS

E.1. INTRODUCTION

If an impulsive sound is generated in a room with reflecting boundaries, repeated reflections at the boundaries result in the rapid establishment of a more or less uniform sound field. This field then decays as the sound energy is absorbed by the bounding materials. The rate at which the sound energy decays is determined by the absorptive properties of the reflecting surfaces and the distances between them. The time taken for the sound intensity or the sound pressure level to decay by 60 dB is called the **reverberation time** (RT). The values of RT may range from fractions of a second to a few seconds and depend upon the size of the room and the nature of the materials used in its construction.

The graphs below present the reverberation time nature (in the case when only one frequency is emitted):

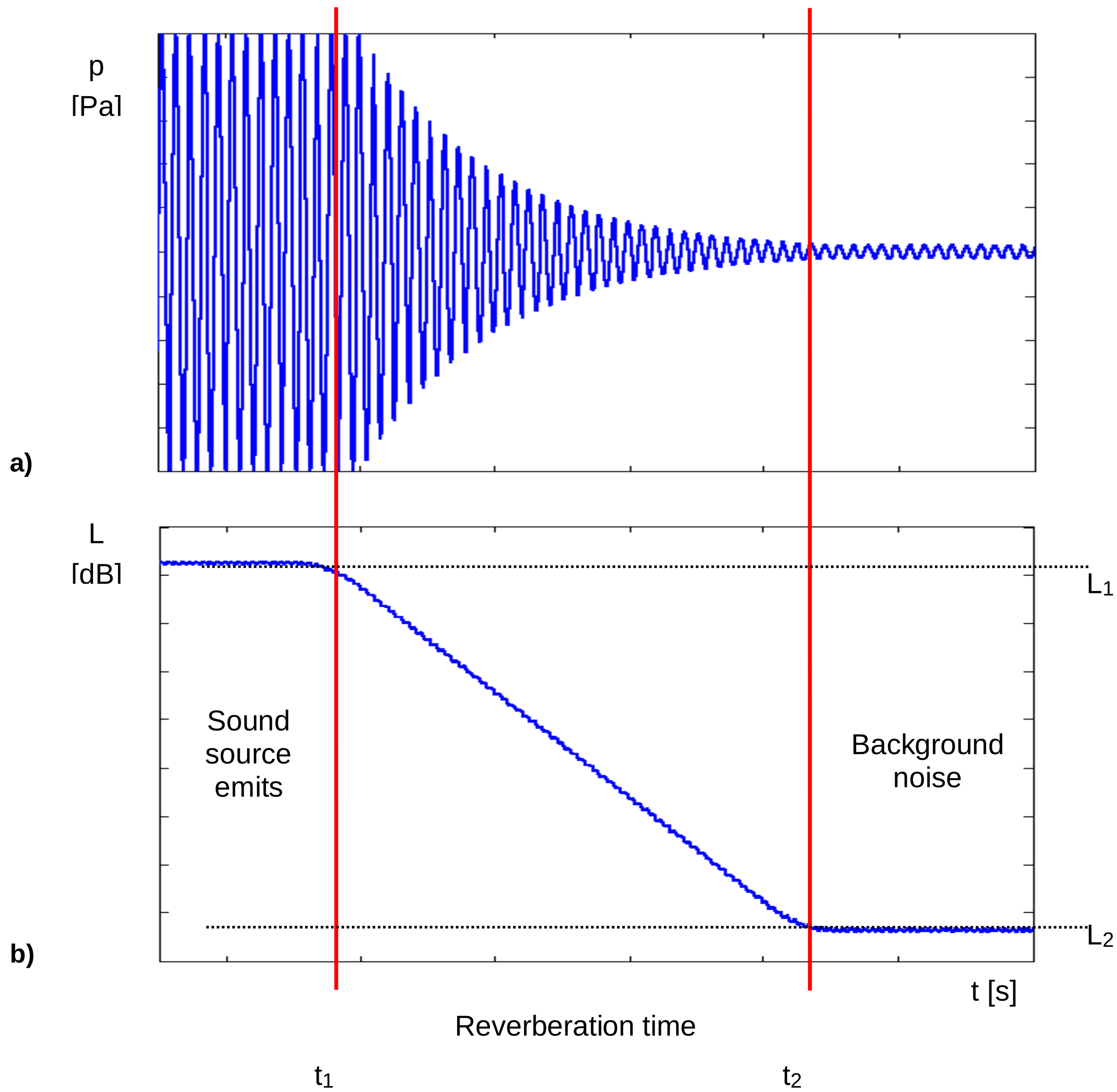


Fig 1. The acoustic pressure versus time (a) and the value of the sound pressure level versus time, so-called decay curve (b)

The marker t_1 indicates the moment when the sound source was switched off. From this moment the acoustic sound pressure / acoustic power (reflected waves propagate in the room) decreases till the moment indicated by the marker t_2. The lower graph presents so-called the **decay curve**. The reverberation time value is equal to $t_2 - t_1$ when the difference between sound pressure levels L_1 and L_2 is 60 dB. The 60 dB dynamic condition is impractical in real measurements (very difficult to fulfil) hence the reverberation time (RT 60) is obtained using the slope coefficient of the decay curve. The type of the definition from which slope coefficient is calculated (EDT, RT 20, RT 30 or user defined) depends on the difference between levels L_1 and L_2 (the difference between background noise level and sound source level) of the decay curve and it depends on significantly from the acoustic source ability. If the level difference is larger than 45 dB, the RT 60 parameter can be calculated using three definitions: EDT, RT 20 and RT 30.

The real measurement results are not as smooth as the curves presented on graphs in Figure 1. In order to point out the interesting decay curve region (the position of the markers t_1 and t_2) some measurement data processing (in general signal smoothing by averaging) need to be applied.

E.2. DEFINITIONS AND CALCULATION OF THE RT 60 REVERBERATION TIME

- **EDT (early decay time):**

The EDT decay curve region is pointed out by markers t_1 and t_3 (cf. Fig. 2). It is checked whether the selected decay curve region has proper dynamics for the EDT calculation:

$$\mathbf{L_1 - L_2 >= 10\ dB}$$

$$\mathbf{L_2 - L_3 >= noise\ margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_1 (with L_1 level) and t_2 (with L_2) are approximated with the straight line ($y = a \cdot x + b$) by the linear regression. Before approximation the EDT value is calculated using the slope coefficient ‘a’ according to the formula:

$$\mathbf{EDT = -60.0 / a}$$

In case of the **decay method**, the EDT value is calculated according to the formula:

$$\mathbf{EDT = 6 \cdot (t_2 - t_1)}$$

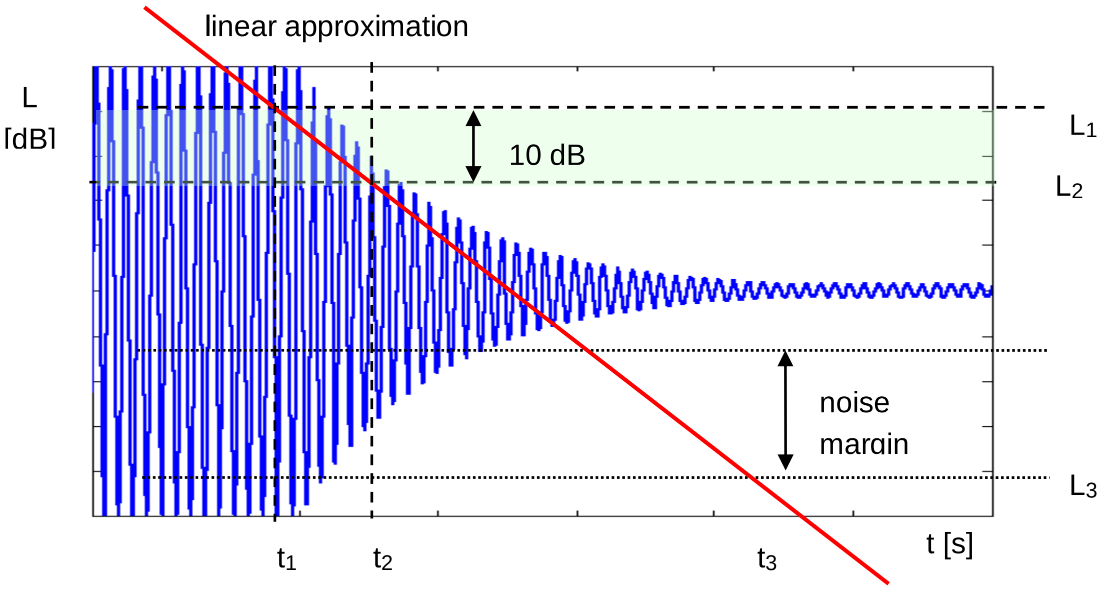


Fig 2. The EDT evaluation

- **RT 20 (reverberation time calculated with 20 dB dynamics):**

The RT 20 decay curve region is pointed out by markers t_1 and t_4 (cf. Fig. 3). It is checked whether the selected decay curve region has proper dynamics for the RT 20 calculation:

$$\mathbf{L_1 - L_4 > 5\ dB + 20\ dB + noise\ margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_2 and t_3 are approximated with the straight line ($y = a \cdot x + b$) by the linear regression. The RT 20 value is calculated using the slope coefficient 'a' according to the formula:

$$\mathbf{RT\ 20 = -\ 60.0 / a}$$

In case of the **decay method**, the RT 20 value is calculated according to the formula:

$$\mathbf{RT\ 20 = 3 \cdot (t_3 - t_2)}$$

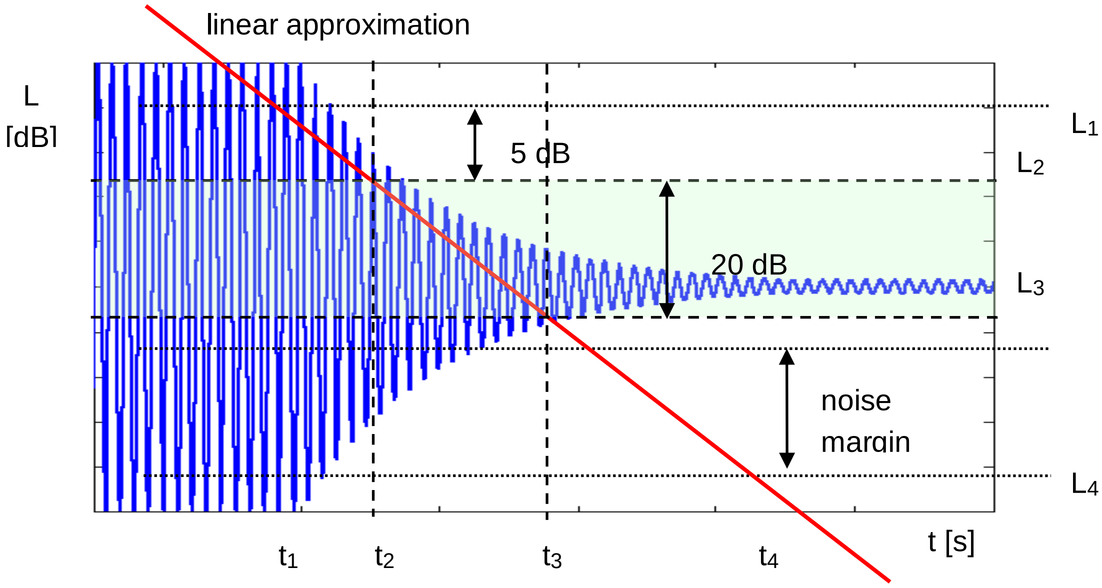


Fig 3. The RT 20 evaluation

- **RT 30 (reverberation time calculated with 30 dB dynamics):**

The RT 30 decay curve region is pointed out by markers t_1 and t_4 (cf. Fig. 4). It is checked whether the selected decay curve region has proper dynamics to the RT 30 calculation:

$$\mathbf{L_1 - L_4 > 5 + 30\ dB + noise\ margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_2 and t_3 are approximated with the straight line ($y = a \cdot x + b$) by the linear regression. The RT 30 value is calculated using the slope coefficient 'a' according to the formula:

$$\mathbf{RT\ 30 = -\ 60.0 / a}$$

In case of the **decay method**, the RT 30 value is calculated according the formula

$$\mathbf{RT\ 30 = 2 \cdot (t_3 - t_2)}$$

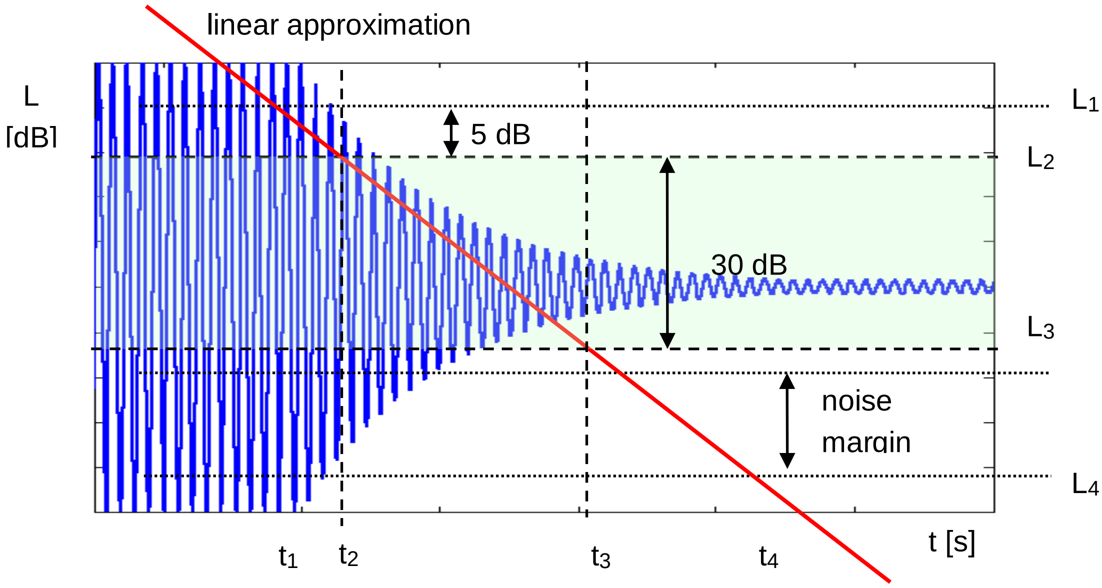


Fig 4. The RT 30 evaluation

E.3. DESCRIPTION OF THE DECAY CURVE RECORDING IN DIFFERENT MEASUREMENT METHODS

➢ **DECAY method**

This RT 60 measurement method requires omnidirectional sound source which emits pink noise in appropriate frequency band. The most critical parameter of the omnidirectional sound source is emitted sound pressure level as it was mentioned in the beginning of the appendix.

The graphical illustration of the data recording in this method is presented in Figure 5.

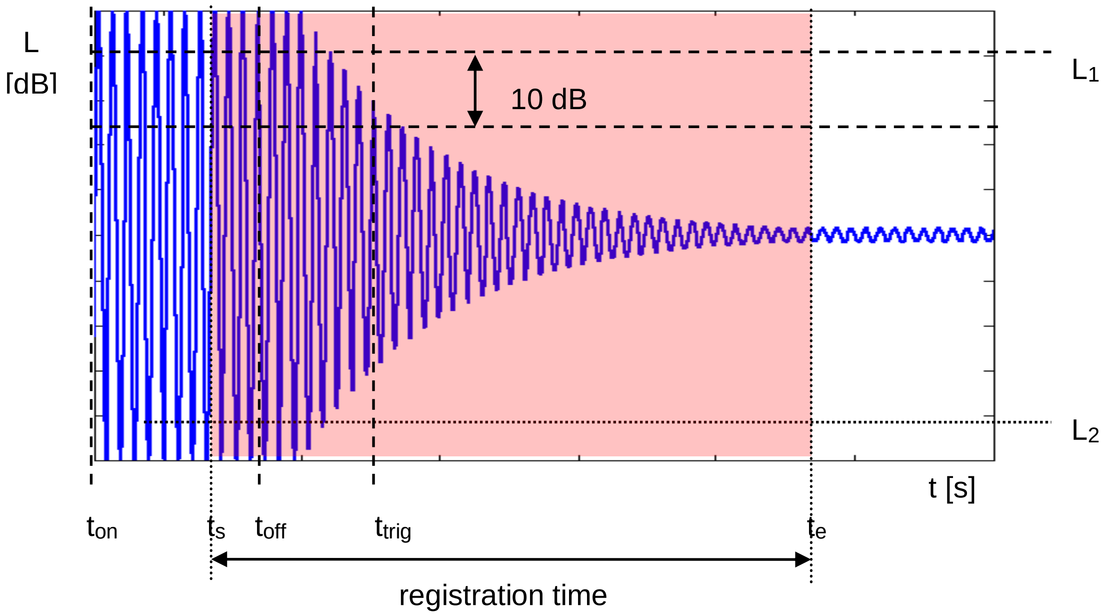


Fig 5. Data recording in the decay method of the reverberation time evaluation

The measurement time in this method consists of:

- The time between markers t_{on} and t_{off} in which the omnidirectional sound source emits acoustic power and the SVAN xxx analyser measures the actual sound pressure level.
- The time between markers t_{off} and t_{trig} in which the omnidirectional sound source is switched off and the SVAN xxx instrument waits for trigger condition fulfilment.
- The time between markers t_s and t_{trig} registered since the trigger condition fulfilment back till point t_s to allow recognising the beginning of the decay region. In the SVAN xxx instruments this time is equal to the **Time Step** (*path: <Menu> / Measurement / RT60 Settings*) parameter value multiplied by 50.
- The time between markers t_{trig} and t_e registered since t_{trig} forward to record whole decay curve together with significantly long period of the noise level. This time in SVAN xxx instruments is adjusted by **Recording Time** (*path: <Menu> / Measurement / RT60 Settings*) parameter.

The above graph shows that the proper setting of the **Recording Time** value is very important. The registration time has to be long enough to acquire sufficient number of background noise level values. In other case the decay curve region could not be properly analysed or decay region could not fulfil the dynamic condition mentioned above. It is recommended to set the **Recording Time** parameter two times longer than expected reverberation time.

➢ IMPULSE method

In the Impulse method, Reverberation Time is computed by using the reverse-time integrated impulse response. This way of measuring sound decay was introduced firstly by M. R. Schroeder in two historical articles:

- New Method of Measuring Reverberation Time, *Journal of Acoust. Soc. Am.1965*
- Integrated-Impulse Method Measuring Sound Decay without Using Impulses, *Journal of Acoust. Soc. Am. Vol. 66(2) 1979*

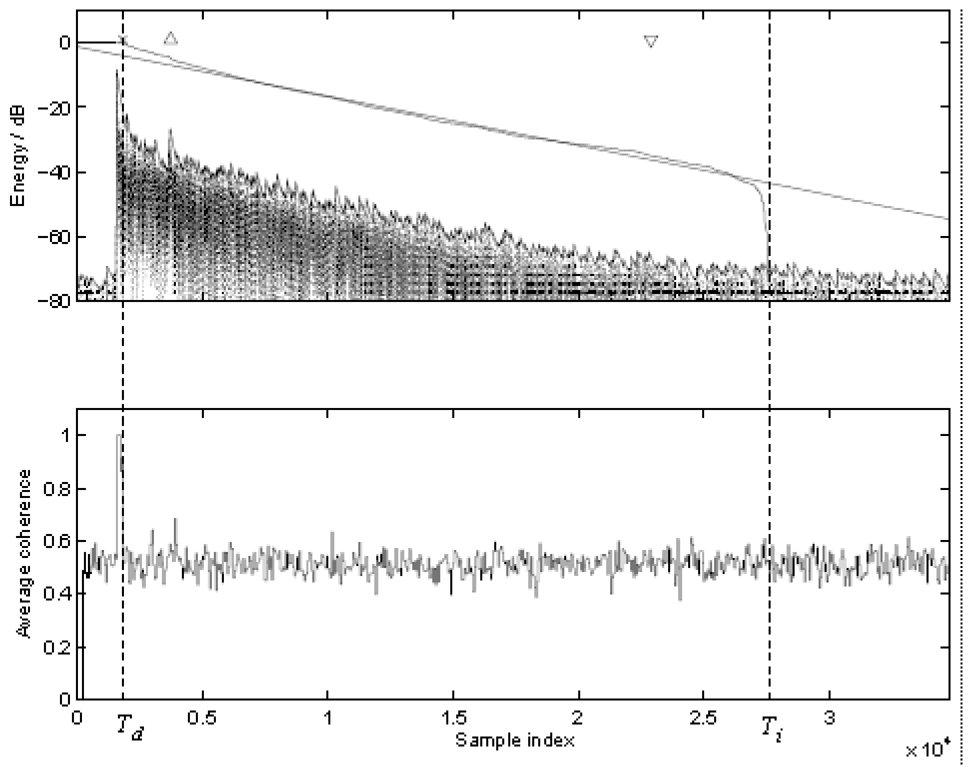


Fig. 6 An example of Schroeder integration with the limits Ti and Td

This RT 60 measurement method requires impulse sound source like pistol, petard or other sound source which emits impulse signal with very high sound pressure level.

The graphical illustration of data registering in this method is presented in Figure 7.

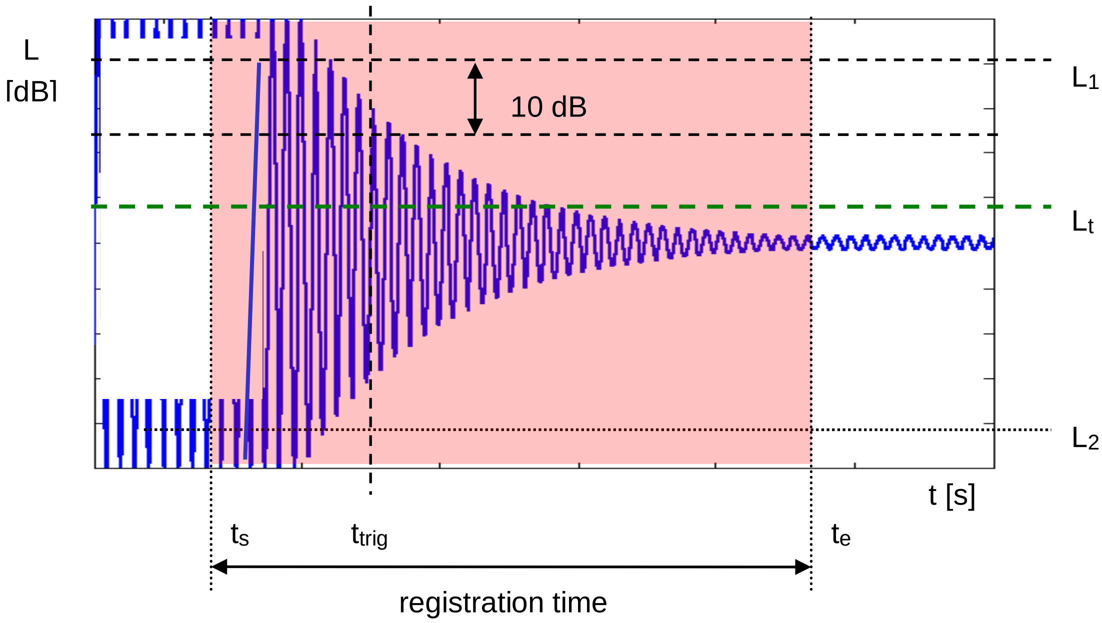


Fig 7. Data recording in the impulse method of the reverberation time evaluation

The measurement time in this method consists of:

- The time before marker t_{trig} in which the SVAN xxx analyser measures the actual sound pressure level and waits for the very high impulse sound pressure level which will fulfil the trigger condition. The trigger conditions will be fulfilled only when emitted impulse has maximal sound pressure level higher than L_t level (cf. Fig. 6). The L_t level in the SVAN xxx analyser is adjusted by parameter **Level** (*path: <Menu> / Measurement / RT60 Settings*).
- The time between markers t_s and t_{trig} registered since the trigger condition fulfilment back till point t_s to allow recognising the beginning of the decay region. In the SVAN xxx instruments this time is equal to the **Time Step** (*path: <Menu> / Measurement / RT60 Settings*) parameter value multiplied by 50.
- The time between markers t_{trig} and t_e registered since t_{trig} forward to record whole decay curve together with significantly long period of the noise level. This time in SVAN xxx instruments is adjusted by **Recording Time** (*path: <Menu> / Measurement / RT60 Settings*) parameter.

The above graph shows that the proper setting of the **Recording Time** value is very important. The registration time has to be long enough to acquire sufficient number of background noise level values. In other case the decay curve region could not be properly analysed or decay region could not fulfil the dynamic condition mentioned above. It is recommended to set the **Recording Time** parameter two times longer than expected reverberation time.