SVANTEK

USER MANUAL



SVAN 979

SOUND & VIBRATION ANALYSER

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Rev. 2.02

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



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

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1 INTRODUCTION



The **SVAN 979** is all digital, Class 1 Sound & Vibration level meter (SLM and VLM) as well as a real time 1/1, 1/3 octave analyser. The instrument is designed for general acoustic and vibration measurements, environmental monitoring, occupational health and safety monitoring.

Three acoustic or vibration user configurable profiles allow parallel measurements with independently defined frequency filters and RMS detector time constants. Each profile provides a significant number of results (like **Spl**, **Leq, Sel**, **Lden**, **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**, **MTVV** in case of vibration measurements). Advanced time history logging for each profile provides complete information about the measured signal using the external SD card or USB Memory Stick and can be easily downloaded to any PC using the USB interface and SvanPC++ software.

All required weighting filters: **A**, **B**, **C**, **G**, **Z** 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.

Standard version of SVAN 979 is equipped with 1/1 and 1/3 octave real-time analysis as well as FFT. In the sound level meter mode, the statistical analysis in 1/1 or 1/3 octaves is also available. Frequency analysis is an essential tool for sound & vibration engineers. Depending on an application it can be more or less detailed. For advanced applications that require the narrow band frequency analysis, SVAN 979 offers options of the 1/6 or 1/12 octave real-time analysis.

The frequency analysis is a critical tool in building acoustics measurements. Depending on the application, frequency analysis can be done in 1/1 octave or 1/3 octave spectra. SVAN 979 records the time history of spectra with milliseconds logging step. It enables one to calculate RT60 results as well as sound insulation results. Additionally, SVAN 979 offers the functionality of a signal generator which is capable of generating pink noise, white noise or a selected sine wave. The signal generator works together with the RT 60 function which is calculated in 1/1 or 1/3 octave bands.

SVAN 979 enables STIPA calculations in accordance with IEC 60268-16:2020.

Another feature of SVAN 979 is a time signal recording, which stands for a recording of the raw signal samples with defined frequency up to 48 kHz. Analysis of the raw signal is used whenever frequency analysis is not sufficient. Time signal is recorded in a wave format which means that it can be played back in the PC software and used for noise source recognition (audio recording).

A fast USB 1.1 interface (12 MHz) creates a real time link for the PC "front-end" application using the SVAN 979. The USB Host functionality is also available. The USB Host controller installed in the instrument enables the user to connect this meter to USB memory sticks, USB hard disks, USB printers etc. With the use of optional interfaces (RS 232, Bluetooth®[1] or IrDA) the instrument can be remotely controlled from the PC or smartphone. Measurement results can be downloaded to the PC using all the interfaces mentioned above.

Working as a part of SV 279 PRO monitoring station, equipped with 3G modem, SVAN 979 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, that 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 - separate charger is required). Powering the instrument from an 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 979 AS SOUND LEVEL METER & ANALYSER

- Noise measurements (**Peak**, **Max**, **Min**, **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, Leq statistics (**Ln**), 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 3.15 Hz to 20 kHz with the GRAS 40AE microphone.
- Parallel **Impulse**, **Fast** and **Slow** detectors for the measurements with **A**, **B**, **C**, **G**, **Z** frequency filters.
- Two measurement ranges 22 dB RMS(A) ÷ 123 dB Peak (**Low**) and 30 dB RMS(A) ÷ 140 dB Peak (**High**).
- **1/1 Octave** (15 filters with centre frequencies 1 Hz ÷16 kHz), **1/3 Octave** (45 filters with centre frequencies 0.8 Hz ÷ 20 kHz) and optional **1/6 Octave** (90 filters with centre frequencies 0.73 Hz ÷ 21.4 kHz) and **1/12 Octave** (180 filters with centre frequencies 0.71 Hz ÷ 22 kHz) real time analysis, in accordance with Class 1 IEC 61260-1:2014.
- **STIPA** (speech transmission index for public address systems) measurements of electro-acoustic and acoustic environments effects that affect the speech intelligibility in the room acoustics and/or public address systems.
- 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.
- Optional **Loudness** and **Tonality** functions.

1.2 SVAN 979 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**, **MTVV** measurements.
- **Z**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10** and **Wh** weighting filters.
- **1/1 Octave** (15 filters with centre frequencies 1 Hz ÷16 kHz), **1/3 Octave** (45 filters with centre frequencies 0.8 Hz ÷ 20 kHz) and optional **1/6 Octave** (90 filters with centre frequencies 0.73 Hz ÷ 21.4 kHz) and **1/12 Octave** (180 filters with centre frequencies 0.71 Hz ÷ 22 kHz) real time analysis, in accordance with Class 1 IEC 61260-1: 2014.
- Optional **RPM** measurement with the use of RPM probe, connected to the **I/O** socket of SVAN 979.
- **FFT** analysis with the single **Total** overall value, performed with preselected frequency weighting filters and screens.

1.3 GENERAL FEATURES OF SVAN 979

- Advanced **Data Logger** function including spectrum logging on the micro **SD card** or **USB Memory Stick** providing almost unlimited logging capacity
- 1/1 ÷ 1/12 octave and FFT analyser (1/6 and 1/12 octave – optionally)
- Time domain waveform signal recording (optionally)
- Advanced trigger and alarm functions
- **USB 1.1 Host & Client interface** (real time PC "front end" application supported)
- **RS 232** (optionally) and **Bluetooth®** (as standard) interface
- Integration time programmable up to **24 h**
- Power supply by **four AA** rechargeable or standard alkaline batteries
- Hand held, light weight and robust case
- Easy to use with menu driven user interface

1.4 ACCESSORIES INCLUDED

- **GRAS 40AE** prepolarised ½" microphone with nominal sensitivity 50 mV/Pa
- **SV 17** microphone preamplifier with 7 pin Lemo connector
- **SA 22** foam windscreen
- **SC 16** USB type A to USB type B cable
- **SC 59** I/O cable
- **SA 33** power supply
- **SA 31** charger for rechargeable batteries
- **SA 62** 16 GB memory card - Kingston MicroSD HC Class 4
- **SA 143** carrying case for the SVAN 979 instrument and accessories
- **four AA** alkaline batteries

1.5 ACCESSORIES AVAILABLE

- **SA 17A** external battery pack using 6 x AA batteries
- **SA 47** carrying bag for SVAN 97x/95x and accessories (fabric material)
- **SA 79** carrying case for SVAN 97x/95x and accessories (waterproof)
- **SA 143** carrying case for SVAN 979 and accessories (lightweight)
- **SA 279** microphone outdoor protection kit for the SVAN 979 microphone (microphone, desiccator and extension cable not included)
- **SA 270D** desiccator for outdoor kit
- **SC 93** extension cable for SV 17 (LEMO 7-pin to LEMO 7-pin)
- **SA 08** microphone preamplifier holder (gooseneck)
- **SV 55** interface RS 232 for SVAN 979
- **SV 80** general purpose vibration accelerometer 100 mV/g (10 mV/ms^{-2})
- **SV 36** Class 1 sound calibrator: 94/114 dB@1000 Hz
- **SC 27** coiled TNC-TNC cable for accelerometer (2 m)
- **SC18T** LEMO 7-pin to TNC integrated connector
- **SA 27/10-32** mounting adapter for SV80 and SV81 accelerometers
- **SA 15** power supply
- **SV 58_C** GPS module with USB CLIENT plug
- **SV 58_H** GPS module with USB HOST plug

1.6 FIRMWARE OPTIONS AVAILABLE

The standard firmware of SVAN 979 includes 1/1 and 1/3 octave analysis, FFT analysis, RT60, Time Domain Signal recording and STIPA. Other functions are optional:

- **SV 979_6** Tonality analysis option for SVAN 979
- **SV 979_7** Loudness analysis option for SVAN 979
- **SV 979_8** Rotation measurement option (not including the RPM tachometer)
- **SV 979_16** User programmable second order band pass filters
- **SV 979_23** 1/6 and 1/12 analysis option for SVAN 979



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 GENERAL INFORMATION

2.1 MEASUREMENT CONFIGURATIONS AS SLM

The instrument's normal operating mode as SLM assumes operating with a preamplifier and a microphone attached to the instrument and without a windscreen. Optionally the instrument can be operated with the windscreen attached to the microphone or with the preamplifier and microphone fitted in the outdoor microphone kit and connected with the instrument by the extension cable (see Appendix C.7 for specification).







During sound measurements, to meet the requirements of the Class 1 accuracy, it is recommended to install the instrument on a tripod or in a holder to minimize the possibility of reflection and diffraction of acoustic waves. In particular, the instrument must not be held close to the body of the person performing the measurement. The instrument should be directed so that the microphone diaphragm plane is perpendicular to the direction of the measured sound source (the incidence angle of the sound wave is 0 degree).

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

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

To have measurements in accordance with the IEC 61672-1:2013 standard it is necessary to set the appropriate compensation in the **Compensation Filter** screen (see Chapter 4.6).

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

Before starting measurements, the instrument should be calibrated using the recommended sound calibrator (see Chapter 3.3).



2.2 MEASUREMENT CONFIGURATIONS AS VLM

The instrument can operate as VLM with the SV 80 general-purpose accelerometer 100 mV/g (10 mV/ms^{-2}) with the SC 27 coiled cable (see Appendix C for specification).

Chapter 17.3 presents the way of connecting the accelerometer to the instrument.



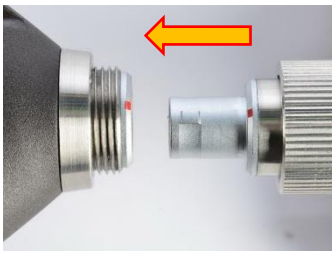
2.3 INPUT AND OUTPUT SOCKETS OF THE INSTRUMENT

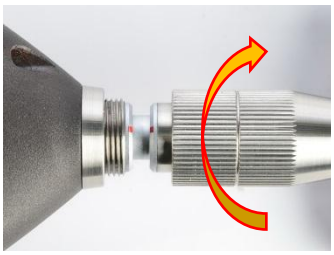
SVAN 979 is supplied disassembled, so the user should mount the GRAS 40AE microphone and **SV 17** preamplifier on his own.

It doesn't matter which elements will be assembled first: the microphone with the preamplifier or the instrument with the preamplifier.

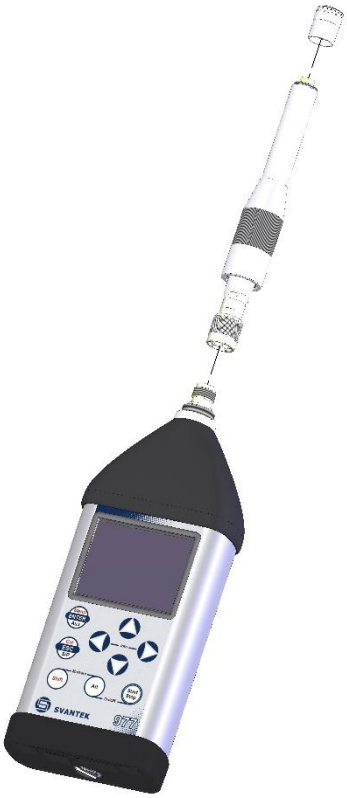


To connect the preamplifier with the microphone to the instrument, first insert the tip of the preamplifier into the socket until the connector clicks.





Then move the preamplifier outer sleeve in the direction to the instrument and tighten it to the screw thread.



See also Chapter 17 for instrument Maintenance.

Top cover of the instrument



The measurement input is placed in the centre of the instrument's top cover. It is the Lemo-7 compatible socket.

The **SV 17** microphone preamplifier has a specially designed matching plug and a locking screw to secure the preamplifier to the meter body.

The accelerometers have to be connected to the instrument also using the Lemo-7 connector. 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.

It is not necessary to remove this preamplifier from the top of the instrument unless the meter is in a calibration laboratory as it is always used close coupled to the meter body.

The full description of the signals connected to the sockets is given in Appendix C.



Bottom cover of the instrument

In the bottom cover there are four sockets, placed from the right to the left as follows: **6-24V**, **USB Host**, **USB Device** and **I/O**.



The **USB Device** 1.1 interface is the serial interface working with 12 MHz clock. Thanks to its speed, it is widely used in all PC. In the instrument, the standard 4-pin socket is used and described in detail in Appendix C.

The **USB Host** 1.1 interface can be used to connect an external USB Memory Stick or USB hard disk, enabling the device to register virtually infinite sequence of measurement results.

The additional multi-purpose input / output socket, called **I/O**, is a two-pin LEMO socket. On this 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. This signal can be recorded using magnetic recorder or observed on the oscilloscope. The Digital Input is 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 6-24V adapter to the **6-24V** 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*: *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.

***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).*

2.4 CONTROL KEYS ON THE FRONT PANEL

Control of the instrument has been developed in a fully interactive manner. Convenient and intuitive menu is used for device configuration Thanks to that, the number of keys has been reduced to nine for ease of use and convenience.

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

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



Functions of these keys are described below. 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> Enables the second function of some keys (for example, **<Menu>**).

<Alt> Enables the third function of some keys (for example, **<S/P>**).

Note: *These keys can be used in two different modes, which are configured in the* ***Keyboard*** *screen (path: <Menu> / Instrument / Keyboard):*

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

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 2.9).

<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 the 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**,**C** etc., **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.

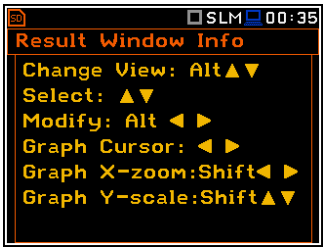
(▲,▼) The ▲ / ▼ keys pressed together with **<Shift>** allow to:

- 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**.

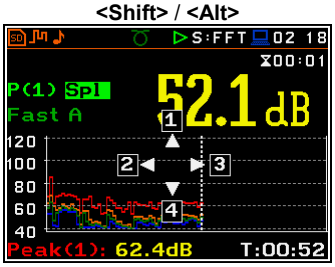
[Info] The **<Info>** key (simultaneous pressing the ◄ and ► keys) opens the screen with the help information in the measurement display modes. Press **<ESC>** or <**ENTER**> to exit the Info screen.



<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 or **Peak**, **P–P**, **Max**, **RMS** for Vibration measurements) in profiles should be active (*path: <Menu> / Measurement / Logging / Logger Results).*

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.

<Shift> / <Alt>

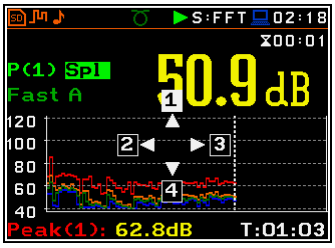


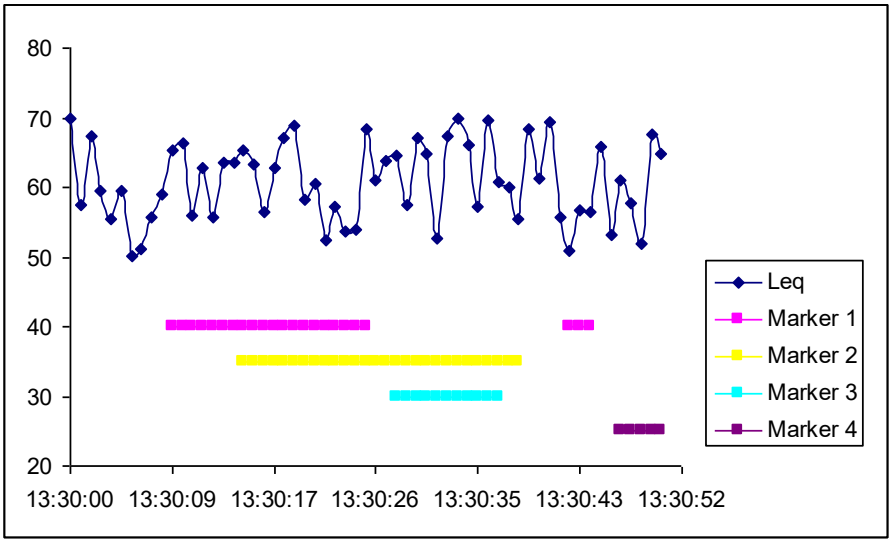
▲

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 below presents markers on the time history plot.





Note: *When the screen saver function is active (see Chapter 5.4) you may face the problem that during dimmed or switched off screen you should press the ▲, ◄, ► or ▼ keys twice to activate the marker, because the first press of these keys will cause switching on the screen. If activating markers is sensitive for your measurement process, switch off the screen saver function.*

2.5 WORKING WITH THE INSTRUMENT

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 colour display (320 x 240 pixels), which displays the measurement results and the configuration menu.

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

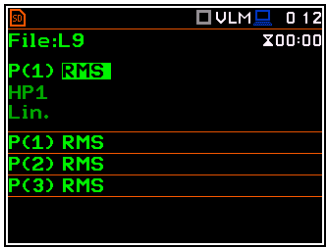
Turning instrument on

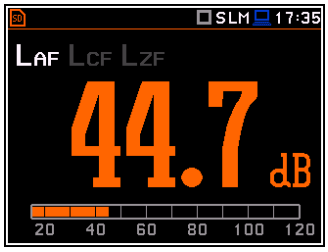


To turn the instrument on, press the **<Alt>** and **<Start/Stop>** keys at the same time.

The instrument goes through the self-test routine after turning on, displaying during this time the manufacturer logo, the name of the instrument and the firmware version. The instrument will warm up for one minute, then it enters one of the results view mode:

- 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.





2.5.1 *Measurement mode*

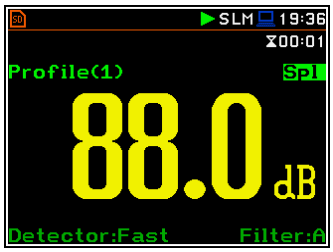
The measurement results can be viewed in different view modes, the set of which depend on the selected **Measurement Function** and which you can change and activate/deactivate.

Measurement results viewing

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.

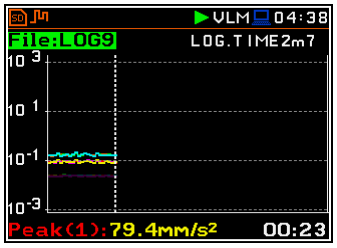
Display modes present some measurement results as well as additional information in the way of icons regarding:

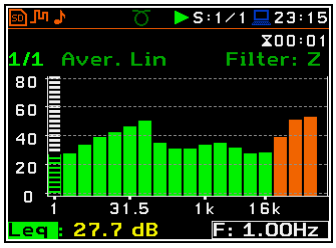
- instrument status: memory, power, real time, Bluetooth, GPS, connection with the modem etc.;
- measurement status: measurement function, measurement elapsed time, measurement start/stop/pause, trigger, logger etc.;
- measurement parameters: measured result, profile number, file name, detector type,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



All icons are described in Chapter 2.8, other fields and view control functions - in Chapter 5.

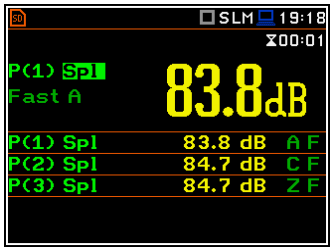
Some views present numerical and some graphical results, like on the right-hand example: time-history plot and spectrum.

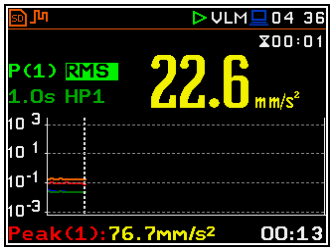




In some views the screen is divided into two parts to show more numerical results in different formats or both numerical and graphical results.

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

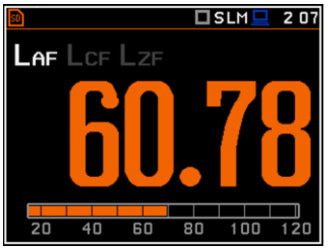




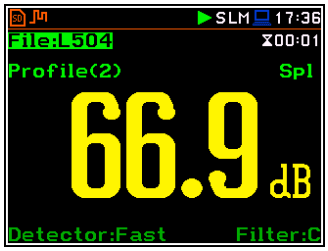
Starting measurement

To start measurement, press the **<Start>** key.

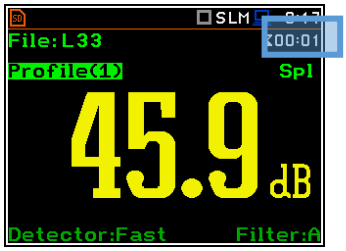
The icon will appear, and the measurement will be performed with the current instrument settings, which are stored in the instrument's internal memory. During the measurement the shape of the icon will be changing from self to contoured.



<Start>

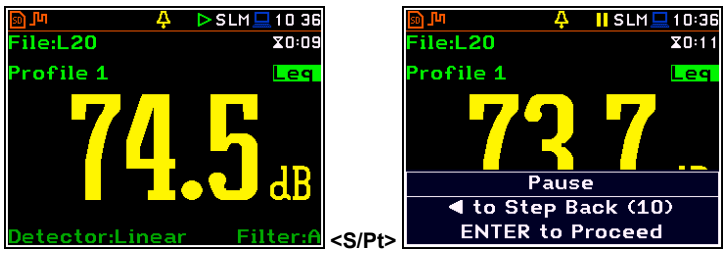


The time passed from the measurement start (elapsed time) is displayed in the right upper corner of the measurement screen in the format ⌛ **mm:ss** in the range from 00:00 to 59:59, or in the format ⌛ **hh:mm:ss** in the range from 01:00:00 to 99:59:59, or in the format ⌛ **xxxh** from 100h to 999h, 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 (see Chapter 4.1).



Pausing measurement

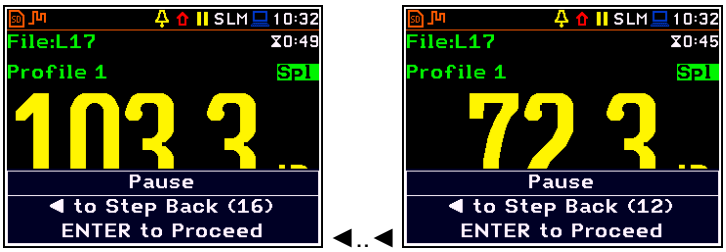
To pause a measurement, press the **<S/P>** key (**<Alt>+<ESC>**). The measurement will be paused and the ⏸ icon will appear together with the **Pause** section at the bottom of the screen.



The Pause mode allows you to erase up to 16 last seconds of the measurement with the ◄ key. One press deletes one second of the measurement and this reduces also the elapsed time.

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

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



2.5.2 Configuration mode

To configure a measurement or the instrument, use the menu 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.

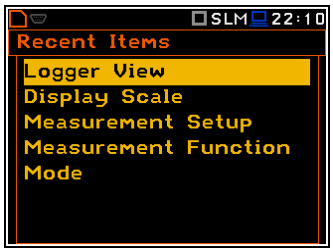
Main menu

The main **Menu** contains the headers of seven 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**, **Auxiliary Setup** and **Report**.



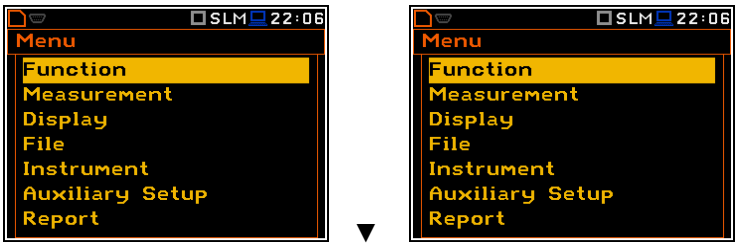
Recent Items list

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.



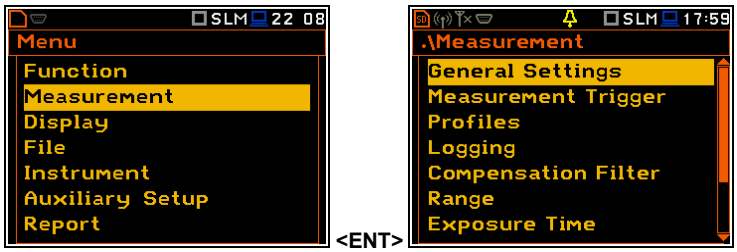
Selecting position

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

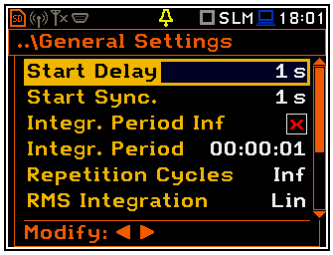


Opening position

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



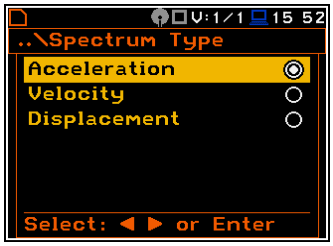
The list of parameters contains parameters the value of which is selected from the available range or set.

- 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.

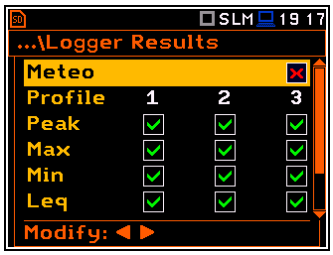
You may change the numerical parameter value with a larger step (usually 10) with the ◄ / ► key pressed together with **<Shift>**.

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.

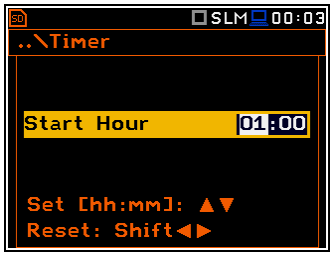
Matrix of parameters

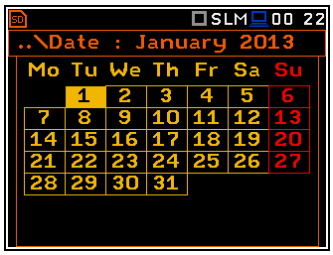


When the list of parameters consists of more than one column you may change:

- 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

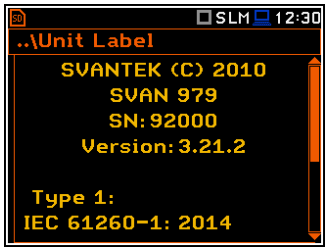




For complex parameters, consisting of more than one value field like **Start Hour** or **Start Date**, you should first select the field and then change the value of this field in accordance with the help information on the bottom of the screen.

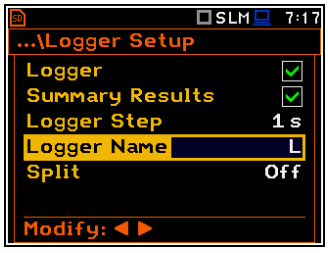
In all cases the **<ENTER>** key is used for confirmation of the selection in a position and for closing the opened list of parameters. The list of parameters is closed, ignoring any changes made in it with the **<ESC>** key.

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



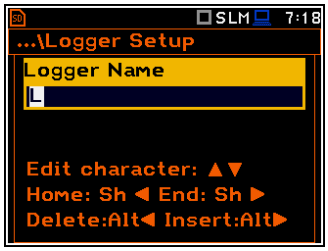
There are also screens in which the user may edit text strings (i.e. the name of the file). The text editor screen is opened with the ◄ / ► key when the position with the text parameter is selected.

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

The character that is displayed inversely may be edited.

►

- You can select the position of the character in the edited text using the ◄ / ► keys.
- The available ASCII characters can be changed using the ▲ or ▼ key. The subsequent digits, underline, upper case letters and space appear on the display in the inversely displayed position after each press of the above-mentioned keys.
- One can insert or delete the position in the edited text using the ◄ / ► keys pressed together with **<Alt>**.



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 **not** 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.

2.6 INSTRUMENT POWER

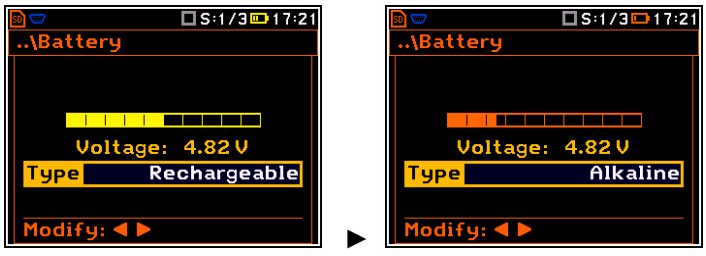
SVAN 979 can be powered by one of the following sources:

- Four AA standard size internal batteries. In case of alkaline type, a new fully charged set can operate more than 12 h (6.0 V / 1.6 Ah). Instead of the ordinary, 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 – 6 V DC÷24 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%).

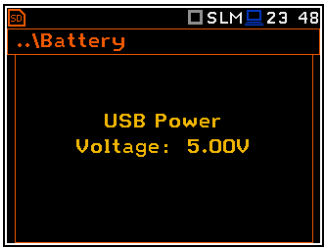


To have right indication of the battery status, select the battery type in the **Type** position: **Alkaline** or **Rechargeable**.

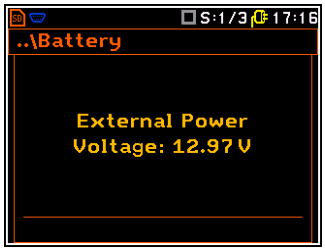
Note: *In case the "battery" icon is red, it is strongly recommended to use an external power adapter or USB interface as soon as possible to ensure reliable operation. If no suitable external power source is provided the instrument will be switched off automatically after a short time!*

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**.

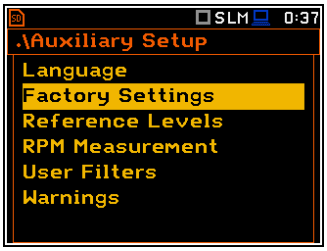


2.7 DEFAULT SETTINGS

Factory settings

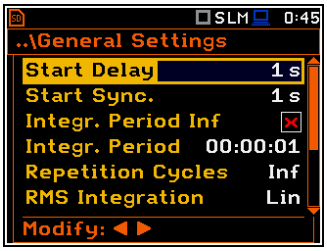
The instrument as sold has default settings which you may change, but always return to them with the use of **Factory Settings** option in the **Auxiliary Setup** menu.

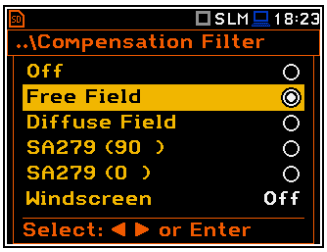
Next chapters of the manual will describe in detail what each parameter means and how to change the instrument settings.



Main default settings

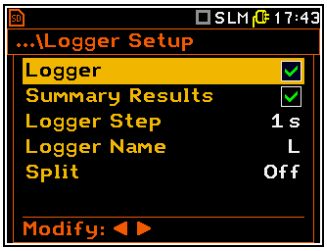
With the default settings, the instrument will measure sound pressure level by three virtual meters, so called profiles (Measurement **Mode: Sound**; **Measurement Function: Level Meter**) with 1 second delay from the **<Start>** key pressure (**Start Delay: 1 s**), 1 second integration time (**Integration 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:

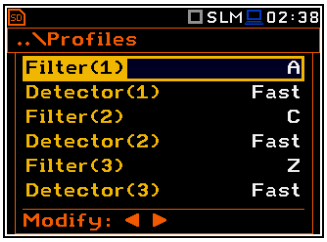
- measurement trigger (**Measurement Trigger: Off**),
- logger trigger (**Logger Trigger: Off**),
- wave recording (**Wave Rec.: Off**),
- timer (**Timer: Mode: Off**).



Default profile settings for Sound measurements:

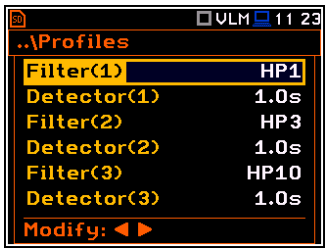
Profile 1 - **A** weighting filter (**Filter(1)=A**), **Fast** RMS detector (**Detector(1)=Fast**);

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**);

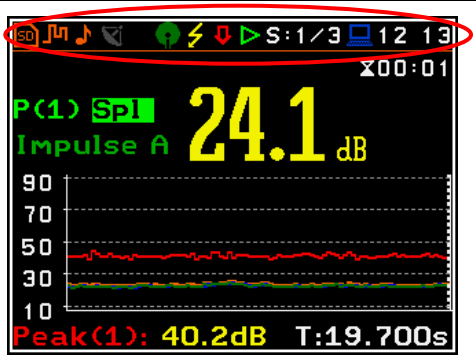
Profile 3 - **HP10** weighting filter (**Filter(3)=HP10**), **1.0s** RMS detector (**Detector(3)=1.0s**).

2.8 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.	**"Bluetooth"** icon is displayed when the *Bluetooth*® is switched on. Colours of the icon define the state of the connection: green – connected, grey – disconnected.
"stop" icon is displayed when the measurement is stopped.	**"pause"** icon is displayed when the measurement is paused.
"plug" icon is displayed if an external power is connected to the **7-16V** socket**.**	**"cable"** icon is displayed when the microphone is connected via extension cable.
„USB" icon is displayed when there is a successful USB connection with the PC.	**"RS232"** icon is displayed when the RS232 port is activated. When the **SV 55** converter is connected the icon is blue.
„wave" icon is displayed when the wave recording is active (wave files with extension WAV are saved automatically).	**„logging"** icon is presented when current measurement results are logged into the logger file.
„overload" icon is displayed when an overload appears.	**„underrange"** icon is displayed when an underrange 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.	**„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.
"slope+" icon is displayed when the "**Slope+**" trigger is waiting for a condition	**"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.		fulfilment. The icon appears alternately with the „measurement", „logging" or „wave" icons.
	**"alt"** icon is displayed when the **<Alt>** key is pressed.		**"shift"** icon is displayed when the **<Shift>** key is pressed.
	**„GPS"** icon is displayed when GPS is active. Colours of the icon define the state of the GPS: green – active, blue – searching, grey – disconnected.		**"trigger"** icon is displayed when other than Level or Slope trigger is waiting for a condition 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 up 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.
	**„polarisation"** icon is displayed when polarisation voltage is 200V.		**„alarm"** icon is displayed when an alarm appears.
	**"USB disk"** icon is displayed when USB disc is connected, activated and assigned for file saving.		**"memory warning"** icon is displayed when there is no inserted micro SD card and USB disc.
	**"windscreen"** icon is displayed when windscreen is applied.		"**SD card**" icon is displayed when the micro SD card memory is inserted.
	**"self-vibration"** icon is displayed when self-vibration level is exceeded.		

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.		

2.9 SAVING DATA

Memory type

All available measurement results and settings can be stored in the memory (micro **SD Card** or **USB Disk**) 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. The manual activation of the **USB Disk** is needed.

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 type of the selected memory shows the icon at the top left-hand corner of the display.



"SD card" icon is displayed when external SD card memory is assigned for file saving. Micro SD card is connected.



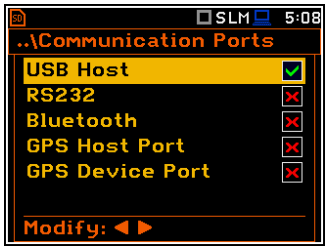
"USB disk" icon is displayed when the USB disc is assigned for file saving. USB disc is connected and activated.



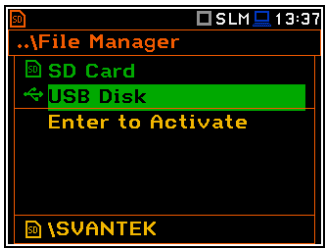
If the SD card and USB disc are removed from the memory slot the "memory warning" icon appears instead of "SD card" or "USB disc" icon.

USB Disc activation

USB disc activation is performed in the **Communication Ports** window of the **Instrument** section (*path: <Menu> / Instrument / Communication Ports*).



Activation of the USB disk can also be done in the **File Manager** window. The user should select the **USB Disk** position and press the **<ENTER>** push-button. Then in the Command list select the Activate **USB Host** position and press the **<ENTER>** push-button again.



<ENT>



The **SD Card** and **USB Disk** memories are 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** section.

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

The file manager is used to check the memory content and to operate on files and directories such as: opening, deleting, copying, moving, renaming, creating new files and directories, and displaying information about files and directories (see Chapter 6).

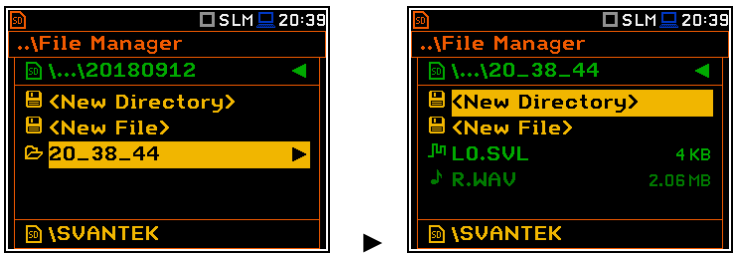


<ENT>



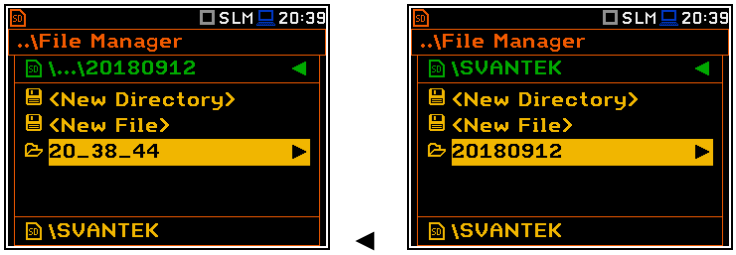
Automatic files saving

Logger files and wave files (SVL and WAV) are always saved automatically in the directory, which is created each time you press the **<Start>** key or start measurement remotely. The name of the measurement time directory is: **hh-mm-ss**, where **hh** is an hour, **mm** is a minute and **ss** is a second of the measurement start.



You can open this directory with the ► key.

The measurement directory is created in the parent directory, which is created automatically when you perform the first measurement on this day. The name of the measurement day directory is: **YYYMMDD**, where **YYYY** is a year, **MM** is a month and **DD** is a day of the first measurement.



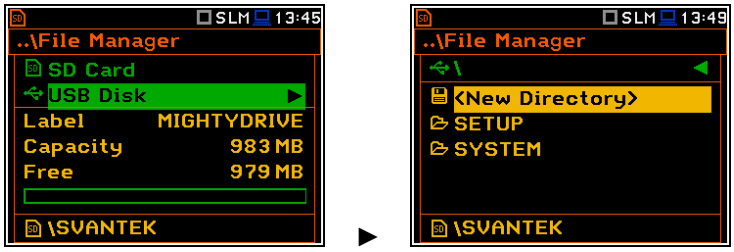
The measurement day directories are created in the working directory, which can be of predefined SVANTEK name or can be created by the user with the user name.

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.

If you wish to save files on the USB disc:

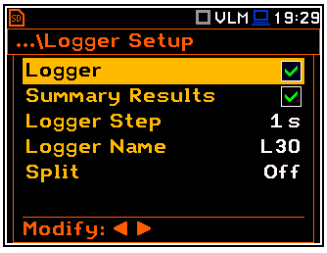
- enter the **USB Disc** catalogue system,
- select the pre-defined **SYSTEM** catalogue or create new catalogue and
- make the selected catalogue as a working one (see Chapter 6.1.1).



Automatic logger files saving ( )

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

- SD card or USB disc should be inserted and there should be enough space for new files.
- The **Logger** (*path: <Menu> / Measurement / Logging / Logger Setup*) should be switched on.



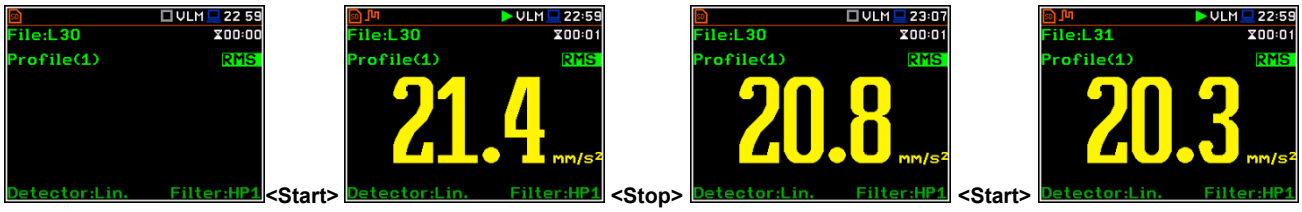
The logger file name may have up to 8 characters and is shown in the **Logger Name** position (*path: <Menu> / Measurement / Logging / Logger Setup*). The default name for the logger files is "**L**".

You can change the file name in the special screen, which is opened when you select the **Logger Name** position and press the ◄ / ► key.



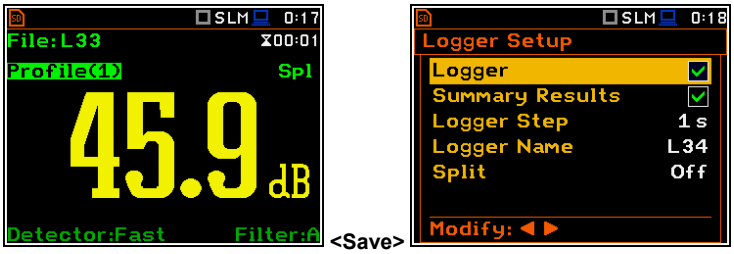
Since every logger file is saved in the special directory as described above there will never be a conflict of the same names, so you can always save new measurements to the files with the same names. But if you don't use manual naming the instrument will always be increasing automatically the number of the file for new created files.

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 directory **hh-mm-ss** after the measurement stop. After start of the second measurement the instrument automatically changes the file name to **L31** and this file will be saved after of the second measurement stop and so on.



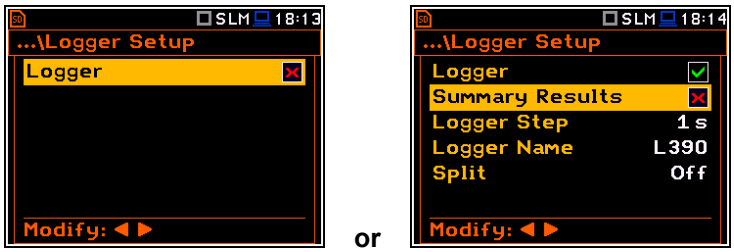
***Note:** During the measurement run with data logging to the logger file, the „logging" icon is displayed.*

If both **Logger** and **Summary Results** are switched on, pressing the **<Save>** key switches you to the **Logger Setup** screen in which the **Logger Name** position shows the name of the logger file which will be created after the next measurement. You can change parameters in this screen and return to the measurement view after pressing **<ENTER>**.

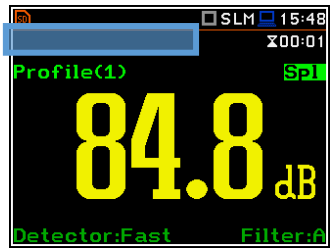


Manual saving of Summary Results

If the **Logger** or the **Summary Results** position 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 this case Summary Results for the last cycle can be saved only manually.



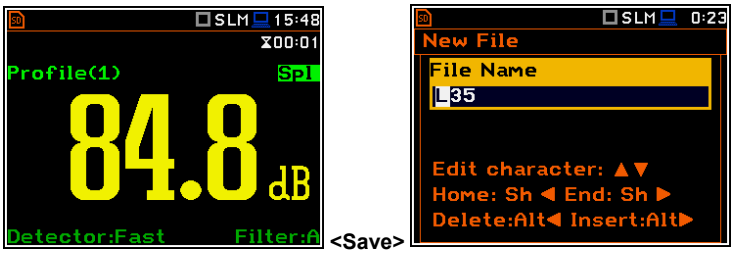
***Note:** If **Logger** is Off, the field with file name in the result view screen will be empty!*



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. Another option is to create **<New File>** with **File Manager**.

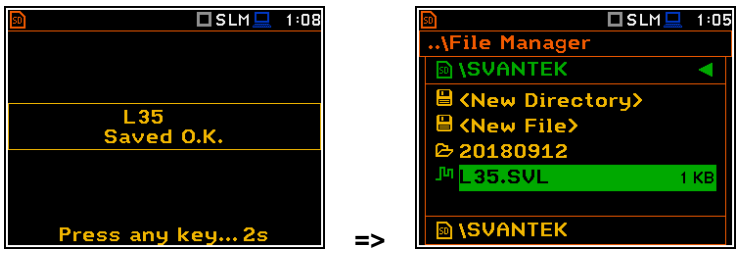
Pressing the **<Save>** key switches you to the **New File** editor screen with the name generated by the instrument.

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



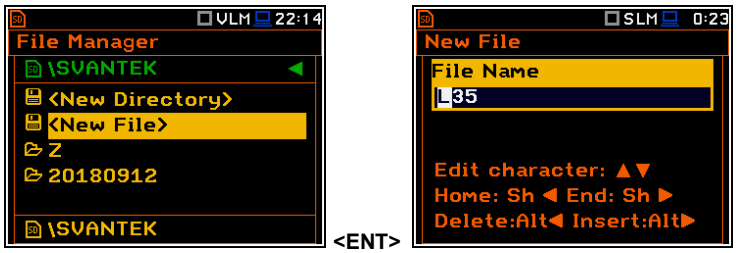
File with the proposed or created by you name will be saved in the working directory on the SD card or the USB disk.

There may be a naming conflict in the working directory. In this case, the instrument will save the file under the proposed name.



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.

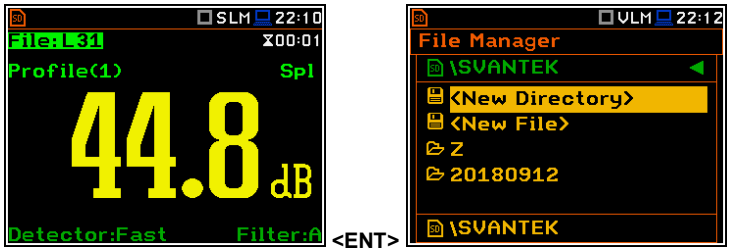
For this, open the **File Manager** after the measurement stop, select **New File** and press **<ENTER>**. The Summary results for the last cycle will be saved in the working directory.

***Note:** Manual saving is not possible during the running measurement. 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 6.1.1.

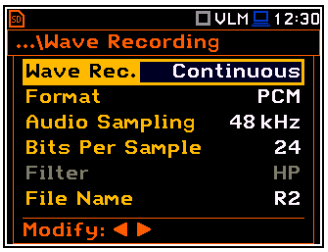


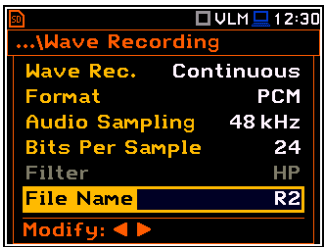
Automatic Wave files saving ( )

Wave files with an extension .WAV containing are also saved automatically in the same measurement directory as logger files (**hh-mm-ss**). To enable automatic saving next conditions should be fulfilled:

1. SD card or USB disc should be inserted and there should be enough space for new files.
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 file is **R**.





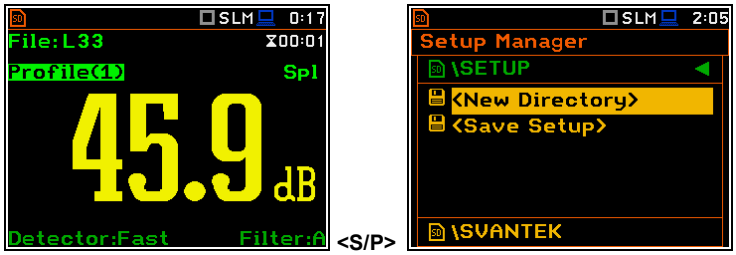
***Note:** If the **Logger** is disabled, wave files will be saved in the measurement directory which will be created after the **<Start>** keystroke.*

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

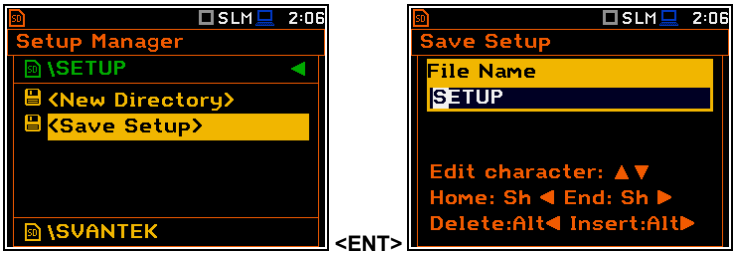
Note: *The wave files usually are big in size and may use enormous memory space. Since the wave-file name is not displayed on the result view screen, you should remember that wave recording function is active and switch it off always when wave recording is not required.*

Saving setup files ( )

The measurement configuration setup files can be stored in the 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 **SETUP**.



2.10 FILES DOWNLOADING AND UPLOADING

Downloading files

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

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

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).

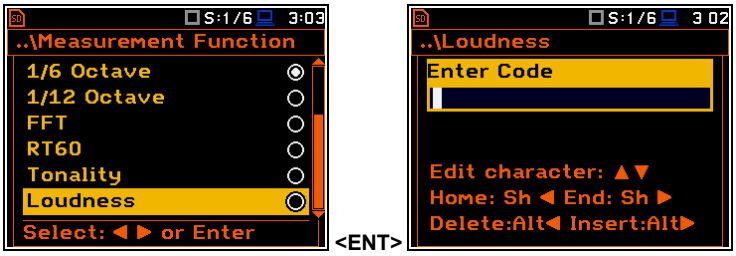
Files can be upload via micro SD card and USB disk or via SvanPC++ software.

2.11 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.

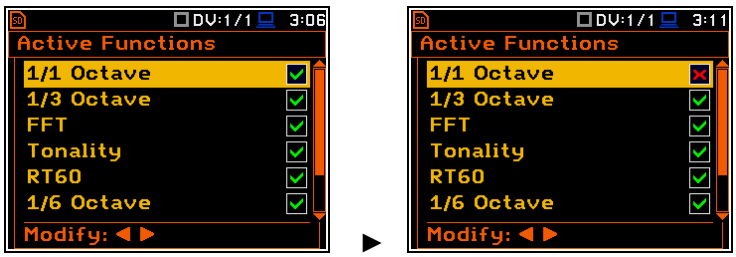
If additional functions were not supplied in the instrument kit and were not unblocked by the supplier, such a task is in responsibility of the user who decides to buy additional functions later.

The optional function should be activated in the moment of the first attempt to use it. For example, if the **Loudness** option 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.



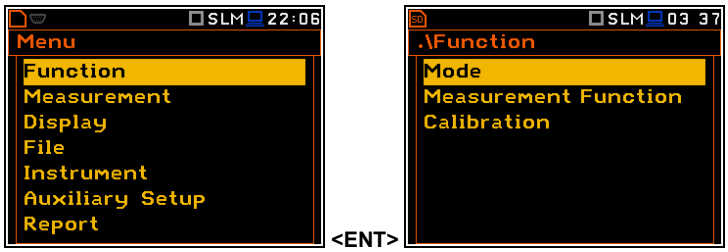
Pressing simultaneously **<Shift>** and ◄ keys right after turning on the instrument allows you to check and lock back early unlocked options.

For example, if you wish to lock the **1/1 Octave** function, deselect it and press **<ENTER>**. After this operation this option will be unavailable.



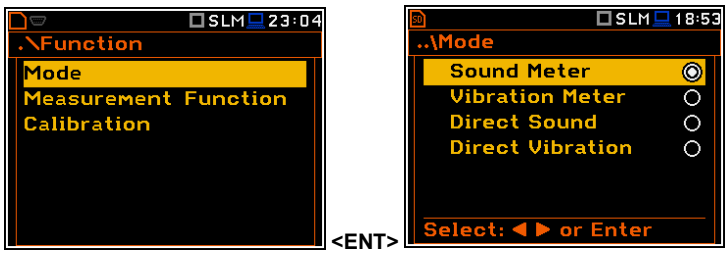
3 FUNCTIONS OF THE INSTRUMENT – Function

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**).



3.1 SELECTING THE INSTRUMENT MODE – MODE

The instrument can work in four modes – two sound modes: **Sound Meter** and **Direct Sound**; and two vibration modes: **Vibration Meter** and **Direct Vibration**.



The **Mode** relates to the type of transducer connected to the instrument: microphone with preamplifier or accelerometer. **Sound Meter** and **Vibration Mete**r modes relates to the Svantek standard accessories, while **Direct Sound** and **Direct Vibration** modes enable using of other manufactures' transducers.

Input modes are connected with IEPE current settings (see Chapter 7.7).

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****, etc.*

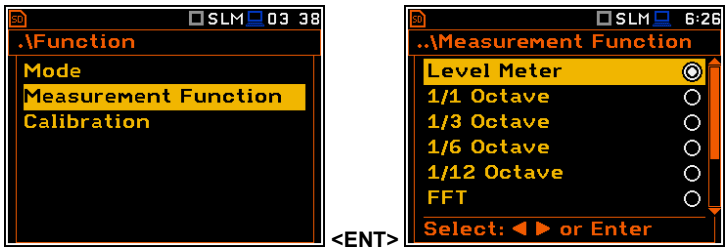
3.2 MEASUREMENT FUNCTIONS OF THE INSTRUMENT – MEASUREMENT FUNCTION

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, 1/3, 1/6 and 1/12 real time octave band or FFT frequency analysis functions. These functions extend the main broad band Level Meter functions of the instrument, because the analysis is performed along with all calculations of the broadband Level Meter results.

The instrument offers also specialized functions dedicated for the reverberation time (**RT60**), loudness (**Loudness**), tonality (**Tonality**) and speech transmission index (**STIPA**) assessments.

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



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:*

Mode: Sound Meter

- ***SLM*** ***Sound Level Meter**,*
- ***S:1/1*** ***Sound 1/1 Octave**,*
- ***S:1/3*** ***Sound 1/3 Octave**,*
- ***S:1/6*** ***Sound 1/6 Octave**,*
- ***S:1/12*** ***Sound 1/12 Octave**,*
- ***S:FFT*** ***Sound FFT**,*
- ***S:RT60*** ***Sound RT60**,*
- ***S:LOUD*** ***Sound Loudness**,*
- ***S:TON*** ***Sound Tonality***
- ***S:STI*** ***Sound STIPA***
- ***DSLM*** ***Direct Sound Level Meter**,*
- ***DS:1/1*** ***Direct Sound 1/1 Octave**,*
- ***DS:1/3*** ***Direct Sound 1/3 Octave**,*
- ***DS:1/6*** ***Direct Sound 1/6 Octave**,*
- ***DS:1/12*** ***Direct Sound 1/12 Octave**,*
- ***DS:FFT*** ***Direct Sound FFT**,*
- ***DS:RT60*** ***Direct Sound RT60,***
- ***DS:TON*** ***Direct Sound Tonality***
- ***DS:LOUD*** ***Direct Sound Loudness,***
- ***DS:STI*** ***Direct Sound STIPA***

Mode: Vibration Meter

- ***VLM*** ***Vibration Level Meter**,*
- ***V:1/1*** ***Vibration 1/1 Octave**,*
- ***V:1/3*** ***Vibration 1/3 Octave**,*
- ***V:1/6*** ***Vibration 1/6 Octave**,*
- ***V:1/12*** ***Vibration 1/12 Octave**,*
- ***V:FFT*** ***Vibration FFT**,*
- ***DVLM*** ***Direct Vibration Level Meter**,*
- ***DV:1/1*** ***Direct Vibration 1/1 Octave**,*
- ***DV:1/3*** ***Direct Vibration 1/3 Octave,***
- ***DV:1/6*** ***Direct Vibration 1/6 Octave,***
- ***DV:1/12*** ***Direct Vibration 1/12 Octave,***
- ***DV:FFT*** ***Direct Vibration FFT**.*

***Note:** Some 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 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.

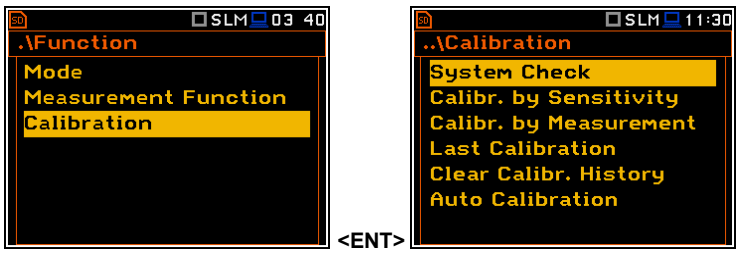
3.3 INSTRUMENT'S CALIBRATION – CALIBRATION

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 (**Last Calibration**, **Clear Calibr. History**) and switching on the automatic calibration (**Auto Calibration**).



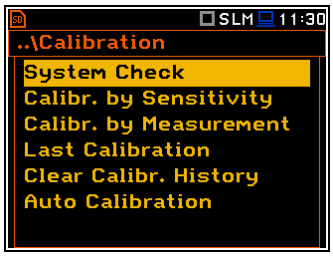
Note: *The calibration factor is always added to measurement results and measurement range limits of the* ***Level Meter****,* ***1/1 Octave****,* ***1/3 Octave*** *and other functions.*

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).*

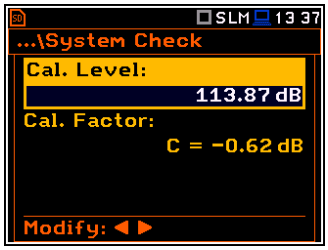
Note: *It is not possible to check and calibrate the instrument during the execution of live measurements. It is possible to open different lists and sub-lists but the positions in these lists are displayed greyed out inversely and so - not accessible. The flashing „measurement" icon on the top line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

3.3.1 System Check

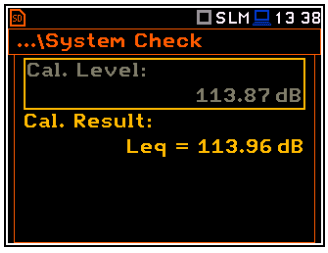
ISO 8041-1:2017 standard advises users to perform in-situ checks of measuring instruments. Checking should be carried out immediately before and after the measurement.



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>** key.



The measurement starts without delay. If maximal difference between three 1-second consecutive results (Leq(C) or RMS) 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**.

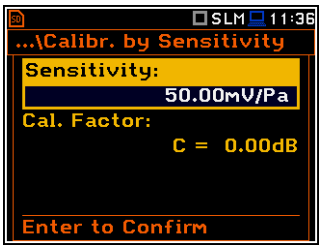
Note: *It is advised to perform the system check of the instrument each time before the measurements begin. If system check gives negative result, then it is necessary to perform calibration.*

3.3.2 Calibration by Sensitivity (Acoustic signal)

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



<ENT>

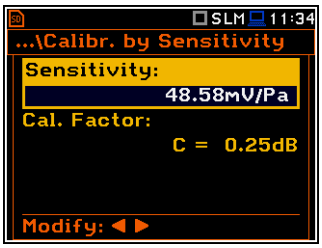


1. Select the **Calibr. by Sensitivity** position in the **Calibration** list and press **<ENTER>**.
2. Set the **Sensitivity** of the microphone taken from its calibration certificate using the ◄ / ► key and then press **<ENTER>.** The calibration factor (**Cal. Factor**) is calculated every time after pressing the ◄ / ► key, in relation to the nominal value of 50.00 mV/Pa.

For microphones with sensitivity higher than 50.0 mV/Pa the calibration factor will always be negative.

For microphones with sensitivity lower than 50.0 mV/Pa the calibration factor will always be positive.

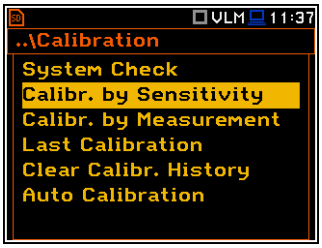
The lowest available value of the sensitivity that can be introduced is equal to 50.0 µV/Pa (it conforms to the calibration factor equal to 60.0 dB) and the highest value is equal to 50.0 V/Pa (calibration factor is equal to -60.0 dB).



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

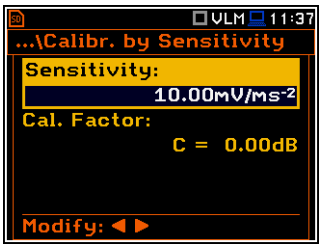
3.3.3 Calibration by Sensitivity (Vibration signal)

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.

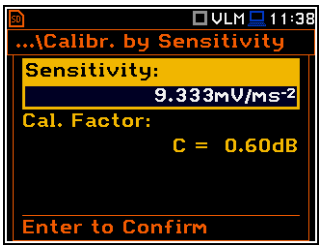
The calibration factor (**Cal. Factor**) is calculated every time after pressing the ◄ / ► key, in relation to the nominal value of 10.0 mV/ms^{-2}.



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.

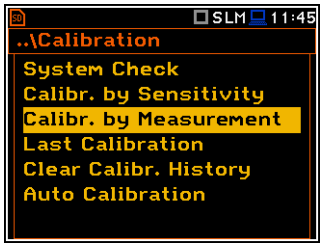
The lowest available value of the sensitivity that can be introduced is equal to 10.0 µV/ms^{-2} (it conforms to the calibration factor equal to 60.0 dB) and the highest value is equal to 10.0 V/ms^{-2} (calibration factor is equal to -60.0 dB).



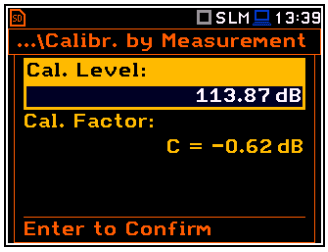
3. To confirm the new calibration factor, press **<ENTER>**, or to return to the **Calibration** list without changes, press **<ESC>**.

3.3.4 Calibration by Measurement (Acoustic signal)

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

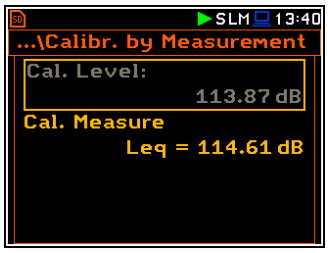


1. Select the **Calibr. by Measurement** position in the **Calibration** list and press **<ENTER>**.



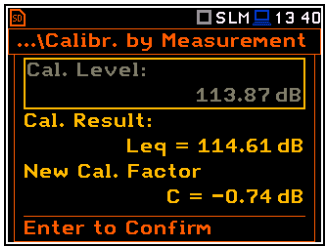
2. Set the reference calibration level (**Cal. Level**) – see Appendix C, Chapter C.1, par. Calibration.
3. Attach the acoustic calibrator SV 36 (or equivalent 114 dB@1000 Hz) carefully over the microphone of the instrument.

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.*



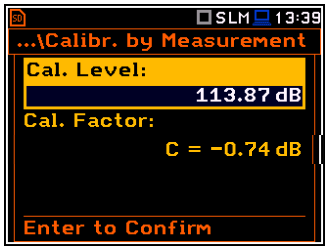
4. Switch on the calibrator (if the used calibrator doesn't have auto run function) and wait approximately 30 seconds for the tone to stabilise before starting the calibration measurement.
5. Start the calibration measurement by pressing the **<Start>** key.

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.
7. Press **<ENTER>** to exits the **Calibration by Measuement** 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:

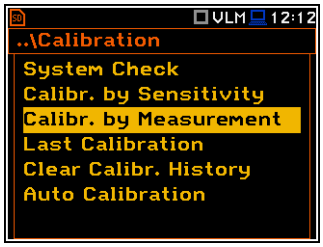
- the calibrator is not properly attached to the instrument,
- there are external acoustic disturbances such as high noise levels close by,
- the calibrator or the measurement channel (the microphone, the preamplifier or the instrument itself) are damaged.

8. Detach the calibrator from the microphone.

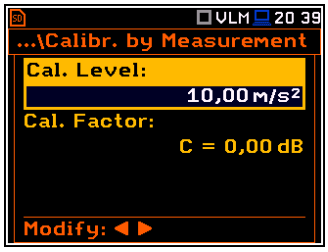
Note: *During the calibration measurement, any external disturbances (acoustic noise or vibrations) should not exceed a value of 100 dB (when using a calibrator that generates a level of 114 dB).*

3.3.5 Calibration by Measurement (Vibration signal)

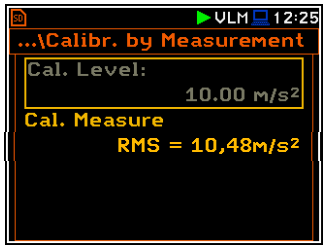
Calibration by measurement of the vibration signal can be done in the following way:



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

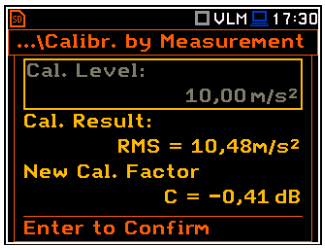


2. Set the calibration level (**Cal. Level**) appropriate to the used calibrator. The default level for calibration in the vibration mode is 10 m/s^2 at 159.2 Hz. Remember to change this level if using an alternative vibration calibration signal source.
3. Attach the instrument's accelerometer to the vibration calibrator using an appropriate or recommended fixing method.



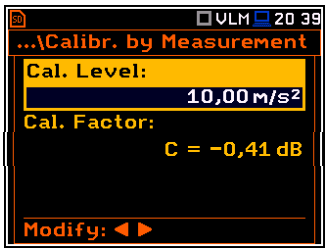
4. Switch on the calibrator and wait approximately 30 seconds before starting the calibration measurement.
5. Start the calibration measurement by pressing the **<Start>** key.

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 (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 **<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.
7. Press **<ENTER>** to exits the **Calibration by Measuement** 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.

8. Detach the accelerometer from the calibrator.

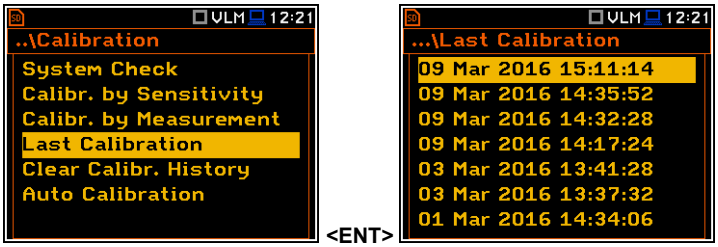


Note: *During the calibration measurement, the external disturbances (vibrations or acoustic noise) should not exceed a value of 1/10 of the level of the calibration level signal being used.*

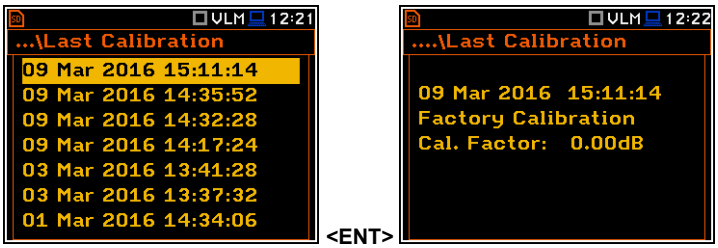
3.3.6 History of performed calibrations – Last Calibration

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

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



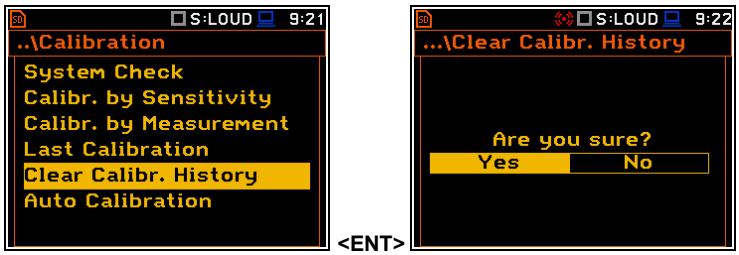
The calibration record screen contains the information regarding the performed calibration: date and time, used calibration method, obtained calibration factor.



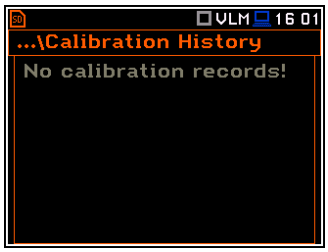
3.3.7 Erasing calibration records – Clear Calibr. History

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*).

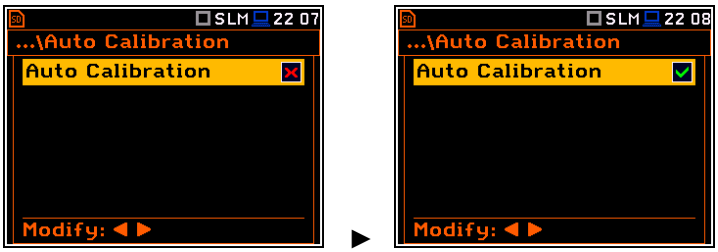


Note: *Acoustic and vibration calibration histories are independent files in the internal instrument's memory and erasing the calibration history in one mode does not erase it in another mode.*

3.3.8 Automatic calibration – Auto Calibration

Automatic calibration feature enables calibration of the instrument 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 with the reference calibration level and starts the calibration measurement if the stable result is within ±5dB of the calibration level.



To perform the automatic microphone calibration, follow next steps:

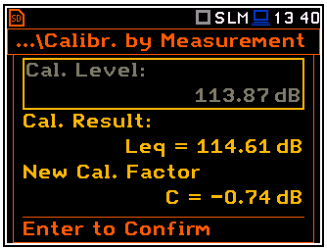
1. Switch on the instrument.
2. Attach the SV 36 (or equivalent 94/114 dB@1000 Hz) calibrator to the microphone and switch it on (if the used calibrator doesn't have automatic switch-on feature).

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 as in case of calibration by measurement The measurement can be always stopped by the **<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.

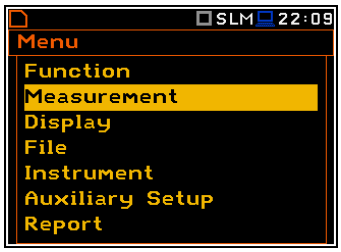


3. Press **<ENTER>** to save the new calibration factor (**Enter to Confirm**), press **<ESC>** to reject it. In both cases the instrument exits the **Calibration by Measurement** screen.
4. Detach the calibrator from the microphone.

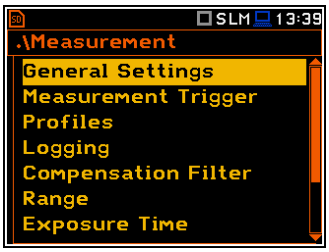
4 CONFIGURING MEASUREMENT PARAMETERS – Measurement

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

The content of the **Measurement** list depends on settings of **Mode** and **Measurement Function**.



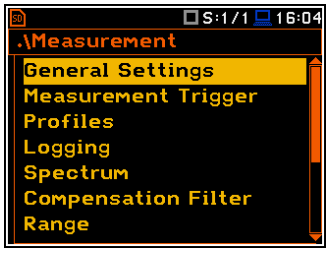
<ENT>

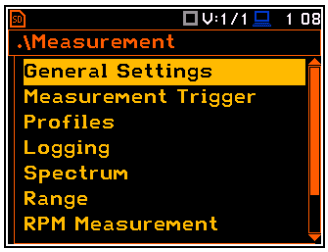


The **Measurement** list contains the following positions:

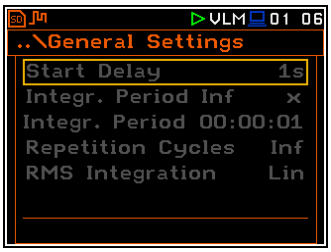
General Settings	allowing you to set up general measurement parameters,
Measurement Trigger	allowing you to set up the measurement trigger,
Profiles	allowing you to program the profile parameters,
Logging	allowing you to program the logging function,
Spectrum	allowing you to set up the octave spectrum parameters; this position appears for the **1/1 Octave**, **1/3 Octave**, **1/6 Octave** and **1/12 Octave** functions,
FFT	allowing you to set up the FFT spectrum parameters; this position appears for the **FFT** function,
RT60	allowing you to set up the RT60 parameters; this position appears for the **RT60** function,
Tonality	allowing you to set up the Tonality parameters; this position appears for the **Tonality** function,
STIPA Settings	allowing you to set up the STIPA parameters; this position appears for the **STIPA** function,
Ambient noise	allowing you to set the ambient noise levels; this position appears for the **STIPA** function,
Compensation Filter	allowing you to switch on the required microphone compensation filter,
Range	allowing you to select the correct measurement range,
Exposure Time	allowing you to set the daily exposure time for dose measurements,
Statistical Levels	allowing you to define 10 statistical levels,
Timer	allowing you to programme the delayed start timer,
Alarms	allowing you to check the status of the advanced alarm function; this position appears if 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 attached.



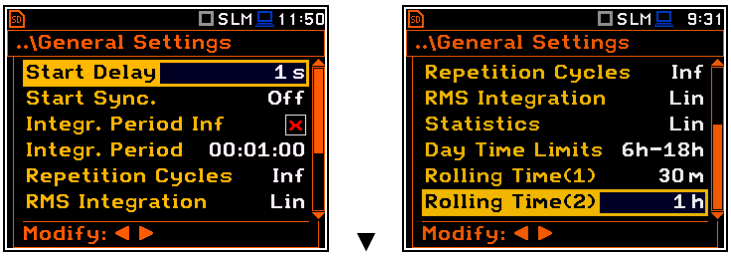


Any parameter in the **Measurement** list can be changed only when the instrument is not currently executing a measurement. The parameters are displayed with grey colour. The blinking „measurement" icon indicates that the instrument is performing a measurement.

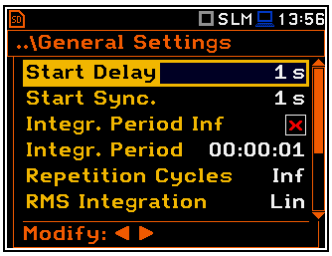


4.1 SETTING UP GENERAL MEASUREMENT PARAMETERS – GENERAL SETTINGS

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**), RMS detector type for statistic results (**Statistics**), day time hours (**Day Time Limits**) and time window for the **LRm** results (**Rolling Time**).

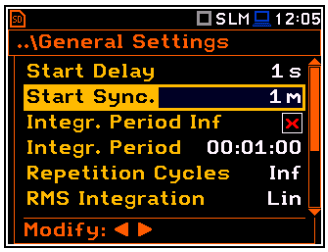


Delay of measurement start



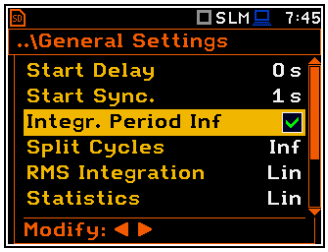
The **Start Delay** parameter defines the delay period from the **<Start>** keystroke to the real start of the measurement (digital filters of the instrument constantly analyses the input signal even when the measurement is stopped). This delay period can be set from **0 second** to **60 seconds**.

Synchronisation of measurement start



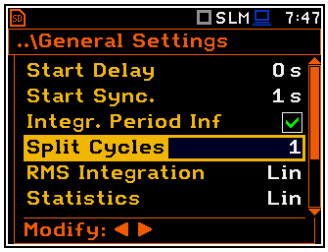
The **Start Sync.** parameter defines synchronisation points with the instrument's RTC and can be set as: **Off**, **1m**, **15m**, **30m** and **1h**. For example, if **1h** is selected, the measurement will start from the beginning of the first second of next hour after the **<Start>** keystroke, and then will be repeated also from the first second of the following hour after elapsing the integration period if the number of cycles is greater than one. Default value: **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.

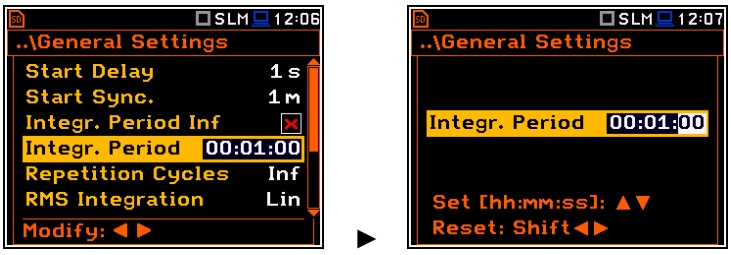
If the **Integr. Period Inf** parameter is On, the **Split Cycles** position appears.



The **Split Cycles** position enables you to limit the number of logger files when the measurement period is not defined. If you select the number instead of **Inf** the logger splitting will be performed no more times than this number.

If the **Integr. Period Inf** parameter is Off, instead the **Split Cycles** position two additional positions appear: **Integration Period** and **Repetition Cycles**.

Measurement period



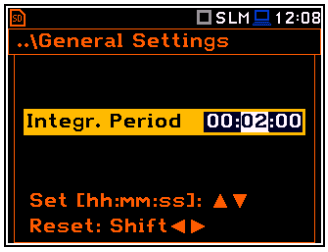
The **Integr. Period** parameter (integration period) defines the period during which the signal is being measured (and for some results integrated) and measured values logged in the result file as **Summary Results**. The integration period can be set in the special screen, which is opened with the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

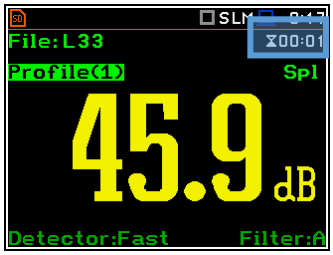
The definitions of the measurement results in which the integration period is used are given in Appendix D.

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.

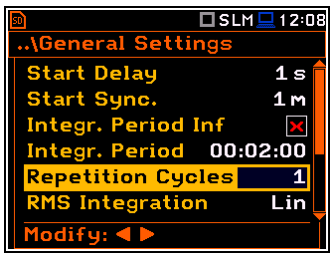
The time passed from the measurement start is displayed in the right upper corner of the measurement screen in the format ⌛ **mm:ss** in the range from 00:00 to 59:59, or in the format ⌛ **hh:mm:ss** in the range from 01:00:00 to 99:59:59, or in the format ⌛ **xxxh** from 100h to 999h, and ⌛ **>999h** 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>** 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.

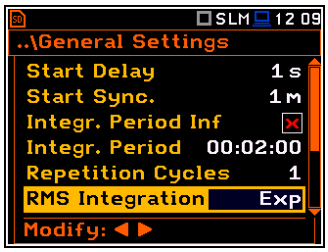


Note: *In case of an infinite integration period or infinite repetition cycles the measurement should be stopped with the* **<Stop>** *key.*

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**, **L(den)** results can be calculated with both detectors, and **Lmax**, **Lmin**, **Spl**, **Ltm3**, **LTeq** results – only with the exponential detector.



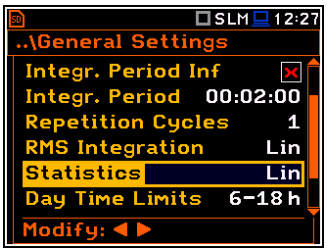
For vibration measurements, **RMS** result can be calculated with both detectors, and **Max** results – only with the exponential detector.

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 **L(den)** 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 **L(den)** 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*).

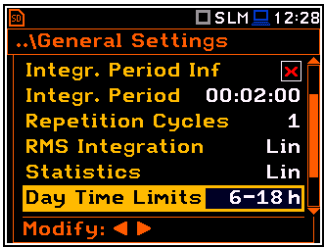
Detector for statistics

The **Statistics** parameter defines the method for calculation of statistical results **Ln**. 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. Default value: **Lin**.

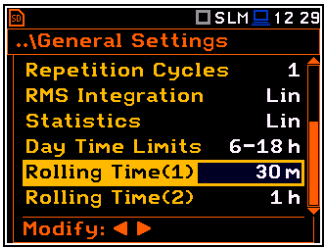


Day time limits

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**.

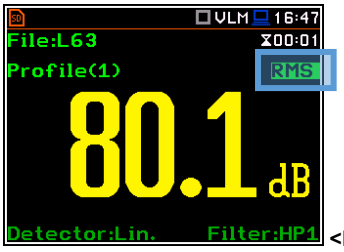


The **Rolling Time(x)** parameter defines „time window" for the "Rolling Leq" calculation. The Rolling Leq are presented as LR+<time window>. For example, if the **Rolling Time** is equal to 30 minutes, the appropriate result will be named as **LR30** and will be calculated each second as Leq of last 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**).

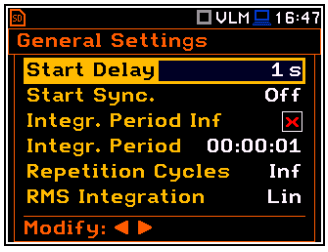


***Note:** In case of vibration measurements, positions **Statistics**, **Day Time Limits** and **Rolling Time(x)** are not presented in the **General Settings** list.*

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>**.



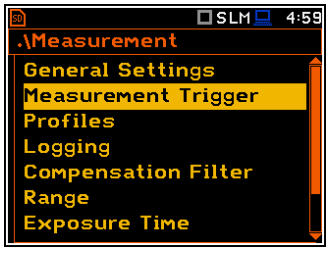
<ENT>



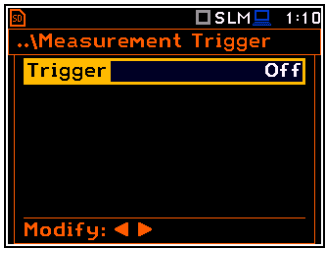
4.2 SETTING MEASUREMENT TRIGGER – MEASUREMENT TRIGGER

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.

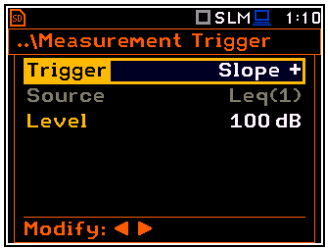


<ENT>



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 selected, additional parameters can be defined: the measurement result that is checked for a trigger condition (**Source**), its threshold value (**Level**) and the rate of its changing (**Gradient**).

Slope trigger

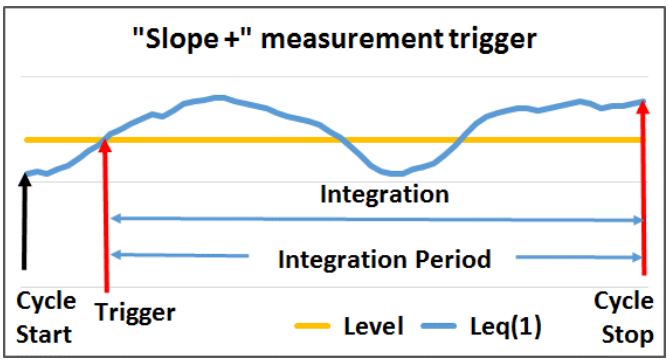


The **Slope +** / **Slope -** trigger starts the measurement/integration with the duration of the **Integration Period** on condition: rising value of the measured result (**Source**) averaged by 0.5 ms passes above/below the threshold value (**Level**).

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 continuous series of 1-second integrations, the number of which is equal to the number of seconds in the **Integration Period**.

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

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

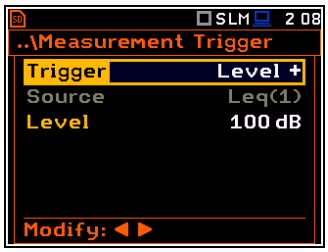




Note: *When a measurement is waiting for the slope trigger, the "slope" icon appears alternatively with the „measurement" icon.*



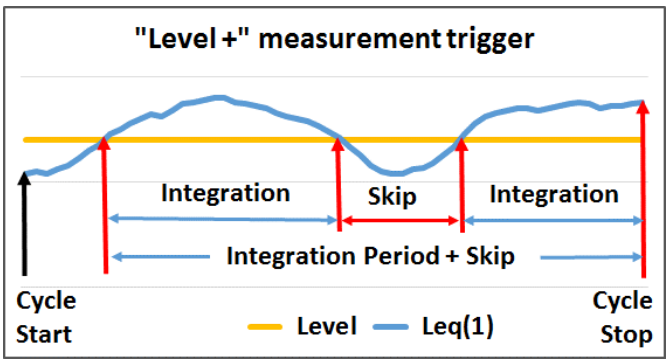
Level trigger



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

When a new measurement cycle begins (after pressing **<Start>** key or automatically after previous measurement cycle stop) 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 may not be continuous, and the duration of the measurement cycle may be longer than the Integration Period.



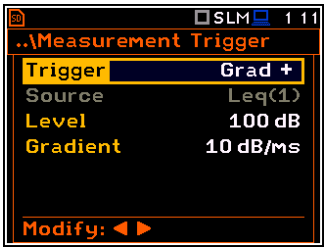
The measurement can be stopped manually at any moment with the **<Stop>** key. Summary Results are calculated on the base of series of 1-second results measured during each measurement cycle and saved in a logger file.



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



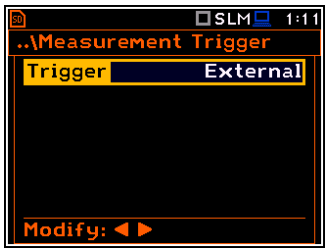
Gradient trigger



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

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

External trigger

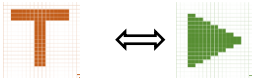


When **External** is selected, the measurement is triggering by the external signal on the **I/O** socket. In this case, it is necessary to set up the **I/O Mode** parameter as **Digital In** (*path: <Menu> / Instrument / Multifunction I/O*).

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.*

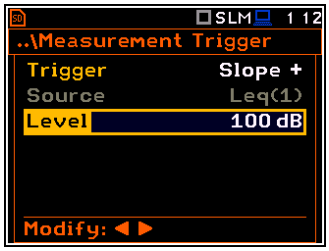


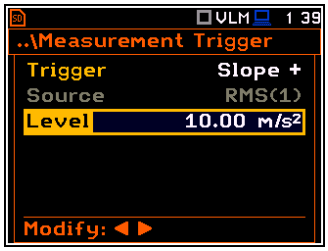
Source result

Only one measured result (**Source**) can be used for checking trigger condition in the **Level Meter** mode, namely the instantaneous RMS from the first profile (with appropriate filter and detector), 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

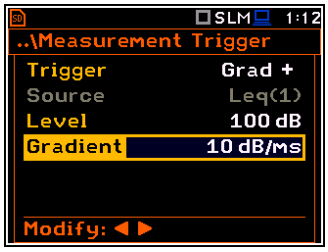
The threshold level for the measurement trigger (**Level**) can be set with 1 dB step in the range from 24 dB to 136 dB in sound modes and from 64dB (1.585mm/s^2) to 176dB (631 m/s^2) in vibration modes.





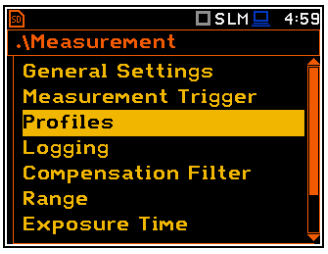
Rate of Source value changing

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

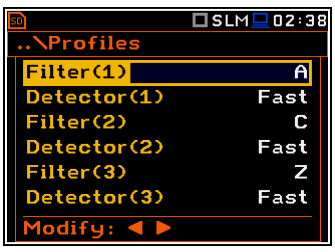


4.3 SETTING PARAMETERS FOR PROFILES – PROFILES

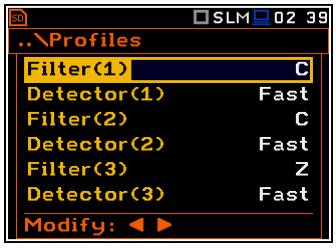
The **Profiles** list enables programming of three virtual level meters (Profiles), which measure the set of results with the same weighting filter (**Filter**) and exponential detector time constant (**Detector**) (see Appendix D). Default values – see Chapter 2.7.



<ENT>



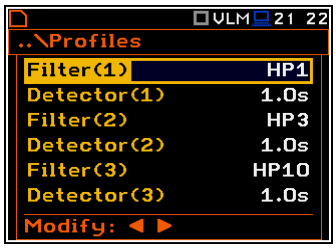
Weighting filter selection



Sound measurements

- **Z** according to IEC 61672-1:2013 for Class 1,
- **A** according to IEC 61672-1:2013 for Class 1,
- **C** according to IEC 61672-1:2013 for Class 1,
- **B** according to IEC 60651 for Class 1,
- **G** according to ISO 7196:1995,
- **R1**, **R2**, **R3** – user real time filters if they were activated *(path: <Menu> / Auxiliary Setup / User Filters / Real Time Filters).*

Vibration measurements



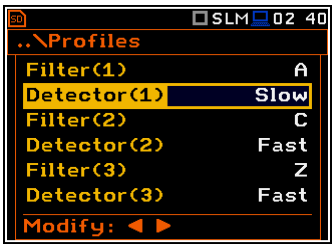
- acceleration measurements: **HP**, **HP1**, **HP3**, **HP10**, **Wh**,
- velocity measurements: **Vel1**, **Vel3**, **Vel10** and **VelMF**,
- displacement measurements: **Dil1**, **Dil3** and **Dil10**,
- **R1**, **R2**, **R3** – user real time filters if they were activated *(path: <Menu> / Auxiliary Setup / User Filters / Real Time Filters).*

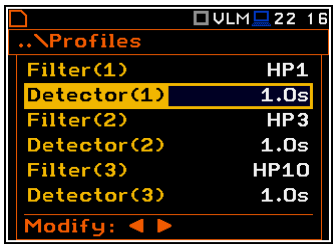
The characteristics of these filters are given in Appendix C.

***Note:** The **Real Time Filters** for SVAN 979 is an extra cost option, part number **SV 979_16**.*

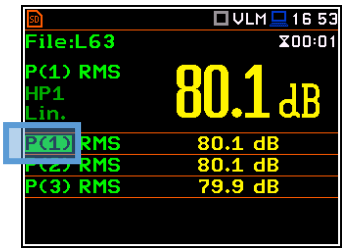
RMS detector

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.

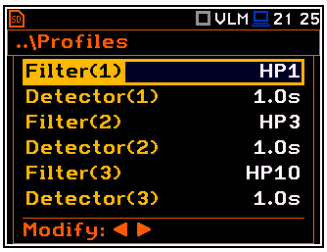




You can easily access the **Profiles** screen from the result view screen. It is necessary to put the cursor on some profile field (for example, **P(1)**) with the ▲ / ▼ or ◄ / ► key and press **<ENTER>**.



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4.4 DATA LOGGING – LOGGING

Summary Results (**Peak**, **Max**, **Min**, **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, 10 x **Ln**, **EX**, **SD**, **LR1**, **LR2**, **OVL**, **NC**, **NR** for Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P**, **MTVV** for Vibration measurements as well as 1/1÷1/12 octave or FFT spectra with Total results and meteo 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.

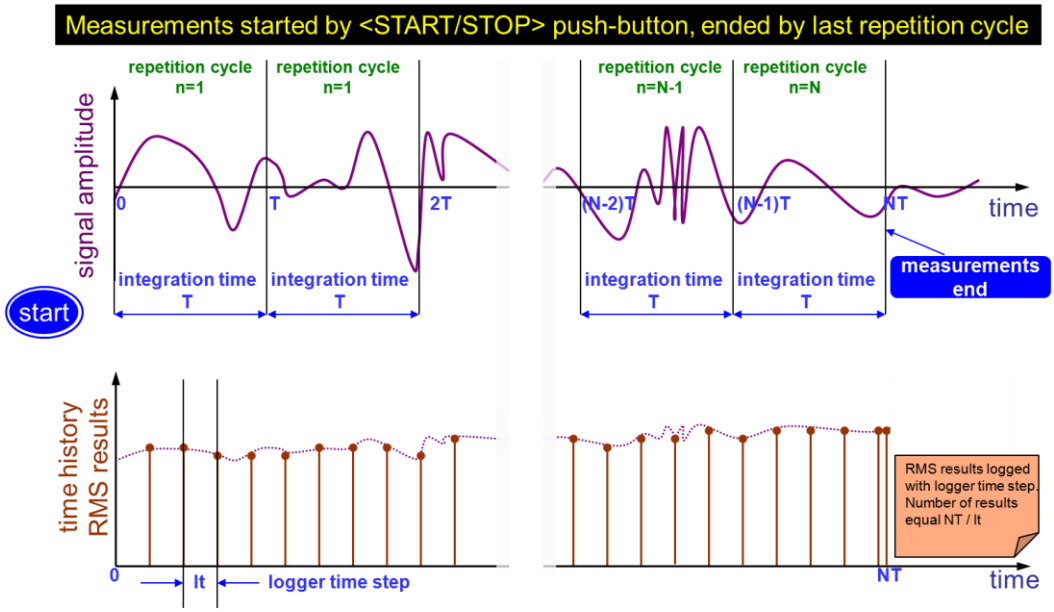
The instrument enables also additional registration of some results with different step defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup*). Therefore, it is possible to save in parallel two sequences of measured results – one for **Summary Results** and another for so called **Logger Results**.

When logging is enabled, selected 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 - 1/12 octave spectra with Total results and meteo results) can be saved simultaneously with time step down to **2ms**. Recording of logger results in a file is stopped after the period, which is equal to **Integration Period** multiplied by **Repetition Cycles** or after stopping a measurement manually.

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

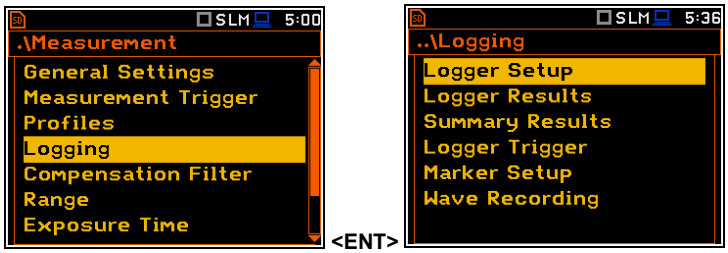
Summary results are saved in the same file with logger results. Blocks of summary results are recorded in the file in the end of every measurement cycle.

The figure below illustrates principles of saving measurement results.



Summary Results and Logger Results logging

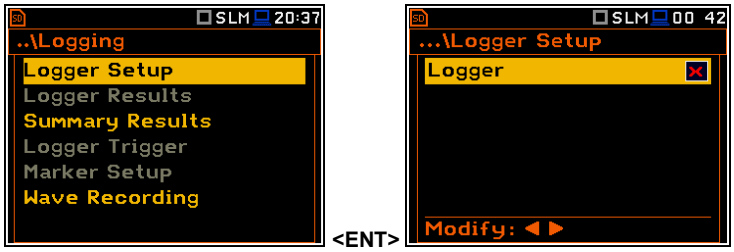
The **Logging** list enables programming of the logging functions: recording of summary and logger results (measurement history) in a logger file and recording of audio signal in a wave file.



4.4.1 Setting logger general parameters – Logger Setup

The **Logger Setup** list enables activating the logger function and programming logging general parameters.

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



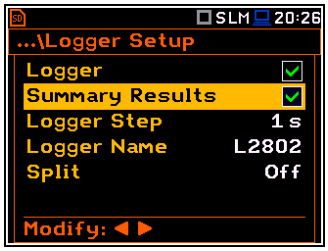
***Note:** If **Logger** is disabled, result files will not be created automatically, and only general results from the last measurement cycle can be saved manually!*

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. Default mode: enabled.



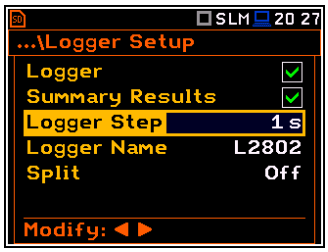
Summary Results saving

The **Summary Results** position enables saving of summary results for each measurement cycle including results obtained from the weather station (**Meteo** results), statistics and spectra. Default value: enabled.



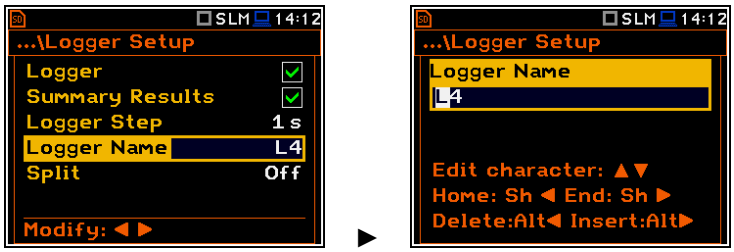
Logger step

Logger Step defines a period of the logger results measuring and logging 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**. Default value: **1 s**.



Logger file name

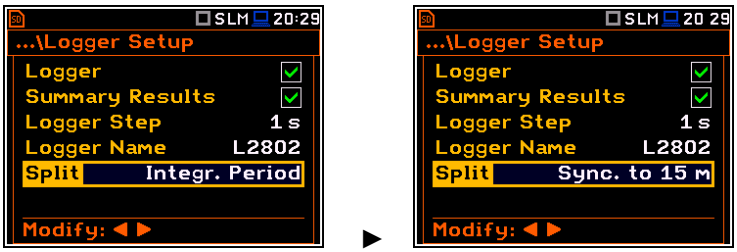
The **Logger Name** position allows you to define the logger file name, which consists of a prefix and a number. The default logger file prefix is **L**. The name can be up to eight characters long. After pressing the ◄ / ► key, the special screen with text editor function is opened.



Splitting logger file

The **Split** position enables splitting the data logging into separate files. If the **Split** parameter is **Off** the data will be logged in one logger file with the name defined in the **Logger Name** position. Default value: **Off**.

In other cases, registration will be carried out in separate files and the registration in the new file will start after expiration of integration period (**Integr. Period**), or at every quarter of the RTC (**Sync. to 15m**), or at every half an hour of the RTC (**Sync. to 30m**), or at every hour of the RTC (**Sync. to 1h**), or at specified by the user times (**Spec. Time**).



Whenever the split time is achieved the logger file is closed and the new file with the increased by one number is opened for subsequent measurement data.

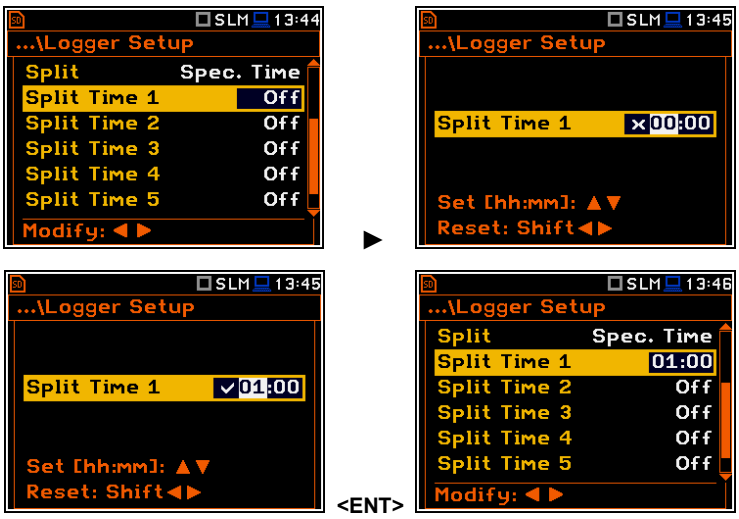
If **Spec. Time** is selected, 6 additional positions appear in the end of the **Logger Setup** list (**Split Time X**).

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.

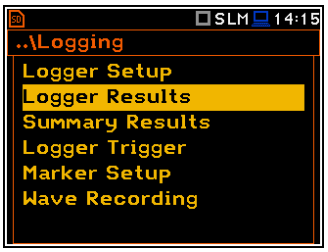
In the time edition line, you may define hour and minute of the split operation and switch on (☑) or off (☒) the current split.

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

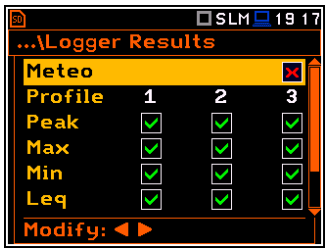


4.4.2 Selecting results for logging – Logger Results

In the **Logger Results** list you can select results for three independent 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 logged in a logger file with the **Logger Step**.



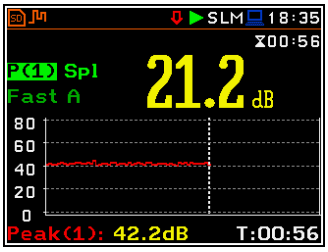
<ENT>



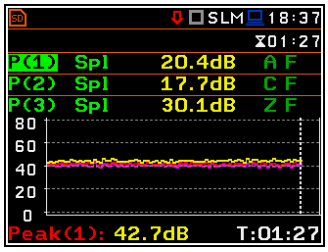
Activation/ deactivation can be done with the ◄ / ► key pressed together with **<Alt>**. The position is changed with the ◄ / ► or ▲ / ▼ key.

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.

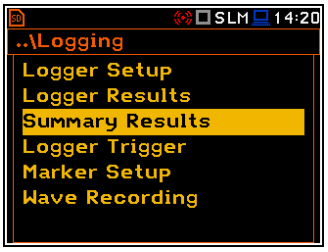


<Alt>+▲

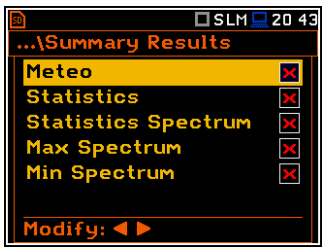


4.4.3 Selecting additional summary results for saving – Summary Results

The **Summary Results** list allows you to include/exclude logging of 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. Default modes: all disabled.



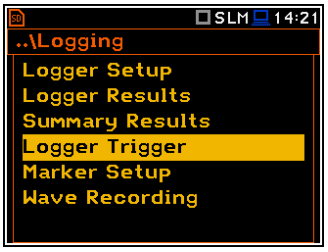
<ENT>



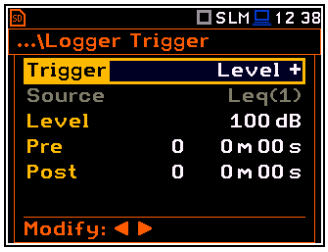
Note: *The* ***Meteo*** *results are transmitted to the instrument from the weather station connected to the SV 279 monitoring station.*

4.4.4 Configuring Logger trigger – 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 (**Level+** or **Level-**) in the **Trigger** position. Default value: **Off**.

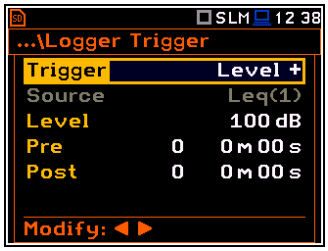


<ENT>



When the trigger is enabled, 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 file before the first fulfilment of the trigger condition (**Pre**) and after the last fulfilment of the trigger condition (**Post**) during the measurement period

Level trigger

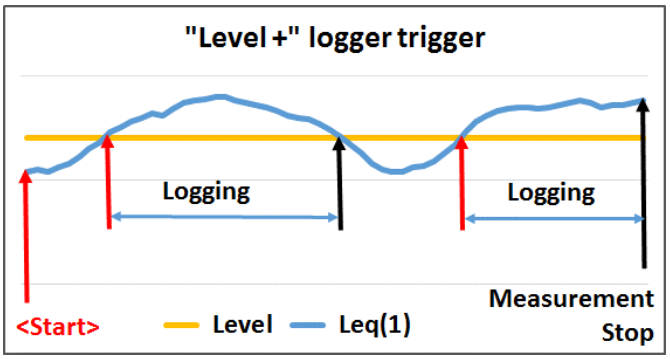


The **Level +** / **Level -** trigger enables logging of the Logger results with the **Logger Step** on condition: value of the measured result (**Source**) averaged over the **Logger Step** period is greater/lower than the threshold value (**Level**). In other cases, the logging is skipped.

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

The logging is active only when the summary results are measured, i.e. from the measurement start till the measurement stop.

This means, for example, that when the measurement is waiting for a trigger condition, logging is skipped, even if the logger trigger condition is met.



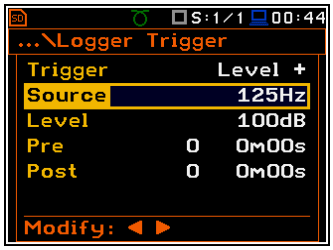
***Note:** When logging is waiting for the level trigger the "level" icon appears alternatively with the „curve" icon.*



Source result

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

When the **1/1 Octave** or **1/3 Octave** mode is chosen it is possible to use the RMS band-pass value of one of the 1/1 octave or 1/3 octave spectrum filters with the appropriate central frequency as the source of the triggering signal for the logger.

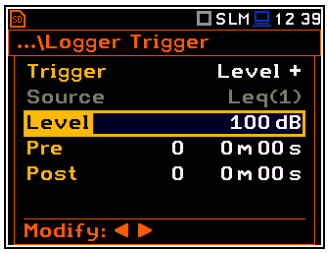


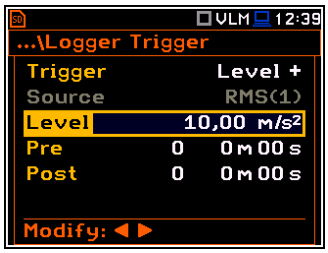
Available values of the **Source** parameter for the **1/1 Octave** mode: **Leq(1)**/**RMS(1)**, **125Hz**, **250Hz**, **500Hz**, **1.00kHz**, **2.00kHz**, **4.00kHz**, **8.00kHz**, **16.0kHz**.

Available values of the **Source** parameter for the **1/3 Octave** mode: **Leq(1)** /**RMS(1)**, **125Hz**, **160Hz**, **200Hz**, **250Hz**, **315Hz**, **400Hz**, **500Hz**, **630Hz**, **800Hz**, **1.00kHz**, **1.25kHz**, **1.60kHz**, **2.00kHz**, **2.50kHz**, **3.15kHz**, **4.00kHz**, **5.00kHz**, **6.30kHz**, **8.00kHz**, **10.0kHz**, **12.5kHz**, **16.0kHz**, **20.0kHz**.

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 1 mm/s^2 (60 dB) to 10 km/s^2 (200 dB) in vibration mode.



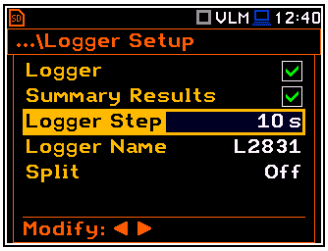


Pre and post trigger logging

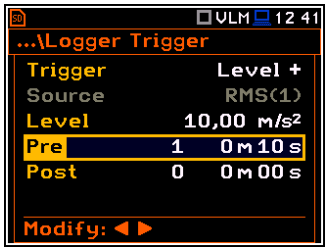
In the **Pre Trigger** position, you can define the number of results which will be registered in the logger file before the fulfilment of the first trigger condition. This number can be set in the range 0..50.

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



=>



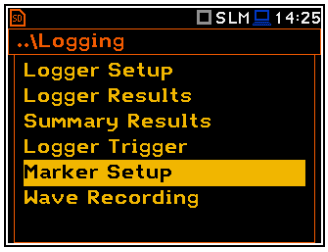
These parameters can perform double role. Firstly, when you wish to collect data right after or before the event that caused logger trigger. Secondly, when it is necessary to have continuous logging, but the source is oscillating near the threshold level. The extension of the registration window allows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

Periods of logging before or after fulfilment of the trigger condition are shown to the right of the number in minutes and seconds (in the format **0m00s**) as a result of multiplication of number of results by the **Logger Step**.

4.4.5 Setting 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 the 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 you to assign a specific name for each marker, select its type (normal or **Point**) and define markers for triggering wave recording (**Trig** column).



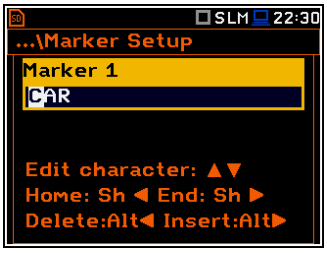
<ENT>



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

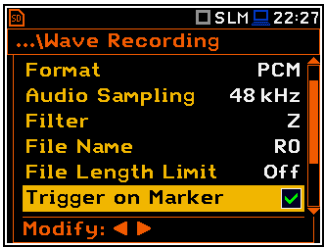


<Alt>+►

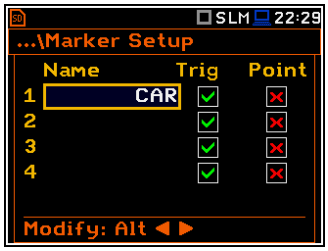


The **Trig** column becomes active only when **Trigger on Marker** (*path: <Menu> / Measurement / Logging / Wave Recording*) is enabled.

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

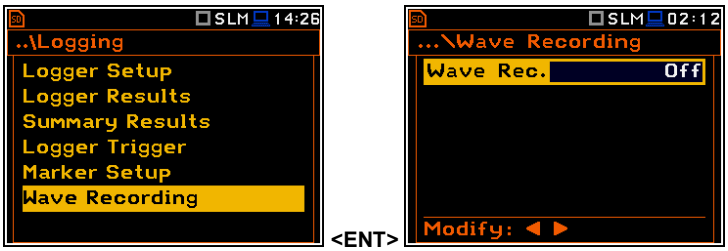


=>



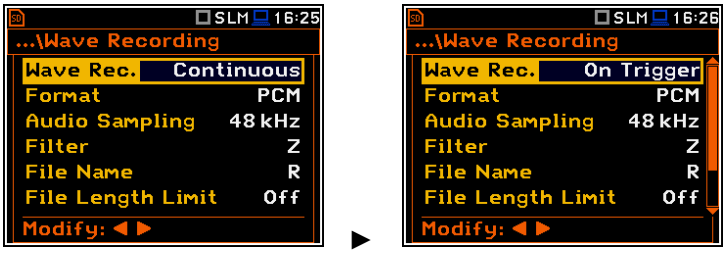
4.4.6 Configuring signal recording – Wave Recording

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 same measurement directory as logger files (**hh-mm-ss**).



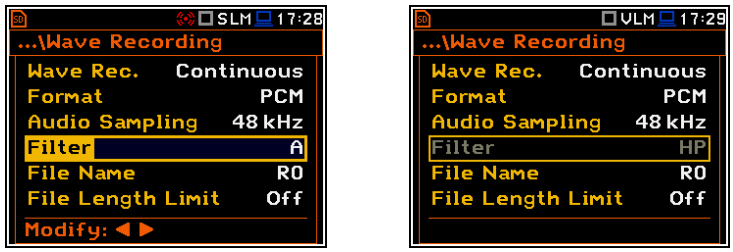
The **Wave Rec.** parameter, if it is not **Off**, defines a way a recording should be done, continuously during the measurement (**Continuous**) or triggered conditionally (**On Trigger**). Default value: **Off**.

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



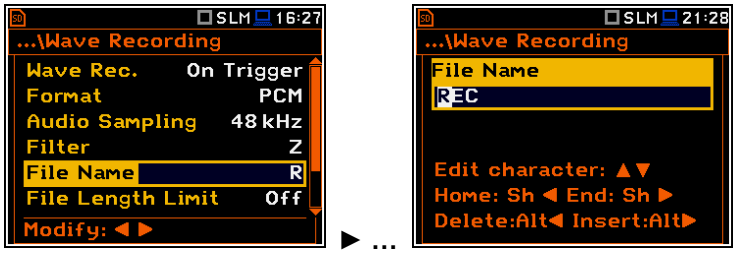
The **Audio Sampling** parameter defines the sampling frequency of the wave recording: **12kHz**, **24kHz** or **48kHz**.

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

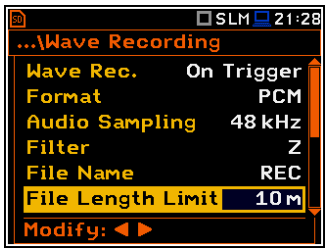


The **File Name** parameter defines the name of the wave file.

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



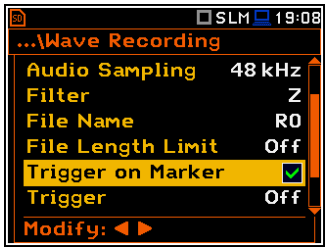
The **File Length Limit** parameter enables defining the limit length of the signal recorded to the WAV file. When **Off** is selected, the signal will be recorded without limitation. To put limitation on the record time, select the value in the range from 10 min to 8 hours.



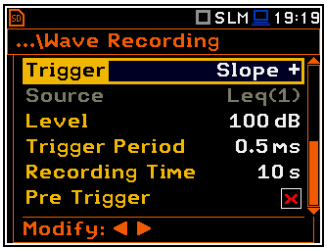
Wave Trigger

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** and **Integr. Period**.



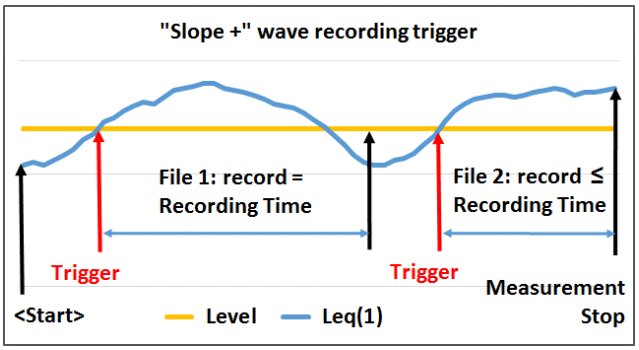
Slope trigger



The **Slope+ / Slope-** trigger starts a signal recording on condition: rising/falling value of the measured result (**Source**) averaged over the **Trigger Period** passes above/below the threshold value (**Level**).

After pressing the **<Start>** key the instrument checks the trigger condition with steps, defined by the **Trigger Period** parameter, and if condition is met starts the signal recording. Recording will last **Recording Time** (unless the measurement is stopped earlier), and during this time the instrument continues to check the trigger condition with the **Trigger Period** step. If next trigger condition is met during **Recording Time** (provided that **Trigger Period** is shorter than **Recording Time**) the instrument triggers recording again, so it will continue 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**. Several WAV files can be created during one measurement.

The attached 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. During the second recording the measurement was stopped, and the record is shorter than **Recording Time**.

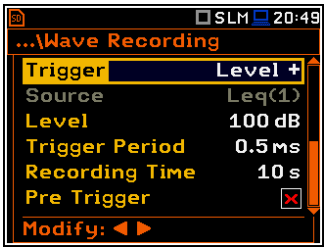




Note: *When recording is waiting for the slope trigger the "slope" icon appears alternatively with the „wave" icon.*

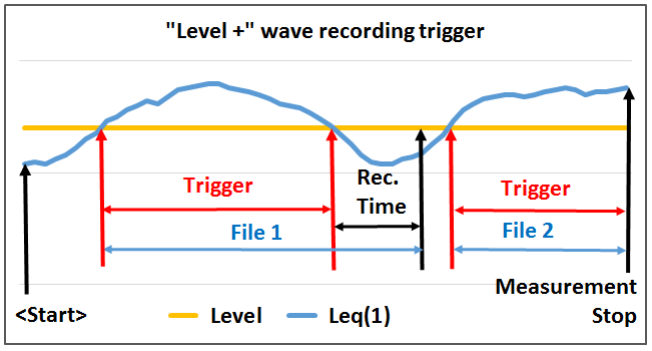


Level trigger



The **Level +** / **Level -** trigger starts a signal recording which will last **Recording Time** (unless the measurement is stopped earlier) on condition: value of the measured result (**Source**) averaged over the **Trigger Period** is greater/lower than the threshold value (**Level**). In other cases, recording doesn't start, but if it has been already started it will 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 recording is waiting for the level trigger the "level" icon appears alternatively with the „wave" icon.*



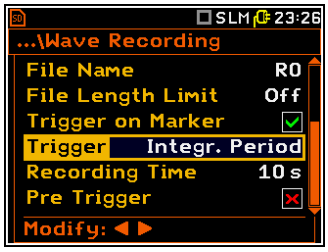
External type trigger



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 **Recording Time** (unless the measurement is stopped earlier) and if during this time new external trigger appears the instrument will prolong recording for another **Recording Time**.

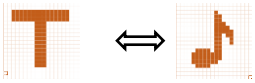
Integr. Period type trigger



When the **Integr. Period** trigger is selected, recording is triggering every time the measurement starts and lasts **Recording Time** (unless the measurement is stopped earlier). 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.



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



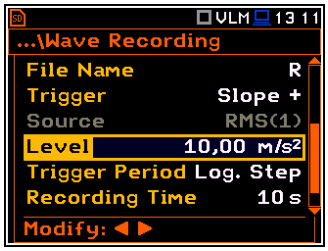
Source result

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

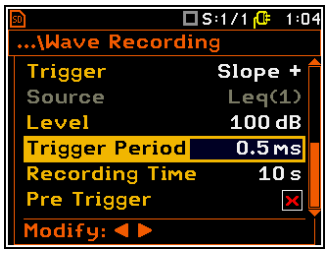
This result averaged for the **Trigger Period** is compared with the **Level** value with the step defined by the **Trigger Period**.

Threshold level



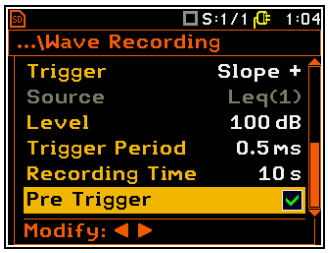


The threshold level for the logger trigger (**Level**) can be set with 1 dB steps in the range from 24 dB to 136 dB in the sound mode and from 1 mm/s^2 (60 dB) to 10 km/s^2 (200 dB) in the vibration mode.



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**.

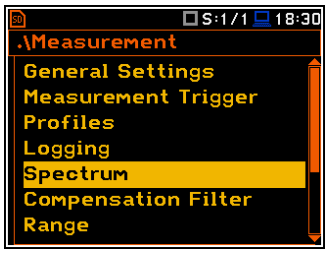
The **Recording Time** parameter defines the time of signal recording after every trigger. The available values can be selected from **1s** to **8h** or **Inf** (recording will last until measurement stop).



When **Pre Trigger** position is switched on the signal starts to be recorded before the trigger. The period of such recording depends on the sample frequency. For 48 kHz the period is 1s, for 24 kHz - 2 s, for 12 kHz - 4s.

4.5 SETTING SPECTRA – SPECTRUM

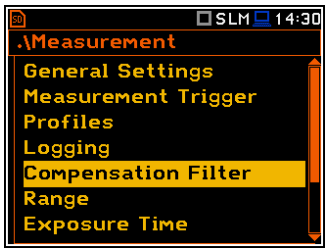
The **Spectrum** position appears in the **Measurement** list when the **1/1 Octave**, **1/3 Octave**, **1/6 Octave**, **1/12 Octave** or **FFT** function is selected in the **Measurement Function** list (*path: <Menu> / Function / Measurement Function*) - see Chapters 10 and 11 for details.



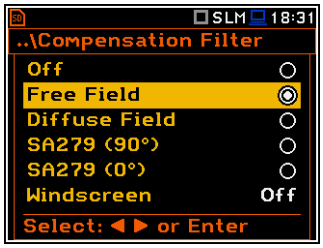
4.6 SELECTING MICROPHONE COMPENSATION – COMPENSATION FILTER

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

The **Compensation Filter** screen comprise a list of options (**Off**, **Free Field**, **Diffuse Field**, **SA279 (90°)**, **SA279 (0°)**) and the **Windscreen** position that should be set.



<ENT>



The microphone inner noise and thermal compensation is switched on by default, however it is possible and necessary to switch it off (**Off**) for electrical measurements (e.g. laboratory calibration measurements).

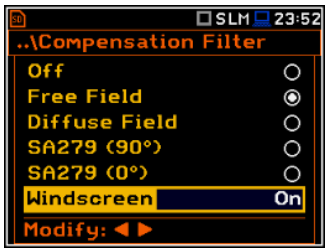
The **Free Field** and **Diffuse Field** filters are intended to compensate sound measurements in the free field or diffuse field conditions. `The microphone supplied with **SVAN 979** (GRAS 40AE) is designed for sound measurements in the free field conditions. The **Free Field** option means that the correction filter for the diffuse field conditions is switched off. In case of sound measurements performed with the use of different specific diffuse field response microphone types, the **Diffuse Field** option should never be used and the microphone inner noise and thermal compensation should be turned off (**Off** option).

SA279 (90°) and **SA279 (0°)** compensations are dedicated for the permanent outdoor monitoring applications with the use of the **SA 279** outdoor microphone outdoor kit (usually when SVAN 979 is working as a part of the SV 279 monitoring station). The characteristics of the outdoor filters depend on the dominating sound incidence angle: environmental monitoring (incidence angle 90 deg) or airport monitoring (incidence angle 0 deg).

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

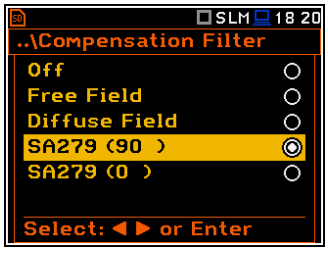


Note: *When using windscreen SA22 the **Windscreen** compensation must be **On** during windy conditions to maintain good tolerances margin of the SVAN 979 frequency response.*





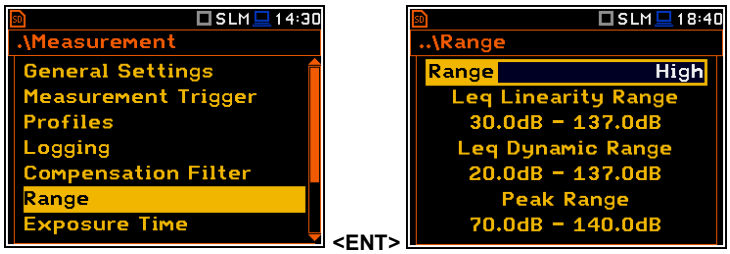
Note: *For the free filed evaluation with the SA 279 microphone outdoor kit the **SA279(90°)** or **SA279(0°)** compensation must be selected.*



4.7 SELECTING MEASUREMENT RANGE – 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.

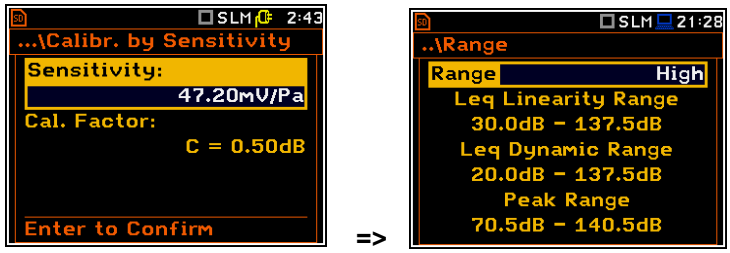


There are two ranges available: **High** and **Low**. The detailed description of the measurement ranges parameters is given in Appendix C.



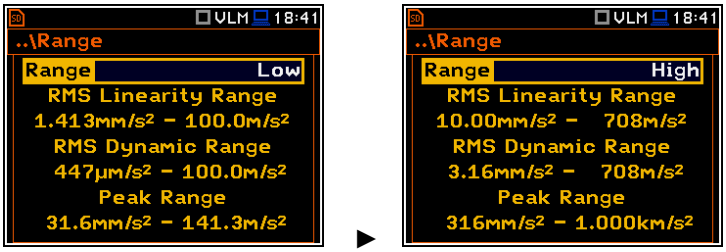
The values of ranges in sound modes depend on the settings in the **Compensation Filer** screen (*path: <Menu> / Measurement / Compensation Filter*) and the calibration factor.

For example, if the calibration factor is equal to 0.5 dB, the **High** range will be changed as shown on the attached screen.



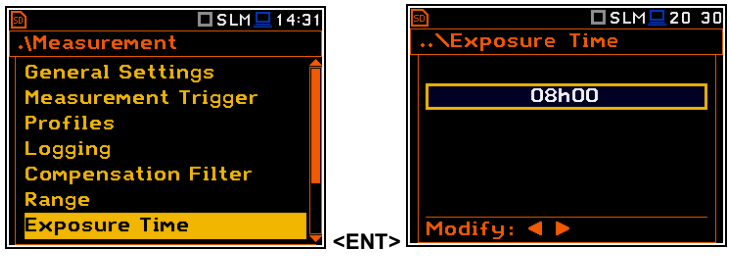
The right-hand screens present the **Range** for the Vibration mode and zero calibration factor.

Nonzero calibration factor always shifts the lower and upper limits of the ranges for vibration modes.



4.8 SETTING WORKDAY EXPOSURE TIME – EXPOSURE TIME

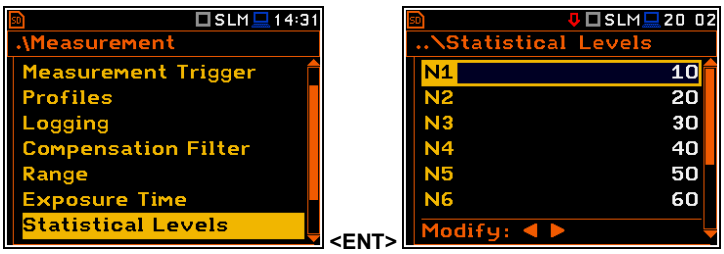
The **Exposure Time** parameter defines the workday exposure time that is used for the calculation of **LEPd** (cf. Appendix D for definitions). This position is available only in the sound mode. The **Exposure Time** values are within the range [00h01, 08h00].



4.9 SETTING STATISTICAL LEVELS – STATISTICAL LEVELS

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

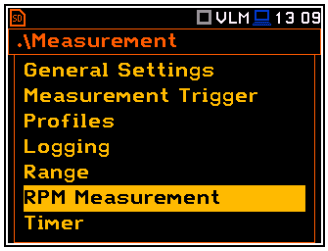
In the **Statistical Levels** screen, you can define ten statistical levels, named from **N1** to **N10**, to be calculated, displayed and saved in a file as Summary results.



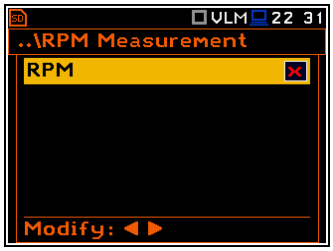
The default statistical levels have following settings: **10**, **20**, **30**, **40**, **50**, **60**, **70**, **80**, **90** and **95**. All values should be within the integer range [1, 99]. Each individual value can be set independently from others.

4.10 SETTING RPM MEASUREMENT – RPM MEASUREMENT

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



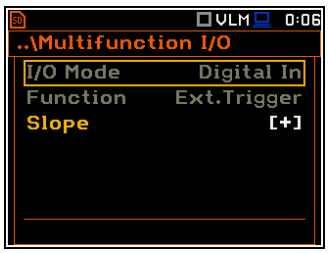
<ENT>



Note: *The **RPM** function is optional and should be activated in the **RPM Measurement Auxiliary Setup** menu during first attempt to switch it on (see Chapter 8.4). After activation this position is transferred to the Measurement menu.*

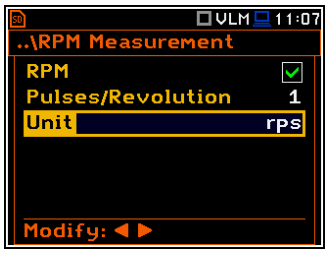
To perform the RPM measurement the RPM probe should be connected to the **I/O** socket and the RPM position in the RPM Measurement screen should be switched on.

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**).

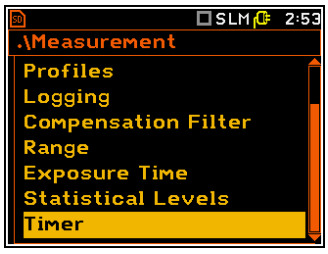


Note: *The RPM results are always registered in the logger file as logger results (with the logger step) and as summary results (with the integration period step).*

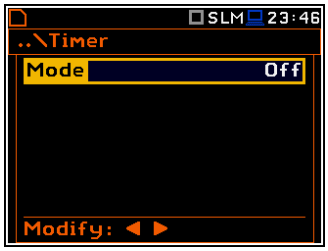
4.11 PROGRAMMING THE INSTRUMENT'S INTERNAL TIMER – TIMER

The **Timer** function is used for automatic measurement start 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.



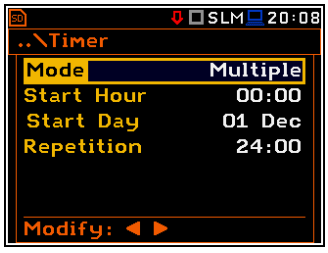
<ENT>



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**).



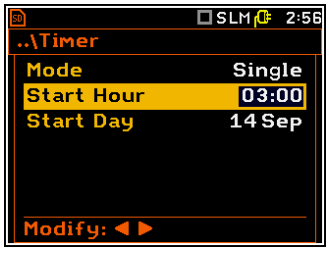


In case the timer is active (**Single** or **Multiple**) and the instrument is switched on, the "clock" icon appears until finishing the programmed measurements.

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.



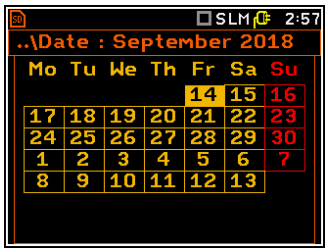


Day of measurement start

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**.



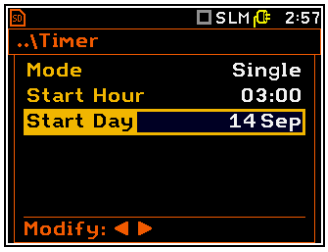


Note: *The **Timer** function can be used for multiple measurements (at the programmed day and time with the selected repetition number). The first start of the instrument must be within one month ahead. Make sure that the RTC is configured correctly before setting up the **Timer**.*

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.*

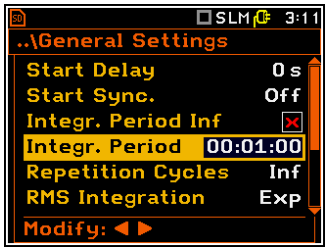
4.11.1 Example of timer execution

Let us assume that the you wish to switch on the instrument on 14th of September at 3 am, measure noise for 1 minute and save the results in a file named **L1**.



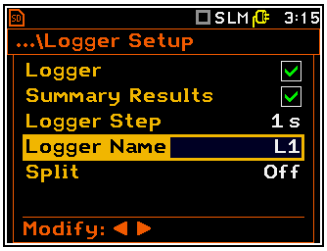
To do this set the **Timer** parameters, set the measurement parameters (*path: <Menu> / Measurement / General Settings*), name the file (*path: <Menu> / Measurement / Logger / Logger Setup*) as on the attached screens and finally – switch off the instrument.

The instrument will be switched on 14th of September at 2:59 and will be warmed up for the period of 60 seconds decrementing the counter visible on the display by one after each second.



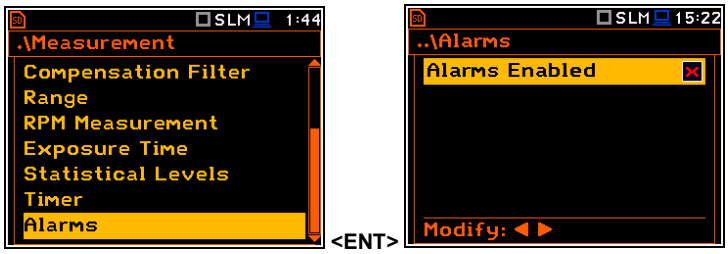
After warming up and the pre-set **Start Delay** time, the measurements will be performed by a period of one minute. Then, results will be saved in the previously named file and finally – the instrument will turn itself off.

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



4.12 ADVANCED ALARM FUNCTION – ALARMS

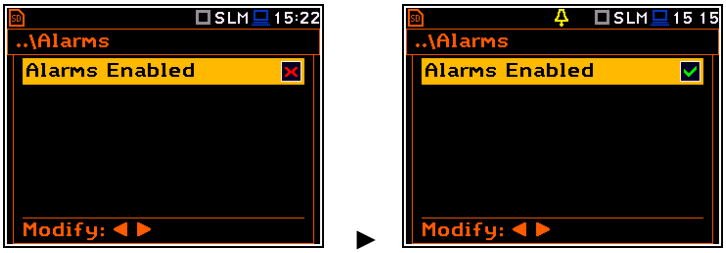
The **Alarms** position appears in the **Measurement** list if the advanced alarms configuration file (ALARM.SVA) is uploaded to the predefined SYSTEM catalogue. This position opens the screen in which you can enable or disable the advanced alarm function.



Note: The advanced alarm settings are configured via SvanPC++ or via SvanNET web-service since this function was designed for the SV 279 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>**.

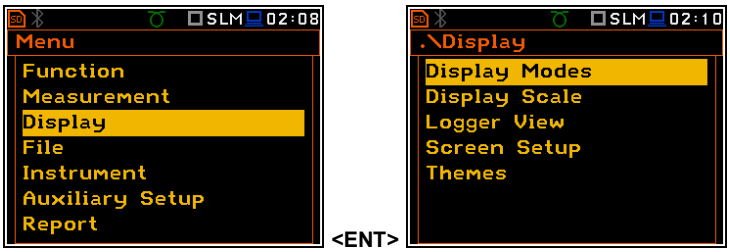
The event, action and condition record can be changed with the ◄ / ► key pressed together with **<Alt>**.



5 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 the selected measurement function.



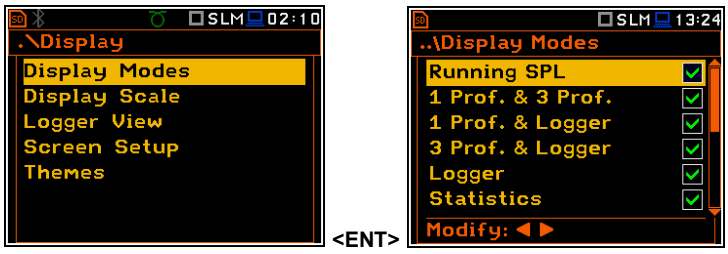
The **Display** section contains following items:

Display Modes	allowing you to define active modes of a measurement results presentation.
Display Scale	allowing you to adjust the scale in a graphical mode of the measurement results presentation,
Spectrum View	allowing you to select spectra to be viewed: instantaneous, averaged, maximum or minimum; this position appears only for the analyser functions,
Spectrum Type	allowing you to change the spectrum type presented on the display: acceleration, velocity or displacement; this position appears only for the spectrum analyser functions in the Vibration mode,
Logger View	allowing you to select and present results stored in logger files,
Spectrum Compare	allowing you to compare current spectrum with the reference one; this position appears only for the **1|1 Octave** - **1/12 Octave** functions,
Screen Setup	allowing you to set up the brightness and switch on/off the energy saver function,
Themes	allowing you to set the colour theme of the display.

5.1 ACTIVATION OF THE DISPLAY MODES – DISPLAY MODES

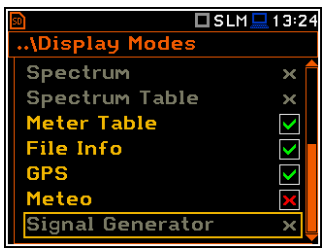
The **Single Profile** view (results display mode) is always active and available. Other views can be enabled or disabled in the **Display Modes** screen.

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



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

In the **Vibration Level Meter** mode, following views are available: **1 Prof. & 3 Prof.**, **1 Prof. & Logger**, **3 Prof. & Logger**, **File Info**, **Meter Table**, **GPS**, **Meteo** and **Signal Generator**.

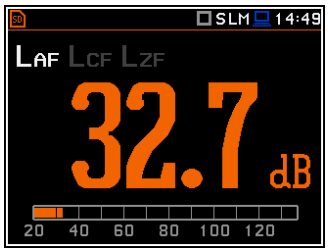


Changing display modes

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

5.1.1 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 for the last second with the weighting filter and detector constant defined in the **Profiles** screen).

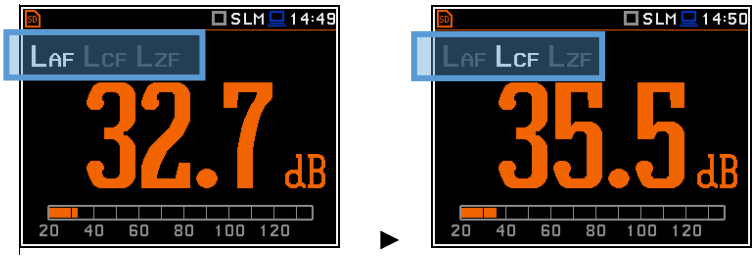


This result is not saved in a file and gives just the first assumption of the sound level before the measurement.

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

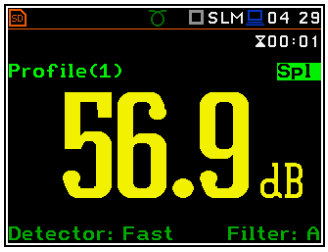
You can hide or open this view with the **<ESC>** key.

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

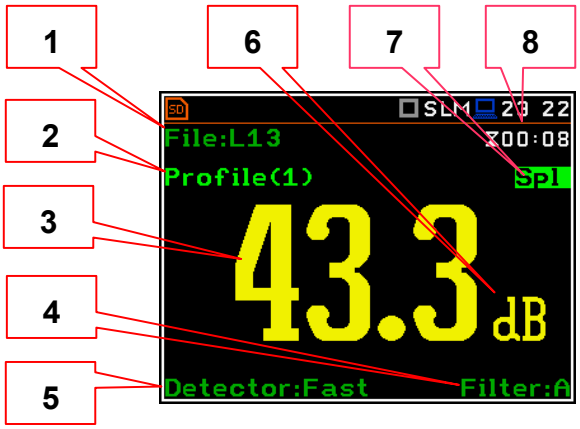


5.1.2 One Result view

The One Result view is always available in all measurement functions. You cannot disable it. In this view, only one measured result is displayed in large digits.



One Result view fields

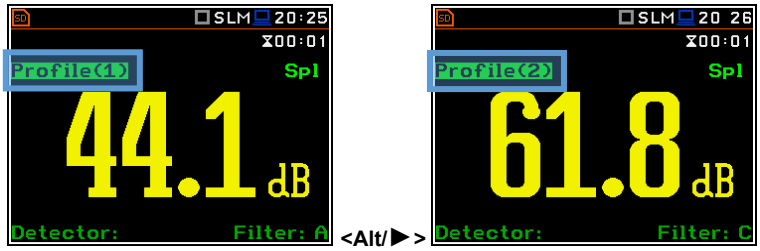


1. Logger file name.
2. Profile number.
3. Value of the measured result.
4. Weighting filter: **Z**, **A**, **C**, **B**, **G** for Sound measurements or **HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10**, **Wh** for Vibration measurements.
5. Detector type: **Lin** when **RMS Integration** is **Lin** *(path: <Menu> / Measurement / General Settings)* or: **Imp.**, **Fast**, **Slow** for Sound measurements or **100 ms**, **125 ms**, **.. 10.0 s**, for Vibration measurements, when **RMS Integration** is **Log**.
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**, **MTVV** 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).*

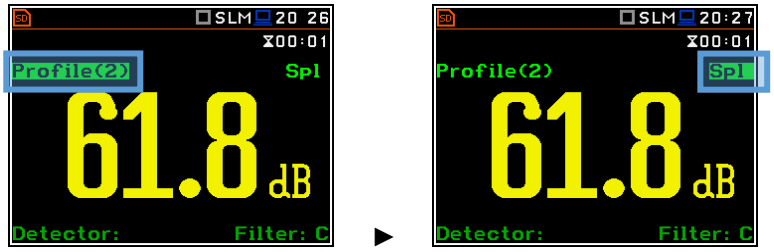
Changing the field content

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



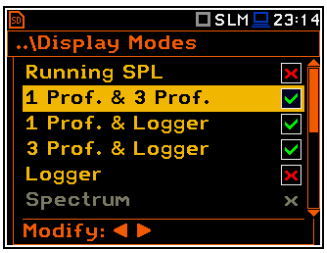
Changing active fields

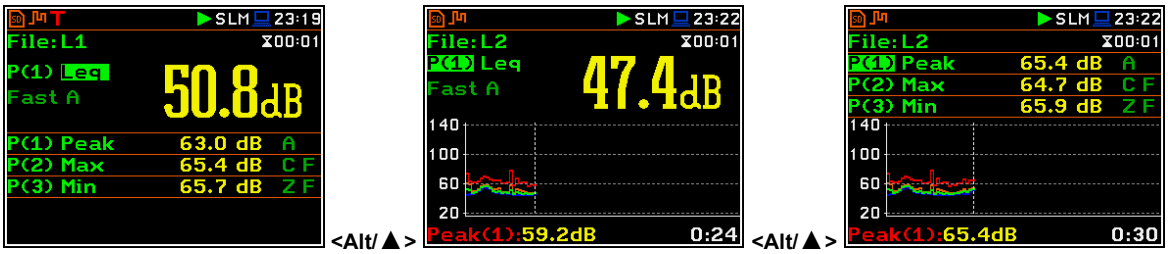
You can change the active field with the ◄ / ► key.



5.1.3 Combined views

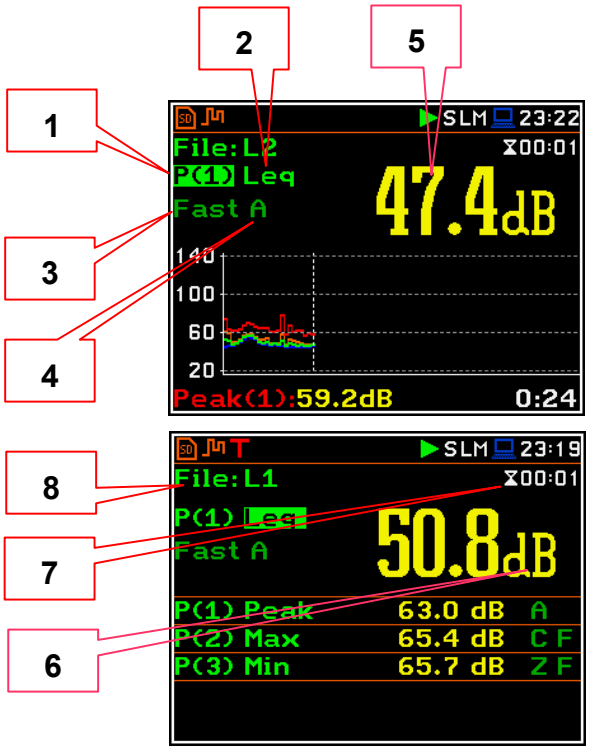
There are three display modes, that combine two views: **1 Prof. & 3 Prof.**, **1 Prof. & Logger**, **3 Prof. & Logger**. These display modes allow you to compare results for profiles and to follow the history of measured results, saved in the logger file.





One result view fields

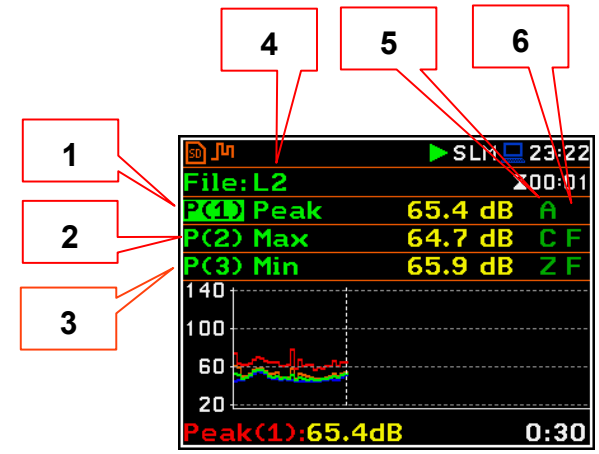
1. Profile number.
2. Result name: **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, **Lnn**, **EX**, **SD**, **LR1**, **LR2**, **Ovl**, **Peak**, **Max**, **Min** for Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P**, **MTVV** for Vibration measurements.
3. Detector type: **Linear** 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**, **G** 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).*

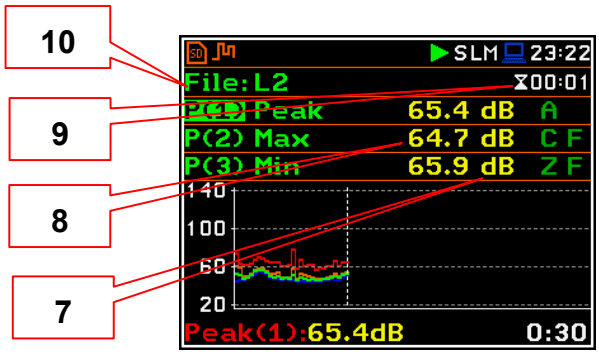


Note: *Detector type for the displayed result depends on settings in* ***General Settings*** *and* ***Profiles*** *lists (path: <Menu> / Measurement). There is no displayed indication of the detector in case of* ***Peak****,* ***P-P*** *and* ***Ovl*** *results (see Appendix D).*

3 Profiles view fields

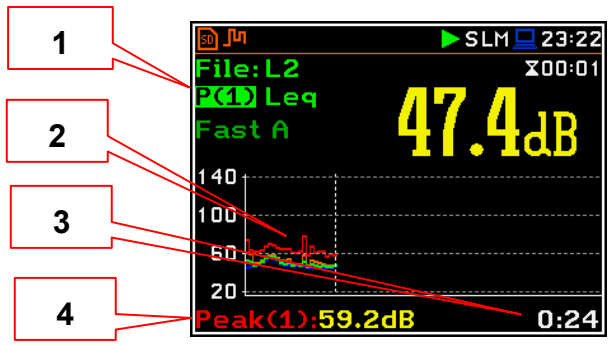
1. Result line for Profile 1.
2. Result line for Profile 2.
3. Result line for Profile 3.
4. Result name: **Spl**, **Leq**, **SEL**, **Lden**, **LEPd**, **Ltm3**, **LTeq**, **Lnn**, **EX**, **SD**, **LR1**, **LR2**, **Ovl**, **Peak**, **Max**, **Min** for Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P** for Vibration measurements.
5. Weighting filter: **A**, **B**, **C**, **Z**, **G** 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).*





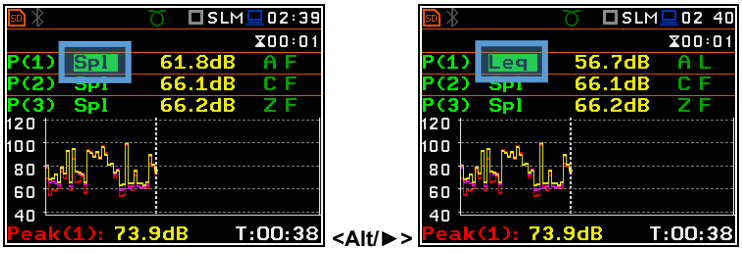
Logger view fields

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



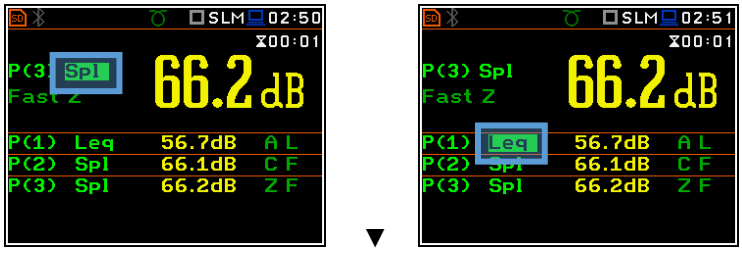
Changing the field content

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



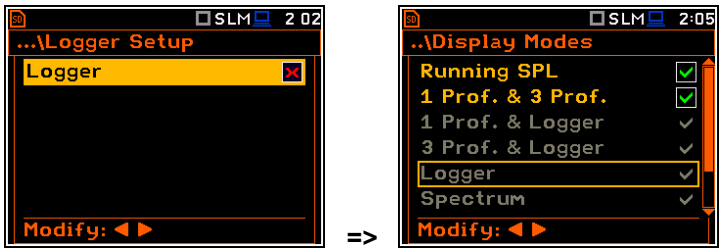
Changing the active fields

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

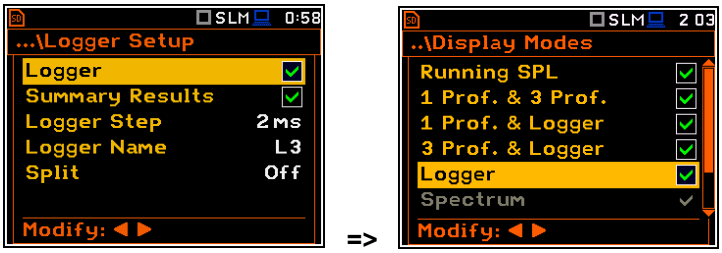


5.1.4 Logger view

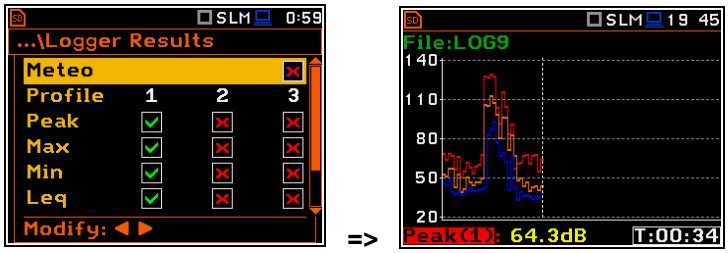
The **Logger** view depends on the settings made in the **Logging** list (*path: <Menu> / Measurement / Logging). If* ***Logger*** is disabled, the **Logger** view mode is not active!



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

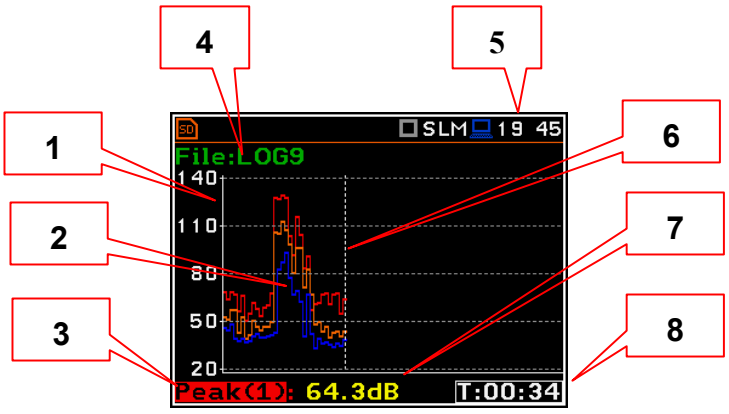


When **Logger** is enabled, and some results have been selected for logging the logger plot can be viewed.



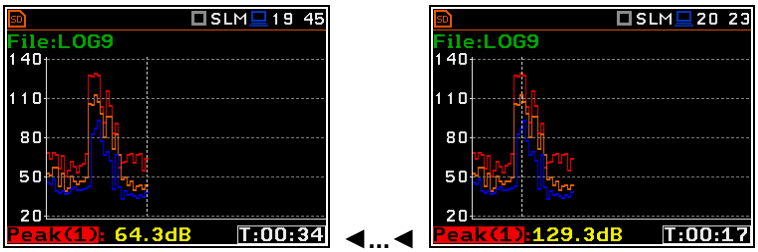
Logger view fields

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

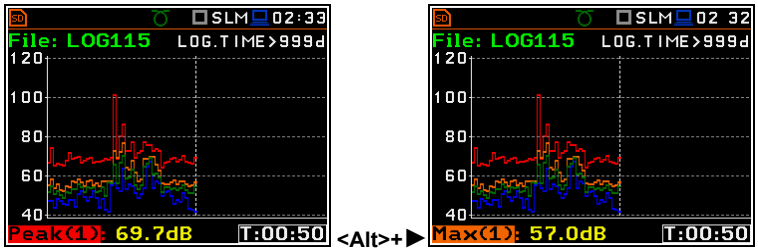


You may change the cursor position with the ◄ / ► key.

The bottom line of the screen displays the value of the result from field 3 for the cursor position.



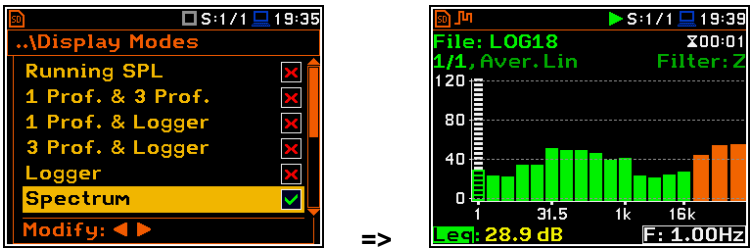
To display a different result, it is necessary to move to field 3 with the ▲/▼ button, and then select the appropriate result with the ◄/► button pressed together with <Alt>.



5.1.5 Spectrum view

The **Spectrum** position is accessible only in the active **1/1 Octave - 1/12 Octave** or **FFT** functions.

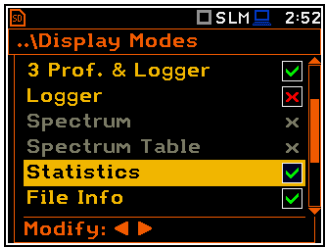
The spectra views are described in Chapters 10 and 11.



5.1.6 Statistics view

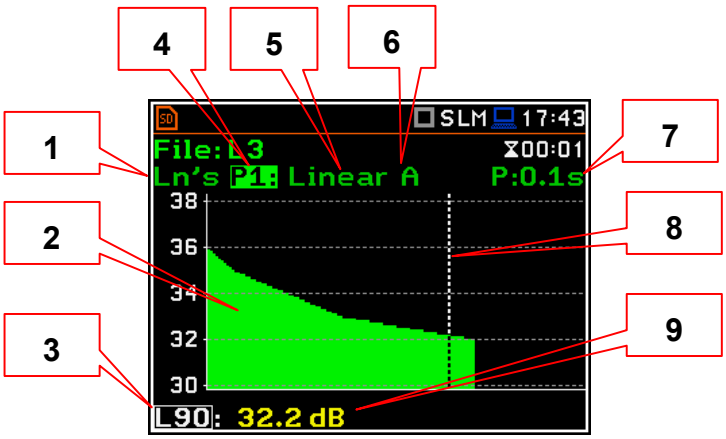
The **Statistics** position is accessible only for Sound measurements.

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.

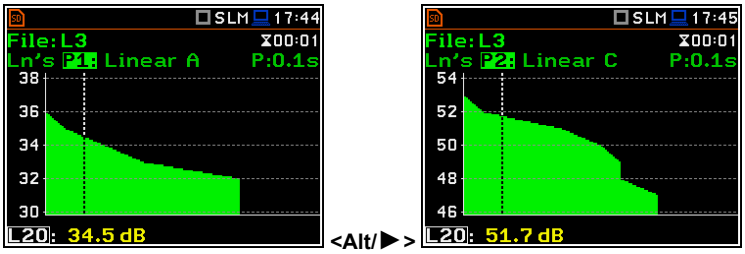


Statistics view fields

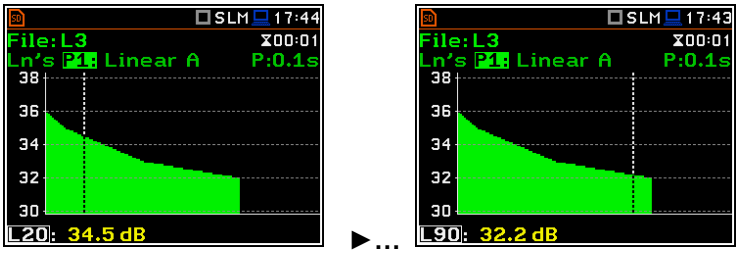
1. Result name
2. Statistics plot
3. Statistical level (**Lnn** percentile value) for the active cursor position
4. Active profile (P1, P2 or P3)
5. RMS detector (**Lin.** or **Fast**, **Slow**, **Imp**.)
6. Weighting filter (**A**, **B**, **C**, **Z**, or **G**)
7. Sampling interval for the **Lnn**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



To change the profile, you should select the field 4 and press the ◄ / ► key together with **<Alt>**.



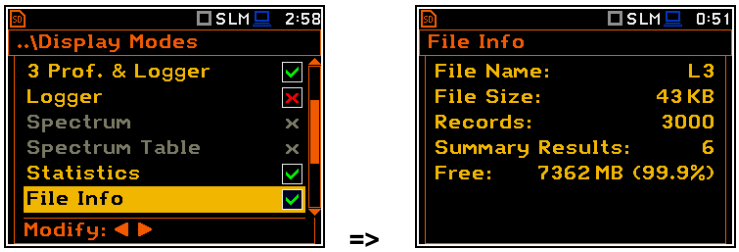
The cursor position is changing with the ◄ / ► key. The statistical level and appropriate value are presented in the line below the plot.



5.1.7 File information view

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

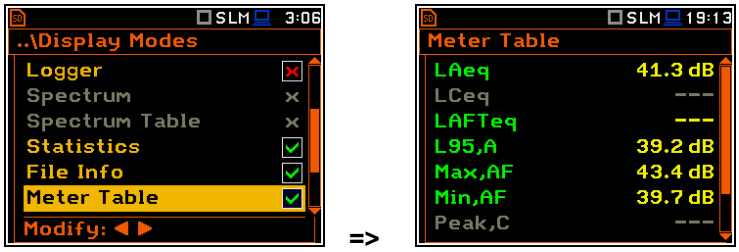
The **File Info** view displays the file name, its size, number of records made with Logger step, number of summary results blocks (records made with Integration period), free memory space etc.



5.1.8 Meter Table view

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

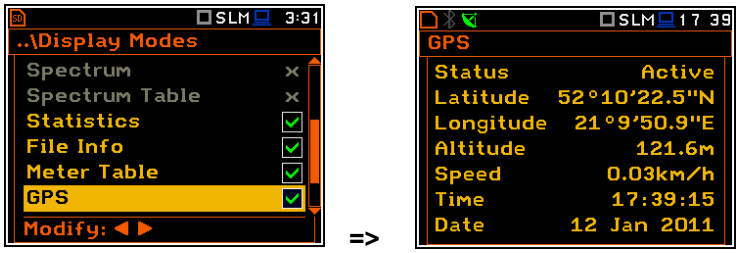
If specified in that list result is not measured in any profile, it will be of grey colour and without value ("**---**").



5.1.9 GPS view

The **GPS** view allows you to display information from GPS module connected to the **USB Device** or **USB Host** socket of the instrument.

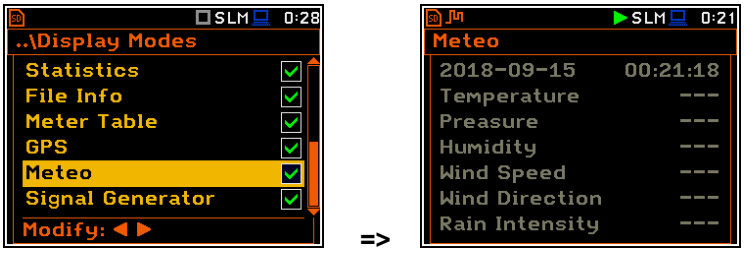
The **GPS** view shows the GPS status, co-ordinates, etc. This view will be active if you switch on the GPS position in the **Display Modes** screen and the **GPS Host Port** or **GPS Device Port** option is active (*path: <Menu> / Instrument / Communication Ports*).



5.1.10 Meteo view

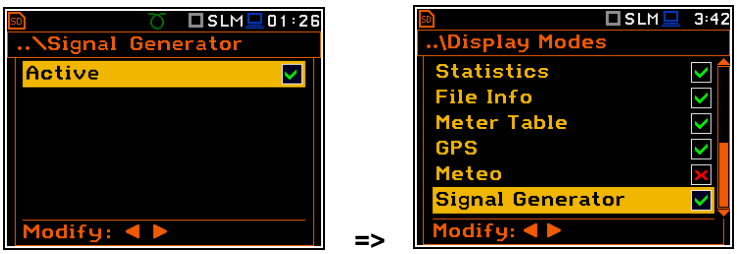
The **Meteo** view allows you to display the results obtained from the Meteo module, connected to the monitoring station SV 279 PRO.

If SV 979 works as standalone instrument the Meteo view only presents possible results that can be measured in grey letters.

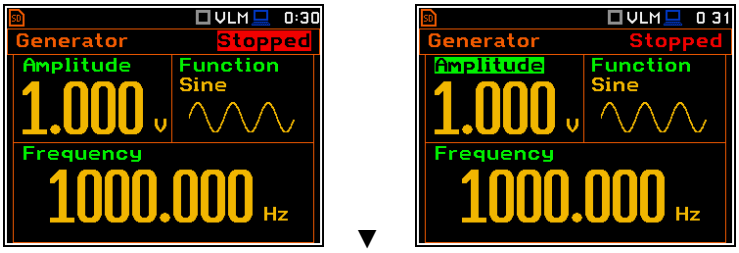


5.1.11 Signal Generator view

The **Signal Generator** view allows you to control the signal generator function of the instrument. This position is active only when the **Signal Generator** function is switched on (**Active**) in the **Instrument** menu (*path: <Menu> / Instrument / Signal Generator*).

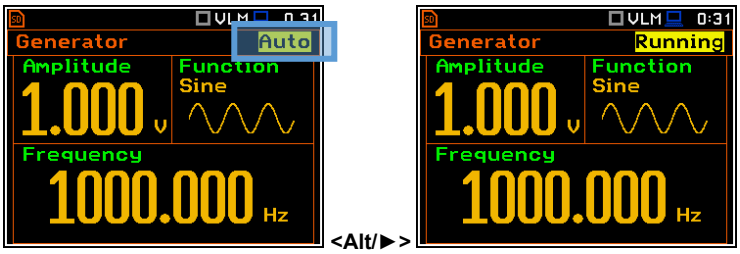


In the **Signal Generator** view you may move from one field to another with the with the ▲ / ▼ keys and to change the field value with the ◄ / ► keys pressed together with **<Alt>**.

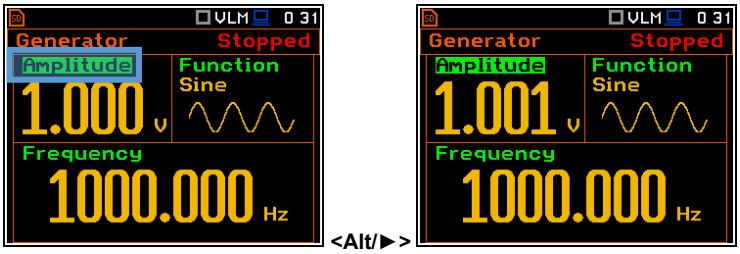


To switch the **Signal Generator** on or off, select the **Generator** field and change its value from **Stopped** to **Auto** or **Running** with the ◄ / ► keys pressed together with **<Alt>**.

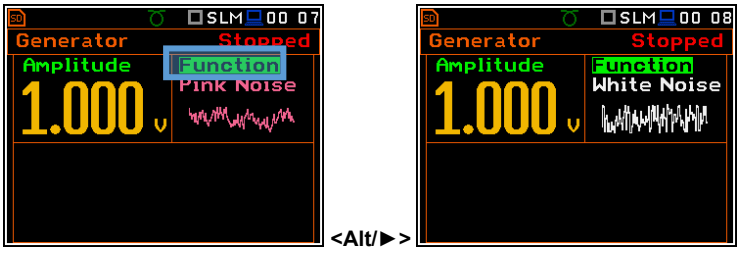
Auto mode means that generator starts and stops with the **<Start/Stop>** key.



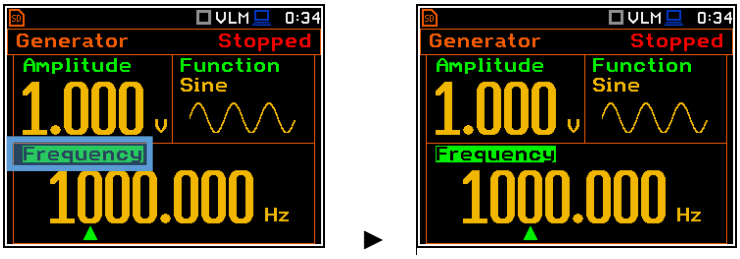
To change the amplitude of the generated signal, select the **Amplitude** field and change its value with the ◄ / ► keys pressed together with **<Alt>**.



To change the type of the generated signal, select the **Function** field and change its value with the ◄ / ► keys pressed together with **<Alt>**. There are three available functions: **Sine**, **Pink Noise** and **White Noise**.

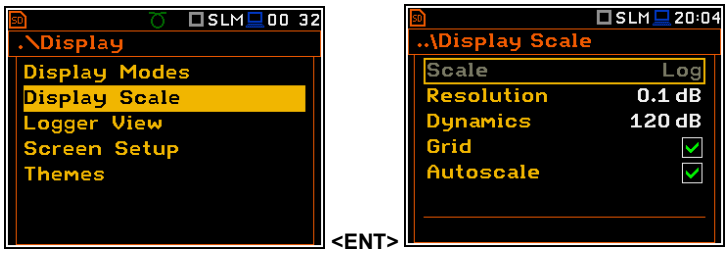


To change the frequency of the generated signal, select the **Frequency** field and then select the digit in the frequency value with the ◄ / ► keys. The selected digit will be marked by green cursor (arrow) at the bottom line of the screen. You may change the value of the selected digit with the ◄ / ► keys pressed together with **<Alt>**.



5.2 ADJUSTING PLOT VIEWS – DISPLAY SCALE

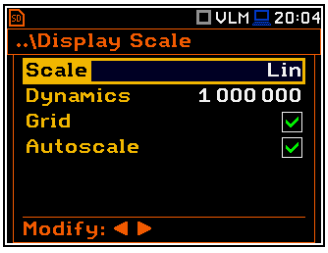
The **Display Scale** list of parameters allows you to define the result units (absolute or logarithmic), number of digits after decimal point, adjust scale of plots, toggle a grid and automatic scale adjustment.



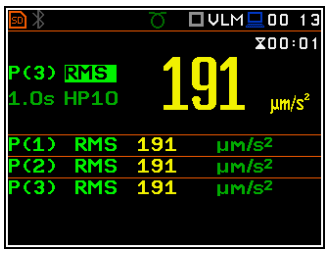
Scale of results presentation

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

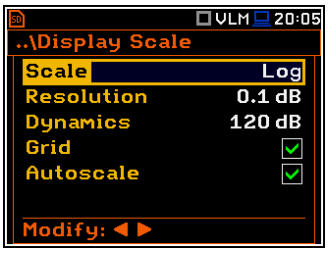
For sound measurements the **Scale** position is not active. All results are always presented in dB.



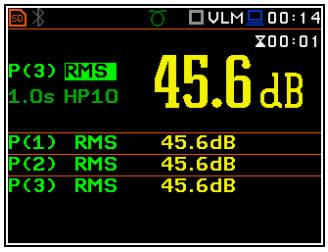
=>



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*)).



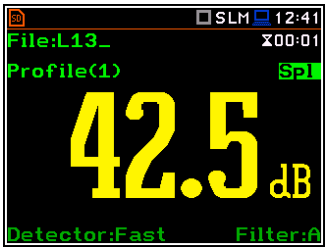
=>

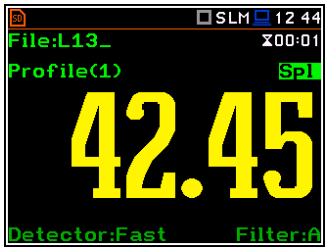


***Note:** In Vibration modes, parameters can be presented in **Logarithmic** (dB) or **Linear** (for example, m/s²) units. It depends on the **Scale** parameter value. For example, 10 m/s² can be presented also as 140 dB.*

Resolution

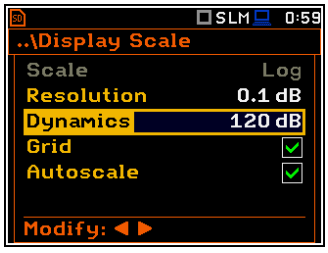
The **Resolution** parameter appears <u>when Scale is Log</u> and defines the number of digits after the decimal point in the presented results: one digit after the decimal point (**0.1 dB**) or two digits after the decimal point (**0.01 dB**).



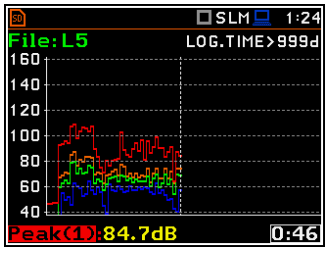


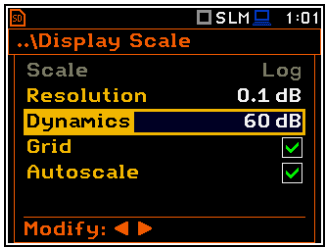
Scaling the vertical axis of the plot

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**.

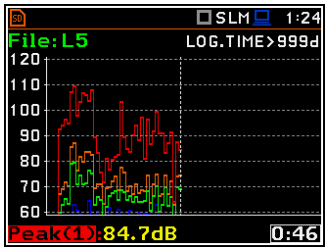


=>



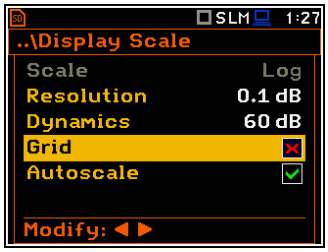


=>

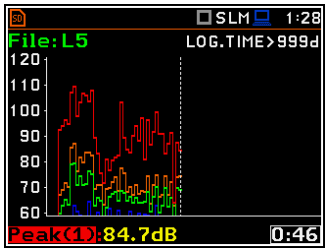


Toggling the grid

The **Grid** position allows you to switch on or off the horizontal grid lines of the logger or spectrum plot.

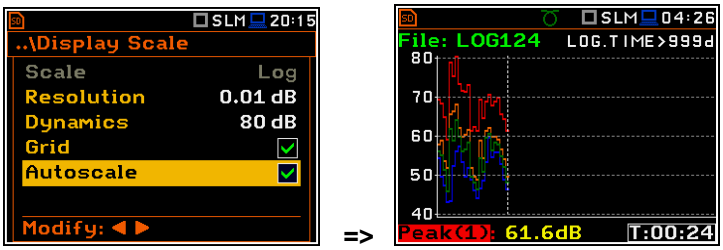


=>



Toggling the automatic Y-scale adjustment

The **Autoscale** position toggles the automatic adjustment of the Y-axis dynamics to the measured result level. The adjustment is performed automatically once after the start of the measurement to suit the initial level of the input signal from the microphone or accelerometer.

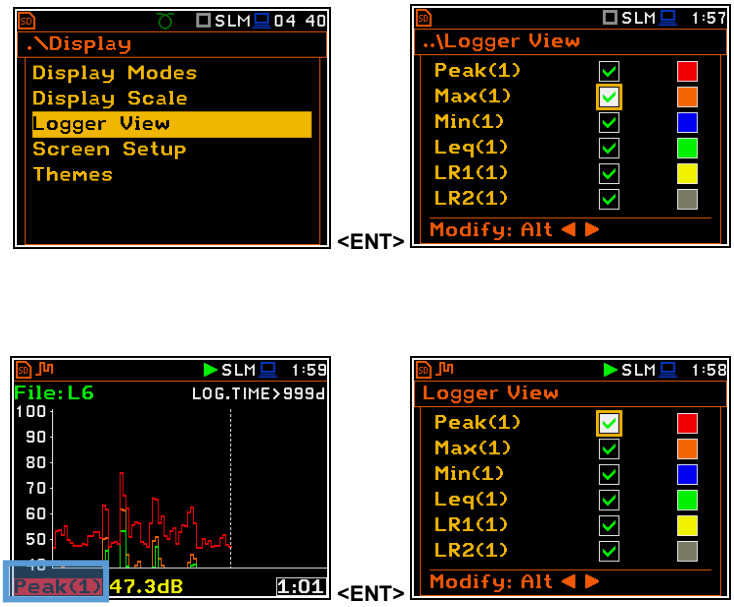


5.3 Adjusting Logger view – Logger View

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

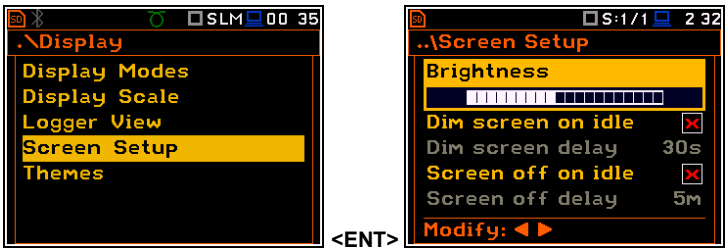
Every logger curve shows the history of one result measured in a profile, like **Peak(1)**. In the **Logger View** screen, you can include or exclude the curve from the logger plot (first column) and define the colour of this curve (second column).

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.



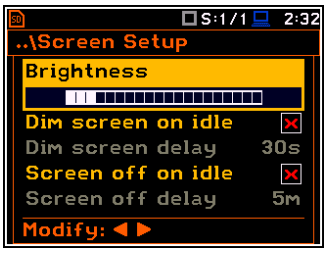
5.4 Configuring display brightness and power saver – Screen Setup

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



Brightness of the display

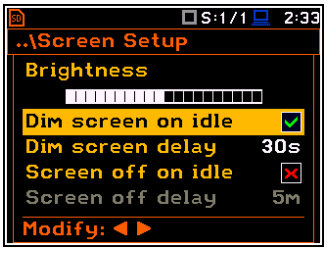
The **Brightness** position allows you to set the proper brightness of the display with the ◄ / ► key. You can select 20 different values of this parameter. The new value of brightness level is confirmed after each press of the ◄ / ► key.



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.

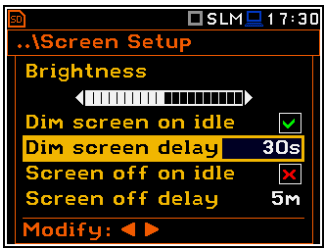
There are two options for the power saver function. The screen may be switched off (**Screen off on idle**) and/or dimmed (**Dim screen on idle**). When either of these options are set, after a delay from pressing any key, defined by



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.



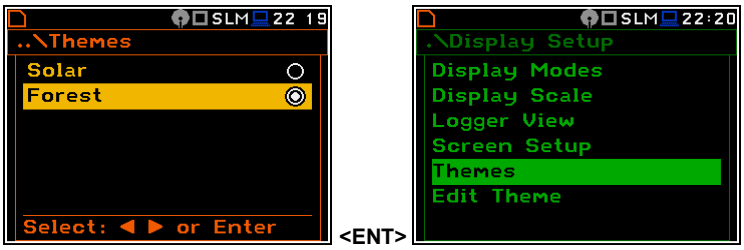
5.5 SETTING THE COLOUR THEME OF THE DISPLAY – THEMES

The **Themes** screen enables setting the colour theme of the display.

It is possible to choose between **Solar** and **Forest** themes. Solar theme is presented in this Manual. Forest theme is presented below.



The **Solar** and **Forest** colour themes are optimised to decrease the energy consumption of the OLED display.

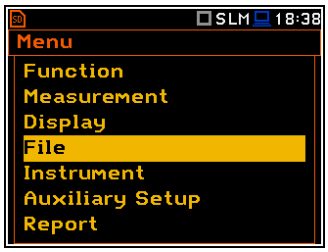


6 MANAGING FILES – File

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 2.9.

The **File** list contains following items:



<ENT>

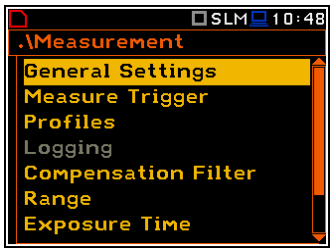


File Manager allowing you to manage all files and directories on the SD card or USB disk,

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

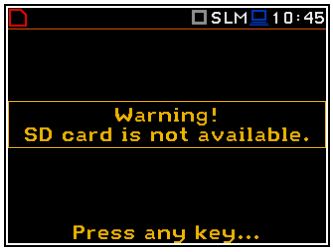


Note: *Both data and setup files are saving in the SD card or USB Disk memory. So, if there is no SD card or USB Disk in the instrument there is no possibility to create any file. Among other things in this case, the* ***Logging*** *position in the* ***Measurement*** *list is not available.*





Note: *Positions in the* ***File*** *list are active only when an SD card or USB Disk is inserted. Otherwise, the instrument will generate a warning every time you try to open any position in the file list.*



There are three types of files that the instrument generates:

- Logger files with measured results (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**, etc.) and logging settings and may include:

- summary results, including results of statistical analysis,
- time histories of measured results,
- marker recordings,
- results of the **1/1 Octave** – **1/12 Octave** analysis,
- results of the **FFT** analysis,
- results of the **TR60** analysis,
- results of the **Tonality** analysis,
- results of the **Loudness** analysis.

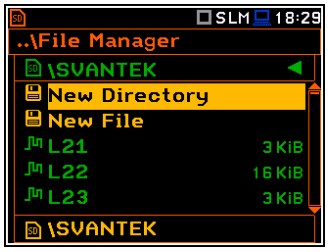
6.1 MANAGING INSTRUMENT'S FILES – FILE MANAGER

Files are stored in directories, which are organised hierarchically.

File Manager enables access to files and directories.

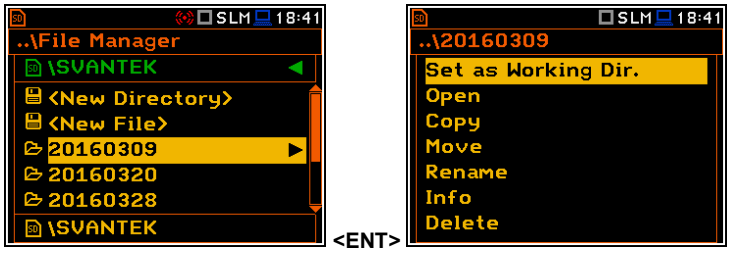


<ENT>



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.

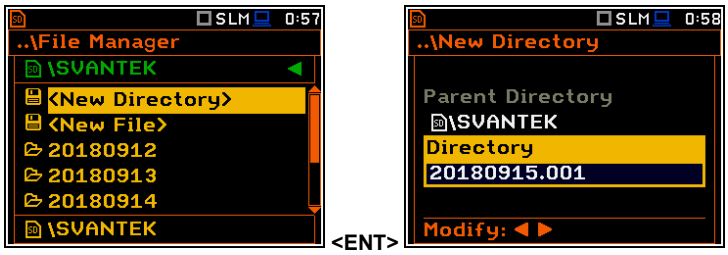
All these operations can be done on the selected file or directory by means of the command list which is opened with the **<ENTER>** key.



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 and press **<ENTER>** at the **New Directory** or **New File** position.



The instrument will propose you the new name which you can accept pressing **<ENTER>** or edit.

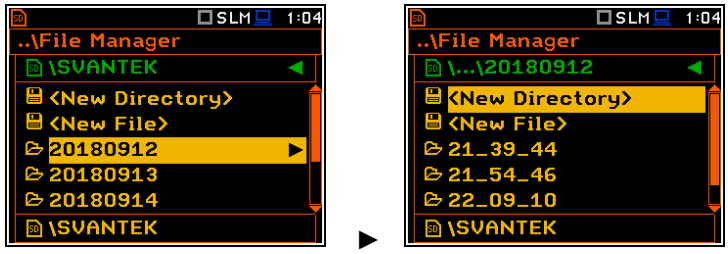
To edit the new directory or file name press the ◄ / ► key and edit the name in the text editor screen.



Changing directories

The marked directory can be opened with the ► key.

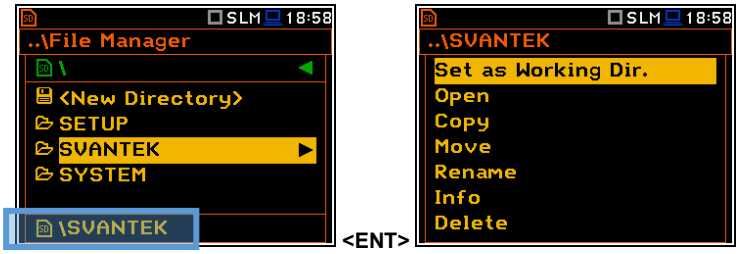
To return to the upper directory press the ◄ key.



6.1.1 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.



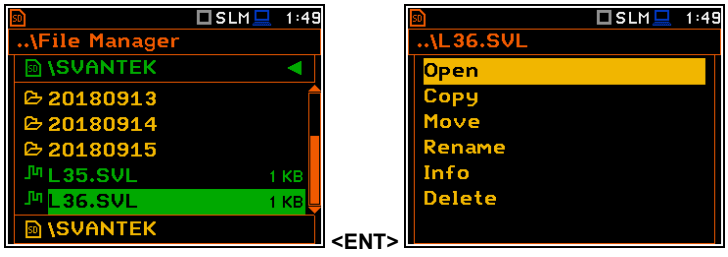


Note: *The working directory name is displayed in the bottom line of the display.*

6.1.2 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>**.

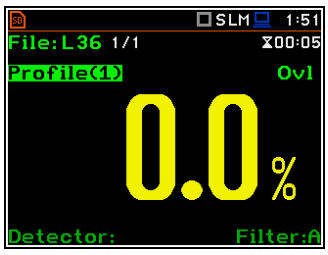
The effect of such operation on a directory is similar to the effect of the ► key.



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.



<Key>

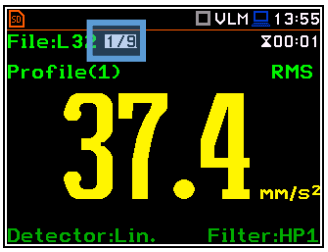




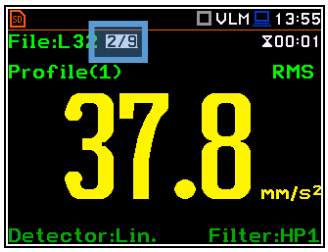
Note: *After loading the logger file, only summary results saved in the logger file as records can be viewed at the display. Each record contains measurement data for one cycle (measured with the* ***Integration Period*** *step).*

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>**.



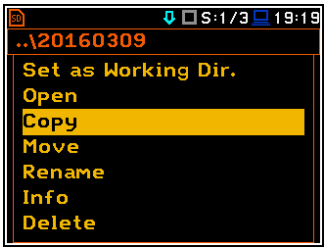
<Alt/►>



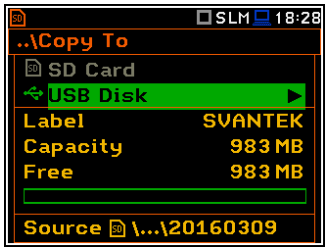
6.1.3 Copying files/directories – Copy

You can copy a file or a directory from the files/directories list of one memory to another.

To perform this operation, select the file/directory and press **<ENTER>**. Select the **Copy** position in the command list and press **<ENTER>**. The instrument will propose to choose the target directory in another memory.



<ENT>



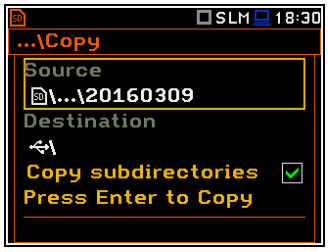
After selection of the target directory, press **<ENTER>**. The screen with two options will appear: **Copy Here** and **Rename**.

In case of directory it is possible to select option to copy all subdirectories.

Press **<ENTER>** to confirm the operation.



<ENT>

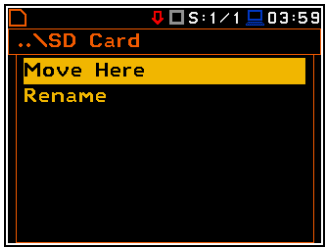


6.1.4 Moving files/directories – Move

You can move a file or a directory from the files/directories list of one memory to another.

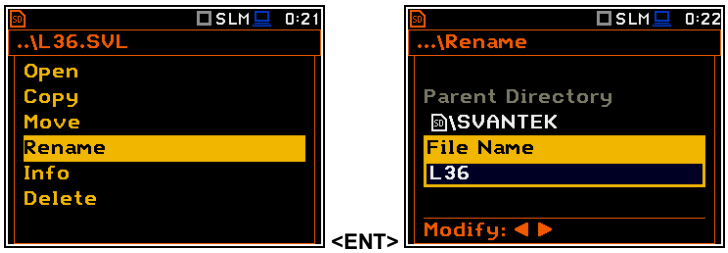
To perform this operation, select the file/directory and press **<ENTER>**. Select the **Move** position in the command list and press **<ENTER>**. The instrument will propose to choose the target directory in another memory.

After selection of the target directory, press **<ENTER>**. The screen with two options will appear: **Move Here** and **Rename**. In case of directory it is possible to select option to move all subdirectories.



6.1.5 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.



If a file with the new name is already 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.



6.1.6 Viewing information about files/directories – Info

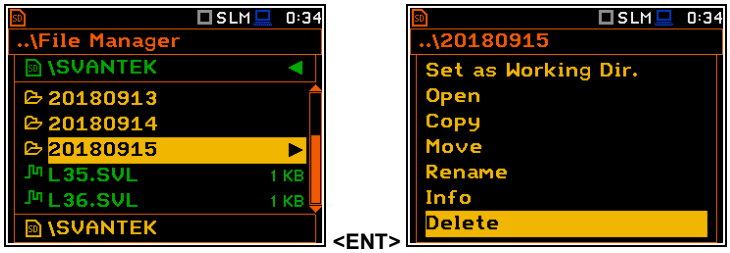
You can view information about a file or a directory. To do this, select the desired file/directory and press **<ENTER>**. Select the **Info** position in the command list and press **<ENTER>**. The information screen will be opened.



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

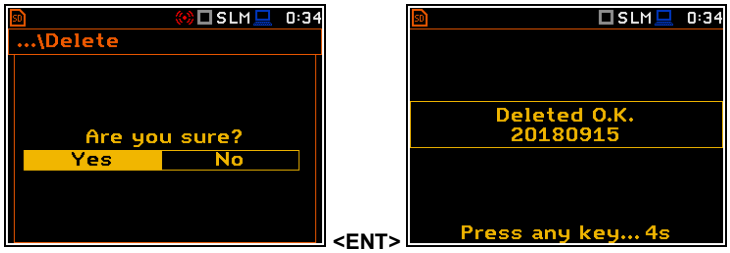
6.1.7 Deleting files/directories – Delete

You can delete a file or a directory. 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.

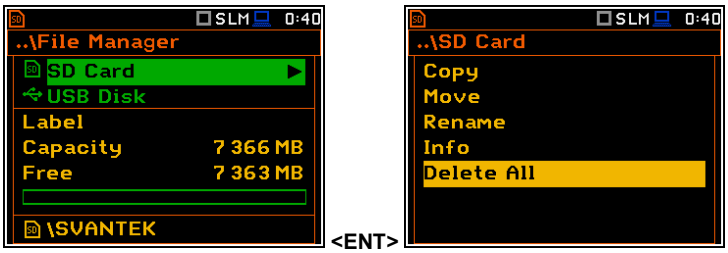
The delete directory command erases all files in this directory and files in all sub-directories.



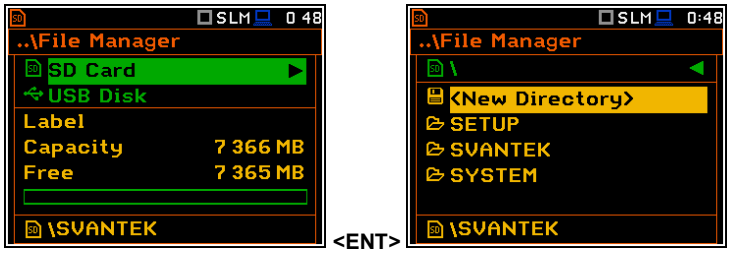
6.1.8 *Erasing all files in a memory – Delete All*

You can delete all elements from the memory. To do this, select the desired memory (**SD Card** or **USB Disk**) and press **<ENTER>**. Select the **Delete All** position in the command list and press **<ENTER>**.

The instrument will ask for confirmation of this operation.



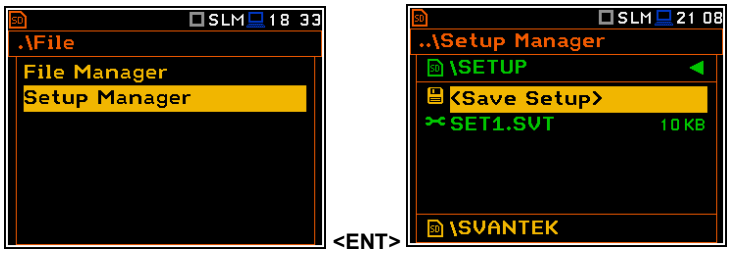
All files and directories in this memory will be erased. After this operation three directories will be created as default directories: **SETUP**, **SVANTEK** and **SYSTEM**.



6.2 MANAGING THE SETUP FILES – SETUP MANAGER

Setup Manager enables saving new setup files, deleting, renaming or loading them.

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

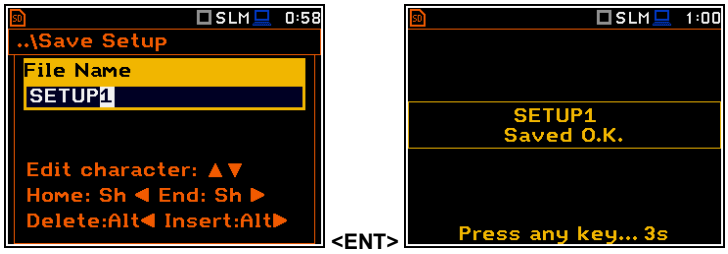


Saving setup files

It is possible to save only current instrument's settings. To save current settings in the setup file, select the **<Save Setup>** position and press **<ENTER>**.



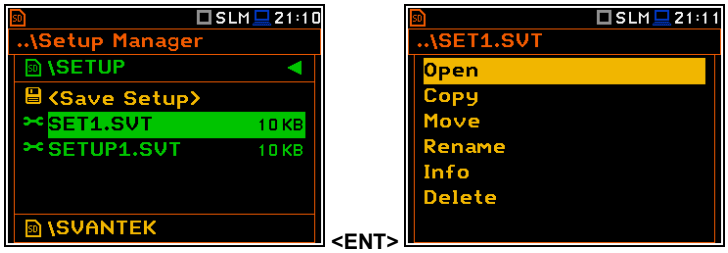
You can edit the setup file name in the editor screen. Press **<ENTER>** to confirm edition. Up to 8 characters can be used to name a setup file.



Opening setup files

Opening 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.

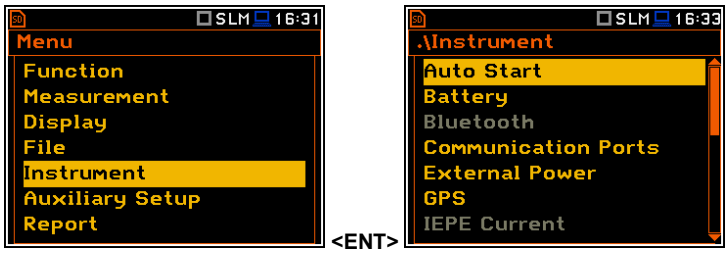
After loading the setup file, the instrument will be reconfigured.



Copying, moving, renaming, info viewing and deleting setup files is performed in the same way as files from the **File Manager** list.

7 CONFIGURING INSTRUMENT SETTINGS – Instrument

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



The **Instrument** list contains following positions:

Auto Start allowing you to automatically start the measurement just after turning the instrument on,

Battery allowing you to get information about current power source,

Bluetooth allowing you to configure Bluetooth®,

Communication Ports allowing you to select the active port of the instrument,

External Power allowing you to select the minimum voltage of the external source, when the instrument should be switched off automatically,

GPS allowing you to select a time zone and switch on/off time synchronization,

IEPE Current allowing you to choose correct IEPE current supply for the used microphone and accelerometer,

Keyboard Settings allowing you to set the operating mode of the **<Shift>**, **<Alt>** and **<Start/Stop>** keys,

Modem Status allowing you to check the status of the modem (position appears when the GPRS function is switched on),

Multifunction I/O allowing you to select the available functionality of the I/O port,

Polarisation Voltage allowing you to choose the polarisation voltage for the instrument's microphone,

Remote Control Mode allowing you to configure the remote control of the instrument,

RS232 allowing you to set the transmission speed and the timeout in the RS232 interface,

RTC allowing you to set the Real-Time Clock,

Self Vibration allowing you to check the self-vibration levels of the instrument,

Signal Generator allowing you to switch on the signal generator function,

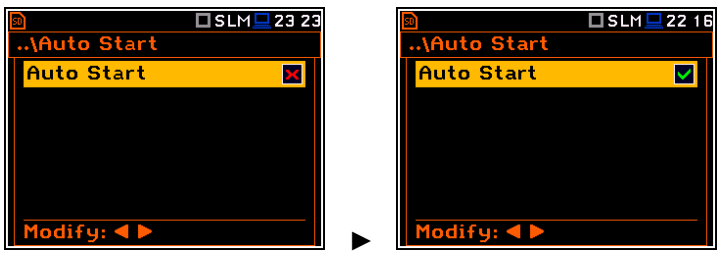
Wireless Transfer allowing you to select the network type and configure parameters of data transmission when it is a part of the SV 279 PRO monitoring station,

Unit Name allowing you to enter the name of the instrument visible by the SvanNET web-service,

Unit Label allowing you to display instrument properties and the standards which the instrument complies with.

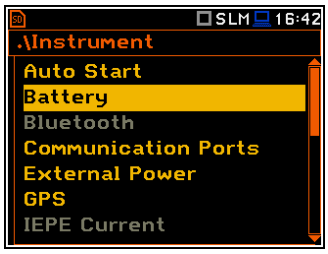
7.1 MEASUREMENT AUTO START – AUTO START

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

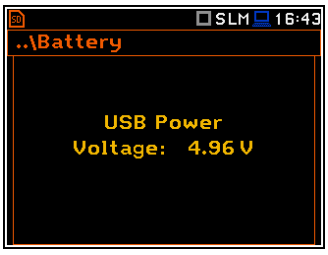


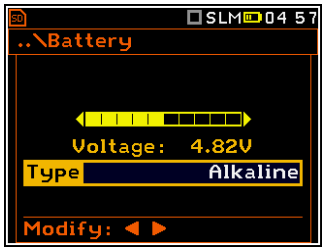
7.2 CHECKING POWER – BATTERY

The **Battery** position allows you to check the condition of the internal battery and the voltage of the external power source. The instrument can be powered from four AA rechargeable batteries or standard alkaline batteries or from an external DC power supply (via the SA 33 power adapter or via the USB port).



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.

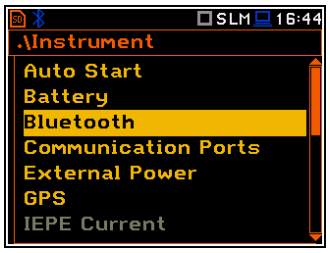




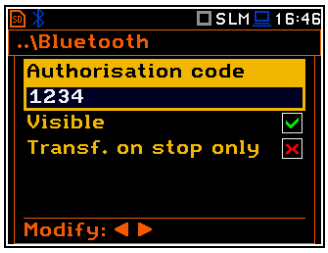
7.3 BLUETOOTH® ACTIVATION – BLUETOOTH

The **Bluetooth** position becomes active after activation of Bluetooth® in the **Communication Ports** screen and allows you to enter an authorization code to pair a PC (tablet or smartphone) with the instrument.

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



<ENT>



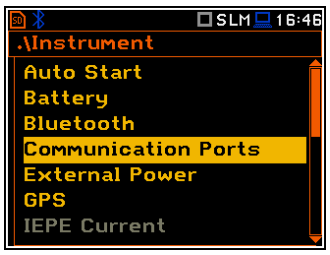
If **Visible** is enabled, the instrument will be visible during searching of Bluetooth units by other devices. The instrument can communicate also with inactive **Visible** parameter.

If **Transf. on stop only** is enabled, the Bluetooth function is switched off during the measurement. Active Bluetooth® may be a source of additional internal electrical noise in a very low acoustic environment.

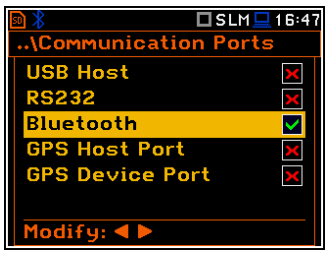
7.4 INTERFACE PARAMETERS SETTINGS – COMMUNICATION PORTS

The **Communication Ports** position enables selecting the active communication port of the instrument.

You can select the following combinations:
- **USB Host** / **Bluetooth** / **GPS Device Port**,
- **RS232** / **GPS Device Port**,
- **GPS Host Port** / **Bluetooth**.



<ENT>



The **USB Host** socket can be used as the input of the different interfaces: **RS 232** or **USB**. The **RS 232** interface in SVAN 979 is available as a hardware option (a special **SV 55** interface/converter with dedicated microprocessor has to be attached to the **USB Host** socket).

Note: *The **SV 55** converter serves as the RS 232 interface. The **SV 55** connection to the **USB Host** socket is detected and after successful detection the "RS232" icon changes its colour to blue. Transmission with the **SV 55** interface is only possible if the instrument is not connected to a PC through the **USB Device** port.*

The USB host interface can be used to control an external USB memory disk with the FAT16 or FAT32 file systems. Switch on the **USB Host** position after USB disc connection.

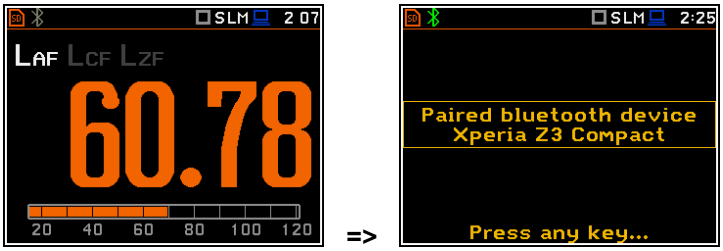
The USB disk should be disconnected when the measurements are not performed or working directory was set up at the SD card.

In the USB disk, that is divided into partitions its first partition must be reserved for FAT32 or FAT16 file system. Only short file names (up to 8 characters, like in the DOS system) may be used. The existing longer names are shortened automatically.

Note: *Disconnection of the USB disk during data transmission can cause the loss of data saved in the USB disk as well as in the instrument's internal flash and should be avoided.*

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

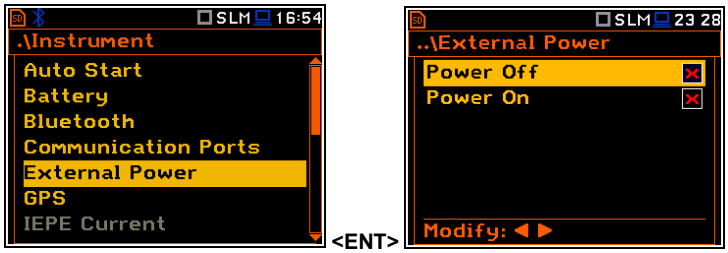
When devices are paired, the "Bluetooth" icon changes its colour to green.



There are two types of GPS modules with different plugs: USB CLIENT or USB HOST. Therefore, when using the GPS module, you should select the port (**GPS Host Port** or **GPS Device Port**) depending on your GPS type (**SV 58_H** or **SV 58_C**).

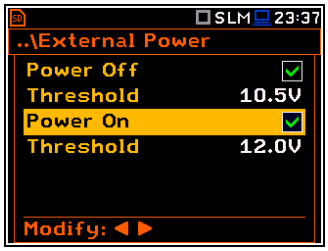
7.5 SETTING EXTERNAL POWER ON/OFF CONDITIONS – EXTERNAL POWER

The **External Power** position allows you to set the minimum voltage of the external DC power source (for example, **SA 15/33**), 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.



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.

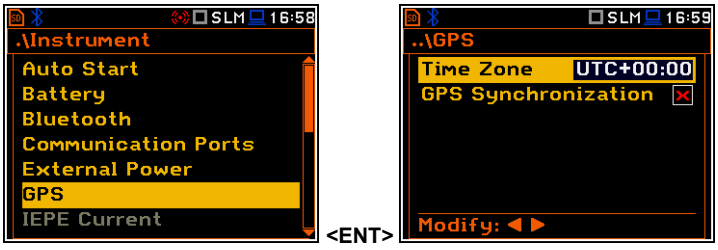


7.6 SETTING GPS PARAMETERS – GPS

The **GPS** position enables selecting the time zone and switch the time synchronization on or off.

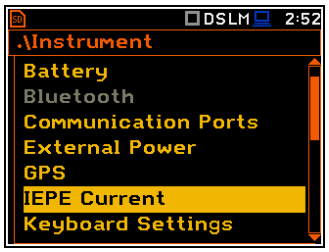
Time Zone selection is made in the special editor screen after pressing the ◄ / ► key.

The **GPS Synchronization** position allows synchronisation of the GPS time with the instrument's RTC.

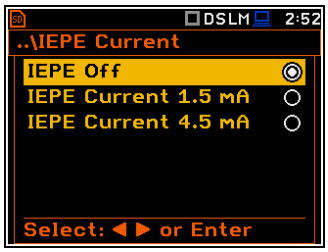


7.7 SELECTING IEPE CURRENT SUPPLY – IEPE CURRENT

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

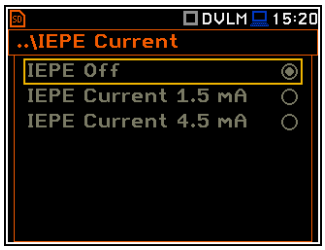


<ENT>



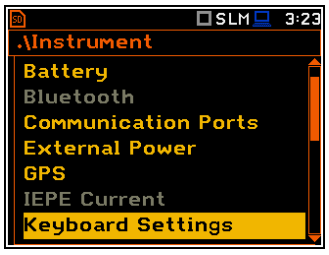
In the **Vibration Meter** mode, you cannot switch off IEPE.

In the **Sound Meter** and **Direct Vibration** modes, all positions in the **IEPE Current** screen are unavailable and IEPE is switched off.

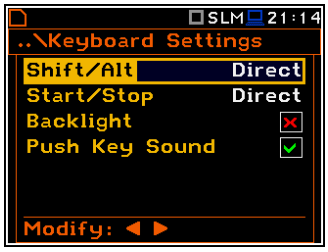


7.8 PROGRAMMING KEYBOARD – KEYBOARD SETTINGS

The **Keyboard Settings** position allows you to programme the functionality of the **<Shift>**, **<Alt>** and **<Start/Stop>** keys and switch backlight and sound options on or off. The default settings are as on the right-hand display screen.

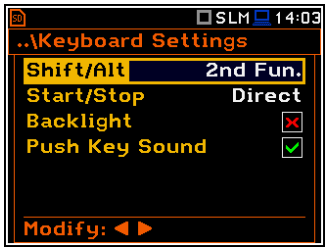


<ENT>



<Shift> / <Alt> key mode

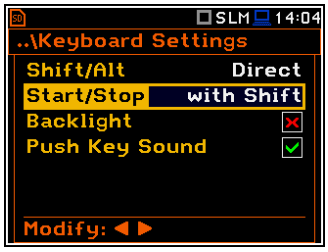
In the **Shift/Alt** position, you can choose between **2nd Fun.** or **Direct**. When the **Direct** option is selected, the **<Shift>** and **<Alt>** keys operate as in a computer keyboard – to achieve the desired result, the second key should be pressed at the same time with **<Shift>**/**<Alt>**.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

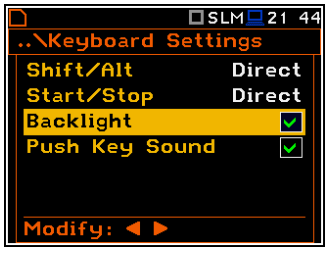


Backlight mode selection

In the **Backlight** position you can switch the keyboard backlight on or off.

Sound mode selection

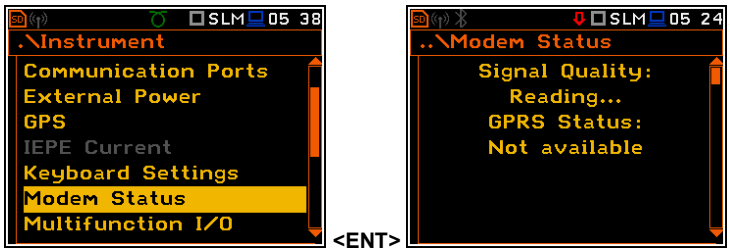
In the **Push Key Sound** position you can switch the keyboard sound on or off. During the actual measurement the key sound is not active even if it was switched on in the **Keyboard Settings** screen.



7.9 CHECKING THE MODEM STATUS – MODEM STATUS

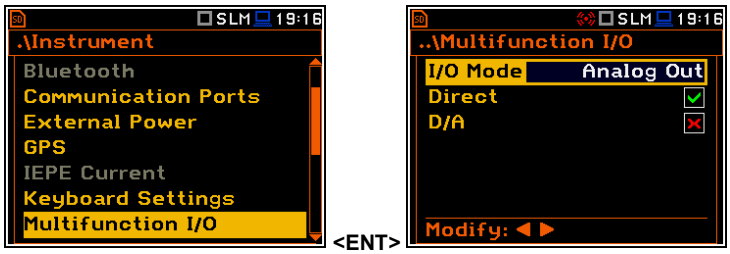
The **Modem Status** position is active only when the **GPRS** option is selected (*path: <Menu> / Instrument / Wireless Transfer / Network*).

This screen shows status of the 3G connection when SV 979 works as a part of the SV 279 PRO/PRIM monitoring station.



7.10 SETTING PARAMETERS OF I/O PORT – MULTIFUNCTION I/O

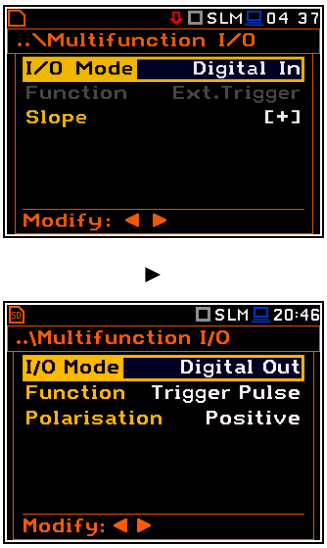
The **Multifunction I/O** position allows you to select the available functionality of the **I/O** port (2 pin Lemo socket).

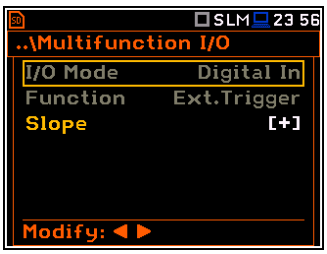


The **I/O** jack socket can be used as (**I/O Mode**):

- output of the analogue signal (**Analog Out**) transmitted from the input of the instrument to its output with or without digital processing,
- 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.



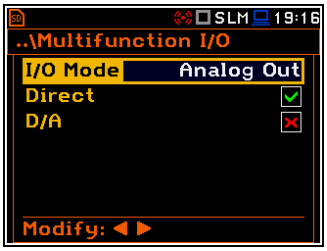


Note: *If the **RPM** function is enabled (path: <Menu> / Auxiliary Settings / RPM Measurement) the **Multifunction I/O** is set automatically to **Digital In** mode with the **Ext.Trigger** function.*

Analog Out mode

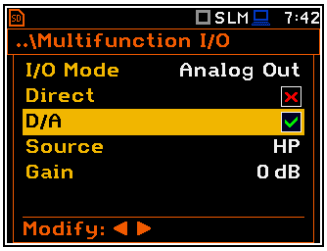
In the **Analog Out** mode, you can select two parameters: **Direct** and **D/A**.

When **Direct** is selected, the measured signal is transmitted to the pin 2 of the **I/O** connector directly from the signal input.



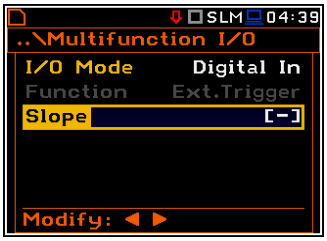
When **D/A** is selected, the analogue signal from the internal signal generator of the instrument after digital-to-analogue converter is transmitted to the pin 1 of the **I/O** connector, and the analogue input signal is transmitted to the pin 2 of the **I/O** connector after digital-to-analogue converter.

The input signal can be weighted with **HP**, **Z**, **A**, **C** or **B** filter (**Source**) and additionally gained by **-60 dB** to **60 dB** (**Gain**).



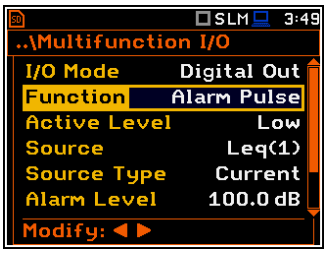
Digital In mode (External trigger function)

In the **Digital In** mode, the signal appeared on the pin 2 of the **I/O** socket will be treated as an 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).



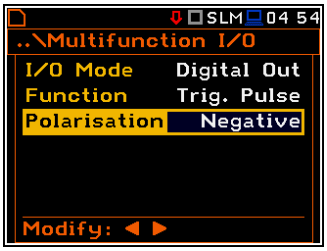
Function of the Digital Out mode

The **Function** position allows you to select the function of the digital output of the **I/O** instrument's socket (pin 2). The pin 2 of 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**).



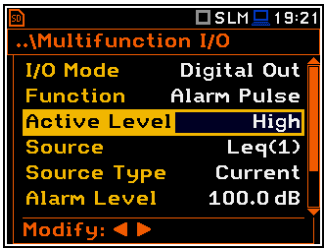
Polarisation of the digital output trigger pulse

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



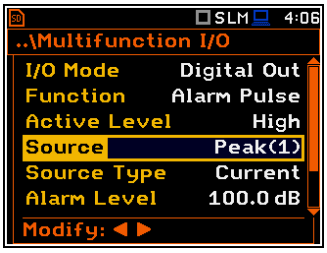
Active level of the alarm pulse

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 and compared with the threshold level 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.

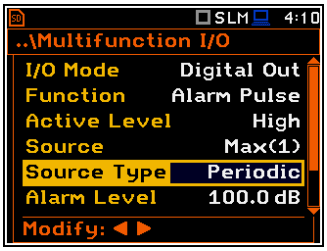


Type of Alarm source

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

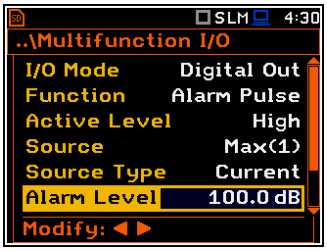
Current means that the alarm pulse will be generated all the time when the Source result averaged with 1-second step is over the **Alarm Level** value.

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.



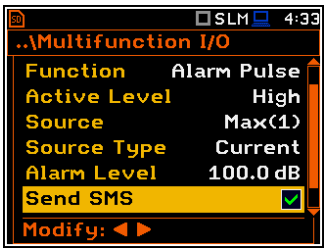
Alarm trigger threshold level

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 Sound modes and [60.0 dB, 180 dB] in Vibration modes.



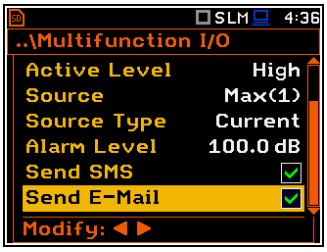
SMS alarm message

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).*

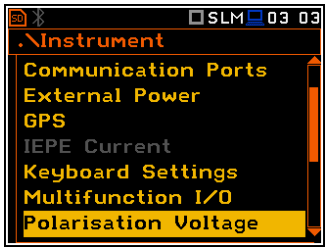


Note: *SMS and e-mails can be sent if the instrument is working as a part of SV 279 PRO monitoring station.*

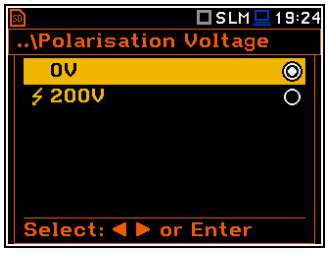
7.11 SETTING MICROPHONE POLARISATION VOLTAGE – POLARISATION VOLTAGE

The **Polarisation Voltage** position allows you to choose polarisation voltage of the instrument's microphone in the **Sound Meter** mode: **0V** and **200V**.

In other modes, the **200V** option is unavailable.

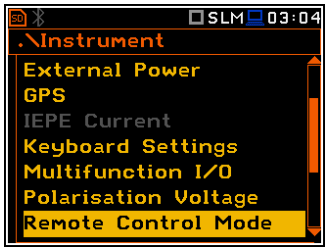


<ENT>

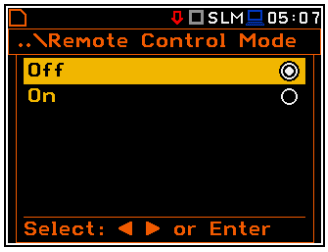


7.12 SWITCHING ON/OFF THE REMOTE CONTROL MODE – REMOTE CONTROL MODE

The **Remote Control Mode** position allows you to activate the remote control mode. In this mode the messages that require manual action from the user will stop being shown after 5 seconds. This mode is helpful when the instrument is configured for remote monitoring during which usually there is no person nearby who can control the instrument manually. In this mode, instrument's normal operations will not be interrupted by such messages.

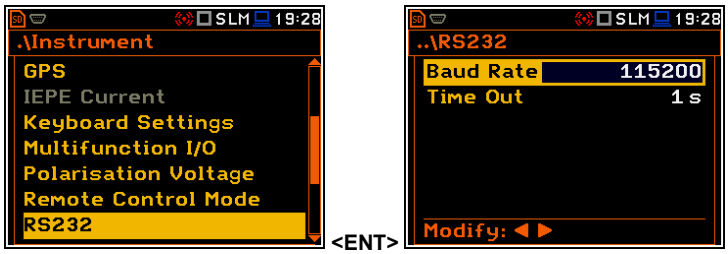


<ENT>



7.13 SETTING PARAMETERS OF THE SERIAL INTERFACE – RS232

The **RS232** position becomes active after activation of **RS232** in the **Communication Ports** screen and enables programming the RS 232 interface transmission speed (**Baud Rate**) and the time limit during which the communication operation should be performed (**Time Out**).



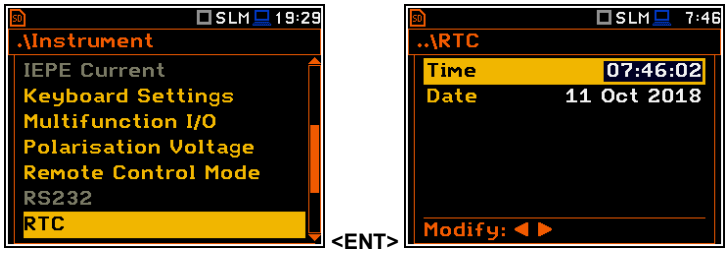
The RS 232 interface transmission speed (**Baud Rate**) can be selected from the following available values: **1200**, **2400**, **4800**, **9600**, **19200**, **38000**, **57600** or **115200** bits/s. The transmission speed should be the same as in the connected device to ensure successful data transfer.

Other RS 232 transmission parameters are fixed to **8 bits for data**, **No parity** & **1 Stop bit**.

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

7.14 PROGRAMMING THE INSTRUMENT'S INTERNAL REAL TIME CLOCK – RTC

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



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>**.

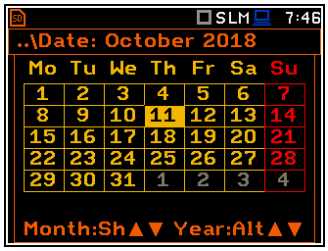
If you exit this screen with **<ESC>** the new time will be also saved.



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

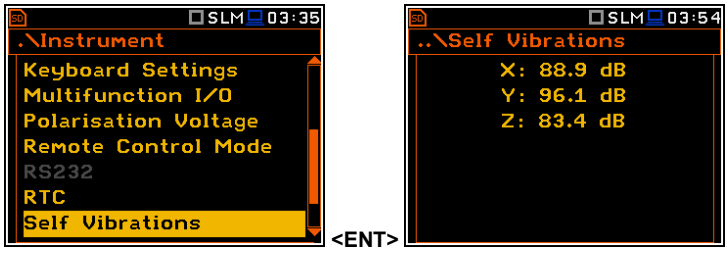
To set the date, select its position in the calendar with the ◄ / ► or ▲ / ▼ key and press **<ENTER>** to confirm the selection.

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



7.15 CHECKING THE INSTRUMENT'S VIBRATION – SELF VIBRATION

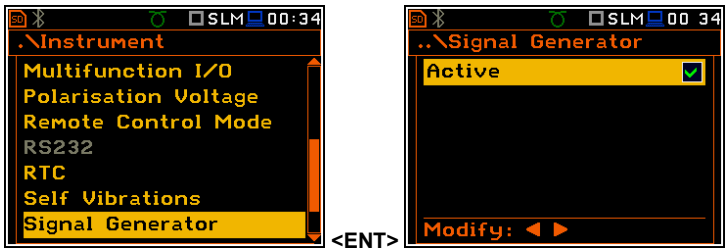
The **Self Vibration** position allows you to check the self-vibration levels of the instrument. The X direction is from side to side, the Y direction is from top to bottom and the Z direction is from front to back. The "self-vibration" icon will flash momentarily at the top of the screen if the level in any direction exceeds 100 dB.



7.16 ACTIVATING THE SIGNAL GENERATOR – SIGNAL GENERATOR

The **Signal Generator** position allows you to enable the signal generator function. The settings of the generated signal are made in the **Signal Generator** presentation mode (see **Display** menu description).

When **Signal Generator** is enabled the generator signal is transmitted to the pin 1 of the **I/O** connector.

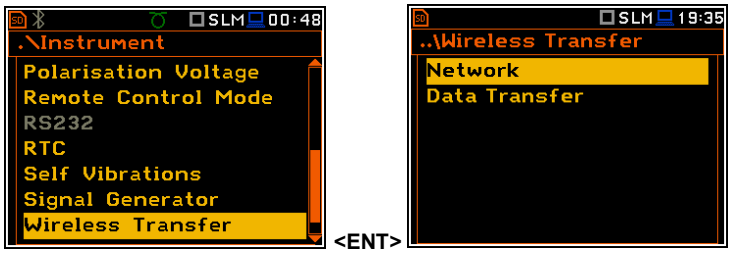


7.17 REMOTE COMMUNICATION SETTINGS – WIRELESS TRANSFER

SVAN 979 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.

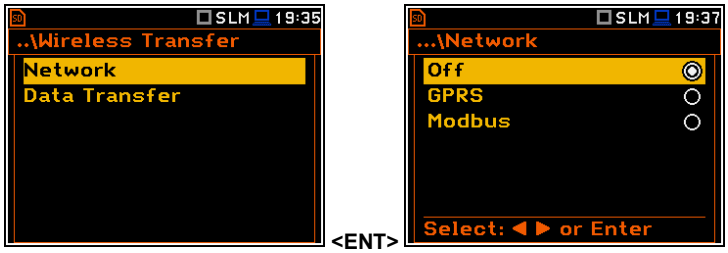
Such solution is used in the SV 279 PRO and SV 279 PRIM monitoring stations.

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

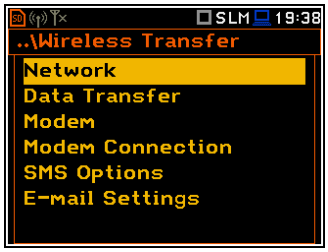


7.17.1 Selecting network type – Network

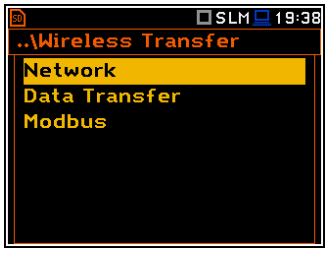
In the **Network** screen you can disable (**Off**) data transfer or enable it selecting the **GPRS** or **Modbus** option.



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**.

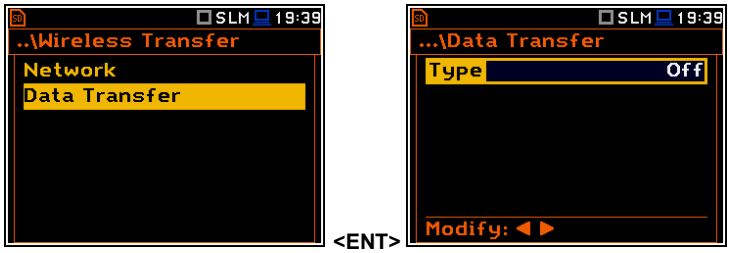


If the **Modbus** network is selected the **Wireless Transfer** screen will have two positions enabling configuring Modbus connection: **Data Transfer** and **Modbus**.

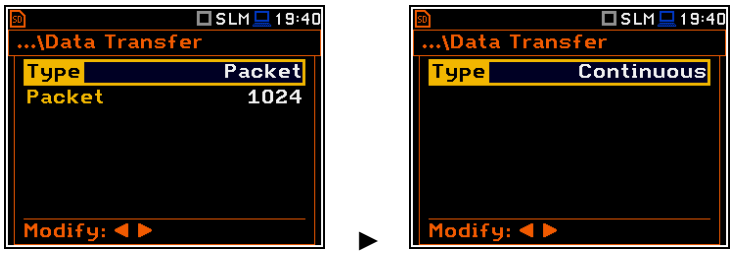


7.17.2 Configuring data transfer – Data Transfer

In the **Data Transfer** screen, you can choose the data transfer type. Three options are available: **Off**, **Continuous** and **Packet**.

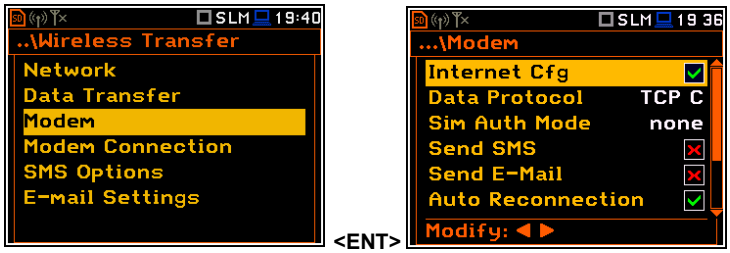


In case of **Packet**, it is possible to select the packet size in bits. The available options are **1024**, **512**, **256**, **128** and **64**.

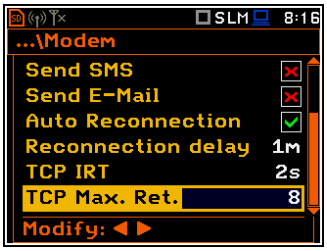


7.17.3 Configuring modem basic settings – Modem

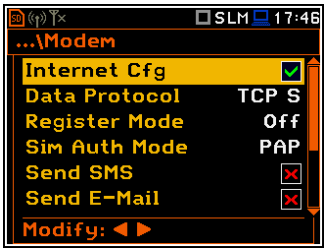
The **Modem** position allows you to configure modem and data transmission settings.



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.*

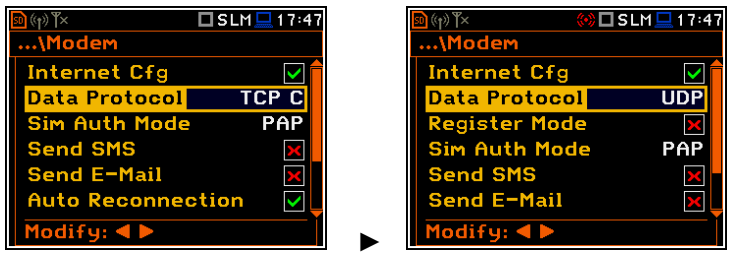


The **Modem** screen contains following parameters:



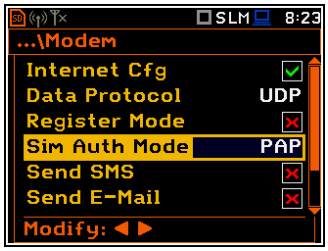
- **Internet Cfg** – if it is switched on, the instrument will automatically configure the modem right after turning on.

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

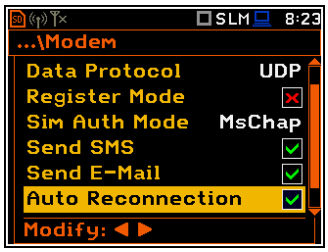


- **Register Mode** – selecting this option ensures that the device instantly attempts to register the station provided the modem is already configured. Depending on selected **Data Protocol** type the values of this parameter are different: in case of **TCP S** the values are: **Off**, **On** (registration using Connection Request Packets), **AS** (periodic registration on Svantek Server Address), **SMT.AS** (registration on Svantek Server Address – performed each time internet connection is initialized by the modem); in case of **UDP**, the values are: **Off** and **On**. In case of **TCP C** the **Register Mode** position does not appear.

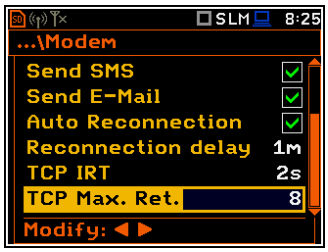
- **Sim Auth Mode** – defines the method of user verification by a SIM card type. Depending on the SIM card, several options are possible, some of them are recognized by the modem:
  - **none** – no verification required.
  - **PAP**
  - **CHAP**
  - **MsChap** – denotes MsChap in version 1.



- **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.

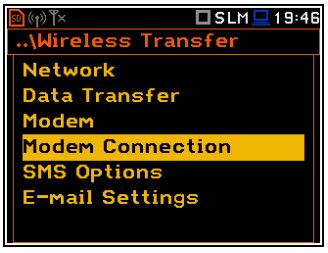


- **Reconnection Delay**– defines time between each reconnection attempts.
- **TCP IRT** - defines TCP Initial Retransmission Timeout. In some cases, extending this timeout may be helpful in case of slow connections, but the default setting is recommended.
- **TCP Max. Ret.** - defines maximum reconnection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

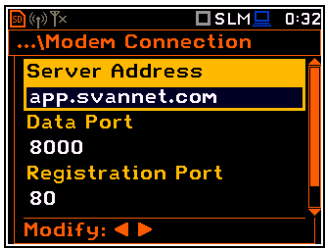


7.17.4 Configuring connections – Modem Connection

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



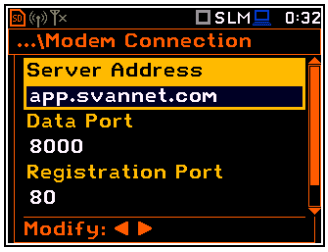
<ENT>



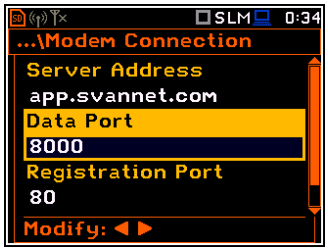


***Note:** For connection with the **SvanNET** server the parameters in the **Modem Connection** list should be set on default values as is shown on the screenshots above and below.*

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

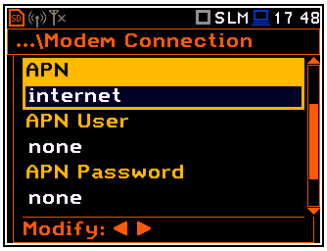


- **Server Address** – allows you to enter up to 32 characters of either IP or domain address, where the registration data will be sent during the registration process (**Data Protocol: TCP S** or **UDP**) or to which the modem will connect to (**Data Protocol: TCP C)**. By default, the server address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

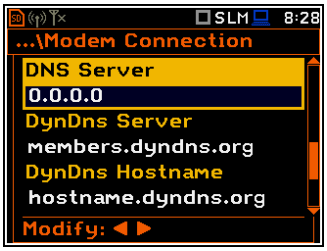


- **Data Port** – allows you to enter up to 5 characters for the port number. This number denotes a port on which a communication socket will be configured for data exchange between the remote host and the station.
- **Registration Port** – allows you to enter up to 5 characters for the port number. 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 you to enter up to 20 characters of APN name of the SIM card used with the modem.
- **APN User** – allows you to enter up to 20 characters of user name used for verification by the SIM card used with the modem.
- **APN Password** – allows you to enter up to 20 characters of password used for verification by the SIM card used with the modem.



- **DNS Server** – allows you 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 Server**, **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.

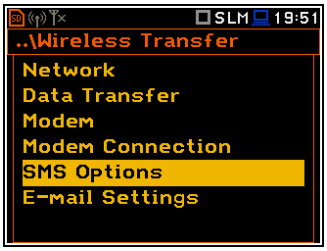


Edition of each position is performed in the text editor screen, which is opened with the ◄ / ► key.



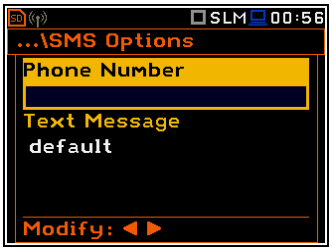
7.17.5 Configuring SMS service - SMS Options

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



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

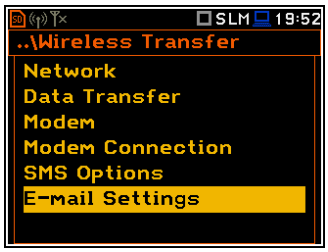
- **Phone Number** – allows you to enter up to 20 characters of the phone number where the text messages will be sent.
- **Text Message** – allows you to enter up to 20 characters of additional text, which will be appended into a standard alarm message template.



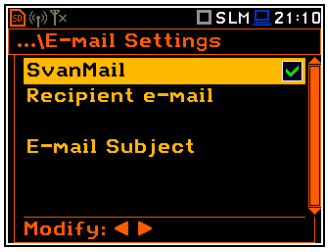
Edition of each position is performing in the special screen with the text editor function, which is opened with the ◄ / ► key.

7.17.6 Configuring e-mail service – E-mail Settings

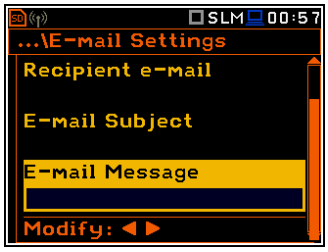
The **E-mail Settings** position allows you to configure the e-mail service used for alarm notification.



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.

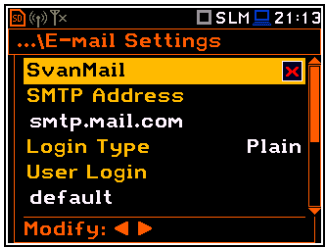


- **Recipient e-mail** – allows you to enter up to 48 characters of e-mail address to which the e-mail message will be sent.
- **E-mail Subject** – allows you to enter up to 20 characters of the message's subject.
- **E-mail Message** – allows you to enter up to 20 characters of additional text which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

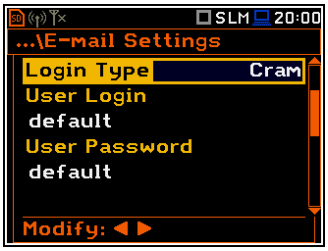


If **SvanMail** position is disabled, you should define some additional positions:

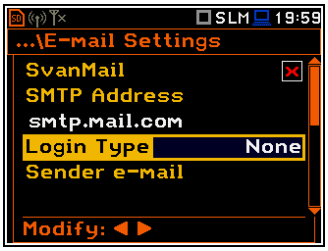
- **SMTP Address** – allows you to enter up to 32 characters of SMTP server address which will be used to send e-mail messages.
- **Login Type** – **None**, **Login**, **Plain** or **Cram**. These options define authentication method, which depends on the SMTP server used for sending e-mails. In most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



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

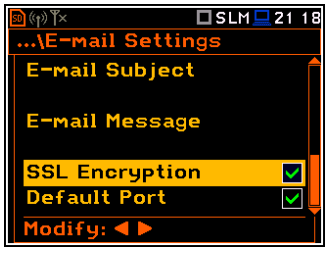


If **Login Type** is **None**, **User Login** and **User Password** positions do not appear in the **E-mail Settings** list. **None** value should be used when SMTP server requires no authentication.

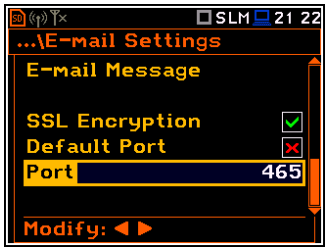


- **Sender e-mail** – allows you to enter up to 48 characters of e-mail address from which e-mail message will be sent.

- **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).



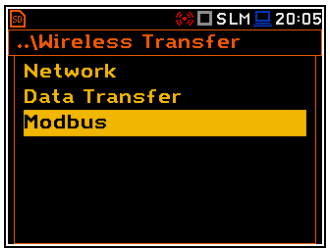
Disabling of **Default Port** will initiate the **Port** position, where the user will be able to define its own port.



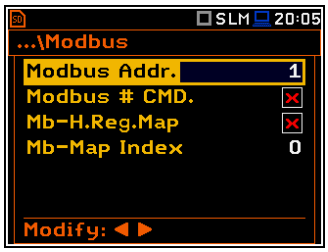
Editing of some positions is performed in the special screen with the text editor function, which is opened after pressing the ◄ / ► key.

7.17.7 Data transfer with Modbus protocol – Modbus

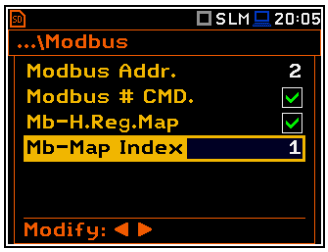
If the **Modbus** network is selected the **Wireless Transfer** window will have three positions: **Network**, **Data Transfer** and **Modbus**.



<ENT>



The **Modbus** window contains the following positions:

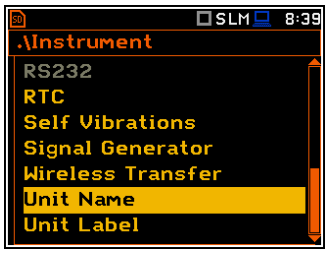


- **Modbus Addr.** - device Modbus address, ranging from 1 to 247.
- **Modbus # CMD.** - selecting this option, enables processing of Svantek # functions via Modbus protocol. Upon entering a # command into Modbus structures, it will be processed, and any results will be placed in Input Registers (and Discrete Inputs) structure. **It is not recommended to use this option alongside with Mb-H.Reg.Map option!**
- **Mb-H.Reg.Map** - selecting this option enables result mapping. During measurement, on-going results will be placed in Holding Registers starting from appointed address. **It is not recommended to use this option alongside with Modbus # CMD. option!**
- **Mb-Map Index** - denotes address from which result map will be placed during measurements.

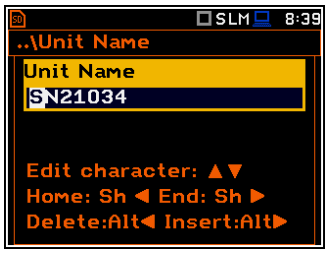
7.18 INTRODUCING THE INSTRUMENT NAME – UNIT NAME

The **Unit Name** position allows you 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.



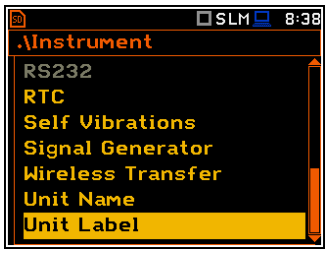
<ENT>



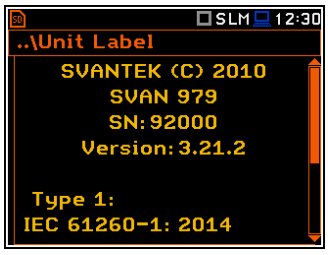
7.19 CHECKING THE INSTRUMENT PROPERTIES – UNIT LABEL

The **Unit Label** position allows you 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>

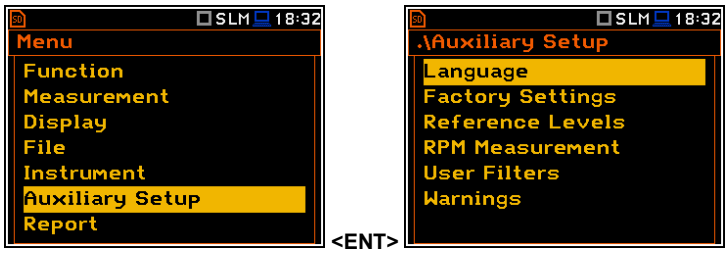




Note: *The contents of the **Unit Label** screen should be always sent to the Svantek service department or official representative in case of any problems faced by the user during the instrument's normal operation.*

8 AUXILIARY SETTINGS – Auxiliary Setup

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



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

Language – allowing you to select the language of the user interface,

Factory Settings – allowing you to return to the default, factory settings,

Reference Levels – allowing you to select reference levels for Vibration measurements,

RPM Measurement – allowing you to unlock the RPM function; after unlocking this position is automatically transferred to the **Measurement** section,

User Filters – allowing you to select and set the correcting values for all real-time and 1/1 - 1/12 octave filters,

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

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

8.1 SELECTING THE USER INTERFACE LANGUAGE – LANGUAGE

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

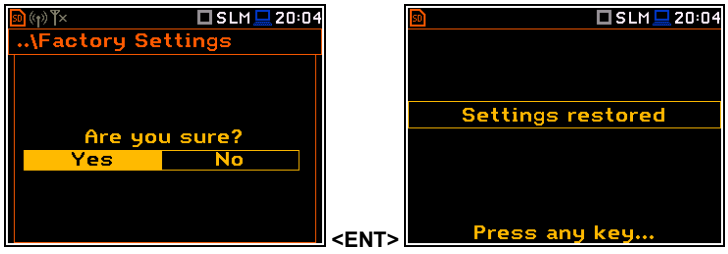
If after turning the instrument on an unknown language interface appears on the display, you can reset the instrument with four **<Shift/Enter/Alt/Start>** keys pressed together. After this, the instrument will come back to the default setup with the English interface.



8.2 RESTORING THE FACTORY SETTINGS – FACTORY SETTINGS

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

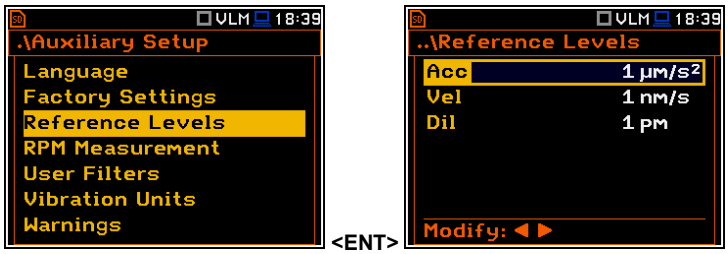
Being on the **Factory Settings** position press **<ENTER>**, select **Yes** in the opened **Factory Settings** screen and press **<ENTER>** to perform the operation. After the restoration process the instrument will inform that "**Settings restored**".



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

8.3 SETTING THE REFERENCE LEVELS – REFERENCE LEVELS

The **Reference Levels** position allows you 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).



Reference levels for vibration measurements

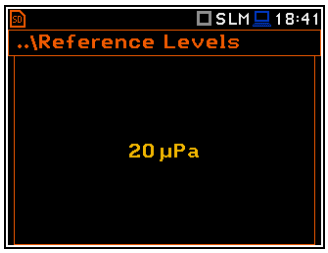
In the **Acc** position you can set the reference level of the acceleration signal in the range: 1 μms^{-2} - 100 μms^{-2}.

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

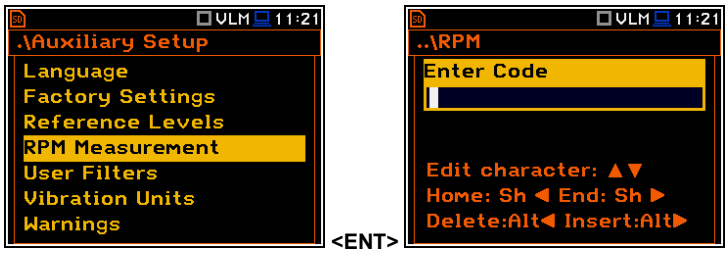
For sound measurements, the **Reference Levels** sub-lists is used to inform only the user that the reference level of the acoustic signal is equal to **20 µPa**.



8.4 UNLOCKING RPM FUNCTION – RPM MEASUREMENT

The **RPM Measurement** position allows you to unlock the RPM function which is usually an optional.

After unlocking this position is automatically transferred from the **Auxiliary Setup** section to the **Measurement** section (see Chapter 4.10).



8.5 SETTING COEFFICIENTS OF THE USER FILTERS – USER FILTERS

The **User Filters** position allows you to introduce the values of the coefficients of the user defined weighting filters.



8.5.1 Parameters of the real time filters – Real Time Filters

The **Real Time Filters** list allows you to introduce the values of the correcting coefficients considered in the real time measurements. You can define three real-time user filters: **R1**, **R2**, **R3**.

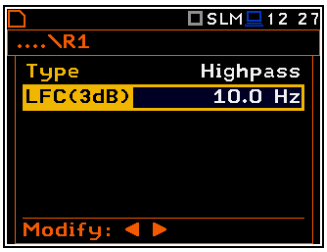


In the **Rx** (**R1**, **R2**, **R3**) screen you can select the filter **Type** (**Highpass**, **Bandpass** or **Lowpass**) and define frequency corners: low frequency corner - **LFC(3dB)** and high frequency corner - **HFC(3dB)**.

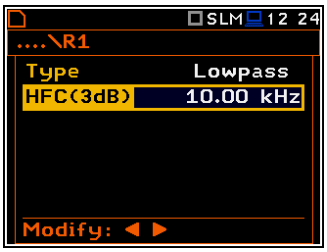


Bandpass filters require definition of two frequencies: **LFC(3dB)** and **HFC(3dB)**. The amplitude of the input signal is attenuated by half at these frequencies. The available values for **LFC** are from 10 Hz to 10.0 kHz, and for **HFC** - from 100 Hz to 10.00 kHz.

The **Highpass** filter requires definition of **LFC(3dB)**, while the **Lowpass** filter requires definition of **HFC(3dB)**.



▶



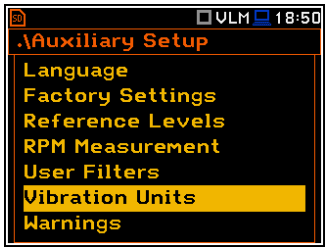
All filters mentioned above, high-pass, band-pass and low-pass, are the second order with the slope equal to 12 dB/octave.

Characteristics if these filters are presented in Appendix C.

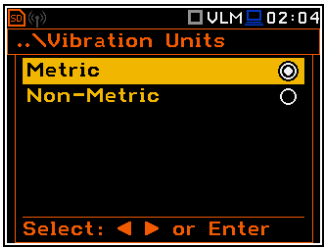
8.6 SELECTING UNITS FOR VIBRATION RESULTS – VIBRATION UNITS

The **Vibration Units** position allows you 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.).



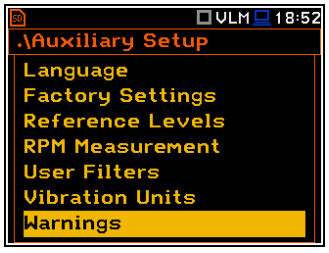
<ENT>



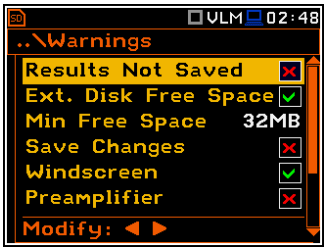
8.7 WARNINGS SETUP – WARNINGS

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

By default, all warnings are enabled except **Preamplifier** and **Self Vibration Level**.

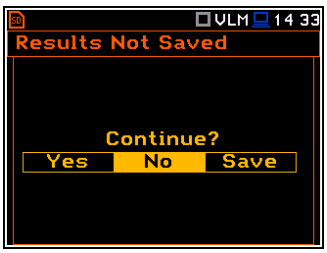


<ENT>



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**].

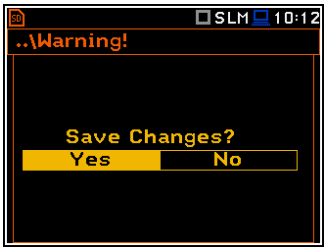


Confirmation of parameters changes

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.



=>

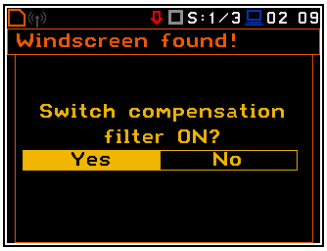


Windscreen detection

If the **Windscreen** warning is enabled, the instrument will ask whether to switch on or off the compensation filter every time the windscreen is removed or put on again? The windscreen is detected automatically if the **Windscreen** parameter is set to **Auto** (*path: <Menu> / Measurement / Compensation Filter*).



=>

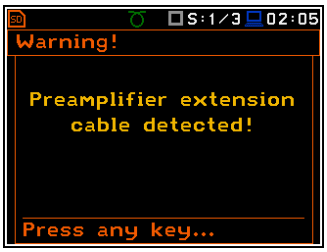


Preamplifier detection

If the **Preamplifier** warning is enabled, the instrument will display the message if a preamplifier is connected to the instrument through the extension cable.



=>

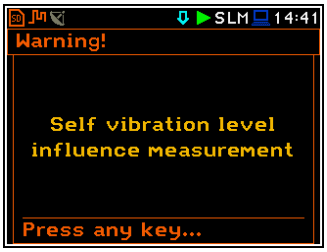


Self-vibration warning

If the **Self Vibration Level** warning is enabled, the instrument will show the message if a self-vibration level is high and can lead to the loss of measurement accuracy.

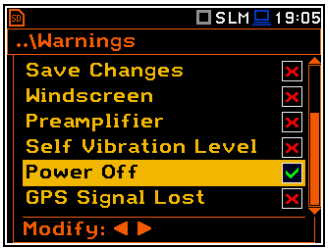


=>

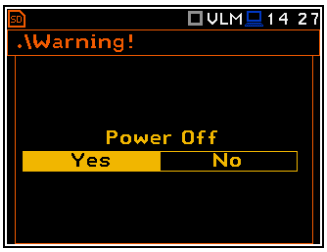


Confirmation of the instrument switching off

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

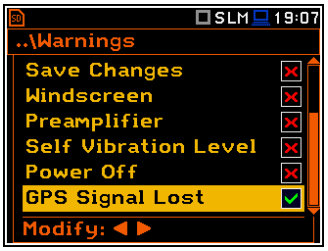


=>

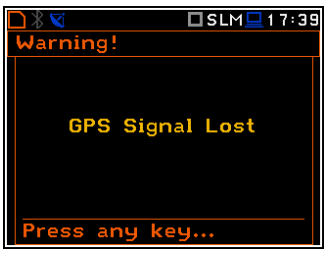


GPS signal lost warning

If the **GPS Signal Lost** warning is enabled, the instrument will display the message in the case the GPS signal was lost.



=>



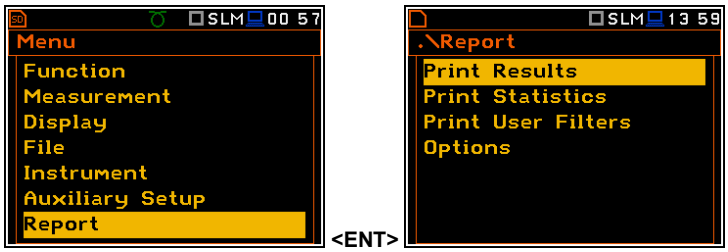
Low Battery warning

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.



9 PRINTING REPORTS – Report

The **Report** section allows you to print reports of the Sound or Vibration measurement results in the predefined format on the printers directly connected to the SVAN 979 instrument.



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

Print Results allowing you to print out the measurement results,

Print Statistics allowing you to print out the statistics of the measurement results; this position is not available in the Vibration modes,

Print User Filters allowing you to print out values of the user filters,

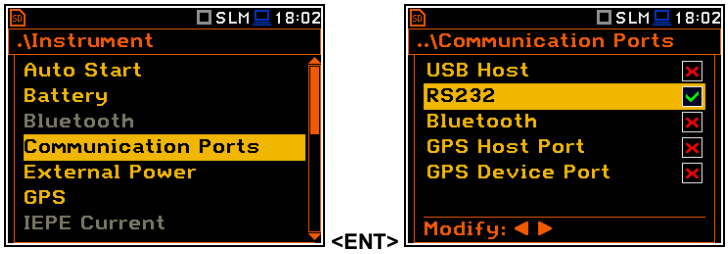
Options allowing you to determine the options of the report.

In order to obtain the report, you should connect the instrument to the printer's RS 232 port using the **SV 55** RS 232 interface. This hardware interface is hidden in the Cannon type, 9-pin RS 232 plug-in. On the other end of the **SV 55** interface, which itself looks like a cable, there is the USB Host plug-in. This plug-in should be placed in the USB Host socket of the instrument.

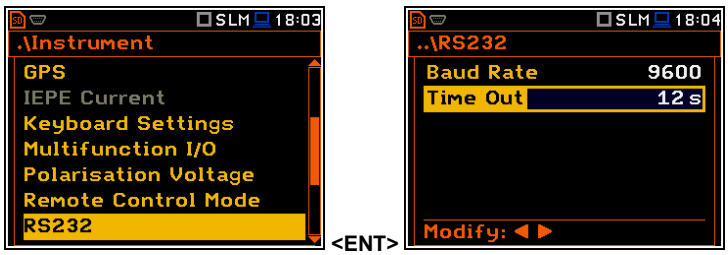
Note: *The **SV 55** converter serves as the RS 232 interface. The **SV 55** connection to the **USB Host** socket is detected and after successful detection the blue "RS232" icon appears on the display.*

Note: *Before printing, be sure that the **RS232** port is active (path: <Menu> / Instrument / Communication Ports).*

The **RS232** position is switched on by default in the **Communication Ports** list of the **Instrument** section.



Additionally, in the **RS232** list (*path: <Menu> / Instrument / RS232*), select the proper speed of the transmission (**Baud Rate**) and the time limit during which the communication operation should be performed (**Time Out**).



The RS 232 interface transmission speed (**Baud Rate**) can be selected from the following available values: **1200**, **2400**, **4800**, **9600**, **19200**, **38000**, **57600** or **115200** bits/s. The transmission speed should be the same as in the connected printer to ensure successful data transfer.

Other RS 232 transmission parameters are fixed to **8 bits for data**, **No parity** & **1 Stop bit**.

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

Printers, in which only the Centronics interface is available instead of RS 232, can be connected to the instrument by means of the **SV 52** RS 232 – Centronics interface.

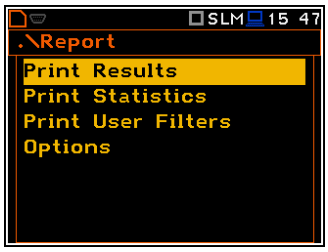
Printers, which have only a USB interface, are currently not driven by the instrument.

Note: *Switch the power off before connecting the instrument to any external device (e.g. a printer or a PC).*

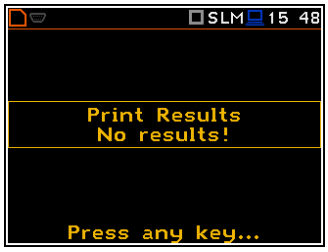
Note: *All reports are printed in the character format using the ASCII set on either A4 or A5 size paper.*

9.1 PRINTING MEASUREMENT RESULTS – PRINT RESULTS

The **Print Results** position allows you to print the report on the attached printer.

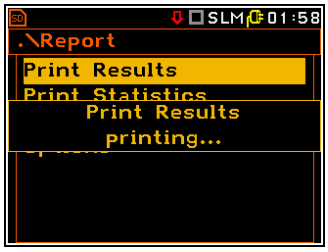


After pressing **<ENTER>** the instrument checks its current state. If the measurements are running, printing is not possible, and the appropriate message is displayed. If no results were recorded the next message is displayed.



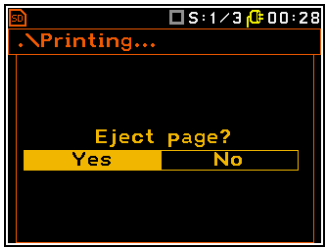
If a measurement has been already performed and results are available, the presented message is displayed.

The data are transferred from the instrument to the attached printer, while the message is displaying. The instrument returns to the **Report** list after transferring all data.



If the **Prompt** parameter was selected in the **Eject Page** position, the following confirmation question is displayed after printing, (*path: <Menu> / Report / Options*). You should answer in this case if the paper in the printer has to be ejected to the new page.

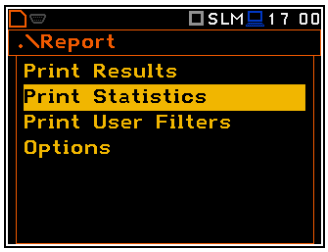
The similar message is displayed after sending out statistics and user filters to the printer (**Print Statistics** and **Print User Filters**).



The message about the time limit is displayed if a printer (or a PC) is not connected or there is any other reason that it does not receive the data. The instrument waits for the reaction of the user (any key should be pressed except **<Shift>** and **<Alt>**) and after pressing a key it returns to the **Report** list.

9.2 PRINTING STATISTICS OF SOUND MEASUREMENT RESULTS – PRINT STATISTICS

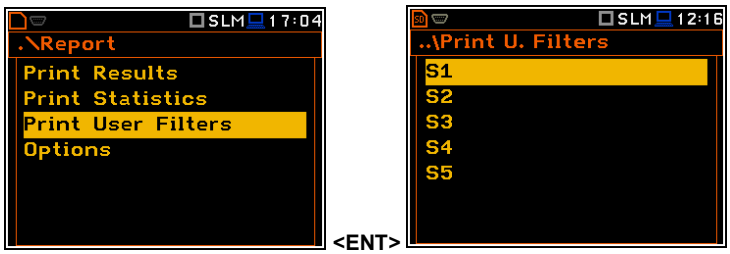
The **Print Statistics** position allows you to print results of the statistics analysis on the attached printer. This position is not accessible for the Vibration measurements.



9.3 PRINTING USER FILTERS COEFFICIENTS – PRINT USER FILTERS

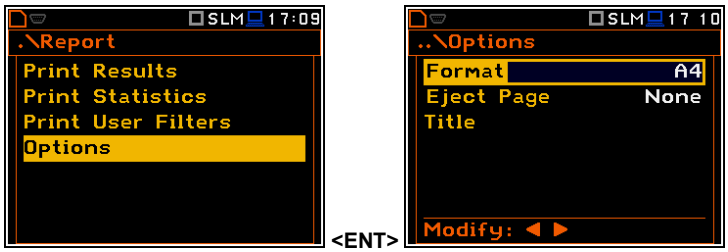
The **Print User Filters** position allows you to print out the values of the user filters: **S1**, **S2**, **S3**, **S4** and **S5**. Select the required filter and press **<ENTER>** to print it.

The contents of the selected file will be sent out to the attached printer (or to a PC).



9.4 SELECTING PRINT OPTIONS – OPTIONS

The **Options** position allows you to select the format of the listing (**Format**), the way the paper is ejected in the printer (**Eject Page**) and to edit the title of the report (**Title**).



The **Format** position allows you to select the format of the listing (**A4** and **A5** options are available).

The **Eject Page** position allows you to control the ejection of the paper after the listing is done. The following options are available: **Prompt** (the instrument asks whether to eject the page after printing report, statistics or catalogue), **Auto** (after printing, the paper is ejected automatically) and **None** (the paper is not ejected after printing). In particular, it is possible to have one result after another using the **None** or **Prompt** options.

The request is displayed after printing the measurement results, statistics or filters (**Print Results**, **Print Statistics**, **Print User Filters**) if the **Prompt** parameter was selected in the **Eject Page** position. You should answer in this case if the paper in the printer has to be ejected to the new page. After pressing **<ENTER>** the instrument returns to the **Report** list.

The **Title** position allows you to edit the text added to the file and to the report.

The text editing is performed in the special editor screen which is opened after pressing the ◄ / ► key.



10 1/1-OCTAVE – 1/12-OCTAVE ANALYSER

The instrument operates as a real time 1/1-octave - 1/12-octave analyser (RTA) in a very similar way to the level meter. Moreover, 1/1-octave - 1/12-octave analysis is performed in parallel with the level meter measurements. All 1/1-octave, 1/3-octave, 1/6-octave and 1/12-octave digital pass-band filters are working in real-time with the weighting filters (**HP**, **Z**, **A**, **B** or **C** - for sound measurements; **HP** - 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.

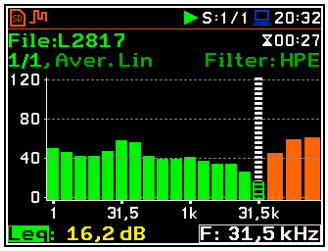
Note: *TOTAL RMS (LEQ) results are measured with their own weighting filters (**A**, **C**, **Z** or **S1**, **S2**, **S3** - for sound measurements; **HP**, **HP3**, **HP10** or **S1**, **S2**, **S3** – for vibration measurements) regardless of settings made in profiles for the Level Meter measurements. Spectra are always linearly averaged. Thus, the **Total** values for 1/1-octave - 1/12-octave analysis can be different from those obtained for profiles (if **RMS Integration** was set as **Exponential**).*

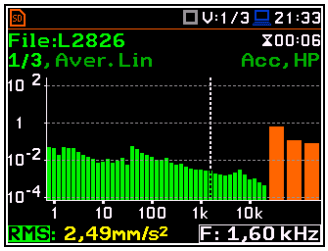
For each 1/1-octave - 1/12-octave band, the **Leq**/**RMS** result is calculated and presented as a bar on the spectrum plot. Spectra can be examined on a display in the **Spectrum** view.

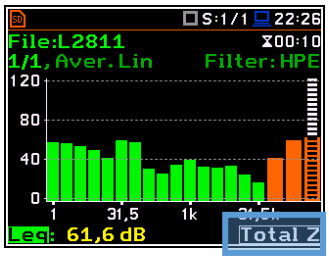
The read-out of spectrum values can be done using a vertical cursor.

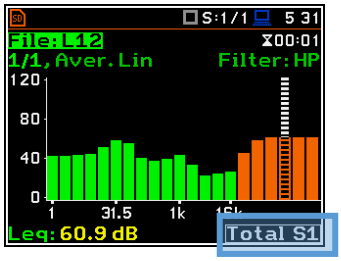
Besides results for bands three **Total** values are measured and displayed as additional three bars on the spectrum plot. Parameters for **Total** values (e.g. filters) are set by default and cannot be changed.

Besides three **Total** values you can define up to three additional **User Total** values with filters: **S1**, **S2**, **S3**, **S4** and **S5**.



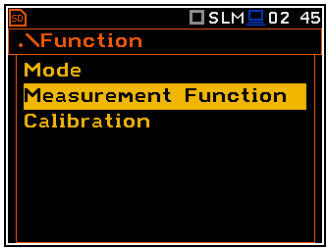




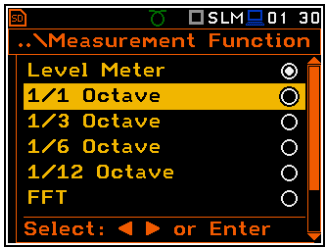


10.1 SELECTING THE 1/1 OCTAVE – 1/12 OCTAVE FUNCTION

To select the 1/1-octave - 1/12-octave analysis function, open the **Measurement Function** screen, select the **1/1 Octave** - **1/12 Octave** position and press **<ENTER>**.



<ENT>



Note: *The **1/6 Octave** and **1/12 Octave** functions are optional and should be unlocked by entering an activation code in the text editor screen, which is opened after first attempt to select one of this option. Once unlocked the 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!*

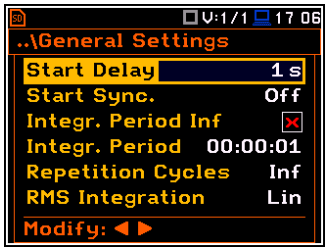
10.2 CONFIGURING 1/1-OCTAVE – 1/12-OCTAVE ANALYSER

Execution of the 1/1-octave - 1/12-octave analysis depends on a certain set of parameters, configured in the **Measurement** section.

10.2.1 General settings for 1/1-octave – 1/12-octave analysis – General Settings

Averaging of results for each spectrum band is performed for the **Integration Period** and is repeated the **Repetition Cycles** times. 1/1-octave – 1/12-octave spectra are always saved as Summary Results.

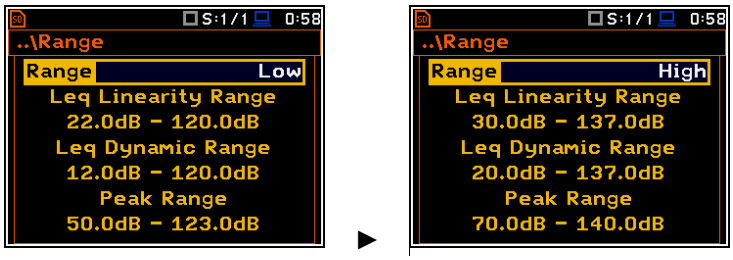
The **Integration Period** and **Repetition Cycles** parameters are defined in the **General Settings** list.



10.2.2 Selecting the measurement range for 1/1-octave - 1/12-octave analysis – Range

The input range for the **1/1 Octave - 1/12 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).

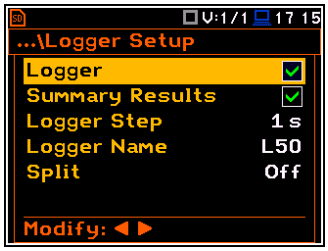


10.2.3 Logging of 1/1-octave - 1/12-octave spectra – Logging

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

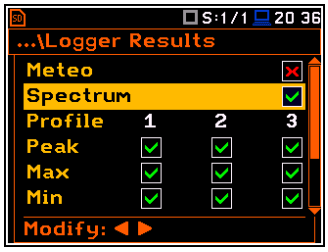
For logging 1/1-octave – 1/12-octave spectra, the **Logger** position must be enabled in the **Logger Setup** screen (*path: <Menu> / Measurement / Logging / Logger Setup*).

If you wish to save spectra together with Summary results, you must enable the **Summary Results** position. 1/1-octave – 1/12-octave spectra will be then logged with the **Integration Period** step.



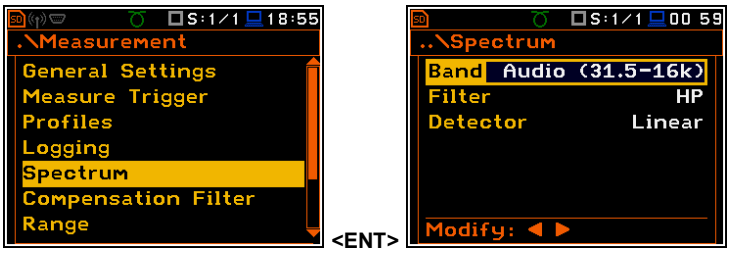
The instrument allows additional logging of 1/1-octave – 1/12-octave spectra in a logger file with the **Logger Step**.

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 - 1/12-octave analysis – Spectrum

For active **1/1 Octave - 1/12 Octave** functions a context position (**Spectrum**) appears in the **Measurement** list (*path: <Menu> / Measurement / Spectrum)*. In the **Spectrum** screen, you can select the band, the pre-weighting broadband frequency filter (only for sound measurements) and the LEQ/RMS detector.

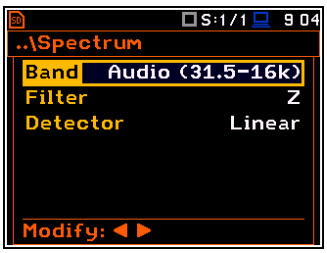


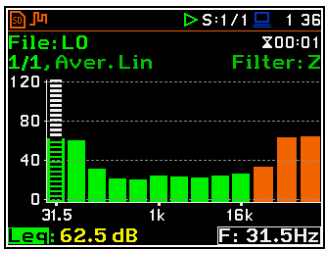
Selection of the band

The **Band** parameter defines the band of 1/1-octave - 1/12-octave analysis.

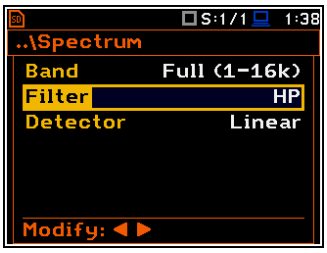
Available bands for sound analysis are as follows:

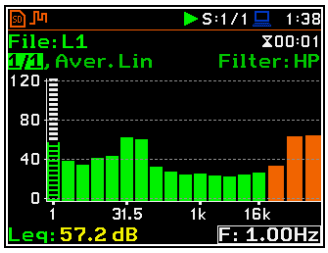
- **1/1 Octave**:
  - **Audio (31.5-16k)** - 10 filters with centre frequencies from 31.5 Hz to 16 kHz



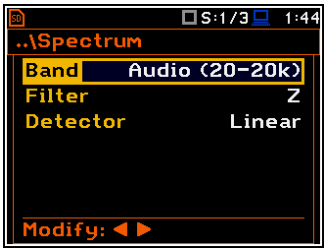
=>


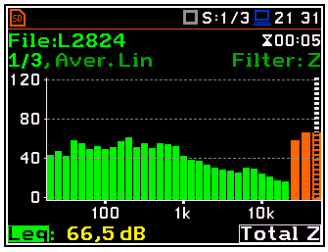
  - **Full (1-16k)** - 15 filters with centre frequencies from 1 Hz to 16 kHz



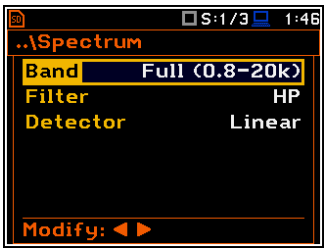
=>


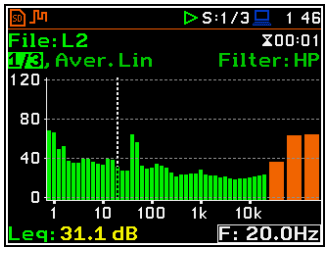
- **1/3 Octave**:
  - **Audio (20-20k)** - 31 filters with centre frequencies from 20 Hz to 20 kHz



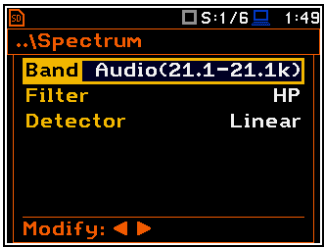
=>


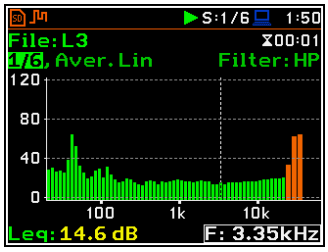
  - **Full (0.8-20k)** - 45 filters with centre frequencies from 0.8 Hz to 20 kHz



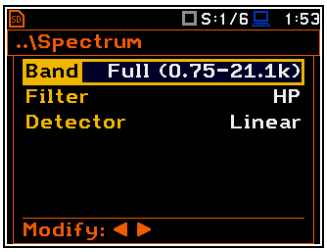
=>


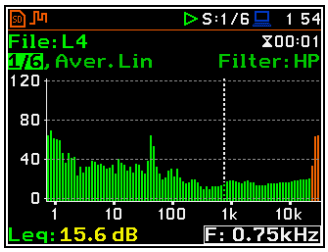
- **1/6 Octave**:
  - **Audio (21.1-21.1k)** - 61 filters with centre frequencies from 21.1 Hz to 21.1 kHz



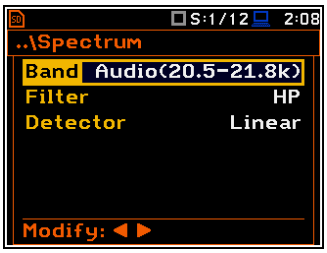
=>


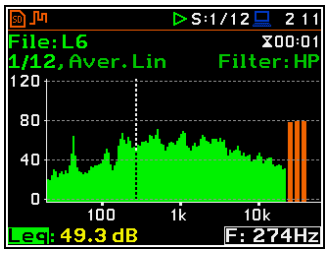
  - **Full (0.75-21.1k)** - 90 filters with centre frequencies from 0.75 Hz to 21.1 kHz



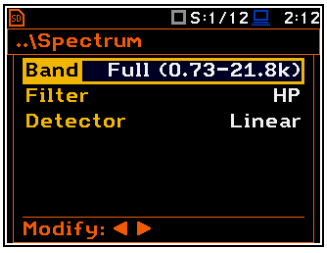
=>


- **1/12 Octave**:
  - **Audio (20.5-21.8k)** - 122 filters with centre frequencies from 20.5 Hz to 21.8 kHz

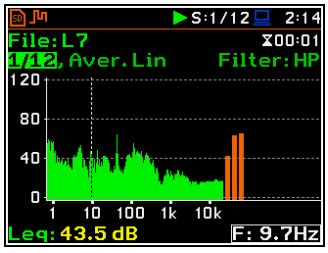


=>


- **Full (0.73-21.8k)** - 180 filters with centre frequencies from 0.73 Hz to 21.8 kHz

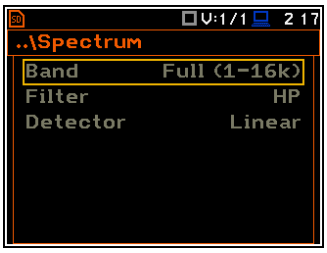


=>

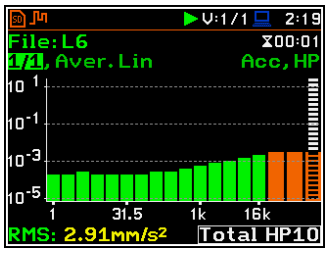


Available bands for vibration analysis are as follows:

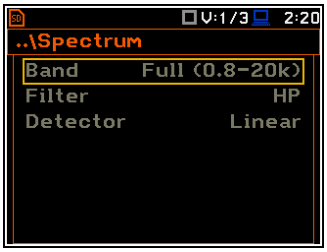
- **1/1 Octave**:
  - **Full (1-16k)** - 15 filters with centre frequencies from 1 Hz to 16 kHz



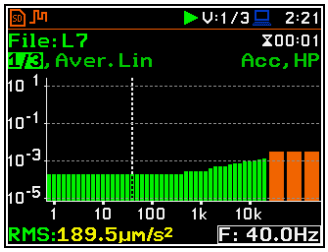
=>



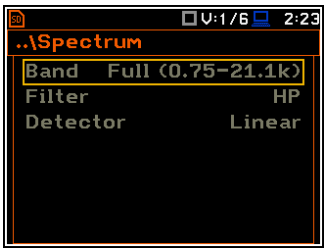
- **1/3 Octave**:
  - **Full (0.8-20k) -** 45 filters with centre frequencies from 0.8 Hz to 20 kHz



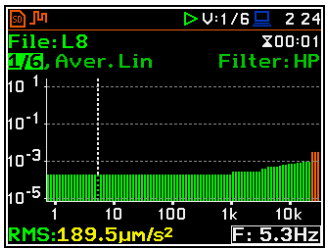
=>



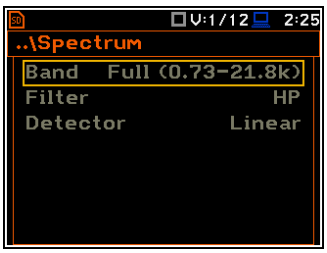
- **1/6 Octave**:
  - **Full (0.75-21.1k) -** 90 filters with centre frequencies from 0.75 Hz to 21.1 kHz



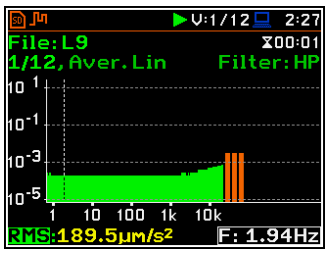
=>



- **1/12 Octave**:
  - **Full (0.73-21.8k) -** 180 filters with centre frequencies from 0.73 Hz to 21.8 kHz



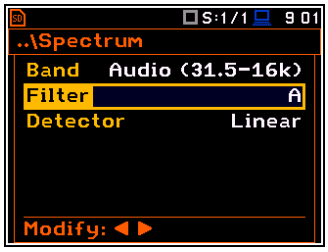
=>



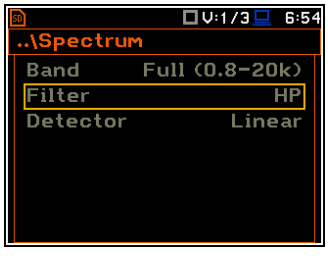
Weighting filter selection

Following weighting filters are available for the **1/1 Octave** - **1/12 Octave** sound analysis:

- **HP** - class 1 according to IEC 61672-1:2013.
- **Z** - class 1 according to IEC 61672-1:2013.
- **A** - class 1 according to IEC 61672-1:2013,
- **C** - class 1 according to IEC 61672-1:2013,
- **B** - class 1 according to IEC 60651.



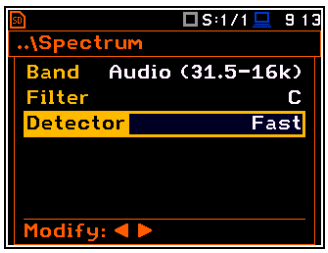
Only one **HP** weighting filter is available in the **1/1 Octave** - **1/12 Octave** vibration analysis.

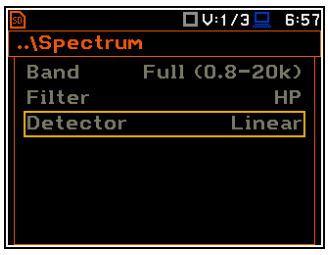


The filter characteristics are given in Appendix C.

RMS detector selection

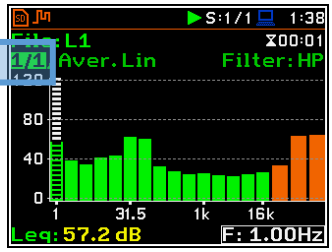
The **Detector** parameter defines the LEQ/RMS detector for the 1/1-octave - 1/12-octave analysis. For Sound measurements, it is possible to select the **Linear**, **Fast** or **Slow** detector. For Vibration measurements, only **Linear** detector is available.



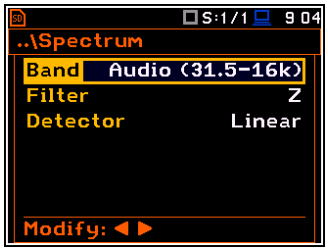


Note: *The filter and detector settings in the* ***General Settings*** *and* ***Profiles*** *screens are used for the level meter results in three profiles.*

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>**.

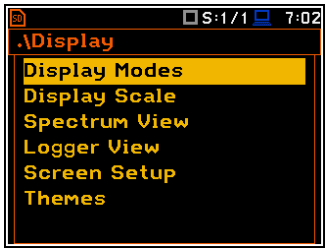


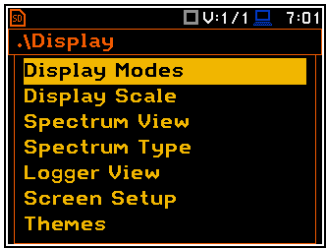
<ENT>



10.3 CONFIGURING 1/1 - 1/12 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 - 1/12-octave results:

Display Modes allowing you to activate the **Spectrum** and **Spectrum Table** views,

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

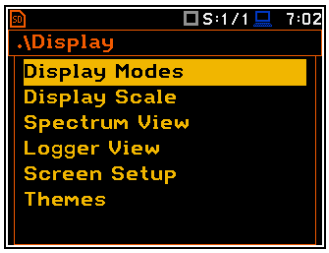
Spectrum View allowing you to select spectra to be viewed: instantaneous, averaged, maximum or minimum,

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

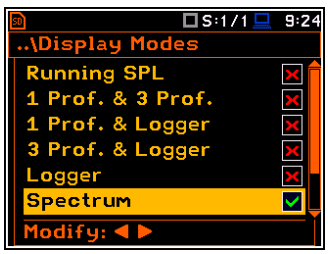
10.3.1 Presentation of 1/1 - 1/12 octave spectra

Spectrum plot view

The **Spectrum** position in the **Display Modes** list becomes available for the **1/1 Octave** - **1/12 Octave** functions and enables/disables the spectrum plot view.

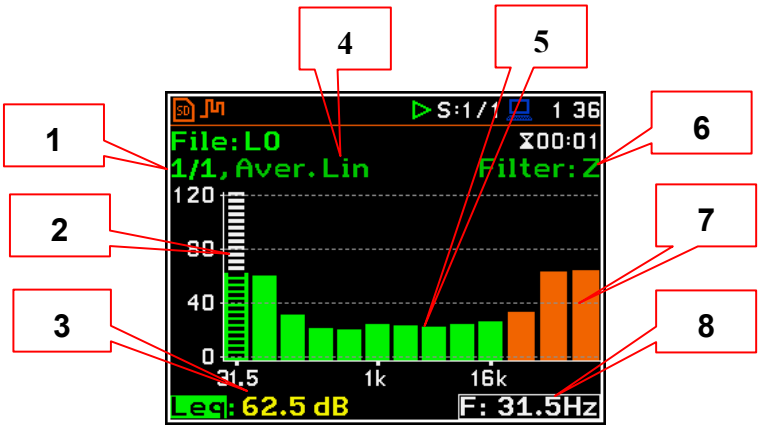


<ENT>

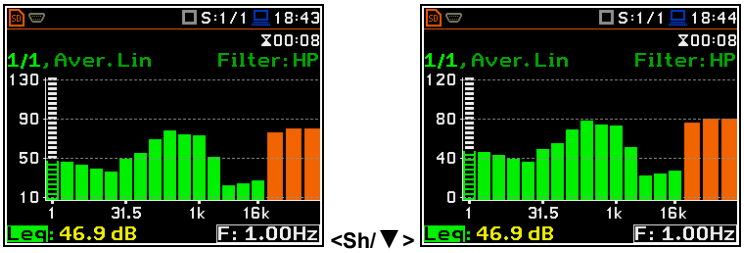


Spectrum view fields

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

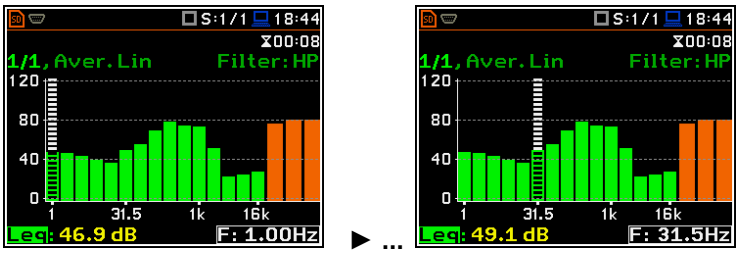


You can shift the Y-axis in the spectrum view with the **<Shift>** and ▲ / ▼ keys pressed together.



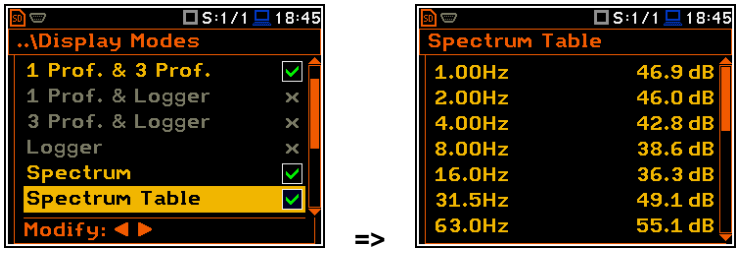
You can change the cursor position with the ◄ / ► key. You can jump to the first or last spectrum line with the **<Shift>** and ◄ / ► keys pressed together.

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



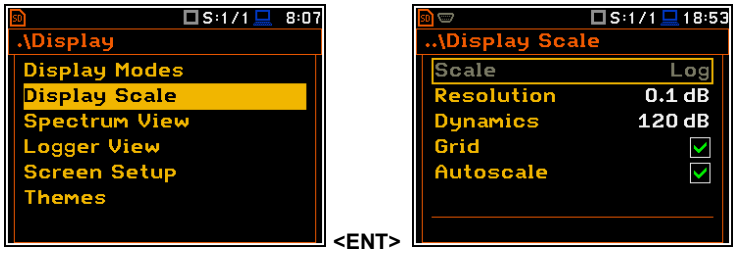
Spectrum table view

The **Spectrum Table** position in the **Display Modes** list becomes available for the **1/1 Octave** - **1/12 Octave** functions and enables or disables the spectrum table view which presents Leq/RMS values for bands.



10.3.2 Adjusting scales of the spectrum plot – Display Scale

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

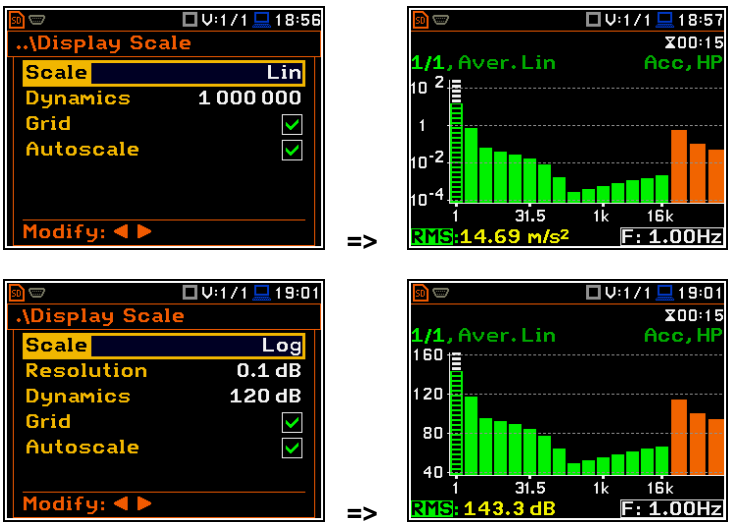


Scale of results presentation

The **Scale** parameter defines results units: linear (**Lin** – m/s², m/s etc.) or logarithmic (**Log** - dB).

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

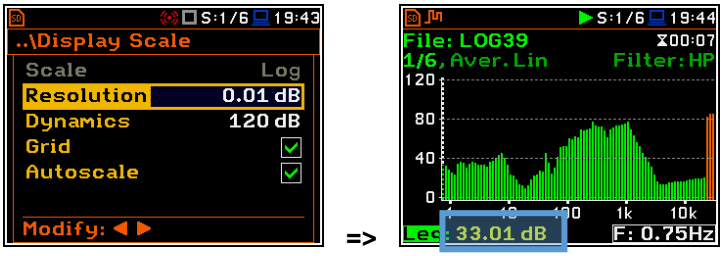
The **Log** option means that the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** screen (*path: <Menu> / Auxiliary Setup / Reference Levels*).



Note: *In Vibration modes, results can be presented in the* ***Logarithmic*** *(dB) or* ***Linear*** *(for example, m/s²) units. It depends on the* ***Scale*** *parameter value. For example, 10 m/s² can be presented also as 140 dB.*

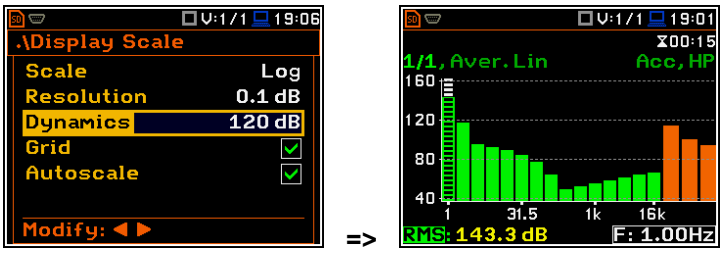
Resolution

The **Resolution** parameter appears when Scale is Log and 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**).

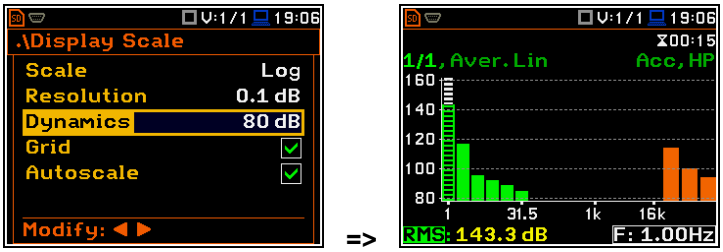


Scaling the vertical axis

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

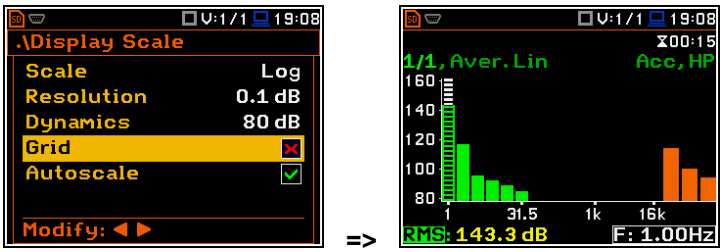


It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB**, **100dB** and **120dB**.



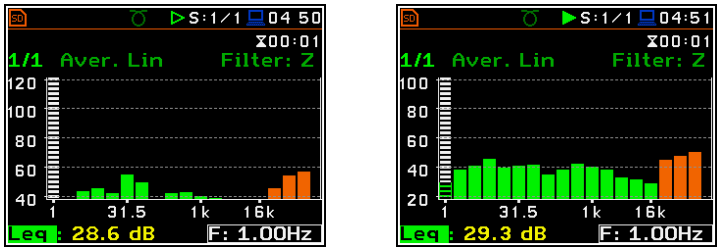
Toggling the grid

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



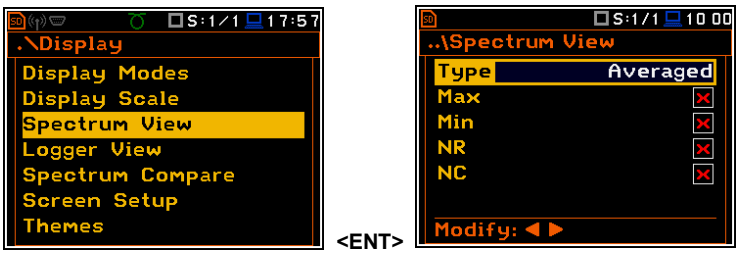
Switching the automatic Y-scale adjustment on/off

The **Autoscale** position switches on the automatic adjustment of the Y scale. Auto scaling is performed only once at the start of the measurement to set the most appropriate scaling for the display.

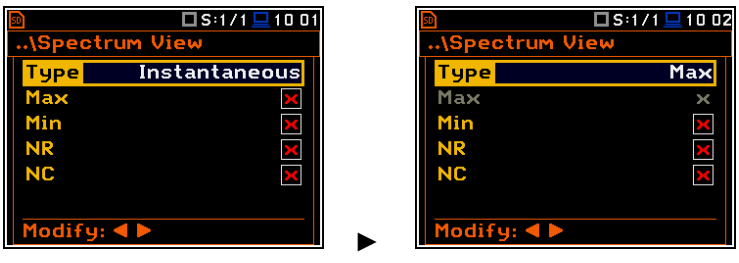


10.3.3 Selecting spectra to be viewed – Spectrum View

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

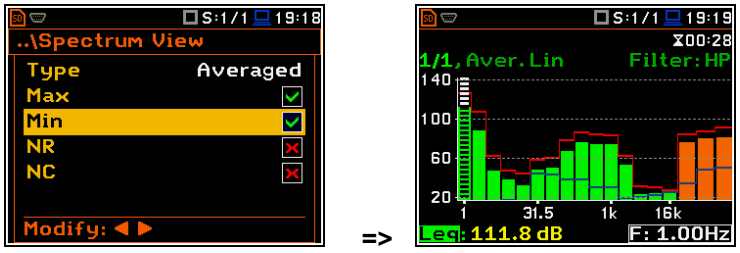


In the **Type** position, you may choose the spectrum type to be presented as a bar plot in the **Spectrum** view: **Averaged**, **Instantaneous**, **Max** or **Min**.



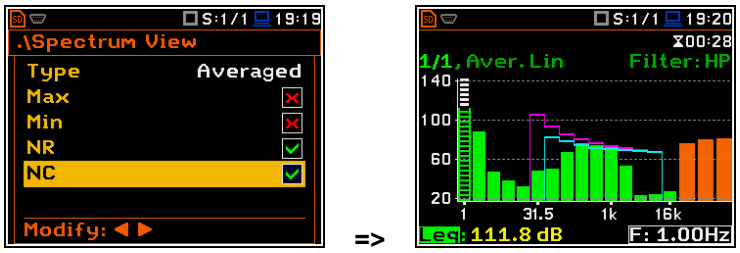
When the **Averaged** or **Instantaneous** spectrum is selected, you can additionally enable presentation of the **Max** and/or **Min** values for each band by switching the **Max** or **Min** parameters on.

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



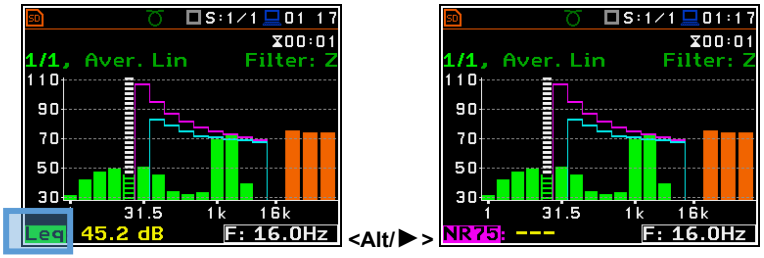
NR and NC results view

In case of 1/1 octave Sound measurements (**S:1/1**) with HP or Z filter, 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.



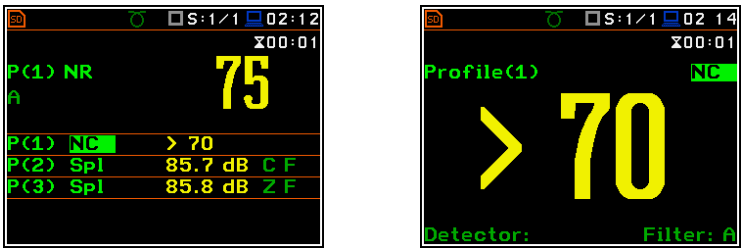
A violet line shows the **NR** results for the octave bands with central frequencies: **31.5Hz**, **63.0Hz**, **125Hz**, **250Hz**, **500Hz**, **1.00kHz**, **2.00kHz**, **4.00kHz** and **8.00kHz**. A blue line shows the **NC** results for the octave bands with central frequencies: **63.0Hz**, **125Hz**,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

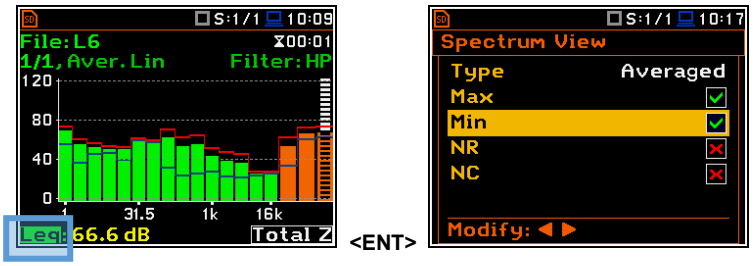


The **NR** or **NC** results can be seen also in the **1 Profile** and/or **3 Profile** modes.

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 to change viewed spectra by selecting the result field in the lower left-hand corner of the display with the ▲ / ▼ key and pressing **<ENTER>**.

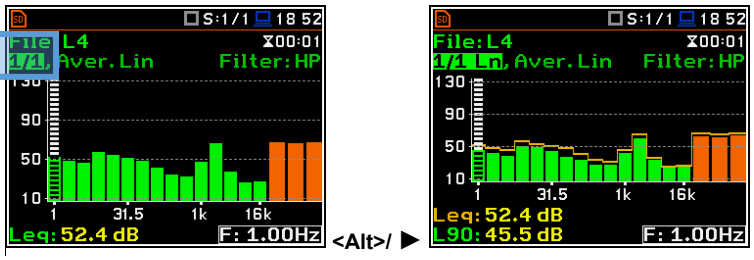


10.3.4 Spectrum statistics

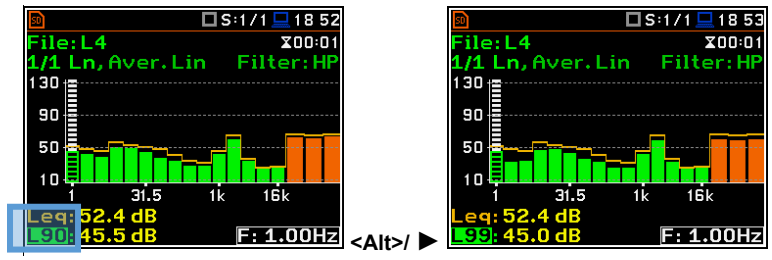
The instrument calculates statistics in Sound modes for all 1/1 - 1/12-octave bands as well as for Total results based on 100 ms Leq results. Special Ln spectrum view presents **Lnn** results for all 1/1 - 1/12-octave bands and Totals.

To view statistics for the selected band you should:

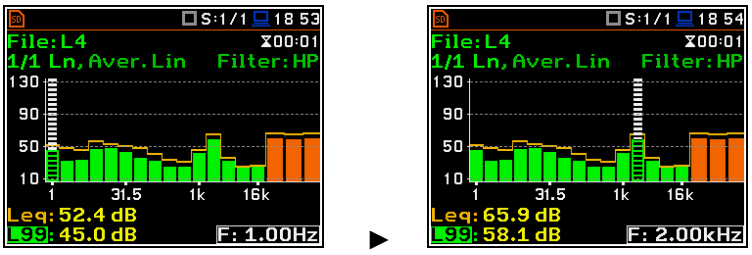
1. Select the **1/1 - 1/12** field with the ▲ / ▼ key.
2. Activate the Ln spectrum view, changing the field content to the **1/1 Ln - 1/12 Ln** with the ◄ / ► key pressed together with **<Alt>**.



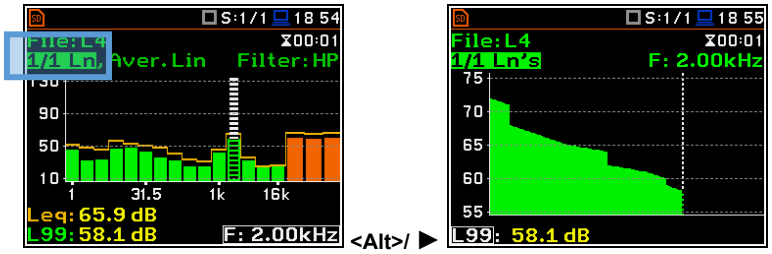
3. Select the **Lnn** field in the Ln spectrum view with the ▲ / ▼ key.
4. Select the required **Lnn** result with the ◄ / ► key pressed together with **<Alt>**.



5. Shift the cursor on the required band or the Total value with the ◄ / ► key.

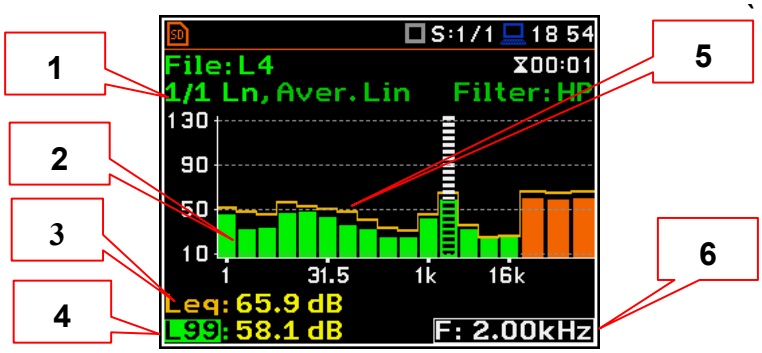


6. Select the **1/1 Ln - 1/12 Ln** field with the ▲ / ▼ key.
7. Activate the statistics view for the selected band, changing the field content to the **1/1 Ln's - 1/12 Ln's** with the ◄ / ► key pressed together with **<Alt>**.



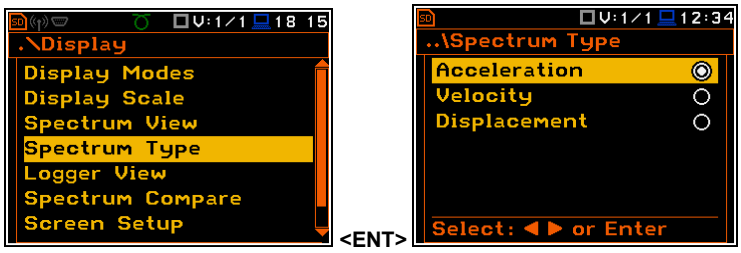
Ln spectrum view fields

1. Ln spectrum name
2. Ln spectrum bar plot
3. Leq value for the cursor position
4. Lnn value for the cursor position
5. Leq spectrum curve plot
6. Central frequency for the cursor position



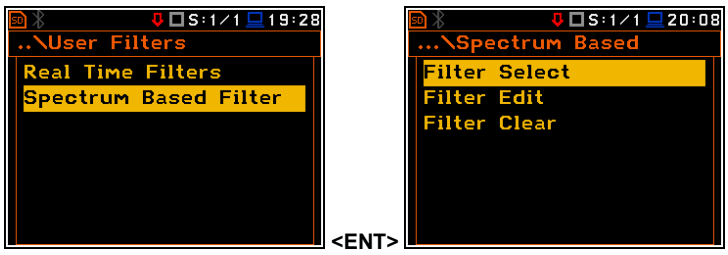
10.3.5 Changing spectrum type in Vibration modes – Spectrum Type

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**.



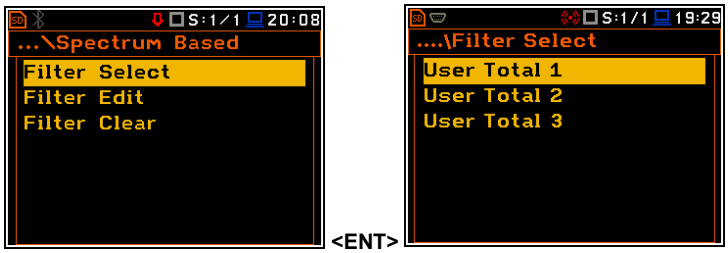
10.4 Setting filter coefficients for 1/1 Octave - 1/12 Octave analysis – Spectrum Based Filter

The **Spectrum Based Filter** position (*path: <Menu> / Auxiliary Setup / User Filters*), allows you to set values of the filter coefficients correcting results of the **1/1 Octave** - **1/12 Octave** analysis. The results of the analysis (the Total values) can be modified by the introduced factors.



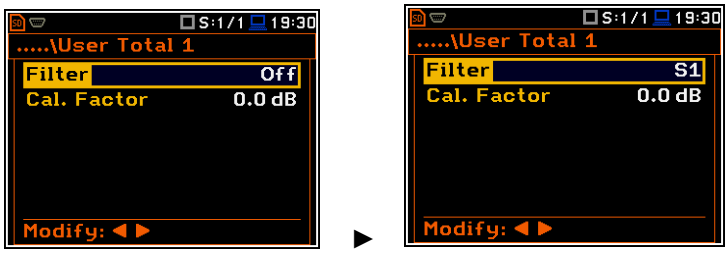
Assigning filters

The **Filter Select** position allows you to assign the filter (**S1**, **S2**, **S3**, **S4** or **S5**) to the Total result with the use of the **User Total 1**, **User Total 2** and **User Total 3** positions.



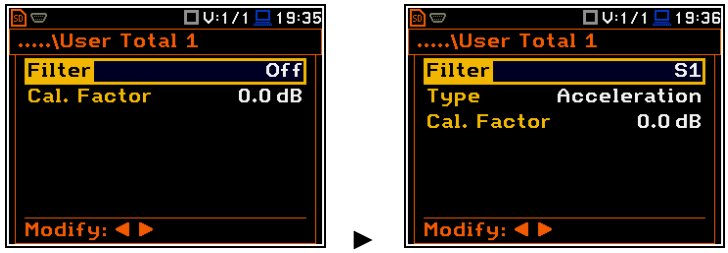
Sound modes

In the **User Total x** screen, you can select one of the five above mentioned filters (**S1**, **S2**, **S3**, **S4** or **S5**) and set the calibration factor applied to the Total value calculation.



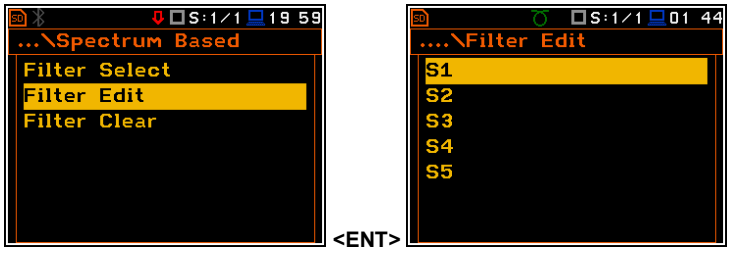
Vibration modes

In the **User Total x** screen, you can select one of the five above mentioned filters (**S1**, **S2**, **S3**, **S4** or **S5**), set the calibration factor and type of integration filter for measuring **Acceleration**, **Velocity** or **Displacement**.



Setting filter coefficients

The **Filter Edit** position allows you to edit filter coefficients for the selected filter: **S1**, **S2**, **S3**, **S4** and **S5**.

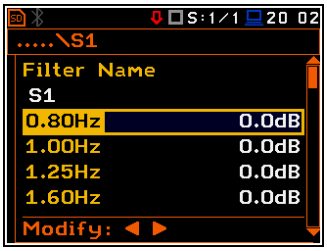


The filter name can be changed in the editor screen, which is opening with the ◄ / ► key.



In the **Sx** screen select the centre frequencies of the filters and their coefficients:

- for **0.80 Hz** in the range: **-100.0dB ... 100.0dB**
- for **1.00 Hz** in the range: **-100.0dB ... 100.0dB**
- **...**
- for **20.0kHz** in the range: **-100.0dB ... 100.0dB**



Clearing coefficients of the user filters

The **Filter Clear** position allows you to clear values of the user coefficients of octave or third octave filters. It is possible to clear all sets of coefficients (**All**) or to clear the selected set (**Sx**).



<ENT>

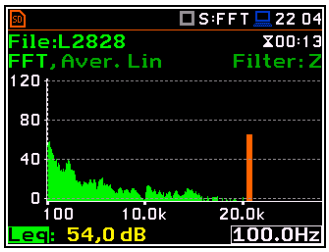


11 FFT ANALYSER

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.

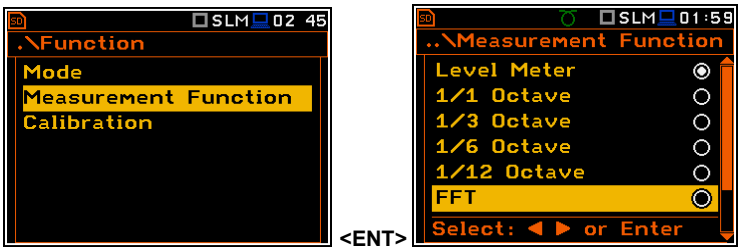
Results of the FFT analysis (spectra) measured with preselected frequency weighting filter and window, are presented in the **Spectrum** view.

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>**.



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!*

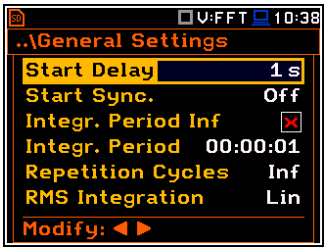
11.2 CONFIGURING FFT ANALYSER

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

11.2.1 General measurement settings of FFT analysis – General Settings

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

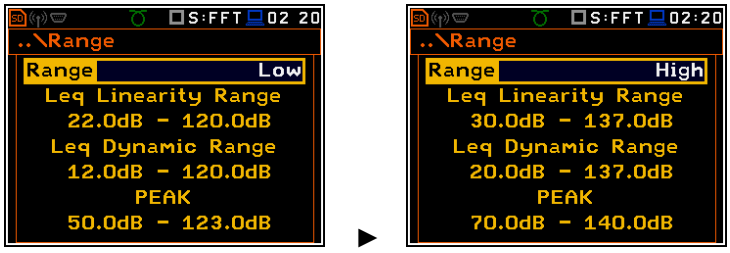
The **Integration Period** and **Repetition Cycles** parameters are defined in the **General Settings** list.



11.2.2 Selecting measurement range for FFT analysis – Range

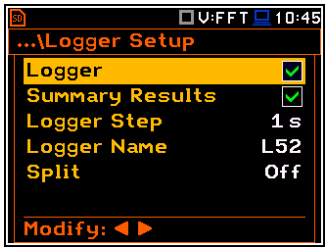
The input range for the **FFT** function can be selected in the **Range** screen: **Low** or **High**.

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).



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

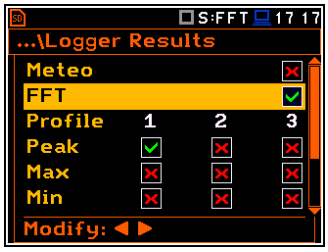
11.2.3 Logging of FFT spectra – Logging



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

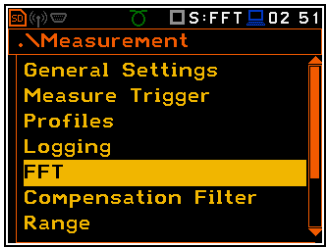


The instrument allows additional logging of FFT spectra in a logger file with the **Logger Step**.

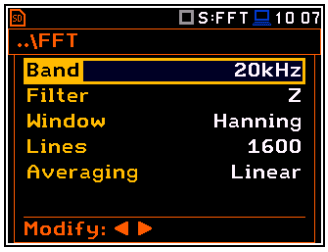
For this, you should enable logging of spectra switching on the **FFT** position in the **Logger Results** screen (*path: <Menu> / Measurement / Logging / Logger Results*).

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**).



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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 weighting filters (**Filter**) are available for the **FFT** analysis of sound:

- **HP** - class 1 according to IEC 61672-1:2013,
- **Z** - class 1 according to IEC 61672-1:2013,
- **A** - class 1 according to IEC 61672-1:2013,
- **C** - class 1 according to IEC 61672-1:2013,
- **B** - class 1 according to IEC 60651.

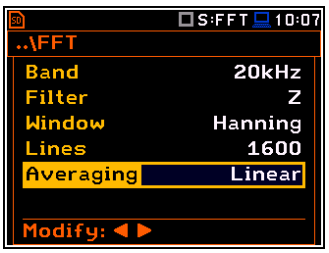
Only one **HP** weighting filter is available for the **FFT** analysis of vibration.

Characteristics of the filters are given in Appendix C.

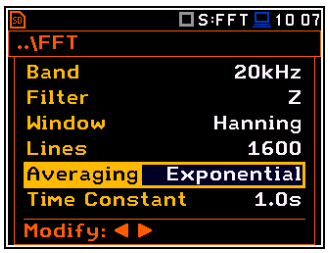
The **Window** parameter defines the weighting window for the **FFT** analysis: **Hanning**, **Rectangle**, **Flat Top** or **Kaiser-Bessel**.

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

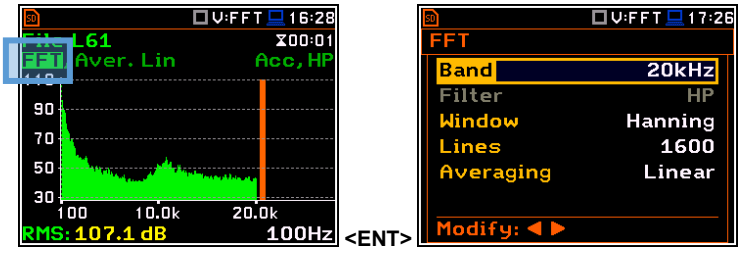
There are two averaging options (**Averaging**): **Linear** and **Exponential**. In case of **Exponential** averaging, the **Time Constant** parameter appears in this screen. You can select: **100ms**, **125ms**, **200ms**, **500ms**, **1.0s**, **2.0s**, **5.0s** or **10.0s**.



▶

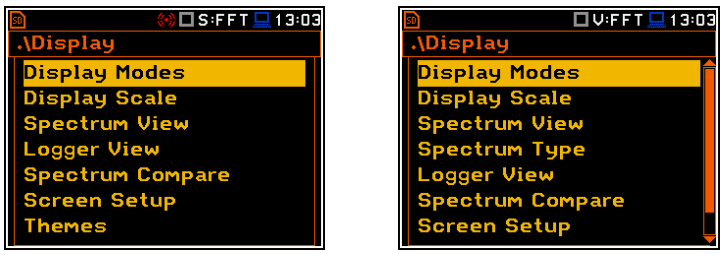


You can easily get into the **FFT** screen from the spectrum view. It is necessary to enter the function field (**FFT**) with the ▲ / ▼ key and press **<ENTER>**.



11.3 CONFIGURING FFT SPECTRA VIEW

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



Following positions are used for setting up the presentation of **FFT** results:

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

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

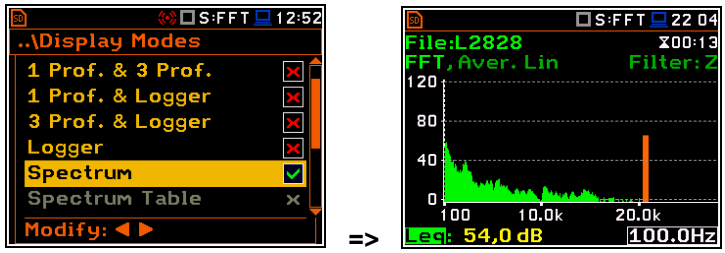
Spectrum View allowing you to select spectra to be viewed: instantaneous, averaged, maximum or minimum;

Spectrum Type allowing you 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

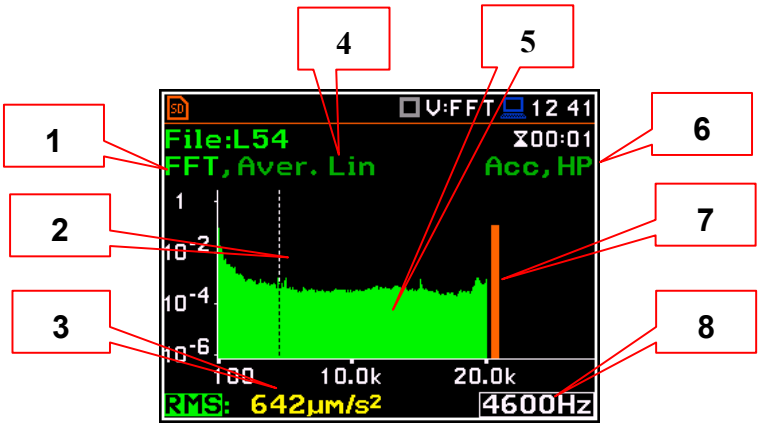
Spectrum plot view

The **Spectrum** position in the **Display Modes** list becomes available for the **FFT** function. It enables/disables the spectrum plot view.

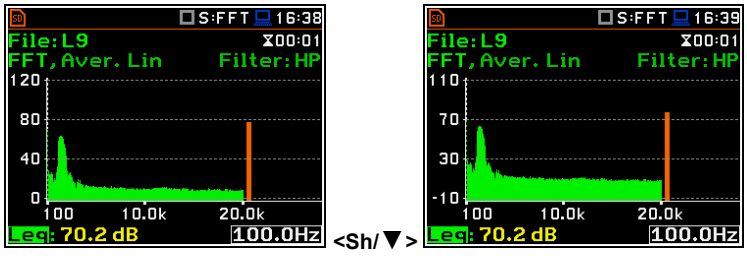


Spectrum view fields

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

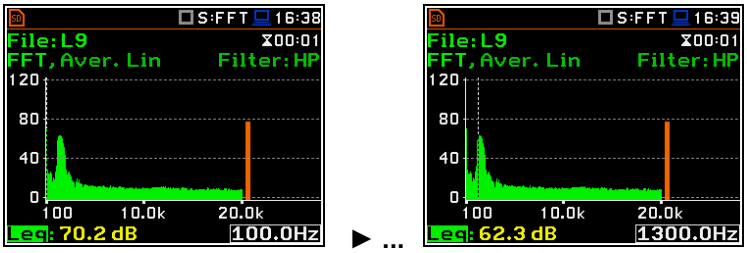


You can shift the Y-axis in the spectrum view with the **<Shift>** and ▲ / ▼ keys pressed together.

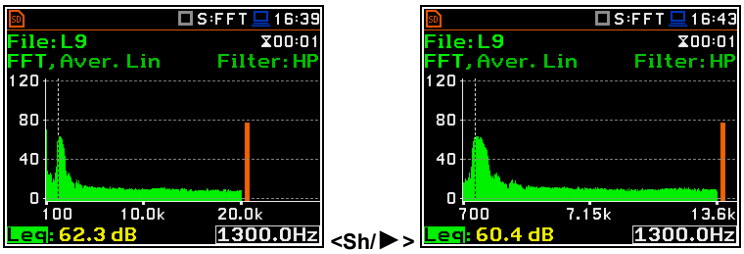


You can change the cursor position with the ◄ / ► key. You can jump to the first or last spectrum line with **<Shift>**.and ◄ / ► keys pressed together.

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

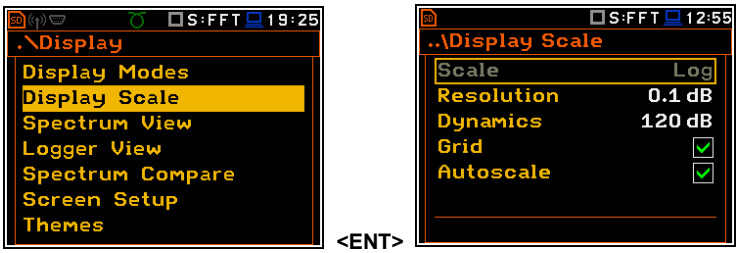


You can zoom in/out the frequency scale at the cursor position with the ◄ / ► key pressed together with **<Shift>**.



11.3.2 Setting up the scale of spectrum plot – Display Scale

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

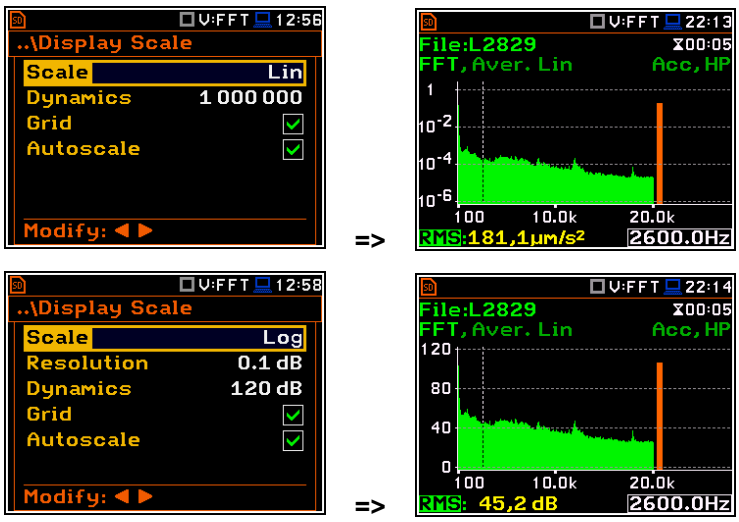


Scale of results presentation

The **Scale** parameter defines results units: linear (**Lin** – m/s², m/s etc.) or logarithmic (**Log** - dB).

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

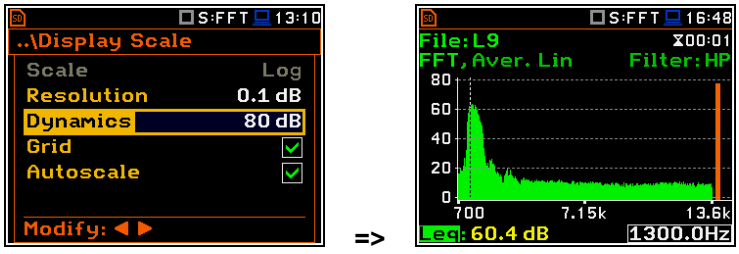
The **Log** option means that the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** screen (*path: <Menu> / Auxiliary Setup / Reference Levels*).



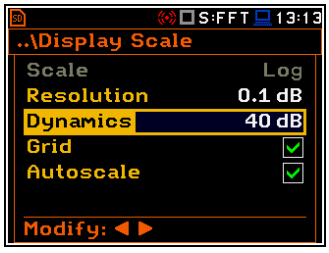
Note: *In Vibration modes, results can be presented in the* ***Logarithmic*** *(dB) or* ***Linear*** *(for example, m/s²) units. It depends on the* ***Scale*** *parameter value. For example, 10 m/s² can be presented also as 140 dB.*

Scaling the vertical axis

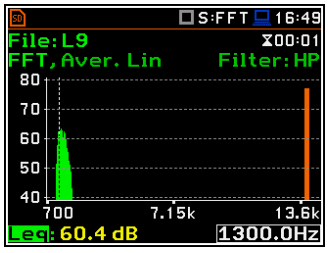
The **Dynamics** parameter defines the dynamic range of the Y-axis scale.



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

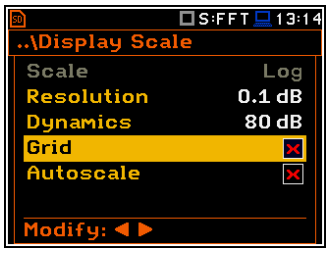


=>

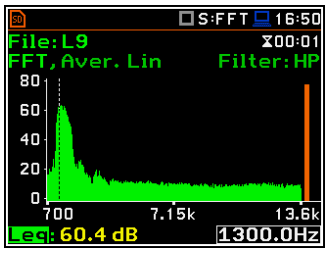


Toggling the grid

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

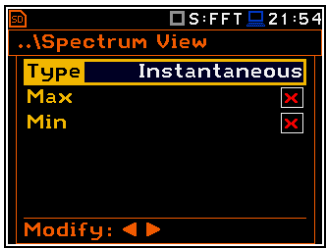


=>

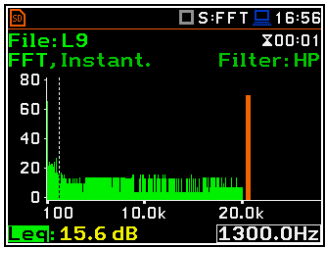


11.3.3 Selection of spectra to be viewed – Spectrum View

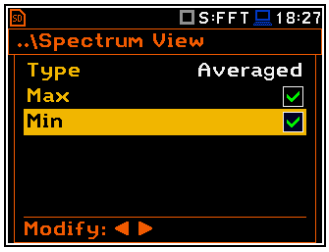
In the **Spectrum View** screen, you can select the different spectra to be viewed in the **Spectrum** display mode: **Averaged**, **Instantaneous**, **Max** or **Min**.



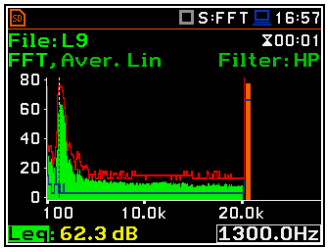
=>



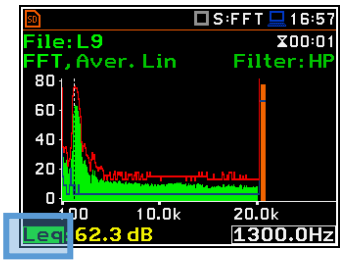
When the **Averaged** or **Instantaneous** spectrum is selected, you can additionally switch on or off the presentation of the **Max** and/or **Min** values by switching the **Max** or **Min** parameters on.



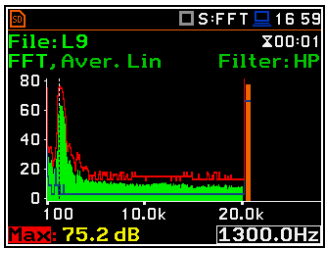
=>



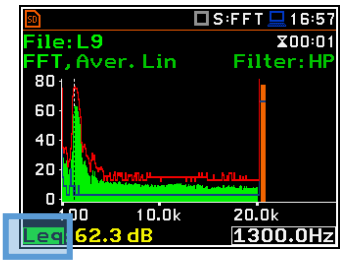
To enable to read the **Max** or **Min** values at the cursor position, select the field in the lower left-hand corner of the display with the ▲ / ▼ key. Then select the appropriate value with the ◄ / ► key pressed together with **<Alt>**.



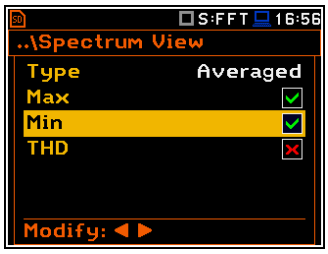
<Alt/►>



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>**.

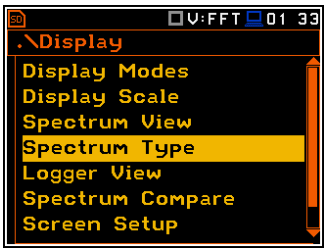


<ENT>

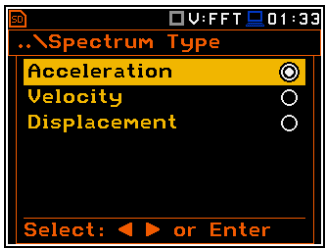


11.3.4 Changing spectrum type in Vibration modes – Spectrum Type

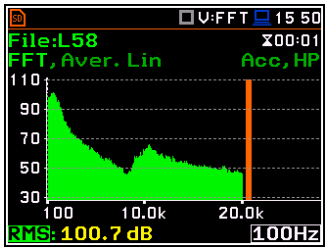
In the **Spectrum Type** screen, which is available only in Vibration modes, you can select the different types of vibration spectra to be presented on the display: **Acceleration**, **Velocity** or **Displacement**.

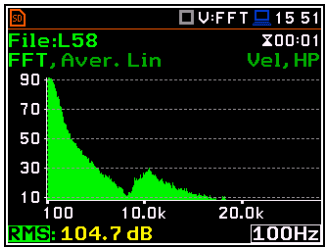


<ENT>



As an example, same spectrum is presented as **Acceleration** and **Velocity**.





12 MEASUREMENT OF REVERBERATION TIME – RT60

The **RT60** analysis is an optional function of SV 977D that 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). The entire measurement process and calculations implemented in the SV 977D comply with the ISO 3382 standard.

The reverberation time of a room can be measured with the use of SV 977D using two measurement methods: Impulse Response Method (**Impulse**) and Interrupted Noise Method (**Decay**). The choice of method depends on the type of the sound source used. The **Impulse** method is designed for measurements with an impulsive sound source (e.g., gunshot, petard explosion), whereas the **Decay** method is designed for measurements when the room is excited by a broadband or narrowband noise source (usually pink noise). For more details on the measurement and calculation process, see Appendix E.

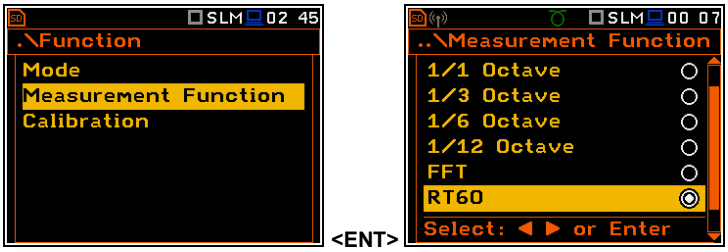
The reverberation time analysis used in the instrument consists of two parts:

1. The measurement part, where the acoustic response of the room is registered.
2. The calculation part, where the reverberation time (**EDT**, **RT20**, **RT30** and **RTUser**) is calculated for the measured room response.

Note: *It is recommended that you familiarise yourself with Appendix E before proceeding. This chapter only describes the navigation of the instruments, whereas Appendix E provides the definitions and describes the philosophy of reverberation time measurement.*

12.1 SELECTING THE RT 60 FUNCTION

To activate the **RT60** analysis function, select the **RT60** item from the **Measurement Function** list and press **<ENTER>**.

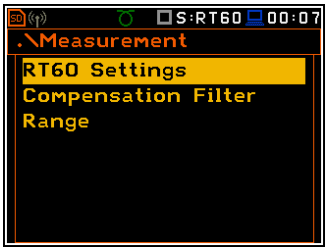


Note: *The **RT60** function is optional and should be unlocked by entering the activation code in the text editor screen that opened after the first attempt to select this function. Once unlocked, this function is permanently available.*

Note**:** *It is not possible to change the current function during a measurement. In this case, the instrument will display the warning: "Measurement in Progress". To change the current measurement function, the measurement must be stopped!*

The **RT60** analysis parameters can be set in the **Measurement** section, which has only three items: **RT60 Settings**, **Compensation Filter** and **Range**.

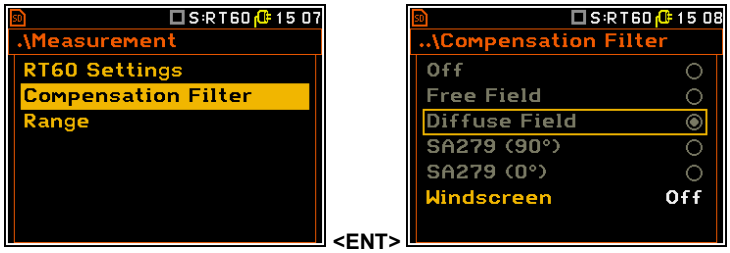
The **RT60 Settings** item allows you to select the method for **RT60** calculations, define the name of the file, where the registered data will be collected, and other parameters for **RT60** calculations.



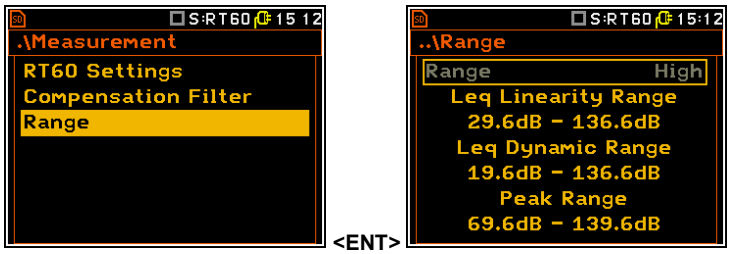
12.2 Compensation Filter and Range Settings

Since the reverberation time measurements concern the rooms, the RT60 function requires the compensation to be set to **Diffuse Field**.

This requirement means that when the RT60 function is selected, the instrument sets **Diffuse Field** as the default and disables the selection of other types of compensation, except **Windscreen**.

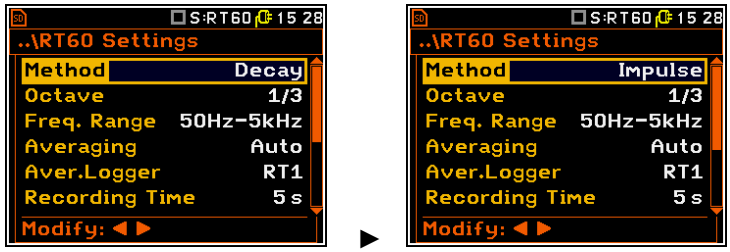


There is only one measurement **Range** available for RT60 measurements – **High**.

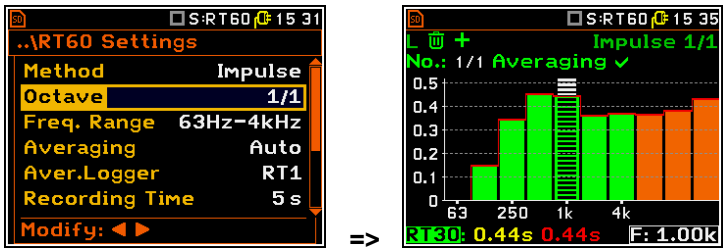


12.3 Setting the RT60 Parameters – RT60 Settings

The **Method** parameter defines the method for **RT60** calculations: **Decay** or **Impulse**. Both methods are described in Appendix E.

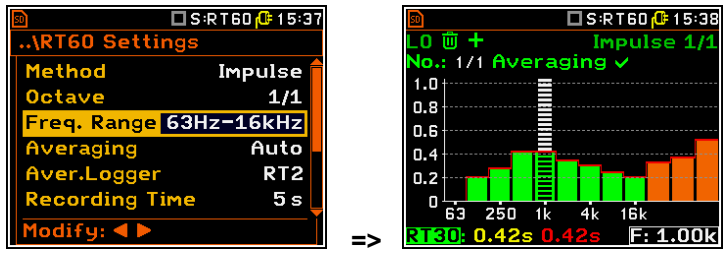


The **Octave** parameter defines the bands (**1/1** octave or **1/3** octave) in which the **RT60** analysis is performed.



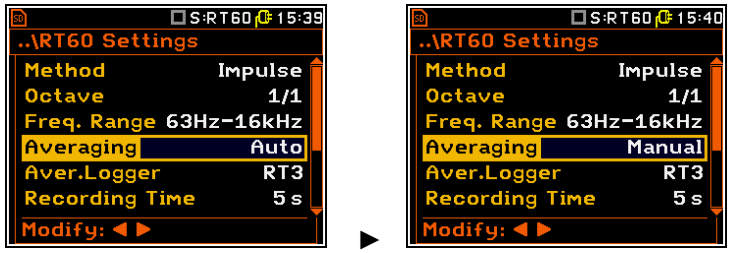
The **Freq. Range** parameter defines the frequency range for 1/1 octave or 1/3 octave calculations:

- 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 **Averaging** parameter defines the mode of averaging of the reverberation time results from several measurements: **Manual** or **Auto**.

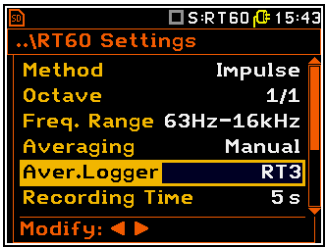
In **Manual** mode, each measurement in a series must be manually started and averaged.

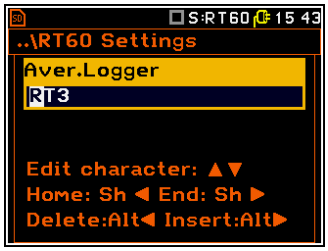


In **Auto** mode, the series of measurements to be averaged is started by pressing the **<Start>** key and stopped by pressing the **<Stop>** key. Pressing the **<Start>** key again in this mode clears the series of averaged results and starts a new series.

The **Aver.Logger** item allows you to specify the name of the file containing the averaged RT60 results for the series of measurements. The name can be up to eight characters in length.

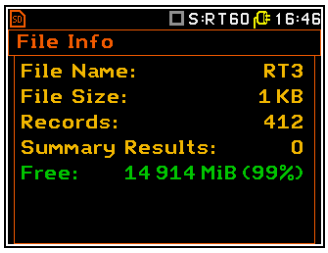
To edit the name, press the ◄ / ► key to open the text editor.





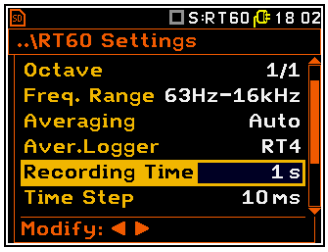
The information about the RT60 averaging results file can be viewed during the measurement session by switching views using the **<Alt>** and the ▲ / ▼ keys simultaneously.

This view shows the name and size of the file with the averaged RT60 results, number of records and averaged Summary Results stored, and free space.

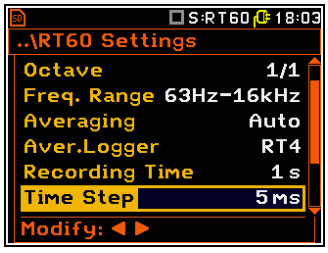


The **Recording Time** parameter defines the length of the measurement data recording (sound pressure level decay curve). Data recording starts when the trigger condition occurs.

The recording time can be set in the range of **1 s** ÷ **30 s**.

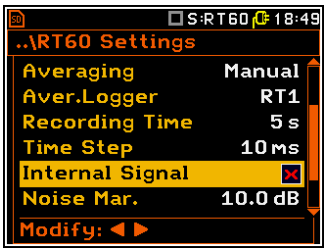


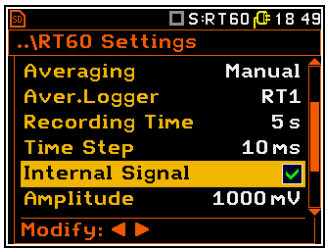
The **Time Step** parameter defines the interval at which the sound pressure level is recorded in the file, from the set: **5 ms**, **10 ms**, **20 ms**, **25 ms** or **50 ms**.



The **Internal Signal** position switches on generation of the pink noise to feed the noise source in the **Decay** method. The signal is transmitted to the pin 1 of the **I/O** connector.

In this case you should set the **Amplitude** of this noise.

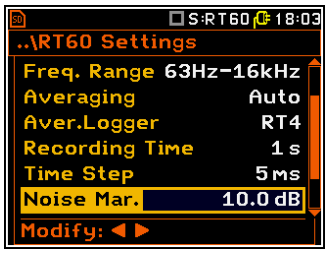






Note: *Although the instrument generates pink noise, the* ***Signal Generator*** *position of the Instrument section is unavailable in the* ***RT60*** *function.*

The **Noise Mar.** parameter defines the margin value for the calculated noise level (see Appendix E for more details). This parameter can be set in the range **0.0 dB** ÷ **20.0 dB**. Default value: **10.0 dB**.

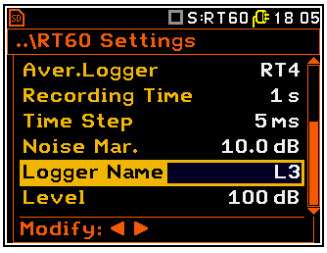


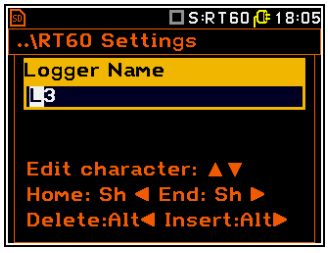


Note: *If the measurement must fulfil the ISO 3382 standard requirements the noise margin is required to be set to 10 dB (or higher).*

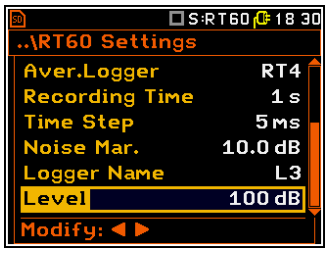
The **Logger Name** item allows you to specify the name of the logger file in which the **RT60** analysis data is recorded for each measurement. The name can be up to eight characters long.

To edit the name, press the ◄ / ► key to open the text editor.





The **Level** parameter 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 dB ÷ 136 dB**. Default value: **100 dB**.



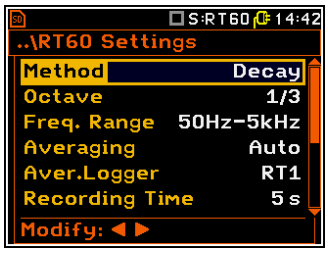
For the **Impulse** method, the trigger source is Leq(1) integrated over 0.5 milliseconds.

For the **Decay** method, the trigger source is Leq(1) integrated over 1 second. It should also be stable within ±0.5 dB for 2 seconds.

12.4 STARTING THE RT60 MEASUREMENT

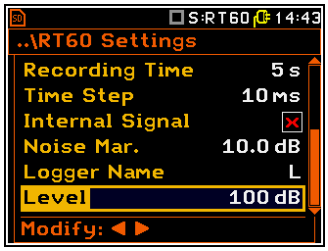
Measurements using the Decay method

1. Set the parameters for the **Decay** method. The most commonly used setup is shown below.
   - **Method:** **Decay**
   - **Averaging:** **Auto**
   - **Recording Time:** **5 s**
   - **Time Step:** **10 ms**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100 dB**.

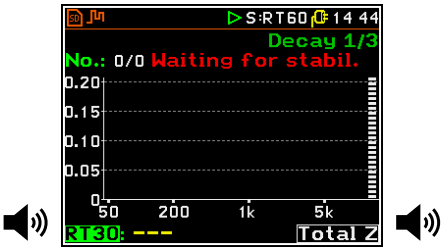


2. Place the sound source in the room to be measured.
3. Place the microphone at one of the selected measurement points.

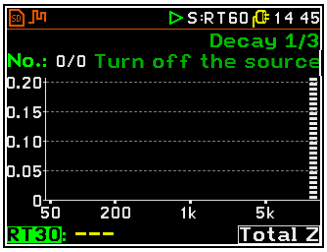
For the location of the source and the measurement points, please refer to the standard used for the measurement of the reverberation time.

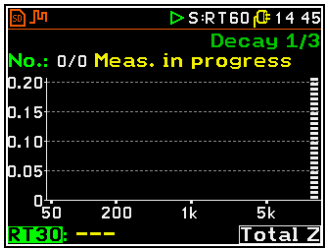


4. Switch on the sound audio source.
5. Start the measurement process by pressing the **<Start>** key. While the instrument is waiting for the trigger condition to be met, the message **Waiting for stabilisation** is displayed (the source should be left on long enough for the sound field to stabilise).

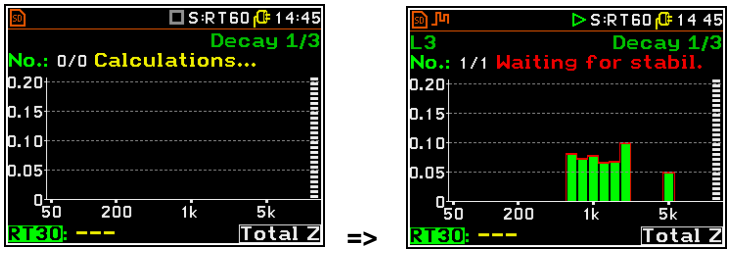


6. When the message **Turn off the source** appears, switch off the sound source. As soon as the trigger condition is met, the instrument starts collecting data and the message **Meas.in progress** appears.



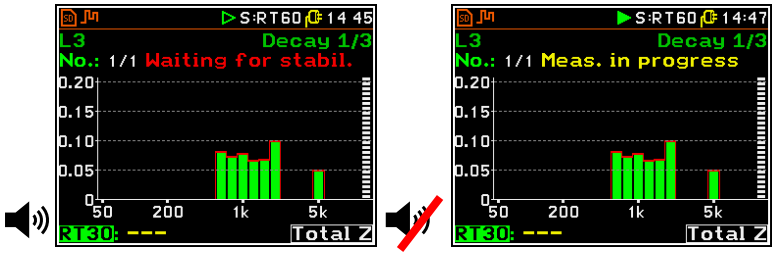


7. At the end of data acquisition, the instrument calculates the reverberation time results and averages them with the previous averaged results. During this process, the message **Calculations…** is displayed. Then the instrument goes to the next measurement initial screen.

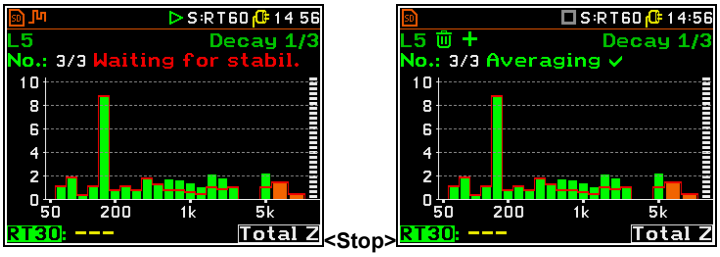


8. To start a new measurement, activate the sound source and then switch it off after stabilisation.

The new bar graph will show new reverberation results, and the red curve will show the previous averaged results.

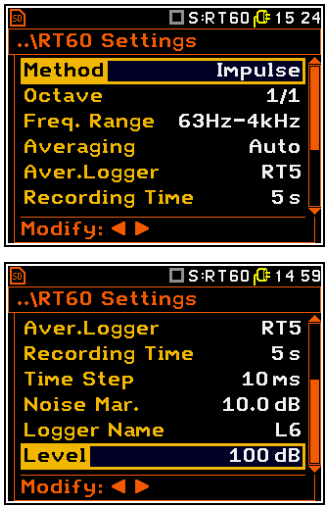


9. To stop the series of measurements, press the **<Stop>** key.



Measurements using the Impulse method

1. Set the parameters for the **Impulse** method. The most commonly used setup is shown below.
   - **Method:** **Impulse**
   - **Averaging:** **Auto**
   - **Recording Time:** **5 s**
   - **Time Step:** **10 ms**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100 dB**.

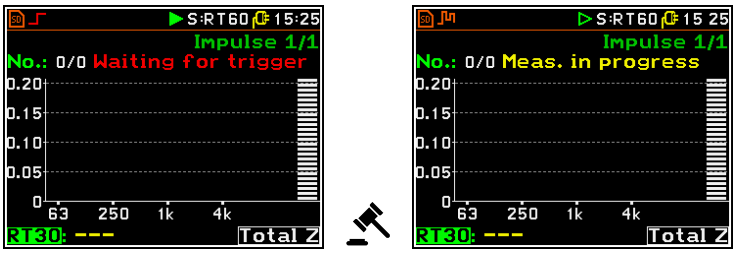


2. Place the microphone at one of the selected measurement points (refer to the ISO standard for reverberation time).

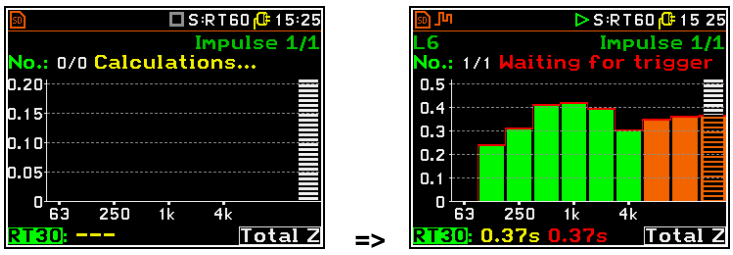
***Note**: The correct value of the sound level trigger threshold should be set well above the background noise and well below the maximum sound level emitted by the impulse source.*

3. Start the measurement process by pressing the **<Start>** key. While the instrument is waiting for the trigger condition to be met, the message **Waiting for trigger** is displayed.

Activate the impulse sound source. As soon as the trigger condition is met, the instrument starts collecting data and the message **Meas. in progress** appears.

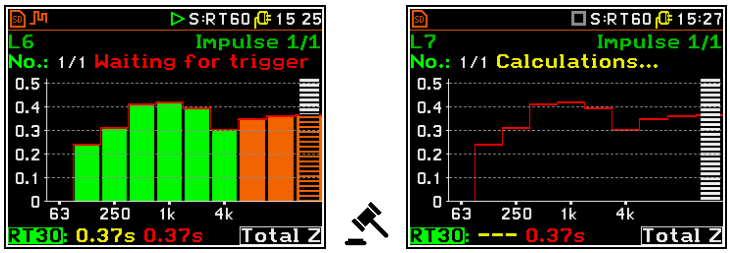


4. At the end of data acquisition, the instrument calculates the reverberation time results and averages them with the previous averaged results. During this process, the message **Calculations…** is displayed. Then the instrument goes to the next measurement initial screen.

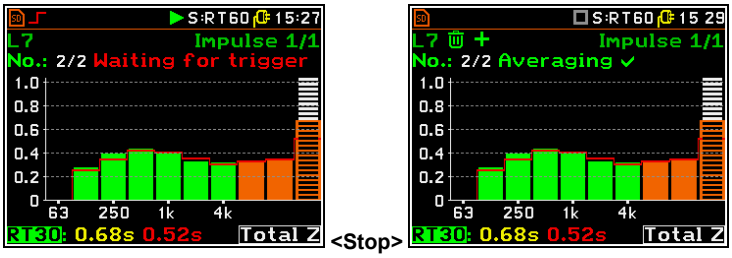


5. To start a new measurement, activate the impulse sound source.

The new bar graph will show new reverberation results, and the red curve will show the previous averaged results.



6. To stop the series of measurements, press the **<Stop>** key.



***Note**: During data collection in the room being tested, all other sound sources should be suppressed so as not to interfere with the measurements.*

12.5 AVERAGING THE RT60 RESULTS

Automatic averaging of RT results

Automatic averaging is shown for the **Decay** and **Impulse** methods in Chapter 12.4.

The first measurement in the series is started by pressing the **<Start>** key. Each subsequent measurement starts automatically and is automatically averaged in the .RT file with the name defined in the **Aver.Logger** item. Please follow the instructions on the line with the measurement number.

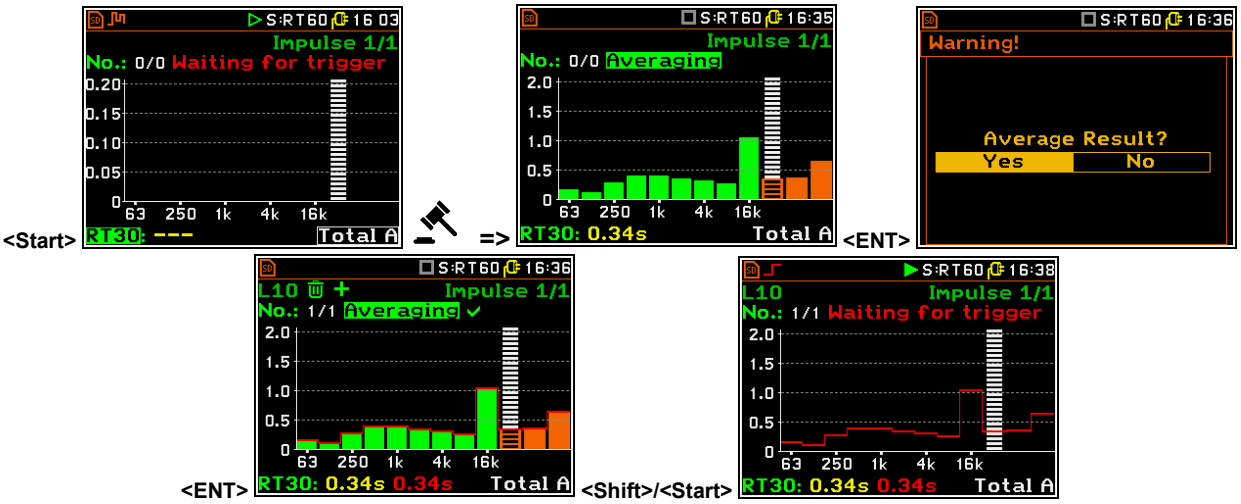
When the averaging series is stopped by pressing the **<Stop>** key, you can:

- resume the averaging series by pressing the **<Shift>** and **<Start>** keys simultaneously or selecting the "**+**" icon and pressing **<ENTER>**,
- delete the selected measurement from the averaging series by selecting the " 🗑 " icon and pressing **<ENTER>**,
- start a new averaging series by pressing the **<Start>** key.

Manual averaging of RT results

In the case of the **Manual** averaging, the **Averaging** box must be used to average the RT60 results.

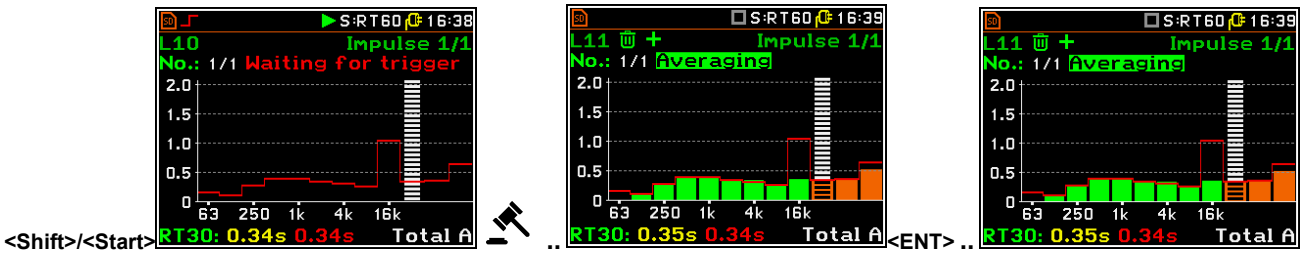
After the measurement has been stopped, select the **Averaging** box and press **<ENTER>**, then select **Yes** in the confirmation screen and press **<ENTER>** again. The averaging number will increase by one and the √ symbol will be displayed to indicate that the results have been averaged. The averaged results are displayed as a red curve on the bar graph.



The averaging series is stopped each time after last averaging. When the averaging series is stopped, you can:

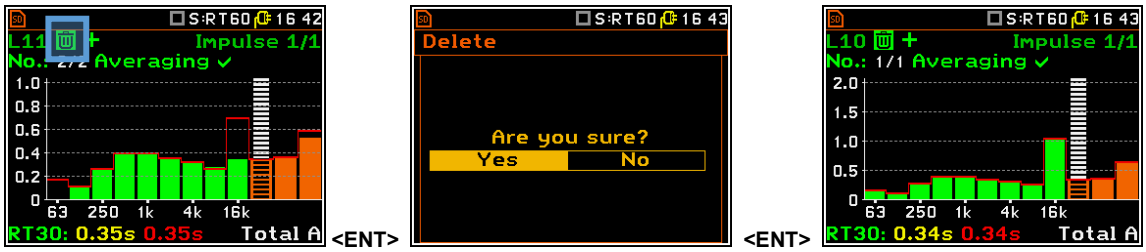
- resume the averaging series by pressing the **<Shift>** and **<Start>** keys simultaneously or selecting the "**+**" icon and pressing **<ENTER>**,

To average new results with previous ones, select the **Averaging** box and press **<ENTER>**, select **Yes** in the confirmation screen and press **<ENTER>** again. The **x/x** values will increase by one and the √ symbol will appear to indicate that the results have been averaged. The red curve will show the averaged results including the last measurement.

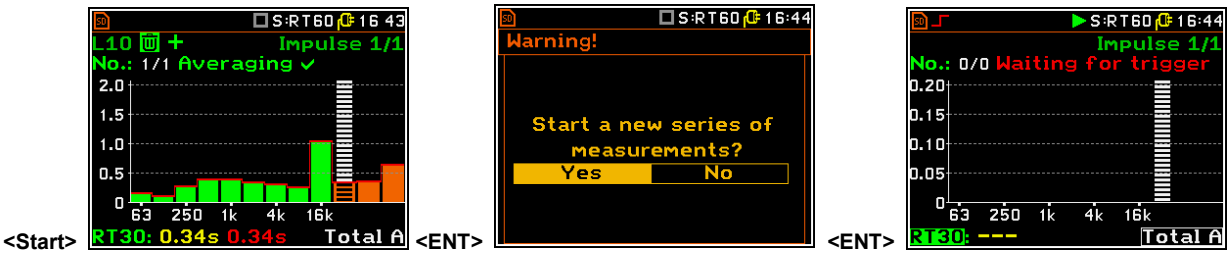


- delete the selected measurement from the averaging series by selecting the "🗑" icon and pressing **<ENTER>**.

The deletion of measurement results from the averaging series is shown below. Deleting the results recalculates the averaging series.

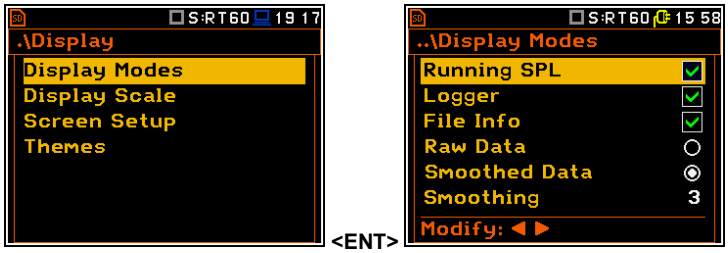


- start a new averaging series by pressing the **<Start>** key.



12.6 CUSTOMIZING THE RT60 VIEW

The **Display** section contains elements for programming the presentation of measurement results.

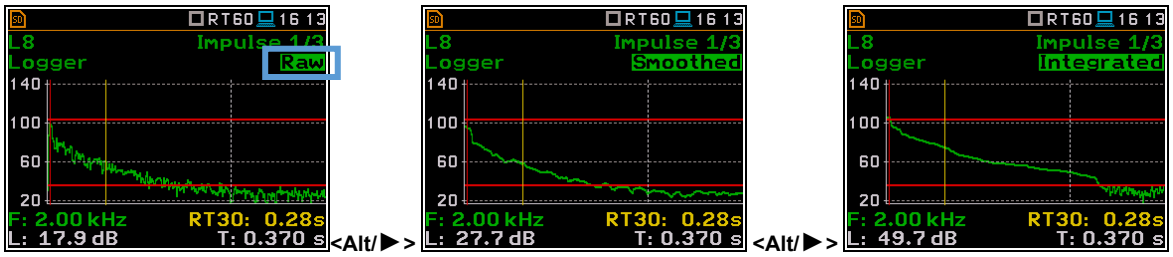


The **Display Modes** item allows you to enable/disable some views (**Running SPL**, **Logger** and **File Info**) and select the type of data displayed when using the **RT60** function.

The **Running SPL** view is like in the other SLM functions (see Chapter 5.1.1).

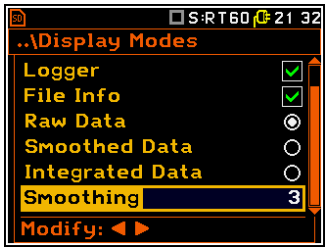
Time data can be viewed as **Raw Data**, **Smoothed Data** or, in the case of the **Impulse** method, as **Integrated Data**.

It is also possible to switch between the different data views. To do this, select the field with the **Raw**, **Smoothed** or **Integrated** text (at the top right of the display) and change its content by pressing the ◄ / ► key with **<Alt>**.



The **Smoothing** item allows you to set the number of samples to be considered by the smoothing algorithm in the range **0** ÷ **15** (default value is **3**). The higher the number, the smoother the curve.

Note: This parameter affects the reverberation time results.



12.7 VIEWING THE RT60 RESULTS

The **RT60** measurement results for all 1/1 octave or 1/3 octave bands and three Totals can be viewed in three different views, such as:

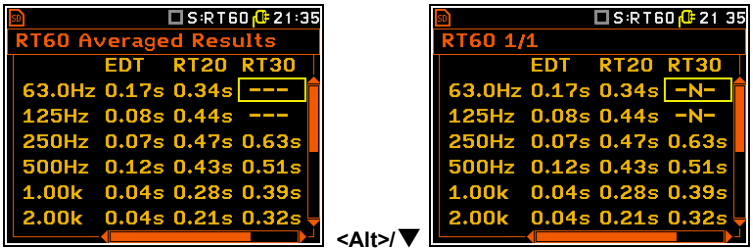
1. Table view of **EDT**, **RT20**, **RT30** and **User** measurement and averaged results.
2. Bar graph view of **EDT**, **RT20**, **RT30** and **User** 1/1 octave or 1/3 octave results.
3. Logger view - sound pressure level decay curves for each 1/1 octave or 1/3 octave.

You can toggle between views by pressing the ▲ / ▼ key with **<Alt>**.

Table view

The table shows:

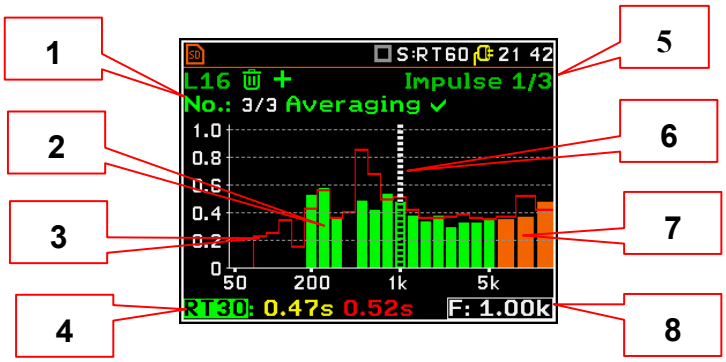
- **EDT** – early decay time,
- **RT20** – reverberation time calculated with 20 dB dynamics,
- **RT30** – reverberation time calculated with 30 dB dynamics,
- **User** – reverberation time, calculated with user-defined dynamics.



Note: *If the text "**-N-**" appears in the RT cell, it means that the background noise is too high for this band. In this case, it is recommended to repeat the measurement in silence after switching off the source.*

Note: *If the text "**- - -**" appears in the RT indicator field, it means that for this band with the selected parameters (**Noise Mar.**) the measurement conditions required to obtain the results were not met (see Appendix E for details).*

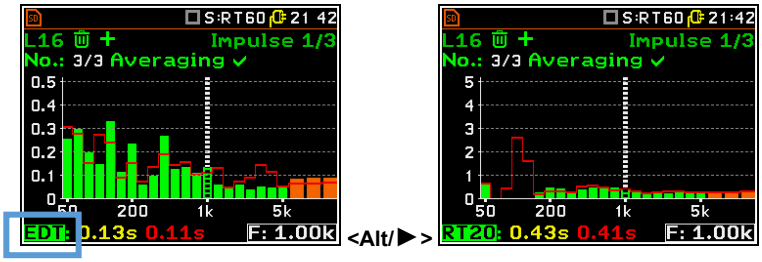
Bar graph view



1. Number of averaged results
2. RT results graph
3. RT averaged results graph
4. RT result name and value
5. RT60 calculation method
6. Cursor
7. RT Total results
8. Cursor value (centre band frequency)

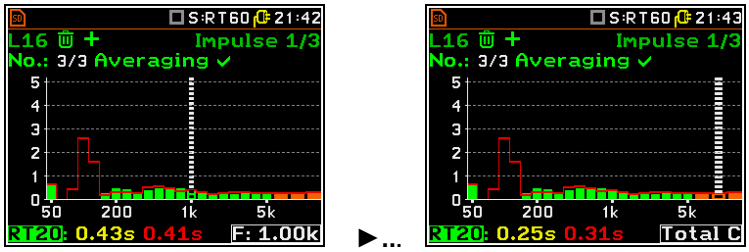
Changing the RT result

When the field 3 is active, the **RT60** analysis result can be changed by pressing the ◄ / ► key with **<Alt>**.



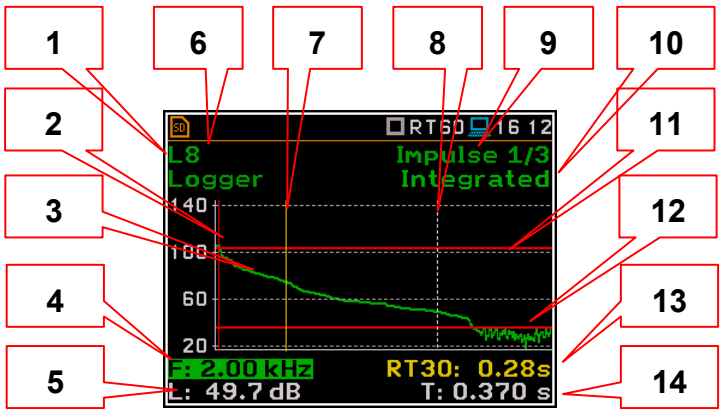
Changing the cursor

You can change the cursor using the ◄ / ► key.



Logger view

The Logger view shows the sound pressure decay curve plot for the selected 1/1 or 1/3 octave band.



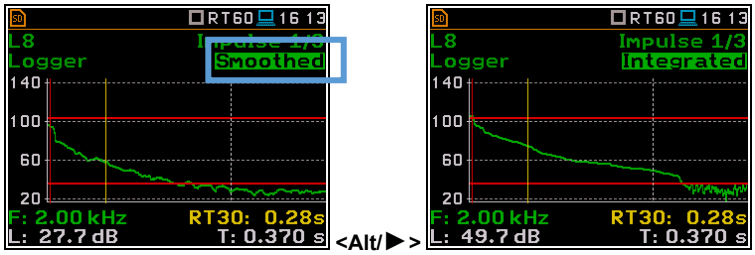
1. Logger file name
2. T0 marker
3. Decay curve plot
4. Centre frequency of the 1/3 octave band selected by the cursor
5. Result value (SPL) for the cursor
6. Name of the logger file
7. T1 marker
8. Cursor
9. RT60 method
10. Calculated steady upper sound level value
11. Calculated steady lower sound level value
12. RT result (**RT30**, **RT20**, **EDT** and **RT User**) with calculated reverberation time
13. 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.

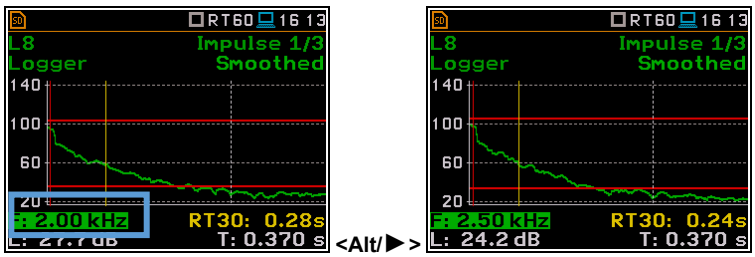
Changing the data type

When field 9 is active, the type of data displayed (**Raw**, **Smoothed** or **Integrated**) can be changed by pressing the ◄ / ► key together with **<Alt>**.



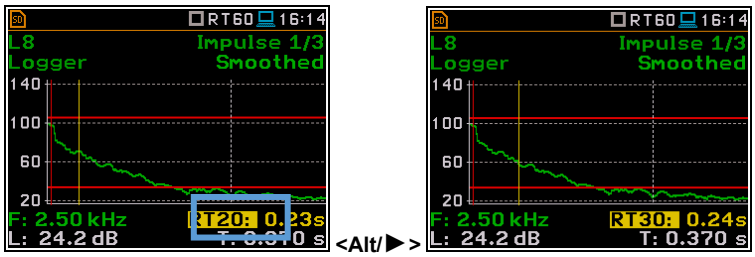
Changing the band

When field 4 is active, the centre frequency of the band can be changed by pressing the ◄ / ► key together with **<Alt>**.



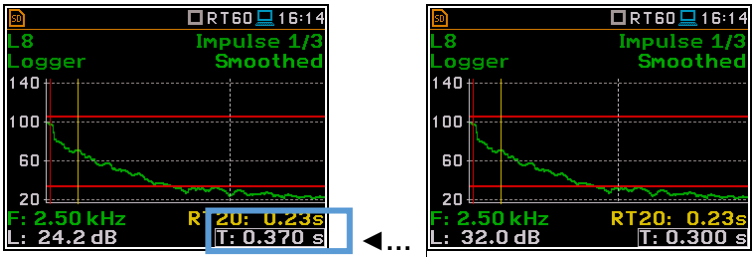
Changing the RT function

When field 13 is active, the **RT60** analysis function can be changed by pressing the ◄ / ► key together with **<Alt>**.



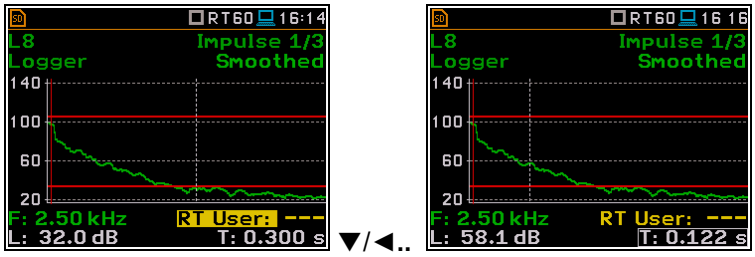
Changing the cursor

When field 14 is active, you can change the cursor with the ◄ / ► key.



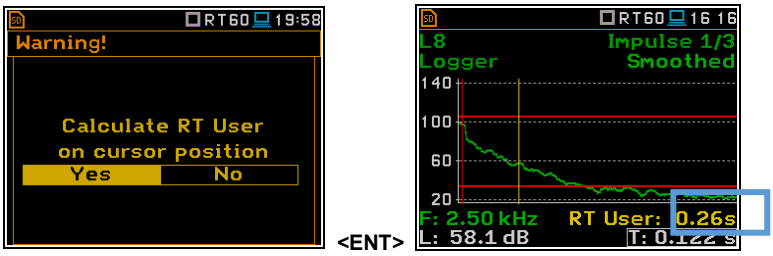
RT User reverberation time calculation

1. Select the band or one of the total levels for the user reverberation time calculation process.
2. Set the position of the T1 marker changing the position of the cursor.



Note: *The marker should be to the right of the T0 marker, but not in the background noise region (see Appendix E for details).*

3. When the marker is set, press **<ENTER>**, then select **Yes** and press **<ENTER>** again.
4. The **RT User** result will be calculated and displayed in field 13.



13 MEASUREMENT OF TONES - Tonality

The instrument assesses the audibility of tones based on the next standards:

- ISO 20065:2016,
- ISO 226:2003,
- ISO 226:1987.

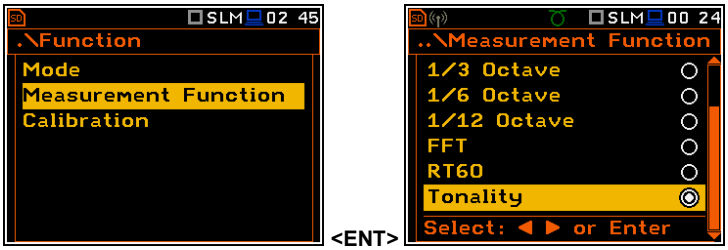
See Appendix F.

Note: *It is recommended to familiarize with the Appendix F before proceeding. This chapter describes only the navigation of the instruments, whereas Appendix F describes the Objective Method for Assessing the Audibility of Tones in Noise – Engineering Method (according to ISOS 20065:2016) applied in the instrument.*

Note: *The* ***Tonality*** *analysis is performed after collecting the necessary data measured with the Sound Level function and, depending on the standard, the 1/3 Octave or FFT function.*

13.1 SELECTING THE TONALITY FUNCTION

To activate the **Tonality** analysis function, select the **Tonality** position in the **Measurement Function** list and press **<ENTER>**.



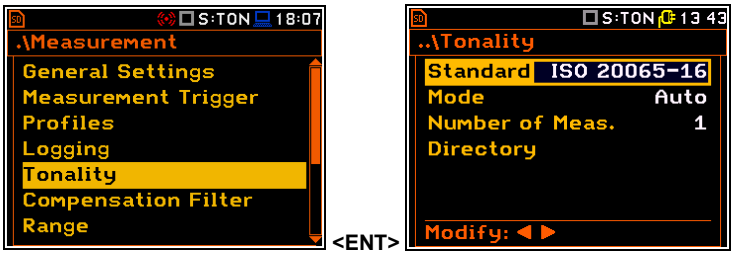
Note: *The* **Tonality** *function is optional and should be unlocked by entering the activation code in the text editor screen, which is opened after first attempt to select this function. Once unlocked this option will be ready to use permanently.*

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!*

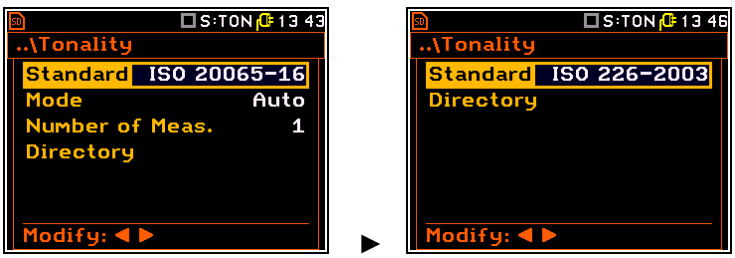
13.2 TONALITY SETTINGS

The execution of the **Tonality** function depends on the standard selected in the **Tonality** list of the **Measurement** section.

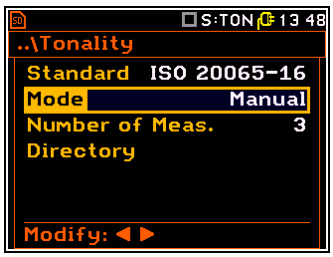
Other settings are set automatically but some of them can be modified in the different items of the **Measurement** menu.



In the **Standard** position, you can select the standard according to which tones will be defined: **ISO 20065-16**, **ISO 226-2003** or **ISO 226-1987**.



For the **ISO 20065-16** standard, you can choose the measurement **Mode**: **Auto** or **Manual**, and the maximum number of measurements (**Number of Meas.**).



In the **Auto** mode, the measurements are performed one by one without pauses after pressing the **<Start>** key, until the number of measurements reaches the **Number of Meas.** value.

In the **Manual** mode, the measurements are performed one by one by the user pressing the **<Start>** key.

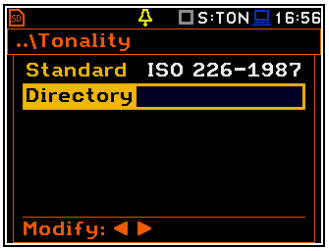
When the number of measurements reaches the **Number of Meas.** value, the instrument automatically performs post-processing calculations.

If you want to continue measuring, please make sure the **Number of Meas.** value has previously been increased. The maximum number of measurements in a specific folder can reach a maximum of 20.

Post-processing calculations are essential for the standard report, since the analysis of all measured files is required for calculating the mean Audibility parameter and the Extended Uncertainty parameter.

All files with measurement results should be saved in the dedicated directory, which should be defined manually in the **Directory** position through the **File Manager**.

To define the directory, press the ► key to enter the File Manager screen.



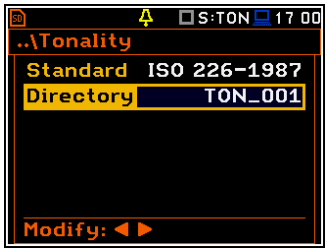
►



Then press **<ENTER>** on the **<New Directory>** position and confirm the automatically proposed directory name with **<ENTER>** or press the ► key to edit this name.

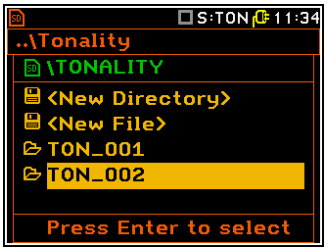


<ENT>



If you already have previously created directories, you can choose them.

In this case, all measurement will be loaded to the instrument for viewing. You also will be able to make more measurements. Just care about **Number of Meas.**, which should be increased by the number of additional measurements.

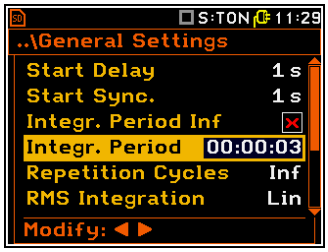


<ENT>

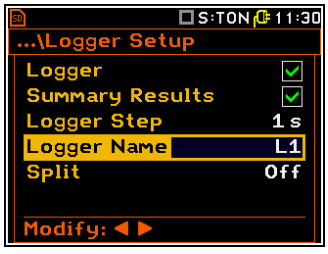


***Note:** The selection of the directory is important step. If the directory is not defined, the measurements will not start.*

You can change the **Integration Period** time in the **General Settings** screen (*path: <Menu> / Measurement / General Settings*).



The **Logger Name** can be changed in the **Logger Setup** screen (*path: <Menu> / Measurement / Logging / Logger Setup*) before the first measurement in a new folder. After the first measurement have been done, the logger's name cannot be changed manually. Every new measurement file name will be created automatically and the name of the automatically created files will consist of the first name plus measurement number.

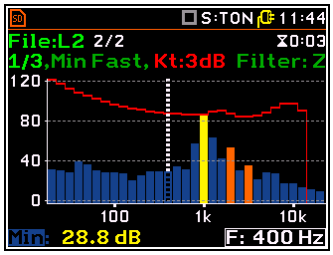


Settings for the standards are shown in the below table. Parameters that can be changed are in **red**.

<table>
<tr><th rowspan="2">Standard</th><th colspan="2">Description</th></tr>
<tr><th>Parameters</th><th>Outcome</th></tr>
<tr><td>ISO 20065-16</td><td>Spectrum: FFT
Band: 5kHz
Filter: A
Averaging: Linear
Investigation region: 50-4575 Hz
Line spacing: 3.125 Hz
General Settings:
Integr. Period: 3 s
Cycles: 1
Logger Setup:
Name: L1, L2, …
Tonality:
Mode: Auto / Manual
Number of Meas.: 1..20
Directory: TON_xxx</td><td>FFT spectrum View and the Tonality results Table.

Tonality results Table consists of:
All found tones and their audibilities,
Maximum tone Critical bandwidth, tone level Lt, noise level Lg, audibility ΔL,
Mean audibility for the number of spectra ‘mean L’, extended uncertainty of the mean audibility ‘U90%’, spectrum penalty Kt.</td></tr>
<tr><td>ISO 226-2003</td><td rowspan="2">Spectrum:1/3 Octave
Band: Audio (20-20k)
Filter: Z
RMS Detector: Lin
Min,Max Detector: Fast
Investigation region: 25Hz-12.5kHz
General Settings:
Integr. Period: 3 s
Cycles: 1
Logger Setup:
Name: L1, L2, …
Tonality:
Directory: TON_xxx</td><td>Equal-loudness level contour corresponding to the highest tone in the spectrum according to ISO 226: 2003.
Loudness levels [phon] of each tone are available in the additional View. All tones that satisfy the standard conditions are shown in the main View (orange colour). Main tone is distinguished by its colour as well (yellow colour). Spectrum Penalty Kt.</td></tr>
<tr><td>ISO 226-1987</td><td>Equal-loudness level contour corresponding to the highest tone in the spectrum according to ISO 226: 1987.
The views are the same as in the previous standard.</td></tr>
<tr><td colspan="3">Note: Integrational Period is 3 s by default for the Tonality function setup. However, it’s possible to settle other integration period, that will be kept in the memory of the Tonality setup and will be loaded next time.
Note: For the 1/3 octave Tonality measurement it’s recommended to set the integrational time for 1 s. For the FFT Tonality measurement it’s recommended to set the integrational time for 3 s.
Note: The repetition Cycles parameter in the General Settings for Tonality according to ISO 20065-16 is always 1. The repetition Cycles for Tonality according to ISO 226-2003 and ISO 226-1987 can be changed and set by user.
Note: The user has the right to stop a measurement or calculations by clicking the <ESC> button. This will lead to the loss of measured data and results.</td></tr>
</table>

13.3 TONALITY MEASUREMENTS



The instrument performs **Tonality** measurements together with SLM measurements.

To start measurements, press the **<Start>** key.

If you use the **ISO 226-2003** or **ISO 226-1987** standards, each press of the **<Start>** key will start series of measurements defined by the **Cycles** parameter, which the user can set. The tonality results for the last cycle will be saved in the file. These results can be viewed as the 1/3 octave spectrum graph.

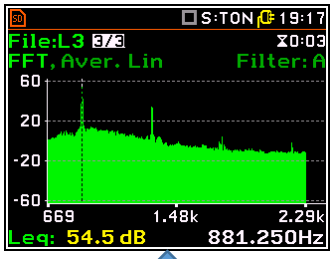


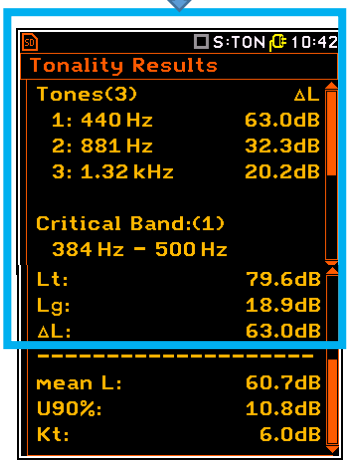
If you use the **ISO 20065-16** standard, you cannot change the number of **Cycles**, but you can set the **Number of Meas.** parameter, which limits the number of measurements. In the **Auto** mode, the instrument will perform just these number of measurements and will stop. In the **Manual** mode, you should press **<Start>** to start new measurement.

After reaching the **Number of Meas.**, the instrument performs postprocessing calculations which is accompanied by a message “Calculations…”.

13.4 TONALITY RESULTS

Results of the Tonality analysis are presented as a spectrum – FFT in case of the **ISO 20065-16** standard or 1/3 octave in case of the **ISO 226-2003** and **ISO 226-1987** standards.





In case of the **ISO 20065-16** standard**,** you can view tonality results in a table form: **Tonality Results**.

The **Tonality Results** view presents:

1) results of Tonality analysis for the currently displayed measurement:

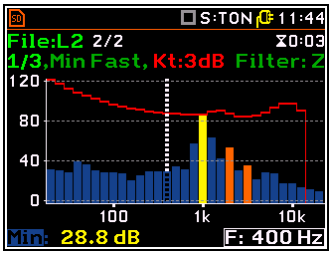
- **Tones(x)** - a list of tones causing penalty, x – number of tones,
  - Tones’ frequencies and the corresponding audibilities in dB (**ΔL**)
- **Critical Band (y)** - frequency band with a bandwidth of a decisive tone, **y** – number of this tone in the list of all detected tones, **XX Hz – YY Hz** - Critical Band frequency boundaries and calculated for this critical band results:
  - **Lt** – tone level
  - **Lg** – critical band level of noise that is assigned to the critical band
  - **ΔL** – audibility, difference between the tone level and the masking threshold

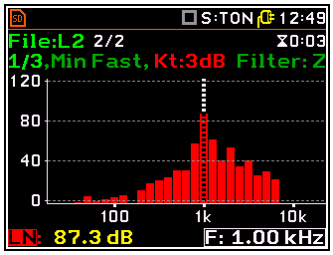
2) averaged results for the series of measurements:

- **mean L** – averaged Audibility result of all measurements
- **U90%** – extended uncertainty of the mean audibility with a coverage probability of 90% in a bilateral confidence interval
- **Kt** – spectrum adjustment

The full Results Table is available to see in the SavnPC++ program. It allows you to view all the measured parameters according to ISO 20065:2016.

1/3 octave results

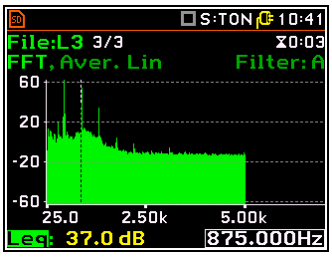




In the left example, the most pronounced tone can be seen (yellow colour) as well as additional tones (1/3 bandwidths) are marked by orange colour. The equal-loudness level contour corresponding to the highest tone in the spectrum according to ISO 226:1987 or ISO 226:2003, depending on the Standard settings, is shown as red line.

In the right example, the corresponding loudness levels (Phon) to each 1/3 band are shown. The absence of the result in a particular bandwidth indicates that the loudness level doesn't meet the requirements of the current standard.

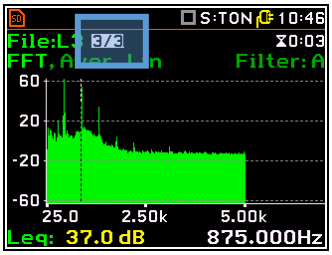
FFT results



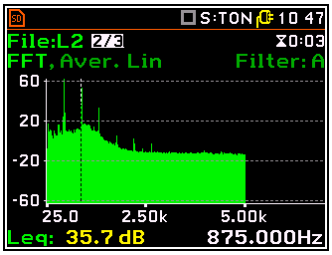
The spectrum view shows the FFT spectrum for the selected measurement, recorded in the file (in the presented example with the name **L3**).

You can shift manage this view same way as normal FFT spectrum, e.g., shift cursor position, zoom the spectrum etc.

Changing the measurement file in the current measurement series

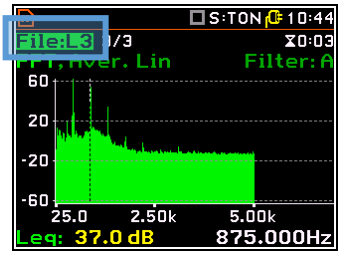


<Alt/◄>



To change the measurement file in the current measurement series, select the field with measurements count and press the ◄ / ► key together with **<Alt>**.

Opening files of a new measurement series



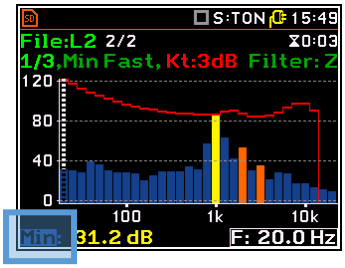
<ENT>



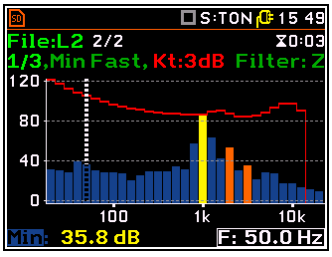
When the **File** field is active you may open files of a new measurement series.

For this, press **<ENTER>**, and in the **File Manager** open the required catalogue and then select any measurement file and press **<ENTER>**.

Changing the cursor position



►...



When the measurement result field is active, you may change the cursor position with the ◄ / ► key.

14 MEASUREMENT OF LOUDNESS – Loudness

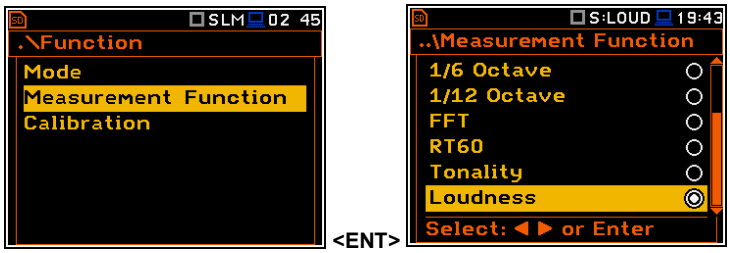
The **Loudness** function is the extension of the **Sound Meter** function for additional calculation of the so called "Bark spectrum". The Bark spectrum is calculated from pre-defined 1/3-octave spectrum (25 Hz - 12.5 kHz) in accordance with the ISO 532B standard.

The **Loudness** function doesn't require any additional settings and the Bark spectrum is calculated every time the user presses the **<Start>** key. Calculated 1/3-octave spectrum is not saved in a logger file.

Note: *The* ***Loudness*** *analysis is performed in parallel to the Sound Level Meter measurements.*

14.1 SELECTING THE LOUDNESS FUNCTION

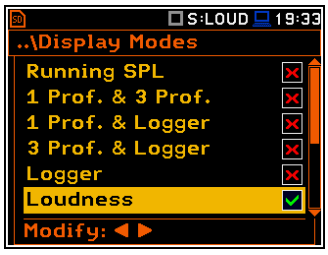
To activate the **Loudness** analysis function, select the **Loudness** position in the **Measurement Function** list and press **<ENTER>**.



14.2 VIEWING LOUDNESS RESULTS

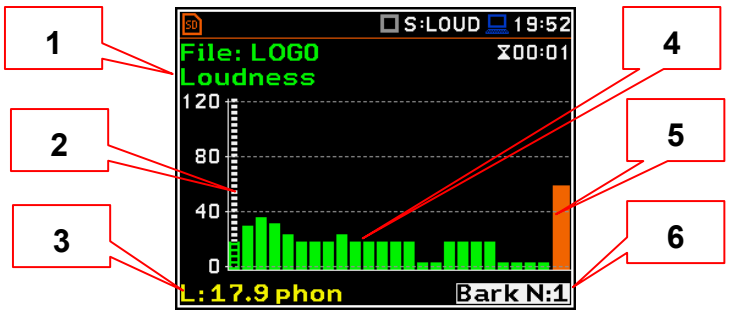
The results of the **Loudness** function can be viewed in a special view mode – **Loudness** (*path: <Menu>/ Display / Display Modes*).

The **Loudness** mode displays the Bark spectrum.

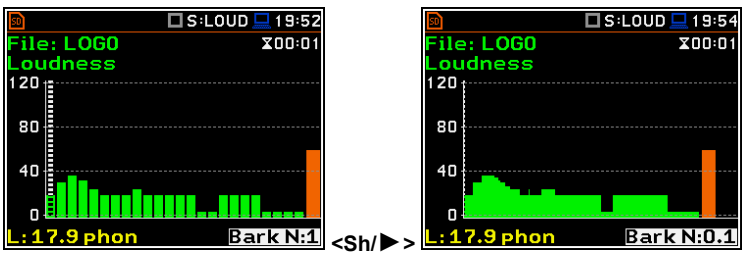


Bark spectrum presentation

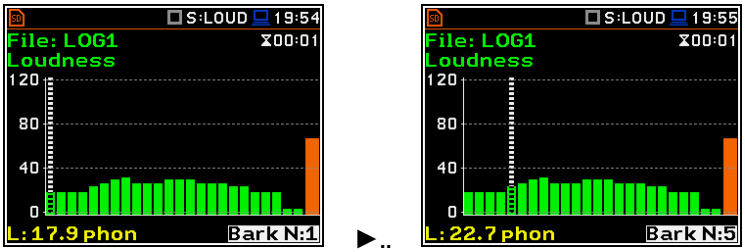
1. Name of the function
2. Cursor position
3. Cursor position value
4. Bark spectrum
5. Bark Total value
6. Bark number



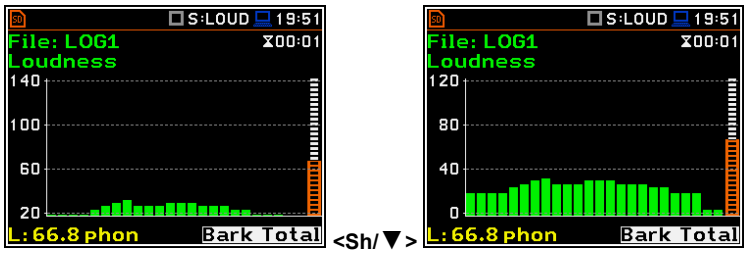
The Bark spectrum can be viewed as 24 or 240 bark plots. You can switch between both spectrum with the ◄ / ► key pressed together with **<Sh>**.



You may change the cursor position with the ◄ / ► keys. The bark number and appropriate value are presented in the line below the plot.



You may shift the Y-axis during the spectrum presentation the ▲ / ▼ keys pressed together with **<Shift>**.



15 MEASUREMENT OF SPEECH TRANSMISSION INDEX – STIPA

15.1 INTRODUCTION

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

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

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

STIPA calculations are realized in SVAN 979 in accordance with IEC 60268-16:2020.

Note: *In addition to the fact that measurements can be made using only SVAN 979, Svantek also provides an application (**Building Acoustics**) for mobile devices (smartphone, tablet), which performs STIPA measurements using SVAN 979 but has a more convenient user interface (see Building Acoustics User Manual).*

15.2 STI METHOD BACKGROUND

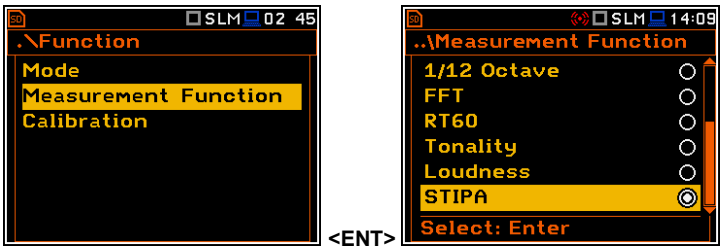
The STI method is based on measurements of the STI test signal comprising seven octave band noise signals corresponding with the octave bands from 125 Hz up to 8 kHz. Each noise carrier is modulated with one or more modulation frequencies at one-third octave intervals ranging from 0,63 Hz up to and including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

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

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

15.3 SELECTING THE STIPA FUNCTION

To activate the **STIPA** function, select the **STIPA** position in the **Measurement Function** list and press **<ENTER>**.



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

15.4 STIPA MEASUREMENT AND CALCULATION PROCESS

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

15.4.1 Measured results

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

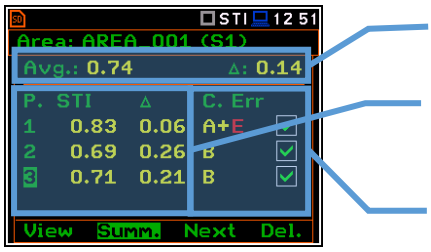
- **STI** - Speech Transmission Index representing the transmission quality of speech with respect to intelligibility by a speech transmission channel, ranging between 0 and 1. STI is calculated for individual measurements and averaged for the measurement point and for the area.
- **Δ** – difference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

There are some additional indications:

- The STI qualification band: **A+** trough **U** (see Annex G to IEC 60268-16:2020).
- Errors detected during measurements and calculation of STI indexes.

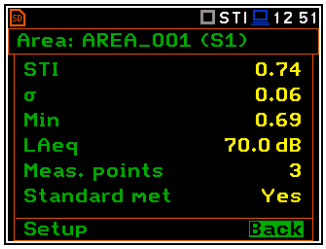
These results are displayed in different views:

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



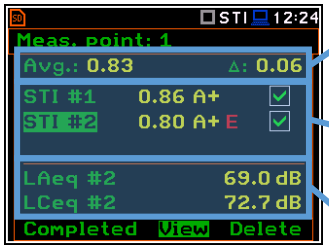
  - Averaged STI (or CIS) index with consideration of the Ambient noise distortions (**Avg.**) and STI spread (**Δ**) for the tested area.
  - Averaged STI (or CIS) indexes with consideration of the Ambient noise distortions (**STI**) and STI spreads (**Δ**) for measurement points.
  - The STI qualification band (**A+** through **U**) and error indication is displayed for each measurement point.

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



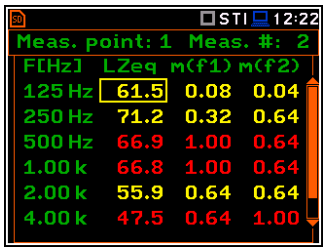
  - Averaged STI (or CIS) index with consideration of the Ambient noise distortions.
  - **σ** - standard deviation of measured STI indexes for the tested area.
  - **Min** – minimal STI value.
  - **LAeq** – averaged LAeq for the area.
  - Number of measurement points taken into consideration for the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

- *Point* view - main STIPA view. The *Point* view allows you to see the modulation function, to delete measurements (only for the last measurement point) and exclude measurement results from the calculation of the averaged STI index. This view corresponds with the measurement point selected in the *Area* view. This view presents a list of measurements for the measurement point with following results:



  - Averaged STI (or CIS) index with consideration of the Ambient noise distortions (**Avg.**) and STI spread (**Δ**) for the measurement point.
  - **STI** (or **CIS**) index with consideration of the Ambient noise distortions, the STI qualification band and error indication for individual measurements (**#1**, **#2** ..).
  - **LAeq** and **LCeq** for the selected measurement.

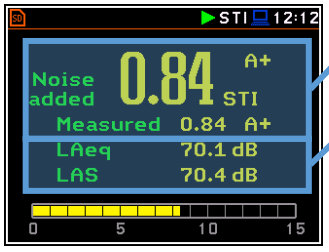
- *Modulation function* view corresponds with the measurement selected in the *Point* view. Modulation function presents LZeq and modulation transfer ratios (*m(f1), m(f2)*) for seven octave bands with central frequency from 125 Hz up to 8 kHz:



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

***Note**: You can switch between above screens with the ▼/▲ key pressed together with **<Alt>**.*

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



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

After completion of the measurement, the instrument will automatically switch to the *Point* view and the measurement results will be placed in the measurement list. If you stop the measurement manually, the instrument switches to the *Point* view, but the measurement result will not be included in the measurement list (see Chapter 15.4.6).

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

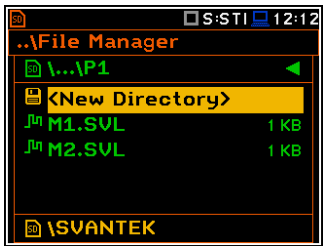
15.4.2 Project structure

Speech intelligibility measurements are organized in the structure of projects. The name of the project is equal to the name of the directory in the instrument's memory. Its subdirectories have names of tested areas. Next down level directories have names of test signal positions (so called sources). The source position directory contains measurement point directories with predefined names (**P1**, **P2** etc.) where the measurement files are saved. The measurement file contains measured results for the single measurement. Projects are saved in the predefined STIPA catalogue in the instrument's memory. Projects can be accessed through **File Manager**.

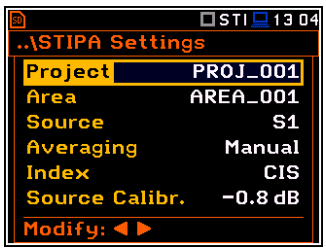
For example, in the below screens the project directory (**PROJ_001**) contains one area directory (**AREA_001**), which contains one source position directory (**S1**), which contains two points directories (**P1** and **P2**) and file with the ambient noise distortions (**NOISE.SVL**).



Directory **P1** contains files with measurement results (**M1.SVL**, **M2.SVL …**).



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



Point directories are created automatically when the user presses the **<Next>** soft-key in the *Area* view.

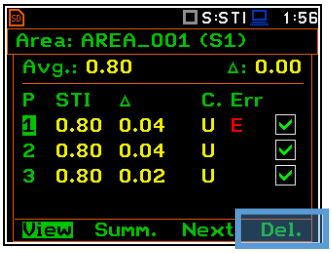


=>



***Note**: To press the soft-key on the display, select it with the ◄ / ► key and press **<ENTER>**.*

If you delete the point in the *Area* view, the appropriate directory will be deleted with all contained files.

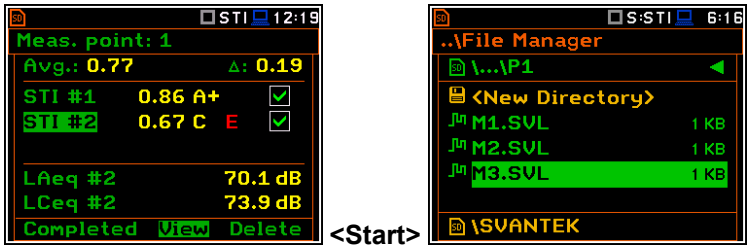


=>

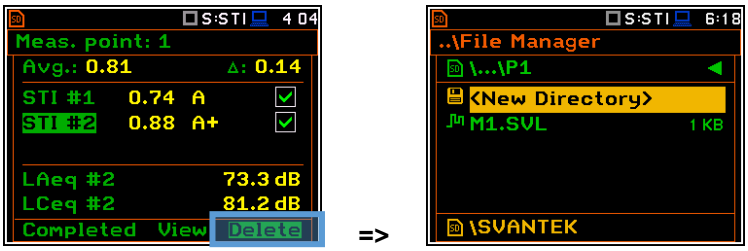


Every time you start a new measurement with the **<Start>** key, a new file will be created and saved in the point directory after the measurement is completed.

If you break the measurement with the **<Stop>** key, the measurement file will not be created.



If you delete the measurement in the *Point* view, the appropriate file will be deleted from the point directory.



Note: *Project, Area and Source directories can be created, renamed or deleted via the* ***File Manager*** *- see Chapter 6.*

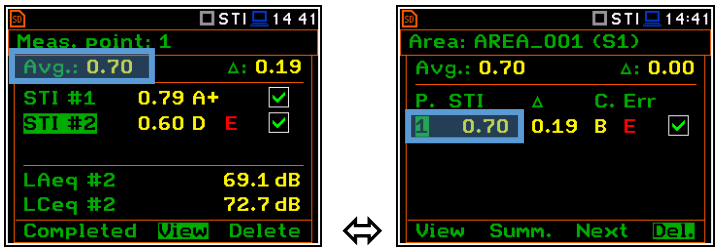
Note: *You cannot delete or rename point directories and measurement file via the* ***File Manager****. You can delete point directory and measurement file using the mechanism described in Chapter 15.4.6.*

15.4.3 Averaging results

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

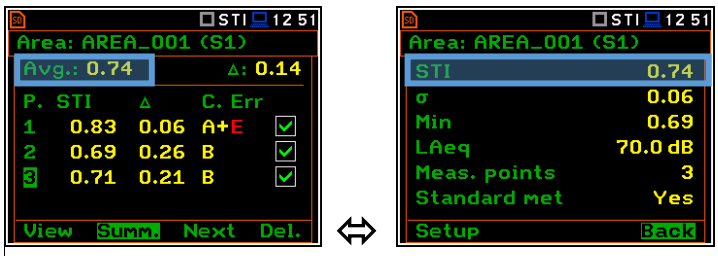
1) averaging of results for a measurement point.

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



2) averaging of results for a tested area.

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

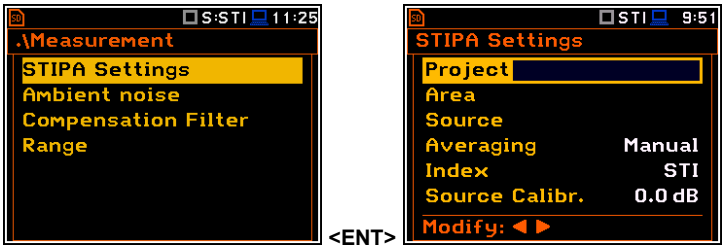


According to most standards, it is good practice to average the results for measurement points for two or three measurements. In case of noise fluctuations during measurements, it is recommended to make not less than three measurements and check whether the spread of the STI index does not exceed 0.03.

15.4.4 STIPA settings

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

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

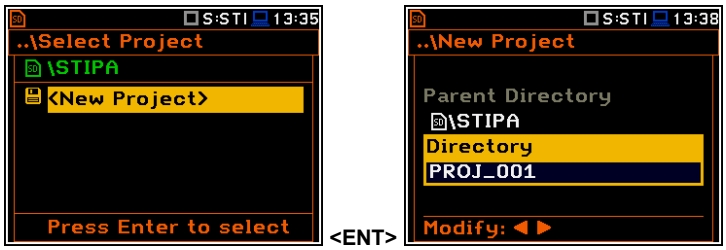


2. Being at the **Project** position, press the ► key and, in the **Select Project** screen, select **<New Project>** to create a new project directory or select the directory of the previously created Project and press **<ENTER>**.



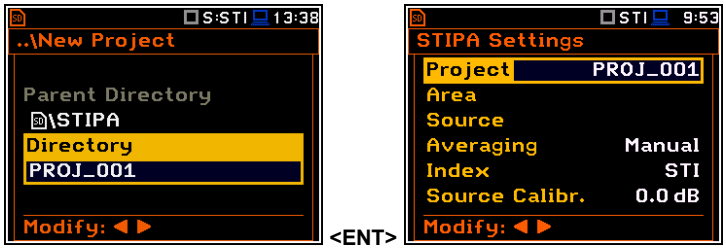
In case of **<New Project>**, the instrument will propose a default name for the new Project directory which can be modified in the editor screen opened after pressing the **<ENTER>** key.

After edition of the project name it should be confirmed by the **<ENTER>** key.



In the **New Project** screen press **<ENTER>** to return to the **STIPA Settings** screen.

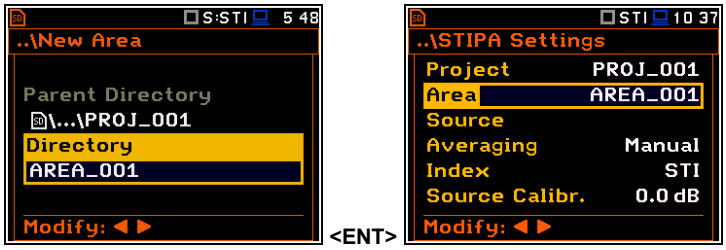
The selected project name will be displayed in the **Project** position of the **STIPA Settings** screen.



3. Go to the **Area** position, press the ► key and, in the **Select Area** screen, select **<New Area>** to create a new area directory or select the directory of the previously created Area and press **<ENTER>**.



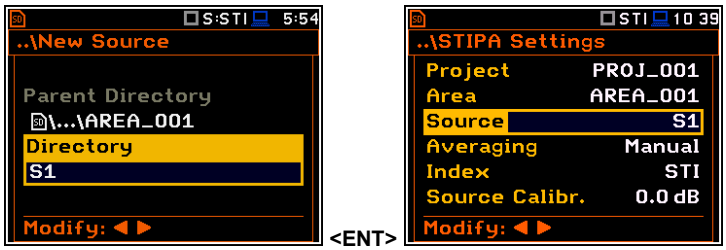
After creation of a new area directory or selection of the existed one press **<ENTER>** and the selected area name will be displayed in the **Area** line of the **STIPA Settings** screen.



4. Being at the **Source** position, press the ► key and in the **Select Source** screen create **<New Source>** or select previously created one (as a directory).

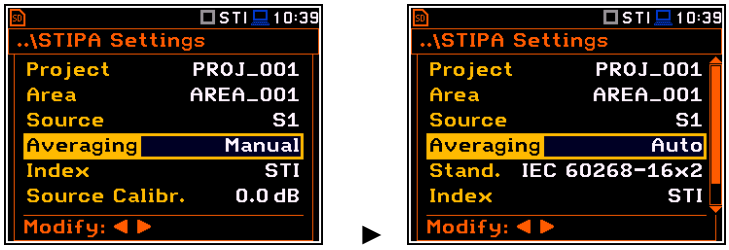


After creation of the new source position or selection of the existed one press **<ENTER>** and the selected source position name will be displayed in the **Source** position of the **STIPA Settings** screen.



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

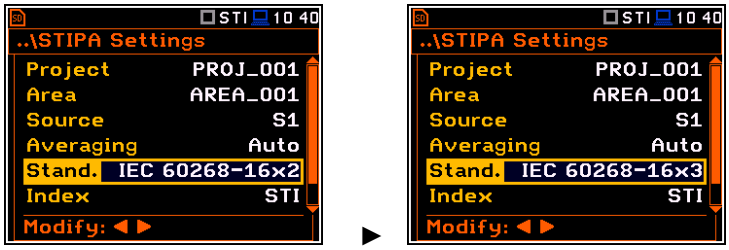
   Manual averaging means that you may perform as many measurements for the measurement point as you heed, and you will decide when to stop series of measurements by using the **<Completed>** soft-key – see Chapter 15.4.6.



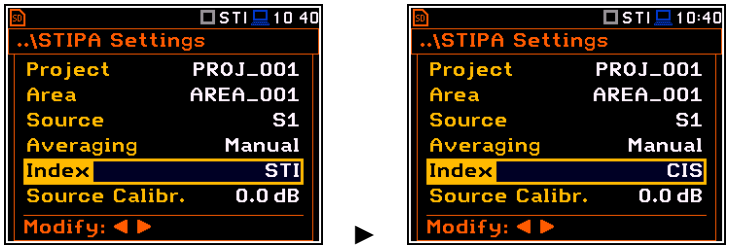
   Automatic averaging assumes that the measurements will be averaged according to IEC 60268-16:2020 which assumes two averaging procedures – for standard measurements (**IEC 60268-16x2**) and for measurements with fluctuating noise (**IEC 60268x3**). In the standard name abbreviation **x2** means that no less than two measurements should be made, and **x3** means that no less than three measurements should be made. When the automatic averaging is selected, additional position **Standard** appears in the **STIPA Settings** screen.

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

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

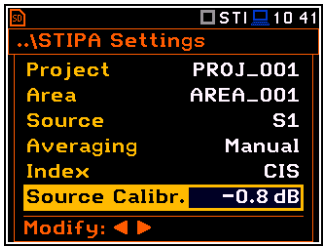


7. The **Index** position allows you to define which index **STI** or **CIS** will be displayed in the main STIPA views.



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

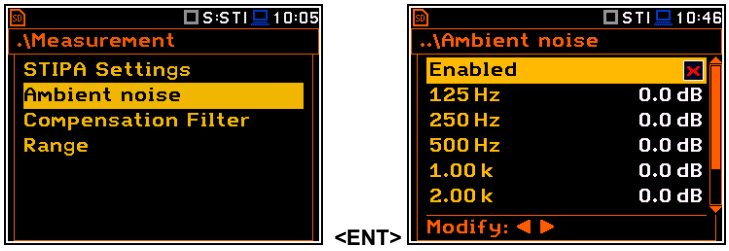
   LAeq of both signals must be measured and if the difference between the real signal and STIPA signal is different than -3 dB, enter it as the Source calibration.



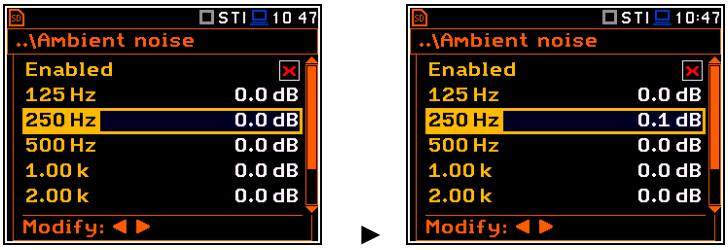
15.4.5 Considering ambient noise distortions

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

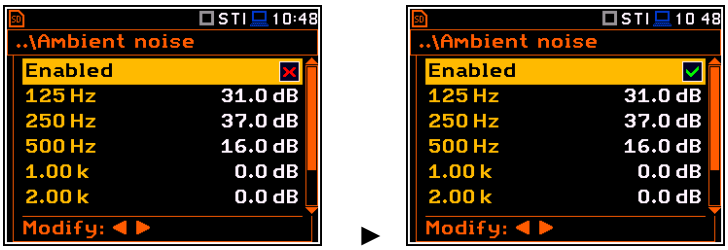
In the **Ambient noise** screen, you can set noise levels for octave bands that will be considered in STIPA calculations.



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



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



Note: *The table with ambient noise distortions can be updated also from the Point view before the first measurement – see next Chapter.*

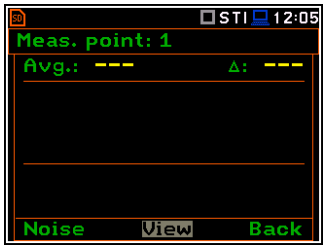
15.4.6 STIPA measurements

After completing the STIPA settings, you can start measuring.

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

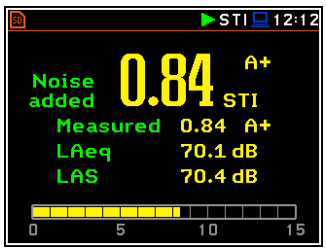
   If you begin measurements, the *Area* view will show the first measurement point with zero STI value.

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



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

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

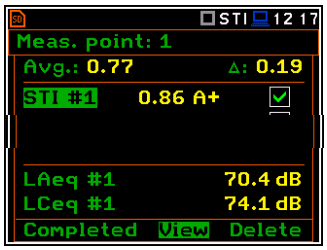


Note: *Ambient noise distortions will be considered in accordance with the values set in the* ***Ambient noise*** *table – see Chapter 15.4.5.*

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

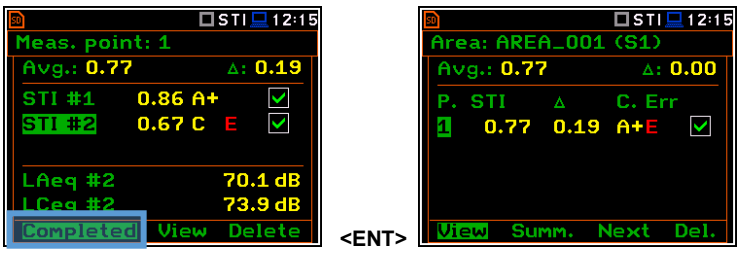
After completing the measurement, the instrument shifts to the *Point* view with current measurement results.

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



4. To finish measurement series for the measurement point, you should complete them pressing the **<Completed>** soft-key.

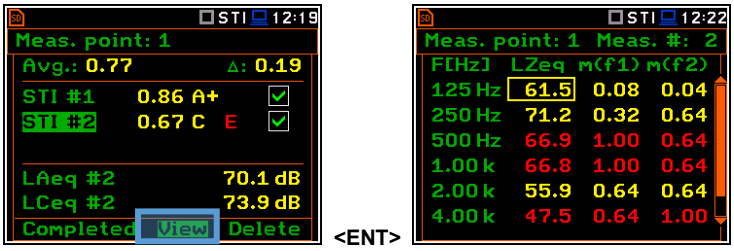
   The instrument switches to the *Area* view.



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

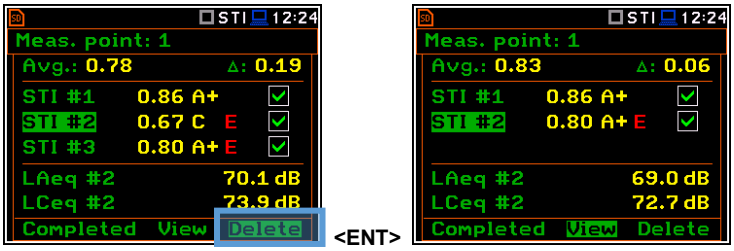
If you select a measurement in the *Point* view and press the **<View>** soft-key, you can view the modulation function coefficients for seven octave bands and two modulation frequencies (f1 and f2) for this measurement.

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

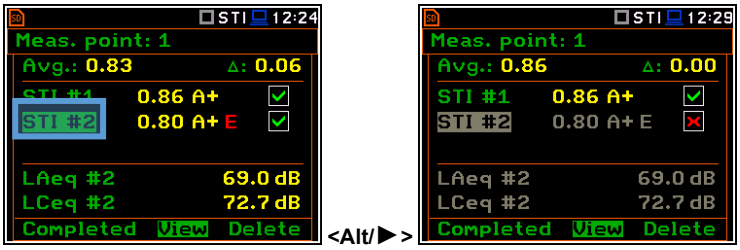


You can delete the selected measurement pressing the **<Delete>** soft-key.

After deleting the measurement, the instrument will change the numeration of measurements in the *Point* view. At the same time the file with the measurement results will be deleted from the Point directory.



You can exclude/include the selected measurement from the averaging by pressing the ◄/► key together with **<Alt>**. The file with the excluded measurement results will have the "_" character instead of "M".



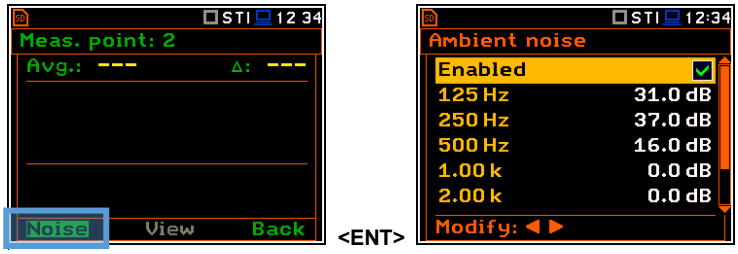
5. After completion of the measurement series for the measurement point, you can create a new measurement point pressing the **<Next>** soft-key in the *Area* view. The instrument will create a new point directory and switch to the *Point* view.

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



In some cases, it may be necessary to change ambient noise levels for a new measurement point.

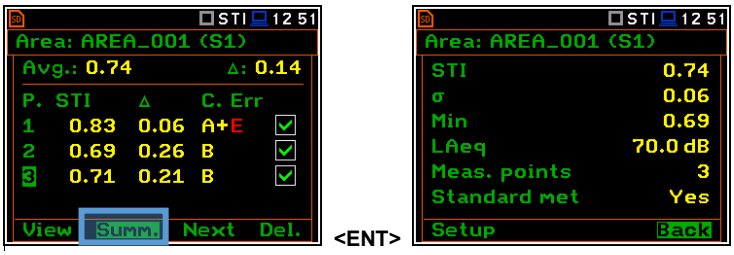
In such a case, before making first measurement in the *Point* view press the **<Noise>** soft-key and in the **Ambient noise** screen make necessary adjustments of the noise levels for octaves.



After confirmation of the changes with the **<ENTER>** key you will return to the measurement mode with new ambient noise distortion parameters.

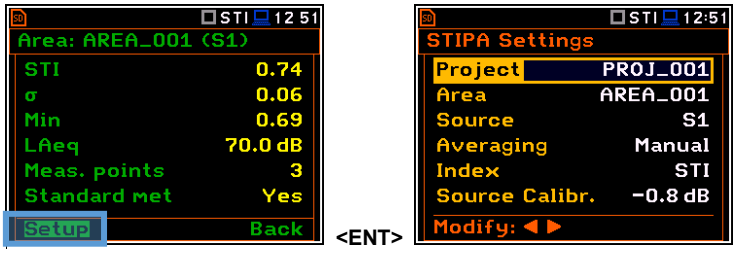
***Note:** Any confirmed changes in the **Ambient noise** table will replace the previous ones and new ambient noise distortions will be considered during the next measurements!*

If you press the **<Summ.>** soft-key in the *Area* view, the instrument will switch to the *Area summary* view.



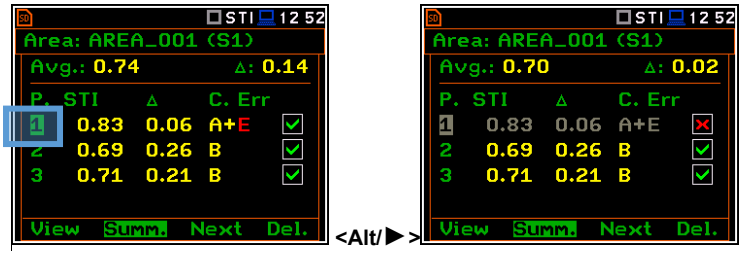
From the *Area summary* view, you can return to the *Area* view with the **<Back>** soft-key or you can go to the **STIPA Settings** screen with the **<Setup>** soft-key.

In the **STIPA Settings** screen you can create new Project, Area or Source and continue measurements for the new area.



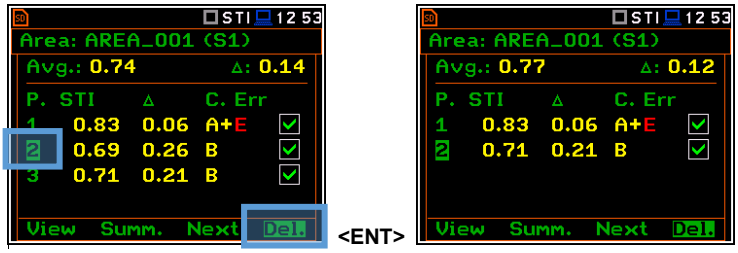
You can exclude/include a measurement point(s) from averaging. For this, select it with the ▼/▲ key and press the ◄/► key together with **<Alt>**. Values in the *Area summary* view will be recalculated without consideration of the excluded point(s).

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

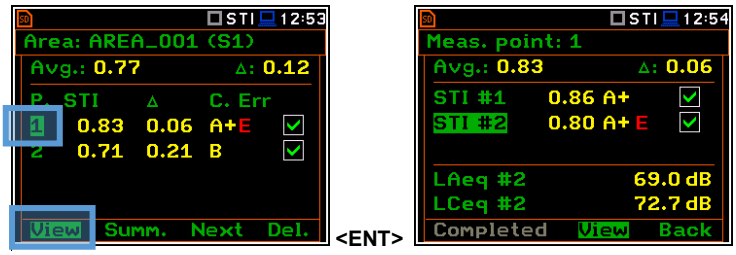


You can delete a measurement point. For this, select it with the ▼/▲ key and press the **<Delete>** soft-key. After confirmation the selected point will be deleted.

The point directory with all measurement files will be deleted from the Source directory.



To view measurements for the measurement point, select it with the ▼/▲ key and press the **<View>** soft-key.



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

15.5 DOWNLOADING FILES AND PROCESSING DATA

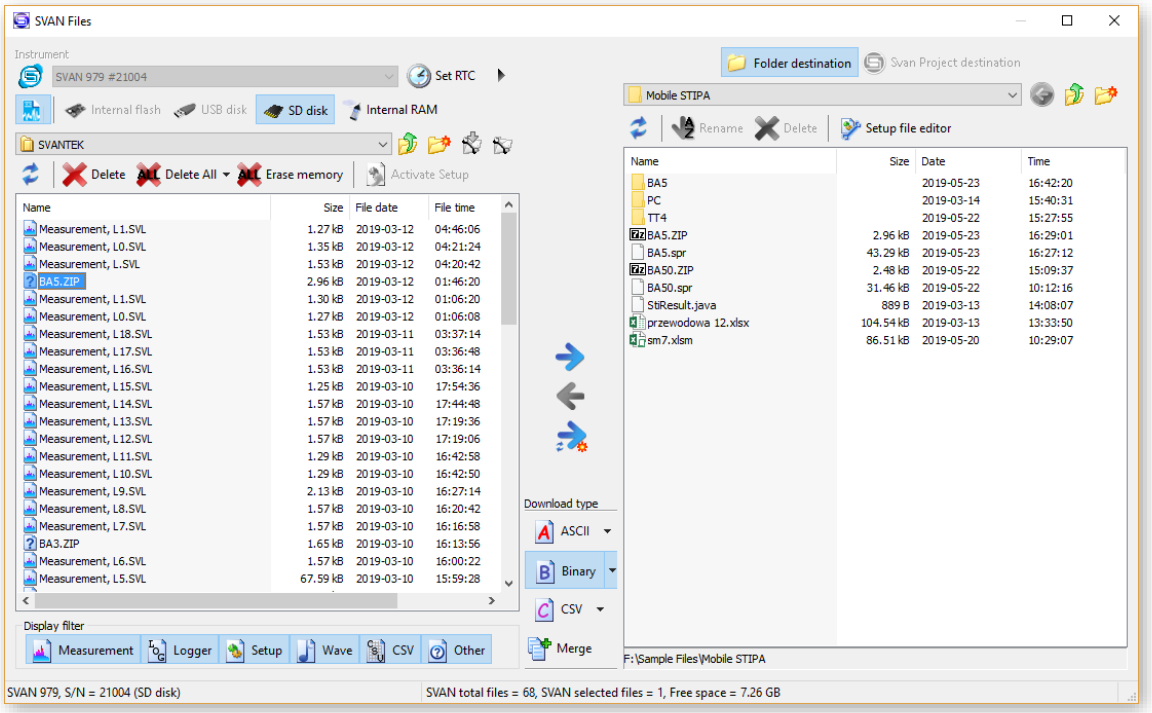
The measurement files created during the STIPA measurements by SVAN 979 can be download and analysed with the use of SvanPC++ software.

The SvanPC++ software allows you to download files and analyse measurement data made with the use of the SVAN 979 instrument as well as projects created by the *Building Acoustics* application for smartphones.

15.5.1 Measurement with Building Acoustics

Building Acoustics is an application for mobile devices (smartphones, tablets) that uses Svantek measuring instruments to measure the building acoustics, including STIPA speech intelligibility.

After taking measurements using *Building Acoustics* a project (zip file containing files with the results obtained during the measurement) will be automatically copied to the measuring instrument. Project zip file is named BAxxx.ZIP and you can download it to a PC and open with the SvanPC++ program using the "SVAN Files" option (available in the menu "SVAN -> SVAN Files" or using the meter icon on the toolbar). If you have the SvanPC++ software installed on your PC, you can open the project directly by doble clicking on it.



To open the project:

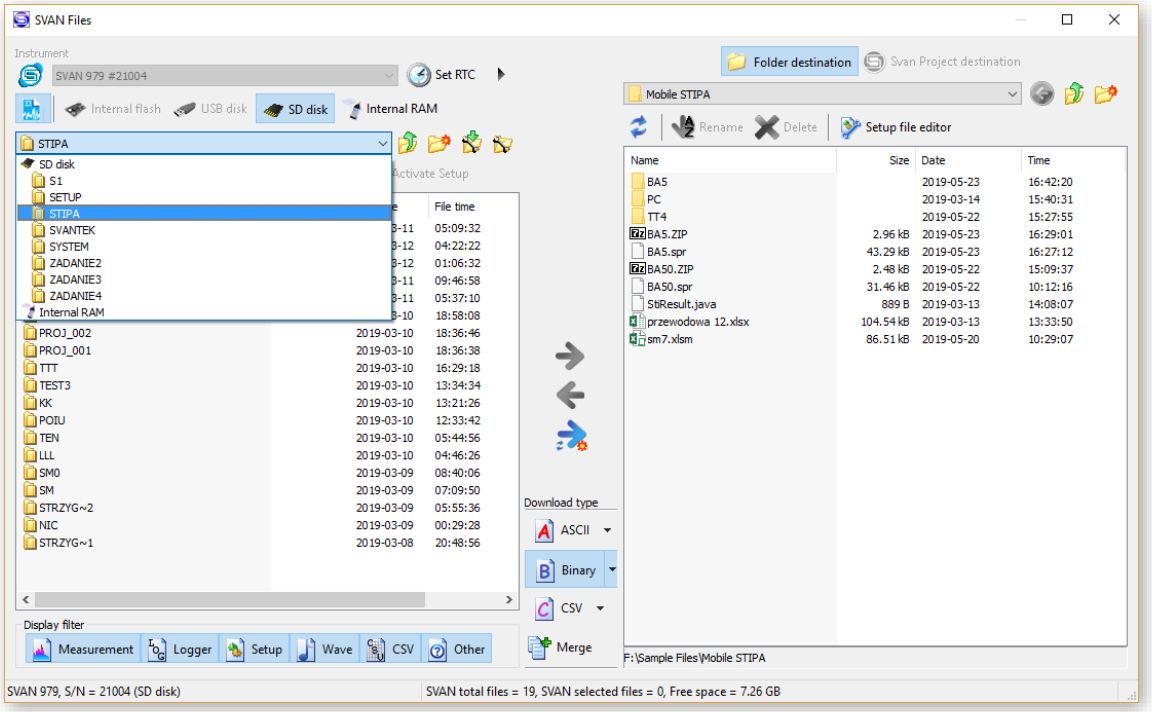
- Connect your Svantek instrument to the PC,
- Launch SvanPC++,
- select the project file in the list on the left side of the window and then use the right arrow button. As a result, the file will be downloaded to the folder on the right side of the window.
- Then just double click on the downloaded file and it will be automatically opened in the SvanPC++ program. The STIPA results window will appear.

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

15.5.2 Direct measurement with SVAN 979 (without Building Acoustics)

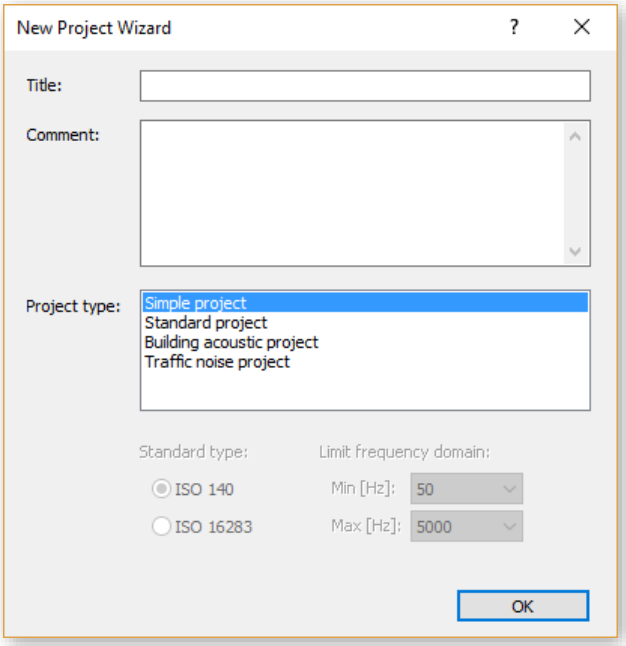
When using the instrument directly STIPA function, the measurement files are grouped in catalogues for points. Point catalogues are grouped into source catalogues. Those, in turn, are grouped in the catalogues for the area, and the catalogues for the area are grouped in the project catalogue.

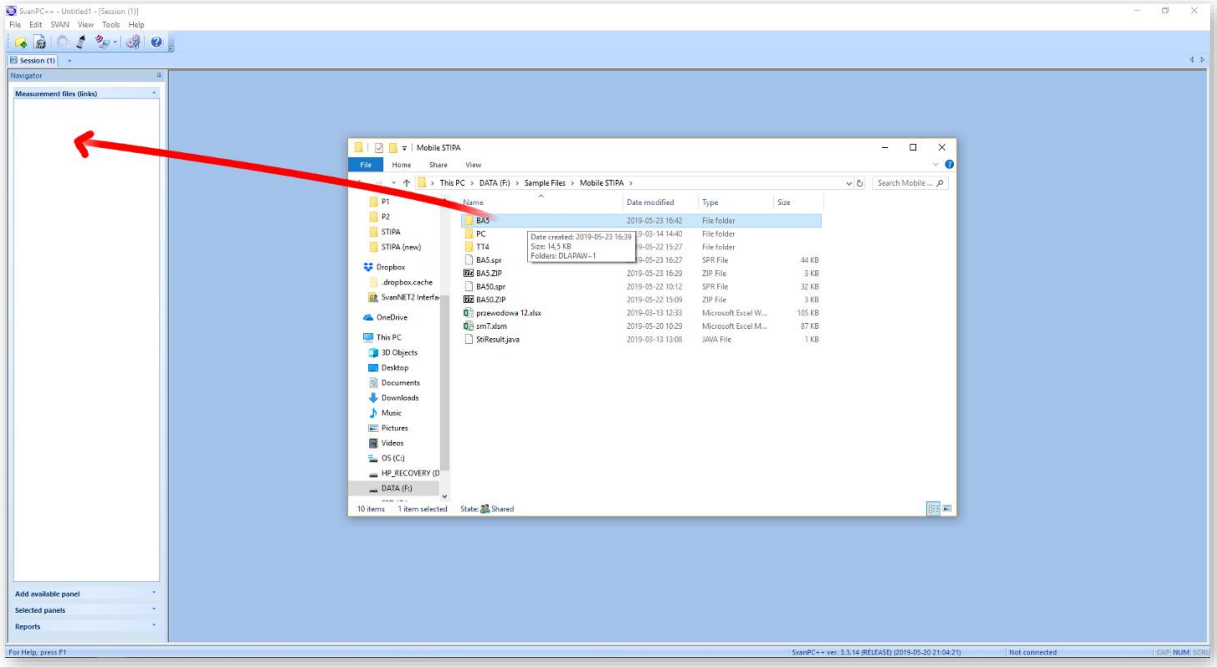
To download files with SvanPC++, use the "SVAN Files" window. Select the appropriate catalogue with required data in the instrument section and then click the right arrow to download them. You can select the entire project catalogue or only a catalogue for the area or point (or even a single SVL file).



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

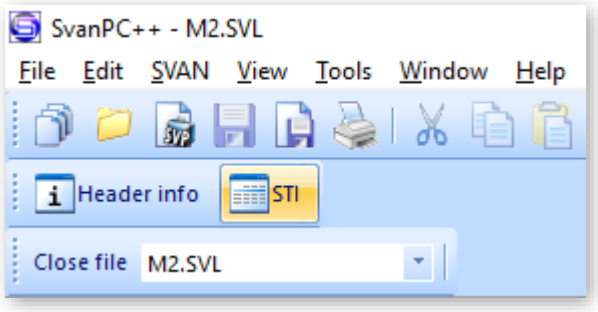
A window on the left side with a list of project files (empty for now) will appear. Add files / folders to the project that you wish to combine. The easiest way to do this is through drag & drop operations from the file explorer by selecting the folder / files and dragging it to the SvanPC++ window.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



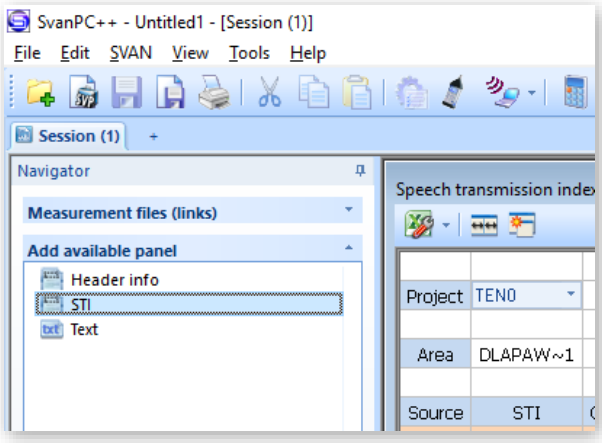


15.5.3 Presentation of STIPA results

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



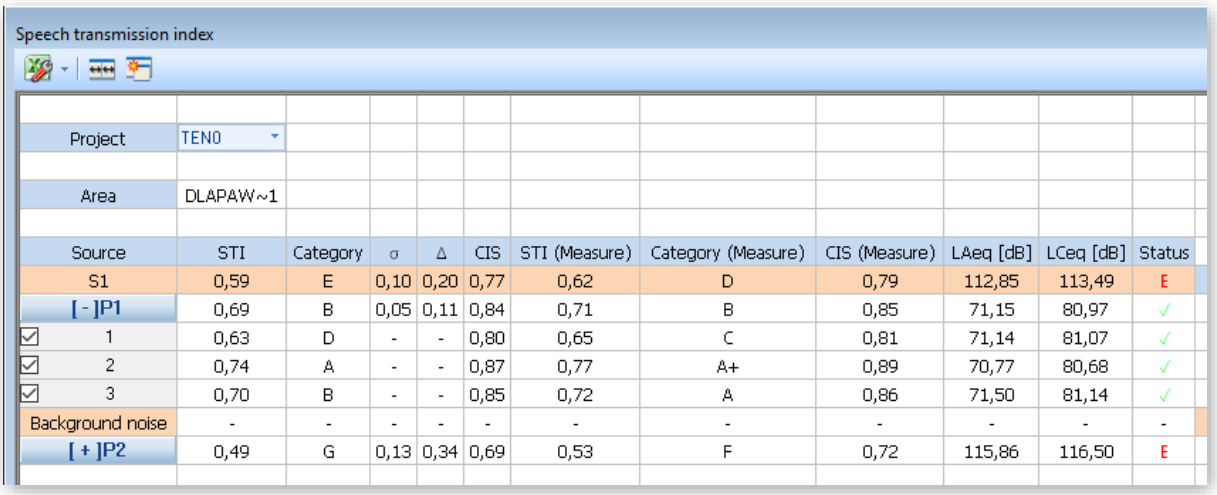
In case of "Simple project" projects, this window can also be opened via the "Add available panel" tab and selecting "STI".



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

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

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



Project TENO

Area DLAPAW~1

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

15.5.4 Changing background noise values

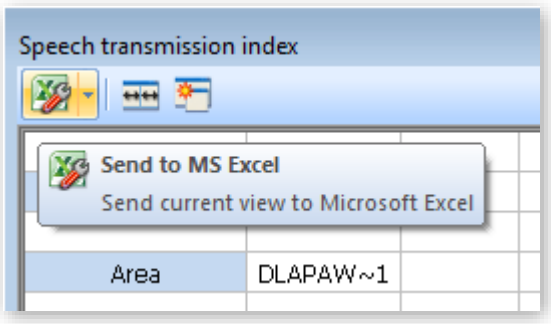
The cells with the background noise results are editable, i.e. you can manually enter values for individual octaves (just double click on the selected background noise value). Such a change will automatically convert the results for a point and above.

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

15.5.5 Generating reports

There are two ways to generate a report:

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



16 REMOTE CONTROL AND DATA PROCESSING TOOLS

Svantek offers several software solutions for data download and processing as well as remote control and communication with SVAN 979 depending on the user's needs and possibilities:

- *SvanPC++* - PC software for data download and upload, data post-processing, reporting and remote control (via USB or RS232 connection to a PC),
- *Assistant Pro* – mobile device application for general SLM measurements (via Bluetooth® connection with a mobile device),
- *Building Acoustics Pro* – mobile device application for building acoustics and speech intelligibility measurements (via Bluetooth® connection with a mobile device).

The *SvanPC++* installation package is available to download from the official Svantek website. *Assistant Pro* and *Building Acoustics Pro* can be installed via the *Google Play Store or App Store* platforms.

The SVAN 979 can be controlled via the *SvanNET* web service if it is connected to the Internet via the mobile modem (as part of the SV 279 PRO Monitoring Station or via the SD 311 Outdoor Monitoring System Router).

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

The general functionality of these tools is described in Appendix R.

Most of the software's functionality is described in its user manuals:

- SvanPC++ User Manual
- SvanNET User Manual
- Building Acoustics Pro User Manual.

17 MAINTENANCE

17.1 POWERING OF THE INSTRUMENT

SVAN 979 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 – 6 V DC÷24 V DC (1.5 W)
- SA 17A external battery pack – operation time > 24 h (option)
- USB interface – 500 mA HUB

SVAN 979 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 6 V DC÷24 V DC, 1.5 W (SA 15) is performed via **6–24V** 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.*

17.2 MEMORY CARD EXTRACTION AND INSERTION

SVAN 979 is delivered with 16 GB micro SD card - Kingston Industrial (SDCIT/16GBSP).

You may exchange it with the higher 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.

17.3 TRANSDUCERS

SVAN 979 is equipped with the Lemo7 connector as an input of the measured signal taken from the microphone preamplifier or the vibration transducer.



Microphone

The SVAN 979 set includes prepolarised ½" microphone with nominal sensitivity 50 mV/Pa (GRAS 40AE) and microphone preamplifier with IEPE power supply (SV 17).



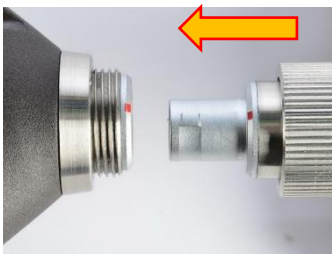
The microphone is delivered in a special box, and you must screw it onto the preamplifier threads themselves.

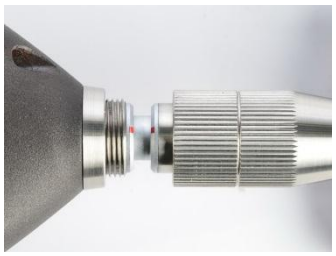
When unscrewing the microphone, care must be taken not to drop the microphone. To avoid this, unscrew the microphone so that it ended up in the user's palm.



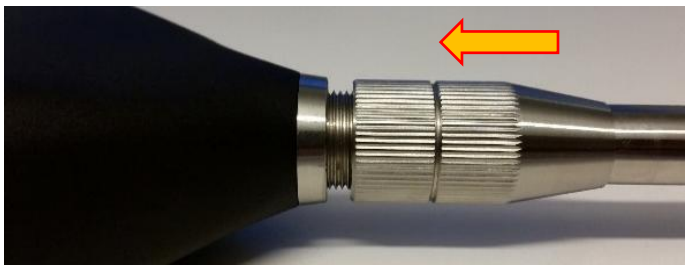


To connect the preamplifier with the microphone to the instrument, first insert the tip of the preamplifier into the socket until the connector clicks.





Then move the preamplifier outer sleeve in the direction to the instrument and tighten it to the screw thread.



Note: *After connecting the preamplifier to the measurement input, the screw should be tightened to light resistance only. Do not over tighten this connector!*

Note: *Do not disconnect the preamplifier by turning the preamplifier body (turn only rings/collars) because it may damage the preamplifier!*

Accelerometer

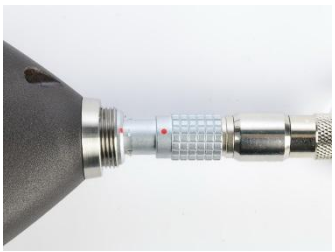


Optionally general-purpose vibration accelerometer 100 mV/g (10 mV/ms^{-2}) (SV 80) with a coiled cable for accelerometer 2 m (SC 27) and TNC-Lemo7 adapter (SC18T) can be used.

The SV 80 is an industry standard IEPE accelerometer offered for SVAN 979. 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 via SC18T adapter is like for the microphone preamplifier but there is no ring to be tighten to the screw thread.





17.4 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!

17.5 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 instrument is turned off.
- Connect the SC 16 cable to the computer and the SVAN 979 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.*

17.6 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.
- When the instrument is turned off, it still draws a small amount of battery power. Therefore, it is recommended to extract them out of the instrument if the storage time is long.

17.7 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.

17.8 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.*

17.9 TROUBLESHOOTING

- In case your instrument does not respond proceed with hardware reset of the instrument (see Chapter 17.4).
- 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.

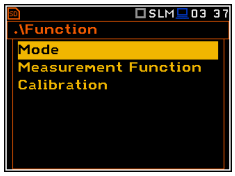
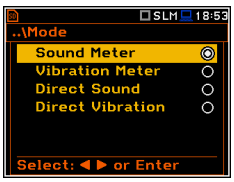
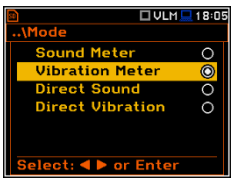
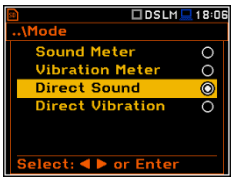
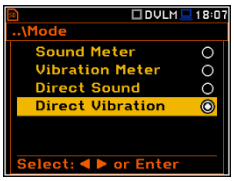
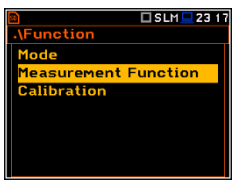
E-mail: office@svantek.com.pl
support@svantek.com.pl

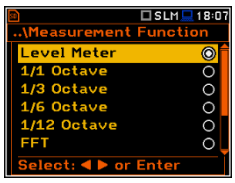
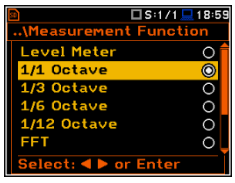
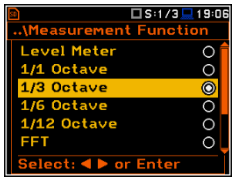
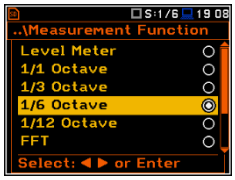
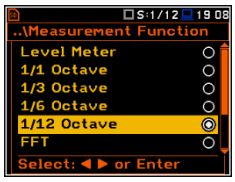
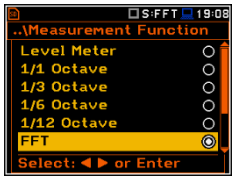
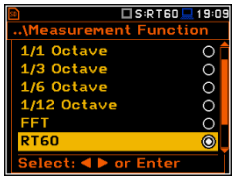
Internet: www.svantek.com

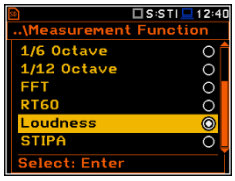
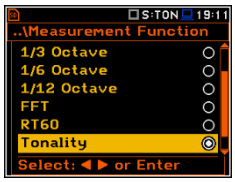
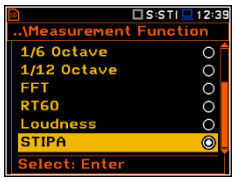
Address: SVANTEK Sp. z o.o.
Strzygłowska 81
04-872 Warszawa,
Poland

18 GLOSSARY

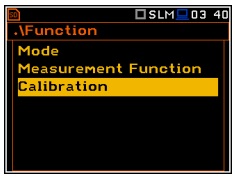
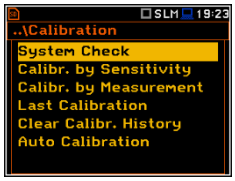
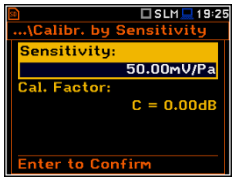
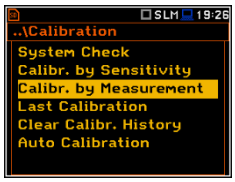
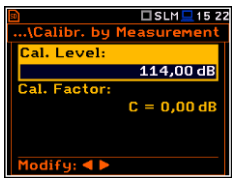
18.1 MODES AND MEASUREMENT FUNCTIONS

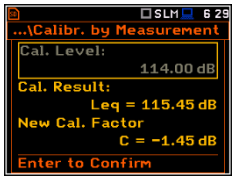
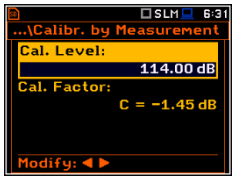
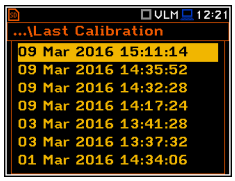
Position	Description	Screen	Reference
Function	The menu section enabling selection of the measurement *Mode*, *Measurement Function* and perform *Calibration* of the instrument.		Chapter 3
Mode	Mode of the instrument operation defined by the connected transducer: - noise parameters measurement (*Sound Meter, Direct Sound*) or - vibration parameters measurement (*Vibration Meter, Direct Vibration*).		Chapter 3.1
Sound Meter	Measurement of sound results with dedicated preamplifier and microphone. When *Sound Meter* is selected all abbreviations of the *Measurement Function* start from S letter.		Chapter 3.1
Vibration Meter	Measurement of vibration results with dedicated accelerometer. When *Vibration Meter* is selected all abbreviations of the *Measurement Function* start from V letter.		Chapter 3.1
Direct Sound	Measurement of sound results with other than dedicated preamplifier and microphone (direct voltage input). When *Sound Meter* is selected all abbreviations of the *Measurement Function* start from DS letters.		Chapter 3.1
Direct Vibration	Measurement of vibration results with other than dedicated accelerometer (direct voltage input). When *Direct Sound* or *Direct Vibration* is selected all abbreviations of the measurement functions have the first letter *D (e.g., DS:1/1* or *DV:1/1*).		Chapter 3.1
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), - *1/6 Octave* (S:1/6 or V:1/6), - *1/12 Octave* (S:1/12 or V:1/12), - *FFT* (S:FFT or V:FFT), - *RT60* (S:RT60), - *Loudness (S:LOUD),* - *Tonality (S:TON),* - *STIPA (S:STI).*		Chapter 3.2

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 3.2
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 value vs central band frequency. 1/1-octave results 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 3.2, 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 value vs central band frequency. 1/3-octave results 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 3.2, 10
1/6 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/6-octave results for sound or vibration measurements in accordance with Class 1 IEC 61260-1:2014. 1/6-octave results are presented as a spectrum plot - a function of result vs central band frequency. 1/6-octave results can be saved as a time-history. When the *1/6 Octave* function is active the S:1/6 or V:1/6 abbreviation appears in the icon line.		Chapter 3.2, 10
1/12 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/12-octave results for sound or vibration measurements in accordance with Class 1 IEC 61260-1:2014. 1/12-octave results are presented as a spectrum plot - a function of result vs central band frequency. 1/12-octave results can be saved as a time-history. When the *1/12 Octave* function is active the S:1/12 or V:1/12 abbreviation appears in the icon line.		Chapter 3.2, 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 3.2, 11
RT60	*Measurement Function* enabling calculation of reverberation time in 1/1-octave bands (from 63 Hz to 16 kHz) 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 3.2, 11

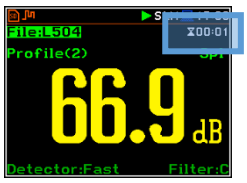
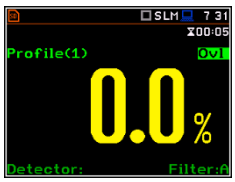
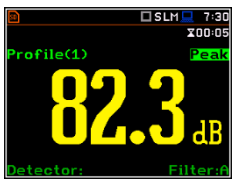
Loudness	*Measurement Function* enabling calculation of the so called “Bark spectrum”. The Bark spectrum is calculated from pre-defined 1/3-octave spectrum (25 Hz - 12.5 kHz) in accordance with the ISO 532B standard. Results are presented in a special presentation view. When the *Loudness* function is active the S:LOUD abbreviation appears in the icon line.		Chapter 3.2, 14
Tonality	*Measurement Function* enabling assessing the audibility of tones in the noise. The results are presented in a special presentation view. When the *Tonality* function is active the S:TON abbreviation appears in the icon line.		Chapter 3.2, 13
STIPA	*Measurement Function* enabling analysis of the speech intelligibility with the STIPA method. When the *STIPA* function is active the S:STI abbreviation appears in the icon line.		Chapter 3.2, 15

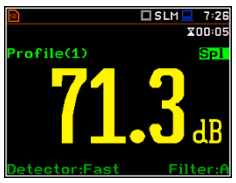
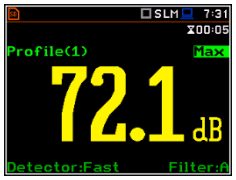
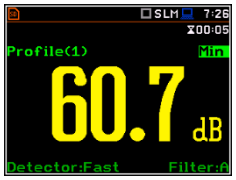
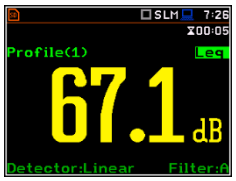
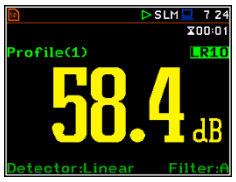
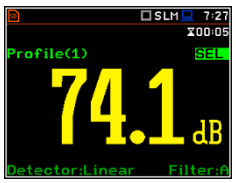
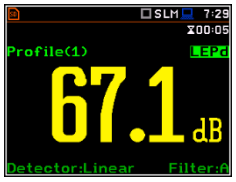
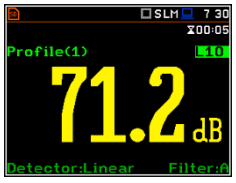
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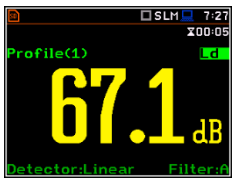
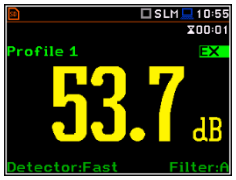
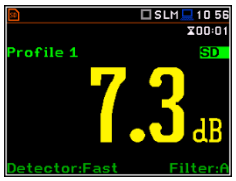
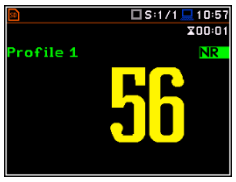
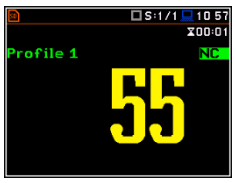
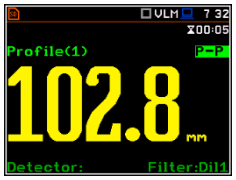
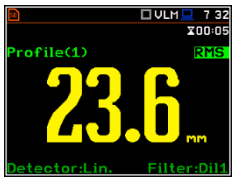
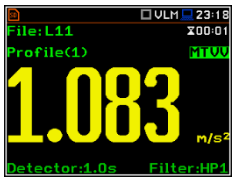
Position	Description	Screen	Reference
Calibration	Position on the *Function* screen that opens a screen with positions allowing you to perform calibration or system check of the instrument: *System Check, Calibration by Sensitivity, Calibration by Measurement, Last Calibration, Clear Calibration History* and *Auto Calibration*.		Chapter 3.3
System Check	Position in the *Calibration* screen allowing you to perform 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.		Chapter 3.3.1
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 3.3.2, 3.3.3
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 3.3.2, 3.3.3
Calibration by Measurement	Type of calibration based on the reference signal measurement with the use of a microphone or accelerometer calibrator.		Chapter 3.3.4, 3.3.5
Calibration Level	Level of the reference signal generated by used calibrator.		Chapter 3.3.4, 3.3.5

Calibration Result	Measured by the instrument reference signal level without calibration factor correction.		Chapter 3.3.4, 3.3.5
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 3.3
Last Calibration	Records of previously performed calibrations of the instrument. Each record contains information about calibration date and time, calibration type, calibration factor etc.		Chapter 3.3.6
Clear Calibration History	Operation that clears all calibration records.		Chapter 3.3.7
Auto Calibration	Feature that enables automatic calibration when the reference sound or vibration signal is detected by the instrument.		Chapter 3.3.8

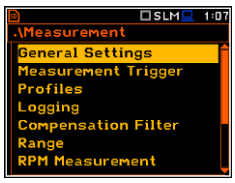
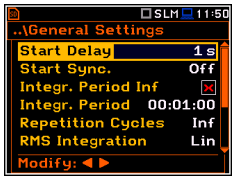
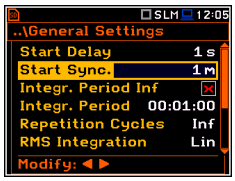
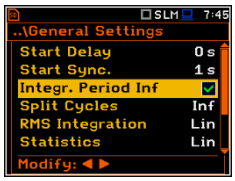
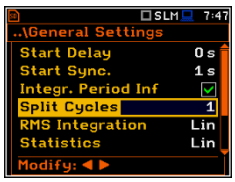
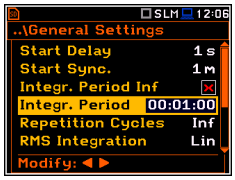
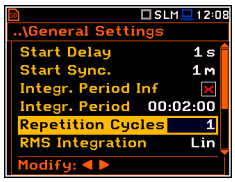
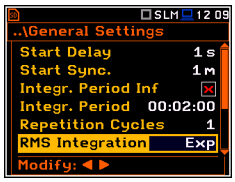
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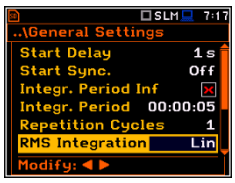
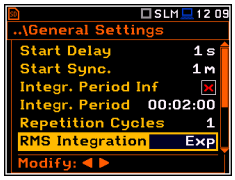
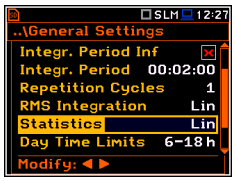
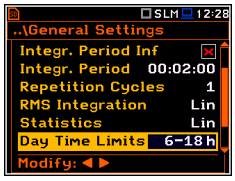
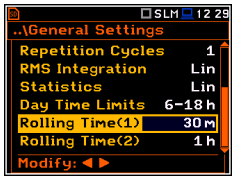
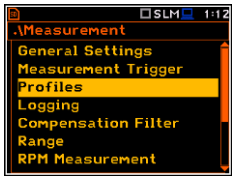
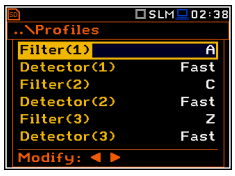
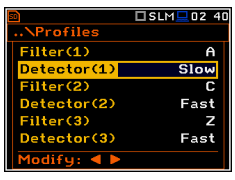
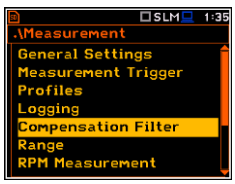
Position	*Description*	*Screen*	*Reference*
Elapsed time	Time from the measurement start, that is displayed in the right upper corner of the display in the format ⌛ mm:ss in the range from 00:00 to 59:59, or in the format ⌛ hh:mm:ss in the range from 01:00:00 to 99:59:59, or in format ⌛ xxxh from 100h to 999h, and ⌛ >999h if the elapsed time exceeds 999 hours. Its maximum value is equal to the *Integration Period* and the elapsed time is zeroed when new measurement cycle starts.		Chapter 5.1
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

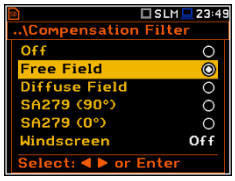
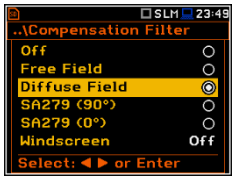
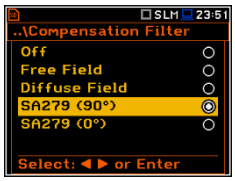
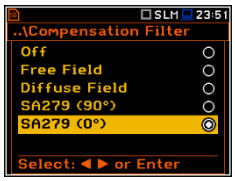
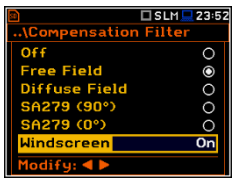
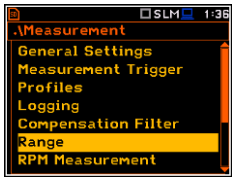
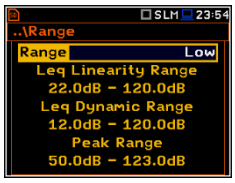
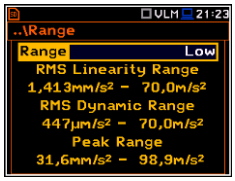
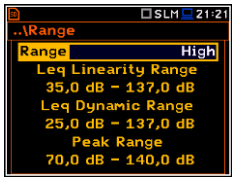
Spl	Sound Pressure Level, the maximal value of the frequency and time-weighted sound pressure level at the exponential RMS detector output for the last second.		Appendix D D.1.2
Max	For sound measurements: maximal value of the time-weighted sound pressure level at the exponential RMS detector output 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 4.1 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
LTeq	Takt-Maximal Level calculated according to the German standard TA Lärm. Applied filter and detector constant are shown also in the name of this result with two letters, as shown on the screen (A filter and F (Fast) detector).		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

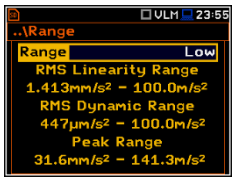
L(den)	Day-evening-night equivalent level, *Leq*. Sound Level, measured over the 24 hour period, with a 10 dB penalty added to the levels between 23.00 and 07.00 hours and a 5 dB penalty added to the levels between 19.00 and 23.00 hours to reflect people's extra sensitivity to noise during the night 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
MTVV	Maximum Transient Vibration Value, according to the ISO 8041-1:2017 standard		Appendix D D.2.2

18.4 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, Tonality, Compensation Filter, Range, RPM Measurement, Exposure Time, Statistical Levels, Timer* and *Alarms*.		Chapter 4
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 4.1
Start Delay	Delay between pressing the <Start> key and the start of measurement integration.		Chapter 4.1
Start Synch.	Synchronization of the measurement/integration start to the nearest full minute or hour of the instrument real-time clock. It helps to measure in full cycles.		Chapter 4.1
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 4.1
Split Cycles	Maximum number of logger files if integration period is infinite.		Chapter 4.1
Integration Period	Time of averaging of *Summary Results*: from 1 second to Infinitive. For example, with 8 hours integration period the LEQ result will be averaged for 8 hours. In case of Infinitive, the measurement will last until the user presses the <Stop> key.		Chapter 4.1
Repetition Cycles	Number of measurement/integration repetitions after the <Start> key pressure. This enables to make a series of measurements without pressing the <Start> key and save this series in the results file.		Chapter 4.1
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 4.1

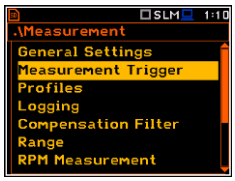
Linear	Linear type of integration of RMS based results (RMS detector), without time weighting according to the IEC 61672-1:2013 standard.		Chapter 4.1
Exponential	Exponential type of integration of RMS based results (RMS detector), where averaging is a continuous process that weighs current and past 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 4.1
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 4.1
Day Time Limits	Definition of the day and night periods required by local standards: 6–18h and 7–19h. These limits are used for the calculation of the L(den) function.		Chapter 4.1
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 4.1
Profiles	Virtual broadband level meters, which calculate the set of results with own weighting filter (*Filter*) and exponential detector time constant (*Detector*).		Chapter 4.3
Filter	Weighting filter applied in the profile in accordance with most applicable world standards: - for sound measurements: Z, A, C, B, G, - for vibration measurements: ○ acceleration: HP, HP1, HP3, HP10, Wh, ○ velocity: Vel1, Vel3, Vel10 and VelMF, ○ displacement: Dil1, Dil3 and Dil10.		Chapter 4.3 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, LTeq*; - from 100ms to 10s for vibration results like *RMS, MAX*.		Chapter 4.3 Appendix D D.1.2
Compensation Filter	Digital filter that compensates some effect: *Free Field*, *Diffuse Field, Outdoor Environment, Outdoor Airport* and *Windscreen*.		Chapter 4.6

Free Field	Digital filter that compensates the free field effect.		Chapter 4.6
Diffuse Field	Digital filter that compensates the diffuse field effect.		Chapter 4.6
SA279 (90°)	Digital filter that compensates the effect of the SA 279 outdoor microphone protection unit in the free field for the reference acoustic wave incidence angle 90 deg.		Chapter 4.6
SA279 (0°)	Digital filter that compensates the effect of the SA 279 outdoor microphone protection unit in the free field for the reference acoustic wave incidence angle 0 deg.		Chapter 4.6
Windscreen	Digital filter that compensates the effect of the SA 22 windscreen when Free Field or Diffuse Field options are selected.		Chapter 4.6
Range	Position that enables selecting the linear operating range for the sinusoidal signal: *Low* or *High*. The calibration factor is always added to the range limits. The ranges depend on the selected *Compensation Filter*.		Chapter 4.7
Low	Low linear operating range for the sinusoidal signal. The calibration factor is always added to the range limits. The range depends on the selected *Compensation Filter*.	 	Chapter 4.7 Appendix C
High	High linear operating range for the sinusoidal signal. The calibration factor is always added to the range limits. The range depends on the selected *Compensation Filter*.		Chapter 4.7 Appendix C



Measurement Trigger

Screen that enables configuring triggering of the measurement/integration process with parameters: *Trigger, Source, Level* and *Gradient*.

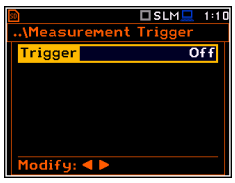


Chapter 4.2

Trigger

Position that switches *Off* or on the measurement trigger by selecting its type: *Slope +, Slope –, Level +, Level –, Grad +* or *External*.

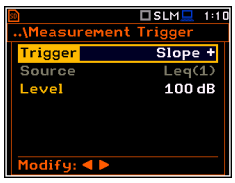
If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „measurement" icon.



Chapter 4.2

Slope +

Type of trigger that starts the measurement/integration by the duration of the *Integration Period* on condition: rising value of the RMS result (*Source*) integrated during 0,5 ms passes above the threshold value (Level).



Chapter 4.2

Slope -

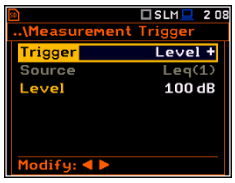
Type of trigger that starts the measurement/integration by the duration of the *Integration Period* on condition: falling value of the RMS result (*Source*) integrated during 0,5 ms passes below the threshold value (Level).



Chapter 4.2

Level +

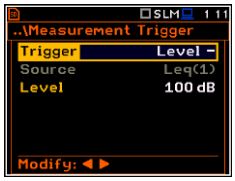
Type of trigger that starts the 1-second measurement/ integration on condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0,5 mc. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.



Chapter 4.2

Level -

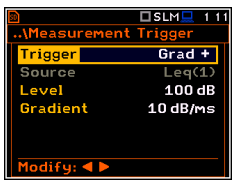
Type of trigger that starts the 1-second measurement/ integration on condition: value of the RMS result (*Source*) integrated during 0,5 ms is lower than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0,5 mc. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.



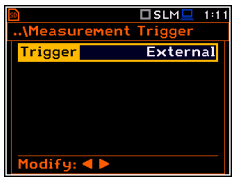
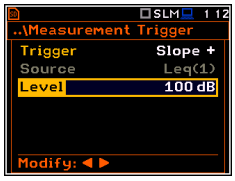
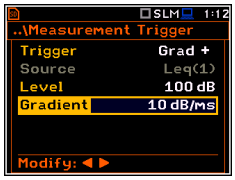
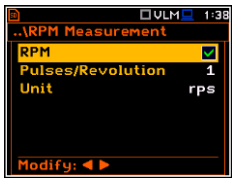
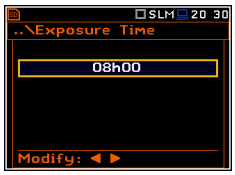
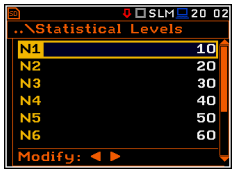
Chapter 4.2

Grad +

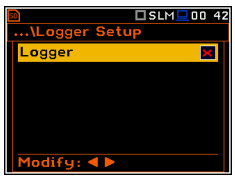
Type of trigger that starts the 1-second measurement/ integration on condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold value (Level) and the gradient of this Source is greater than the threshold level (*Gradient*). In other cases, the instrument continues 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.



Chapter 4.2

	This type of trigger has the same logic as *Level +* trigger, but the trigger condition requires also gradient level to be exceeded.		
External	Type of trigger that starts the measurement/integration when the trigger signal appears on the pin 2 of 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 4.2
Source	Measured result that is compared with the threshold value (Level) for triggering – RMS measured in the first profile: Leq(1) in sound modes and RMS(1) in vibration modes.		Chapter 4.2
Level	Threshold level of *Source* for triggering condition fulfilment.		Chapter 4.2
Gradient	Threshold level of the Source gradient for triggering condition fulfilment.		Chapter 4.2
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 4.10
Exposure Time	Screen that enables setting a duration of worker's exposition to the noise. This duration is considered in LEPd calculations.		Chapter 4.8 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 4.9 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 4.11
Logging	Screen that enables configuring saving of the *Summary Results*, *Logger Results,* markers and a waveform signal in files with the use of the next screens: *Logger Setup, Logger Results, Summary Results, Logger Trigger, Marker Setup* and *Wave Recording.*		Chapter 4.4

Logger Setup — Screen that enables switching the logger function on and setting the main logging parameters: *Logger*, *Summary Results*, *Logger Step*, *Logger Name* and *Split*.



Chapter 4.4.1

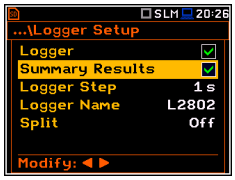
Logger — Position in the *Logger Setup* screen that switches on or off the *Logging* function.

If *Logger* is switched off only *Wave Recording* is available.



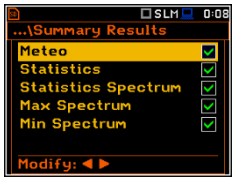
Chapter 4.4.1

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, MTVV* 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.



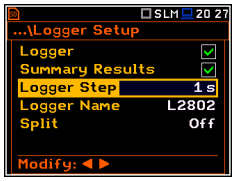
Chapter 4.4.1

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 - 1/12 octaves (*Statistics Spectrum*), spectra for max and min results (*Max Spectrum* and *Min Spectrum*).



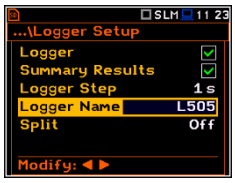
Chapter 4.4.3

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.



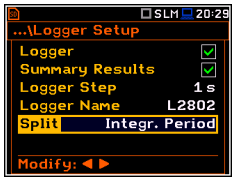
Chapter 4.4.1

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.



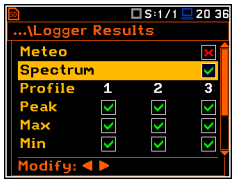
Chapter 4.4.1

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.



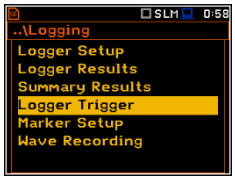
Chapter 4.4.1

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 - 1/12 Octave* functions also spectra can be logged.



Chapter 4.4.2

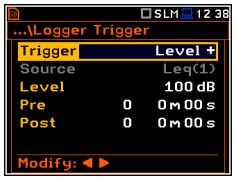
Logger Trigger — Screen that enables configuring parameters for triggering of *Logger Results* recording to the logger file: *Trigger, Source, Level, Pre* and *Post*.



Chapter 4.4.4

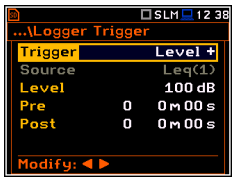
Trigger — Position that switches Off or On the logger trigger by selecting its type: *Level +* or *Level –*.

If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „logger" icon.



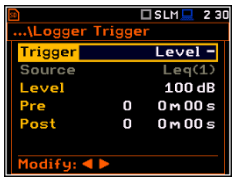
Chapter 4.4.4

Level + — Type of trigger, that starts logging of *Logger Results* on condition: value of the Leq/RMS result (*Source*) integrated by the *Logger Step* period is greater than the threshold value (Level). In other cases, the logging is skipped.



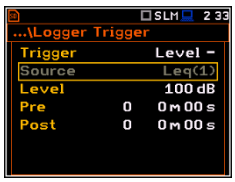
Chapter 4.4.4

Level - — Type of trigger, that starts logging of *Logger Results* on condition: value of the Leq/RMS result (*Source*) integrated by the *Logger Step* period is lower than the threshold value (Level). In other cases, the logging is skipped.



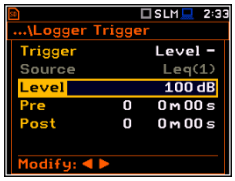
Chapter 4.4.4

Source — Measured result that is compared with the threshold value (Level) for triggering – RMS measured in the first profile: Leq(1) in sound modes and RMS(1) in vibration modes.



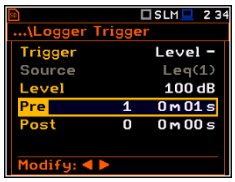
Chapter 4.4.4

Level — Threshold level of *Source* for triggering condition fulfilment.



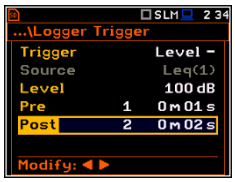
Chapter 4.4.4

Pre — Period of additional logging before triggering condition fulfilment.



Chapter 4.4.4

Post — Period of additional logging after triggering condition fulfilment.



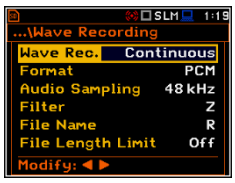
Chapter 4.4.4

Wave Recording — Recording of the waveform signal in 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.



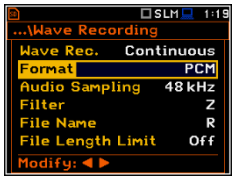
Chapter 4.4.6

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.



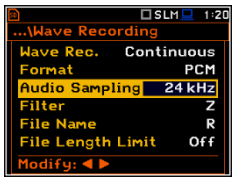
Chapter 4.4.6

Format — WAV file format: PCM or Extensible. PCM is typical supported by the audio players.



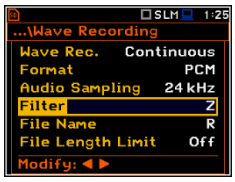
Chapter 4.4.6

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.



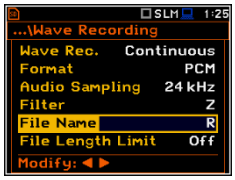
Chapter 4.4.6

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.



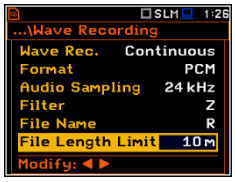
Chapter 4.4.6

File Name — Name of the WAV type file.



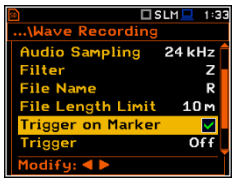
Chapter 4.4.6

File Length Limit — Limit of the length of the signal recorded to the WAV file.



Chapter 4.4.6

Trigger on Marker — Parameter that enables triggering the wave recording when one of the *Marker* is initiated.



Chapter 4.4.6

Trigger — Parameter that enables switching Off or selecting the trigger type for triggering wave recording: *Slope +, Slope –, Level +, Level –, External* and *Integr. Period*.

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.

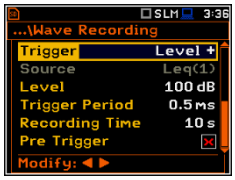
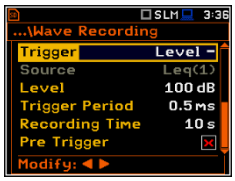
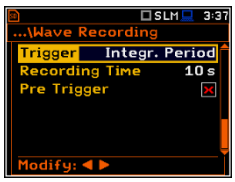


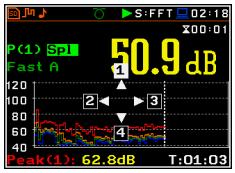
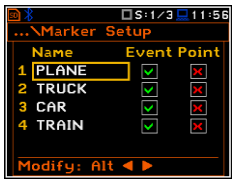
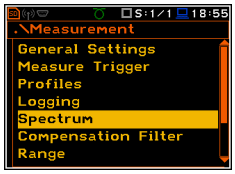
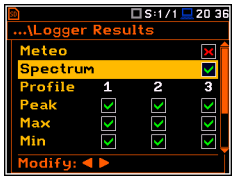
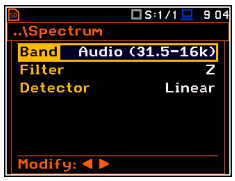
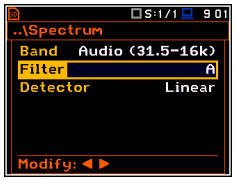
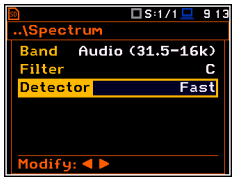
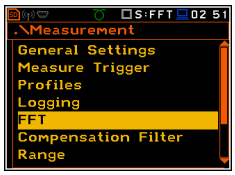
Chapter 4.4.6

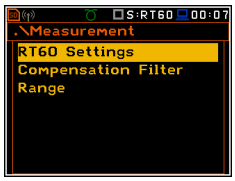
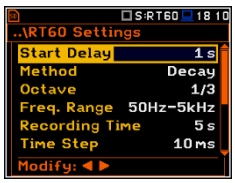
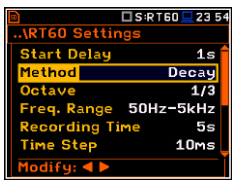
Slope + — Type of trigger that starts the wave recording for *Recording Time* on condition: rising value of the Leq/RMS result (*Source*) integrated during *Trigger Period* passes above the threshold value (Level).



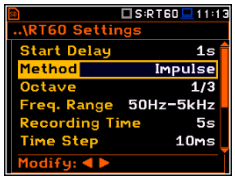
Chapter 4.4.6

Slope -	Type of trigger that starts the wave recording for *Recording Time* on condition: falling value of the Leq/RMS result (*Source*) integrated during *Trigger Period* passes below the threshold value (Level).		Chapter 4.4.6
Level +	Type of trigger that starts the wave recording for *Recording Time* on condition: value of the Leq/RMS result (*Source*) integrated during *Trigger Period* is greater than the threshold value (Level).		Chapter 4.4.6
Level -	Type of trigger that starts the wave recording for *Recording Time* on condition: value of the Leq/RMS result (*Source*) integrated during *Trigger Period* is lower than the threshold value (Level).		Chapter 4.4.6
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 4.4.6
Integr. Period	Type of trigger that starts the wave recording 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 4.4.6
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 4.4.6
Level	Threshold level of the trigger condition.		Chapter 4.4.6
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 4.4.6
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 4.4.6

Pre Trigger	Period of signal recording before the first trigger condition fulfilment. The length of pre-recording depends on sampling rate.		Chapter 4.4.6
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 2.4
Marker Setup	Position in the Menu that enables to set up the markers – name them and define them as Event or Point type.		Chapter 4.4.5
Spectrum	Screen that enables setting the *1/1 Octave - 1/12 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 - 1/12-spectrum. Depending on the function and mode of the instrument the frequency range can be selected: for sound measurements as *Audio* or *Full* and for vibration measurements as *Full*.		Chapter 10.2.4
Filter	Weighting filters for the *1/1 Octave - 1/12 Octave* analysis: *HP, A, B, C, Z* for sound and HP for vibration analysis.		Chapter 10.2.4
Detector	Type of integration of RMS based results for *1/1 Octave - 1/12 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

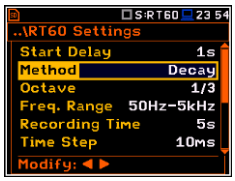
Band	Frequency band in which the FFT analysis is performed: *20 kHz, 10 kHz, 5 kHz, 2.5 kHz, 1.25 kHz, 625 Hz, 312 Hz, 156 Hz* and *78 Hz*.		Chapter 11.2.4
Filter	Weighting filters used during the FFT analysis: *A, C, B, Z* in the sound mode and *HP* in the vibration mode.		Chapter 11.2.4
Window	Weighting 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, Smoothing, Internal Signal, Amplitude, Noise Mar., Logger Name* and *Level*.		Chapter Error! Reference source not found. Appendix E
Start Delay	Delay between pressing the <Start> key and the start of measurement integration.		Chapter Error! Reference source not found.
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 Error! Reference source not found. Appendix E

Impulse — Method of RT60 calculation that uses the impulse sound source (like pistol shot, petard explosion).



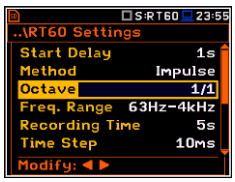
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Decay — Method of RT60 calculation intended for measurements when room is excited by broad or narrow band sound noise source (usually pink noise).



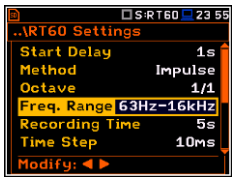
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Octave — Type of spectrum (1/1-octave or 1/3-octave) based on which the RT60 analysis is performed.



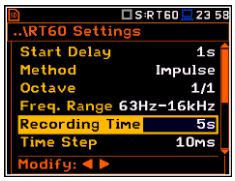
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Freq. Range — Frequency range for RT60 calculations: *63Hz-4kHz* (7 bands) and *63Hz-16kHz* (9 bands) for 1/1-octave; *50Hz-5kHz* (21 bands) and *50Hz-20kHz* (27 bands) for 1/3 octave.



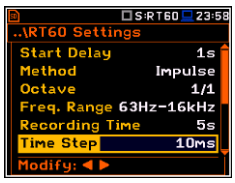
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Recording Time — Time of measurement data (sound pressure level decay curve) registration during RT60 calculations: *1s .. 30 s*.



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Time Step — Time-step of data registration (sound pressure level) in the file during RT60 calculations: *2, 5, 10, 20, 50, 100 ms*.



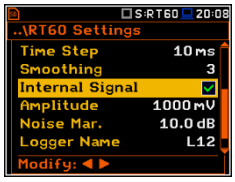
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Smoothing — Process of smoothing of the raw reverberation time results. This is used for better visualization of the RT60 results. The value of this parameter means number of samples taken into consideration by the smoothing algorithm. The higher is this number the smoother is a graph.



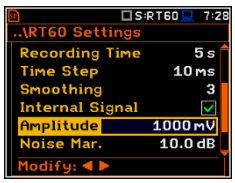
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Internal Signal — Position that switches on generation of the pink noise to feed the noise source in the *Decay* method. The signal is transmitted to the pin 1 of the **I/O** connector.



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Amplitude — Amplitude of the generated pink noise in the *Decay* method.



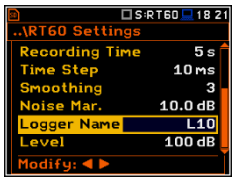
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Noise Mar. — Margin value to the calculated noise level for RT60 calculations: *0 ÷ 20 dB*.



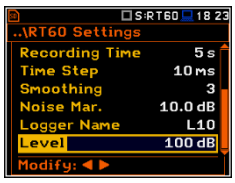
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Logger Name — Name of the Logger file in which data of the RT60 analysis will be recorded.



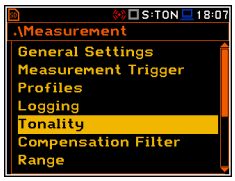
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Level — Threshold level of the sound source for triggering the RT60 measurement. If the measured sound is below the *Level* value, the RT60 measurement will not start.



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Tonality — Screen that enables setting the tonality measurement parameters: *Standard, Mode, Meas. Count* and *Directory*.



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Standard — Standard according to which tones will be defined: *ISO 20065-16*, *ISO 226-2003* or *ISO 226-1987*.



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Mode — Measurement mode for the ISO 20065-16 standard: *Auto* or *Manual*.

In the *Auto* mode, the measurements are performed one by one without pauses after pressing the <Start> key, until the number of measurements reaches the *Meas. Count* value.

In the *Manual* mode, the measurements are performed one by one by the user pressing the <Start> key.



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Meas. Count — Maximum number of measurements.

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Directory — Directory for saving measurement files.

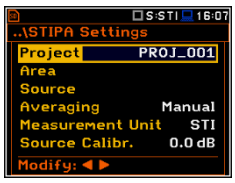
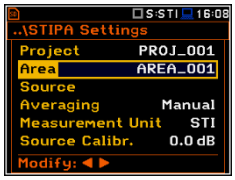
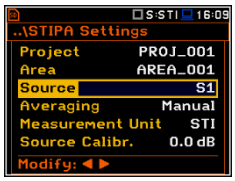
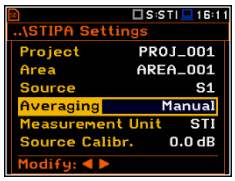
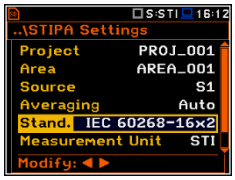
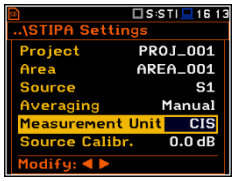
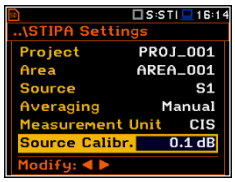
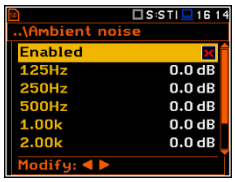
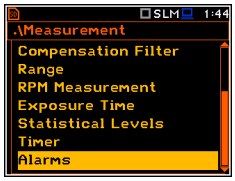


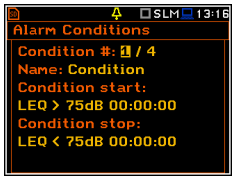
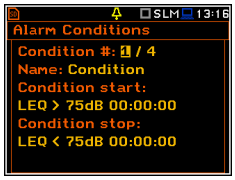
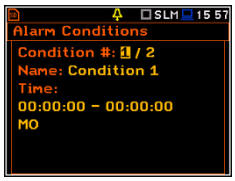
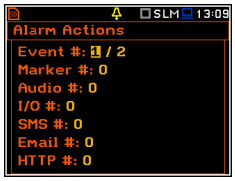
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STIPA Settings — Screen that enables setting the STIPA parameters: *Project, Area, Source, Averaging, Standard, Measurement Unit,* and *Source Calibration*.

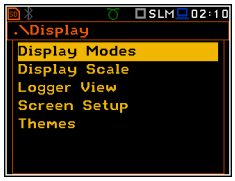
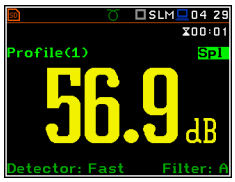
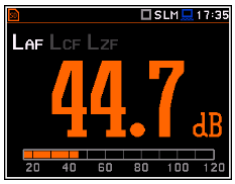


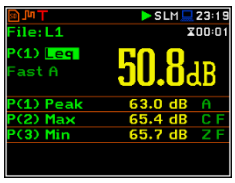
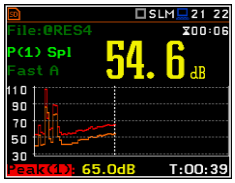
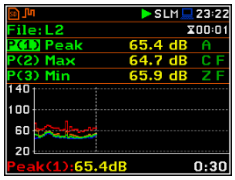
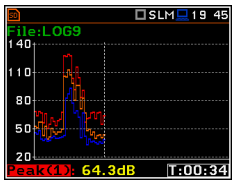
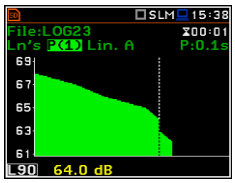
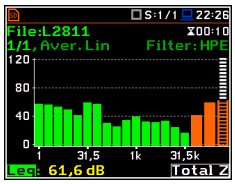
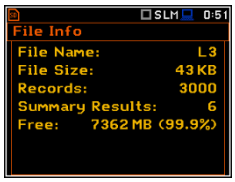
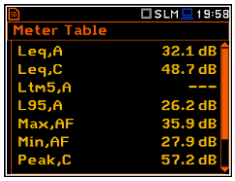
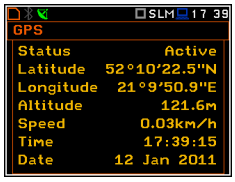
Chapter 15.4.4

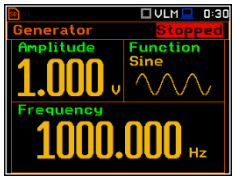
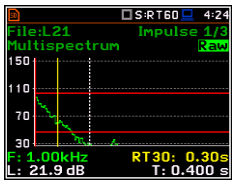
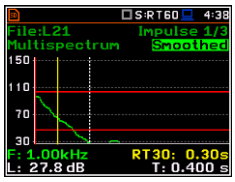
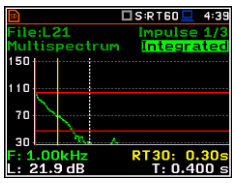
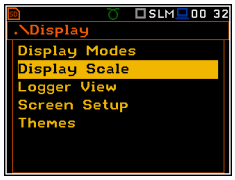
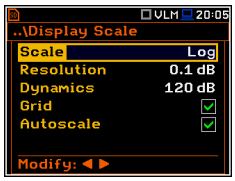
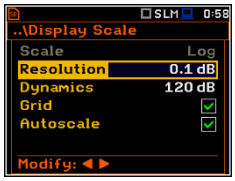
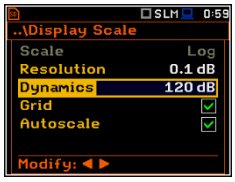
Project	Position enabling selecting the catalogue in the instrument memory which contains Area catalogues.		Chapter 15.4.4
Area	Position enabling selecting the catalogue in the instrument memory which contains Source catalogues.		Chapter 15.4.4
Source	Position that enables selecting the catalogue in the instrument memory which contains files with STIPA measurement results.		Chapter 15.4.4
Averaging	Type of STIPA results averaging: Manual or Auto.		Chapter 15.4.4
Standard	Standard according to which STIPA averages will be performed in the automatic mode: IEC 60268-16x2 or IEC 60268x3.		Chapter 15.4.4
Measurement Unit	Results to be displayed: STI or CIS.		Chapter 15.4.4
Source Calibration	Adjustment of the reference STIPA signal level to the level of a real voice signal in the tested area.		Chapter 15.4.4
Ambient noise	Screen that enables setting the ambient noise distortions in the way of sound pressure in the 1/1-octave bands with central frequencies from 125 to 8000 Hz. This screen is connected with the STIPA function.		Chapter 15.4.5
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 4.12

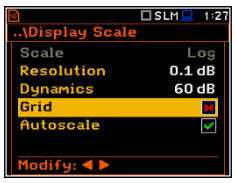
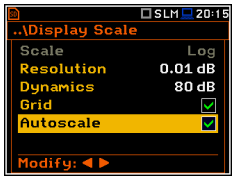
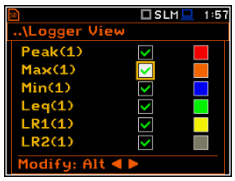
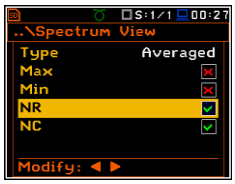
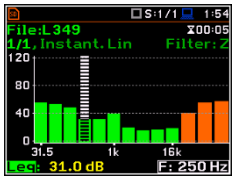
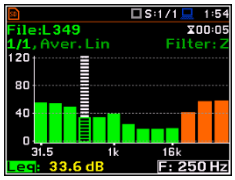
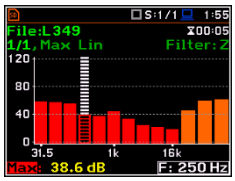
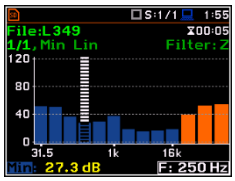
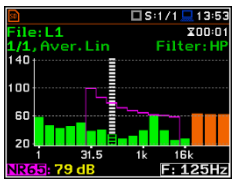
Alarm Conditions	List of alarm conditions. Alarm condition can be a *Threshold* or *Time* type.		Chapter 4.12
Threshold	Alarm condition type. Alarm is generated if the selected result (*Leq, Lpeak, Lmax, Lmin* or sliding *Leq* for screens of 15 or 60 minutes) exceeds the threshold level.		Chapter 4.12
Time	Alarm condition type. Alarm is generated in the selected days of the week and during the defined time period.		Chapter 4.12
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 4.12
Action	Type of action in case of alarm: marker, audio, external I/O, SMS text message, or e-mail.		Chapter 4.12

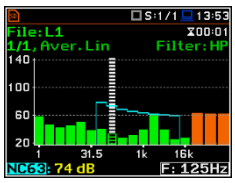
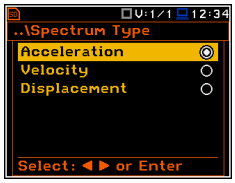
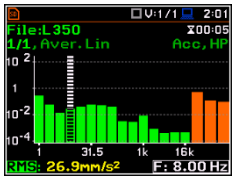
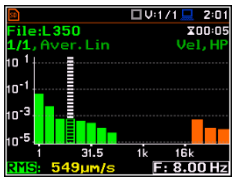
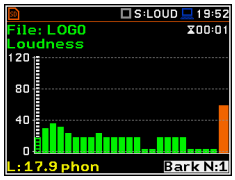
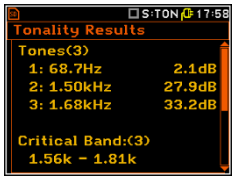
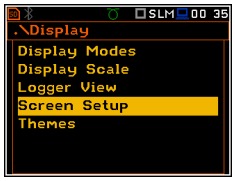
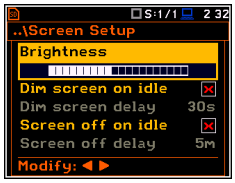
18.5 DISPLAY PARAMETERS

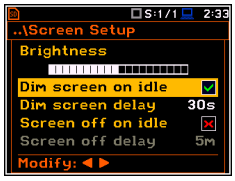
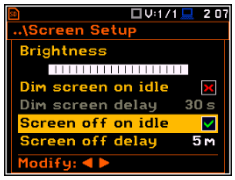
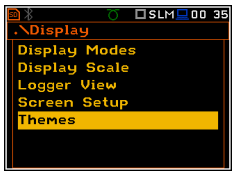
Name	Description	Screen	Reference
Display	Section of the Main Menu that enables setting of the measurement views.		Chapter 5
Display Mode	Mode of measurement results presentation/view. Modes can be activated in the *Display Modes* screen.		Chapter 5.1
One Result view	Mode of the one result view. This mode is always available and cannot be disabled in most functions: *Level Meter*, *1/1 Octave*, *1/3 Octave, 1/6 Octave*, *1/12 Octave, FFT* and *Loudness*.		Chapter 5.1.2
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 5.1.1

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 5.1.3
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 5.1.3
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 5.1.3
Logger view	Mode of presentation of time-history (logger) results.		Chapter 5.1.4
Statistics view	Mode of presentation of statistics of sound results.		Chapter 5.1.6
Spectrum view	Mode of presentation of different spectra: *1/1 Octave*, *1/3 Octave, 1/6 Octave*, *1/12 Octave* and *FFT*.		Chapter 5.1.5, 10.3, 11.3
File Info view	Presentation of information regarding file: name, size, number of records, etc.		Chapter 5.1.7
Meter Table view	Presentation of *Summary Results* combined in the table.		Chapter 5.1.8
GPS view	Presentation of GPS information: *Status, Latitude, Longitude, Altitude, Speed, Time* and *Date*.		Chapter 5.1.9

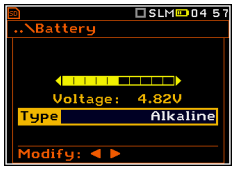
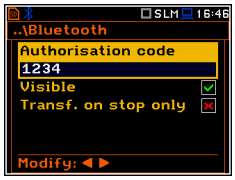
Meteo view	Presentation of results measured by the weather station when the instrument works as a part of the SV 279 PRO monitoring station.		Chapter 5.1.10
Signal Generator view	Signal generator control screen. In this screen you can switch on the generator and configure its parameters: *Amplitude, Function* and *Frequency*. The generator signal is transmitted to the pin 1 of the **I/O** socket.		Chapter 5.1.11
Raw Data view	Presentation of decay curve of *Leq* results for 1/1 or 1/3-octave bands, integrated within *Time Step* interval.		Chapter 12.7
Smoothed Data view	Presentation of smoothed decay curve of *Leq* results for 1/1 or 1/3-octave bands.		Chapter 12.7
Integrated Data view	Presentation of the integrated raw decay curve (Schroeder curve).		Chapter 12.7
Display Scale	Screen that enables setting parameters of results presentation: *Scale*, *Resolution*, *Dynamics*, *Grid* and *Autoscale*.		Chapter 5.2
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 5.2
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 5.2
Dynamics	Range of the plot scale: *10dB, 20dB, 40dB, 80dB, 100dB* and *120dB*.		Chapter 5.2

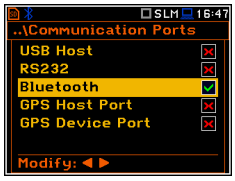
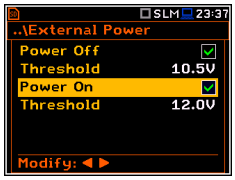
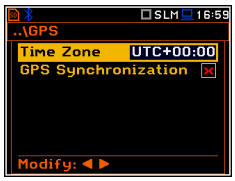
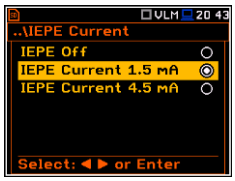
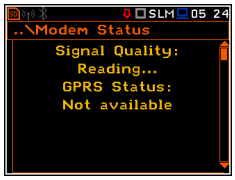
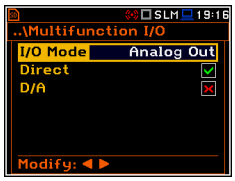
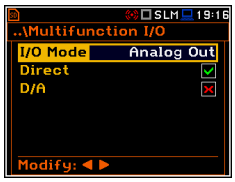
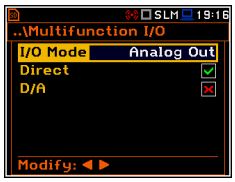
Grid	Grid swither on or off during the time history or spectrum presentation.		Chapter 5.2
Autoscale	Automatic adjustment of the Y-axis dynamics to the measured result level.		Chapter 5.2
Logger View	Screen that enables selecting of time-history results, which will be presented on the display and colours of their plots.		Chapter 5.3
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 - 1/12-octave* bands.		Chapter 10.3.3, 11.3.3
Averaged	Spectrum of averaged Leq results for the *1/1-octave - 1/12-octave* bands.		Chapter 10.3.3, 11.3.3
Max	Spectrum of Max results for the *1/1-octave - 1/12-octave* bands.		Chapter 10.3.3, 11.3.3
Min	Spectrum of Min results for the *1/1-octave - 1/12-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 10.3.4, 11.3.4
Loudness	Display view that presents the Bark spectrum.		Chapter 14.2
Tonality Results	Display view that presents the results of the tonality analysis.		Chapter 13.4
Screen Setup	Screen that enables setting screen brightness and power saving.		Chapter 5.4
Brightness	Brightness of the instrument display. Is setting up in the *Screen Setup* screen.		Chapter 5.4

Dim screen on idle	Screen dimming in no activity after certain delay. Is setting up in the *Screen Setup* screen.		Chapter 5.4
Screen off on idle	Screen switching off in no activity after certain delay. Is setting up in the *Screen Setup* screen.		Chapter 5.4
Themes	Screen that enables setting colour theme of the display.		Chapter 5.5
Solar	Colour theme of the display.		Chapter 5.5
Forest	Colour theme of the display.		Chapter 5.5

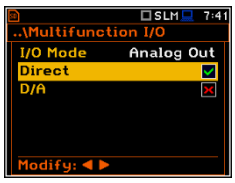
18.6 INSTRUMENT PARAMETERS

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, Bluetooth, Communication Ports, External Power, GPS, IEPE Current, Keyboard Settings, Modem Status, Multifunction I/O, Polarisation Voltage, Remote Control Mode, RS232, RTC, Self Vibration, Signal Generator, Wireless Transfer, Unit Name* and *Unit Label.*		Chapter 7
Auto Start	Instrument function that enables the measurement start right after the instrument is turning on without pressing the <Start> key.		Chapter 7.1
Battery	Screen allowing you to check the instrument power source status.		Chapter 7.2
Bluetooth	Screen that enables introducing the authorisation code to pair a PC (tablet or smartphone) with the instrument.		Chapter 7.3

Communication Ports	Screen that enables configuring the instrument communication ports: *USB Host, RS232, Bluetooth* or *GPS*.		Chapter 7.4
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 7.5
GPS	Screen that enables setting parameters of the external GPS: *Time Zone* and *GPS Synchronisation* (switching the time synchronization on or off).		Chapter 7.6
IEPE Current	Screen that enables setting the supply current of the microphone or accelerometer: *Off, 1.5mA* or *4.5mA*.		Chapter 7.7
Keyboard Settings	Screen that enables setting the Shift, Alt, Start, Stop keys functionality.		Chapter 7.8
Modem Status	Screen that enables checking status of the 3G connection when SV 979 works as a part of the SV 279 PRO/PRIM monitoring station.		Chapter 7.9
Multifunction I/O	Screen that enables configuring the instrument's I/O port parameters: I/*O Mode, Direct, D/A, 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 7.10 Appendix C
I/O Mode	Mode of the I/O port: *Analog Out*, *Digital In*, *Digital Out*.		Chapter 7.10 Appendix C
Analog Out	Mode of the I/O port when analogue signal is transmitted from the input of the instrument to its output (pin 1 of the **I/O** connector) without any digital processing (*Direct*) or after digital-to-analogue converter (*D/A*).		Chapter 7.10 Appendix C

Direct

Parameter that enables the measured signal from the measurement channel to be transmitted to the pin 1 of the **I/O** connector without any digital processing (filtering and gaining).

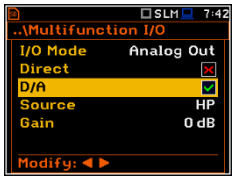


Chapter 7.10 Appendix C

D/A

Parameter that enables transmitting the analogue signal from the internal signal generator of the instrument after digital-to-analogue converter to the pin 1 of the **I/O** connector, and the analogue input signal to the pin 2 of the **I/O** connector after digital-to-analogue converter.

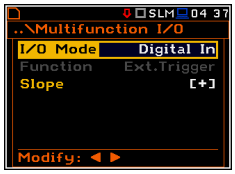
The input signal can be weighted with *HP, Z, A, C* or *B* filter (*Source*) and additionally gained by *-60 dB* to *60 dB* (*Gain*).



Chapter 7.10 Appendix C

Digital In

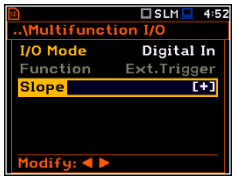
Mode of the I/O port when external digital signal is used as an external trigger to start measurements. The instrument is acting in this case as so called "slave instrument".



Chapter 7.10 Appendix C

Slope

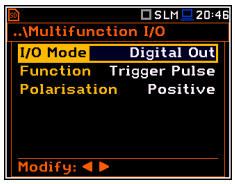
Trigger voltage slope defined for the *Digital In* I/O mode: [+] (uprising as default) or [–] (falling).



Chapter 7.10 Appendix C

Digital Out

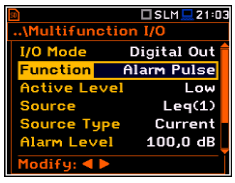
Mode of the I/O port when digital signal is used for triggering other "slave instrument(s)" (the instrument is acting in this case as a "master instrument"), or as a source of alarm signal.



Chapter 7.10 Appendix C

Function

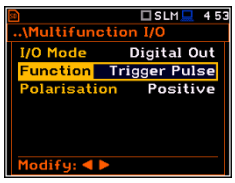
Functionality of the *Digital Out* I/O mode: *Trigger Pulse* or *Alarm Pulse*.



Chapter 7.10 Appendix C

Trigger Pulse

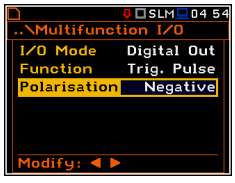
Functionality of the *Digital Out* I/O mode when digital signal used for triggering other "slave instrument(s)" (the instrument is acting in this case as a "master instrument"). One additional parameter is used for this functionality of the *Digital Out* I/O mode: *Polarisation.*



Chapter 7.10 Appendix C

Polarisation

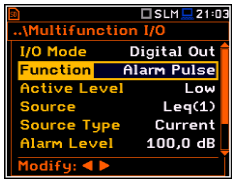
Parameter of the *Digital Out* I/O mode defining which polarisation of the signal (*Negative* or *Positive*) will be applied to the output trigger pulse.



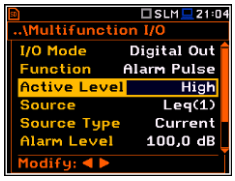
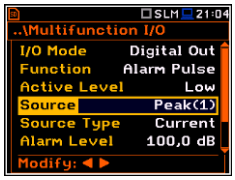
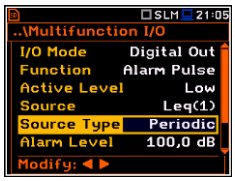
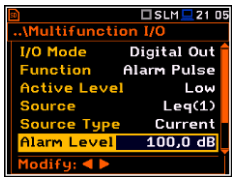
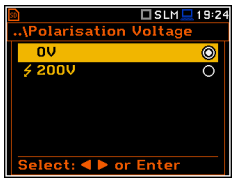
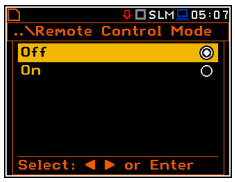
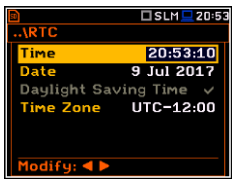
Chapter 7.10 Appendix C

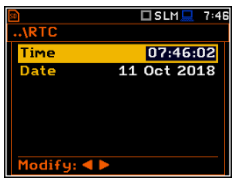
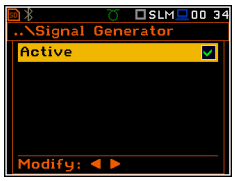
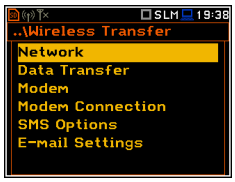
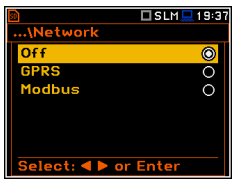
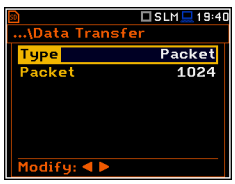
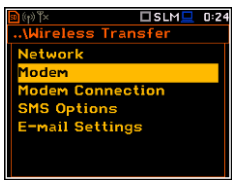
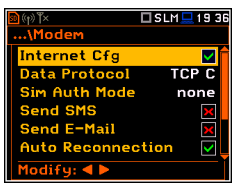
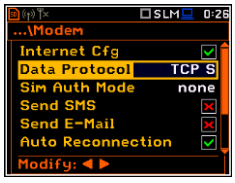
Alarm Pulse

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*.

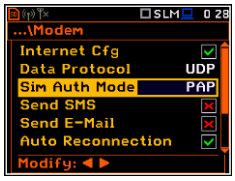


Chapter 7.10 Appendix C

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 7.10 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 7.10
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 7.10
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 7.10
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 7.10
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 7.10
Polarisation Voltage	Screen that enables setting polarisation voltage of the instrument's microphone in the *Sound Meter* mode: *0V* and *200V*.		Chapter 7.11
Remote Control Mode	Screen that enables activating the Remote Control mode. In this mode the messages that require manual action from the user will stop being shown after 5 seconds. This mode is helpful when the instrument is configured for remote monitoring.		Chapter 7.12
RS232	Screen that enables programming the RS 232 interface transmission speed (*Baud Rate*) and the time limit during which the communication operation should be performed (*Time Out*).		Chapter 7.13

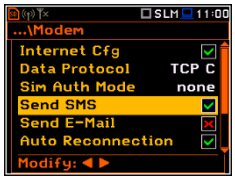
RTC	Screen that enables programming the instrument's real-time clock. This clock is displayed in the upper right corner of the display.		Chapter 7.14
Self Vibration	Screen allowing you to check the instrument's self-vibration levels.		Chapter 7.15
Signal Generator	Screen that enables switching on the signal generator function.		Chapter 7.16, 7.15
Wireless Transfer	Screen that enables configuring data transfer control via external modem supporting 3G connection through additional screens: *Network, Data Transfer, Modem, Modem Connection, SMS Options* and *E-mail Settings*.		Chapter 7.17
Network	Screen that enables selecting the wireless network option: *Off, GPRS* or *Modbus*.		Chapter 7.17.1
Data Transfer	Screen that enables selecting the data transfer type: *Off, Packet* or *Continuous*. In case of *Packet* option additional parameter should be defined – *Packet* size: *1024, 512, 256, 128* or *64*.		Chapter 7.17.2
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 7.17.3
Internet Cfg	Parameter of the *Modem* screen enabling automatic modem configuration after switching the instrument on.		Chapter 7.17.3
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 7.17.3

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*.



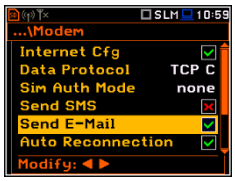
Chapter 7.17.3

Send SMS — Parameter of the *Modem* screen switching on the SMS alarm notification.



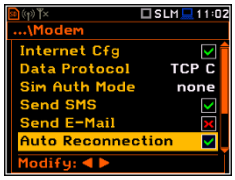
Chapter 7.17.3

Send E-Mail — Parameter of the *Modem* screen switching on the e-mail alarm notification.



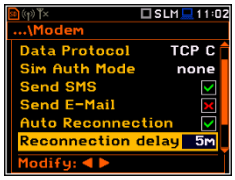
Chapter 7.17.3

Auto Reconnection — Parameter of the *Modem* screen switching on the device attempting to reconnect the modem in case of errors or sudden disconnection.



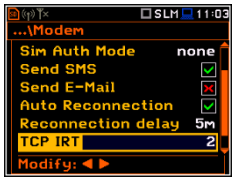
Chapter 7.17.3

Reconnection Delay — Parameter of the *Modem* screen defining period between each reconnection attempts.



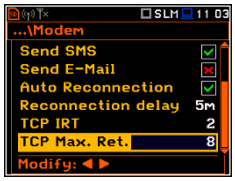
Chapter 7.17.3

TCP IRT — Parameter of the *Modem* screen defining TCP Initial Retransmission Timeout.



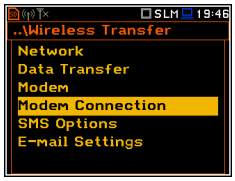
Chapter 7.17.3

TCP Max. Ret. — Parameter of the *Modem* screen defining maximum reconnection attempts performed within a simple connection cycle.



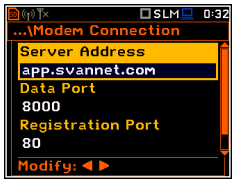
Chapter 7.17.3

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*.

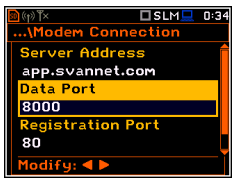
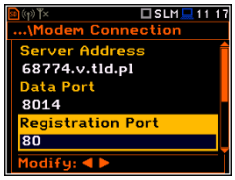
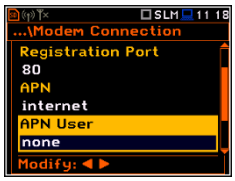
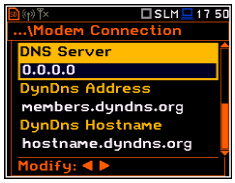
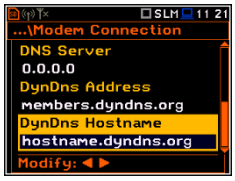


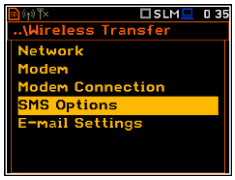
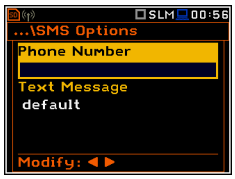
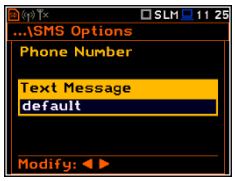
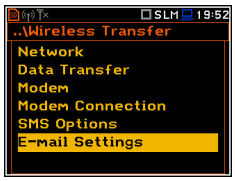
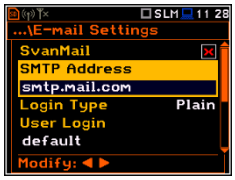
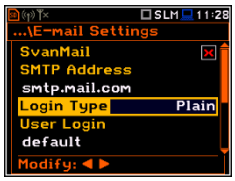
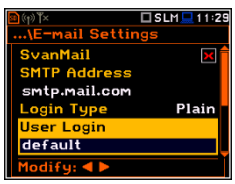
Chapter 7.17.4

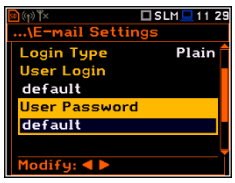
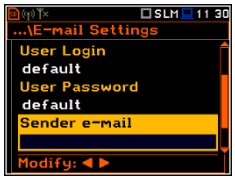
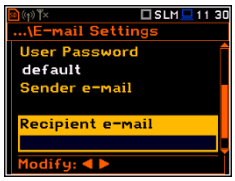
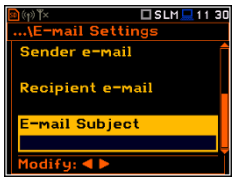
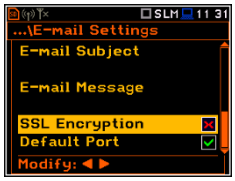
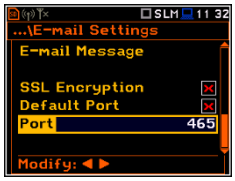
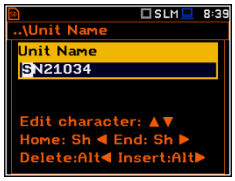
Server Address — Parameter of the *Modem Connection* screen defining either IP or domain address, where the registration data will be sent during registration process (*Data Protocol: TCP S* or *UDP*) or to which the modem will be connected to (*Data Protocol: TCP C*). By default, the server address is app.svannet.com.

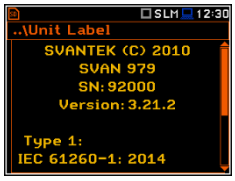


Chapter 7.17.4

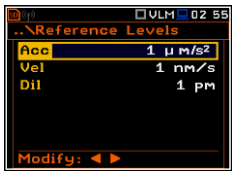
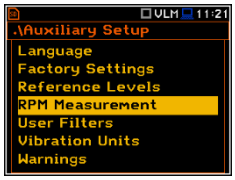
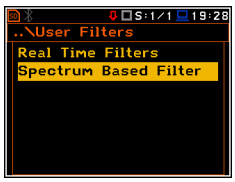
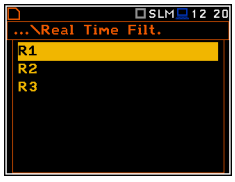
Data Port	Parameter of the *Modem Connection* screen defining the port number that denotes a port on which a communication socket will be configured for data exchange between the remote host and the station.		Chapter 7.17.4
Registration Port	Parameter of the *Modem Connection* screen defining the port 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 7.17.4
APN	Parameter of the *Modem Connection* screen defining the APN name of the SIM card used with the modem.		Chapter 7.17.4
APN User	Parameter of the *Modem Connection* screen defining the user name used for verification by the SIM card of the modem.		Chapter 7.17.4
APN Password	Parameter of the *Modem Connection* screen defining the password used for verification by the SIM card of the modem.		Chapter 7.17.4
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 7.17.4
DynDns Address	Parameter of the *Modem Connection* screen defining the server address when using DynDNS service in case of dynamic IP address.		Chapter 7.17.4
DynDns Hostname	Parameter of the *Modem Connection* screen defining the server hostname address when using DynDNS service in case of dynamic IP address.		Chapter 7.17.4
DynDns Login	Parameter of the *Modem Connection* screen defining the login when using DynDNS service in case of dynamic IP address.		Chapter 7.17.4

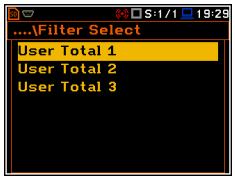
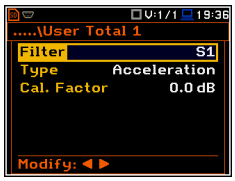
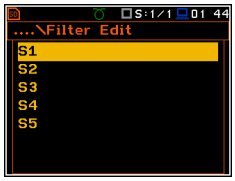
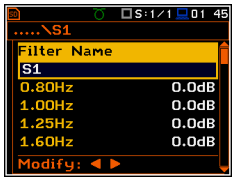
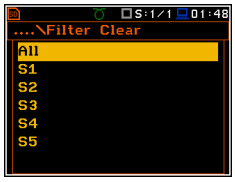
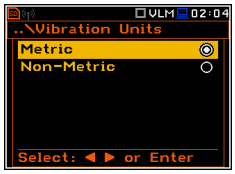
DynDns Password	Parameter of the *Modem Connection* screen defining the password when using DynDNS service in case of dynamic IP address.		Chapter 7.17.4
SMS Option	Screen that enables configuring parameters of the SMS service used for alarm notification: *Phone Number* and *Text Message*.		Chapter 7.17.5
Phone Number	Parameter of the *SMS Option* screen defining the phone number where the text messages will be sent.		Chapter 7.17.5
Text Message	Parameter of the *SMS Option* screen defining additional text, which will be appended into a standard alarm message template.		Chapter 7.17.5
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 7.17.6
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 7.17.6
SMTP Address	Parameter of the *E-mail Settings* screen defining SMTP server address used for sending e-mail messages.		Chapter 7.17.6
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 7.17.6
User Login	Parameter of the *E-mail Settings* screen defining user login used to establish verified connection with SMTP server.		Chapter 7.17.6

User Password	Parameter of the *E-mail Settings* screen defining user password used to establish verified connection with SMPT server.		Chapter 7.17.6
Sender e-mail	Parameter of the *E-mail Settings* screen defining e-mail address from which the e-mail message will be sent.		Chapter 7.17.6
Recipient e-mail	Parameter of the *E-mail Settings* screen defining e-mail address to which the e-mail message will be sent.		Chapter 7.17.6
E-mail Subject	Parameter of the *E-mail Settings* screen defining e-mail message's subject.		Chapter 7.17.6
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 7.17.6
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 7.17.6
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 7.17.6
Port	Parameter of the *E-mail Settings* screen defining user's own port.		Chapter 7.17.6
Unit Name	Screen that enables editing of the instrument name visible by the SvanNET web-service.		Chapter 7.18

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 7.19

18.7 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, RPM Measurement, User Filters, Vibration Units* and *Warnings*.		Chapter 8
Language	Screen that enables selecting the user interface language.		Chapter 8.1
Factory Settings	Restoration of the default settings of the instrument.		Chapter 8.2
Reference Levels	Screen that enables defining reference levels of the vibration signal for acceleration (Acc), velocity (Vel) and displacement (Dil).		Chapter 8.3
RPM Measurement	Position that enables activating RPM measurements by entering the unlocking code for this function. After unlocking this position disappears from the *Auxiliary Setup* screen.		Chapter 8.4
User Filters	Screen that enables configuring user filters: *Real Time Filters* and *Spectrum Based Filter*.		Chapter 8.5, 10.4
Real Time Filters	Screen that enables configuring three real-time user filters: *R1, R2* and *R3*.		Chapter 8.5.1
Rx	Screen that enables configuring parameters of the selected real-time user filter: filter *Type (Highpass, Bandpass or Lowpass)* and frequency corners: low frequency corner - *LFC(3dB*) and low frequency corner - *HFC(3dB)*.		Chapter 8.5.1

Spectrum Based Filter	Screen that enables setting user filters for total results of the **1/1 Octave** - **1/12 Octave** analysis in screens: *Filter Select, Filter Edit* and *Filter Clear*.		Chapter 10.4
Filter Select	Screen that allows you to assign the user filter to the additional Total result with the use of the *User Total 1, User Total 2* and *User Total 3* screens.		Chapter 10.4
User Total x	Screen that allows you to select the user filter (*S1, S2, S3, S4 or S5*) to the user *Total x* result, set the calibration factor and, in case of vibration measurements, type of integration filter for measuring *Acceleration, Velocity* or *Displacement*.		Chapter 10.4
Filter Edit	Screen that allows you to select the user filters for editing in the screens: *S1, S2, S3, S4 or S5*.		Chapter 10.4
Sx	Screen that allows you to edit coefficients of the selected user filter and to change the name of the filter (*Filter Name*).		Chapter 10.4
Filter Clear	Screen that allows you to clear values of the user coefficients of octave or third octave filters. It is possible to clear all sets of coefficients (*All*) or to clear the selected set (*Sx*).		Chapter 10.4
Vibration Units	Screen that enables selecting units for vibration measurements.		Chapter 8.6
Warnings	Screen that enables activating warning messages, which are to be displayed during the normal operation of the instrument.		Chapter 8.7

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 **HOST USB** functionality is also available. The USB HOST controller installed in the instrument enables the user to connect to this instrument the USB memory sticks, USB hard disks, USB printers etc.

The **RS 232** interface is also available but as an option. In order to activate this option, the user must 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 **IrDA** serial interface is also available as an option. It requires dedicated hardware and this option should be unlocked by a software code.

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.

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,
#4 read out of the data file from the internal Flash-disc,
#5 read out of the statistical analysis results,
#6 remote settings of the user filters,
#7 special control functions,
#9 writing the data file on the internal flash-disk,
#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 – A.38. 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

A.2.1. Read-out the profile results

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

#2 function has the format defined as follows:

#2,t,p,X?,X?,X?,(...),X?;

where:

t – the type of the results (**a – averaged**, **i – instantaneous**, **c – 1 second results**)

p – the number of the profile (**1**, **2** or **3**) or **0** for all profiles.

X – the code of the result,

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

#2,t,p,Xccc,Xccc,Xccc,(...),Xccc; (where **t=a/i/c**, **p=1/2/3**)

or

#2,t,1,Xccc,(...),Xccc,2,Xccc,(...),Xccc,3,Xccc,(...),Xccc; (when **t=a/i/c**, **p=0**)

or

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

If the command contains status query (optional **s** letter) #2 function has the format as follows

#2,ts,p,X?,X?,X?,(...),X?;

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

#2,tsf,p,Xccc,Xccc,Xccc,(...),Xccc; (where **t=a/i/c**, **p=1/2/3**)

or

#2,tsf,1,Xccc,(...),Xccc,2,Xccc,(...),Xccc,3,Xccc,(...),Xccc; (when **t=a/i/c**, **p=0**)

or

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

In above commands, **f** means status binary flags:

0x01 – RUN flag

0x02 – PAUSE flag

0x04 – TRIGGER flag

The codes of the results in the case of **Sound Meter** mode are defined as follows:

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

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

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

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

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

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

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

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

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

B(k) the **Lden** result (ccc – 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;

l(nn) the **LEPd** result (ccc – the value in dB, nn – the value of Exposure Time in minutes);

Z the **LTeq** result (ccc – the value in dB);

L(nn) the value L of the nn statistics (ccc – the value in dB).

g the **LR1** result (ccc – the value in dB);

h the **LR2** result (ccc – the value in dB);

C the cycle of the measurement (ccc – cycle number);

F date of the measurement (ccc – date in the format yyyy-mm-dd where yyyy – year, mm – month, dd – day);

G time of the measurement (ccc – time in the format hh:mm:ss where hh – hour, mm – minute, ss – second);

O the **NR** result (ccc – the value in dB);

K the **NC** result (ccc – the value in dB).

The codes of the results in the case of VLM mode are defined as follows:

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

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

T time of the measurement (ccc – value in seconds);
P the **PEAK** value (ccc – the value in dB);
Q the **P_P** value (ccc – the value in dB);
M the **MAX** value (ccc – the value in dB);
R the **RMS** value (ccc – the value in dB);
H the **VDV** value (ccc – the value in dB);
C the cycle of the measurement (ccc – cycle number);
F date of the measurement (ccc – date in the format yyyy-mm-dd where yyyy – year, mm – month, dd – day);
G time of the measurement (ccc – time in the format hh:mm:ss where hh – hour, mm – minute, ss – second).

A.2.2. Read-out the RT60 results

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

The function's answer is in the one of the following format:
#2,<type>,0,<status>; when results are not available
#2,<type>,1,<results>; when results are available.

<type> accepts the following values: **EDT/T20/T30**
<status> is the status of device (0 – no results, 1 – waiting for trigger, 2 – measurement in progress, 3 – calculations)
<results> is the full list of frequencies with corresponding results in the format: **freq1:value1,freq2:value2,…,freqN:valueN**

The exemplary answer:
#2,T30,1,50.0Hz:---,63.0Hz:---,80.0Hz:---,100Hz:0.48s,125Hz:---,160Hz:0.31s,200Hz:0.61s,250Hz:0.62s,315Hz:0.65s,400Hz:0.56s,500Hz:0.66s,630Hz:0.81s,800Hz:0.69s,1.00k:0.74s,1.25k:0.75s,1.60k:0.70s,2.00k:0.69s,2.50k:0.58s,3.15k:0.63s,4.00k:0.61s,5.00k:0.60s,6.30k:0.45s,8.00k:0.35s,10.0k:0.26s,12.5k:0.20s,16.0k:0.25s,20.0k:0.18s,TOT.A:0.70s,TOT.C:0.72s,TOT.Z:0.82s;

A.2.3. Read-out the RPM results

In the case of activation **RPM** option there are additional codes:
#2,t,rps; The instrument sends the values of results in the format defined as follows:
#2,t,rps,<ROT>,<RMAX>,<RMIN>;
#2,t,rpm; The instrument sends the values of results in the format defined as follows:
#2,t,rpm,<ROT>,<RMAX>,<RMIN>;

t – optional type of the results (**a – averaged**, **i – instantaneous**)

A.2.4. Examples

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

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

#2,a,1,v1,V0,T39,P125.4,M107.0,N20.6,S81.7,R102.1,U118.0,B(4)112.1,I(480)102.1,Y103.9,Z105.4, L(01)107.9,L(10)107.6,L(20)107.2,L(30)102.8,L(40)99.0,L(50)96.7,L(60)82.5,L(70)54.5,L(80)20.9, L(90)20.4,g90.8,h94.4,C1,F2017-11-24,G16:26:03,O?,K?;

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

#2,a,1,v0,V0,T1,P93.9,Q99.7,M45.6,R45.6,H85.0,C1,F2017-11-24,G17:00:01;



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

Example: After sending to the instrument the string:

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

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

#2,i,1,V0,T39,P125.4,R102.1,L(01)107.9,L(10)107.6,L(20)107.2,L(30)102.8,L(40)99.0,L(50)96.7, L(60)82.5,L(70)54.5,L(80)20.9,L(90)20.4;



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,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>
<LSB data byte> <MSB data byte>
(...)
<LSB data byte> <MSB data byte>

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

b7	b6	b5	b4	b3	b2	b1	b0

where:

b7 = 0 means that "overload does not happen"

	=	1	means that "overload appeared"
b6	=	0	means that "spectrum is not averaged"
	=	1	means that "spectrum is averaged"
b5	=	0	the instantaneous current result (RUN State)
	=	1	the final result (STOP State)
b4..b0	=	1'0000	means FFT spectrum
		0'1000	means 1/3 octave spectrum
		0'0100	means 1/1 octave spectrum
		0'0010	means 1/12 octave spectrum
		0'0001	means 1/6 octave spectrum

Transmission Counter gives the information about the numbers of data bytes.

Each **word of result** consists of two data bytes (LSB first).



Note: *The measurement result is coded in binary form as dB•100 (e.g. 34.5 dB is sent as binary number 345).*

A.4. FUNCTION #4 – READ-OUT OF THE CONFIGURATION DATA FILES INTO THE EXTERNAL MEMORY (SD CARD / USB DISK)

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

#4 function formats are defined as follows:

#4,0; the file containing the catalogue

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

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

where:

index - first record

count - number of records in the catalogue

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

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

#4,4; the current setup

#4,4,?; size of current setup

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

where:

offset - offset from the beginning of the current setup

length - number of bytes to read



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

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

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

#4,?;

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

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

#5 function format is defined as follows:

#5,p;

where:

p the source of the statistical analysis results, for p = 1, 2 or 3 it is the corresponding profile and for p = 0 - the results obtained during **1/1 OCTAVE** or **1/3 OCTAVE** analysis.

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

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

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

b7	b6	b5	b4	b3	b2	b1	b0

where:

b7	=	0	means that "overload does not happen"
	=	1	means that “overload appeared”
b6	=		reserved
b5	=	0	the instantaneous current result (RUN State)
	=	1	the final result (STOP State)
b4	=	1	always 1
b3..0	=		reserved



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

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

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

where:

n the number of the transmitted statistics. For p = 1, 2 or 3 only one statistic is transmitted (n = 1). For p = 0 the number of the transmitted statistics depends on the measurement function and
1. in case of **1/1 OCTAVE** analysis n is equal to the number of the analysis results (NOct – cf. App. B) plus the number of the **TOTAL** values for this type of analysis (NOctTot);
2. in case of **1/3 OCTAVE** analysis n is equal to the number of the analysis results (NTer – cf. App. B) plus the number of the **TOTAL** values for this type of analysis (NTerTot).

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

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

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

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



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

A.6. FUNCTION #6 – REMOTE SETTING OF THE USER FILTERS

Function **#6** enables one to send to the instrument the coefficients of the user filters. In the available formats description of **#6** functions the following symbols are used:

type	- 0 for the vibration filters
	- 1 for the acoustic filters
name, **name$_1$**, **name$_2$**	- filter names given by the user
v	- real type value, expressed in [dB]
first	- integer type value (number of the coefficient in the user filter)
pos	- integer type value (Total value number)
avd	- for the vibration filters: 0 - Acc, 1- Vel, 2 - Dil
	- for the acoustic filters, this parameter is always equal to 0
cal	- the calibration coefficient given as the real number expressed in [dB]
chn	- channel number (1, 2, 3 or 4)

#6 function formats are defined as follows:

#6,type,L;

This function returns the list of the defined (existing in the instrument) filters in the following format: **#6,type,n,name$_1$, ... ,name$_n$;**

#6,type,W,name,v,v,...,v;

This function sets the coefficients of the new user filter named as **name**. The **name** parameter should be unique (in the instrument there is not any other filter with the same name, otherwise it will be an error). The function answers in the format: **#6;**

#6,type,R,name;

This function returns the coefficients of the user filter named as **name**. If the **name** filter does not exist, an error occurs. The function's answer is in the following format: **#6,type,n,v$_1$,v$_2$, ... ,v$_n$;**

#6,type,D,name;

This function deletes from the instrument the user filter named as **name**. If the **name** filter does not exist, an error occurs. The function answers in the format: **#6;**

#6,type,S,name,v,v,...,v;

This function sets the user filter named as **name**. If the **name** filter already exists, its coefficients are redefined. If the **name** filter does not exist, the filter is created. The function answers in the format: **#6;**

#6,type,C,name,first,v,v,...,v;

This function sets the coefficients in the user filter named as name starting from the first position. If the **name** filter does not exist, an error occurs. The function answers in the format: **#6;**

#6,type,N,name$_1$,name$_2$;

This function changes the name of the user filter from **name$_1$** to **name$_2$**. The function answers in the format: **#6;**

#6,type,@,chn,L;

This function returns the names of the user filters, assigned to the channel **chn** consecutive **TOTAL** values, in the following format: **#6,type,chn,3,name$_1$,name$_2$,name$_3$;**

#6,type,@,chn,pos,?;

This function returns the description record of the user filter assigned to the **pos TOTAL** value of channel **chn** in the following format: **#6,type,@,chn,pos,name,avd,cal;** (the description record contains: the name of the filter, its type and the calibration coefficient).

#6,type,@,chn,pos,*;

This function recovers the predefined filter for the **pos TOTAL** value of channel **chn** and answers in the following format: **#6,type,@,chn,pos,name,avd,cal;**

#6,type,@,chn,pos,name,avd,cal;

This function sets the description record of the user filter assigned to the **pos TOTAL** value of channel **chn** in the following format: **#6,type,@,chn,pos,name,avd,cal;**

The returned parameters: **name**, **avd** and **cal** are set in the description record after the execution of the function. In case of an error, they can differ from the current parameters of the function.



Note: *In case of an error, all these functions return* ***#6?;****.*

A.7. 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.** A list of the control setting codes is given in Tab. A.1 – A.38.

A.8. FUNCTION #9 – WRITE-IN OF THE CONFIGURATION DATA FILES INTO THE EXTERNAL MEMORY (SD CARD / USB DISK)

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

#9 function formats are defined as follows:

#9,FILE_TYPE,FILE_LENGTH,DATA the setup file

where:

FILE_TYPE	2 – setup file, 4 – current setup, 6 – alarm configuration file
FILE_LENGTH	length of the file in bytes,
DATA	binary content of the file.

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

<disk>	logical disk number: 0 – SD Card, 1 – USB Disk
<address>	directory address (cluster number) – for internal memory 0
<offsetB>	offset the first byte to read/write (an even number).
<nB>	number of bytes to read/write (an even number)
<data>	binary data.
<count>	directory size in bytes
<name>	name and extension of the file or directory
<CRC>	binary CRC

#D,c,?;

This function returns the list of available disks in format:
#D,c,<disk1>[,<disk2>[,<disk3>]];

#D,d,?;

This function returns the parameters of the working directory in format:
#D,d,<disk>,<address>,<count>;

#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

#D,M,?;

This function returns the parameters of the last measurement directory in format:
#D,s,<disk>,<address>;

#D,s,?;

This function returns the parameters of the setup directory in format:
#D,s,<disk>,<address>;

#D,l,?;

This function returns the parameters of the current logger in format:
#D,l,<name>,<nB>;

#D,a,?;

This function returns the parameters of the alarm directory in format:
#D,a,<disk>,<address>,<first_clust>,<file_length>;

#D,t,?;

This function returns the parameters of the system directory in format:
#D,t,<disk>,<address>;

#D,e;

This function deletes all files in working directory.
Response:
#D,e;

#D,e,<name>;

This function deletes the file in working directory specified by the name.
Response:
#D,e;

#D,m,<address>,<name>;

This function makes directory specified by the name.
Response:
#D,m;

#D,f,0;

This function erases active disk.
Response:
#D,f;

#D,f,<address>;

This function deletes the directory specified by the cluster number.
Response:
#D,f;

#D,r,<disk>,<address>,<offsetB>,<nB>;

This function enables the user to read the file.
Response:
#D,r,<disk>,<address>,<offsetB>,<nB>; [<data>]

#D,z,<disk>,<address>,<offsetB>,<nB>;

This function enables the user to read the file with CRC.
Response:
#D,z,<disk>,<address>,<offsetB>,<nB>; [<data><CRC>]

#D,w,<name>,<nB>; [<data>]

This function enables the user to write the file (in the working directory)
Response:
#D,w;

A.6. FUNCTION #R – AUTOMATIC RESULTS TRANSMISSION DURING THE MEASUREMENT

#R remote command is used to configure the instrument to automatically send results during measurements. The command and response formats described below are available as part of the command.

1 – Turn off command

#R,0;

Response:

#R,0;

Note: If any additional characters appear in the command after the number 0 (zero), they will be ignored, and the command will not be treated as incorrect.

2 – Turn on command

#R,1[:[f][:[r][:[d]]]],C_1[,C_2[..[,C_n]]];

where:

[] – square brackets mean that the parameter is optional,

1 – a number indicating the activation of the 1-second results sending mode,

f,r,d – transferred data format parameters

C_k – results or result parameter identifier (k = 1..n)

The parameters of data transmission format have following meanings:

f – line separator parameter – allows to send an additional character or line separator characters after each transmission:

- **f** = 0 – no line separator sent (default)
- **f** = 1 – *line feed* character sent (LF, ASCII value 10),
- **f** = 2 – *carriage return* character sent (CR, ASCII value 13),
- **f** = 3 – *carriage return* i *line feed* character sent,

r – results separator parameter – allows for change of results separator character (comma character as default, ASCII value 44):

- **r** – any ASCII character from range 1 to 255

d – decimal separator parameter – allows for change of decimal separator character (dot character as default, ASCII value 46):

- **d** – any ASCII character from range 1 to 255

Note: The lack of any data transmission format parameter between the colon characters will keep the default value of the parameter. For example, command:

#R,1::9:44,(...);

will change the result separator to the horizontal tab (HT, ASCII value 9), change the decimal point to the decimal point (ASCII value 44) and will not change the default line separator parameter.

Note: If the results separator and decimal separator characters are identical, the command will not be accepted, and the command error message will be returned - see point 4.

Each **C_k** identifier consists of a letter and possible numeric parameters separated by a colon. If the identifier is given without the required parameters, default values of missing parameters will be zero. If the identifier will contain more parameters than required, the command will not be accepted, and the command error message will be returned - see point 4.

Available identifiers:

F[:p_1] – measurement start date; date is sent in a format depending on the parameter:

p_1 = 0 – DD-MM-YYYY (default),

p_1 = 1 – YYYY-MM-DD,

G[:p_1] – measurement start time; time is sent with a second or millisecond resolution depending on the parameter:

p_1 = 0 – HH:MM:SS (default),

p_1 = 1 – HH:MM:SS.mmm,

V – overload flag,

P:p_1 – **Peak** result value:

p_1 – profile number (1..3),

Q:p_1 – **P–P** result value:

p_1 – profile number (1..3),

M:p_1 – **Max** result value:

p_1 – profile number (1..3),

N:p_1 – **Min** result value:

p_1 – profile number (1..3),

R:p_1 – **RMS** result value: (for vibration) or **Leq** (for sound):

p_1 – profile number (1..3),

X[:p_1[:p_2]] – octave or fractional-octave bandwidth values:

p_1 – index of first band (0..182),

p_2 – number of results sent (0..183) (zero means all results from the specified index of first band to last total result included)

Note: If the index of the first band is larger than the index of the last total result calculated, the spectrum results will not be sent.

Note: If the number of results sent is greater than the number of available results, only available results will be sent.

Note: If the parameter values are outside the acceptable range, the command will not be accepted, and the command error message will be returned – see point 4.

Note: The identifier of any result or parameter can appear in the command only once. If any identifier occurs again, the command will not be accepted, and the command error message will be returned - see point 4.

Note: The order of identifiers in the mode enable command determines the order in which the results will be sent. The exception are the spectrum results that will always be sent last!

If the format order is correct, instrument will send full information about the mode settings in the answer - see point 3.

If the format order is incorrect, the error message will be returned - see point 4.

3 – Read current mode set command

```
#R;
```

If the mode of automatic sending of results is off, then instrument will send:

```
#R,0;
```

If the mode of automatic sending of results is enabled, then instrument will send full information about the mode settings in the following format:

#R,1[:f:r:d],C$_1$,..,C$_n$;

where:

1 – a number denoting the mode of sending 1-second results

f,r,d – data transmission format parameters described in point 2,

C$_k$ – identifier of the result or measurement parameter (k = 1..n) described in point 2.

Note: Data transmission format parameters are given only when at least one of them has been given in the command to enable the mode.

Note: The number of **C$_k$** identifiers and their alignment is consistent with their appearance in the order to enable the mode and determines the order in which the results will be sent during the measurement. The exceptions are spectral results, which regardless of the place of occurrence of the identifier in the mode enable command will be sent last - see the corresponding "warning" in point 2. For this reason, in the above response sent by the instrument the spectral identifier (provided it was given in the order to switch mode) will always be the last one.

Note: All identifiers appearing in the above response will be given with all parameters, even if the parameters were not given in the command to enable the mode

4 – Command error response

#R,?;

The instrument will send this response after receiving an incorrect instruction. Sending this response by the instrument also means that the automatic sending of results mode is turned off.

5 – Results transmission

#R,V$_1$,..,V$_n$;[CR][LF]

where:

V$_k$ – identifier of the result or measurement parameter (k = 1..n) described in point 2.

CR – *carriage return* sing sent optionally, according to the line separator parameter described in point 2,

LF – *line* feed sing sent optionally, according to the line separator parameter described in point 2,

If the mode of automatic sending of results is turned on, after every second of measurement the device will send data in accordance with the above format.

Measurement parameters (such as date and time) will be sent in accordance with the format described in point 2.

Overload flag will be sent as 0 or 1, where 0 means no overload.

The measurement results will be sent as numerical values in dB.

Note: If the result separator character set is different from the comma sign, in the above format the character will be sent instead of commas and additionally this character will be sent before the final semicolon mark.

Example 1

In the instrument, the measurement of the 1/3-octave spectrum is set in the "Full" band in the sound measurement mode. We want to take the following results every second:

- measurement time (with seconds resolution),
- overload information,
- second profile Peak results,
- first profile Leq results,
- 1/3-octave results between 20.0Hz to 20kHz (without Total results).

To do this, we send command:

#R,1,G,V,P:2,R:1,X:14:31;

In response instrument sends:

#R,1,G:0,V,P:2,R:1,X:14:31;

After measurement start, instrument will send below data every second:

#R,13:27:54,0,93.54,71.29,60.67,63.57,69.93,75.29,87.73,75.24,66.34,63.63,60.82,66.65,61.17,71.03,66.60,64.23,62.27,65.70,64.17,56.26,57.68,54.91,57.38,53.00,52.35,50.90,55.02,51.95,50.74,52.74,52.27,51.75,56.18;

#R,13:27:55,1,123.78,91.24,62.51,65.20,70.08,78.82,101.13,84.21,74.35,74.55,72.48,74.91,73.17,81.27,81.76,80.51,80.55,80.36,81.58,78.94,80.25,80.17,79.56,79.32,79.21,78.46,78.51,77.67,76.90,75.86,76.07,76.24,76.15;

#R,13:27:56,1,123.62,93.45,72.19,75.20,78.78,83.65,103.80,88.12,82.32,79.41,74.86,77.43,76.41,83.58,83.85,82.13,81.68,82.88,82.98,80.14,81.48,81.09,81.48,81.78,81.50,81.75,81.54,81.19,81.02,80.88,80.28,80.31,80.19;

#R,13:27:57,1,123.82,93.62,73.59,76.01,78.85,83.59,103.10,86.77,77.58,78.62,81.30,81.19,78.04,83.42,84.42,83.16,82.34,83.15,82.99,82.45,82.80,82.93,82.67,81.60,81.72,80.63,80.34,79.97,78.50,78.43,78.51,78.08,77.98;

etc.

Interpretation of the data obtained from the first measurement is as follows:

13:27:54	– time of start of current measurement second,
0	– no overload,
93.54	– second profile Peak result in dB
71.29	– first profile Leq result in dB
60.67	– 20.0Hz spectrum band result in dB,
63.57	– 25.0Hz spectrum band result in dB,
(...)	
51.75	– 16.0kHz spectrum band result in dB,
56.18	– 20.0kHz spectrum band result in dB,.

Example 2

We want to get the following results every second:

- measurement time (with seconds resolution),

- overload information,
- first profile Leq results. wynik Leq z pierwszego profilu,
- second profile Leq results, wynik Leq z drugiego profilu,
- third profile Leq results,

and then import them into a spreadsheet program (e.g. Excel) where the decimal separator is the comma.

To do this, we send command:

#R,1:3:9:44,G,V,R:1,R:2,R:3;

In response, instrument sends:

#R,1:3:9:44,G:0,V,R:1,R:2,R:3;

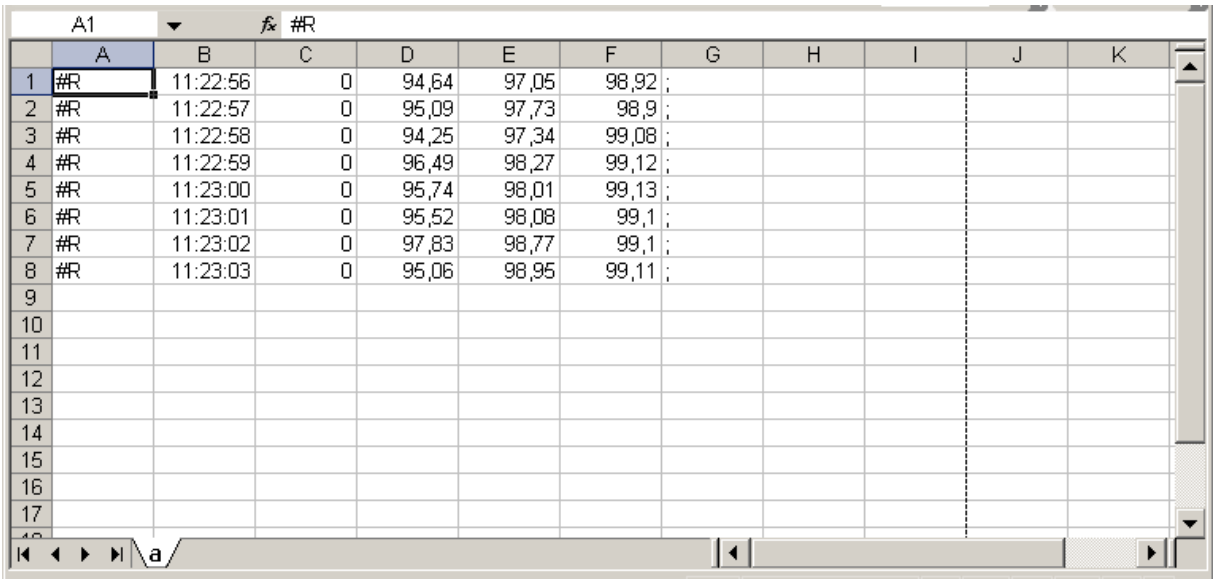
After measurement start, instrument will send below data every second:

#R<HT>11:22:56<HT>0<HT>94,64<HT>97,05<HT>98,92<HT>;<CR><LF>
#R<HT>11:22:57<HT>0<HT>95,09<HT>97,73<HT>98,90<HT>;<CR><LF>
#R<HT>11:22:58<HT>0<HT>94,25<HT>97,34<HT>99,08<HT>;<CR><LF>
#R<HT>11:22:59<HT>0<HT>96,49<HT>98,27<HT>99,12<HT>;<CR><LF>
#R<HT>11:23:00<HT>0<HT>95,74<HT>98,01<HT>99,13<HT>;<CR><LF>
#R<HT>11:23:01<HT>0<HT>95,52<HT>98,08<HT>99,10<HT>;<CR><LF>
#R<HT>11:23:02<HT>0<HT>97,83<HT>98,77<HT>99,10<HT>;<CR><LF>
#R<HT>11:23:03<HT>0<HT>95,06<HT>98,95<HT>99,11<HT>;<CR><LF>

where:

<HT> – *horizontal tab sign* (HT, ASCII value 9),
<CR> –*carriage return sign* (CR, ASCII value 13),
<LF> –*line feed* sign (LF, wartość ASCII value 10).

After importing the data into the spreadsheet program, we get results grouped into separate columns:



	A	B	C	D	E	F	G	H	I	J	K
1	#R	11:22:56	0	94,64	97,05	98,92	;				
2	#R	11:22:57	0	95,09	97,73	98,9	;				
3	#R	11:22:58	0	94,25	97,34	99,08	;				
4	#R	11:22:59	0	96,49	98,27	99,12	;				
5	#R	11:23:00	0	95,74	98,01	99,13	;				
6	#R	11:23:01	0	95,52	98,08	99,1	;				
7	#R	11:23:02	0	97,83	98,77	99,1	;				
8	#R	11:23:03	0	95,06	98,95	99,11	;				
9											
10											
11											
12											
13											
14											
15											
16											
17											

Indexes of 1/1 octave bands

Nominal frequency	Audio band	Full band	Ultra band
1.00 Hz		0	0
2.00 Hz		1	1
4.00 Hz		2	2
8.00 Hz		3	3
16.0 Hz		4	4
31.5 Hz	0	5	5
63.0 Hz	1	6	6
125 Hz	2	7	7
250 Hz	3	8	8
500 Hz	4	9	9
1.00 kHz	5	10	10
2.00 kHz	6	11	11
4.00 kHz	7	12	12
8.00 kHz	8	13	13
16.0 kHz	9	14	14
31.5 kHz			15
Total 1	10	15	16
Total 2	11	16	17
Total 3	12	17	18

Indexes of 1/3 octave bands

Nominal frequency	Audio band	Full band	Ultra band
0.80 Hz		0	0
1.00 Hz		1	1
1.25 Hz		2	2
1.60 Hz		3	3
2.00 Hz		4	4
2.50 Hz		5	5
3.15 Hz		6	6
4.00 Hz		7	7
5.00 Hz		8	8
6.30 Hz		9	9
8.00 Hz		10	10
10.0 Hz		11	11
12.5 Hz		12	12
16.0 Hz		13	13
20.0 Hz	0	14	14
25.0 Hz	1	15	15
31.5 Hz	2	16	16
40.0 Hz	3	17	17

50.0 Hz	4	18	18
63.0 Hz	5	19	19
80.0 Hz	6	20	20
100 Hz	7	21	21
125 Hz	8	22	22
160 Hz	9	23	23
200 Hz	10	24	24
250 Hz	11	25	25
315 Hz	12	26	26
400 Hz	13	27	27
500 Hz	14	28	28
630 Hz	15	29	29
800 Hz	16	30	30
1.00 kHz	17	31	31
1.25 kHz	18	32	32
1.60 kHz	19	33	33
2.00 kHz	20	34	34
2.50 kHz	21	35	35
3.15 kHz	22	36	36
4.00 kHz	23	37	37
5.00 kHz	24	38	38
6.30 kHz	25	39	39
8.00 kHz	26	40	40
10.0 kHz	27	41	41
12.5 kHz	28	42	42
16.0 kHz	29	43	43
20.0 kHz	30	44	44
25.0 kHz			45
31.5 kHz			46
40.0 kHz			47
Total 1	31	45	48
Total 2	32	46	49
Total 3	33	47	50

Indexes of 1/6 octave bands

Nominal frequency	Audio band	Full band	Nominal frequency	Audio band	Full band
0.75 Hz		0	**168 Hz**	18	47
0.84 Hz		1	**188 Hz**	19	48
0.94 Hz		2	**211 Hz**	20	49
1.06 Hz		3	**237 Hz**	21	50
1.19 Hz		4	**266 Hz**	22	51
1.33 Hz		5	**299 Hz**	23	52
1.50 Hz		6	**335 Hz**	24	53
1.68 Hz		7	**376 Hz**	25	54

1.88 Hz		8	**422 Hz**	26	55
2.11 Hz		9	**473 Hz**	27	56
2.37 Hz		10	**0.53 kHz**	28	57
2.66 Hz		11	**0.60 kHz**	29	58
2.99 Hz		12	**0.67 kHz**	30	59
3.35 Hz		13	**0.75 kHz**	31	60
3.76 Hz		14	**0.84 kHz**	32	61
4.22 Hz		15	**0.94 kHz**	33	62
4.73 Hz		16	**1.06 kHz**	34	63
5.3 Hz		17	**1.19 kHz**	35	64
6.0 Hz		18	**1.33 kHz**	36	65
6.7 Hz		19	**1.50 kHz**	37	66
7.5 Hz		20	**1.68kHz**	38	67
8.4 Hz		21	**1.88 kHz**	39	68
9.4 Hz		22	**2.11 kHz**	40	69
10.6 Hz		23	**2.37 kHz**	41	70
11.9 Hz		24	**2.66 kHz**	42	71
13.3 Hz		25	**2.99 kHz**	43	72
15.0 Hz		26	**3.35 kHz**	44	73
16.8 Hz		27	**3.76 kHz**	45	74
18.8 Hz		28	**4.22 kHz**	46	75
21.1 Hz	0	29	**4.73 kHz**	47	76
23.7 Hz	1	30	**5.3 kHz**	48	77
26.6 Hz	2	31	**6.0 kHz**	49	78
29.9 Hz	3	32	**6.7 kHz**	50	79
33.5 Hz	4	33	**7.5 kHz**	51	80
37.6 Hz	5	34	**8.4 kHz**	52	81
42.2 Hz	6	35	**9.4 kHz**	53	82
47.3 Hz	7	36	**10.6 kHz**	54	83
53 Hz	8	37	**11.9 kHz**	55	84
60 Hz	9	38	**13.3 kHz**	56	85
67 Hz	10	39	**15.0 kHz**	57	86
75 Hz	11	40	**16.8 kHz**	58	87
84 Hz	12	41	**18.8 kHz**	59	88
94 Hz	13	42	**21.1 kHz**	60	89
106 Hz	14	43	**Total 1**	61	90
119 Hz	15	44	**Total 2**	62	91
133 Hz	16	45	**Total 3**	63	92
150 Hz	17	46			

A.10. CONTROL SETTING CODES

The control setting codes used in the SVAN 979 instrument are given in the table below.

Table A.1 Unit parameters

Group name	#1 code	#7 code	#S code	Code value description
Unit type	U			979 (read only)
Serial number	N			xxxx (read only)
Software version	W			x.xx.x x.xx.x - revision number (read only)
Meter Mode	Z		BE	0 - **Vibration Meter** 1 - **Sound Meter**
Measurement function	M		AL	1 - **Level Meter** 2 - **1/1 Octave** analyser 3 - **1/3 Octave** analyser 5 - **Loudness** function (in **SLM** mode only) 6 - **FFT** analyser 7 - **Tonality** analyser (in **SLM** mode only) 8 - **RT60** function (in **SLM** mode only) 15 - **1/6 Octave** analyser 16 - **1/12 Octave** analyser
Microphone Compensation		MC	EY	0 - **Off** 1 - **Free Field** 2 - **Diffuse Field** 3 - **SA279 (90°)** 4 - **SA279 (0°)**
Polarisation Voltage		PV	JO	0 - **0V** 1 - **200V**
Direct Input	V		EH	0 - **Off** 1 - **On**
Remote Control Mode		RZ	KY	0 - **Off** 1 - **On**
Windscreen		WD	KJ	0 - **Off** 1 - **On** 2 - **Auto**
ZigBee		ZM	MM	0 - **Off** 1 - **On**
Range	R		AM	1 - **Low** 2 - **High**

Table A.2 Calibration parameters

Group name	#1 code	#7 code	#S code	Code value description
Auto Calibration		**AB**	**QH**	0 - **Off** 1 - **On**
Calibration factor	**Q**			n.nn - calibration factor in dB
Calibration factor in **SLM** mode			**AK**	xx - calibration factor in dB multiplied by 10 ∈ (-10100 ÷ 10100)
Calibration factor in **VLM** mode			**AJ**	xx - calibration factor in dB multiplied by 10 ∈ (-10100 ÷ 10100)

Table A.3 Measurement parameters

Group name	#1 code	#7 code	#S code	Code value description
Start Delay	**Y**		**AE**	nn - delay given in seconds ∈ (0 ÷ 60)
Start Synchronization	**u**		**NY**	0 Off -1 Sync. to 1 second 1 Sync. to full minute 15 Sync. to the full 15 minutes 30 Sync. to the full 30 minutes 60 Sync. to a full hour
Integration Period	**D**			0 - **infinity** (measurement finished by pressing the **<STOP>** push-button or remotely - by sending S0 control code) nn nn number in seconds ∈ (1 ÷ 86400) nns nn number in seconds ∈ (1 ÷ 86400) nnm nn number in minutes ∈ (1 ÷ 1440) nnh nn number in hours ∈ (1 ÷ 24)
Integration Period Infinity			**EJ**	0 - **Off** 1 - **On**
Integration Period Hour			**EL**	nn - nn number of hours ∈ (0 ÷ 24)
Integration Period Minute			**EM**	nn - nn number of minutes ∈ (0 ÷ 60)
Integration Period Second			**EN**	nn - nn number of seconds ∈ (0 ÷ 60)
Repetition Cycles	**K**		**BA**	0 - infinity (measurement finished by pressing the **<STOP>** push-button or remotely - by sending S0 control code) ..... nnn - nnn number of repetitions ∈ (1 ÷ 1000)
Detector type in the **LEQ / RMS** function	**L**		**AX**	0 - **Linear** 1 - **Exponential**
Detector type for statistic calculations		**SE**	**NF**	0 - **Linear** 1 - **Exponential**
Day Time Limits		**DL**	**DZ**	0 - **6h-18h** 1 - **7h-19h**

Group name	#1 code	#7 code	#S code	Code value description
Rolling Time(1)			QF	nn - nn time in seconds ∈ (1 ÷ 60) nn - nn time in minutes multiplied by 60 ∈ (60 ÷ 3600)
Rolling Time(2)			QG	nn - nn time in seconds ∈ (1 ÷ 60) nn - nn time in minutes multiplied by 60 ∈ (60 ÷ 3600)
Exposure Time	e		EP	nnn - nnn time in minutes ∈ (1 ÷ 480)
Reference Level Acc	Xa	RA	BO	nn - nn reference level ∈ (1 ÷ 100) in μm/s²
Reference Level Vel	Xv	RV	BP	nn - nn reference level ∈ (1 ÷ 100) in nm/s
Reference Level Dil	Xd	RD	BQ	nn - nn reference level ∈ (1 ÷ 100) in pm

Table A.4 Profile parameters

Group name	#1 code	#7 code	#S code	Code value description
Filter type in profile n in **SLM** mode	F			-3:n **R3** filter for profile n -2:n **R2** filter for profile n -1:n **R1** filter for profile n 1:n **Z** filter for profile n 2:n **A** filter for profile n 3:n **C** filter for profile n 4:n **G** filter for profile n 5:n **B** filter for profile n
Filter type in profile 1 in **SLM** mode			AB0	-3 - **R3** filter -2 - **R2** filter -1 - **R1** filter 1 - **Z** filter 2 - **A** filter 3 - **C** filter 4 - **G** filter 5 - **B** filter
Filter type in profile 2 in **SLM** mode			AB1	-3 - **R3** filter -2 - **R2** filter -1 - **R1** filter 1 - **Z** filter 2 - **A** filter 3 - **C** filter 4 - **G** filter 5 - **B** filter

Group name	#1 code	#7 code	#S code	Code value description
Filter type in profile 3 in **SLM** mode			**AB2**	-3 - **R3** filter -2 - **R2** filter -1 - **R1** filter 1 - **Z** filter 2 - **A** filter 3 - **C** filter 4 - **G** filter 5 - **B** filter
Detector type in profile n in **SLM** mode	**C**			0:n - **IMPULSE** detector in profile n 1:n - **FAST** detector in profile n 2:n - **SLOW** detector in profile n
Detector type in profile 1 in **SLM** mode			**AC0**	0 - **IMPULSE** detector 1 - **FAST** detector 2 - **SLOW** detector
Detector type in profile 2 in **SLM** mode			**AC1**	0 - **IMPULSE** detector 1 - **FAST** detector 2 - **SLOW** detector
Detector type in profile 3 in **SLM** mode			**AC2**	0 - **IMPULSE** detector 1 - **FAST** detector 2 - **SLOW** detector
Logger type in profile n in **SLM** mode	**B**			x:n - x - sum of the following 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
Logger type in profile 1 in **SLM** mode			**AD0**	x - x - sum of the following flags 1 - logger with **PEAK** values 2 - logger with **MAX** values 4 - logger with **MIN** values 8 - logger with **RMS** values
Logger type in profile 2 in **SLM** mode			**AD1**	x - x - sum of the following flags 1 - logger with **PEAK** values 2 - logger with **MAX** values 4 - logger with **MIN** values 8 - logger with **RMS** values

Group name	#1 code	#7 code	#S code	Code value description
Logger type in profile 3 in **SLM** mode			**AD2**	x - x - sum of the following flags 1 - logger with **PEAK** values 2 - logger with **MAX** values 4 - logger with **MIN** values 8 - logger with **RMS** values
Filter type in profile n in **VLM** mode	**I**			-3:n **R3** filter for profile n -2:n **R2** filter for profile n -1:n **R1** filter for profile n 0:n **HP** filter for profile n 1:n **HP1** filter for profile n 2:n **HP3** filter for profile n 3:n **HP10** filter for profile n 4:n **Vel1** filter for profile n 5:n **Vel3** filter for profile n 6:n **Vel10** filter for profile n 7:n **VelMF** filter for profile n 8:n **Dil1** filter for profile n 9:n **Dil3** filter for profile n 10:n **Dil10** filter for profile n 21:n **Wh** filter for profile n
Filter type in profile 1 in **VLM** mode			**AR0**	-3 - **R3** filter -2 - **R2** filter -1 - **R1** filter 0 - **HP** filter 1 - **HP1** filter 2 - **HP3** filter 3 - **HP10** filter 4 - **Vel1** filter 5 - **Vel3** filter 6 - **Vel10** filter 7 - **VelMF** filter 8 - **Dil1** filter 9 - **Dil3** filter 10 - **Dil10** filter 21 - **Wh** filter

Group name	#1 code	#7 code	#S code	Code value description
Filter type in profile 2 in **VLM** mode			**AR1**	-3 - **R3** filter -2 - **R2** filter -1 - **R1** filter 0 - **HP** filter 1 - **HP1** filter 2 - **HP3** filter 3 - **HP10** filter 4 - **Vel1** filter 5 - **Vel3** filter 6 - **Vel10** filter 7 - **VelMF** filter 8 - **Dil1** filter 9 - **Dil3** filter 10 - **Dil10** filter 21 - **Wh** filter
Filter type in profile 3 in **VLM** mode			**AR2**	-3 - **R3** filter -2 - **R2** filter -1 - **R1** filter 0 - **HP** filter 1 - **HP1** filter 2 - **HP3** filter 3 - **HP10** filter 4 - **Vel1** filter 5 - **Vel3** filter 6 - **Vel10** filter 7 - **VelMF** filter 8 - **Dil1** filter 9 - **Dil3** filter 10 - **Dil10** filter 21 - **Wh** filter
Detector type in profile n in **VLM** mode	**E**			0:n - **100ms** detector in profile n 1:n - **125ms** detector in profile n 2:n - **200ms** detector in profile n 3:n - **500ms** detector in profile n 4:n - **1.0s** detector in profile n 5:n - **2.0s** detector in profile n 6:n - **5.0s** detector in profile n 7:n - **10.0s** detector in profile n

Group name	#1 code	#7 code	#S code	Code value description
Detector type in profile 1 in **VLM** mode			**CQ0**	0 - **100ms** detector 1 - **125ms** detector 2 - **200ms** detector 3 - **500ms** detector 4 - **1.0s** detector 5 - **2.0s** detector 6 - **5.0s** detector 7 - **10.0s** detector
Detector type in profile 2 in **VLM** mode			**CQ1**	0 - **100ms** detector 1 - **125ms** detector 2 - **200ms** detector 3 - **500ms** detector 4 - **1.0s** detector 5 - **2.0s** detector 6 - **5.0s** detector 7 - **10.0s** detector
Detector type in profile 3 in **VLM** mode			**CQ2**	0 - **100ms** detector 1 - **125ms** detector 2 - **200ms** detector 3 - **500ms** detector 4 - **1.0s** detector 5 - **2.0s** detector 6 - **5.0s** detector 7 - **10.0s** detector
Logger type in profile n in **VLM** mode	**G**			x: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
Logger type in profile 1 in **VLM** mode			**CR0**	x - 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
Logger type in profile 2 in **VLM** mode			**CR1**	x - 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

Group name	#1 code	#7 code	#S code	Code value description
Logger type in profile 3 in **VLM** mode			**CR2**	x - 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

Table A.5 Logger parameters

Group name	#1 code	#7 code	#S code	Code value description
Logger	**T**		**LC**	0 - **Off** 1 - **On**
Summary Results			**QC**	0 - **Off** 1 - **On**
Logger Markers	**XXM**		**QD**	0 - **Off** 1 - **On**
Logger Meteo	**p**		**JB**	0 - **Off** 1 - **On**
Logger Step	**d**			nn nn number in milliseconds ∈(**2**, **5**, **10**, **20**, **25**, **50**, **100**, **200**, **500**, **1000**) nns nn number in seconds ∈(1 ÷ 60) nnm nn number in minutes ∈(1 ÷ 60)
			AG	nn nn number in milliseconds ∈(**2**, **5**, **10**, **20**, **25**, **50**, **100**, **200**, **500**, **1000**) nn **1000**..**6000** with step 1000 nn **60000**..**3600000** with step 60000
Logger Name for SD card			**JT**	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Logger Name for USB disk			**JU**	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Logger Split Mode	**s**		**NS**	0 Off -1 Sync. to the Integration Period 15 Sync. to the full 15 minutes 30 Sync. to the full 30 minutes 60 Sync. to a full hour 1440 Sync. at the Specified Time
Specified Time for Logger Splitting	**t**			x:n x = -1 (switched off) x = 0..1429 (time in minutes) n = 1..6 (specified time number)

Group name	#1 code	#7 code	#S code	Code value description
			NV	x - x - sum of the following flags 1 - 1st split time switched on 2 - 2nd split time switched on 4 - 3rd split time switched on 8 - 4th split time switched on 16 - 5th split time switched on 32 - 6th split time switched on
			NTn	x - hours part of nth split time ∈ (0 ÷ 23)
			NUn	x - minutes part of nth split time ∈ (0 ÷ 59)
Visibility of nth logger series in 1st profile			**KU1n**	0 - **Off** 1 - **On**
Visibility of nth logger series in 2nd profile			**KU2n**	0 - **Off** 1 - **On**
Visibility of nth logger series in 3rd profile			**KU3n**	0 - **Off** 1 - **On**
Color index of nth logger series in 1st profile			**KK1n**	nn - color index ∈ (0 ÷ 30)
Color index of nth logger series in 2nd profile			**KK2n**	nn - color index ∈ (0 ÷ 30)
Color index of nth logger series in 3rd profile			**KK3n**	nn - color index ∈ (0 ÷ 30)

Table A.6 Spectrum parameters

Group name	#1 code	#7 code	#S code	Code value description
1/x OCTAVE analysis band	**A**		**DT**	0 - **Full** 1 - **Audio** (in **SLM** mode only)
Filter type in **1/x OCTAVE** or **FFT** analysis in **SLM** mode	**f**		**AV**	0 - **HP** filter 1 - **Z** filter 2 - **A** filter 3 - **C** filter 5 - **B** filter
Filter type in **1/x OCTAVE** or **FFT** analysis in **VLM** mode	**i**		**CS**	0 - **HP** filter
Detector type in **1/x OCTAVE** analysis in **SLM** mode (for Audio band only)	**XXB**		**ML**	0 - **Linear** 1 - **Fast** 2 - **Slow**
Storing the results of **1/x OCTAVE** analysis in logger's file in **SLM** mode	**b**			0 - **Off** 1 - **RMS**
			AW	0 - **Off** 8 - **RMS**

Group name	#1 code	#7 code	#S code	Code value description
Storing the results of **1/x OCTAVE** analysis in logger's file in **VLM** mode	g			0 - **Off** 1 - **RMS**
			CT	0 - **Off** 8 - **RMS**

Table A.7 FFT parameters

Group name	#1 code	#7 code	#S code	Code value description
FFT analysis band	r		BJ	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**
Window in **FFT** analysis	w		BK	0 - **Hanning** 1 - **Rectangle** 2 - **Flat Top** 3 - **Kaiser-Bessel**
FFT lines	y		CY	0 - **1600** 1 - **800** 2 - **400**
Averaging in **FFT** analysis	a		BL	0 - **Linear** 1 - **Exponential**
Time Constant for exponential averaging in **FFT** analysis	j		JQ	100 - **100ms** 125 - **125ms** 200 - **200ms** 500 - **500ms** 1000 - **1.0s** 2000 - **2.0s** 5000 - **5.0s** 10000 - **10.0s**
Storing the results of **FFT** analysis in logger's file	z			0 - **Off** 1 - **RMS**
			CZ	0 - **Off** 8 - **RMS**

Table A.8 Tonality parameters

Group name	#1 code	#7 code	#S code	Code value description
Max Band		MB	DH	xx - xx tonality maximum band in percentage ∈ (5 ÷ 25)
Tone Seek		TS	DI	xx - xx tonality tone seek in dB*10 ∈ (10 ÷ 50)
Regression		RE	DJ	xx - xx tonality regression in percentage ∈ (50 ÷ 100)
Tone Band		TB	DK	xx - xx tonality tone band in dB*10 ∈ (10 ÷ 60)

Table A.9 Measurement trigger parameters

Group name	#1 code	#7 code	#S code	Code value description
Trigger Mode	m		BS	0 - **Off** 1 - **Slope +** 2 - **Slope –** 3 - **Level +** 4 - **Level –** 6 - **Gradient +** 7 - **External**
Level in **SLM** mode	l		BW	xxx - xxx level in dB ∈ (24 ÷ 136)
Level in **VLM** mode	n		BX	xxx - xxx level in dB ∈ (60 ÷ 200)
Gradient in **SLM** mode	o		BY	xxx - xxx gradient in dB/ms ∈ (1 ÷ 100)
Gradient in **VLM** mode	k		BZ	xxx - xxx gradient in dB/ms ∈ (1 ÷ 100)

Table A.10 Logger trigger parameters

Group name	#1 code	#7 code	#S code	Code value description
Trigger Mode	XT		CA	0 - **Off** 3 - **Level +** 4 - **Level –**
Level in **SLM** mode	XL		CE	x - x level in dB ∈ (24 ÷ 136)
Level in **VLM** mode	XC		CF	x - x level in dB ∈ (60 ÷ 200)
Logger Pre-triggering Number of records taken into account before the fulfilment of the triggering condition	XQ		CI	x - x number of records saved in logger before the fulfilment of the triggering condition; x ∈ (0 ÷ 50)
Logger Post-triggering Number of records taken into account after the fulfilment of the triggering condition	Xq		CJ	x - x number of records saved in logger after the fulfilment of the triggering condition; x ∈ (0 ÷ 200)

Table A.11 Wave recording parameters

Group name	#1 code	#7 code	#S code	Code value description
Wave Recording	**XXC**		**KC**	0 - **Off** 1 - **Continuous** 2 - **On Trigger**
Format	**XXm**		**IN**	0 - **PCM** 1 - **Extensible**
Audio Sampling	**XXl**		**GN**	0 - **48 kHz** 1 - **24 kHz** 2 - **12 kHz**
Filter in in **SLM** mode			**NH**	0 - **HP** filter 1 - **Z** filter 2 - **A** filter 3 - **C** filter 5 - **B** filter
Filter in in **VLM** mode			**NI**	0 - **HP** filter
Wave Name for SD card			**KE**	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Wave Name for USB disk			**KF**	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Wave Length Limit			**AF**	x - x number in minutes with step 10 ∈(0 ÷ 480)
Trigger on Marker	**XXO**		**BH**	0 - **Off** 1 - **On**
Trigger Mode	**XXu**		**EZ**	1 - **Slope +** 2 - **Slope –** 3 - **Level +** 4 - **Level –** 7 - **External** 10 - **Integration Period**
Trigger Level in **SLM** mode	**XXv**		**FD**	x - x level in dB ∈ (24 ÷ 136)
Trigger Level in **VLM** mode	**XXw**		**FE**	x - x level in dB ∈ (60 ÷ 200)
Trigger Period			**MB**	0 - **Log. Step** 5 - **0.5 ms** 1000 - **100 ms** 10000 - **1 s**
Recording Time	**XXY**		**FI**	0 - **Inf** x - x number of seconds ∈(1..60) x - 60..3600 with step 60 x - 3600..28800 with step 3600
Pre Trigger	**XXz**		**FJ**	0 - **Off** 1 - **On**

Table A.12 Timer parameters

Group name	#1 code	#7 code	#S code	Code value description
Auto Start		AS		**#7,AS,e,hh,mm,DD,Rhh,Rmm;** where e=1 if AutoStart function is switched ON in **Single** mode, e=2 if AutoStart function is switched ON in **Multiple** mode or 0 if it is switched **Off**, **hh:mm** gives the time, **DD** gives the day for the current date, **Rhh,Rmm** gives the repetitions time
Mode			DB	0 - **Off** 1 - **Single** 2 - **Multiple**
Repetition Hour			ES	x - x hour ∈ (0 ÷ 99)
Repetition Minute			ET	x - x minute ∈ (0 ÷ 59)

Table A.13 Warnings

Group name	#1 code	#7 code	#S code	Code value description
Results Not Saved		WS	CL	0 - **Off** 1 - **On**
Ext. Disk Free Space		WF	EQ	0 - **Off** 1 - **On**
Min Free Space		WM	ER	x - x minimum disk free space ∈ (1 ÷ 1024)
Save Changes			JI	0 - **Off** 1 - **On**
Windscreen			KL	0 - **Off** 1 - **On**
Preamplifier			KS	0 - **Off** 1 - **On**
Self Vibration Level			KR	0 - **Off** 1 - **On**
Power Off			LD	0 - **Off** 1 - **On**
GPS Signal Lost			LG	0 - **Off** 1 - **On**
Low Battery			QL	0 - **Off** 1 - **On**

Table A.14 Marker parameters

Group name	#1 code	#7 code	#S code	Code value description
Name of n^{th} marker; n ∈ (1 ÷ 4)			KZn	xxxxx - xxxxx up to 10 characters (permitted characters: 0-9, a-z, A-Z and following characters _,./;'<>?:[]{}!@#$%^&*()-+=)

Group name	#1 code	#7 code	#S code	Code value description
Trigger of nth marker; n ∈ (1 ÷ 4)			**LAn**	0 - **Off** 1 - **On**
Point of nth marker; n ∈ (1 ÷ 4)			**LYn**	0 - **Off** 1 - **On**

Table A.15 Modbus parameters

Group name	#1 code	#7 code	#S code	Code value description
Modbus Mode	**Xj**		**GU**	0 - **Off** 1 - **On** (issuing this command will also switch off GPRS Mode setting)

Table A.16 GPRS parameters

Group name	#1 code	#7 code	#S code	Code value description
GPRS Mode	**Xk**		**GV**	0 - **Off** 1 - **On** (issuing this command will also switch off Modbus Mode setting)
Internet Configure	**Xo**		**HE**	0 - **Off** 1 - **On**
Data Port	**XJ**		**HF**	xxxxx - xxxxx up to 5 decimal characters (0 ÷ 65535)
Server Address	**XI**		**HG**	xxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, '.', '-' and '_')
Registration Port	**XK**		**HH**	xxxxx - xxxxx up to 5 decimal characters (0 ÷ 65535)
APN	**XN**		**HI**	xxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, '.', '-' and '_')
APN User	**XO**		**HJ**	xxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, A-Z, '.', '@', '-' and '_')
APN Password	**XU**		**HK**	xxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, A-Z, '.', '@', '-' and '_')
DNS Server	**XV**		**HL**	xxxxx - xxxxx up to 15 characters (permitted characters: 0-9 and '.')
Sim Auth Mode	**XF**		**HM**	0 - none 1 - PAP 2 - CHAP 3 - MsChapV1
Auto Reconnection	**XG**		**HN**	0 - **Off** 1 - **On**

Group name	#1 code	#7 code	#S code	Code value description
Data Protocol	**XB**		**HO**	XB0 - TCP Server XB1 - TCP Client XB2 - UDP
Registration Mode	**Xw**		**HP**	0 - **Off** 1 - **On** (Connection Request Packets) 2 - **AS** (Address Server registration) 3 - **Smart AS** (Address Server registration – only if necessary)
DynDns Server	**XXF**		**OE**	xxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, '.', '-' and '_')
DynDns Hostname	**XXG**		**OF**	xxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, '.', '-' and '_')
DynDns Login	**XXH**		**OG**	xxxxx - xxxxx up to 48 characters (permitted characters: 0-9, a-z, A-Z, '!','#','$','%','&','"','*','+','-','.','/', '=','?','@','^','_','`','{','|','}','~')
DynDns Password	**XXI**		**OH**	xxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, A-Z, '!','#','$','%','&','"','*','+','-','.','/', '=','?','@','^','_','`','{','|','}','~')
Phone Number	**XXa**		**HQ**	xxxxx - xxxxx up to 15 characters (permitted characters: '+',0-9)
Text Message	**XXb**		**HR**	xxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, A-Z, '.',',',':',';','!','?')
Modem Alphabet	**XXA**		**HT**	0 - **Off** 1 - **On**
Send SMS	**XXc**		**HU**	0 - **Off** 1 - **On**
Send e-mail	**XXk**		**HV**	0 - **Off** 1 - **On**
E-mail SMTP Address	**XXd**		**HW**	xxxxx - xxxxx up to 32 characters (permitted characters: 0-9, a-z, '.', '-' and '_')
E-mail SMTP User	**XXe**		**HX**	xxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, A-Z, '.','@','-', '_','!','#','$','%','&','"','*','+','-','/','=','?','^','_','`','{','|','}','~')
E-mail SMTP Password	**XXf**		**HY**	xxxxx - xxxxx up to 20 characters (permitted characters: 0-9, a-z, A-Z, '.','@','-', '_','!','#','$','%','&','"','*','+','-','/','=','?','^','_','`','{','|','}','~')
E-mail Sender	**XXg**		**HZ**	xxxxx - xxxxx up to 48 characters (permitted characters: 0-9, a-z, '.','@','-', '_','!','#','$','%','&','"','*','+','-','/','=','?','^','_','`','{','|','}','~')

Group name	#1 code	#7 code	#S code	Code value description
E-mail Recipient	**XXh**		**IA**	xxxxx - xxxxx up to 48 characters (permitted characters: 0-9, a-z, '.','@','-', '_','!','#','$','%','&','"','*','+','-','/','=','?','^','_','`','{','|','}','~')
E-mail Subject	**Xxi**		**IB**	xxxxx - xxxxx up to 20 characters (permitted characters: a-z, A-Z, 0-9, '.',',',':',';','!','?')
E-mail Message	**XXj**		**IC**	xxxxx - xxxxx up to 20 characters (permitted characters: a-z, A-Z, 0-9, '.',',',':',';','!','?')
E-mail flags	**XXY**		**OJ**	x - sum of the following flags; x∈(1 ÷ 63)
E-mail port	**XXV**		**OK**	x - port; x ∈ (0 ÷ 65535)
Reconnection Delay	**XH**			xs - x number of seconds between reconnection attempts; x ∈ (1 ÷ 59) xm - x number of minutes between reconnection attempts; x ∈ (1 ÷ 59) 1h - 1 hour between reconnection attempts
			ID	x - x number of seconds between reconnection attempts; x ∈ (1 ÷ 59) x - x number of minutes between reconnection attempts; x ∈ (60 ÷ 118) 119 - 1 hour between reconnection attempts
TCP IRT			**IE**	x - x number of seconds; x ∈ (1 ÷ 60)
TCP Max Ret.			**IF**	x - x maximum number of TCP retransmission; x ∈ (1 ÷ 30)

Table A.17 RT60 parameters

Group name	#1 code	#7 code	#S code	Code value description
RT60 Method			**CX**	1 - **Decay** 2 - **Impulse**
Recording Time			**DC**	x - recording time given in seconds ∈ (1 ÷ 30)
Time Step			**DE**	1 - **5ms** 2 - **10ms** 3 - **20ms** 4 - **25ms** 5 - **50ms**
Smoothing		**SM**	**CV**	x - smoothing parameter ∈ (0 ÷ 15)
Noise Margin		**NM**	**CW**	x - noise margin value in dB*10 ∈ (0 ÷ 200)
Level	**XL**		**CE**	x - x trigger level in dB ∈ (24 ÷ 136)
Display Mode in **Decay** method			**DF**	1 - **Raw Data** 2 - **Smoothed Data**

Group name	#1 code	#7 code	#S code	Code value description
Display Mode in **Impulse** method			DG	1 - **Raw Data** 2 - **Smoothed Data** 3 - **Integrated Data**
Internal Signal			NG	0 - **Off** 1 - **On**
Octave			DD	1 - **1/1** 2 - **1/3**
Freq. Range in **1/1** mode			NN	1 - 63Hz ÷ 4kHz 2 - 63Hz ÷ 16kHz
Freq. Range in **1/3** mode			NO	1 - 50Hz ÷ 5kHz 2 - 50Hz ÷ 20kHz
Amplitude			EO	x - amplitude for Internal Signal Generator given in mV ∈ (100 ÷ 1500)

Table A.18 RPM parameters

Group name	#1 code	#7 code	#S code	Code value description
RPM Measurement	Xr		DO	0 - **Off** 1 - **On**
RPM Pulse/Rot.	Xp		DP	x - pulse/rot. x ∈ (1 ÷ 360)
RPM Unit	Xu		DQ	0 - **rps** 1 - **rpm**

Table A.19 Display modes parameters

Group name	#1 code	#7 code	#S code	Code value description
1 Prof. & 3 Prof.			AO	0 - **Off** 1 - **On**
1 Prof. & Logger			JC	0 - **Off** 1 - **On**
3 Prof. & Logger			JY	0 - **Off** 1 - **On**
Logger			JF	0 - **Off** 1 - **On**
Spectrum			JD	0 - **Off** 1 - **On**
Spectrum Table			KQ	0 - **Off** 1 - **On**
Statistics			JE	0 - **Off** 1 - **On**

Group name	#1 code	#7 code	#S code	Code value description
Loudness			NX	0 - **Off** 1 - **On**
File Info			JG	0 - **Off** 1 - **On**
Meter Table			LH	0 - **Off** 1 - **On**
GPS			LK	0 - **Off** 1 - **On**
Running SPL			JH	0 - **Off** 1 - **On**
Signal Generator			MO	0 - **Off** 1 - **On**

Table A.20 Display scale parameters

Group name	#1 code	#7 code	#S code	Code value description
Scale in **SLM** mode			BM	1 - **Log**
Scale in **VLM** mode			BN	0 - **Lin** 1 - **Log**
Resolution			NQ	0 - **0.1 dB** 1 - **0.01 dB**
Dynamics in **SLM** mode			BF	0 - **10 dB** 1 - **20 dB** 2 - **40 dB** 3 - **60 dB** 4 - **80 dB** 5 - **100 dB** 6 - **120 dB**
Dynamics in **VLM** mode			NR	0 - **1000** 1 - **1000000**
Grid			AP	0 - **Off** 1 - **On**
Autoscale			CK	0 - **Off** 1 - **On**

Table A.21 Spectrum view parameters

Group name	#1 code	#7 code	#S code	Code value description
Type			DS	0 - **Averaged** 1 - **Instantaneous** 2 - **Max** 3 - **Min**
Max			EG	0 - **Off** 1 - **On**
Min			EF	0 - **Off** 1 - **On**
NR (for **1/1 OCTAVE** analysis in **SLM** mode only)			NA	0 - **Off** 1 - **On**
NC (for **1/1 OCTAVE** analysis in **SLM** mode only)			NB	0 - **Off** 1 - **On**
THD (for **FFT** analysis only)			GA	0 - **Off** 1 - **On**

Table A.22 Spectrum type parameters

Group name	#1 code	#7 code	#S code	Code value description
Spectrum Type (in **VLM** mode only)			CU	0 - **Acceleration** 1 - **Velocity** 2 - **Displacement**

Table A.23 Screen parameters

Group name	#1 code	#7 code	#S code	Code value description
Dim screen on idle			JM	0 - **Off** 1 - **On**
Screen off on idle			JN	0 - **Off** 1 - **On**
Dim screen delay			LS	x - Dim screen delay x ∈ (5 ÷ 60)
Screen off delay			LT	x - Screen off delay x ∈ (1 ÷ 60)
Auto Rotation			NZ	0 - **Off** 1 - **On**

Table A.24 Battery parameters

Group name	#1 code	#7 code	#S code	Code value description
Battery Type			CU	0 - **Alkaline** 1 - **Rechargeable**

Table A.25 Communication ports parameters

Group name	#1 code	#7 code	#S code	Code value description
USB Host		UP	JV	0 - **Off** 1 - **On**
RS232		RS	JW	0 - **Off** 1 - **On**
Bluetooth		BT	JX	0 - **Off** 1 - **On**
GPS Host Port		GH	LI	0 - **Off** 1 - **On**
GPS Device Port		GD	LJ	0 - **Off** 1 - **On**

Table A.26 RS232 ports parameters

Group name	#1 code	#7 code	#S code	Code value description
Baud Rate		BD		1 - **1200** 2 - **2400** 3 - **4800** 4 - **9600** 5 - **19200** 6 - **38400** 7 - **57600** 8 - **115200**
			AQ	0 - **1200** 1 - **2400** 2 - **4800** 3 - **9600** 4 - **19200** 5 - **38400** 6 - **57600** 7 - **115200**
Time Out		TO	BB	x - RS232 time out x ∈ (1 ÷ 60)

Table A.27 Bluetooth parameters

Group name	#1 code	#7 code	#S code	Code value description
Authorisation code			KN	xxxxx - xxxxx up to 16 characters (permitted characters: 0-9)
Visible			KO	0 - **Off** 1 - **On**
Transfer on stop only			KP	0 - **Off** 1 - **On**

Table A.28 GPS parameters

Group name	#1 code	#7 code	#S code	Code value description
Time Zone		TZ	LF	x - number of minutes with step 15; x ∈ (-720 ÷ 840)
GPS Synchronization		GS	KI	0 - **Off** 1 - **On**

Table A.29 Power parameters

Group name	#1 code	#7 code	#S code	Code value description
Auto Start			OA	0 - **Off** 1 - **On**
Power Off			MH	0 - **Off** 1 - **On**
Power Off Threshold			MI	x - threshold in dB*10 ∈ (60 ÷ 235)
Power On			OB	0 - **Off** 1 - **On**
Power On Threshold			OC	x - threshold in dB*10 ∈ (65 ÷ 240)

Table A.30 IEPE parameters

Group name	#1 code	#7 code	#S code	Code value description
IEPE Current		IE		0 - **IEPE Off** 1 - **IEPE Current 1.5 mA** 2 - **IEPE Current 4.5 mA**
IEPE in **Sound Meter** mode			DR	0 - **IEPE Off**
IEPE in **Vibration Meter** mode			GS	1 - **IEPE Current 1.5 mA** 2 - **IEPE Current 4.5 mA**
IEPE in **Direct Sound** mode			GT	0 - **IEPE Off** 1 - **IEPE Current 1.5 mA** 2 - **IEPE Current 4.5 mA**
IEPE in **Direct Vibration** mode			II	0 - **IEPE Off**

Table A.31 Keyboard parameters

Group name	#1 code	#7 code	#S code	Code value description
Shift/Alt mode			AN	0 - **2nd Function** 1 - **Direct**
Start/Stop mode			AU	0 - **with Shift** 1 - **Direct**

Group name	#1 code	#7 code	#S code	Code value description
Backlight			KG	0 - **Off** 1 - **On**
Push Key Sound			KH	0 - **Off** 1 - **On**

Table A.32 Multifunction I/O parameters

Group name	#1 code	#7 code	#S code	Code value description
IO Mode	Xx		DL	0 - **Analog Out** 1 - **Digital In** 2 - **Digital Out**
Function in **Digital In** Mode			DM	0 - **External Trigger**
Function in **Digital Out** Mode	Xz		DN	0 - **Trigger Pulse** 1 - **Alarm Pulse**
Active Level	Xc		GH	0 - **Low** 1 - **High**
Source in **Digital Out** mode	Xs		GI	0 - **Leq(1)** 1 - **Peak(1)** 2 - **Max(1)** 3 - **Spl(1)**
Source Type	Xt		IM	0 - **Current** 1 - **Periodic**
Alarm Level in **SLM** mode	Xn		GJ	x - alarm level in dB*10; x ∈ (300 ÷ 1400)
Alarm Level in **VLM** mode	Xn		NP	x - alarm level in dB*10; x ∈ (600 ÷ 2000)
Direct (only **Analog Out** mode)	Xe			0 - **D/A** 1 - **Direct**
			GK	0 - **D/A** 1 - **Direct**
			GL	0 - **Direct** 1 - **D/A**
Source (only **Analog Out** mode)	XE		GM	0 - **HP** 1 - **Z** 2 - **A** 3 - **C** 4 - **B**
Gain (only **Analog Out** mode)			ND	x - signal gain in dB; x ∈ (-60 ÷ 60)
Polarisation (only **Trigger Pulse** mode)	Xg		EI	0 - **POSITIVE** 1 - **NEGATIVE**
Slope (only **External Trigger** mode)	Xh		BG	0 - **SLOPE +** 1 - **SLOPE -**

Table A.33 Data transfer parameters

Group name	#1 code	#7 code	#S code	Code value description
Transfer Type		RC	EB	0 - **Off** 1 - **Packet** 2 - **Continuous**
Packet Size		RP	EC	x - packet size; x ∈ (64, 128, 256, 512, 1024)

Table A.34 Language parameters

Group name	#1 code	#7 code	#S code	Code value description
Language		LA		DE - **German** EN - **English** SP - **Spanish** IT - **Italian** NL - **Flemish** FR - **French** HU - **Hungarian** NO - **Norwegian** PL - **Polish** RU - **Russian** TU - **Turkish**
			BI	0 - **German** 1 - **English** 2 - **Spanish** 3 - **Italian** 4 - **Flemish** 5 - **French** 6 - **Hungarian** 7 - **Norwegian** 8 - **Polish** 9 - **Russian** 10 - **Turkish**

Table A.35 Signal generator parameters

Group name	#1 code	#7 code	#S code	Code value description
Active			MP	0 - **Off** 1 - **On**
Running			MQ	0 - **Stopped** 1 - **Running** 2 - **Auto**

Group name	#1 code	#7 code	#S code	Code value description
Function			MR	0 - **Sine** 1 - **Pink Noise** 2 - **White Noise**
Amplitude			MS	x - signal amplitude in V; x ∈ (1 ÷ 1500)
Frequency			MT	x - signal frequency in Hz*1000; x ∈ (1000 ÷ 20000000)

Table A.36 Save options

Group name	#1 code	#7 code	#S code	Code value description
Meteo	XW		JA	0 - **Off** 1 - **On**
Statistics	XS		AY	0 - **Off** 1 - **On**
Statistics Spectrum	XP		QI	0 - **Off** 1 - **On**
Max Spectrum	XM		BC	0 - **Off** 1 - **On**
Min Spectrum	Xm		BD	0 - **Off** 1 - **On**
Setup File Name			FW	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')

Table A.37 Report parameters

Group name	#1 code	#7 code	#S code	Code value description
Format			AS	0 - **A4** 1 - **A5**
Eject Page			AT	0 - **None** 1 - **Prompt** 2 - **Auto**
Title			FX	xxxxx - xxxxx up to 132 characters (permitted characters: 0-9, a-z, A-Z and following characters _,./;'<>?:[]{}!@#$%^&*()-+=)

Table A.38 Other control setting codes

Group name	#1 code	#7 code	#S code	Code value description
State of the instrument	S			0 - **Stop** 1 - **Start / Run** 2 - **Pause**

Group name	#1 code	#7 code	#S code	Code value description
Alarm Active		**AE**	**QE**	
Vibration Units		**WU**	**BR**	0 - **Non-Metric** 1 - **Metric**
ActiveSkin			**KM**	0 - **Solar** 1 - **Forest**
Clear logger memory (write only)		**CB**		**#7,CB;** This function clears the logger memory - all logger files will be deleted. The function returns **#7,CB;** This function is not accepted while the instrument is in the RUN state.
Logger memory free space (read only)		**BF**		**#7,BF;** This function returns logger memory free space in the format: **#7,BF,ddddd;** (**ddddd** - number of bytes in decimal format).
Number of logger files in current directory (read only)		**BN**		**#7,BN;** This function returns the number of logger files created to the current time in the format: **#7,BN,ddddd;** (**ddddd** - number of logger files in decimal format).
Real time clock settings		**RT**		Current real time clock settings in the format: **#7,RT,hh,mm,ss,DD,MM,YYYY;** where **hh:mm:ss** denote the time and **DD/MM/YYYY** gives the date.
Delete all (write only)		**DA**		**#7,DA;** This function deletes all files (result files and setup files). The function returns **#7,DA;** This function is not accepted while the instrument is in the RUN state.
Temperature (read only)		**TP**		x - temperature*10 °C
Pressure (read only)		**PR**		x - pressure hPa
Internal flash memory (read only)		**ME**		**#7,ME;** This function returns the size of internal flash memory in format **#7,ME,FlashMB;**
Load setup (write only)		**LS**		**#7,LS,setup_name;** This function loads setup and writes settings into EEPROM. The selected file must exist. The function returns **#7,LS;**
Save setup (write only)		**SS**		**#7,SS;** This function creates setup file based on the current settings. The function returns **#7,SS;**
Clear setup (write only)		**CS**		**#7,CS;** This function clears current setup (without RS232 and Bluetooth).
Delete file(s) (write only)		**DF**		**#7,DF;** **#7,DF,file_name;** **#7,DF,file_name<address;** This function deletes all result files or deletes file specified by **file_name** or internal flash address.
Delete setup(s) (write only)		**DS**		**#7,DS;** **#7,DS,file_name;** **#7,DS,file_name<address;** This function deletes all setup files or deletes file specified by **file_name** or internal flash address.
Unit subversion (read only)		**US**		**#7,US;** This function returns unit subversion.

Group name	#1 code	#7 code	#S code	Code value description
Battery State (read only)		**BS**		**#7,BS;** This function returns battery state in percentage. If the instrument is powered from the external power, this function return -1 or if it is powered from the USB interface, the function returns -2.
Statistical levels		**SL**		**#7,SL;** This function returns all statistical levels in the format **#7,SL,sl1,sl2,sl3,sl4,sl5,sl6,sl7,sl8,sl9,sl10;** **#7,SL,sl_index,sl_level;** This function sets statistical levels where **sl_index** is the statistical index, **sl_level** is the statistical level and it returns the following sequence of characters: **#7,SL;**
Power off (write only)		**PO**		This function powers off the instrument.
Clear RT60 averaging (write only)		**AC**		**#7,AC;** This function clears the RT60 averaging and returns the following sequence of characters: **#7,AC;**
Last logger name (read only)		**LB**		**#7,LB;** This function returns the name of last logger in format **#7,LB,logger_name;**
Last wave name (read only)		**LW**		**#7,LW;** This function returns the name of last wave in format **#7,LW,wave_name;**
PIC version (read only)		**PI**		x.xx
Hardboot version (read only)		**VH**		x.xx
Bootstrap version (read only)		**VB**		x.xx
File system version (read only)		**FS**		x.xx
Bluetooth internal software version (read only)		**BR**		x.xx
Active Disk		**UH**		1 - **USB Disk** 2 - **SD Card**
Meteo (read only)		**MT**		**#7,MT,<len>;<data>** This function returns buffered meteo data.

Group name	#1 code	#7 code	#S code	Code value description
		mt		**#7,mt,YYYY-MM-DD,HH:MM:SS,Tx.x,Px,Hx.x,Vx.x,Dx,Rx,Nx.x;** where: YYYY-MM-DD – results date HH:MM:SS - results time Tx.x - temperature in °C Px - pressure in hPa Hx.x - humidity in % Vx.x - wind speed in m/s Dx - wind direction in ° Rx - rain flag (0 or 1) Nx.x - rain intensity mm/h
Send screen (read only)		**SP**		**#7,SP,x;** where x: 1 - function returns the screen settings 2 - function returns the color palette 3 - function returns the screen status
External cable connection (read only)		**PC**		0 - disconnected 1 - connected
Alarm (read only)		**AL**		**#7,AL;** This function returns the alarm status in the format **#7,AL,curr_level,text,alarm_level;** where: curr_level – result that triggered the alarm text – text of the alarm alarm_level – the value of the trigger

Group name	#1 code	#7 code	#S code	Code value description
GPS position (read only)		**GP**		Get position of the instrument from the GPS module. Response format: **#7,GP,qq,YY,MM,DD,hh,mm,ss,LaD,LaM,LaS, LaS10,Ladir,LoD,LoM,LoS,LoS10,Lodir;** where: qq – Fix (qq>0), Not fix (qq=0), YY – Year, MM – month, DD – day, hh – hour, mm – minute, ss – seconds, LaD – Latitude degree, LaM – Latitude minutes, LaS – Latitude seconds, LaS10 – Latitude fraction of seconds, Ladir – Latitude direction (N- north, S- south), LoD – Longitude degree, LoM – Longitude minutes, LoS – Longitude seconds, LoS10 – Longitude fraction of seconds, Lodir – Longitude direction (E- east, W- west),
Start the measurement without data recording		**ST**		**#7,ST;** This function start the measurement without logging and wave recording.
Time from last GPS synchronization		**GL**		**#7,GL;** This function returns the time from last GPS synchronization.
Battery voltage		**BV**		**#7,BV;** This function returns the battery voltage.
USB voltage		**UV**		**#7,UV;** This function returns the USB voltage.
External voltage		**EV**		**#7,EV;** This function returns the external voltage.
Marker definition		**CM**		**#7,CM,<no>,"<name>",<event>,<point>;** where: <no> – marker number , “<name>” – marker name, <event> – 0 (Off) or 1 (On), <point> – 0 (Off) or 1 (On),
Marker status		**MR**		**#7,MR,<no>,<state>;** where: <no> – marker number , <state> – marker status,
Unit Name		**UN**		**#7,UN,<name>;**
Display the Unit Name on the screen		**DN**		**#7,DN,<time>,<color>;**

APPENDIX B. DATA FILE STRUCTURES (revision 3.30)

Each file consists of blocks of parameters followed by the logger data. The number and sequence of the blocks of parameters may vary depending on the type of measurement performed, however, the header block (see Table B.1.1) is always first in the file. Each data block consists of a specified number of words. The term word means two consecutive bytes, with the lower byte preceding the higher. If the words contain ASCII text characters, the low byte of the word also precedes the high byte. The number of words in a block is constant (as in the case of a file header) or is defined in the first or second word of a block. Exception is the block of the primary results record (see Table B.2.1), the length of which depends on the parameters placed in the respective blocks of parameters. The following chapters describe the structure of each block.

B.1. DESCRIPTION OF BLOCKS OF PARAMETERS

Table B.1.1. File header

Word number	Name	Comment
0..2	SvanPC	text „SvanPC”
3	001Ah	value 001Ah
4..15		reserved

Table B.1.2. File information

Word number	Name	Comment
0	0nn01h	01h = block identifier 0nnh = block length in words
1..4	FileName	file name (8 ASCII characters)
5		reserved
6	FileDate	date of file creation
7	FileTime	hour of file creation
…		reserved

Table B.1.3. Unit and software specification

Word number	Name	Comment
0	0nn02h	02h = block identifier 0nnh = block length in words
1	UnitSubtype	subtype of the instrument: 1 - SVAN 979 2 – SVAN 979u
2	UnitType	device type identifier: 9797 – SVAN 979, SVAN 979u
3..4	UnitNumber	serial number of the instrument
5	FirmwareVersion	firmware version number; for example, value 321 means version 3.21
6	FirmwareSubVer	additional number identifying internal firmware conversion; for example, the complete software version number is 3.21.5

7	FirmwareBetaSubVer	additional internal software upgrade number for Beta version; number is relevant only if the internal software upgrade is zero; for example, Beta version is 3.21.06
8	FirmwareDate	internal software date
9	FileSysVersion	version number of the result files system; for example, 321 means version 3.21
…		reserved

Table B.1.4. Information about calibration

Word number	Name	Comment
0	0nn47h	47h = block identifier 0nnh = block length in words
1	PreCalibrType	calibration type: 0 – no calibration 1 – calibration **By Measurement** 2 – calibration **By Sensitivity** 3 – factory calibration
2	PreCalibrDate	date of the calibration “Pre" (parameter important only for the performed calibration)
3	PreCalibrTime	hour of the calibration “Pre" (parameter important only for the performed calibration)
4	PreCalibrFactor	calibration “Pre" factor in 0.01 dB format (parameter important only for the performed calibration)
…		reserved

Table B.1.5. User’s text

Word number	Name	Comment
0	0nn03h	03h = block identifier, 0nnh = block length in words
1..	TitleText	comment text; ASCII character row (terminated by zero byte)

Table B.1.6. Information about the instrument name

Word number	Name	Comment
0	0nn58h	58h = block identifier 0nnh = block length in words
1	UnitNameID	instrument name identifier (text "UN")
2..	UnitName	ASCII character row (terminated by zero byte) specifying the instrument name
…		reserved

Table B.1.7. Measurement parameters

Word number	Name	Comment
0	0nn04h	04h = block identifier 0nnh = block length in words

Word number	Name	Comment
1	MeasureStartDate	start date of the measurement
2	MeasureStartTime	start time of the measurement
3	DeviceMode	measurement mode: 0 – vibration measurement mode, 1 – sound measurement mode,
4	DeviceFunction	measurement function 1 – **Level Meter** 2 – **1/1 Octave** 3 – **1/3 Octave** 5 – **Loudness** 6 – **FFT** 7 – **Tonality** 8 – **RT60** 15 – **1/6 Octave** 16 – **1/12 Octave** 19 - **STIPA**
5	MeasureInput	measurement Input type: 2 – measurement with the microphone 5 – measurement with the vibration accelerometer
6	Range	measurement range: 1 – **Low** 2 – **High**
7	StatDet	for sound measurement mode: 0 – measurement of statistical results with the linear detector 1 – measurement of statistical results with the exponential detector
8	RepCycle	number of measurement cycles (zero means infinity) - the parameter is important if the duration of the measurement cycle (IntTimeSec) is finite; for infinite measuring cycle time this parameter is irrelevant (see SplitCycles)
9	NofProf	number of measurement profiles
10	StartDelay	measurement start delay in seconds
11..12	IntTimeSec	duration of one measurement cycle in seconds (zero means infinity)
13	StartSync	measurement start synchronization: 0 – no synchronization, -1 – synchronization to full second 1 – synchronization to full minute 15 – synchronization to full 15 minutes 30 – synchronization to full 30 minutes 60 – synchronization to full hour
14	RmsInt	detector type for RMS/Leq results: 0 – measurement with linear detector 1 – measurement with exponential detector
15	SpecLogg	bit mask of logged spectra results: 8 – RMS/Leq spectrum (applies to octave spectra) 8 – average spectrum (applies to FFT spectrum) the remaining masks are reserved

Word number	Name	Comment
16	SummaryResLog	bit mask of logged cyclic results (Summary Results): 1 – Main Results 2 – Statistical Levels, 4 – Spectrum, 8 – Spectrum Max, 16 – Spectrum Min, 32 – Spectrum Peak, 64 – Statistical analysis in profiles 128 – Statistical analysis in spectrum 256 – RPM 512 – Meteo other masks are reserved
17	ExposureTime	exposure time in minutes (sound mode only)
18	RefAcc/LR1Time	for vibration measurement mode: – value of reference vibration acceleration in 0.01dB relative to 1µm/s^2 for sound measurement mode: – „Rolling Leq's" first result in seconds
19	RefVel/LR2Time	for vibration measurement mode: – value of reference vibration speed at 0.01dB relative to 1nm/s for sound measurement mode – Second „Rolling Leq's" score in seconds
20	RefDil	for vibration measurement mode: – value of reference vibration displacement at 0.01dB relative to 1pm for sound measurement mode: – reserved value
21	RPM_On	rotation measurement mode: 0 – disabled 1 – enabled
22	RPM_Pulse	Number of pulses per rotation
23	Widscreen	windscreen (only for sound measurement mode): 0 – measurement without windscreen 1 – measurement with windscreen
24	CompensationFilter	compensation filter (only for sound measurement mode): 0 – measurement without compensation filter 1 – measurement with the free field compensation filter 2 – measurement with the diffuse field compensation filter 3 – measurement with the SA279 (90°) outdoor filter 4 – measurement with the SA279 (0°) outdoor filter
25	VoltageInput	voltage input mode: 0 – off 1 – on
26	IEPE_Current	IEPE preamplifier currency: 0 – no current supply 1 – 1,5 mA 2 – 4,5 mA

Word number	Name	Comment
27	SplitMode	logger file splitting mode: 0 – no splitting -1 – split after each measurement cycle 15 – split after each full 15 minutes of real time clock 30 – split after each full 30 minutes of real time clock 60 – split after each full hour of the real time 1440 – split at defined times
28..33	SplitTimeN	Six timestamp values of logger file splitting (only if SplitMode is 1440): -1 – value is inactive 0..1439 – time in minutes (for example, 100 means 1:40 AM)
34	GpsLast30sSyncTime	time in seconds between start of measurement and last synchronization of real time clock based on GPS signal: - Value 0FFFFh means that within 30 seconds before the start of measurement, real-time clock synchronization did not occur - The parameter says nothing about synchronizing the real-time clock before 30 seconds prior to the measurement start
35..36	MeasureStartTimeMs	measurement start time in milliseconds
37	SplitCycles	number of split measurement files (zero means infinity) - the parameter is important if the duration of the measurement cycle (IntTimeSec) is set to infinity; for finite measuring cycle times this parameter is irrelevant (see: RepCycle)
38		reserved
39		reserved
40	TonalityStandard	Tonality standard: 0 – **ISO 20065-16** 1 – **ISO 226-2003** 2 – **ISO 226-1987**
41	TonalityMode	Tonality measurement mode: 0 – **Auto** 1 – **Manual**
42	MeasCount	[1…20] – numer of measuremets
43	FileLastID	last file ID in a folder
44…47	Directory	directory name
…		reserved

Table B.1.8. Measurement triggering parameters

Word number	Name	Comment
0	0nn2Bh	2Bh = block identifier 0nnh = block length in words
1	TriggerMode	trigger mode: 0 – measurement without triggering 1 – positive slope (**Slope +**) 2 – negative slope (**Slope –**) 3 – positive level trigger (**Level +**) 4 – negative level trigger (**Level –**) 6 – positive gradient (**Grad +**) 7 – external pulse

2	TriggerSource	trigger source (parameter relevant only to modes in which triggering is related to signal level): 0 – triggering RMS/Leq level from the first profile - Other remaining values
3	TriggerLevel	trigger threshold value in 0.01 dB format (parameter relevant only to modes in which triggering is related to signal level)
4	TriggerGrad	trigger gradient value in 0.01 dB/ms format (parameter relevant only to „Grad+" mode)
5		reserved
6		reserved
7	TriggerStep	trigger time check in 0.1ms format
…		reserved

Table B.1.9. Logging triggering parameters

Word number	Name	Comment
0	0nn2Ch	2Ch = block identifier 0nnh = block length in words
1	TriggerMode	triggering mode: 0 – logging without triggering 3 – positive level (**Level +**) 4 – negative level (**Level –**)
2	TriggerSource	triggering source: 0 – triggering by RMS/Leq level from the first profile – remaining values reserved
3	TriggerLevel	trigger threshold value in 0,01 dB format
4		reserved
5	TriggerPre	number of records logged before trigger condition occurred
6	TriggerPost	number of records logged after trigger condition disappears
…		reserved

Table B.1.10. Reserved block

Word number	Name	Comment
0	0nn31h	31h = block identifier 0nnh = block length in words
…		reserved

Table B.1.11. Waveform signal registration (wave recording)

Word number	Name	Comment
0	0nn2Dh	2Dh = block identifier 0nnh = block length in words

Word number	Name	Comment
1	RecordingMode	recording mode: 0 – no recording 1 – continuous recording 2 – recording on trigger 3 – alarm mode.
2	TriggerMode	triggering mode (parameter relevant only to triggering mode): 0 – recording without triggering 1 – positive slope (**Slope +**) 2 – negative slope (**Slope –**) 3 – positive level (**Level +**) 4 – negative level (**Level –**) 7 – external pulse 10 – triggering after every measurement cycle
3	TriggerSource	triggering source (parameter relevant only to modes in which triggering is related to signal level): 0 – triggering by RMS/Leq level from the first profile, – remaining values reserved
4	TriggerLevel	triggering threshold value in 0.01 dB format (parameter relevant only for modes in which triggering is related to signal level)
5		reserved
6	TriggerPre	recording period before triggering condition occurs in the 10 ms format (parameter relevant only for recording on trigger and in alarm mode)
7		reserved
8	TriggerStep	triggering status check period in 0.1 ms format - zero means period equal to logger step (parameter relevant only for recording with triggering)
9	SamplingFreq	signal rate Sample in 10 Hz format
10	RecTime	maximum recording time in seconds - zero means no registration time limit (parameter relevant only for recording with triggering)
11	RecFilter	measurement filter for the recorded signal: 0 – **HP** 1 – **Z** 2 – **A** 3 – **C** 5 – **B**
12	BitsPerSample	number of bits per sample
13	TriggerOnMarker	marker triggering (parameter relevant only to triggering mode): 0 – disabled 1 – enabled
…		reserved

Table B.1.12. Parameters of external port settings (Multifunction I/O)

Word number	Name	Comment
0	0nn2Eh	2Eh = block identifier 0nnh = block length in words

Word number	Name	Comment
1	Mode	port mode: 0 – analog output (**Analog Out**) 1 – digital input (**Digital In**), 2 – digital output (**Digital Out**)
2	Function	port function for digital input mode: 0 – external triggering input port function for digital output mode: 0 – external triggering pulse output 1 – alarm pulse output
3	ActiveLevel	impulse active level (parameter relevant only to alarm pulse function in digital output mode): 0 – low active level (Low) 1 – high active level (High)
4	Source	triggering source (parameter relevant only for alarm pulse function in digital output mode): 0 – triggering by RMS/Leq level from the first profile 1 – triggering by the Peak level from the first profile 2 – triggering by max level from the first profile 3 – triggering by P-P/Spl level from the first profile mode
5	SourceType	triggering type (parameter relevant only for alarm pulse function in digital output mode)): 0 – triggering condition checked every second (**Current**) 1 – triggering condition checked after the end of the measurement cycle (**Periodic**)
6	AlarmLevel	triggering threshold value in 0.01 dB format (parameter relevant only to alarm function in digital output mode)
7	Polarisation/Slope	polarity of external triggering pulse (parameter relevant only to instantaneous triggering pulse function): 0 – positive polarity 1 – negative polarity active slope of external triggering pulse (essential for out-of-range performance): 0 – active positive slope 1 – active negative slope
…		reserved

Table B.1.13. Main block of profile parameters

Word number	Name	Comment
0	0nn05h	05h = block identifier 0nnh = block length in words
1	00nxxh	n = number of profiles, 0xxh = profile bit mask (bit mask informs which parameter profiles are available)
2..	Profile[1]	inner block with identifier 06h containing parameters of the first profile (if the first profile bit mask is set) – see Table B.1.14
...	...	...
...	Profile[n]	inner block with identifier 06h containing parameters of the last profile (if the bit mask of the last profile is set) – see Table B.1.14

Word number	Name	Comment
…		reserved

Table B.1.14. Profile parameters (block exists only inside the main block - see Table B.1.13)

Word number	Name	Comment
0	0nn06h	06h = block identifier 0nnh = block length in words
1	Detector	type of exponential detector in vibration measurement mode: 0 – 100 ms time constant detector 1 – 125 ms time constant detector 2 – 200 ms time constant detector 3 – 500 ms time constant detector 4 – 1 s time constant detector 5 – 2 s time constant detector 6 – 5 s time constant detector 7 – 10 s time constant detector type of exponential detector in sound measurement mode: 0 – **Impulse** 1 – **Fast** 2 – **Slow**
2	Filter	measurement filter in vibration measurement mode: -3 – **R3** -2 – **R2** -1 – **R1** 0 – **HP** 1 – **HP1** 2 – **HP3** 3 – **HP10** 4 – **Vel1** 5 – **Vel3** 6 – **Vel10** 7 – **VelMF** 8 – **Dil1** 9 – **Dil3** 10 – **Dil10** 21 – **Wh** measurement filter in sound measurement mode: -3 – **R3** -2 – **R2** -1 – **R1** 1 – **Z** 2 – **A** 3 – **C** 4 – **G** 5 – **B**

Word number	Name	Comment
3	LoggerRes	bit mask of results written to logger in vibration measurement mode: 1 – Peak 2 – P–P 4 – Max 8 – RMS bit mask of results written to logger in sound measurement mode: 1 – Peak 2 – Max 4 – Min 8 – Leq 16 – LR1 32 – LR2 64 – LXY
…		reserved

Table B.1.15. Real Time Filters parameters

Word number	Name	Comment
0	0nn21h	21h = block identifier 0nnh = block length in words
1	Type[1]	type of the first filter: 0 – highpass filter 1 – lowpass filter 2 – bandpass filter
2	Order[1]	order of the first filter
3..4	LowPole[1]	low pole of the first filter in 10mHz format (parameter not relevant to low-pass filter)
5..6	HighPole[1]	high pole of the first filter in 10 mHz format (parameter not relevant to the upper-pass filter)
...		second filter parameters
...		third filter parameters
…		reserved

Table B.1.16. Marker parameters

Word number	Name	Comment
0	0043h	43h = block identifier
1	BlockLength	block length in words
2	MarkerCount	number of markers
3..7	MarkerName[1]	name of the first marker (10 ASCII symbols)
8		reserved
9	MarkerType[1]	type of the first marker: 0 – block marker 1 – point marker
...		parameters of further markers
…		reserved

Table B.1.17. Statistical analysis parameters (relevant only in Sound measurement mode)

Word number	Name	Comment
0	0nn09h	09h = block identifier 0nnh = block length in words
1	00pxxh	p = number of profiles, 0xxh = profile bit mask (bit mask informs for which profiles parameters are available)
2..	ProfileStat[1]	Internal block with identifier 0Ah containing parameters of the first profile (if the first profile bit mask is set)
...	...	...
...	ProfileStat[p]	internal block with 0Ah containing parameters of the last profile (if the last profile bit mask is set)
…		reserved

Table B.1.18. Parameters of the profile histogram (block exists only inside the main block – see Table B.1.17)

Word number	Name	Comment
0	0nn0Ah	0Ah = block identifier 0nnh = block length in words
1	N	number of statistical class histogram
2	BottomClass	first class histogram in 0.01 dB format
3	ClassWidth	class histogram width in 0.01 dB format
…		reserved

Table B.1.19. Octave and partial octave spectra analysis

Word number	Name	Comment
0	004Ah	4Ah = block identifier
1	BlockLength	block length in words
2		reserved
3	SystemBase	filter database (2 or 10)
4	OctaveDivider	octave division (type of filters): 1 – octave filters 3 – 1/3 octave filters 6 – 1/6 octave filters 12 – 1/12 octave filters
5	FirstFreqIndex	index of the first filter; the exact centre filter frequency in Hertz according to its index is given by the following formula: $f = 1000 \cdot G^{i/b}$ – for odd value b $f = 1000 \cdot G^{(2i+1)/(2b)}$ – for even value b where: $G = 2$ – for filter base 2 $G = 10^{0.3}$ – for filter base 10 i – filter index b – octave division
6	N	number of octave or partial octave filters

Word number	Name	Comment
7	T	number of total results; total results, depending on the measurement mode, are calculated with the following filters: in vibration measurement mode: Total[1] – measurement with HP filter Total[2] – measurement with a filter from the second profile Total[3] – measurement with a filter from the third profile in sound measurement mode: Total[1] – measurement with A filter Total[2] – measurement with C filter Total[3] – measurement with Z filter
8	Filter	spectrum measurement filter: 0 – **HP** 1 – **Z** 2 – **A** 3 – **C** 5 – **B**
9	Detectors	type of RMS detectors for spectra: 0 – linear detector (**Linear**) 1 – exponential detector **Fast** 2 – exponential detector **Slow**
10	Band	frequency range: 0 – full band (**Full**) 1 – audible band (**Audio**)
11	MinMaxDetectors	type of RMS detectors for Max and Min spectra: 0 – linear detector (**Linear**) 1 – exponential detector **Fast** 2 – exponential detector **Slow**
…		reserved

Table B.1.20. Parameters of 1/1 and 1/3 octave spectra histograms

Word number	Name	Comment
0	0nn13h	13h = block identifier 0nnh = block length in words
1	N	number of histograms (spectra bands and total results)
2	NofClasses	number of statistical histogram classes
3	BottomClass	first class histogram level in 0.01 dB format
4	ClassWidth	histogram classes width in 0.01 dB format
…		reserved

Table B.1.21. Parameters of FFT analysis

Word number	Name	Comment
0	0051h	51h = block identifier
1	BlockLength	block length in words
2..6		reserved
7..8	M	frequency resolution (total value of the mantissa)
9	E	frequency resolution (binary exponent); exact resolution of the frequency in Hertz is given by the following formula: $\Delta F = M \cdot 2^{E}$
10	N	number of spectra bands
11	T	number of total results (if there is only one total result, it is calculated with the same filter and in the same band as the spectrum – see offset 17)
12	Band	analysis band (approximate values): 0 – 40 kHz band 1 – 20 kHz band 2 – 10 kHz band 3 – 5 kHz band 4 – 2,5 kHz band 5 – 1,25 kHz band 6 – 625 Hz band 7 – 312 Hz band 8 – 156 Hz band 9 – 78 Hz band
13	Window	window function: 0 – **Hanning** 1 – **Rectangular** 2 – **Flat Top** 3 – **Kaiser-Bessel**
14	WindowFactor	window correction factor in 0.01 dB format
15	Averaging	type of averaging: 0 – linear averaging 1 – exponential averaging
16	TimeConst	time averaging constant in milliseconds (exponential averaging only)
17	Filter	spectrum measurement filter: 0 – **HP** 1 – **Z** 2 – **A** 3 – **C** 5 – **B**
18	InstFreq	frequency of instantaneous spectra counting
…		reserved

Table B.1.22. Reverberation time analysis parameters (RT60)

Word number	Name	Comment
0	0nn1Ah	1Ah = block identifier 0nnh = block length in words
1	ResultsType	type of results included in the block with the identifier 1Bh: 1 – single measurement results 2 – averaged results
2	Method	measurement method: 1 – **Decay** 2 – **Impulse**
3	Spectrum	Type of measured spectra: 1 – 1/1 octave 2 – 1/3 octave
4	TimeStep	measurement step in milliseconds
5	MeasureTime	measurement time in seconds
6		reserved
7	DispSmooth	parameter "smoothing" of the time curve (0 means no smoothing)
8	NoiseMargin	level of noise margin in the format 0,01 dB
9		reserved
10	AverNo	number of averaged results
…		reserved

Table B.1.23. RT60 T0 offset parameters

Word number	Name	Comment
0	0xnn71h	71h = block identifier 0nnh = block length in words
1	SystemBase	filter database (2 or 10)
2	OctaveDivider	octave division (type of filters): 1 – octave filters 3 – 1/3 octave filters
3	FirstFreqIndex	index of the first filter; the exact centre filter frequency in Hertz according to its index is given by the following formula: $f = 1000 \cdot G^{i/b}$ – for odd value b $f = 1000 \cdot G^{(2i+1)/(2b)}$ – for even value b where: G = 2 – for filter base 2 $G = 10^{0.3}$ – for filter base 10 i – filter index b – octave division
4	N	number of values
5	T0_Offset[1]	First offset value
...	...	...
5+N-1	T0_Offset[N]	Last offset value
…		reserved

Table B.1.24. Alarms events parameters

Word number	Name	Comment
0	0060h	60h = block identifier
1	BlockLength	block length in words
2	EventCount	number of defined events (Events)
3..10	EventName[1]	name of the first event (16 ASCII symbols)
11		reserved
12	EventType[1]	type of the first event: 0 – block event 1 – point event
...		parameters of the following events
…		reserved

Table B.1.25. STIPA parameters

Word number	Name	Comment
0	0063h	63h = block identifier
1	BlockLength	block length in words
2	Standard	standard: 0 – IEC 60268-16x2 1 – IEC 60268-16x3
3	Averaging	averaging type: 0 – Manual 1 – Auto
4	N	Project name length
5..	ProjectName[N]	Project name
5+N	M	Area name length
6+N..	AreaName[M]	Area name
6+N+M	PointId	Point Id
7+N+M	K	Source name length
8+N+M..	SourceName[K]	Source name
8+N+M+K	CalibrLevel	Source calibration factor in 0.01 dB format
…		reserved

Table B.1.26. Logger parameters

Word number	Name	Comment
0	0nn0Fh	0Fh = block identifier 0nnh = block length in words
1	Ts	logger step in seconds
2	Tms	logger step in milliseconds; actual logger step in seconds is expressed as: T = Ts + Tms / 1000
3..4	LoggLength	total block size of recorded results in bytes
5..6	NofLoggRec	number of saved records

Word number	Name	Comment
7..8	NofAllRec	number of all records measured during the entire measurement
9..10		reserved
11	MStUnitNumber	serial number of the monitoring station (if the parameter value is equal to 0FFFFh this parameter is irrelevant)
12	MStUnitType	type of monitoring station (if parameter value is 0FFFFh this parameter is irrelevant): 210 – SV 210 monitoring station 211 – SV 211 monitoring station
13	MStFirmwareVersion	firmware version number of the monitoring stations; for example, 123 means version 1.23 (if the parameter value is 0FFFFh this parameter is not relevant)
14..15	MStIntTimeSec	meteorological results averaging time used in the monitoring station in seconds (if the parameter value is 0FFFF'FFFFh this parameter is negligible)
16..17	NofSummaryRes	number of records saved as the summary results
…		reserved

B.2. DESCRIPTION OF LOGGER'S DATA BLOCKS

The logger consists of data records of basic results that are recorded with a fixed logger step (see Table B.1.23, Ts and Tms parameters) and various additional information blocks (markers). Markers contain information about events that occurred during the registration process, as well as additional measurement results independent of the basic results records. Markers can only appear between full base result records and occur entirely asynchronously.

The identification of the logger block is based on the four highest bits of the first and last block words:

08xxxh – block of user markers,

09xxxh – reserved block,

0Axxxh – pause marker block,

0Bxxxh – marker block of discontinuity of basic results records,

0Cxxxh – other marker blocks.

In general, the rule is that in the first word of the block the bit b11 is deleted and in the last word the bit b11 is set, except for the user marker block (08xxxh), because the block consists of only one word. If the highest four bits of the start or end of a block word are not any of the numbers from 08h to 0Ch, then we are dealing with a block of the basic result record. The table below shows the structure of the record of the basic results record and the structure of the markers.

Table B.2.1 Block of primary results record (data name in square brackets means data is optional)

Word number	Name	Comment
0	Flags	bit 0 (overload flag): 0 – no overload 1 – overload occurred bit 1 (excessive vibration flag): 0 – no excessive vibration 1 – excessive vibration bits 2..7 – reserved bits 8..(7+n) – underrange flags in “n” profiles: 0 – the signal level is equal to or greater than the declared lower range of measured values 1 – the signal level is lower than the declared lower range of measured values remaining bits are reserved
1..	[ResProf_1[..]]	measurement results of the first profile: – number and order of results is determined by the result bit mask in the profile parameter block (see Table B.1.14, the word "LoggerRes") – results are in format 0,01 dB
...	...	...
...	[ResProf_n[..]]	measurement results of the n^{th} profile: – number and order of results is determined by the result bit mask in the profile parameter block (see Table B.1.13, the word "LoggerRes") – results are in format 0,01 dB, – The number of profiles comes from the corresponding parameter in the main parameter block (see Table B.1.12, the word "00nxxh").
...	[ResRPM[2]]	lowest and highest word of the RPM measurement result value: – result is available if the RPM measurement is enabled (see the word "RPM_On" in the measurement parameter block - Table B.1.7) – value of the result is calculated according to the formulas given in the comment of the RPM measurement results block (see Table B.3.5)
...	[ResSpec[..]]	results of the spectrum measurement: – results are available if the spectra recording during measurement is enabled (see the word "SpecLogg" in the measurement parameter block - Table B.1.7) – results are in format 0,01 dB

Table B.2.2 Block of user marker (only one word)

Word number	Name	Comment
0	08nnnh	08h = block identifier 0nnnh= bit mask of markers states: – each bit specifies the state of one marker (the lowest bit defines the state of the first marker, the next bit defines the state of the next marker, and so on.) – set bit indicates that the marker is active – erased bit indicates that the marker is inactive – number of available markers (maximum 12) and marker type (block or spot) are defined in the corresponding parameter block (see Table B.1.16)

Table B.2.3 Reserved block

Word number	Name	Comment
0	09xxxh	09h = block identifier 0xxxh = any value (bit b11 is zero)
1	0nnnnh	block length in words
2..		reserved
...	0nnnnh	block length in words
...	09xxxh	09h = block identifier, 0xxxh = any value (bit b11 is set)

Table B.2.4 Block of pause marker

Word number	Name	Comment
0	0A0nnh	0A0h = ID of the first word of the block 0nnh = first (the lowest) byte of the parameter
1	0A1xxh	0A1h = ID of the second word of the block 0xxh = second byte of the parameter
2	0A2yyh	0A0h = ID of the third word of the block 0yyh = third byte of the parameter
3	0A3zzh	0A3h = ID of the forth (last) word of the block 0zzh = forth (last) byte of the parameter – value 0zzyyxxnnh specifies the duration of the pause in milliseconds

Table B.2.5 Block of marker for lack of continuity of record results

Word number	Name	Comment
0	0B0nnh	0B0h = ID of the first word of the block 0nnh = first (the lowest) byte of the parameter
1	0B1xxh	0B1h = ID of the second word of the block 0xxh = second byte of the parameter
2	0B2yyh	0B0h = ID of the third word of the block 0yyh = third byte of the parameter
3	0B3zzh	0B3h = identifier of the fourth (last) word of the block 0zzh = forth (last) byte of the parameter – value 0zzyyxxnnh specifies the number of results records that have not been registered

Table B.2.6 Block of meteorological data calculated with step of the measurement cycle

Word number	Name	Comment
0	0C1nnh	0C1h = block start identifier 0nnh = block length in words
1	Temperature	temperature measurement result in format 0,1°C
2	Pressure	atmospheric pressure measurement result in hectopascals
3	Humidity	relative humidity measurement result in format 0,1%
4	AvgWindSpeed	average wind speed measurement result in the format 0,1 m/s
5	WindDirection	wind direction in degrees for maximum wind speed (if the parameter value is equal to 0FFFFh the direction is undefined)

Word number	Name	Comment
6	MaxWindSpeed	maximum wind speed measurement result in the format 0,1 m/s
7..8	WindDirTotalPuffs	number of wind measurement samples
9	RainDetection	flag of rain show
...		reserved
...	0C9nnh	0C9h = block end identifier 0nnh = block length in words

Table B.2.7 Block of marker for meteorological data block calculated with the logger step

Word number	Name	Comment
0	0C704h	0C704h= block start identifier
1	0nnnnh	block length in words
2	N_1s	number of averaged 1 second results
3	Temperature	temperature measurement result in format 0,1°C
4	Pressure	atmospheric pressure measurement result in hectopascals
5	Humidity	relative humidity measurement result in format 0,1%
6	WindDirTotalPuffs	number of non-zero wind sample
7	AvgWindSpeed	average wind speed measurement result in the format 0,1 m/s
8	WindDirection	wind direction in degrees for maximum wind speed (if the parameter value is equal to 0FFFFh the direction is undefined)
9	MaxWindSpeed	maximum wind speed measurement result in the format 0,1 m/s
...		reserved
...	0nnnnh	block length in words
...	0CF04h	0CF04h = block end identifier

Table B.2.8 Block of marker for meteorological rainfall calculated with the logger step

Word number	Name	Comment
0	0C705h	0C705h= block start identifier
1	0nnnnh	block length in words
2	RainIntensity	rainfall intensity in 0.1 mm / h format (this is a rolling average for 1 minute measurement)
3..4	RainAccumulation	sum of rainfall in 0.01 mm format
5..6	RainDuration	duration of precipitation in seconds
7	HailIntensity	hail intensity in the format 0,1/cm²h (this is a rolling average for 1 minute measurement)
8..9	HailAccumulation	sum of hail in the format 0,1/cm²
10..11	HailDuration	duration of the hail in seconds
...		reserved
...	0nnnnh	block length in words
...	0CF05h	0CF05h = block end identifier

Table B.2.9 Block of marker for wave file recording

Word number	Name	Comment
0	0C2nnh	0C2h = block start identifier 0nnh = block length in words
1..4	FileName	File name (8 ASCII symbols)
...		reserved
...	0CAnnh	0CAh = block end identifier 0nnh = block length in words

Table B.2.10 Block for the Summary Results

Word number	Name	Comment
0	0C300h	0C300h= block start identifier
1	0nnnnh	block length in words
2..	SumResBlock[..]	set of cyclic results blocks; each block has its own header with ID and block length; blocks of cyclic results are described in chapter B.3.
...	0nnnnh	block length in words
...	0CB00h	0CB00h = block end identifier

Table B.2.11 Block of marker for alarms

Word number	Name	Comment
0	0C5nnh	0C5h = block start identifier 0nnh = block length in words
1	AlarmEventStateP	point event state bit mask: – each bit specifies the state of one event (the lowest bit defines the state of the first event, the next one – the second event, and so on), – set bit indicates that the event is active – cleared bit indicates that the event is inactive – number of available events and the type (block or point) are defined in the corresponding block of parameters (see Table B.1.23)
2	AlarmEventState	block event state bit mask: – each bit specifies the state of one event (the lowest bit defines the state of the first event, the next one – the second event, and so on) – set bit indicates that the event is active – cleared bit indicates that the event is inactive – number of available events and the type (block or point) are defined in the corresponding block of parameters (see Table B.1.23)
3	AlarmEventSMS	bit mask of sent SMS: – each bit specifies the sending status of the SMS for one event (the lowest bit specifies the SMS sending status for the first event, the next one for the second event, and so on) – set bit indicates that SMS has been sent – cleared bit indicates that SMS has not been sent – number of available events is defined in the corresponding block of parameters (see Table B.1.23)

Word number	Name	Comment
4	AlarmEventEmail	bit mask of sent e-mail: – each bit specifies the sending status of the e-mail for one event (the lowest bit specifies the e-mail sending status for the first event, the next one for the second event, and so on) – set bit indicates that e-mail has been sent – cleared bit indicates that e-mail has not been sent – number of available events is defined in the corresponding block of parameters (see Table B.1.23)
...		reserved
...	0CDnnh	0CDh = block end identifier 0nnh = block length in words

Table B.2.12 Blocks for reserved markers

Word number	Name	Comment
0	0C7kkh	0C7kkh = block start identifier (0kkh is an additional number from 0 to 127 identifying the block)
1	0nnnnh	block length in words
2..		reserved
...	0nnnnh	block length in words
...	0CFkkh	0CFkkh = block end identifier (0kkh is an additional number from 0 to 127 identifying the block)

B.3. DESCRIPTION OF CYCLICAL RESULTS BLOCKS (SUMMARY RESULTS)

Table B.3.1 Block of counters

Word number	Name	Comment
0	0nn59h	59h = block identifier 0nnh = block length in words
1..2	CycleNo	measurement cycle number
…		reserved

Table B.3.2 Block of Summary Results

Word number	Name	Comment
0	0nn07h	07h = block identifier 0nnh = block length in words
1	00pxxh	p = number of profiles, 0xxh = profile bit mask (the bit mask indicates for which profiles the results are available)

Word number	Name	Comment
2..	Profile[1]	internal block with identifier 08h with the results for the first profile whose bitmask is set - see Table B.3.3
...	...	...
...	Profile[p]	internal block with identifier 08h with the results for the last profile whose bitmask is set - see Table B.3.3
…		reserved

Table B.3.3 Results for one profile (block exists only inside the Summary results block – see Table B.3.2)

Word number	Name	Comment
0	0nn08h	08h = block identifier 0nnh = block length in words
1..2	Time	for the results of the first profile: – measurement time in seconds for the results of the second profile: – overload duration in seconds for the results of the third profile: – duration of excessive vibration in seconds
3	Peak	value of the "Peak" result in the format 0.01 dB
4	P–P/SEL	"P-P" value in 0.01 dB format for vibration measurement mode or "SEL" value in 0.01 dB format for sound measurement mode
5	Max	value of the "Max" result in the format 0.01 dB
6	Reserved/ Min	value reserved for vibration measurement mode or „Min" value in 0.01 dB format for sound measurement mode
7	Reserved/ Spl	value reserved for vibration measurement mode or „Spl" value in 0.01 dB format for sound measurement mode
8	RMS/Leq	"RMS" value in 0.01 dB format for vibration measurement mode or "Leq" value in 0.01 dB format for sound measurement mode
9	Reserved/ Lden	value reserved for vibration measurement mode or „Lden" value in 0.01 dB format for sound measurement mode
10	Reserved	
11	Reserved/ LTeq	value reserved for vibration measurement mode or „LTeq" value in 0.01 dB format for sound measurement mode
12	Reserved/ LR1	value reserved for vibration measurement mode or „LR1" value in 0.01 dB format for sound measurement mode
13	Reserved/ LR1	value reserved for vibration measurement mode or „LR2" value in 0.01 dB format for sound measurement mode
14		reserved

Word number	Name	Comment
15	Underrange	underrange flag: 0 – signal level values are equal to or greater than the declared lower range of measured values, 1 – signal level values are less than the declared lower range of measured values
16	ResultsFlags	bit 1 (overload flag): 0 – no overload, 1 – overload occurred bits 5..3 (Lden result type - only for sound measurement mode): 000 – no Lden result 001 – Ld result 010 – Le result 011 – Lde result 100 – Ln result 101 – Lnd result 110 – Len result 111 – Lden result remaining bits are reserved
17	Reserved/ EX	value reserved for the vibration measurement mode or EX result value in the format 0.01 dB for the sound measurement mode
18	Reserved/ SD	value reserved for the vibration measurement mode or SD result value in the format 0.01 dB for the sound measurement mode
...		reserved

Table B.3.4 Statistical analysis results (only for sound measurement mode)

Word number	Name	Comment
0	0nn17h	17h = block identifier 0nnh = block length in words
1	00pxxh	p = number of profiles, 0xxh = profile bit mask (bit mask informs about which profile results are available)
2	N	number of statistical levels
3	nn[1]	first level number (common to all profiles)
4	Lnn[1][1]	first level Lnn value for the first profile whose bit mask is set
...	...	...
...	Lnn[1][p]	first level Lnn value for the last profile whose bit mask is set
...	nn[i]	number of the next level (common for all profiles): i = 2..N
...	Lnn[i][1]	next level Lnn value for the first profile whose bit mask is set
...	...	...
...	Lnn[i][p]	next level Lnn value for the last profile whose bit mask is set
...		reserved

Table B.3.5 RPM measurement results

Word number	Name	Comment
0	0nn1Fh	1Fh = block identifier 0nnh = block length in words
1..2	ROT	lower and higher word of the last value of RPM measured during the measurement cycle; the value of the result is calculated according to the formulas: rps = 1/d – number of revolutions per second, rpm = 60/d – number of revolutions per minute where: $d = m \cdot 2^w$ m = ((H & 7Fh)<<16) + ((L & 7FFFh)<<1) w = ((H>>8) & 7Fh) – 87 L – lower word of the result H – higher word of the result & – bit product operator >> – bit right shift operator << – bit left shift operator
3..4	RMAX	lower and higher word of the maximum value of the rpm measured during the measurement cycle; the value of the result is calculated according to the formulas given in the comment of the ROT result
5..6	RMIN	lower and higher word of the minimum value of the rpm measured during the measurement cycle; the value of the result is calculated according to the formulas given in the comment of the ROT result
…		reserved

Table B.3.6 Loudness measurement results

Word number	Name	Comment
0	001Eh	1Eh = block identifier
1	BlockLength	block length in words
2	OverloadFlags	overload flags: bit 0 – level 130 dB exceeded, bit 1 – measurement path overloaded
3..242	BarkVal[1..240]	240 values of the bark spectrum in the format 0,1 son
243	BarkTotalVal	value of the total result in the format 0,1 son
…		reserved

Table B.3.7 Results of octave and partial-octave analysis

Word number	Name	Comment
0	0nnxxh	0xxh = block identifier: 04Bh – results of averaged spectrum 04Ch – results of minimum spectrum 04Dh – results of maximum spectrum 0nnh = block length in words
1		reserved
2	Result[1]	value of the first result in the format 0,01 dB
3	Result[2]	value of the second result in the format 0,01 dB

Word number	Name	Comment
...	...	...
...	Result[N+T–1]	value of the penultimate result in the format 0,01 dB
...	Result[N+T]	value of the last result in the format 0.01 dB (the number of spectral bands and the number of total results are specified in the corresponding octave and partial-octave analysis block of results - see Table B.1.19**Error! Reference source not found.**)
…		reserved

Table B.3.8 Results of FFT analysis

Word number	Name	Comment
0	00xxh	0xxh = block identifier: 052h – results of averaged spectrum 053h – results of minimum spectrum 054h – results of maximum spectrum
1	BlockLength	block length in words
2		reserved
3..4	NofAver	number of averaged spectra
5	Result[1]	value of the first result in the format 0,01 dB
6	Result[2]	value of the second result in the format 0,01 dB
...	...	...
...	Result[N+T–1]	value of the penultimate result in the format 0,01 dB
...	Result[N+T]	value of the last result in the format 0,01 (number of spectral lines and the number of aggregate results are determined in the corresponding FFT analysis block of results - see Table B.1.21)
…		reserved

Table B.3.9 Results of statistical analysis

Word number	Name	Comment
0	0xx0Bh	0Bh = block identifier 0xxh = profile bit mask
1	BlockLength	block length in words
2..3	Histogram[1]	histogram counter of the first class
4..5	Histogram[2]	histogram counter of the second class
...	...	...
...	Histogram[N–1]	histogram counter of the penultimate class
...	Histogram[N]	histogram counter of the last class (number of statistical classes of the histogram N is given in the block of profile histogram parameters - see Table B.1.18)
…		reserved

Table B.3.10 Results of statistical analysis for 1/1 and 1/3 octaves

Word number	Name	Comment
0	0xx14h	14h = block identifier 0xxh = spectrum band number (counted from 1) for which the histogram is calculated
1	BlockLength	block length in words
2..3	Histogram[1]	histogram counter for the first class
4..5	Histogram[2]	histogram counter for the second class
...	...	...
...	Histogram[N–1]	histogram counter for the penultimate class
...	Histogram[N]	histogram counter for the last class (number of statistical classes of the histogram N is given in the block of 1/1 and 1/3 octave histogram parameters – see Table B.1.20)
...		reserved

Table B.3.11 Results of GPS measurements

Word number	Name	Comment
0	0nnxxh	0xxh = block identifier: 34h – GPS measurement results at the beginning of the measurement cycle 35h – GPS measurement results at the end of the measurement cycle 0nnh = block length in words
1	Quality	GPS signal quality: 0 – no signal 1 – „FIX” 2 – „FIX–DIF”
2	TimeSec	value of seconds of real-time clock
3	TimeMin	value of minutes of real-time clock
4	TimeHour	value of hours of real-time clock
5	DateDay	day number
6	DateMonth	month number
7	DateYear	year number
8	LatitudeDeg	latitude - number of degrees
9	LatitudeMin	latitude - number of minutes
10	LatitudeSec	latitude - number of seconds
11	LatitudeMSec	latitude - number of milliseconds in the format 10 ms
12	LatitudeDir	latitude - orientation (ASCII symbol): N – latitude north, S – latitude south
13	LongitudeDeg	longitude - number of degrees
14	LongitudeMin	longitude - number of minutes
15	LongitudeSec	longitude - number of seconds
16	LongitudeMSec	longitude - number of milliseconds in the format 10 ms
17	LongitudeDir	longitude - orientation (ASCII symbol): E – longitude east W – longitude west

Word number	Name	Comment
18	Altitude	altitude - the number of meters
19	Altitude10	absolute altitude - number of decimetres
20	Speed	speed in format 0,01 km/h
…		reserved

Table B.3.12 Meteorological measurement results (Meteo)

Word number	Name	Comment
0	002Ah	2Ah = block identifier
1	BlockLength	block length in words
2	MStUnitNumber	serial number of the monitoring station
3	MStUnitType	type of monitoring station: 210 – SV 210 monitoring station 211 – SV 211 monitoring station
4	MStFirmwareVersion	firmware version number of the monitoring stations; for example, 123 means version 1.23
5..6	MStIntTimeSec	meteorological results averaging time used in the monitoring station
7	Temperature	temperature measurement result in format 0,1°C
8	Pressure	atmospheric pressure measurement result in hectopascals
9	Humidity	relative humidity measurement result in format 0,1%
10	AvgWindSpeed	average wind speed measurement result in the format 0,1 m/s
11	WindDirection	wind direction in degrees for maximum wind speed (if the parameter value is equal to 0FFFFh the direction is undefined)
12	MaxWindSpeed	maximum wind speed measurement result in the format 0,1 m/s
13..14	WindDirTotalPuffs	number of wind measurement samples
15	N	number of directions of wind direction distribution
16..	WindDir[N]	wind direction distribution table - values in the format 0.1%
16+N	M	number of directions of measurement of maximum wind speed
...	WindMax[M]	table of maximum wind speeds - values in 0.1 m / s format
16+N+M	V	number of directions for measuring average wind speeds
...	WindAver[V]	table of average wind speeds - values in the format 0,1 m/s
16+N+M+V	RainDetection	flag of precipitation: **Note:** if the flag is zero, the next 10 words of precipitation parameters are not present in this block
+[0]	[RainIntensity]	rainfall intensity in 0.1 mm / h format (this is a rolling average for 1 minute measurement)
+[1..2]	[RainAccumulation]	sum of rainfall in 0.01 mm format
+[3..4]	[RainDuration]	duration of precipitation in seconds
+[5]	[HailIntensity]	hail intensity in the format 0,1/cm²h (this is a rolling average for 1 minute measurement)
+[6..7]	[HailAccumulation]	sum of hail in the format 0,1/cm²
+[8..9]	[HailDuration]	duration of the hail in seconds
…		reserved

Table B.3.13 STIPA results

Word number	Name	Comment
0	0061h	61h = block identifier
1	BlockLength	block length in words
2	STI	STI result in the format 0.01dB
3	LAeq	LAeq result in the format 0.01dB
4	LCeq	LCeq result in the format 0.01dB
5	N	number of frequencies of the STIPA analysis
6	LZeq[1]	LZeq result number for the first frequency in the format 0.01dB
7	Err1[1]	m(f1) error flag for the first frequency (0,1)
8	Mf1[1]	m(f1) result value for the first frequency in the format 0.01
9	Err2[1]	m(f2) error flag for the first frequency (0,1)
10	Mf2[1]	m(f2) result value for the first frequency in the format 0.01
i*5+1	LZeq[i]	LZeq result number for the next frequency in the format 0.01 dB
i*5+2	Err1[i]	m(f1) error flag for the next frequency (0,1)
i*5+3	Mf1[i]	m(f1) result value for the next frequency in the format 0.01
i*5+4	Err2[i]	m(f2) error flag for the next frequency (0,1)
i*5+5	Mf2[i]	m(f2) result value for the next frequency in the format 0.01
N*5+6	Flags	bit 0 – underrange flag bit 1 – overload flag
N*5+7	STI-Measured	STI result not considering Ambient Noise
…		reserved

Table B.3.14 STIPA Ambient noise results

Word number	Name	Comment
0	0062h	62h = block identifier
1	BlockLength	block length in words
2	N	number of frequencies of the STIPA analysis
3..	Distortion[N]	STIPA Ambient noise table in the format 0.01 dB
…		reserved

Table B.3.15 RT60 results

Word number	Name	Comment
0	00xxh	0xxh = block identifier: 1Bh – instantaneous results, 1Ch – averaged results
1	BlockLength	block length in words
2	ReferenceFreq	reference frequency in 0.01 Hz format (nominal value)
3		reserved

Word number	Name	Comment
4	Ntot	total number of summary results; Total results are calculated with the following filters: Total[1] – measured with filter A Total[2] – measured with filter C Total[3] – measured with filter Z
5	NF1	index of the lower analysis frequency related to the reference frequency
6	NF2	index of the upper analysis frequency related to the reference frequency
7	CalcFlag[1]	flag of the calculated results for the first frequency: 0 – no calculated results 1 – results calculated
8	EDT[1]	EDT result value for the first frequency in milliseconds
9	RT20[1]	RT20 result value for the first frequency in milliseconds
10	RT30[1]	RT30 result value for the first frequency in milliseconds
11	RTuser[1]	RTuser result value for the first frequency in milliseconds
12	N_EDT[1]	in the instantaneous results block: – reserved value in the averaged results block: – number of EDT averaged results for the first frequency
13	N_RT20[1]	in the instantaneous results block: – reserved value in the averaged results block: – number of RT20 averaged results for the first frequency
14	N_RT30[1]	in the instantaneous results block: – reserved value in the averaged results block: – number of RT30 averaged results for the first frequency
15	N_RTuser[1]	in the instantaneous results block: – reserved value in the averaged results block: – number of RTuser averaged results for the first frequency
6+i*9+1	CalcFlag[i]	flag of the calculated results for the next frequency: 0 – no calculated results 1 – results calculated
6+i*9+2	EDT[i]	EDT result value for the next frequency in milliseconds
6+i*9+3	RT20[i]	RT20 result value for the next frequency in milliseconds
6+i*9+4	RT30[i]	RT30 result value for the next frequency in milliseconds
6+i*9+5	RTuser[i]	RTuser result value for the next frequency in milliseconds
6+i*9+6	N_EDT[i]	in the instantaneous results block: – reserved value in the averaged results block: – number of averaged EDT results for the next frequency
6+i*9+7	N_RT20[i]	in the instantaneous results block: – reserved value in the averaged results block: – number of averaged RT20 results for the next frequency

Word number	Name	Comment
6+i*9+8	N_RT30[i]	in the instantaneous results block: – reserved value in the averaged results block: – number of averaged RT30 results for the next frequency
6+i*9+9	N_RTuser[i]	in the instantaneous results block: – reserved value in the averaged results block: – number of averaged RTuser results for the next frequency
…		reserved

Table B.3.16 RT60 averaging file list

Word number	Name	Comment
0	0077h	77h = block identifier
1	BlockLength	block length in words
2	FileCount	
[+0]	FileNameLength[i]	file name length in words
[+1..FileNameLength[i]]	FileName[i]	
...		reserved

Table B.3.17 Tonality results (ISO 20065:2016)

Word number	Name	Comment
0	0072h	72h = block identifier
1	BlockLength	block length in words
2	df	line spacing of the FFT spectrum in the format 0.001 Hz
3	N	number of lines if the FFT spectrum
4	TonPenalty	number of tones in the FFT spectrum
5	maxToneIndex	index of the maximum tone in the FFT spectrum
i*4+1	centerLine[i]	tone line index
i*4+2	L[i]	audibility of the tone in the format 0.01 dB
i*4+3	F1_index[i]	left boundary of the critical bandwidth, line index
i*4+4	F2_index[i]	right boundary of the critical bandwidth, line index
i*4+5	Lt[i]	tone level in the format 0.01 dB
i*4+6	Ls[i]	averaged signal level of the tone in the format 0.01 dB
i*4+7	Lg[i]	noise level of the tone in the format 0.01 dB
i*4+8	av[i]	masking index of the tone in the format 0.01 dB
i*4+9	Kt[i]	Spectrum level tuning in dB
i*4+10	sigma[i]	measurement uncertainty in the format 0.01 dB
…		reserved

Table B.3.18 Tonality partial results for postprocessing (ISO 20065:2016)

Word number	Name	Comment
0	0073h	73h = block identifier
1	BlockLength	block length in words
2	L[maxToneIndex]	partial L(max) result for post-processing, 0.01 dB
3	sigma[maxToneIndex]	partial sigma result (max) for post-processing, 0.01 dB

B.4. DATE AND TIME (EXAMPLE DECODING PROCEDURE)

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

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

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

APPENDIX C. TECHNICAL SPECIFICATIONS

C.1. SPECIFICATION OF SVAN 979 AS A SOUND LEVEL METER

C.1.1 Specification of SVAN 979 as SLM in the standard configuration

SVAN 979 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 979	sound & vibration analyser,
SV 17	microphone preamplifier,
G.R.A.S. 40AE	prepolarized free-field microphone (1/2", nominal sensitivity 50 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 979 instrument set

SC 59	Output cable for I/O connector, LEMO to 2 x BNC
SC 16	USB 1.1 cable
SA 22	Windscreen

Accessories available:

SV 55	RS 232 interface for SVAN 95x/97x instrument series
SC 93	Extension cable Lemo 7 (plug) to Lemo 7 (socket)
SA 08	microphone preamplifier holder (gooseneck)
SA 15	Power supply unit,
SA 17A	External battery pack,
SA 279	Outdoor microphone kit (waterproof).

Measured quantities

The measured quantities in the sound meter mode are: **PEAK**, **SPL**, **MAX**, **MIN**, **LEQ**, **Leq**, **SEL**, **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
High self-vibration warning	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.

Preamplifier can be connected with **SVAN 979** in two ways:
- directly attached to the meter or
- with the **SC 93/5** extension cable (with the microphone preamplifier holder mounted on tripod).

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 electrical conformance tests or the conformance tests with the acoustic coupler, all compensation filters must be* ***Off*** *(path: <Menu> / Measurement / Compensation Filter).*



Note: *For the conformance of acoustical tests, the* ***Free Field*** *compensation filter should be switched on and the Windscreen position must be* ***Off*** *(path: <Menu> / Measurement / Compensation Filter).*

If the case of Windscreen testing the Windscreen position must be ***On****.*



Note: *Installation of the SC 93 preamplifier extension cable is automatically detected by the instrument. When SC 93 is installed the "case compensation" filter is switching off.*

Periodical test upper frequency 8 kHz

Linear Operating Ranges

Two measurement 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 50 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	22	80	22	103	22	117	38	120	22	80	22	103	22	117	25	83	50	120
500 Hz	22	116	22	119	22	120	38	120	22	116	22	119	22	120	25	119	50	123
1 kHz	22	120	22	120	22	120	38	120	22	120	22	120	22	120	25	123	50	123
4 kHz	22	121	22	119	22	119	38	120	22	121	22	119	22	119	25	124	50	122
8 kHz	22	119	22	117	22	117	38	120	22	119	22	117	22	117	25	122	50	120
12.5 kHz	22	115	22	114	22	114	38	120	22	115	22	114	22	114	25	118	50	117

Table C.1.2. Linear operating range: „HIGH“ (primary level range) for the sinusoidal signal and microphone sensitivity 50 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	30	97	30	120	30	134	40	137	30	97	30	120	30	134	33	100	70	137
500 Hz	30	133	30	136	30	137	40	137	30	133	30	136	30	137	33	136	70	140
1 kHz	30	137	30	137	30	137	40	137	30	137	30	137	30	137	33	140	70	140
4 kHz	30	138	30	136	30	136	40	137	30	138	30	136	30	136	33	141	70	139
8 kHz	30	136	30	134	30	134	40	137	30	136	30	134	30	134	33	139	70	137
12.5 kHz	30	132	30	131	30	131	40	137	30	132	30	131	30	131	33	135	70	134



Note: *For the signals with the crest factor* ***n > 1.41*** *upper measurement 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***

Measurement ranges

Reference measurement range of the acoustic pressure High

Measurement frequency range of the acoustic pressure (-3 dB) 3.15 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 IEC 61672-1:2013 for Class 1
- **A** meeting requirements of IEC 61672-1:2013 for Class 1
- **C** meeting requirements of IEC 61672-1:2013 for Class 1
- **B** meeting requirements of IEC 60651 for Class 1
- **G** meeting requirements of ISO 7196:1995 standard

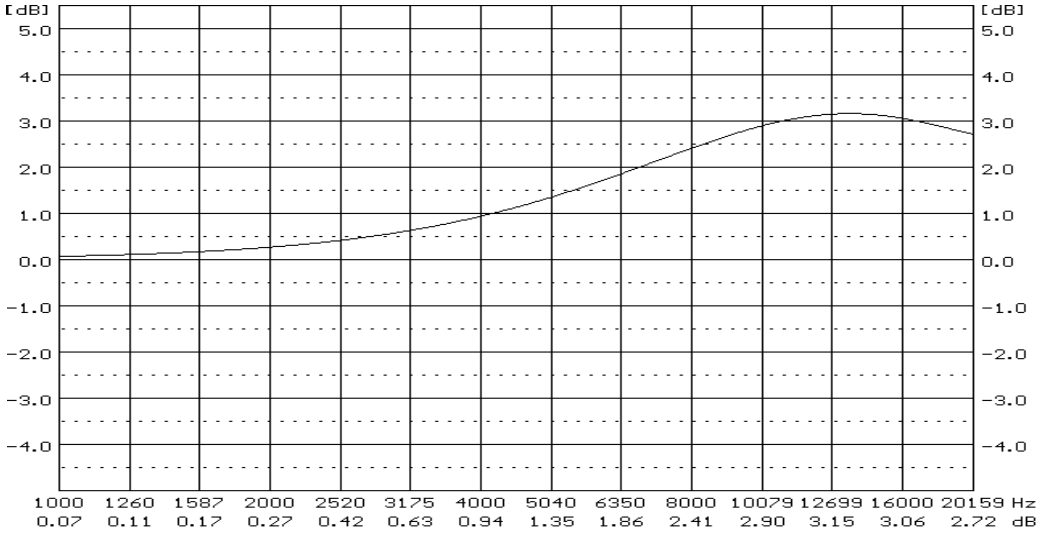
Table C.1.3. Self-generated noise for different weighting filters

	Electrical *)			Acoustical compensated		
Weighting filter / Range	A	C	Z	A	C	Z
Low	< 11 dB	< 10 dB	< 16 dB	< 12 dB	< 12 dB	< 28 dB
High	< 19 dB	< 18 dB	< 26 dB	< 20 dB	< 20 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)
- **Free field – compensation filter** filter improving the complete instrument frequency response in the free acoustic field (see below)
- **Windscreen – compensation filter** filter improving the instrument frequency response in the free acoustic field when windscreen SA 22 is mounted on the microphone (see C.1.2)



SVAN 979 diffuse field compensation filter

Note: *Using special filters might change the frequency response and measurement ranges of SVAN 979. 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 50 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	23	80	25	103	23	117	40	120	23	80	23	103	23	117	26	83	50	120
500 Hz	23	116	25	119	23	120	40	120	23	116	23	119	23	120	26	119	50	123
1 kHz	23	120	25	120	23	120	40	120	23	120	23	120	23	120	26	123	50	123
4 kHz	23	121	25	119	23	119	40	120	23	121	23	119	23	119	26	124	50	121
8 kHz	23	119	25	117	23	117	40	120	23	119	23	117	23	117	26	122	50	117
12.5 kHz	23	115	25	114	23	114	40	120	23	115	23	114	23	114	26	118	50	114

Table C.1.5. Linear operating range for the “Diffuse” filter: „HIGH“ (primary level range) for the sinusoidal signal and microphone sensitivity 50 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	31	97	33	120	31	134	42	137	31	97	31	120	31	134	34	100	70	137
500 Hz	31	133	33	136	31	137	42	137	31	133	31	136	31	137	34	136	70	140
1 kHz	31	137	33	137	31	137	42	137	31	137	31	137	31	137	34	140	70	140
4 kHz	31	138	33	136	31	136	42	137	31	138	31	136	31	136	34	141	70	138
8 kHz	31	136	33	134	31	134	42	137	31	136	31	134	31	134	34	139	70	134
12.5 kHz	31	132	33	131	31	131	42	137	31	132	31	131	31	131	34	135	70	131

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 61672-1:2013 Class 1, Equivalent Time Constant 1000 ms
Fast “**F**” according to IEC 61672-1:2013 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 G.R.A.S. 40AE at 1000 Hz – see Table C.1.6)

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

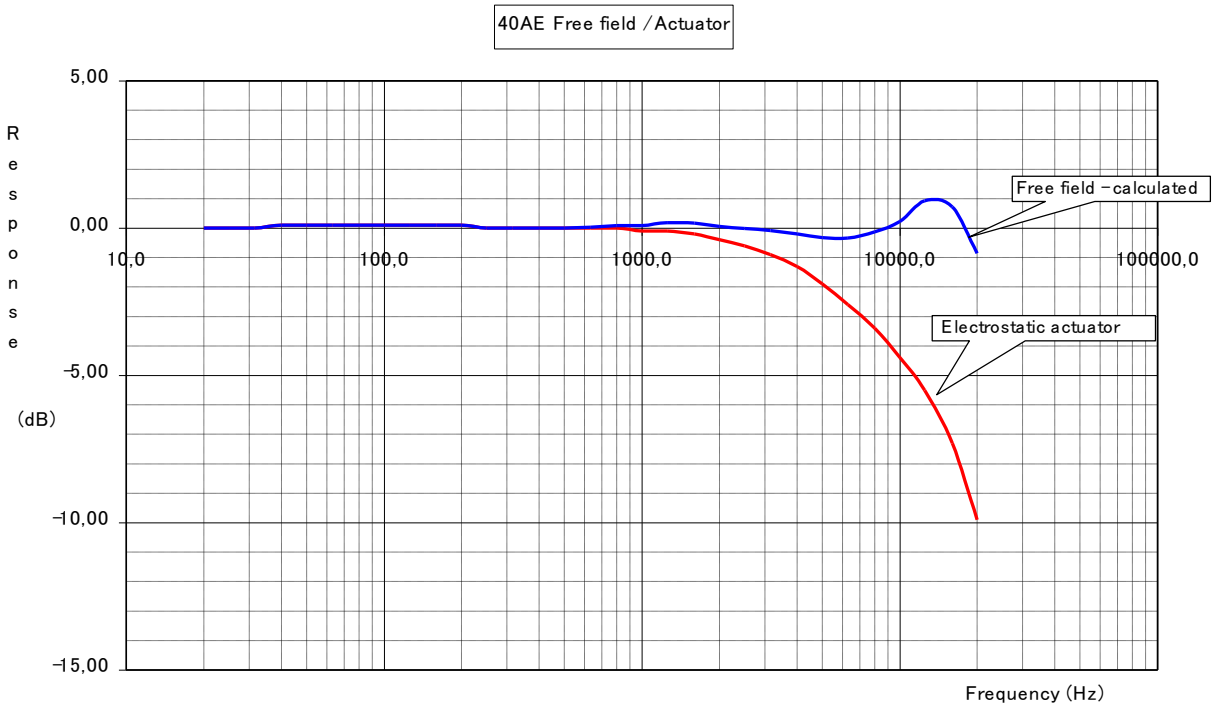
Microphone

G.R.A.S. 40AE	prepolarized free-field ½" condenser microphone
Nominal sensitivity	50 mV/Pa (corresponding to -26 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: 148 dB.*

Table C.1.6. G.R.A.S. 40AE free field correction for electrostatic actuator the 0 deg incidence

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	0.1	0.08	0.07	0.08	0.18
	Frequency [Hz]															
	1000	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**12500**	**16000**	**20000**		
	0.13	0.05	0.19	0.45	0.58	0.8	1.11	1.68	2.58	3.78	5.06	6.83	8.29	9.49		



Preamplifier

SV 17	nominal preamplifier attenuation: 0.7 dB; Voltage Type – power supply 1.5 mA@30 V 7 pin Lemo connector. See chapter C.3 for the SV17 connector pin-out.
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 979 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.

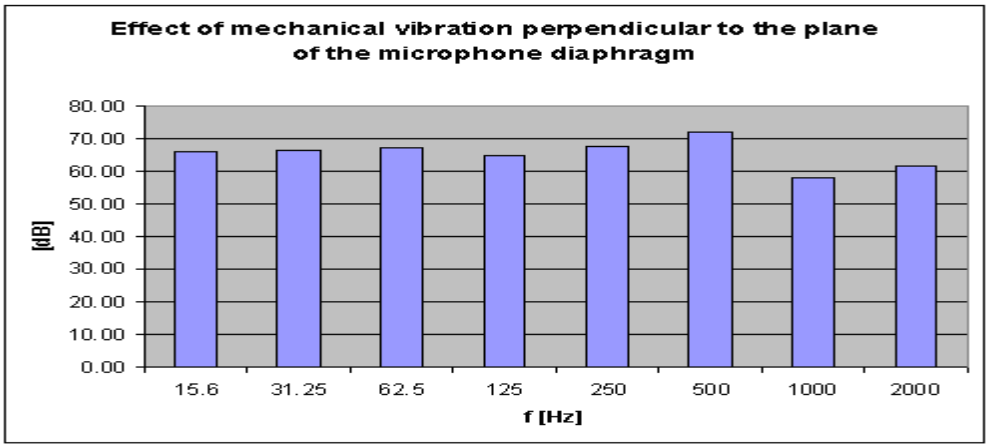
Ref 2. Vibration is applied in a direction parallel to the plane of the microphone diaphragm.

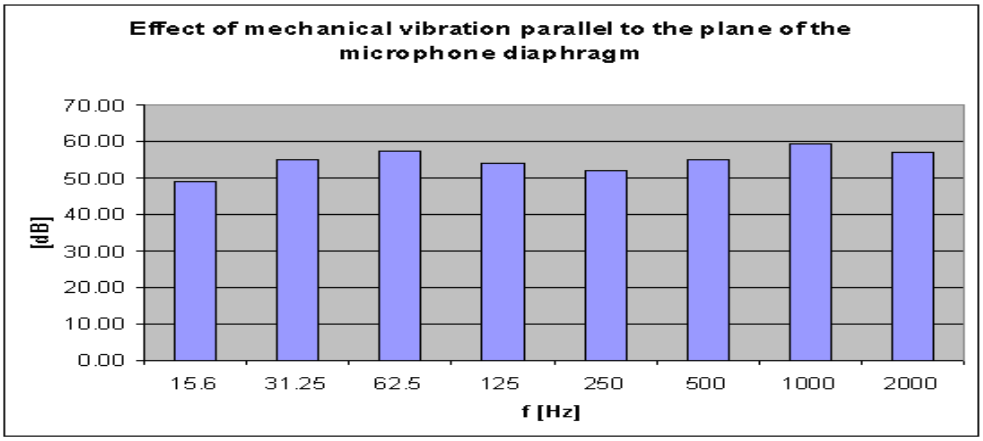
Table C.1.7. Typical effect of vibration perpendicular to the plane of microphone diaphragm

f (Hz)	15.6	31.25	62.5	125	250	500	1000	2000
Typical effect of vibration [dB]	66.13	66.36	67.03	64.55	67.46	71.66	57.59	61.58

Table C.1.8. 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]	48.99	54.98	57.19	54.25	52.11	54.89	59.60	57.07





Free Field frequency response of SVAN 979

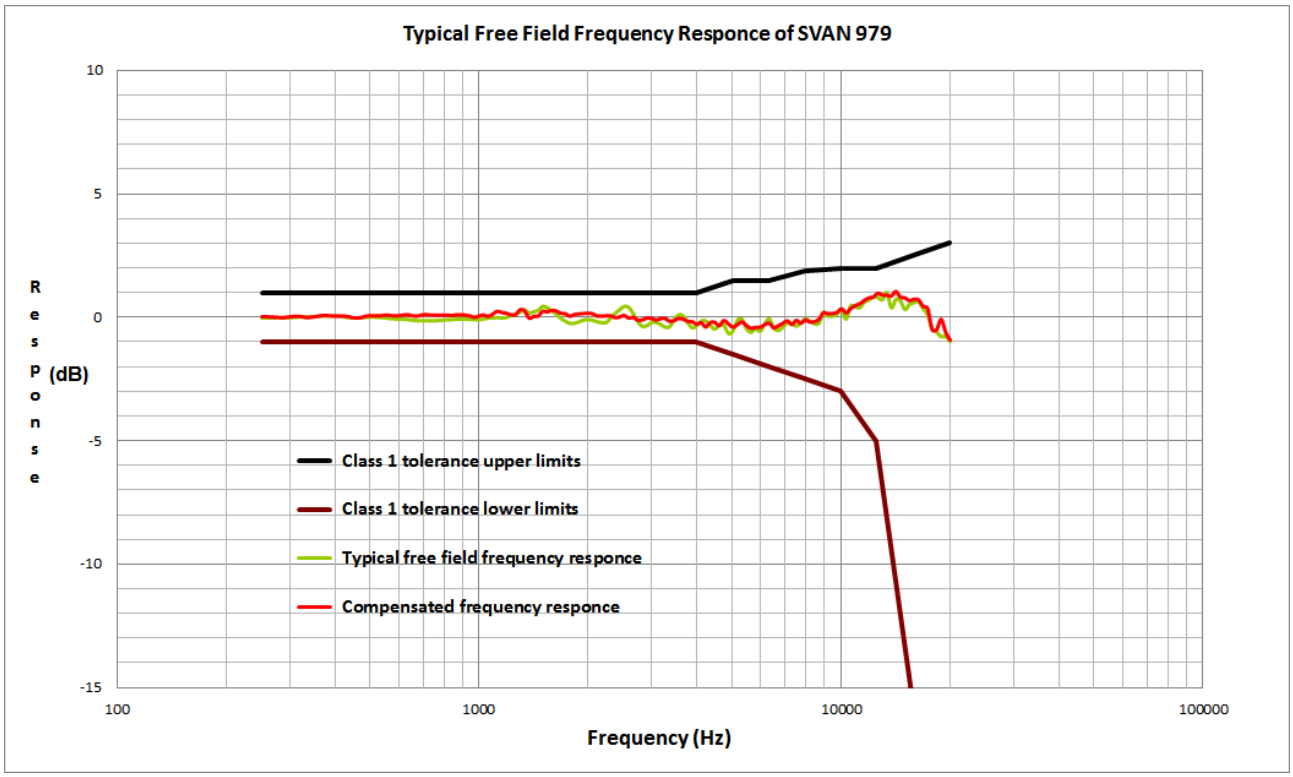


Table C.1.9. SVAN 979 typical free field frequency response

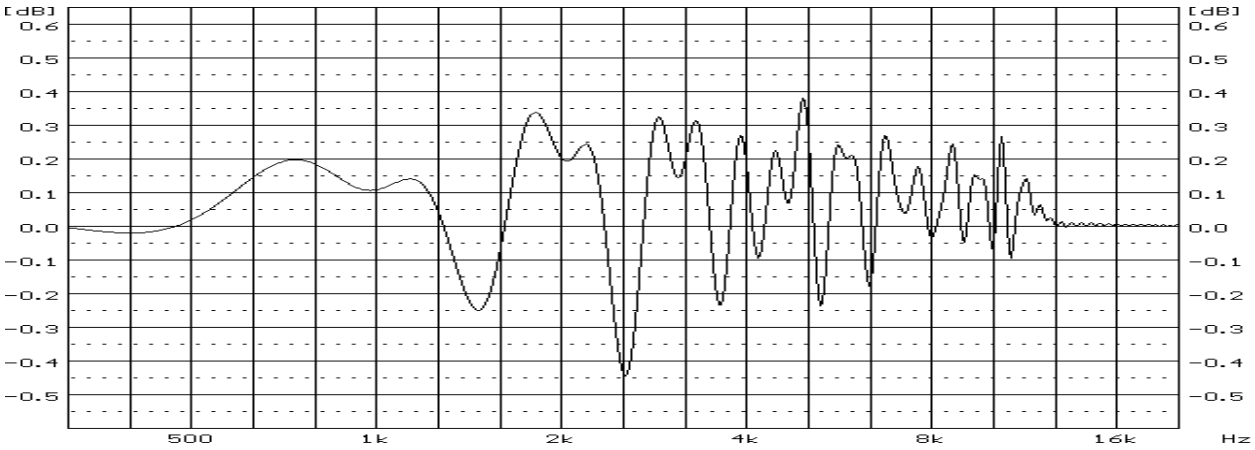
Frequency [Hz}	SVAN 979 free field response [dB]	SVAN 979 compensated free field response [dB]	Frequency [Hz}	SVAN 979 free field response [dB]	SVAN 979 compensated free field response [dB]
251,19	-0,04	0,02	**2304,09**	-0,04	0,06
258,52	-0,04	0,02	**2371,37**	0,15	-0,02
266,07	-0,04	0,01	**2440,62**	0,30	0,01
273,84	-0,03	0,00	**2511,89**	0,43	0,07
281,84	-0,03	-0,01	**2585,23**	0,40	-0,03
290,07	-0,03	-0,01	**2660,73**	0,14	-0,01
298,54	-0,02	0,01	**2738,42**	-0,19	-0,12
307,26	-0,02	0,04	**2818,38**	-0,38	-0,11
316,23	0,00	0,04	**2900,68**	-0,35	-0,04
325,46	0,00	0,02	**2985,38**	-0,22	-0,04
334,97	0,01	-0,01	**3072,56**	-0,22	-0,11
344,75	0,01	0,00	**3162,28**	-0,30	-0,06
354,81	0,02	0,03	**3254,62**	-0,41	-0,05
365,17	0,03	0,06	**3349,65**	-0,40	-0,16
375,84	0,03	0,08	**3447,47**	-0,12	-0,14
386,81	0,04	0,06	**3548,13**	0,09	-0,05
398,11	0,05	0,05	**3651,74**	0,06	-0,08
409,73	0,04	0,05	**3758,37**	-0,22	-0,16
421,70	0,01	0,05	**3868,12**	-0,44	-0,18
434,01	-0,02	0,03	**3981,07**	-0,35	-0,28
446,68	-0,04	-0,02	**4097,32**	-0,16	-0,22
459,73	-0,04	-0,03	**4216,97**	-0,16	-0,40

Frequency [Hz}	SVAN 979 free field response [dB]	SVAN 979 compensated free field response [dB]	Frequency [Hz}	SVAN 979 free field response [dB]	SVAN 979 compensated free field response [dB]
473,15	-0,02	-0,01	**4340,10**	-0,33	-0,22
486,97	-0,01	0,05	**4466,84**	-0,49	-0,20
501,19	0,00	0,07	**4597,27**	-0,33	-0,35
515,82	0,00	0,06	**4731,51**	-0,33	-0,13
530,88	-0,01	0,06	**4869,68**	-0,67	-0,27
546,39	-0,03	0,08	**5011,87**	-0,57	-0,40
562,34	-0,05	0,08	**5158,22**	-0,14	-0,30
578,76	-0,07	0,06	**5308,84**	-0,08	-0,19
595,66	-0,09	0,06	**5463,87**	-0,48	-0,34
613,06	-0,09	0,08	**5623,41**	-0,62	-0,45
630,96	-0,09	0,10	**5787,62**	-0,48	-0,41
649,38	-0,12	0,07	**5956,62**	-0,58	-0,42
668,34	-0,14	0,04	**6130,56**	-0,31	-0,30
687,86	-0,14	0,08	**6309,57**	-0,07	-0,24
707,95	-0,15	0,11	**6493,82**	-0,45	-0,43
728,62	-0,16	0,09	**6683,44**	-0,55	-0,36
749,89	-0,15	0,09	**6878,60**	-0,43	-0,25
771,79	-0,14	0,09	**7079,46**	-0,24	-0,14
794,33	-0,13	0,08	**7286,18**	-0,26	-0,30
817,52	-0,11	0,09	**7498,94**	-0,37	-0,13
841,40	-0,10	0,07	**7717,92**	-0,25	-0,24
865,96	-0,08	0,10	**7943,28**	-0,08	-0,11
891,25	-0,08	0,10	**8175,23**	-0,17	-0,19
917,28	-0,08	0,09	**8413,95**	-0,27	-0,18
944,06	-0,10	0,05	**8659,64**	-0,25	-0,08
977,63	-0,10	-0,01	**8912,51**	0,19	0,18
1000,00	-0,11	0,06	**9172,76**	0,04	0,14
1029,20	-0,07	0,09	**9440,61**	0,04	0,15
1059,25	-0,04	0,03	**9776,28**	0,12	0,20
1090,18	-0,04	0,13	**10000,00**	0,33	0,34
1122,02	-0,02	0,24	**10292,01**	-0,08	0,17
1154,78	-0,04	0,19	**10592,54**	0,45	0,35
1188,50	-0,02	0,16	**10901,84**	0,42	0,48
1223,21	0,06	0,10	**11220,18**	0,38	0,55
1258,93	0,11	0,11	**11547,82**	0,60	0,68
1295,69	0,20	0,31	**11885,02**	0,70	0,79
1333,52	0,30	0,26	**12232,07**	0,83	0,82
1372,46	0,17	-0,04	**12589,25**	0,80	0,98
1412,54	0,22	0,03	**12956,87**	0,71	0,90
1453,78	0,27	0,05	**13335,21**	1,00	0,90
1496,24	0,44	0,24	**13724,61**	0,37	0,86
1539,93	0,38	0,22	**14125,38**	0,73	1,06
1584,89	0,25	0,28	**14537,84**	0,65	0,82
1631,17	0,13	0,25	**14962,36**	0,31	0,79
1678,80	-0,06	0,16	**15399,27**	0,52	0,68
1727,83	-0,17	0,14	**15848,93**	0,59	0,73
1778,28	-0,26	0,04	**16311,73**	0,64	0,71
1830,21	-0,26	0,11	**16788,04**	0,35	0,44
1883,65	-0,20	0,14	**17278,26**	0,09	0,36

Frequency [Hz}	SVAN 979 free field response [dB]	SVAN 979 compensated free field response [dB]	Frequency [Hz}	SVAN 979 free field response [dB]	SVAN 979 compensated free field response [dB]
1938,65	-0,12	0,15	**17782,79**	-0,46	-0,51
1995,26	-0,11	0,17	**18302,06**	-0,61	-0,51
2053,53	-0,13	0,14	**18836,49**	-0,80	-0,09
2113,49	-0,19	0,05	**19386,53**	-0,79	-0,62
2175,20	-0,23	0,05	**19952,62**	-1,00	-0,94
2238,72	-0,23	0,06			

Case effect

Effect of reflections and diffraction of the acoustic plane wave from the case of SVAN 979 (“case effect”).



Case Effect Compensation Filter

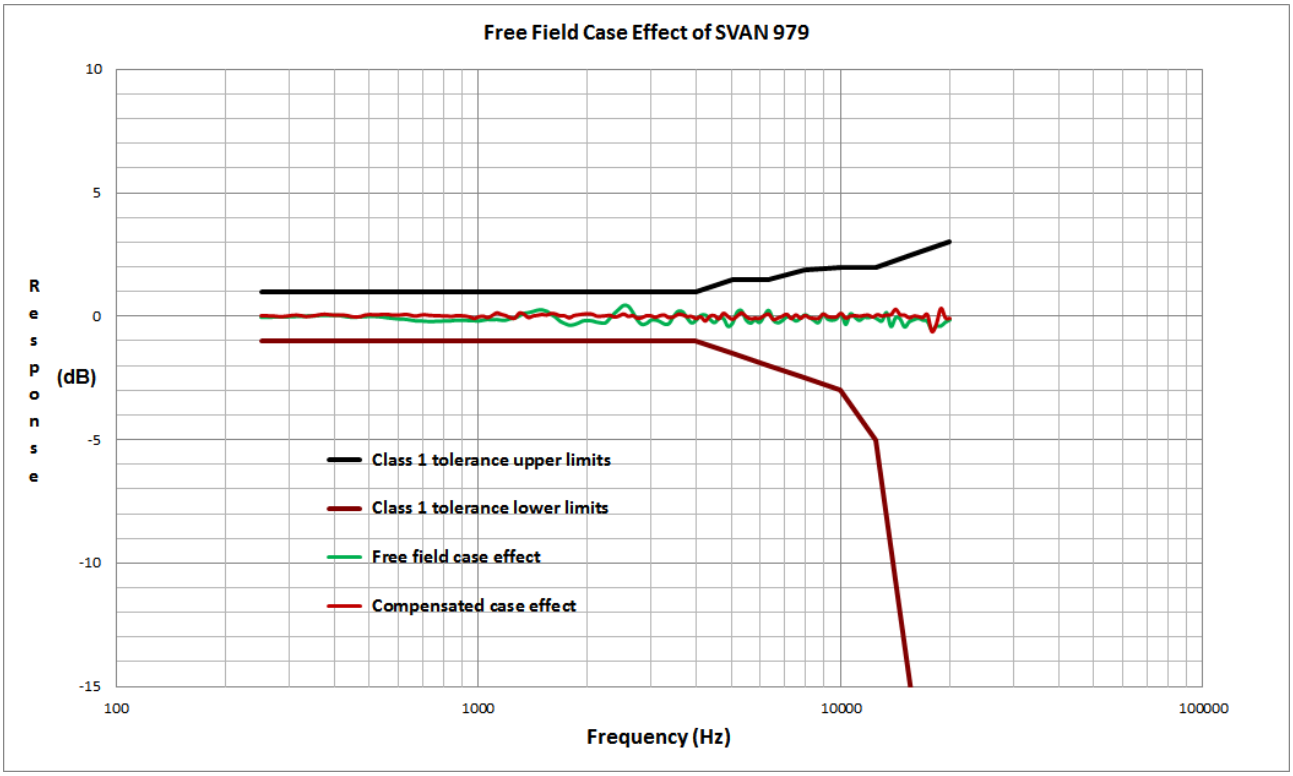


Table C.1.10. SVAN 979 "Case effect" and "Compensated case effect"

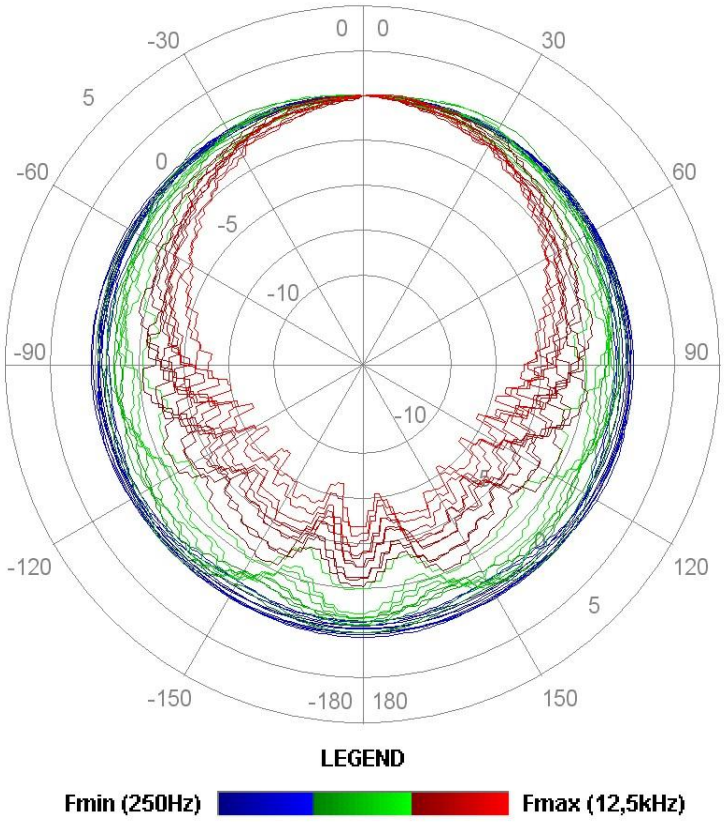
Frequency [Hz}	Free field case effect [dB]	Compensated case effect [dB]	Frequency [Hz}	Free field case effect [dB]	Compensated case effect [dB]
251,19	-0,04	0,02	**2304,09**	-0,07	0,03
258,52	-0,04	0,02	**2371,37**	0,13	-0,04
266,07	-0,04	0,01	**2440,62**	0,30	0,01
273,84	-0,03	0,00	**2511,89**	0,45	0,09
281,84	-0,03	-0,01	**2585,23**	0,42	-0,01
290,07	-0,03	-0,01	**2660,73**	0,17	0,02
298,54	-0,02	0,01	**2738,42**	-0,15	-0,08
307,26	-0,02	0,04	**2818,38**	-0,33	-0,06
316,23	0,00	0,04	**2900,68**	-0,30	0,02
325,46	0,00	0,02	**2985,38**	-0,16	0,02
334,97	0,01	-0,01	**3072,56**	-0,15	-0,04
344,75	0,01	0,00	**3162,28**	-0,22	0,02
354,81	0,02	0,03	**3254,62**	-0,32	0,04
365,17	0,03	0,06	**3349,65**	-0,30	-0,06
375,84	0,03	0,08	**3447,47**	-0,01	-0,03
386,81	0,04	0,06	**3548,13**	0,21	0,07
398,11	0,05	0,05	**3651,74**	0,19	0,05
409,73	0,04	0,05	**3758,37**	-0,07	-0,01
421,70	0,01	0,05	**3868,12**	-0,27	-0,01
434,01	-0,02	0,03	**3981,07**	-0,16	-0,09
446,68	-0,04	-0,02	**4097,32**	0,04	-0,02
459,73	-0,04	-0,03	**4216,97**	0,05	-0,19
473,15	-0,02	-0,01	**4340,10**	-0,11	0,00
486,97	-0,01	0,05	**4466,84**	-0,26	0,03
501,19	0,00	0,07	**4597,27**	-0,09	-0,11
515,82	0,00	0,06	**4731,51**	-0,08	0,12
530,88	-0,01	0,06	**4869,68**	-0,41	-0,01
546,39	-0,03	0,08	**5011,87**	-0,29	-0,12
562,34	-0,06	0,07	**5158,22**	0,16	0,00
578,76	-0,08	0,04	**5308,84**	0,24	0,13
595,66	-0,11	0,04	**5463,87**	-0,15	-0,01
613,06	-0,11	0,06	**5623,41**	-0,28	-0,11
630,96	-0,12	0,07	**5787,62**	-0,15	-0,08
649,38	-0,16	0,04	**5956,62**	-0,25	-0,09
668,34	-0,18	0,00	**6130,56**	0,02	0,02
687,86	-0,19	0,03	**6309,57**	0,25	0,08
707,95	-0,20	0,06	**6493,82**	-0,15	-0,13
728,62	-0,21	0,04	**6683,44**	-0,27	-0,08
749,89	-0,21	0,03	**6878,60**	-0,18	0,00
771,79	-0,20	0,02	**7079,46**	-0,02	0,08
794,33	-0,20	0,01	**7286,18**	-0,06	-0,10
817,52	-0,19	0,01	**7498,94**	-0,19	0,05
841,40	-0,18	-0,01	**7717,92**	-0,09	-0,08
865,96	-0,16	0,02	**7943,28**	0,06	0,03
891,25	-0,16	0,02	**8175,23**	-0,04	-0,06
917,28	-0,16	0,01	**8413,95**	-0,17	-0,08
944,06	-0,18	-0,03	**8659,64**	-0,25	-0,08
977,63	-0,18	-0,09	**8912,51**	0,09	0,08
1000,00	-0,19	-0,02	**9172,76**	-0,11	-0,01

Frequency [Hz}	Free field case effect [dB]	Compensated case effect [dB]	Frequency [Hz}	Free field case effect [dB]	Compensated case effect [dB]
1029,20	-0,16	0,00	**9440,61**	-0,16	-0,05
1059,25	-0,13	-0,06	**9776,28**	-0,10	-0,02
1090,18	-0,14	0,03	**10000,00**	0,10	0,11
1122,02	-0,13	0,13	**10292,01**	-0,33	-0,08
1154,78	-0,16	0,07	**10592,54**	0,10	0,00
1188,50	-0,16	0,02	**10901,84**	-0,03	0,03
1223,21	-0,10	-0,06	**11220,18**	-0,17	0,00
1258,93	-0,07	-0,07	**11547,82**	-0,05	0,03
1295,69	0,02	0,13	**11885,02**	-0,05	0,04
1333,52	0,12	0,08	**12232,07**	-0,02	-0,03
1372,46	0,15	-0,06	**12589,25**	-0,12	0,06
1412,54	0,20	0,01	**12956,87**	-0,19	0,00
1453,78	0,26	0,03	**13335,21**	0,15	0,05
1496,24	0,27	0,07	**13724,61**	-0,43	0,06
1539,93	0,21	0,05	**14125,38**	-0,05	0,28
1584,89	0,08	0,11	**14537,84**	-0,11	0,06
1631,17	-0,04	0,08	**14962,36**	-0,44	0,04
1678,80	-0,21	0,01	**15399,27**	-0,22	-0,06
1727,83	-0,30	0,01	**15848,93**	-0,14	0,00
1778,28	-0,37	-0,07	**16311,73**	-0,08	-0,01
1830,21	-0,35	0,02	**16788,04**	-0,15	-0,06
1883,65	-0,28	0,06	**17278,26**	-0,21	0,06
1938,65	-0,19	0,08	**17782,79**	-0,56	-0,61
1995,26	-0,17	0,10	**18302,06**	-0,41	-0,31
2053,53	-0,19	0,08	**18836,49**	-0,40	0,31
2113,49	-0,24	0,00	**19386,53**	-0,24	-0,07
2175,20	-0,27	0,00	**19952,62**	-0,15	-0,09
2238,72	-0,27	0,02			

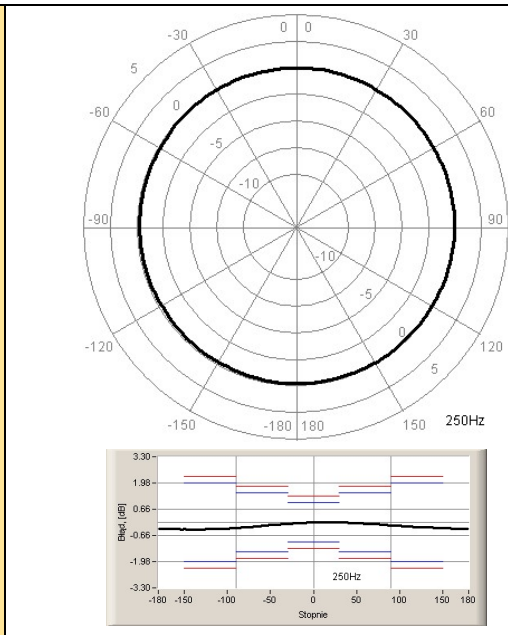
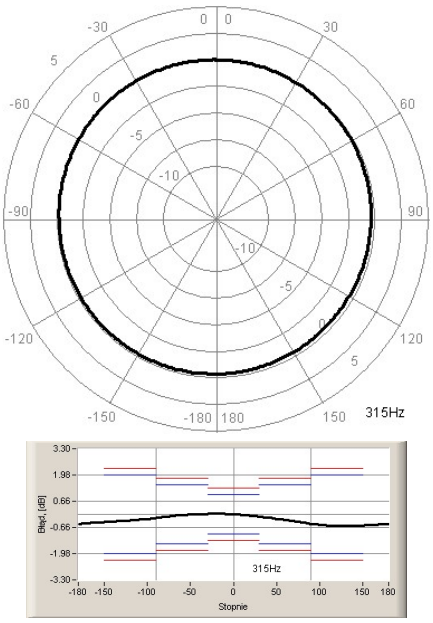
Directional characteristics of SVAN 979

Directional response for SLM Type **SVAN 979** with microphone type **G.R.A.S. 40AE** and preamplifier **SV 17** for specified frequencies:

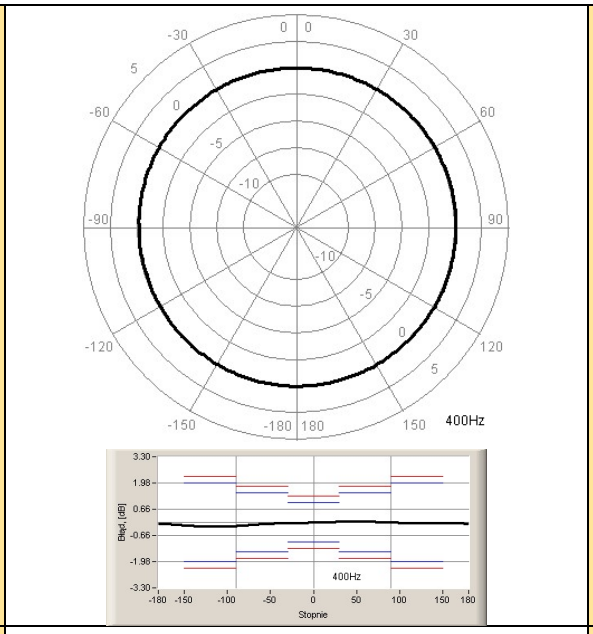
Total directional characteristics



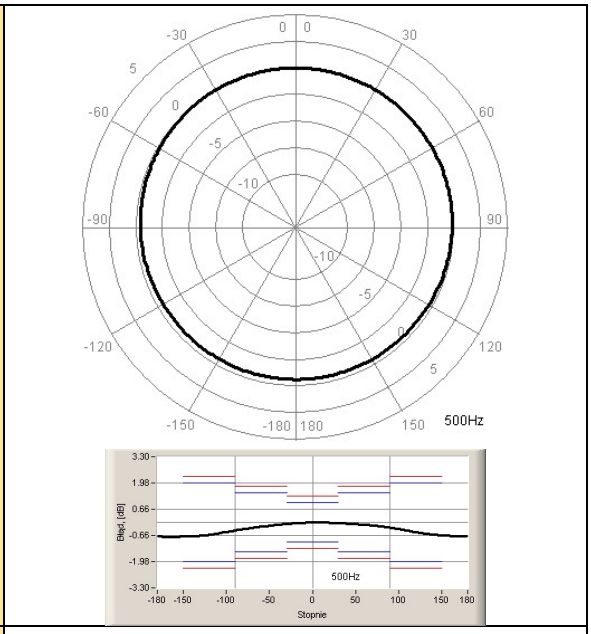
The round charts show the directional characteristic and the charts below shows the errors for angles.

250 Hz	
315 Hz	

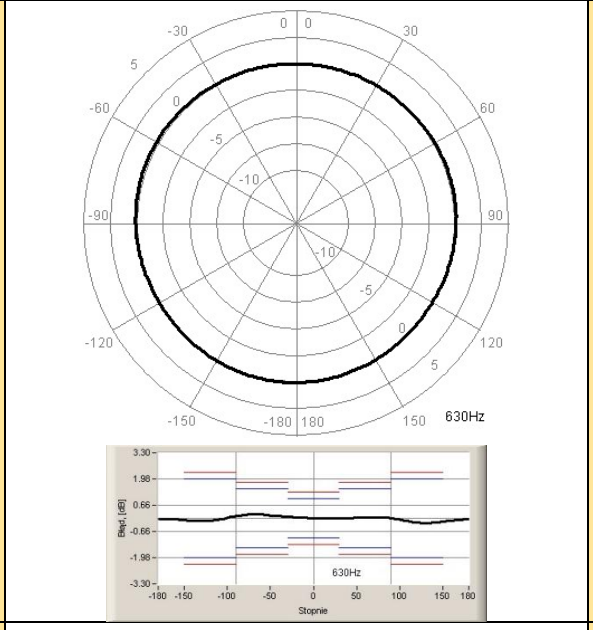
400 Hz



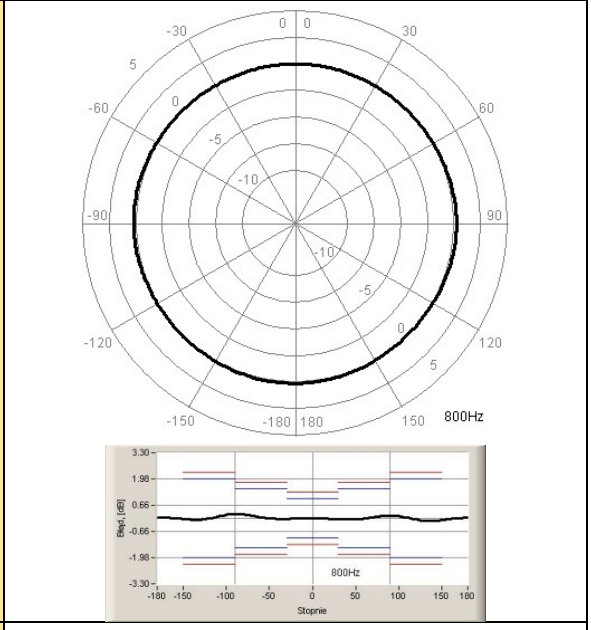
500 Hz



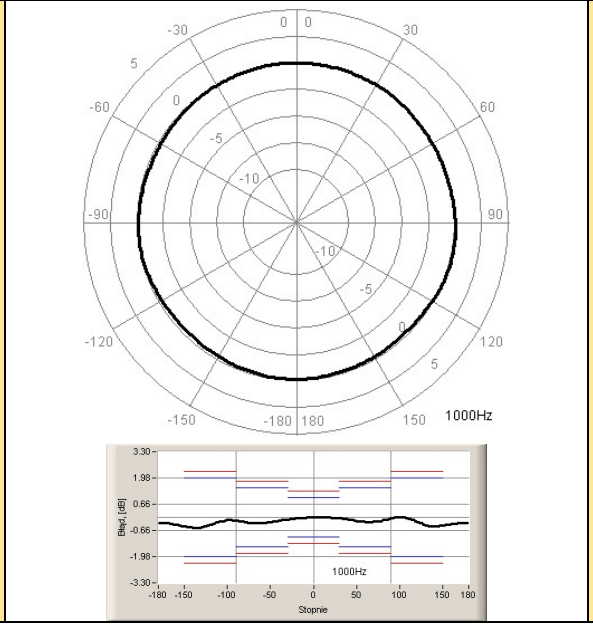
630 Hz



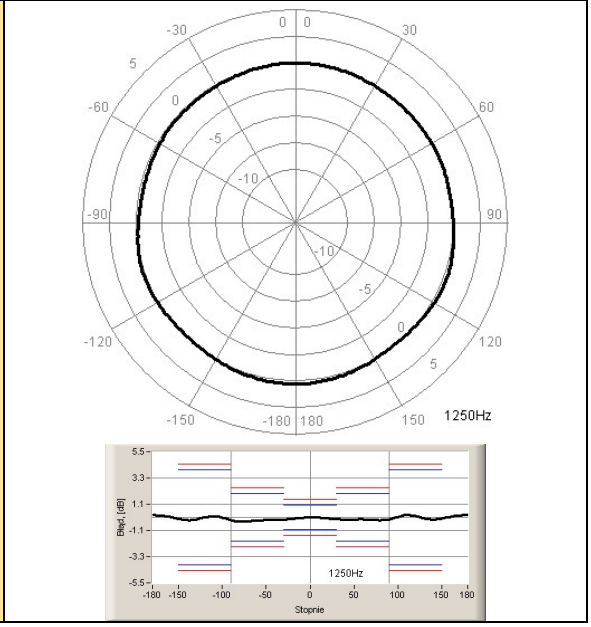
800 Hz



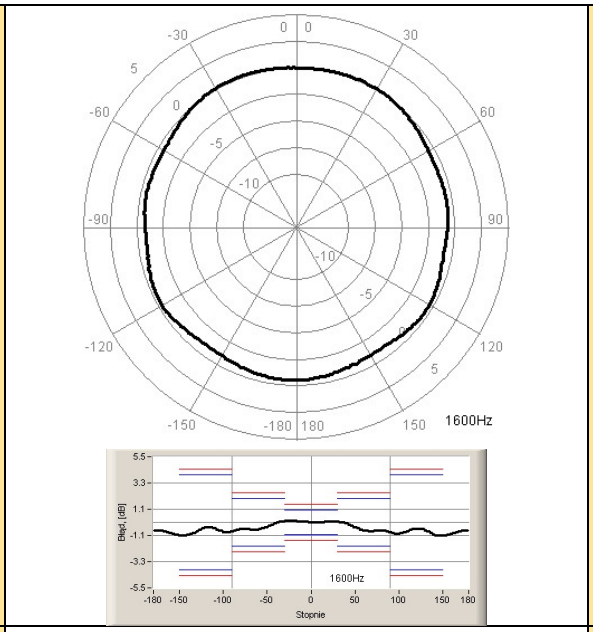
1000 Hz



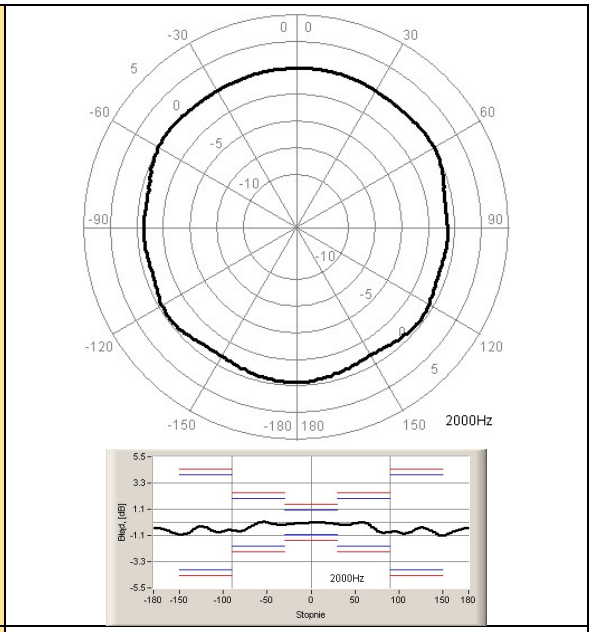
1250 Hz



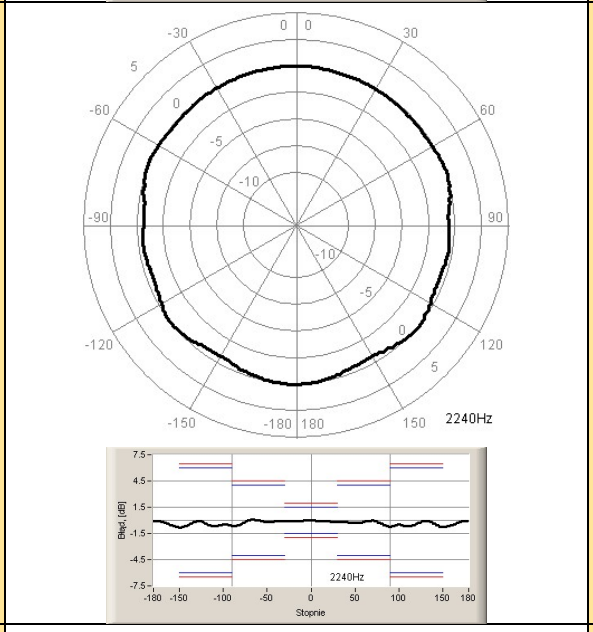
1600 Hz



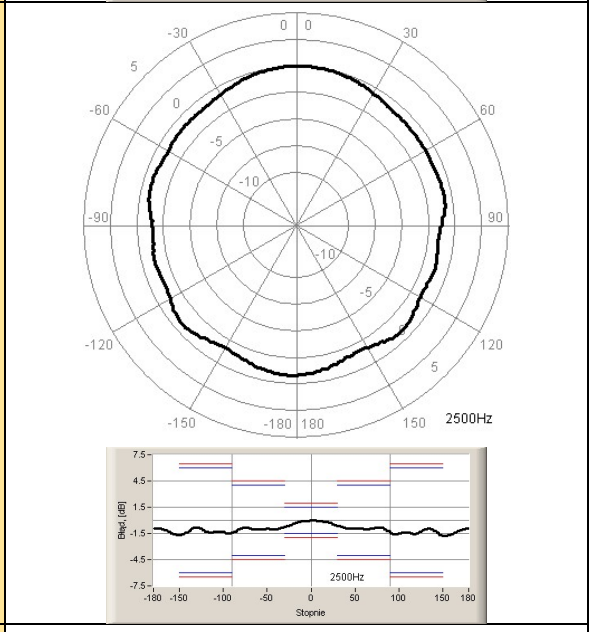
2000 Hz



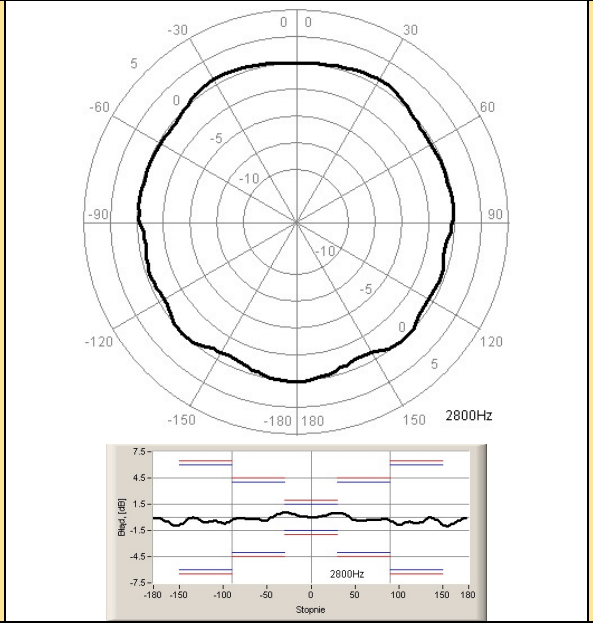
2240 Hz



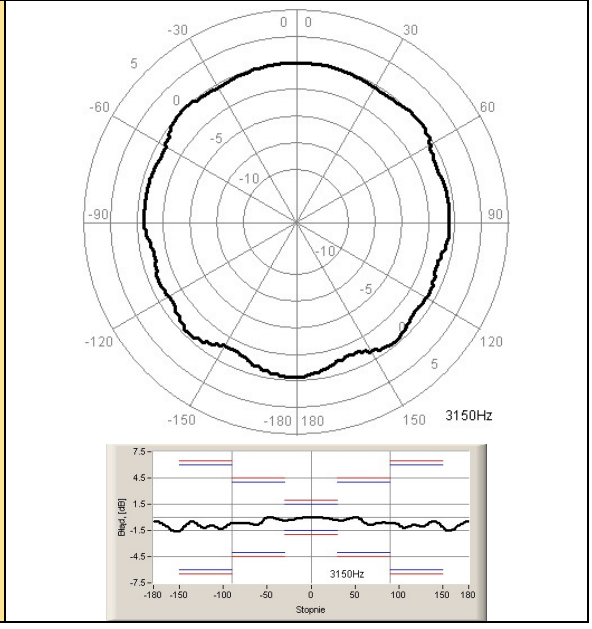
2500 Hz



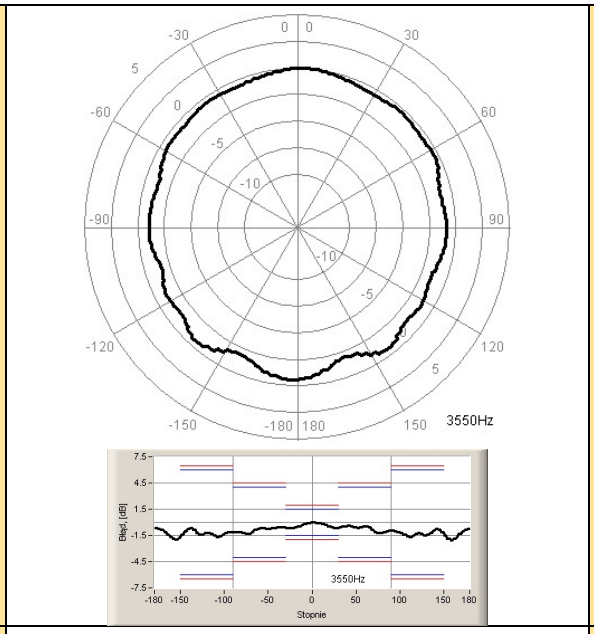
2800 Hz



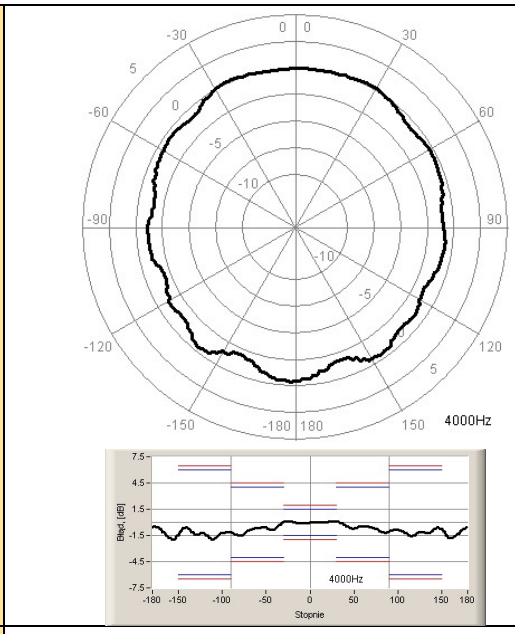
3150 Hz



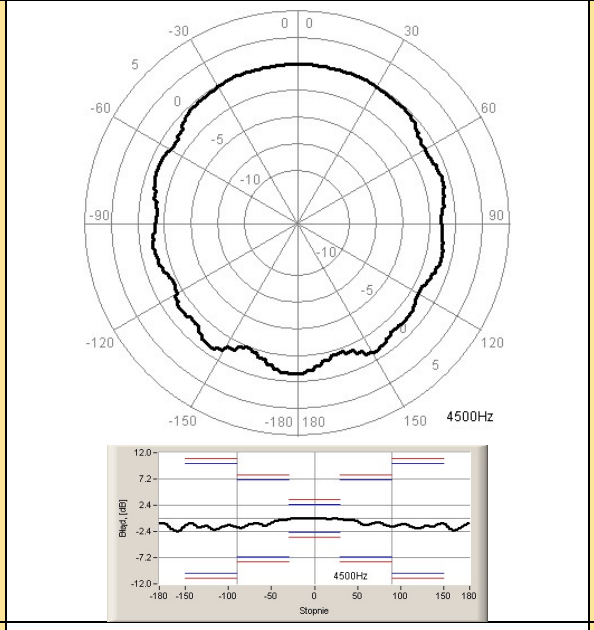
3550 Hz



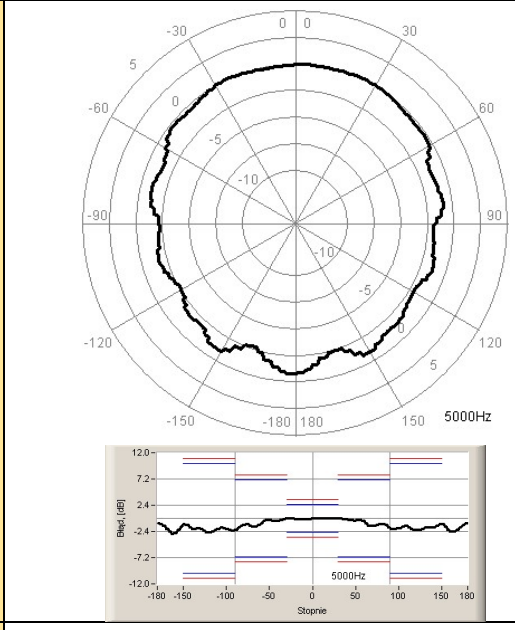
4000 Hz



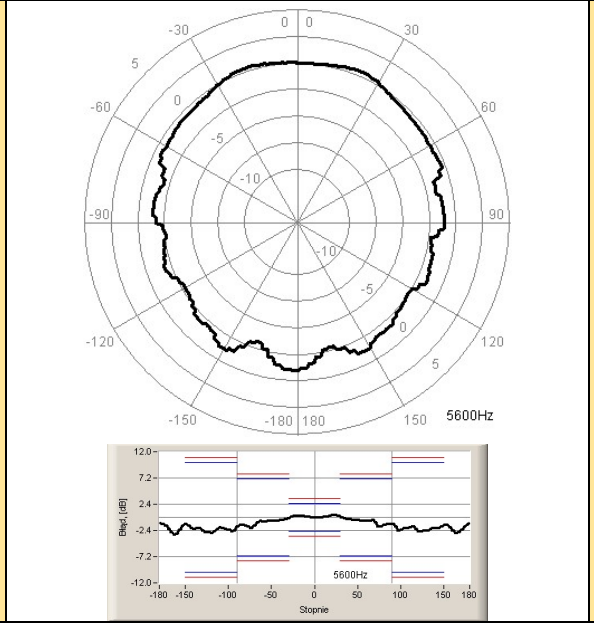
4500 Hz



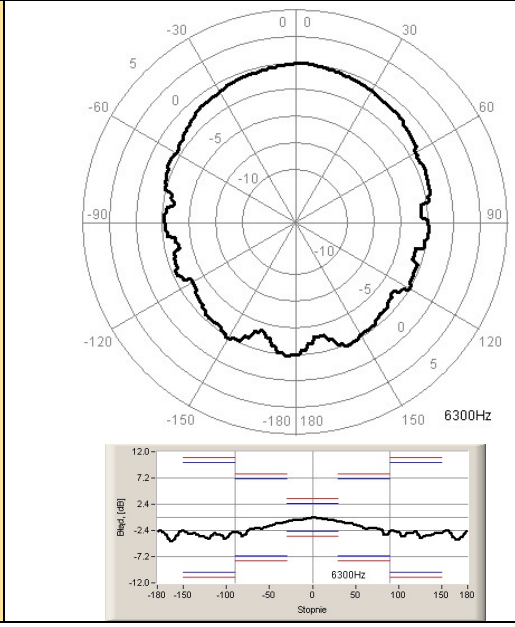
5000 Hz

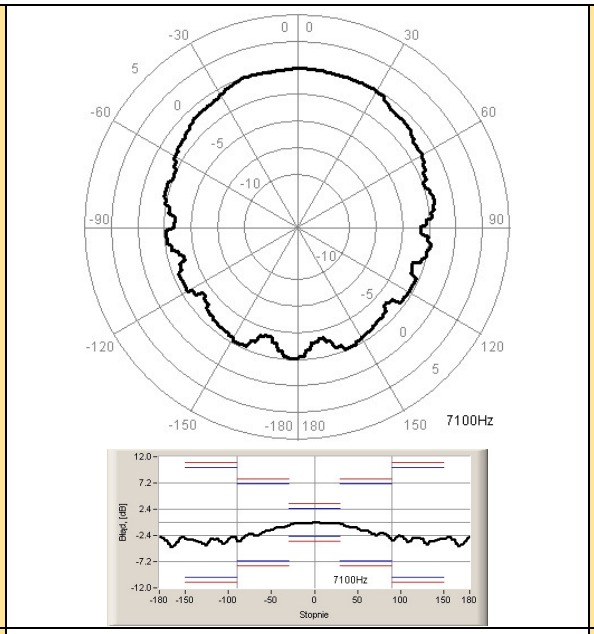
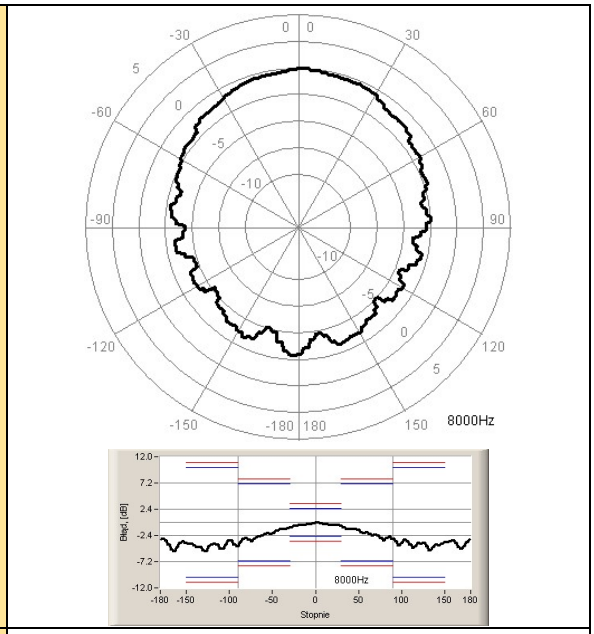
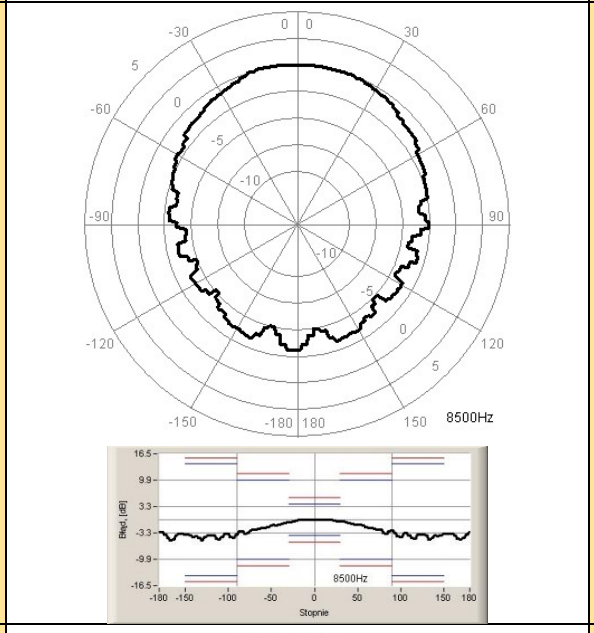
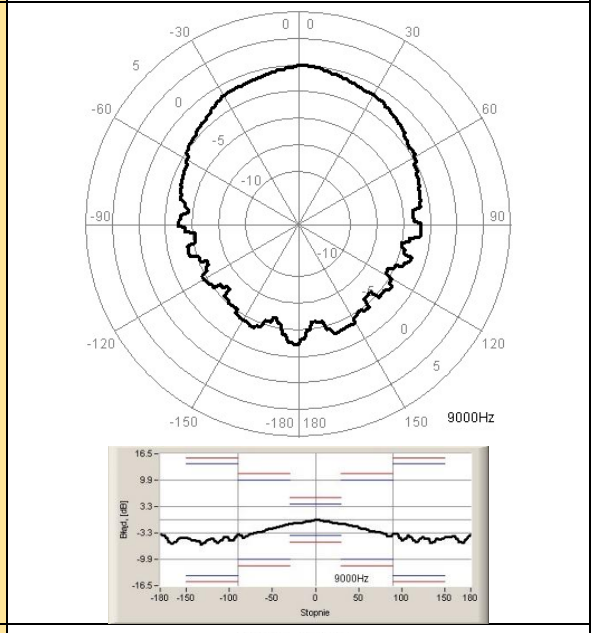
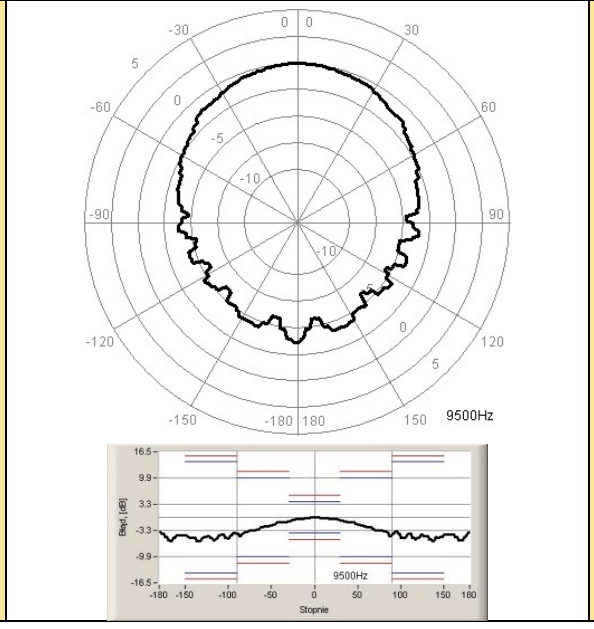
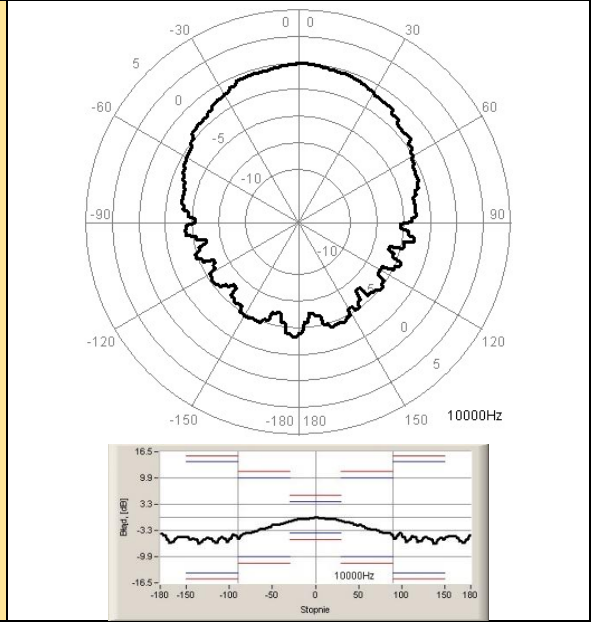


5600 Hz



6300 Hz



7100 Hz		8000 Hz	
8500 Hz		9000 Hz	
9500 Hz		10000 Hz	

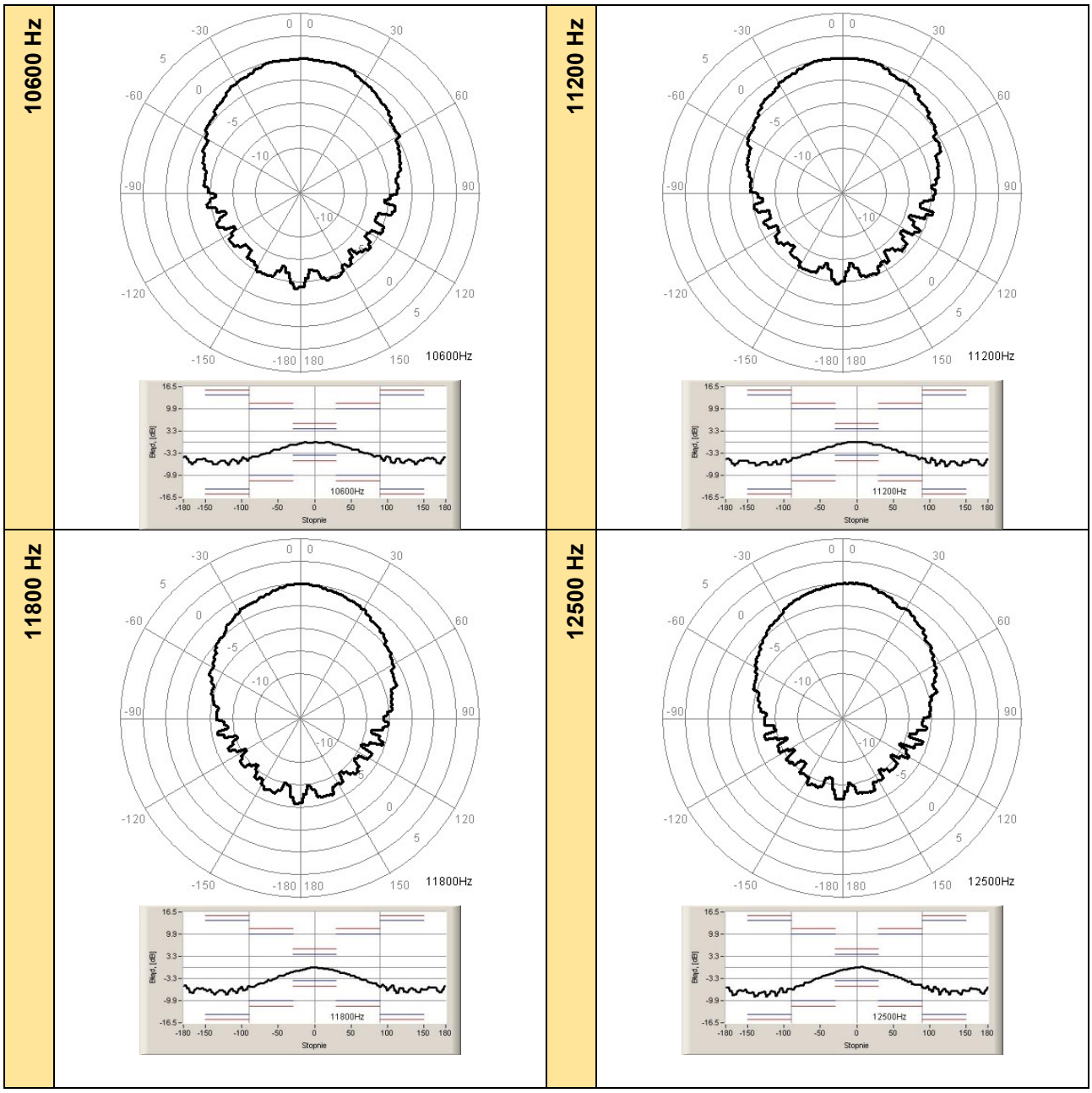


Table C.1.11. Directional response for SVAN 979 with microphone G.R.A.S. 40AE

	Angle [°]								
f [Hz]	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
250	0,00	0,00	0,00	0,00	0,00	0,00	-0,01	-0,02	-0,03
315	0,00	-0,02	-0,03	-0,05	-0,07	-0,10	-0,12	-0,15	-0,16
400	0,00	0,00	0,01	0,01	0,02	0,02	0,03	0,03	0,03
500	0,00	0,00	-0,01	-0,01	-0,03	-0,03	-0,04	-0,05	-0,07
630	0,00	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	0,00	0,00
800	0,00	0,00	-0,01	-0,02	-0,03	-0,04	-0,05	-0,06	-0,06
1000	0,00	-0,01	-0,01	-0,02	-0,03	-0,04	-0,06	-0,08	-0,11
1250	0,00	-0,02	-0,03	-0,07	-0,10	-0,13	-0,15	-0,18	-0,18
1600	0,00	0,01	0,02	0,03	0,06	0,06	0,06	0,05	-0,09
2000	0,00	0,00	-0,02	-0,03	-0,08	-0,10	-0,16	-0,20	-0,21
2240	0,00	-0,02	-0,07	-0,10	-0,14	-0,16	-0,18	-0,19	-0,22
2500	0,00	-0,02	-0,05	-0,15	-0,23	-0,44	-0,68	-0,79	-0,93

2800	0,00	0,04	0,13	0,21	0,38	0,45	0,51	0,51	0,34
3150	0,00	-0,01	-0,02	-0,06	-0,11	-0,24	-0,32	-0,38	-0,38
3550	0,00	-0,06	-0,12	-0,32	-0,43	-0,61	-0,62	-0,58	-0,51
4000	0,00	-0,03	-0,04	-0,04	0,02	0,12	0,12	-0,08	-0,27
4500	0,00	-0,03	-0,06	-0,09	-0,09	-0,07	-0,18	-0,25	-0,28
5000	0,00	-0,03	-0,05	-0,06	-0,05	0,01	0,01	-0,08	-0,17
5600	0,00	-0,02	0,09	0,20	0,42	0,42	0,28	-0,13	-0,34
6300	0,00	-0,08	-0,16	-0,35	-0,44	-0,59	-0,68	-0,94	-0,98
7100	0,00	-0,07	-0,15	-0,18	-0,19	-0,17	-0,26	-0,53	-0,91
8000	0,00	-0,15	-0,26	-0,39	-0,40	-0,43	-0,58	-1,16	-1,26
8500	0,00	0,00	-0,03	-0,04	-0,05	-0,32	-0,43	-0,49	-0,83
9000	0,00	-0,06	-0,32	-0,49	-0,76	-0,89	-0,97	-0,98	-1,41
9500	0,00	-0,07	-0,20	-0,27	-0,42	-0,50	-0,75	-1,02	-1,30
10000	0,00	-0,12	-0,23	-0,37	-0,40	-0,66	-1,07	-1,15	-1,50
10600	0,00	-0,13	-0,15	-0,15	-0,09	-0,56	-0,79	-1,03	-1,25
11200	0,00	0,02	0,02	-0,11	-0,34	-0,92	-0,92	-1,19	-1,58
11800	0,00	-0,15	-0,29	-0,40	-0,60	-0,78	-0,97	-1,56	-1,62
12500	0,00	0,07	0,11	-0,14	-0,56	-0,88	-1,08	-1,17	-1,61
	Angle [°]								
f [Hz]	**45-50**	**50-55**	**55-60**	**60-65**	**65-70**	**70-75**	**75-80**	**80-85**	**85-90**
250	-0,03	-0,05	-0,05	-0,07	-0,09	-0,10	-0,10	-0,13	-0,15
315	-0,20	-0,23	-0,26	-0,29	-0,34	-0,35	-0,39	-0,41	-0,45
400	0,04	0,04	0,04	0,04	0,03	0,03	0,02	0,02	0,01
500	-0,08	-0,10	-0,11	-0,13	-0,14	-0,16	-0,18	-0,21	-0,23
630	0,02	0,03	0,05	0,05	0,06	0,06	0,06	0,06	0,04
800	-0,06	-0,06	-0,05	-0,03	0,03	0,05	0,09	0,11	0,13
1000	-0,13	-0,19	-0,20	-0,23	-0,24	-0,24	-0,22	-0,19	-0,14
1250	-0,19	-0,18	-0,18	-0,17	-0,19	-0,21	-0,24	-0,25	-0,24
1600	-0,18	-0,38	-0,59	-0,67	-0,71	-0,73	-0,73	-0,69	-0,70
2000	-0,21	-0,16	-0,10	-0,03	-0,22	-0,38	-0,74	-0,84	-0,88
2240	-0,26	-0,28	-0,28	-0,24	-0,18	-0,05	-0,10	-0,42	-0,60
2500	-0,95	-0,96	-0,96	-0,99	-1,00	-1,00	-0,93	-0,88	-1,03
2800	0,16	-0,24	-0,41	-0,39	-0,34	-0,29	-0,29	-0,25	-0,19
3150	-0,19	-0,06	-0,18	-0,67	-0,82	-0,83	-0,75	-0,67	-0,61
3550	-0,46	-0,55	-0,61	-0,58	-0,59	-0,84	-1,22	-1,22	-1,09
4000	-0,66	-0,72	-0,65	-0,51	-0,48	-0,55	-0,79	-1,01	-1,18
4500	-0,33	-0,75	-1,01	-1,14	-1,17	-1,06	-0,81	-1,13	-1,34
5000	-0,34	-0,40	-0,37	-0,44	-1,31	-1,40	-1,32	-1,23	-1,27
5600	-0,43	-0,52	-0,53	-0,63	-0,63	-0,88	-1,63	-1,71	-1,31
6300	-1,11	-1,35	-1,58	-1,90	-2,04	-1,90	-2,03	-2,31	-3,14
7100	-0,91	-1,25	-1,46	-1,57	-1,78	-2,44	-2,44	-2,09	-2,34
8000	-1,26	-1,39	-1,90	-1,90	-2,33	-2,33	-2,88	-3,23	-2,88
8500	-1,10	-1,25	-1,54	-1,95	-2,07	-2,37	-2,44	-3,21	-3,52
9000	-1,58	-2,08	-2,26	-2,38	-2,79	-3,06	-3,19	-3,44	-4,21
9500	-1,30	-1,91	-2,07	-2,47	-2,52	-3,23	-3,32	-3,48	-3,73
10000	-1,90	-1,97	-2,27	-2,80	-3,03	-3,09	-3,65	-3,97	-3,94
10600	-1,56	-1,80	-2,31	-2,31	-3,04	-3,23	-3,52	-3,92	-4,26
11200	-1,83	-2,23	-2,59	-3,08	-3,11	-3,87	-4,05	-4,14	-5,09
11800	-2,06	-2,50	-2,87	-3,13	-3,68	-3,68	-4,56	-4,70	-5,31
12500	-1,96	-2,28	-2,67	-3,17	-3,49	-4,26	-4,85	-5,18	-5,25

	Angle [°]								
f [Hz]	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135
250	-0,15	-0,18	-0,18	-0,19	-0,21	-0,23	-0,23	-0,25	-0,25
315	-0,48	-0,51	-0,52	-0,54	-0,56	-0,57	-0,59	-0,59	-0,59
400	0,00	-0,01	-0,03	-0,03	-0,03	-0,03	-0,03	-0,04	-0,04
500	-0,27	-0,29	-0,34	-0,37	-0,42	-0,45	-0,50	-0,52	-0,57
630	0,03	-0,03	-0,06	-0,11	-0,14	-0,19	-0,21	-0,23	-0,23
800	0,14	0,14	0,13	0,11	0,06	0,03	-0,06	-0,11	-0,11
1000	-0,08	-0,03	0,01	0,01	-0,08	-0,12	-0,24	-0,30	-0,40
1250	-0,22	-0,14	-0,07	0,14	0,18	0,18	0,17	0,07	-0,07
1600	-0,82	-0,89	-0,94	-0,94	-0,83	-0,73	-0,56	-0,58	-0,68
2000	-0,85	-0,80	-0,82	-0,94	-0,94	-0,92	-0,71	-0,57	-0,45
2240	-0,71	-0,71	-0,55	-0,61	-0,67	-0,67	-0,58	-0,42	-0,11
2500	-1,48	-1,61	-1,61	-1,50	-1,43	-1,53	-1,57	-1,50	-1,33
2800	-0,43	-0,67	-0,85	-0,85	-0,53	-0,53	-0,64	-0,68	-0,37
3150	-0,62	-0,64	-0,79	-1,20	-1,20	-1,00	-0,94	-1,04	-1,04
3550	-1,01	-1,00	-1,09	-1,39	-1,61	-1,65	-1,50	-1,33	-1,46
4000	-1,18	-0,96	-0,88	-1,07	-1,25	-1,57	-1,48	-1,26	-1,13
4500	-1,48	-1,43	-1,34	-1,09	-1,47	-1,67	-1,81	-1,79	-1,60
5000	-1,99	-1,99	-1,97	-1,76	-1,54	-1,97	-2,16	-2,16	-2,08
5600	-1,21	-1,72	-2,35	-2,18	-1,91	-1,74	-2,59	-2,61	-2,44
6300	-3,14	-2,48	-2,72	-3,44	-3,42	-2,90	-2,84	-3,75	-3,75
7100	-3,36	-3,36	-2,68	-2,93	-3,65	-3,49	-2,92	-3,02	-4,01
8000	-2,94	-4,16	-4,16	-3,40	-3,98	-4,67	-4,33	-3,89	-4,33
8500	-2,99	-4,12	-4,43	-4,43	-3,85	-4,65	-4,65	-3,80	-3,94
9000	-4,17	-3,51	-5,09	-5,09	-4,37	-5,10	-5,57	-4,82	-4,78
9500	-4,72	-4,14	-5,25	-5,25	-4,24	-5,12	-5,61	-5,18	-4,82
10000	-5,38	-5,38	-4,86	-6,13	-6,13	-4,99	-6,11	-6,08	-5,33
10600	-4,20	-5,55	-5,55	-5,99	-6,12	-4,95	-6,28	-6,28	-5,51
11200	-5,09	-5,90	-6,22	-5,38	-7,09	-6,38	-5,83	-7,15	-6,56
11800	-5,75	-5,75	-6,89	-6,89	-6,81	-7,56	-6,17	-7,38	-7,38
12500	-5,97	-6,13	-6,56	-7,31	-6,35	-7,99	-7,00	-7,25	-8,14

	Angle [°]								
f [Hz]	135-140	140-145	145-150	150-155	155-160	160-165	165-170	170-175	175-180
250	-0,26	-0,27	-0,28	-0,29	-0,29	-0,31	-0,31	-0,32	-0,33
315	-0,59	-0,59	-0,57	-0,56	-0,56	-0,55	-0,53	-0,52	-0,50
400	-0,04	-0,04	-0,04	-0,04	-0,04	-0,06	-0,06	-0,06	-0,07
500	-0,58	-0,61	-0,63	-0,65	-0,67	-0,69	-0,69	-0,70	-0,71
630	-0,23	-0,23	-0,21	-0,19	-0,16	-0,14	-0,11	-0,09	-0,07
800	-0,12	-0,12	-0,12	-0,11	-0,09	-0,06	-0,02	0,00	0,03
1000	-0,44	-0,45	-0,45	-0,42	-0,41	-0,38	-0,33	-0,29	-0,28
1250	-0,16	-0,18	-0,18	-0,16	-0,08	-0,03	0,11	0,14	0,18
1600	-0,79	-1,01	-1,12	-1,12	-1,12	-1,03	-0,97	-0,82	-0,77
2000	-0,70	-0,85	-1,07	-1,10	-1,10	-0,99	-0,78	-0,68	-0,59
2240	-0,10	-0,40	-0,57	-0,77	-0,77	-0,68	-0,56	-0,31	-0,13
2500	-1,00	-1,22	-1,44	-1,77	-1,80	-1,72	-1,58	-1,25	-1,11
2800	-0,04	-0,25	-0,51	-0,96	-1,01	-0,93	-0,76	-0,37	-0,22
3150	-0,82	-0,58	-0,67	-0,99	-1,50	-1,52	-1,38	-1,17	-0,73
3550	-1,44	-1,20	-0,83	-1,14	-1,89	-2,03	-1,91	-1,65	-1,05

4000	-1,25	-1,23	-0,72	-0,71	-1,47	-1,76	-1,80	-1,30	-0,97
4500	-1,45	-1,47	-1,27	-1,09	-1,52	-2,24	-2,24	-1,84	-1,45
5000	-1,64	-1,65	-1,61	-1,33	-1,46	-2,47	-2,47	-2,11	-1,63
5600	-2,35	-1,91	-1,94	-1,69	-1,38	-2,47	-2,89	-2,77	-2,24
6300	-3,51	-3,25	-2,82	-2,81	-2,52	-2,82	-4,09	-4,09	-3,53
7100	-4,01	-3,38	-3,33	-3,06	-2,94	-3,17	-3,92	-4,33	-4,05
8000	-5,08	-4,51	-4,22	-3,85	-3,63	-3,47	-4,52	-4,84	-4,40
8500	-4,96	-4,58	-4,18	-3,91	-3,58	-3,51	-4,68	-5,01	-5,01
9000	-5,73	-5,67	-5,04	-4,84	-4,34	-4,26	-4,75	-5,74	-5,74
9500	-5,61	-6,01	-5,06	-5,00	-4,37	-4,31	-4,87	-5,84	-5,84
10000	-5,50	-6,56	-5,60	-5,64	-4,96	-4,77	-5,08	-6,37	-6,37
10600	-5,69	-6,59	-5,79	-5,65	-4,98	-4,92	-5,23	-6,17	-6,37
11200	-6,22	-6,76	-6,97	-6,17	-5,88	-5,38	-5,51	-6,51	-7,09
11800	-6,64	-7,15	-7,48	-6,62	-6,62	-5,90	-5,93	-6,92	-7,40
12500	-7,03	-7,56	-7,95	-6,99	-7,08	-6,31	-6,51	-7,37	-7,76

	Angle [°]								
f [Hz]	**180-185**	**185-190**	**190-195**	**195-200**	**200-205**	**205-210**	**210-215**	**215-220**	**220-225**
250	-0,33	-0,33	-0,34	-0,35	-0,35	-0,36	-0,36	-0,36	-0,36
315	-0,49	-0,48	-0,46	-0,45	-0,43	-0,41	-0,40	-0,38	-0,38
400	-0,08	-0,09	-0,10	-0,11	-0,12	-0,14	-0,15	-0,17	-0,18
500	-0,72	-0,72	-0,73	-0,73	-0,73	-0,73	-0,72	-0,72	-0,71
630	-0,06	-0,05	-0,04	-0,05	-0,05	-0,07	-0,09	-0,11	-0,11
800	0,03	0,03	0,03	0,03	0,02	-0,02	-0,03	-0,05	-0,07
1000	-0,27	-0,27	-0,30	-0,33	-0,37	-0,40	-0,47	-0,49	-0,52
1250	0,18	0,18	0,17	0,12	0,08	-0,07	-0,12	-0,21	-0,24
1600	-0,68	-0,66	-0,70	-0,80	-0,87	-1,01	-1,07	-1,10	-1,10
2000	-0,47	-0,48	-0,53	-0,69	-0,80	-0,98	-1,05	-1,05	-0,98
2240	-0,08	-0,07	-0,18	-0,40	-0,53	-0,76	-0,81	-0,81	-0,69
2500	-0,94	-0,92	-1,06	-1,17	-1,48	-1,61	-1,70	-1,69	-1,40
2800	-0,05	-0,09	-0,33	-0,51	-0,87	-0,96	-0,94	-0,79	-0,27
3150	-0,58	-0,51	-0,80	-1,03	-1,51	-1,64	-1,64	-1,38	-1,05
3550	-0,84	-0,75	-0,89	-1,40	-1,69	-1,95	-1,95	-1,39	-1,00
4000	-0,71	-0,58	-1,08	-1,46	-1,82	-2,01	-1,53	-1,04	-0,65
4500	-0,92	-0,91	-1,46	-1,89	-2,45	-2,45	-1,68	-1,13	-1,25
5000	-0,95	-1,02	-1,88	-2,45	-2,82	-2,72	-2,16	-1,17	-1,98
5600	-1,28	-1,18	-2,08	-2,75	-3,17	-2,97	-1,55	-1,52	-2,17
6300	-2,93	-2,67	-3,19	-4,32	-4,32	-3,32	-2,62	-2,97	-2,97
7100	-2,89	-2,79	-3,95	-4,43	-4,43	-3,53	-2,99	-3,16	-3,32
8000	-3,65	-3,34	-4,09	-5,18	-5,18	-3,74	-3,79	-3,97	-4,23
8500	-3,66	-3,65	-4,51	-5,14	-4,87	-4,00	-3,77	-3,89	-4,24
9000	-4,18	-3,90	-5,50	-5,96	-5,48	-4,71	-4,63	-4,75	-5,23
9500	-4,07	-4,05	-5,86	-5,89	-5,07	-4,61	-4,61	-5,19	-5,19
10000	-5,58	-4,56	-6,33	-6,33	-5,36	-5,00	-5,00	-5,49	-5,66
10600	-5,43	-4,96	-6,03	-6,62	-5,98	-5,15	-5,58	-5,80	-6,65
11200	-6,26	-5,34	-6,38	-6,98	-6,38	-5,58	-5,54	-6,13	-6,14
11800	-6,56	-6,21	-7,42	-7,64	-6,68	-6,34	-6,50	-7,08	-7,39
12500	-6,87	-5,98	-8,28	-8,28	-7,06	-6,98	-7,45	-7,53	-8,61

	Angle [°]								
f [Hz]	225-230	230-235	235-240	240-245	245-250	250-255	255-260	260-265	265-270
250	-0,36	-0,36	-0,36	-0,35	-0,34	-0,33	-0,32	-0,32	-0,30
315	-0,37	-0,35	-0,34	-0,32	-0,30	-0,29	-0,26	-0,25	-0,23
400	-0,20	-0,20	-0,21	-0,22	-0,22	-0,22	-0,21	-0,21	-0,20
500	-0,71	-0,69	-0,67	-0,64	-0,63	-0,58	-0,56	-0,51	-0,49
630	-0,14	-0,14	-0,14	-0,14	-0,11	-0,09	-0,04	0,04	0,07
800	-0,07	-0,07	-0,07	-0,04	0,03	0,07	0,14	0,16	0,20
1000	-0,53	-0,52	-0,50	-0,47	-0,37	-0,26	-0,22	-0,15	-0,14
1250	-0,25	-0,24	-0,16	-0,10	0,07	0,09	0,09	-0,07	-0,15
1600	-1,06	-0,86	-0,73	-0,49	-0,43	-0,51	-0,71	-0,80	-0,85
2000	-0,88	-0,57	-0,44	-0,41	-0,66	-0,77	-0,82	-0,80	-0,68
2240	-0,35	-0,19	-0,19	-0,35	-0,52	-0,69	-0,69	-0,56	-0,56
2500	-1,18	-0,86	-0,96	-1,34	-1,45	-1,44	-1,35	-1,35	-1,46
2800	-0,07	-0,07	-0,46	-0,58	-0,57	-0,40	-0,52	-0,72	-0,60
3150	-0,51	-0,67	-1,15	-1,18	-1,06	-1,13	-1,30	-1,32	-1,14
3550	-0,89	-1,18	-1,39	-1,39	-1,29	-1,51	-1,68	-1,62	-1,18
4000	-1,14	-1,44	-1,44	-1,46	-1,78	-1,93	-1,76	-1,24	-1,19
4500	-1,59	-1,61	-1,43	-1,97	-2,12	-2,12	-1,65	-1,46	-1,37
5000	-2,00	-1,90	-2,24	-2,60	-2,60	-2,16	-1,88	-2,01	-2,09
5600	-2,17	-2,34	-2,77	-2,83	-2,83	-2,06	-2,13	-2,31	-2,57
6300	-3,16	-3,39	-3,79	-3,86	-3,86	-3,11	-3,25	-3,84	-3,59
7100	-3,45	-3,97	-4,22	-3,54	-3,12	-3,40	-3,97	-3,59	-3,02
8000	-4,49	-5,07	-5,30	-4,38	-4,05	-4,77	-4,74	-4,03	-4,12
8500	-4,61	-5,21	-4,43	-4,01	-4,72	-4,93	-4,26	-3,60	-4,55
9000	-5,32	-6,20	-5,76	-4,86	-5,75	-5,75	-5,16	-5,16	-5,25
9500	-6,02	-6,02	-5,19	-5,24	-5,86	-5,39	-5,18	-5,40	-4,47
10000	-6,55	-6,09	-5,52	-6,05	-6,31	-6,31	-5,36	-6,14	-5,26
10600	-6,66	-6,66	-5,62	-6,76	-6,76	-5,56	-6,44	-6,44	-4,96
11200	-7,01	-6,83	-6,08	-6,77	-6,88	-6,58	-6,58	-6,58	-6,08
11800	-7,96	-7,40	-7,20	-8,03	-7,00	-7,04	-7,67	-6,33	-6,87
12500	-8,61	-7,59	-8,62	-8,62	-7,21	-8,45	-7,35	-7,48	-7,36

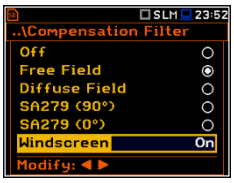
	Angle [°]								
f [Hz]	270-275	275-280	280-285	285-290	290-295	295-300	300-305	305-310	310-315
250	-0,29	-0,27	-0,26	-0,24	-0,23	-0,20	-0,19	-0,18	-0,14
315	-0,20	-0,17	-0,16	-0,13	-0,12	-0,09	-0,06	-0,04	-0,03
400	-0,20	-0,18	-0,17	-0,15	-0,14	-0,12	-0,11	-0,09	-0,08
500	-0,44	-0,41	-0,37	-0,34	-0,30	-0,28	-0,24	-0,22	-0,19
630	0,13	0,14	0,17	0,19	0,20	0,20	0,20	0,19	0,16
800	0,21	0,21	0,21	0,20	0,16	0,11	0,09	0,06	0,02
1000	-0,17	-0,19	-0,24	-0,27	-0,29	-0,30	-0,30	-0,29	-0,25
1250	-0,29	-0,33	-0,36	-0,37	-0,36	-0,32	-0,29	-0,26	-0,25
1600	-0,84	-0,79	-0,63	-0,57	-0,60	-0,63	-0,63	-0,58	-0,50
2000	-0,66	-0,74	-0,75	-0,75	-0,58	-0,27	-0,13	0,04	0,04
2240	-0,64	-0,66	-0,60	-0,26	-0,09	0,06	-0,04	-0,11	-0,20
2500	-1,52	-1,45	-1,07	-0,91	-0,92	-1,01	-1,06	-1,06	-1,00
2800	-0,38	-0,18	-0,14	-0,19	-0,20	-0,18	-0,22	-0,34	-0,33
3150	-0,87	-0,66	-0,68	-0,67	-0,70	-0,88	-0,85	-0,65	-0,14
3550	-1,09	-1,09	-1,12	-1,31	-1,31	-1,12	-0,89	-0,68	-0,75

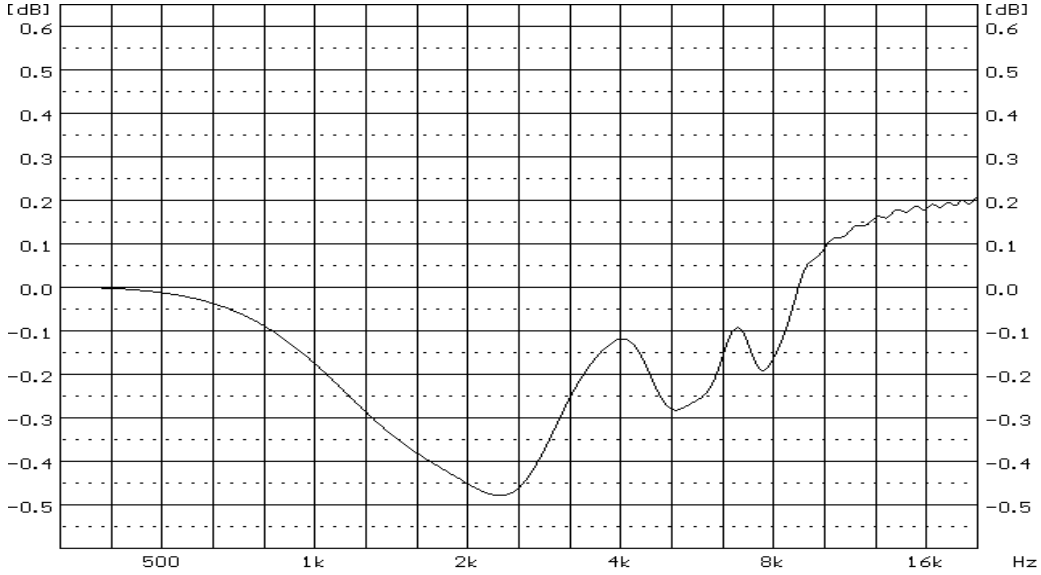
4000	-1,16	-1,43	-1,54	-1,46	-1,23	-0,80	-0,72	-0,62	-0,60
4500	-1,72	-1,79	-1,63	-1,35	-0,99	-0,94	-1,29	-1,31	-1,09
5000	-2,20	-2,11	-1,32	-1,14	-1,45	-1,46	-1,25	-0,88	-0,37
5600	-2,38	-1,67	-1,47	-1,93	-1,93	-1,55	-0,77	-0,77	-0,63
6300	-2,74	-2,85	-3,43	-3,12	-2,37	-2,09	-2,03	-2,03	-1,87
7100	-3,43	-3,51	-2,85	-2,40	-2,42	-2,42	-2,06	-1,73	-1,49
8000	-4,30	-3,53	-3,01	-3,52	-3,52	-2,64	-2,58	-2,16	-2,08
8500	-4,55	-3,66	-3,50	-3,50	-2,76	-2,38	-2,20	-2,15	-1,87
9000	-4,36	-4,56	-4,56	-4,19	-3,48	-3,32	-3,11	-2,87	-2,30
9500	-4,16	-4,77	-4,06	-3,63	-3,33	-3,26	-2,65	-2,48	-2,19
10000	-5,29	-5,29	-4,10	-3,89	-3,71	-3,41	-2,97	-2,79	-2,40
10600	-5,59	-4,79	-4,29	-4,27	-3,92	-3,51	-3,23	-2,78	-2,30
11200	-6,08	-4,81	-4,79	-4,44	-3,90	-3,77	-3,66	-2,86	-2,86
11800	-6,56	-5,81	-5,81	-5,03	-4,74	-4,28	-3,84	-3,50	-3,22
12500	-6,33	-6,51	-5,86	-5,62	-5,33	-4,46	-4,33	-3,60	-3,31

	Angle [°]								
f [Hz]	**315-320**	**320-325**	**325-330**	**330-335**	**335-340**	**340-345**	**345-350**	**350-355**	**355-360**
250	-0,13	-0,12	-0,10	-0,08	-0,08	-0,05	-0,04	-0,03	-0,02
315	0,01	0,02	0,02	0,02	0,04	0,04	0,04	0,04	0,02
400	-0,07	-0,06	-0,06	-0,06	-0,04	-0,03	-0,03	-0,03	-0,03
500	-0,17	-0,14	-0,12	-0,10	-0,08	-0,06	-0,05	-0,03	-0,03
630	0,14	0,14	0,11	0,09	0,08	0,05	0,05	0,04	0,03
800	-0,02	-0,03	-0,03	-0,03	-0,03	-0,02	-0,02	-0,01	-0,01
1000	-0,23	-0,19	-0,17	-0,12	-0,11	-0,08	-0,06	-0,04	-0,03
1250	-0,24	-0,24	-0,24	-0,21	-0,18	-0,16	-0,11	-0,08	-0,04
1600	-0,30	-0,19	0,05	0,09	0,13	0,13	0,11	0,10	0,06
2000	-0,11	-0,16	-0,20	-0,20	-0,19	-0,16	-0,10	-0,08	-0,06
2240	-0,20	-0,17	-0,11	-0,09	-0,09	-0,09	-0,08	-0,07	-0,03
2500	-0,99	-1,00	-1,00	-0,89	-0,79	-0,53	-0,40	-0,21	-0,14
2800	-0,03	0,36	0,48	0,53	0,52	0,38	0,29	0,14	0,09
3150	-0,01	-0,21	-0,31	-0,37	-0,36	-0,31	-0,17	-0,11	-0,04
3550	-0,75	-0,68	-0,54	-0,56	-0,64	-0,64	-0,54	-0,44	-0,22
4000	-0,85	-0,85	-0,60	-0,30	0,14	0,14	-0,05	-0,10	-0,11
4500	-0,75	-0,38	-0,35	-0,23	-0,12	-0,02	-0,07	-0,07	-0,07
5000	-0,46	-0,48	-0,40	-0,13	-0,03	-0,08	-0,14	-0,18	-0,18
5600	-0,59	-0,57	-0,48	-0,27	0,23	0,31	0,31	0,23	0,15
6300	-1,50	-1,34	-0,99	-0,94	-0,79	-0,62	-0,49	-0,40	-0,30
7100	-1,33	-0,91	-0,90	-0,75	-0,57	-0,17	-0,16	-0,19	-0,19
8000	-1,97	-1,46	-1,27	-1,23	-0,86	-0,66	-0,45	-0,42	-0,35
8500	-1,40	-1,35	-0,98	-0,81	-0,71	-0,48	-0,24	0,04	0,02
9000	-2,03	-1,89	-1,72	-1,18	-1,00	-0,92	-0,75	-0,62	-0,51
9500	-1,77	-1,34	-1,22	-1,14	-0,93	-0,61	-0,49	-0,33	-0,23
10000	-1,95	-1,87	-1,65	-1,24	-1,12	-0,52	-0,45	-0,41	-0,33
10600	-2,19	-1,67	-1,49	-0,90	-0,81	-0,68	-0,39	-0,13	-0,15
11200	-2,33	-2,00	-1,52	-1,48	-0,89	-0,72	-0,44	-0,19	-0,04
11800	-2,56	-2,46	-1,82	-1,64	-1,17	-1,12	-0,88	-0,70	-0,28
12500	-2,78	-2,53	-1,96	-1,86	-1,18	-1,03	-0,63	-0,53	-0,28

C.1.2 Effect of the SA 22 windscreen

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





SA22 free field compensation filter characteristic

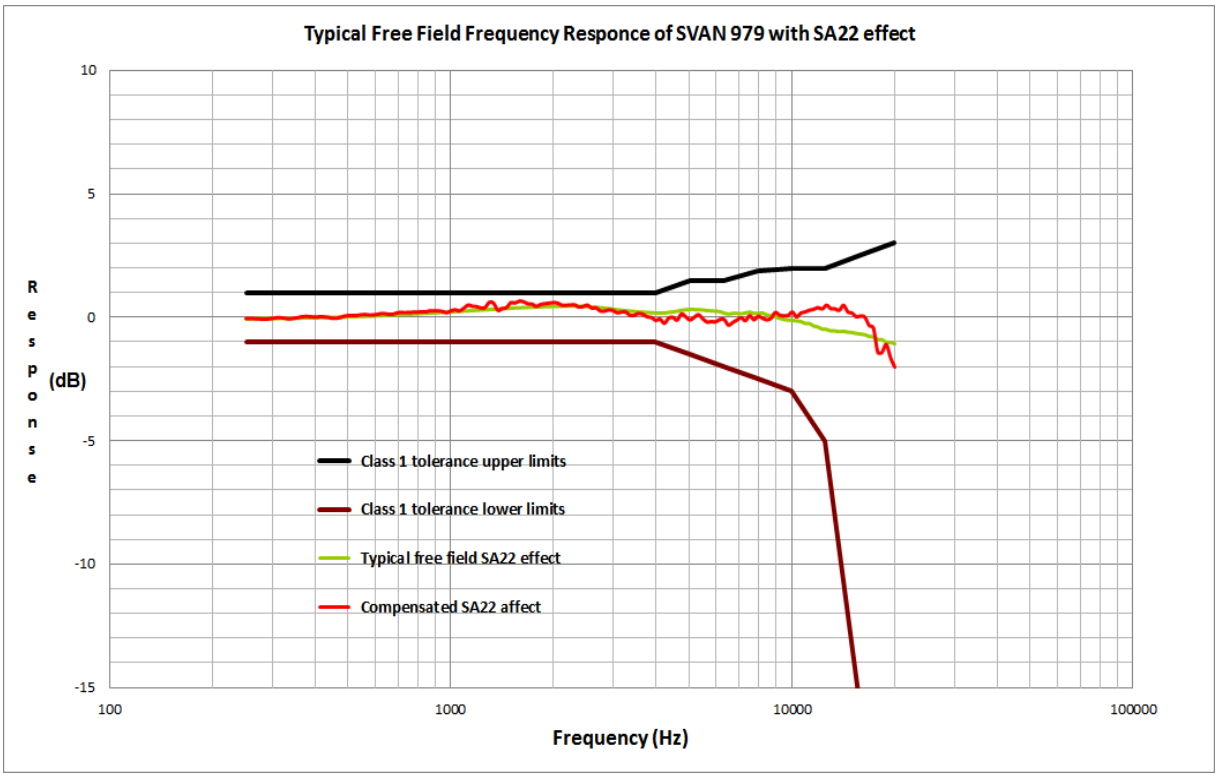


Table C.1.12. SVAN 979 effect of the SA 22 windscreen

Frequency [Hz}	Free field SA22 effect [dB]	Compensated SA22 effect [dB]	Frequency [Hz}	Free field SA22 effect [dB]	Compensated SA22 effect [dB]
251,19	-0,06	-0,04	**2304,09**	0,45	0,51
258,52	-0,06	-0,04	**2371,37**	0,44	0,42
266,07	-0,06	-0,05	**2440,62**	0,43	0,45
273,84	-0,06	-0,06	**2511,89**	0,43	0,50
281,84	-0,06	-0,07	**2585,23**	0,41	0,38
290,07	-0,05	-0,06	**2660,73**	0,40	0,39
298,54	-0,05	-0,04	**2738,42**	0,38	0,26
307,26	-0,05	-0,01	**2818,38**	0,37	0,26
316,23	-0,05	-0,01	**2900,68**	0,34	0,31
325,46	-0,04	-0,03	**2985,38**	0,32	0,28
334,97	-0,04	-0,06	**3072,56**	0,30	0,19
344,75	-0,04	-0,04	**3162,28**	0,28	0,22
354,81	-0,04	-0,01	**3254,62**	0,26	0,22
365,17	-0,03	0,03	**3349,65**	0,25	0,09
375,84	-0,03	0,05	**3447,47**	0,23	0,09
386,81	-0,03	0,03	**3548,13**	0,21	0,17
398,11	-0,03	0,02	**3651,74**	0,20	0,13
409,73	-0,02	0,02	**3758,37**	0,19	0,03
421,70	-0,02	0,03	**3868,12**	0,18	0,00
434,01	-0,01	0,01	**3981,07**	0,17	-0,11
446,68	-0,01	-0,02	**4097,32**	0,16	-0,06
459,73	0,00	-0,04	**4216,97**	0,17	-0,23
473,15	0,00	-0,01	**4340,10**	0,19	-0,03
486,97	0,01	0,06	**4466,84**	0,21	0,01
501,19	0,01	0,08	**4597,27**	0,24	-0,11
515,82	0,02	0,08	**4731,51**	0,27	0,14
530,88	0,03	0,09	**4869,68**	0,30	0,03
546,39	0,03	0,11	**5011,87**	0,31	-0,09
562,34	0,04	0,12	**5158,22**	0,31	0,01
578,76	0,04	0,10	**5308,84**	0,30	0,11
595,66	0,05	0,11	**5463,87**	0,29	-0,05
613,06	0,06	0,14	**5623,41**	0,27	-0,18
630,96	0,06	0,16	**5787,62**	0,25	-0,16
649,38	0,07	0,14	**5956,62**	0,24	-0,17
668,34	0,08	0,12	**6130,56**	0,22	-0,08
687,86	0,09	0,17	**6309,57**	0,17	-0,07
707,95	0,10	0,21	**6493,82**	0,12	-0,31
728,62	0,11	0,20	**6683,44**	0,15	-0,21
749,89	0,12	0,20	**6878,60**	0,15	-0,10
771,79	0,12	0,21	**7079,46**	0,14	-0,01
794,33	0,13	0,21	**7286,18**	0,17	-0,12
817,52	0,14	0,23	**7498,94**	0,20	0,07
841,40	0,15	0,22	**7717,92**	0,15	-0,09
865,96	0,16	0,27	**7943,28**	0,16	0,05
891,25	0,17	0,27	**8175,23**	0,17	-0,03
917,28	0,18	0,27	**8413,95**	0,09	-0,09
944,06	0,19	0,25	**8659,64**	0,05	-0,03
977,63	0,20	0,19	**8912,51**	0,02	0,20
1000,00	0,21	0,27	**9172,76**	-0,04	0,10

Frequency [Hz}	Free field SA22 effect [dB]	Compensated SA22 effect [dB]	Frequency [Hz}	Free field SA22 effect [dB]	Compensated SA22 effect [dB]
1029,20	0,22	0,31	**9440,61**	-0,09	0,07
1059,25	0,23	0,27	**9776,28**	-0,12	0,08
1090,18	0,24	0,37	**10000,00**	-0,12	0,22
1122,02	0,25	0,50	**10292,01**	-0,15	0,02
1154,78	0,27	0,46	**10592,54**	-0,17	0,18
1188,50	0,28	0,44	**10901,84**	-0,25	0,23
1223,21	0,29	0,39	**11220,18**	-0,25	0,29
1258,93	0,30	0,40	**11547,82**	-0,35	0,33
1295,69	0,31	0,61	**11885,02**	-0,39	0,40
1333,52	0,32	0,58	**12232,07**	-0,47	0,35
1372,46	0,33	0,29	**12589,25**	-0,49	0,50
1412,54	0,34	0,36	**12956,87**	-0,54	0,36
1453,78	0,35	0,40	**13335,21**	-0,55	0,35
1496,24	0,36	0,60	**13724,61**	-0,57	0,29
1539,93	0,37	0,58	**14125,38**	-0,56	0,49
1584,89	0,38	0,66	**14537,84**	-0,59	0,23
1631,17	0,38	0,64	**14962,36**	-0,61	0,18
1678,80	0,39	0,55	**15399,27**	-0,65	0,03
1727,83	0,40	0,54	**15848,93**	-0,67	0,06
1778,28	0,41	0,45	**16311,73**	-0,70	0,01
1830,21	0,41	0,53	**16788,04**	-0,77	-0,32
1883,65	0,42	0,56	**17278,26**	-0,79	-0,42
1938,65	0,43	0,58	**17782,79**	-0,88	-1,39
1995,26	0,43	0,60	**18302,06**	-0,90	-1,41
2053,53	0,44	0,58	**18836,49**	-1,00	-1,09
2113,49	0,44	0,50	**19386,53**	-1,00	-1,62
2175,20	0,45	0,49	**19952,62**	-1,06	-2,00
2238,72	0,45	0,51			

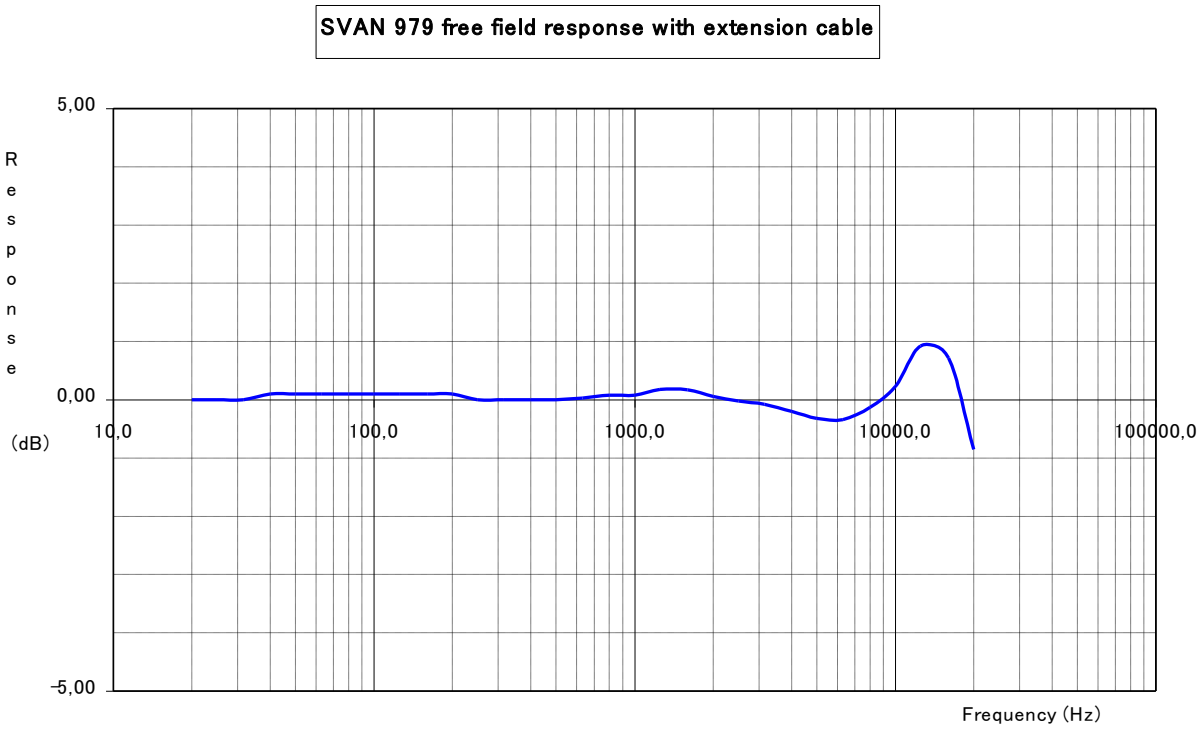
C.1.3 Effect of the extension cable SC 93

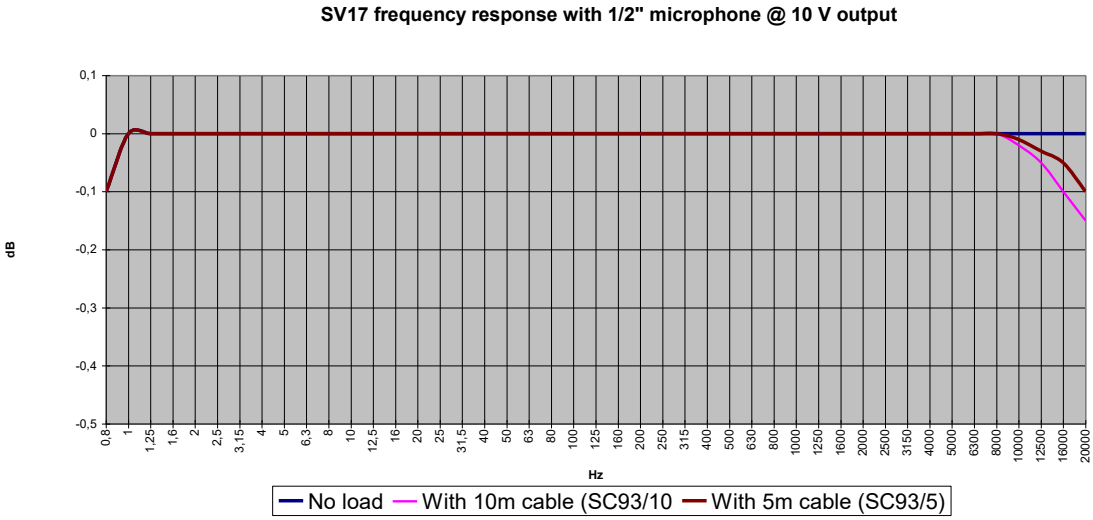


Note: *Using of the extension cable does not affect the linear operation ranges.*



Note: *Using of the preamplifier mounted on the extension cable SC 93 change metrological property of SVAN 979 in the free field.*

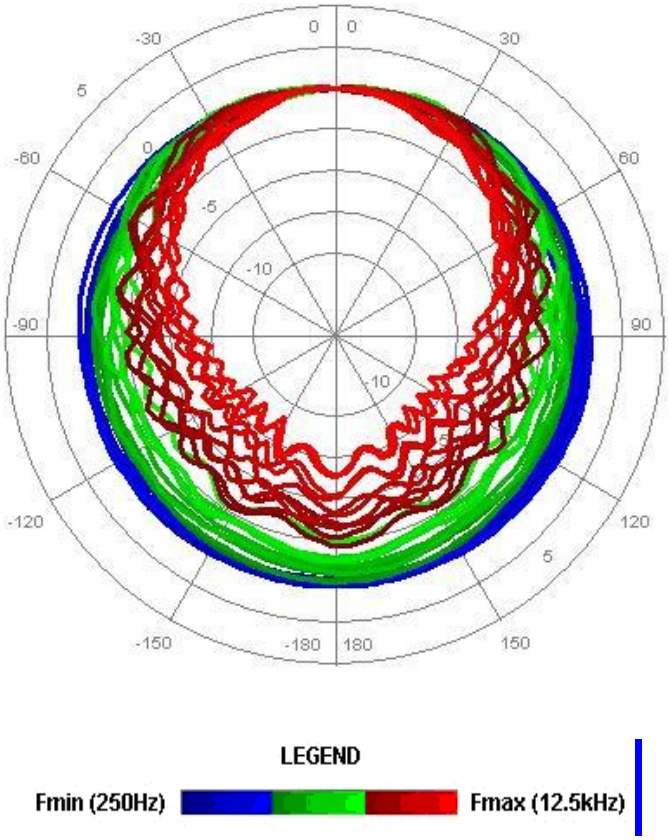




As shown above, the change in the electrical frequency response caused by the use of the SC 93 cable can be neglected.

Directional characteristics

Note: *The way of mounting of the preamplifier (when using the extension cable SC 93) is critical for the SVAN 979 acoustic characteristics in the free field. Thus, using the tripod and the "gooseneck" SA 08 is strongly recommended.*



Directional characteristics of SVAN 979 with extension cable SC 93 and preamplifier holder SA 08 mounted on the tripod

Table C.1.12 Directional characteristics of the SVAN 979 with extension cable SC 93 and preamplifier holder SA 08 mounted on the tripod

	Angle [°]								
f [Hz]	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
250	0	0	-0.01	-0.01	-0.01	-0.03	-0.03	-0.04	-0.04
315	0	0	0	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
400	0	0	0	0	0	0	-0.01	-0.01	-0.01
500	0	0	-0.01	-0.01	-0.02	-0.03	-0.03	-0.04	-0.05
630	0	-0.01	-0.02	-0.03	-0.04	-0.05	-0.06	-0.07	-0.07
800	0	-0.01	-0.02	-0.04	-0.05	-0.07	-0.09	-0.09	-0.11
1000	0	0.02	0.05	0.1	0.14	0.17	0.21	0.24	0.26
1250	0	-0.01	-0.02	-0.02	-0.02	-0.01	-0.01	-0.02	-0.05
1600	0	0	0.02	0.06	0.07	0.07	0.07	0.04	-0.09
2000	0	-0.04	-0.06	-0.07	-0.06	-0.05	0.11	0.15	0.22
2240	0	0.01	0.01	-0.03	-0.06	-0.15	-0.19	-0.19	-0.2
2500	0	-0.01	-0.02	0.02	0.03	0.02	-0.03	-0.12	-0.26
2800	0	0.01	0.03	0.04	0.05	0.08	0.13	0.13	0.1
3150	0	-0.01	-0.12	-0.23	-0.33	-0.38	-0.45	-0.47	-0.45
3550	0	0.12	0.13	0.1	0.07	0.04	-0.19	-0.48	-0.66
4000	0	-0.07	-0.12	-0.18	-0.23	-0.23	-0.23	0.05	0.16
4500	0	0.02	0.03	-0.08	-0.16	-0.41	-0.75	-0.92	-1.22
5000	0	0.01	-0.15	-0.29	-0.37	-0.43	-0.37	-0.16	-0.05
5600	0	-0.03	0.11	0.27	0.29	0.26	-0.18	-0.45	-0.86
6300	0	-0.01	-0.11	-0.42	-0.87	-1.21	-1.25	-1.23	-1.03
7100	0	-0.15	-0.16	-0.32	-0.44	-0.27	-0.1	0.09	-0.73

8000	0	-0.03	0.05	0.03	0	0.09	-0.19	-0.73	-1.2
8500	0	0.04	-0.3	-0.58	-0.85	-1.11	-1.04	-0.89	-0.95
9000	0	0.05	0.07	0.11	0.08	-0.01	-0.31	-0.87	-1.09
9500	0	-0.03	-0.12	-0.38	-0.61	-0.72	-0.67	-0.61	-0.83
10000	0	-0.02	-0.02	-0.04	-0.12	-0.43	-1.27	-1.21	-1.21
10600	0	-0.08	-0.31	-0.55	-0.78	-0.93	-0.99	-1.23	-1.97
11200	0	-0.03	0.04	-0.1	-0.18	-0.42	-0.89	-1.21	-1.35
11800	0	0.03	0.04	-0.41	-0.71	-1.24	-1.29	-1.4	-1.73
12500	0	-0.1	-0.32	-0.61	-0.86	-0.81	-0.87	-1.55	-2.15
	Angle [°]								
f [Hz]	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
250	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.1
315	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04
400	-0.02	-0.02	-0.03	-0.04	-0.05	-0.05	-0.06	-0.06	-0.07
500	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.02
630	-0.08	-0.08	-0.08	-0.07	-0.04	-0.02	0.02	0.05	0.07
800	-0.13	-0.13	-0.13	-0.12	-0.1	-0.07	-0.05	0.05	0.08
1000	0.26	0.25	0.24	0.19	0.12	0.04	-0.06	-0.15	-0.28
1250	-0.08	-0.12	-0.15	-0.16	-0.18	-0.18	-0.16	-0.14	-0.11
1600	-0.23	-0.33	-0.57	-0.85	-1.05	-1.08	-0.93	-0.82	-0.58
2000	0.27	0.29	0.32	0.32	0.31	0.33	0.37	0.4	0.42
2240	-0.21	-0.2	-0.17	-0.14	-0.2	-0.27	-0.46	-0.65	-0.8
2500	-0.43	-0.62	-0.76	-0.78	-0.79	-0.71	-0.59	-0.49	-0.47
2800	0.06	-0.07	-0.2	-0.39	-0.55	-0.59	-0.54	-0.52	-0.68
3150	-0.36	-0.31	-0.36	-0.59	-0.74	-0.8	-0.92	-0.98	-0.98
3550	-0.92	-1.02	-1.04	-1.01	-0.86	-0.84	-1.02	-1.42	-1.62
4000	0.13	-0.12	-0.51	-0.81	-0.87	-0.75	-0.47	-0.88	-1.18
4500	-1.39	-1.32	-1.23	-1.04	-1.35	-1.7	-2.06	-2.01	-1.84
5000	0.06	-0.31	-0.6	-1.07	-1.09	-0.75	-0.95	-1.74	-2
5600	-0.91	-0.8	-0.69	-0.63	-1.39	-1.77	-1.79	-1.31	-1.18
6300	-0.8	-1.32	-1.79	-2.16	-1.75	-2.08	-2.93	-2.43	-2.32
7100	-1.28	-1.26	-1.03	-1.62	-2.3	-2.02	-1.56	-2.65	-2.99
8000	-1.22	-0.91	-1.12	-2.37	-1.79	-2.13	-3.17	-2.91	-3.27
8500	-1.92	-2.09	-2.11	-2.63	-3.06	-2.87	-3.59	-3.9	-3.78
9000	-0.97	-1	-1.58	-2.07	-1.95	-2.57	-2.99	-2.94	-3.21
9500	-1.8	-1.83	-1.7	-2.21	-2.92	-2.78	-2.86	-3.65	-3.56
10000	-2.28	-2.3	-2.28	-3.1	-3.36	-3.54	-4.04	-4.18	-4.47
10600	-2.15	-1.98	-2.76	-3.29	-3.27	-3.82	-4.34	-4.28	-4.7
11200	-1.44	-2.4	-2.6	-2.96	-3.58	-3.68	-4.64	-4.47	-5.19
11800	-2.48	-2.47	-3.2	-3.64	-4.07	-4.72	-4.66	-5.72	-5.61
12500	-2.17	-2.62	-3.33	-3.45	-4.42	-4.25	-4.96	-5.46	-6.51
	Angle [°]								
f [Hz]	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
250	-0.09	-0.09	-0.09	-0.08	-0.07	-0.06	-0.05	-0.05	-0.04
315	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
400	-0.07	-0.07	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07
500	-0.02	0.01	0.02	0.04	0.05	0.07	0.09	0.11	0.12
630	0.1	0.13	0.15	0.19	0.21	0.21	0.23	0.24	0.24
800	0.14	0.2	0.23	0.28	0.31	0.33	0.34	0.35	0.34
1000	-0.35	-0.39	-0.41	-0.43	-0.43	-0.41	-0.38	-0.36	-0.31
1250	-0.09	-0.08	-0.07	-0.07	-0.09	-0.12	-0.14	-0.19	-0.23
1600	-0.36	-0.19	-0.1	-0.1	-0.18	-0.29	-0.35	-0.44	-0.48

2000	0.46	0.51	0.54	0.57	0.57	0.53	0.5	0.4	0.32
2240	-0.86	-0.94	-0.99	-1	-1.01	-0.99	-0.95	-0.92	-0.76
2500	-0.54	-0.64	-0.7	-0.69	-0.65	-0.64	-0.69	-0.78	-0.9
2800	-0.87	-0.92	-0.92	-0.82	-0.78	-0.79	-0.77	-0.68	-0.61
3150	-1.01	-1.08	-1.17	-1.14	-1.05	-1	-1	-0.99	-0.98
3550	-1.61	-1.57	-1.59	-1.57	-1.6	-1.57	-1.45	-1.42	-1.45
4000	-1.16	-0.93	-0.7	-0.83	-1.22	-1.31	-1.19	-1.08	-1.01
4500	-1.77	-2.15	-2.3	-2.31	-2.37	-2.38	-2.52	-2.6	-2.41
5000	-1.57	-1.25	-1.65	-1.97	-2.26	-2.22	-1.83	-2.28	-2.43
5600	-1.97	-2.28	-2.04	-2.05	-2.27	-2.21	-2.06	-2.52	-2.68
6300	-3.47	-3.7	-2.87	-2.72	-3.58	-3.6	-3.11	-3.63	-3.72
7100	-2.4	-3.16	-3.76	-3.58	-2.9	-3.76	-3.25	-2.92	-3.74
8000	-3.72	-3.28	-4.1	-4.15	-3.44	-3.89	-4.33	-3.78	-3.73
8500	-3.98	-4.43	-3.9	-4.56	-4.17	-5.07	-4.87	-4.35	-4.82
9000	-3.66	-3.53	-4.1	-4.05	-4.06	-4.6	-4.45	-4.67	-4.89
9500	-3.71	-4.18	-4.1	-4.42	-4.88	-4.66	-5.43	-5.06	-5.53
10000	-4.77	-4.79	-5.31	-5.35	-5.37	-5.9	-5.3	-6.08	-5.77
10600	-4.92	-5.53	-5.79	-6.54	-6.38	-5.96	-6.53	-6.2	-7.06
11200	-5.62	-5.78	-6.03	-5.75	-6.63	-6.26	-7.33	-6.74	-7.41
11800	-6.63	-6.35	-7.59	-7.08	-7.87	-7.81	-8.35	-8.28	-7.53
12500	-6.4	-7	-6.56	-7.87	-8	-8.72	-7.62	-8.83	-8.15
	Angle [°]								
f [Hz]	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
250	-0.04	-0.03	-0.03	-0.02	-0.02	-0.01	0	0	0.01
315	-0.05	-0.04	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04
400	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06	-0.07	-0.07
500	0.13	0.15	0.16	0.16	0.17	0.18	0.19	0.19	0.19
630	0.24	0.23	0.23	0.22	0.21	0.21	0.2	0.2	0.2
800	0.33	0.32	0.28	0.24	0.22	0.19	0.16	0.14	0.14
1000	-0.25	-0.2	-0.16	-0.14	-0.11	-0.09	-0.08	-0.08	-0.08
1250	-0.23	-0.24	-0.25	-0.25	-0.25	-0.25	-0.25	-0.24	-0.24
1600	-0.48	-0.38	-0.26	-0.15	-0.05	0.07	0.11	0.13	0.14
2000	0.26	0.24	0.19	0.15	0.13	0.08	0.05	0.03	-0.02
2240	-0.62	-0.45	-0.4	-0.33	-0.28	-0.26	-0.24	-0.23	-0.21
2500	-1	-1.03	-1.04	-0.98	-0.89	-0.78	-0.68	-0.62	-0.59
2800	-0.6	-0.58	-0.51	-0.42	-0.31	-0.26	-0.16	-0.08	-0.05
3150	-1.01	-1.05	-1.12	-1.14	-1.1	-1.02	-0.97	-0.89	-0.83
3550	-1.5	-1.5	-1.45	-1.41	-1.36	-1.23	-1.15	-1.11	-1.06
4000	-1.2	-1.25	-1.23	-1.19	-1.03	-0.82	-0.62	-0.53	-0.54
4500	-2.35	-2.42	-2.38	-2.37	-2.32	-2.14	-1.87	-1.75	-1.59
5000	-2.1	-1.79	-1.85	-1.99	-1.99	-1.92	-1.7	-1.42	-1.3
5600	-2.33	-2.06	-2.25	-2.32	-2.32	-2.09	-1.77	-1.51	-1.41
6300	-3.57	-3.03	-3.05	-3.48	-3.59	-3.53	-3.12	-2.77	-2.57
7100	-3.77	-3.2	-2.92	-3.03	-3.32	-3.37	-3.01	-2.47	-2.33
8000	-4.17	-3.94	-3.2	-3.18	-3.78	-3.88	-3.82	-3.32	-2.9
8500	-5.04	-4.35	-3.93	-4.36	-4.49	-4.15	-3.95	-3.6	-3.44
9000	-4.55	-4.89	-4.77	-3.98	-4.04	-4.56	-4.55	-3.82	-3.59
9500	-5.32	-4.78	-5.45	-5.61	-4.45	-4.43	-5.01	-5.1	-4.65
10000	-5.33	-5.93	-5.69	-4.79	-5.23	-5.41	-5.17	-4.86	-4.29
10600	-6.83	-6.15	-6.9	-6.67	-5.66	-5.98	-6.63	-6.48	-5.72
11200	-7	-6.51	-7.28	-6.82	-6.14	-6.37	-6.68	-6.65	-6.02
11800	-8.52	-7.79	-8.48	-8.36	-7.03	-7.86	-7.99	-7.71	-6.93
12500	-8.96	-8.15	-8.13	-8.66	-7.59	-7.51	-7.99	-7.73	-6.92

	Angle [°]								
f [Hz]	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
250	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.01
315	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
400	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08	-0.09	-0.09	-0.09
500	0.19	0.19	0.19	0.19	0.18	0.18	0.17	0.16	0.15
630	0.2	0.2	0.2	0.2	0.2	0.21	0.22	0.22	0.23
800	0.13	0.14	0.17	0.19	0.21	0.24	0.27	0.29	0.31
1000	-0.09	-0.1	-0.13	-0.14	-0.17	-0.2	-0.24	-0.29	-0.32
1250	-0.24	-0.23	-0.23	-0.23	-0.23	-0.23	-0.22	-0.21	-0.18
1600	0.14	0.13	0.1	0.04	-0.02	-0.1	-0.21	-0.33	-0.38
2000	-0.04	-0.08	-0.15	-0.2	-0.21	-0.22	-0.17	-0.09	-0.04
2240	-0.2	-0.19	-0.15	-0.16	-0.19	-0.24	-0.28	-0.38	-0.53
2500	-0.58	-0.63	-0.71	-0.77	-0.9	-1.03	-1.12	-1.14	-1.11
2800	-0.06	-0.12	-0.15	-0.26	-0.38	-0.48	-0.52	-0.54	-0.55
3150	-0.8	-0.78	-0.83	-0.9	-0.97	-1.03	-1.08	-1.08	-1.04
3550	-1.1	-1.15	-1.22	-1.34	-1.39	-1.45	-1.47	-1.5	-1.54
4000	-0.63	-0.8	-0.99	-1.09	-1.2	-1.21	-1.14	-0.99	-0.92
4500	-1.54	-1.6	-1.72	-1.92	-2.05	-2.25	-2.29	-2.25	-2.2
5000	-1.26	-1.37	-1.47	-1.73	-1.97	-2.1	-2.07	-1.85	-1.82
5600	-1.38	-1.5	-1.78	-2.05	-2.14	-2.25	-2.16	-1.9	-2.17
6300	-2.69	-2.83	-3.24	-3.6	-3.65	-3.38	-2.86	-2.89	-3.69
7100	-2.26	-2.68	-3.25	-3.48	-3.58	-3.28	-2.86	-3.39	-3.76
8000	-2.79	-3.27	-3.58	-3.91	-3.85	-3.24	-3.1	-3.76	-4.01
8500	-3.68	-4.1	-4.38	-4.73	-4.59	-3.97	-4.14	-4.93	-4.93
9000	-3.36	-3.65	-4.33	-4.62	-4.83	-4.44	-4.33	-4.82	-5.06
9500	-4.33	-3.92	-3.76	-4.14	-4.78	-5.26	-4.72	-4.29	-5.49
10000	-4.39	-4.68	-5.4	-5.59	-5.2	-4.92	-5.77	-5.94	-5.37
10600	-5.15	-5.16	-5.72	-6.61	-6.85	-6.38	-5.97	-6.89	-7.36
11200	-5.29	-5.68	-6.51	-6.99	-6.16	-6.01	-7.32	-6.66	-6.86
11800	-6.51	-6.7	-7.5	-8.01	-7.73	-7.18	-8.34	-8.42	-7.61
12500	-6.58	-7.19	-8.08	-8.12	-7.8	-7.39	-9.08	-8.42	-7.99

	Angle [°]								
f [Hz]	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
250	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
315	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
400	-0.09	-0.1	-0.1	-0.1	-0.1	-0.11	-0.1	-0.1	-0.1
500	0.14	0.12	0.1	0.09	0.07	0.05	0.03	0.02	-0.01
630	0.24	0.24	0.24	0.24	0.24	0.23	0.22	0.19	0.15
800	0.32	0.32	0.31	0.29	0.26	0.22	0.2	0.15	0.1
1000	-0.37	-0.42	-0.48	-0.49	-0.5	-0.5	-0.49	-0.47	-0.42
1250	-0.15	-0.13	-0.08	-0.03	-0.02	-0.01	-0.02	-0.05	-0.08
1600	-0.44	-0.44	-0.35	-0.19	-0.08	0.19	0.26	0.26	0.19
2000	0.14	0.2	0.3	0.35	0.35	0.31	0.32	0.39	0.44
2240	-0.61	-0.77	-0.91	-0.96	-1	-0.99	-0.95	-0.88	-0.84
2500	-1.01	-0.95	-0.83	-0.76	-0.75	-0.76	-0.79	-0.79	-0.7
2800	-0.58	-0.66	-0.69	-0.66	-0.56	-0.48	-0.47	-0.46	-0.4
3150	-0.96	-1	-1.11	-1.14	-1.07	-0.94	-0.91	-0.93	-0.85
3550	-1.58	-1.57	-1.58	-1.83	-1.86	-1.74	-1.52	-1.44	-1.32
4000	-0.9	-0.97	-1.04	-0.92	-0.78	-0.7	-0.97	-1.18	-1.15
4500	-2.16	-2.22	-2.44	-2.42	-2.27	-2.24	-2.18	-2.11	-2

5000	-1.94	-2.24	-2.26	-1.89	-1.72	-2.02	-2.2	-1.63	-1.08
5600	-2.63	-2.65	-2.53	-2.27	-2.39	-2.51	-2.35	-1.88	-2.13
6300	-3.93	-3.6	-3.22	-3.72	-3.85	-3.14	-3.46	-3.68	-3.42
7100	-3.92	-3.42	-3.9	-4	-3.5	-3.09	-3.53	-2.81	-2.28
8000	-3.96	-4.17	-4.25	-3.91	-3.66	-4.06	-3.21	-3.02	-3.5
8500	-4.62	-4.93	-4.87	-4.37	-4.92	-4.08	-4.52	-4.71	-3.53
9000	-4.6	-4.95	-4.38	-4.46	-4.69	-4.39	-4.36	-4.34	-3.78
9500	-5.58	-5.36	-5.45	-5.6	-5.17	-5.55	-4.9	-5	-4.79
10000	-6.24	-6.32	-5.69	-5.97	-5.28	-5.47	-5.18	-5.05	-4.9
10600	-6.69	-6.82	-7.46	-6.54	-6.93	-6.61	-6.93	-6.98	-6.17
11200	-7.43	-6.68	-7.09	-7.11	-6.82	-6.72	-5.93	-6.33	-5.33
11800	-8.42	-7.37	-8.14	-8.15	-7.64	-7.35	-6.75	-7	-6.4
12500	-9.07	-8.08	-8.98	-7.96	-8.3	-7.87	-7.96	-7.18	-7.5

	Angle [°]								
f [Hz]	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
250	0.03	0.03	0.03	0.03	0.03	0.02	0.01	0.01	0.01
315	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
400	-0.09	-0.09	-0.08	-0.08	-0.06	-0.06	-0.05	-0.05	-0.04
500	-0.03	-0.05	-0.06	-0.07	-0.08	-0.09	-0.09	-0.09	-0.09
630	0.13	0.08	0.05	0.04	-0.01	-0.02	-0.03	-0.04	-0.05
800	0.08	0.03	0	-0.03	-0.06	-0.06	-0.08	-0.08	-0.08
1000	-0.4	-0.33	-0.26	-0.19	-0.11	-0.08	-0.02	0.03	0.05
1250	-0.09	-0.1	-0.11	-0.11	-0.1	-0.08	-0.06	-0.04	-0.01
1600	0.12	-0.18	-0.45	-0.69	-0.78	-0.84	-0.8	-0.62	-0.36
2000	0.54	0.6	0.61	0.6	0.58	0.57	0.57	0.56	0.52
2240	-0.78	-0.73	-0.68	-0.59	-0.55	-0.57	-0.59	-0.58	-0.49
2500	-0.53	-0.39	-0.33	-0.34	-0.37	-0.44	-0.45	-0.39	-0.33
2800	-0.37	-0.47	-0.58	-0.6	-0.59	-0.51	-0.4	-0.24	-0.16
3150	-0.78	-0.81	-0.81	-0.78	-0.76	-0.64	-0.54	-0.4	-0.44
3550	-1.44	-1.48	-1.37	-0.92	-0.75	-0.89	-1.05	-1.12	-0.98
4000	-0.98	-0.39	-0.42	-0.67	-0.7	-0.65	-0.36	0.17	0.3
4500	-1.74	-1.64	-1.78	-1.88	-1.67	-0.95	-0.99	-1.29	-1.4
5000	-1.62	-1.75	-1.7	-1.12	-1.13	-1.18	-1.13	-0.8	-0.31
5600	-2.22	-1.77	-1.21	-1.43	-1.73	-1.17	-0.86	-0.79	-1.11
6300	-2.47	-2.92	-3.03	-2.07	-1.72	-2.07	-2.28	-1.68	-0.95
7100	-3.18	-3	-1.71	-2.2	-2.4	-1.97	-0.87	-1.44	-1.2
8000	-2.39	-3.05	-1.84	-1.81	-2.3	-1.91	-0.98	-0.88	-1.33
8500	-3.85	-4.07	-3.02	-3.33	-3.16	-2.25	-2.16	-2.23	-1.61
9000	-3.79	-3.19	-2.95	-3.11	-2.59	-2.17	-2.26	-2.04	-1.26
9500	-4.4	-4.4	-4.42	-3.81	-3.45	-2.67	-2.83	-1.89	-1.82
10000	-4.33	-4.21	-3.68	-3.62	-2.91	-2.53	-2.63	-1.76	-1.16
10600	-5.32	-4.83	-5.09	-4.47	-4.78	-3.74	-3.51	-3.09	-2.24
11200	-5.72	-5.29	-4.75	-4.42	-3.64	-3.54	-2.98	-2.67	-2.4
11800	-6.23	-5.35	-5.53	-4.57	-4.53	-4.32	-3.6	-3.42	-2.45
12500	-6.64	-6.46	-5.72	-5.67	-4.68	-4.49	-4.05	-3.39	-3.02

	Angle [°]								
f [Hz]	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
250	-0.01	-0.02	-0.02	-0.05	-0.07	-0.07	-0.08	-0.08	-0.09
315	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
400	-0.02	-0.02	-0.02	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01

500	-0.08	-0.07	-0.07	-0.06	-0.05	-0.04	-0.03	-0.03	-0.02
630	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.05
800	-0.07	-0.07	-0.05	-0.04	-0.03	-0.01	-0.01	-0.01	0
1000	0.05	0.05	0.05	0.03	0.02	0.01	0	-0.01	-0.01
1250	0.01	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.01
1600	-0.1	0.09	0.19	0.2	0.19	0.12	0.09	0.04	0.01
2000	0.46	0.39	0.31	0.23	0.19	0.12	0.08	0.06	0.03
2240	-0.45	-0.36	-0.21	-0.15	-0.13	-0.09	-0.06	-0.04	-0.01
2500	-0.17	-0.03	0.09	0.11	0.12	0.11	0.1	0.08	0.03
2800	0.07	0.09	0.06	0.03	-0.05	-0.07	-0.05	-0.04	-0.01
3150	-0.54	-0.58	-0.6	-0.55	-0.37	-0.22	-0.15	-0.06	-0.01
3550	-0.84	-0.4	-0.15	-0.08	-0.04	-0.08	-0.1	-0.11	-0.07
4000	0.27	0.23	0.12	0.03	0.02	0.02	0.1	0.11	0.07
4500	-1.36	-1.27	-1	-0.69	-0.53	-0.13	0.03	0.05	0.01
5000	-0.09	-0.17	-0.42	-0.49	-0.49	-0.46	-0.37	-0.3	-0.12
5600	-0.83	-0.49	0.24	0.33	0.36	0.29	0.2	0.15	0.1
6300	-0.94	-1.17	-1.24	-1.17	-0.88	-0.71	-0.37	-0.24	-0.1
7100	-0.52	-0.22	0.1	-0.37	-0.49	-0.44	-0.35	-0.19	0.03
8000	-1.3	-0.96	-0.23	0.13	0.19	0.13	0.01	-0.04	0.01
8500	-0.98	-0.86	-1.05	-1.02	-0.93	-0.49	-0.24	-0.14	-0.03
9000	-1.13	-1.11	-1.03	-0.33	0.22	0.21	0.16	0.04	0.05
9500	-1.82	-1.24	-0.64	-0.73	-0.73	-0.43	-0.2	-0.1	0.02
10000	-1.37	-1.33	-0.76	-0.48	-0.19	-0.08	-0.07	-0.08	-0.04
10600	-2.39	-1.82	-1.38	-1.07	-1.03	-0.82	-0.62	-0.21	-0.02
11200	-1.29	-1.33	-1.12	-0.55	-0.28	-0.12	-0.16	-0.09	0.06
11800	-2.5	-1.46	-1.23	-1.32	-1.01	-0.47	-0.13	-0.02	-0.01
12500	-2.16	-2.16	-1.5	-0.83	-0.85	-0.68	-0.5	-0.18	-0.02

C.1.4 Effect of the SA 279 Outdoor Protection Unit

See chapter C.7 for the details related to using of the SA 279 Outdoor Protection Unit.

C.2. SPECIFICATION OF SVAN 979 AS A VIBRATION LEVEL METER

The configuration of the complete VLM and its normal mode of operation

SVAN 979	sound & vibration analyser
SV 80	10mV/m/s2, IEPE accelerometer (see C.6 for details)
SC 27	coiled cable for accelerometer 2 m
SV 18T	LEMO 7-pin to TNC integrated connector

Accessories included in SVAN 979 instrument set

SC 59	Output cable for I/O connector, LEMO to 2 x TNC
SC 16	USB 1.1 cable,
SA 33	Power supply unit.

Accessories available

SV 55	RS 232 interface for SVAN 95x instrument series
SC 18T	LEMO 7-pin to TNC 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**, **MAX** and **MTVV**.

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: 1**00 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 SV 80 (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 SV 80 (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 SV 80 (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 SV 80 (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:* $A_n = A + 10 - 20\log(n / \sqrt{2})$ *[m], where* ***A*** *is the given range for the sinusoidal signal. E.g. for* ***n = 10*** *and* ***A = 180*** *the value of* 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 3.3 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 979 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 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.

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 filter	(see Chapter C.5 for the filter characteristics)
HP1 filter	(see Chapter C.5 for the filter characteristics)
HP3 filter	(see Chapter C.5 for the filter characteristics)
HP10 filter	(see Chapter C.5 for the filter characteristics)

Frequency weighting filters (filter includes Band Limiting filter).

(Conforms to ISO 8041-1:2017, 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 8041-1:2017)

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 8041-1:2017)

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 979 AS 1/1 OCTAVE - 1/12 OCTAVE ANALYSER

SVAN 979 can operate as 1/1-octave, 1/3-octave, 1/6-octave or 1/12-octave analyser conforming to the international IEC 61260-1:2014 standard for the pass band filters.



Note: *Simultaneously to the frequency analysis SVAN 979 operates as Level Meter! See Chapters C.1 and C.2 for specification.*

Signal input

- Connector: 7 pin Lemo.
- Maximum input voltage: the **SVAN 979** meets the requirements IEC 348 for the 2nd class device. The input voltage shall not exceed the limits between 0 V and 28 V.
- Impedance: 150 kΩ / 100 pF.
- IEPE transducer or preamplifier powering: 28 V / 1.5 mA or 4.5 mA current source, user-selectable (*path: <Menu> / Instrument / IEPE Current: 1.5 mA as default*).

Linear Operating Ranges

Two measurement ranges are available: “LOW” and "HIGH"

Table C.3.1 Linear operating range

Range	**Linear operating range** (with the error < 0.8 dB) (**RMS** for the sinusoidal signal at reference conditions @ 1 kHz, 0.0 dB calibration factor)	
LOW	from 10 μV_{RMS} “A”-weighting	to 1 V_{RMS} “A”-weighting
	from 10 μV_{RMS} “C”-weighting	to 1 V_{RMS} “C”-weighting
	from 20 μV_{RMS} “HP”-weighting	to 1 V_{RMS} “HP”-weighting
HIGH	from 30 μV_{RMS} “A”-weighting	to 7.07 V_{RMS} “A”-weighting
	from 30 μV_{RMS} “C”-weighting	to 7.07 V_{RMS} “C”-weighting
	from 50 μV_{RMS} “HP”-weighting	to 7.07 V_{RMS} “HP”-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
	1.4 V “C”-weighting
	1.4 V “HP”-weighting
HIGH	10 V “A”-weighting
	10 V “C”-weighting
	10 V “HP”-weighting

Note: *For the signals with the crest factor* ***n >1.41*** *upper measurement range of the RMS 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***

Measurement frequency range with the **HP** filter (-3 dB) 0.4 Hz ÷ 22.4 kHz.

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 114.0 dB (re 1μV_{RMS})

Basic accuracy < ± 0.2 dB (for the temperature T=+23°C ± 5°C for sinusoidal signal 1 V_{RMS} in the band 10 Hz ÷ 20 kHz with **Z** 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 1 V_{RMS} in the band 10 Hz ÷ 20 kHz with **Z** 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 analog-to-digital converter, ensuring correct sampling of the measured signal.

Pass band (-1 dB)	22.200 kHz
Pass band (-3 dB)	23.520 kHz
Stop band	26.256 kHz
Attenuation in the stop band	> 80 dB.
Sampling frequency	48 kHz (internal only).
Analogue to digital converter	1 x 24 bit
Reference range	HIGH
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

See Chapter C.3 for the A, C and Z filters characteristics.

“Human Vibration” frequency weighting filter (including Band Limiting filter).
See part C.4 for the frequency response characteristics.

- **Wh** from 0.8 Hz to 4000 Hz

Integrating filters (see part C.4 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 state of machines:

- **VelMF** from 0.2 Hz to 4100 Hz; conforms to the ISO 10816 standard (see part C.5 for the frequency response characteristics).

Internal noise level for Sound Measurements

Noise voltage measured both in **Sound Meter** mode (with SV17 preamplifier, equivalent impedance - adapter type of ST02 and 50 Ω input impedance) and **Direct Sound** mode (with 50 Ω input impedance).

Range Low

- ”**A**” weighting < 2,2 μV_{RMS} (with digital noise compensation),
- ”**C**” weighting < 2,2 μV_{RMS}. **“”,**
- ”**Z**” weighting < 2,2 μV_{RMS}. **“”,**

Range High

- ”**A**” weighting < 5,6 μV_{RMS} (with digital noise compensation),
- ”**C**” weighting < 5,6 μV_{RMS}. “”,
- ”**Z**” weighting < 5,6 μV_{RMS}, “”.

Internal noise level for Vibration Measurements

Noise voltage measured on **Range Low**, both in **Vibration Meter** mode (with ST08 IEPE adapter and 50 Ω input impedance) and **Direct Vibration** mode (with 50 Ω input impedance).

Range Low

- with the **HP** filter < 4 μV_{RMS}
- with the **HP1** filter < 4 μV_{RMS}
- with the **HP3** filter < 4 μV_{RMS}
- with the **HP10** filter < 4 μV_{RMS}
- with the **Wh** filter < 0,5 μV_{RMS}
- with filter **VelMF** n/a

Range High

- with the **HP** filter < 35 μV_{RMS}
- with the **HP1** filter < 35 μV_{RMS}
- with the **HP3** filter < 35 μV_{RMS}
- with the **HP10** filter < 35 μV_{RMS}
- with the **Wh** filter < 4,3 μV_{RMS}
- with filter **VelMF** n/a

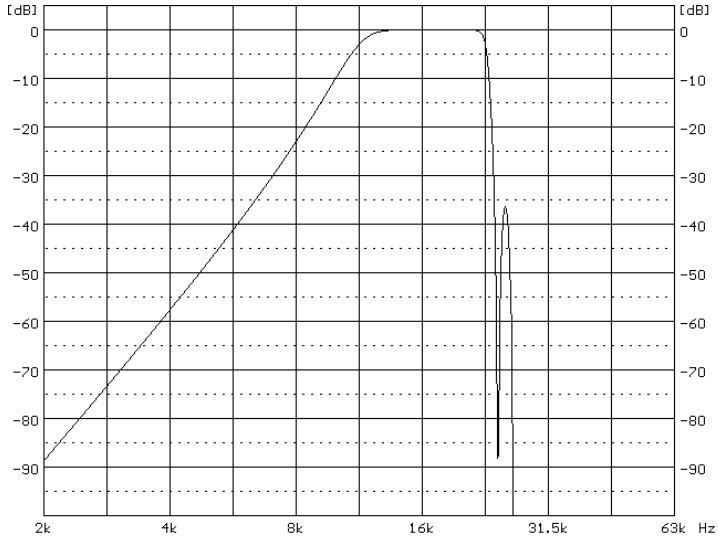
Low-pass filters

8 eighth-order elliptic filters with the cut-off frequencies from 10 kHz to 78.125 Hz in the binary sequence.

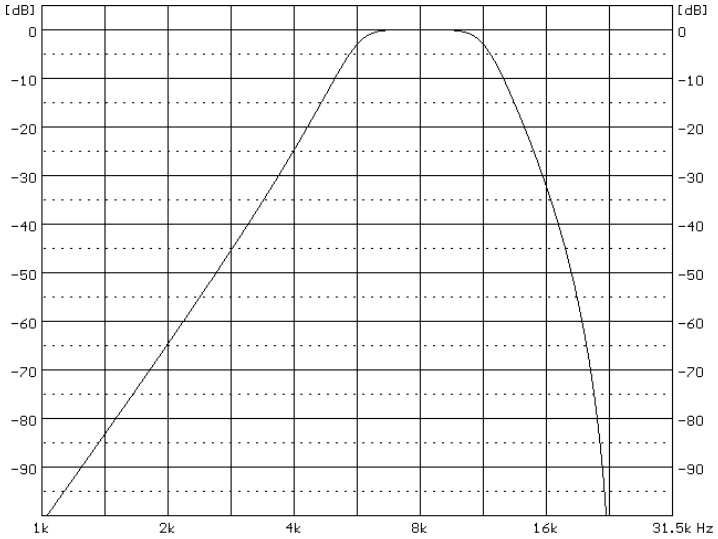
Ripple in the pass band ± 0.1 dB.

Attenuation in the stop band > 100 dB.

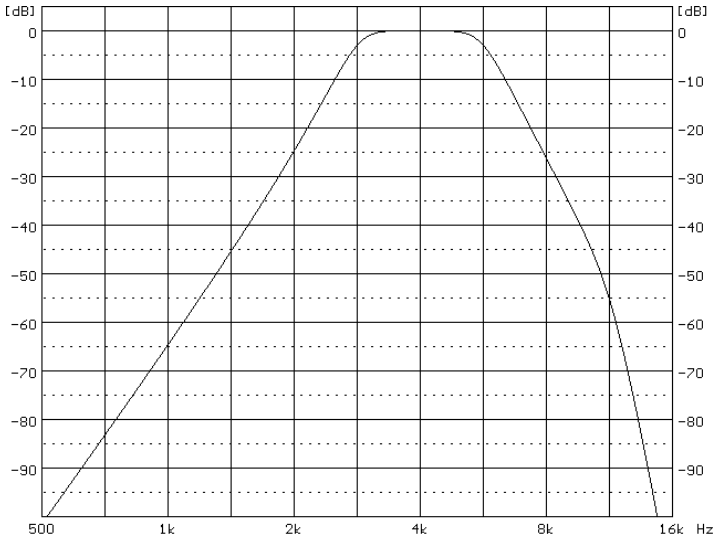
1/1 Octave filters 15 filters with centre frequencies from 1 Hz to 16 kHz (base 10), meeting IEC 61260-1:2014 standard for Class 1



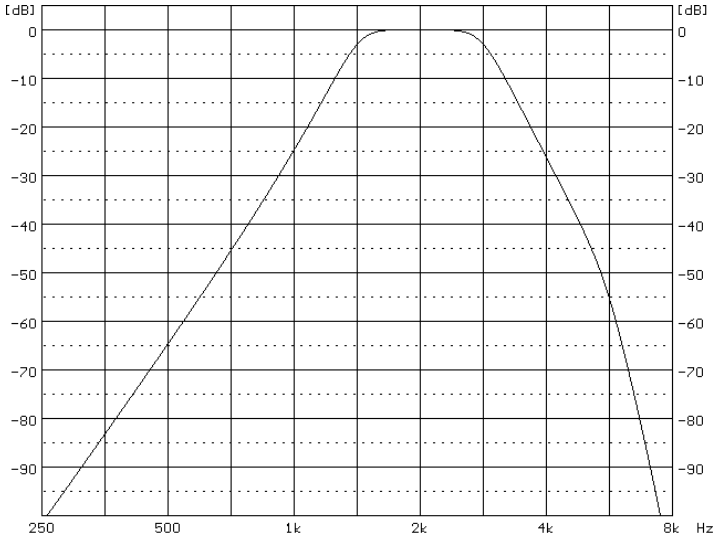
16.0 kHz 1/1 octave filter



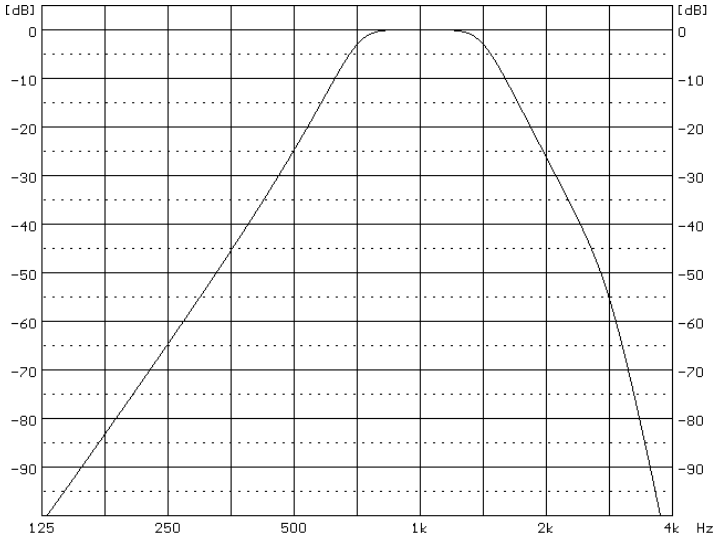
8.0 kHz 1/1 octave filter



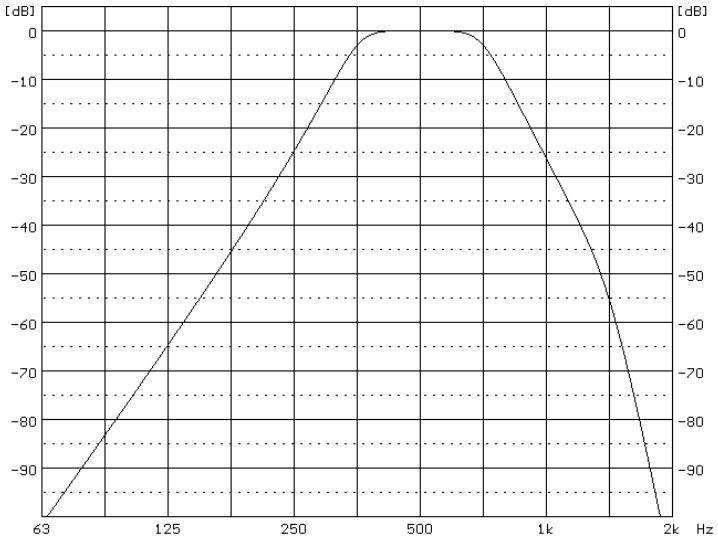
4.0 kHz 1/1 octave filter



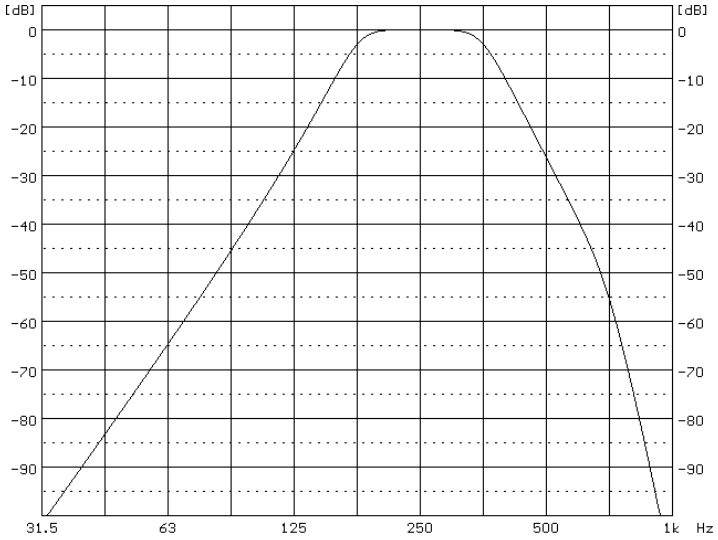
2.0 kHz 1/1 octave filter



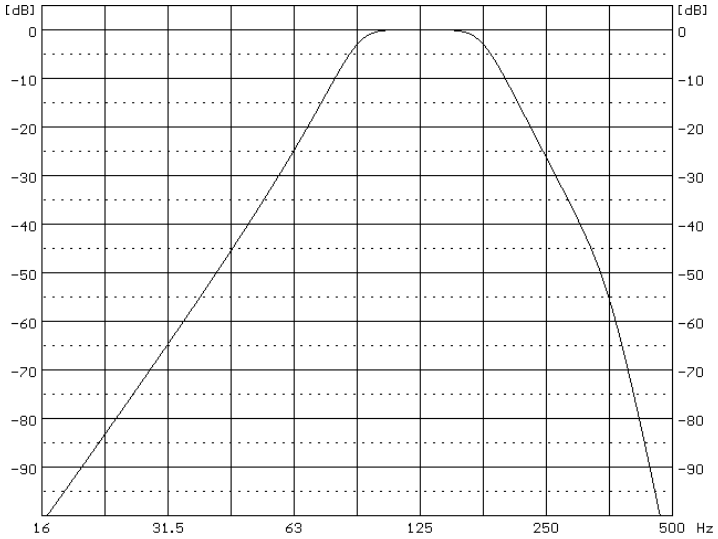
1.0 kHz 1/1 octave filter



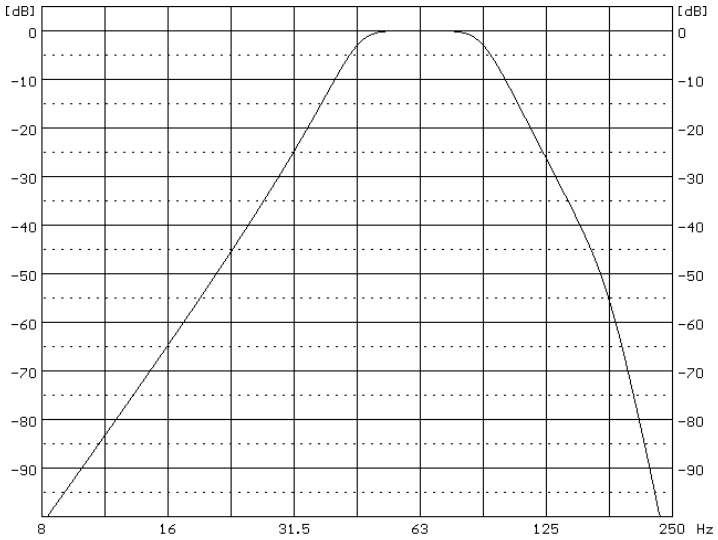
500 Hz 1/1 octave filter



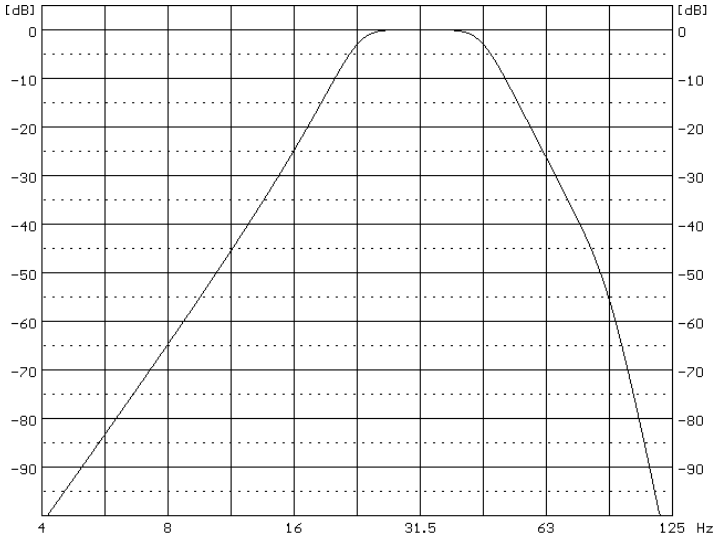
250 Hz 1/1 octave filter



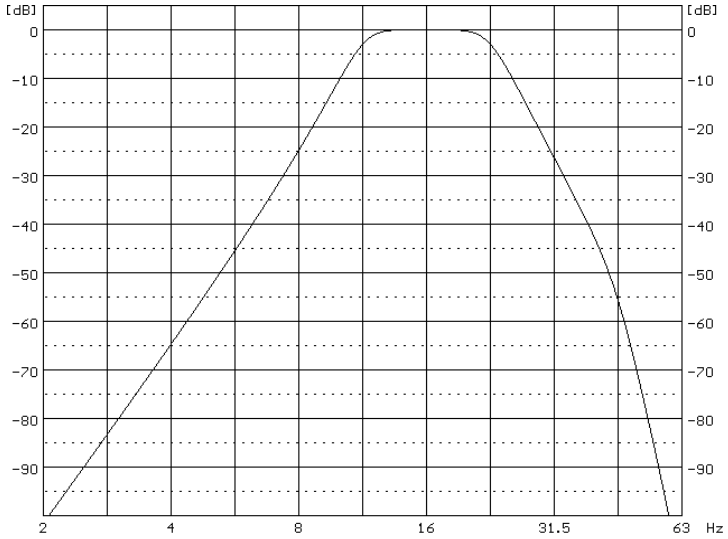
125 Hz 1/1 octave filter



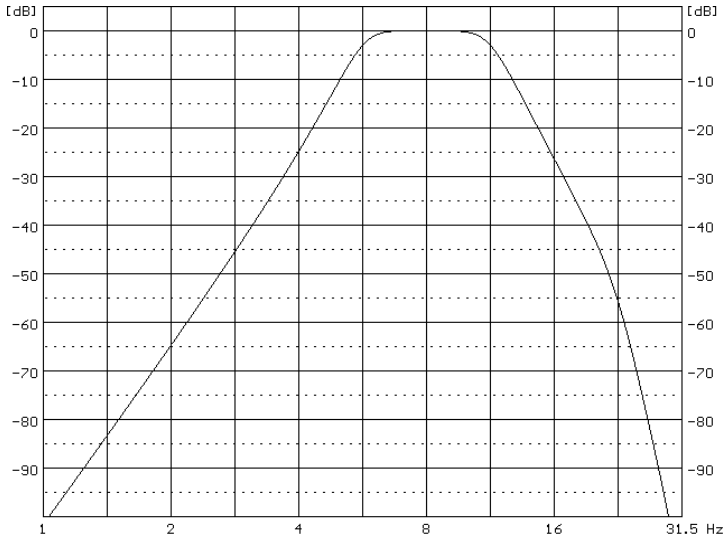
63.0 Hz 1/1 octave filter



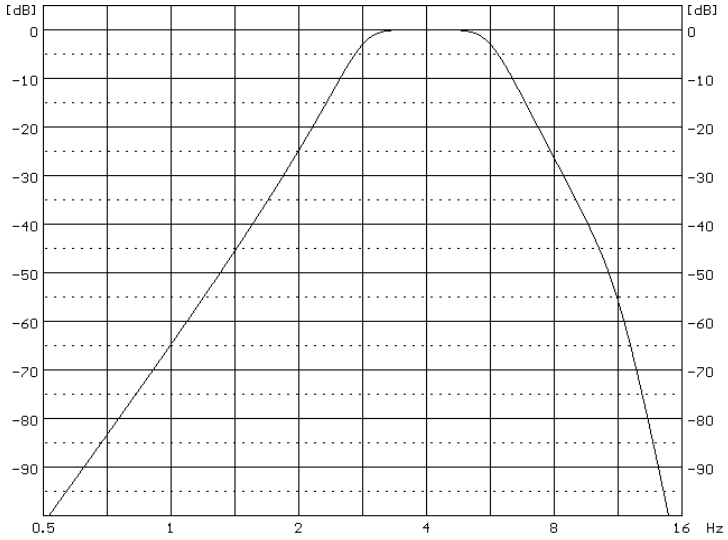
31.5 Hz 1/1 octave filter



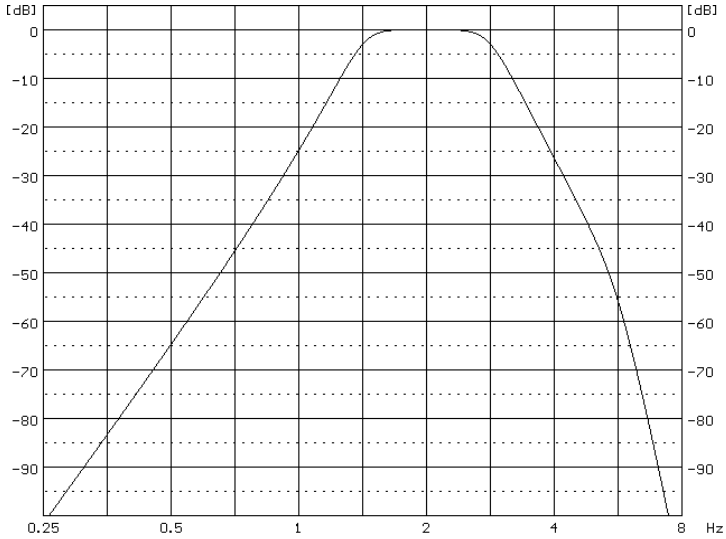
16.0 Hz 1/1 octave filter



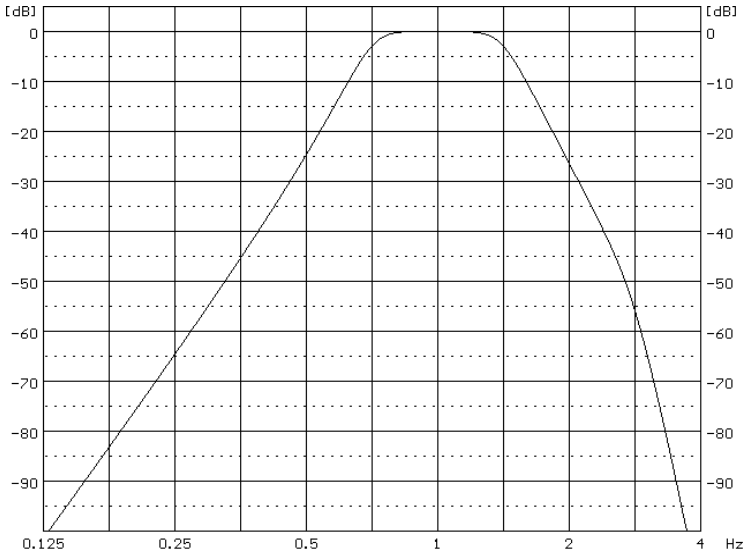
8.00 Hz 1/1 octave filter



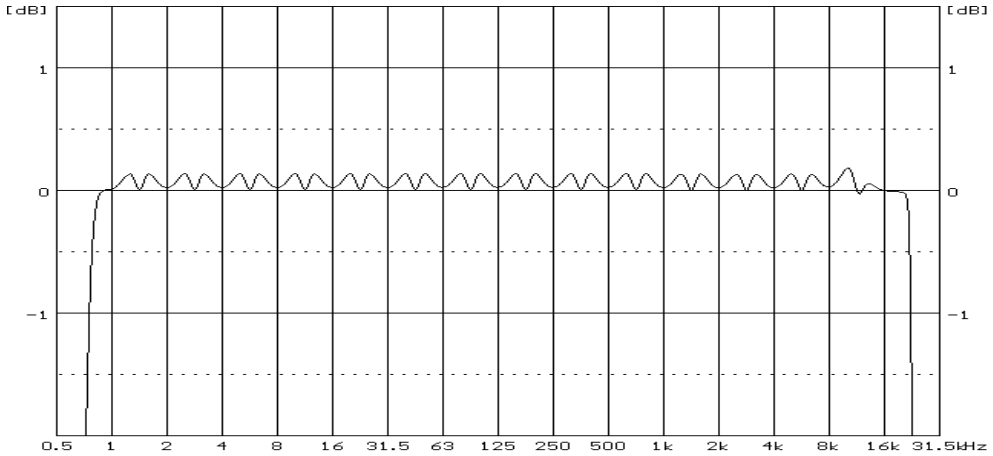
4.00 Hz 1/1 octave filter



2.00 Hz 1/1 octave filter

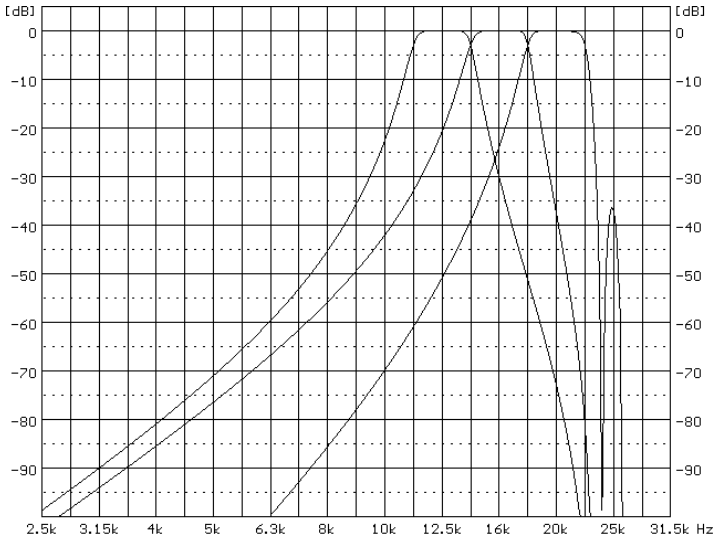


1.00 Hz 1/1 octave filter

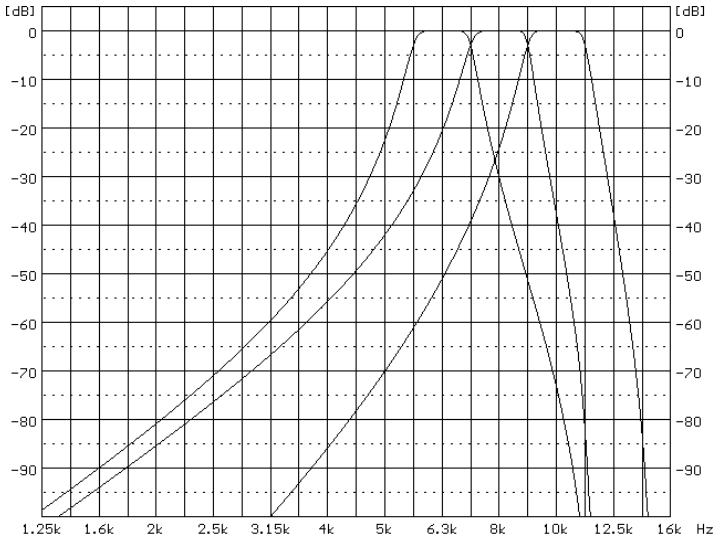


Summary curve

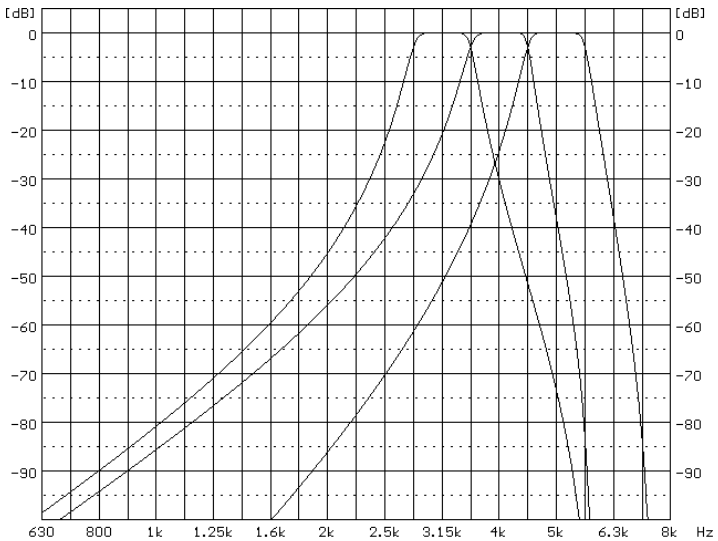
1/3 Octave filters 45 filters with centre frequencies from 0.8 Hz to 20 kHz (base 10), meeting IEC 61260-1:2014 standard for Class 1



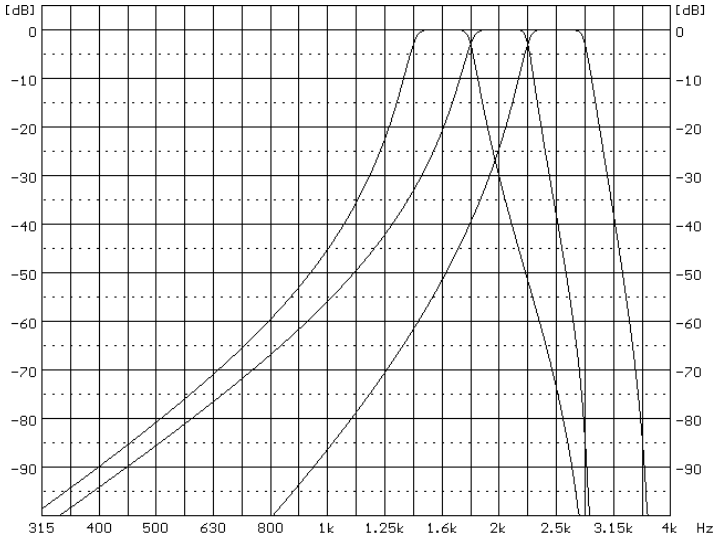
1/3 octave filters for 16.0 kHz 1/1 octave filter



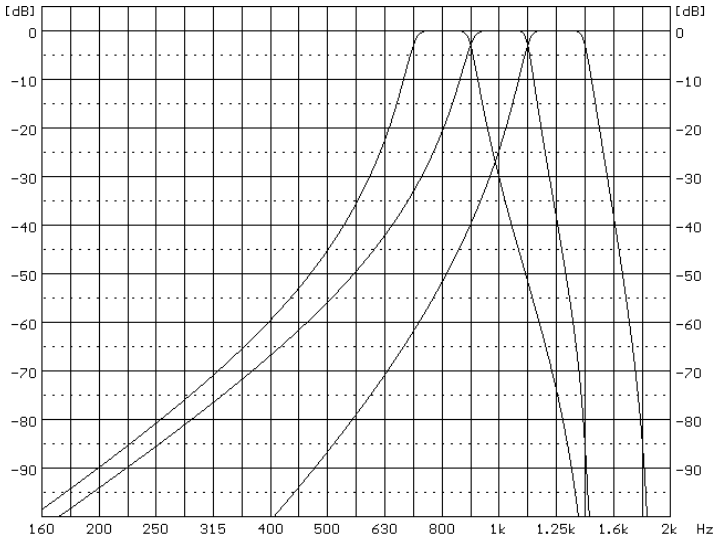
1/3 octave filters for 8.0 kHz 1/1 octave filter



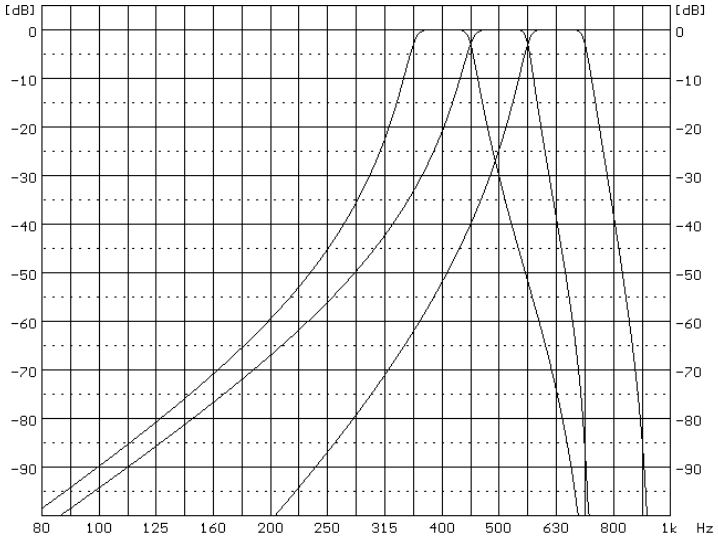
1/3 octave filters for 4.0 kHz 1/1 octave filter



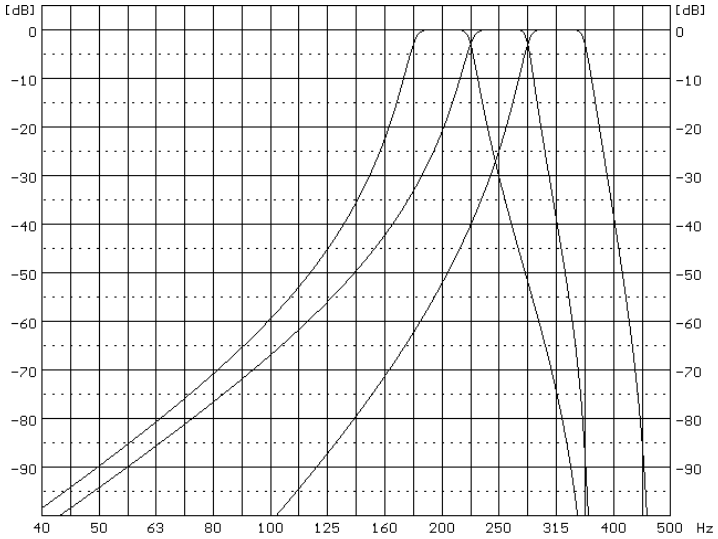
1/3 octave filters for 2.0 kHz 1/1 octave filter



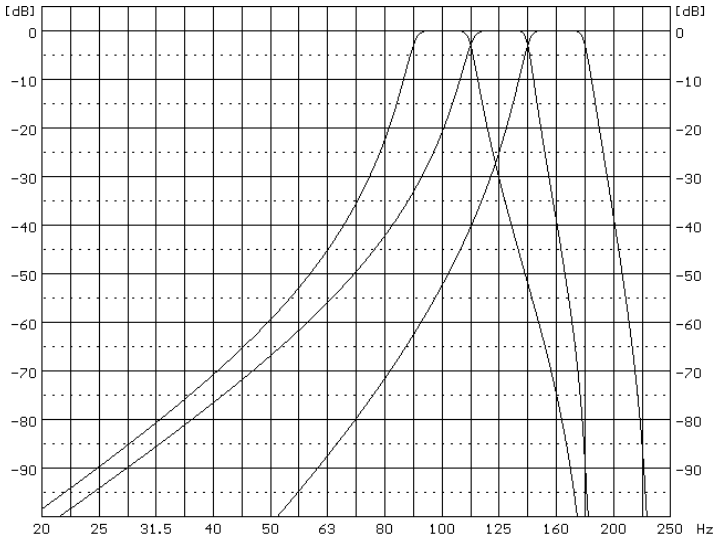
1/3 octave filters for 1.00 kHz 1/1 octave filter



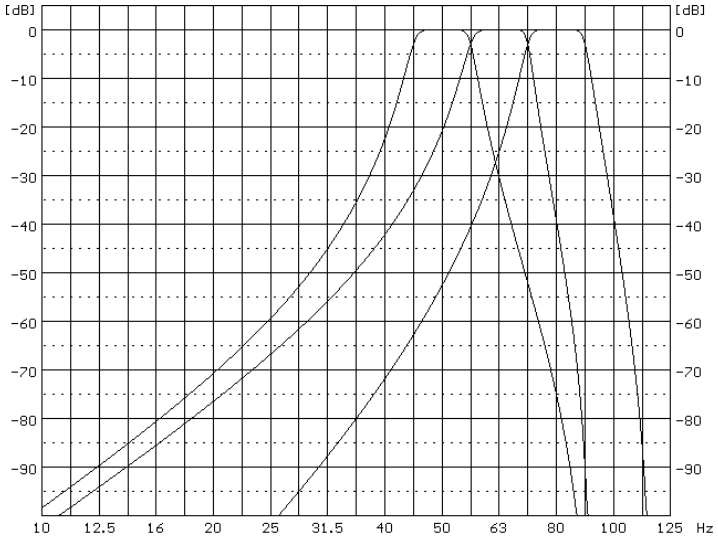
1/3 octave filters for 500 Hz 1/1 octave filter



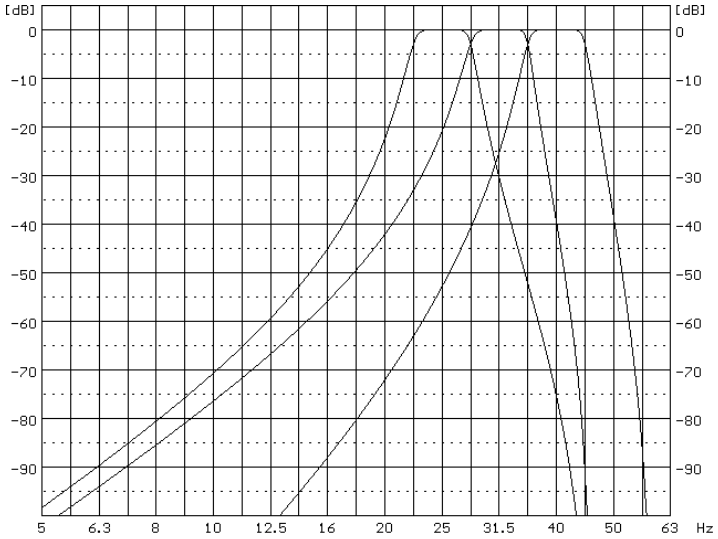
1/3 octave filters for 250 Hz 1/1 octave filter



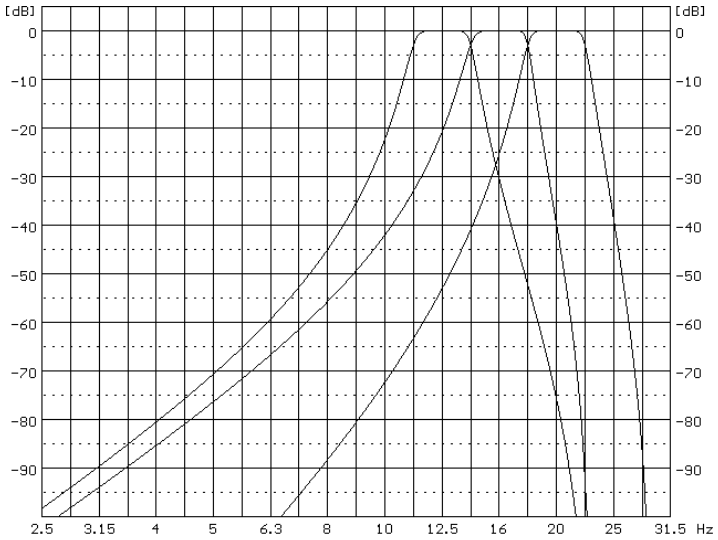
1/3 octave filters for 125 Hz 1/1 octave filter



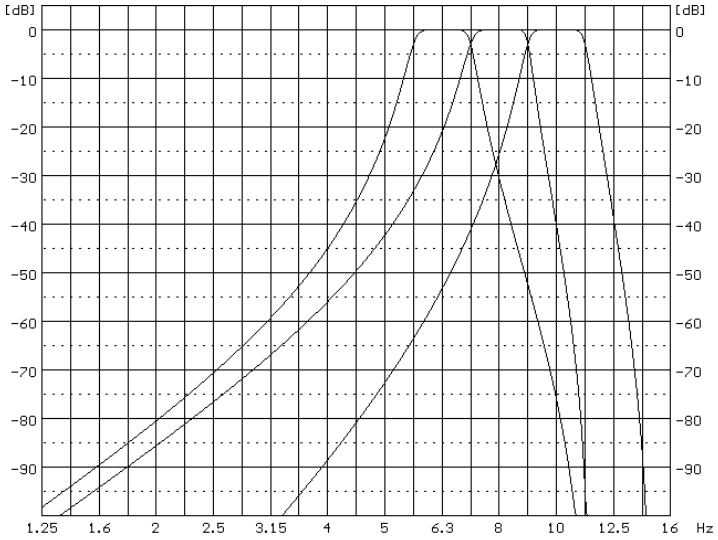
1/3 octave filters for 63.0 Hz 1/1 octave filter



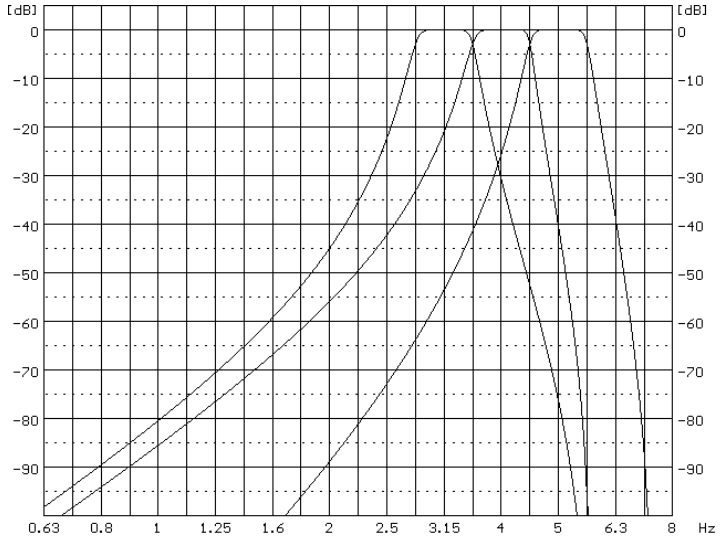
1/3 octave filters for 31.5 Hz 1/1 octave filter



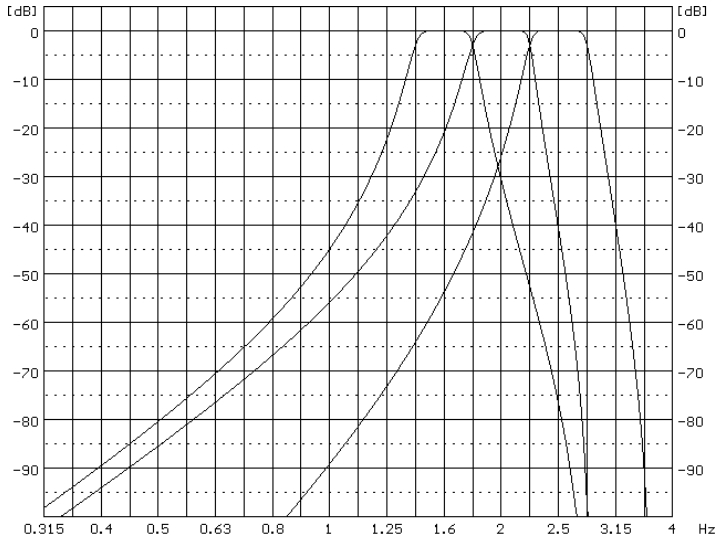
1/3 octave filters for 16.0 Hz 1/1 octave filter



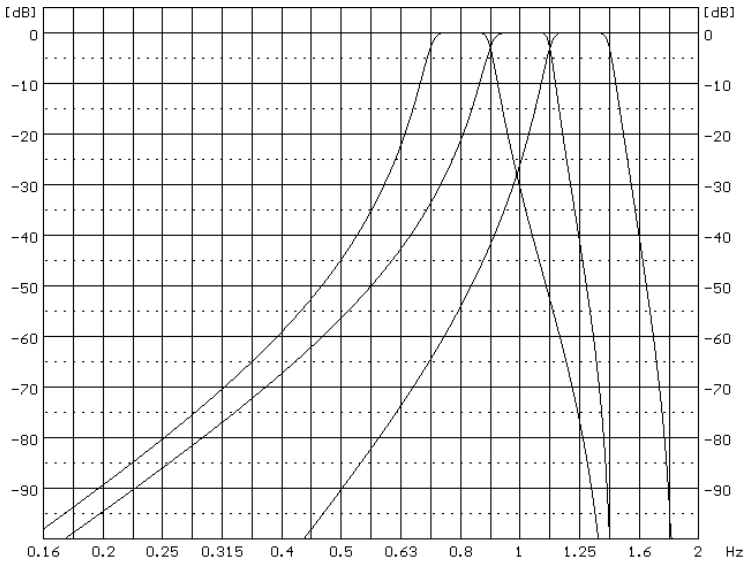
1/3 octave filters for 8.00 Hz 1/1 octave filter



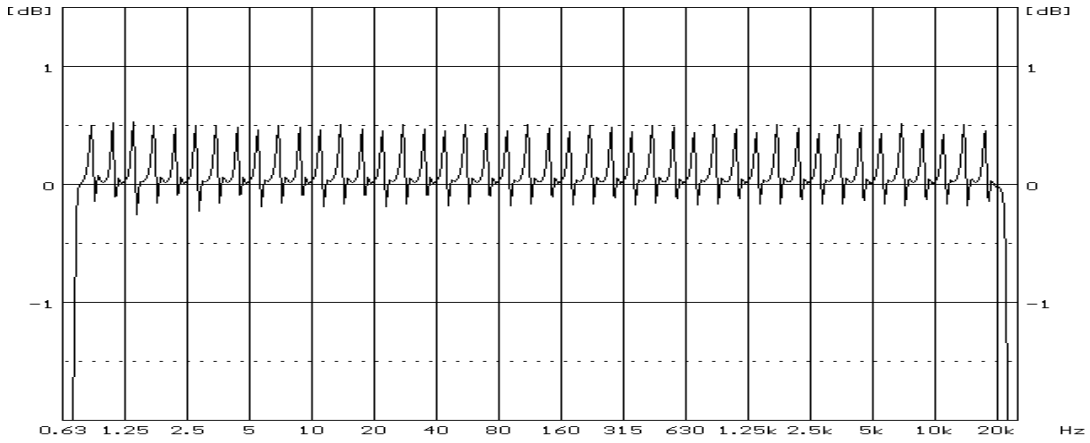
1/3 octave filters for 4.00 Hz 1/1 octave filter



1/3 octave filters for 2.00 Hz 1/1 octave filter



1/3 octave filters for 1.00 Hz 1/1 octave filter

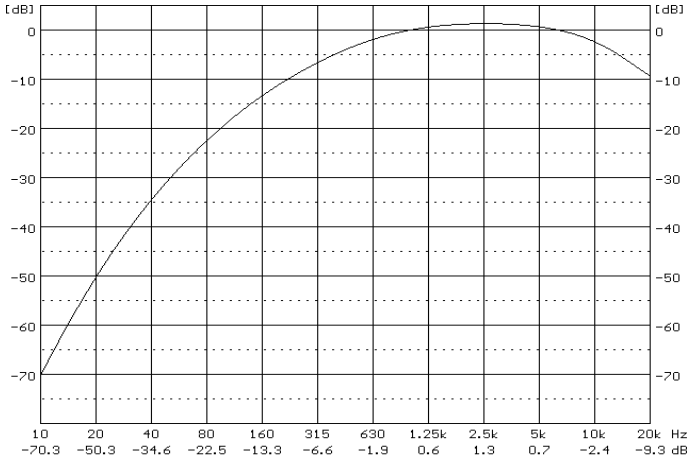


Summary curve

C.4. FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED BROADBAND DIGITAL FILTERS

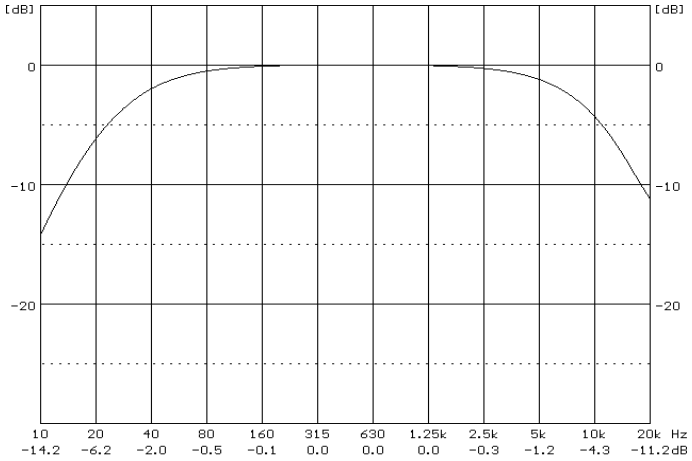
C.4.1 Digital weighting filters implemented in sound modes

“A” filter Class 1 according to IEC 61672-1:2013.



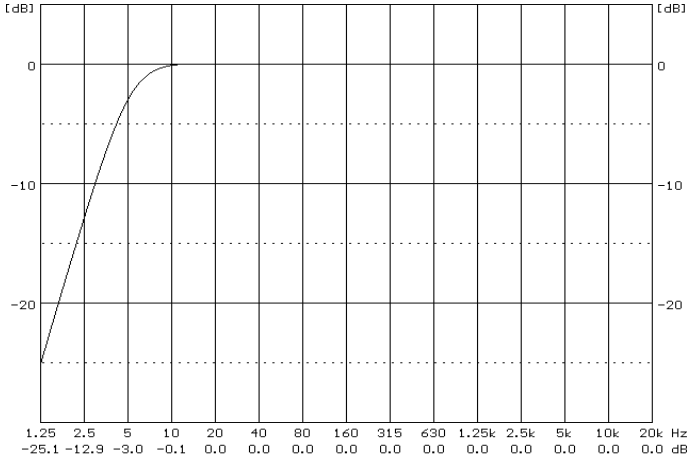
“A” filter characteristics

“C” filter Class 1 according to IEC 61672-1:2013.



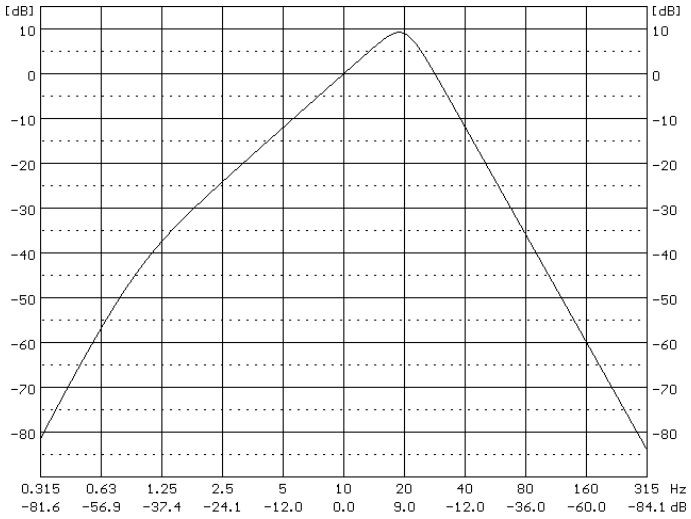
“C” filter characteristics

“Z” filter Class 1 according to IEC 61672-1:2013.



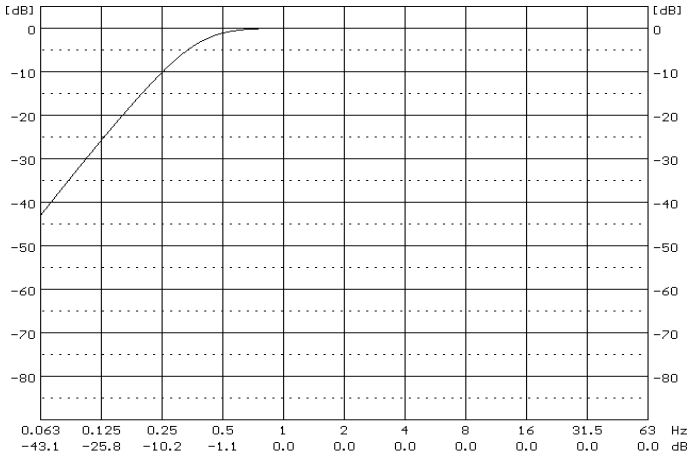
“Z” filter characteristics

“G” filter according to ISO 7196:1995



“G” filter characteristics

“HP” filter

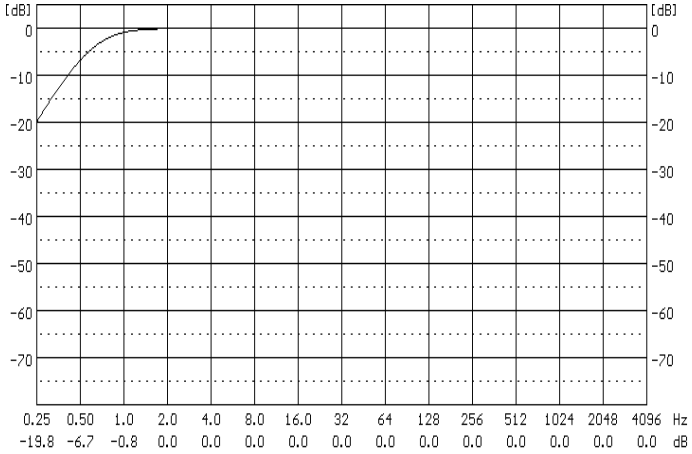


“HP” filter characteristic

C.4.2 Digital weighting filters implemented in vibration modes

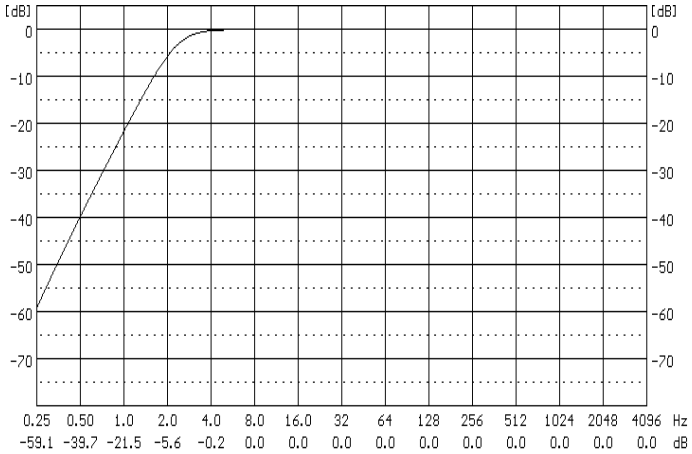
C.4.2.1 Digital filters implemented in vibration modes for acceleration measurements

"**HP1**" **filter** is used for acceleration measurements (vibration signal) in the frequency range 1 Hz - 20 kHz.



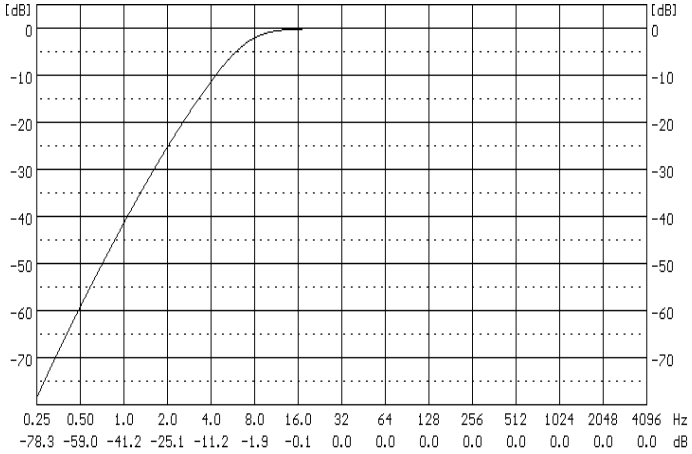
"HP1´ filter characteristics

"**HP3" filter** is used for acceleration measurements (vibration signal) in the frequency range 3.5 Hz - 20 kHz.



"HP3" filter characteristics

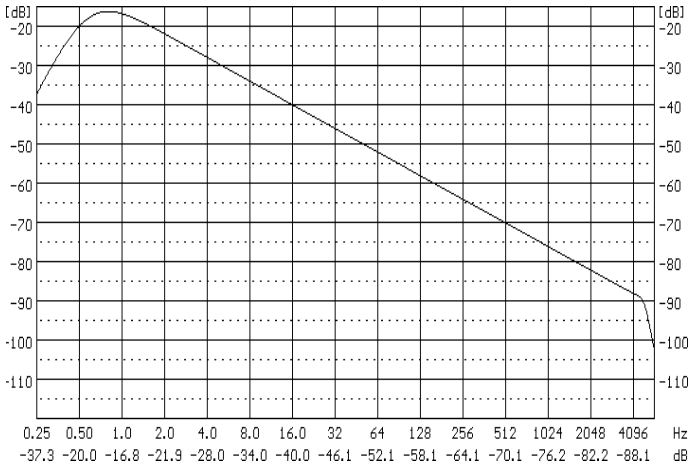
"HP10" filter is used for acceleration measurements (vibration signal) in the frequency range 10 Hz - 20 kHz.



"HP10" filter characteristics

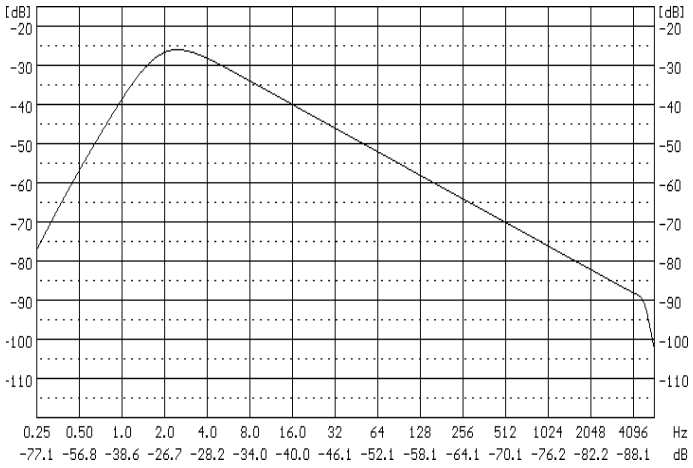
C.4.2.2 Digital filters implemented in vibration modes for velocity measurements

"**Vel1" filter** is used for velocity measurements (vibration signal) in the frequency range 1 Hz - 20 kHz.



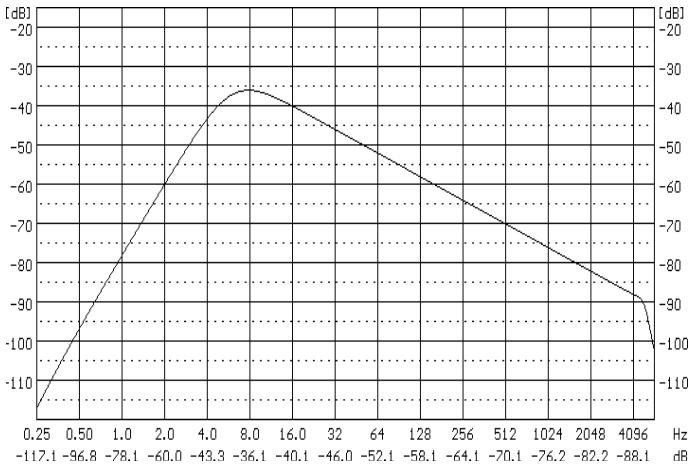
"Vel1" filter characteristics

"**Vel3" filter** is used for velocity measurements (vibration signal) in the frequency range 3.5 Hz - 20 kHz.



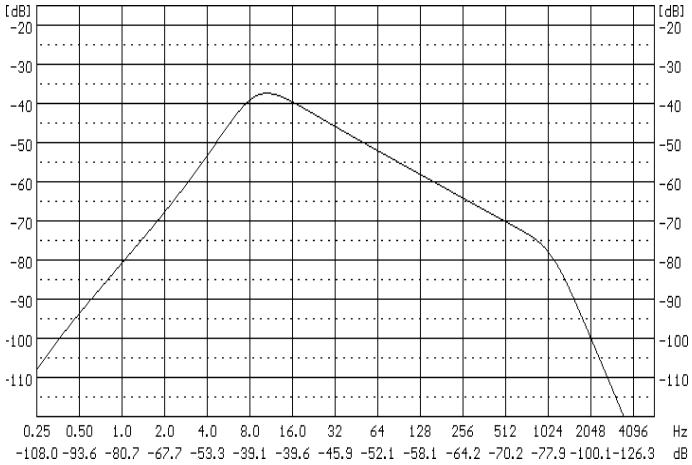
"Vel3" filter characteristics

"**Vel10" filter** is used for velocity measurements (vibration signal) in the frequency range 10 Hz - 20 kHz.



"Vel10" filter characteristics

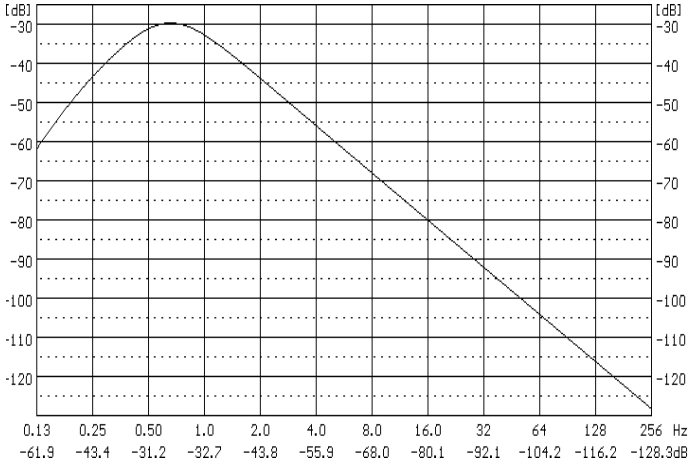
"**VelMF" filter** is used for evaluation of the state of machines. This filter is used for measurements in the frequency range from 10 Hz to 1000 Hz and conforms the ISO 10816 standard.



"VelMF" filter characteristics

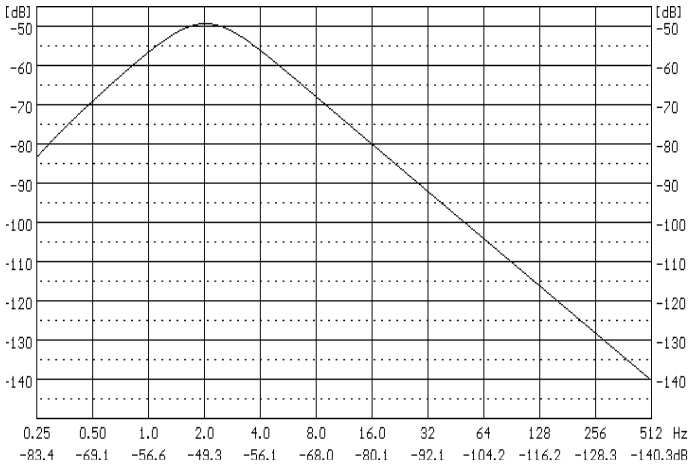
C.4.2.3 Digital filters implemented in vibration modes for displacement measurements

"**Dil1" filter** is used for displacement measurements (vibration signal) in the frequency range 1 Hz - 20 kHz.



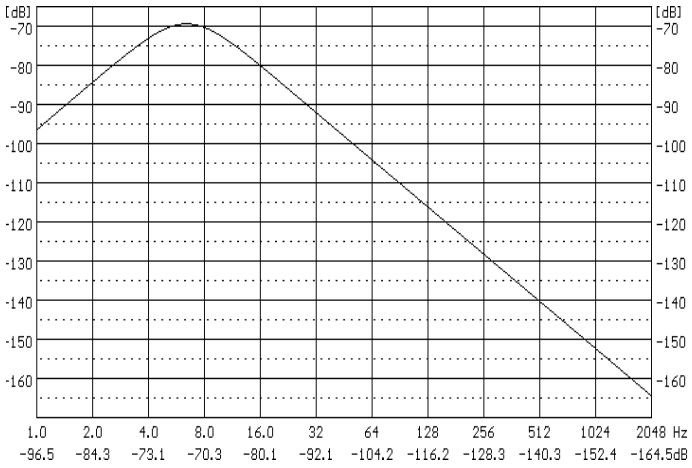
"Dil1" filter characteristics

"**Dil3" filter** is used for displacement measurements (vibration signal) in the frequency range 3.5 Hz - 20 kHz.



"Dil3" filter characteristics

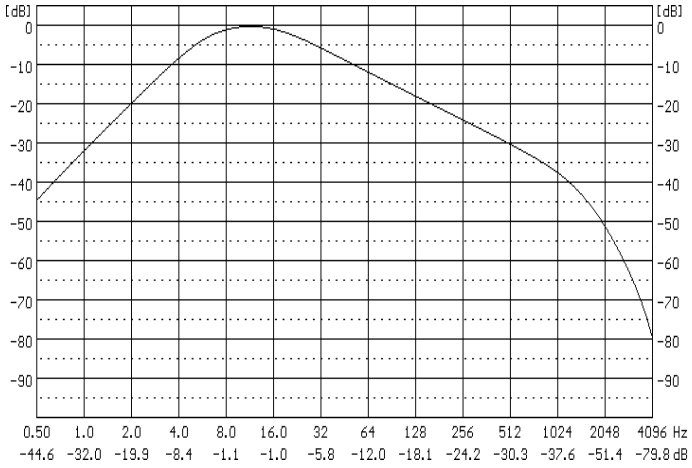
"**Dil10" filter** is used for displacement measurements (vibration signal) in the frequency range 10 Hz - 20 kHz.



"Dil10" filter characteristics

C.4.2.4 Digital filter implemented in vibration modes for Hand–Arm vibration measurements according to ISO 5349

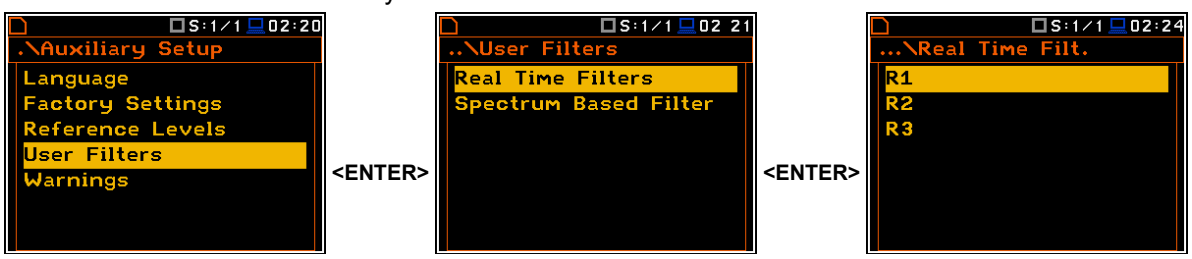
"**Wh" filter** is used for assessment of influence of the vibration signal on the human body. It conforms the ISO 5349 and ISO 8041-1:2017 standards.



"Wh" filter characteristics

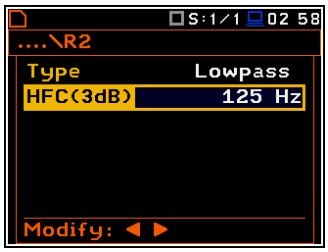
C.4.5 Digital Real Time Filters implemented in SVAN 979

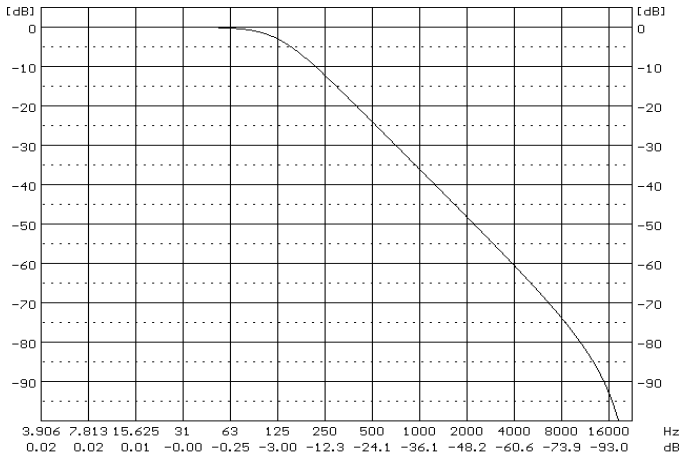
Real Time Filters (**R1**, **R2** and **R3**) are the second order Butterworth's filters with the slope equal to 12 dB/octave which are introduced by the user.



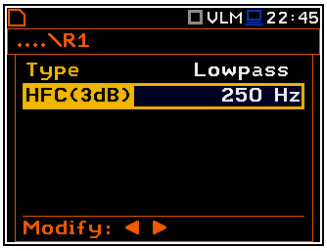
In the **Rx** (**R1**, **R2, R3**) screen, you can select the **Lowpass**, **Highpass** or **Bandpass** filters.

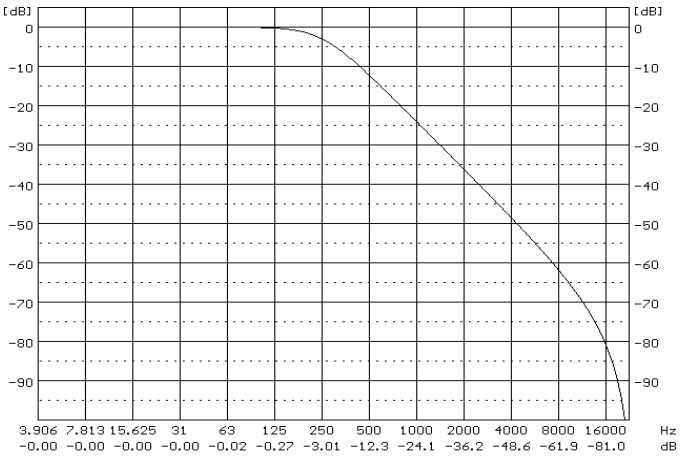
In the case of the low-pass filters, you should determine the **HFC(3dB)** parameter which denotes the **HFC** (**H**igh **F**requency **C**orner) of the **Rx** filter at which the amplitude of the input signal is attenuated two times. Available values are from 100 Hz to 10.0 kHz.



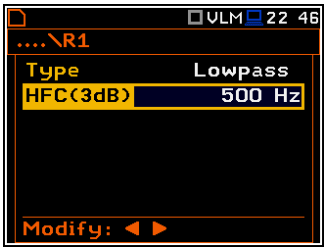


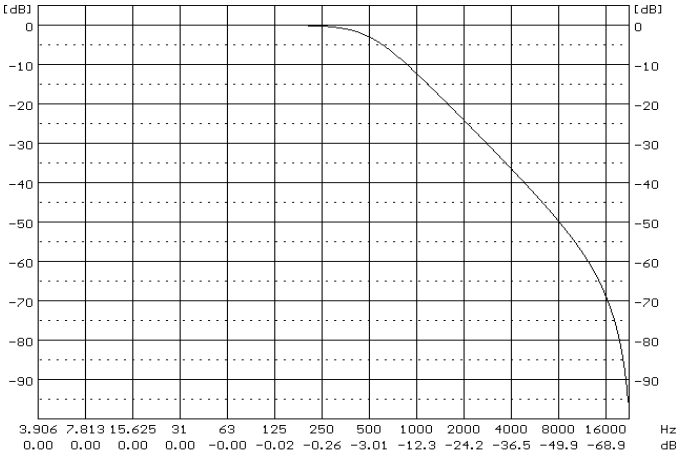
Characteristics of the Lowpass filter with the HFC (3dB) = 125 Hz implemented in the instrument



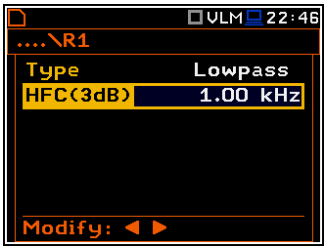


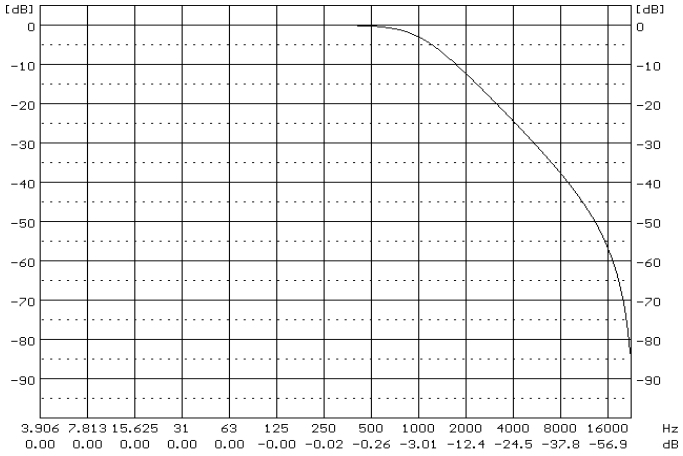
Characteristics of the Lowpass filter with the HFC (3dB) = 250 Hz implemented in the instrument



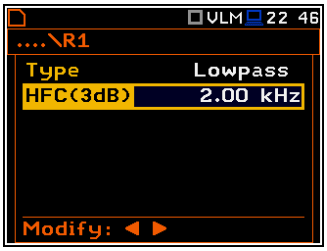


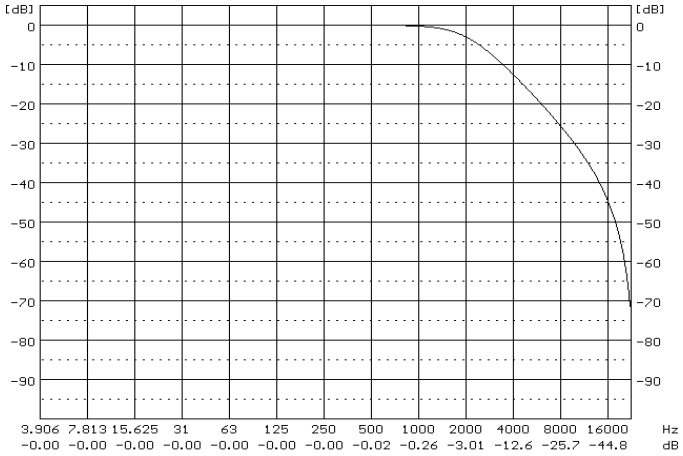
Characteristics of the Lowpass filter with the HFC (3dB) = 500 Hz implemented in the instrument



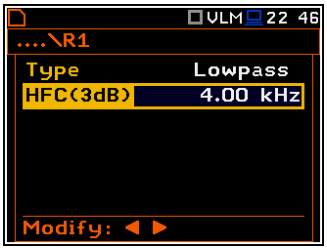


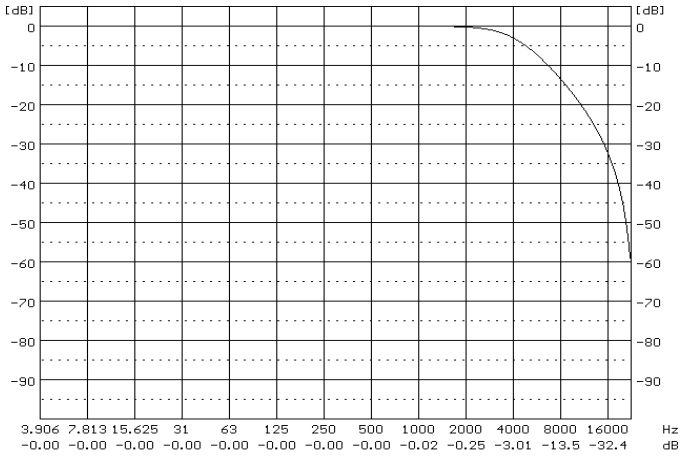
Characteristics of the Lowpass filter with the HFC (3dB) = 1.00 kHz implemented in the instrument



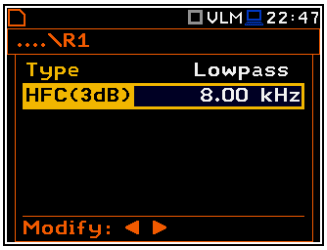


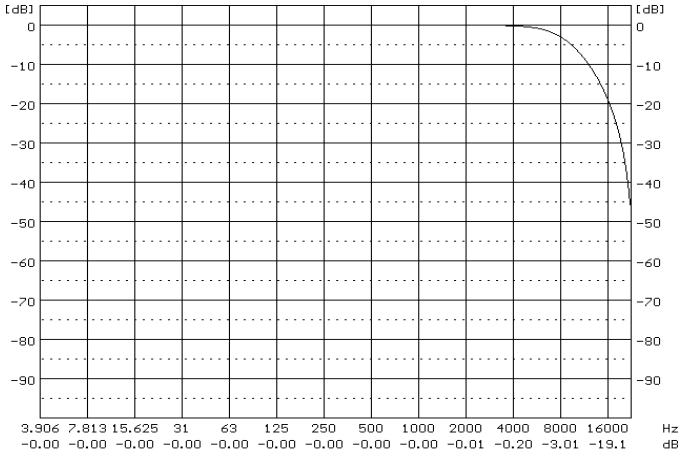
Characteristics of the Lowpass filter with the HFC (3dB) = 2.00 kHz implemented in the instrument





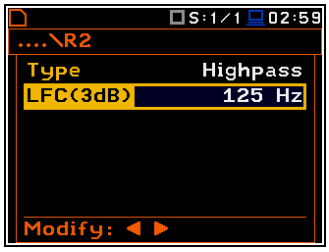
Characteristics of the Lowpass filter with the HFC (3dB) = 4.00 kHz implemented in the instrument

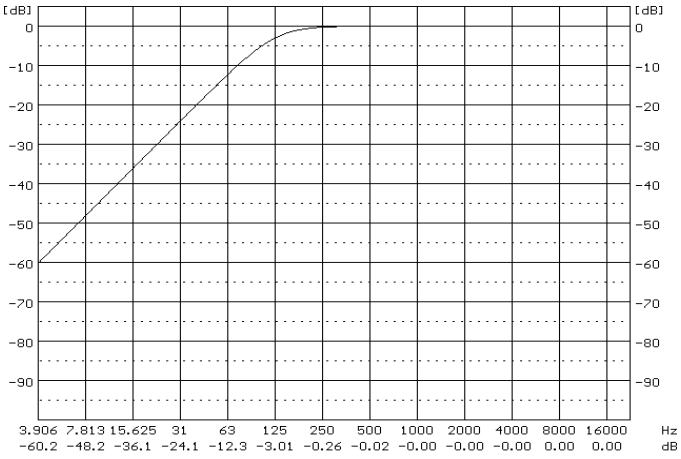




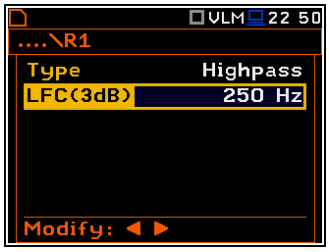
Characteristics of the Lowpass filter with the HFC (3dB) = 8.00 kHz implemented in the instrument

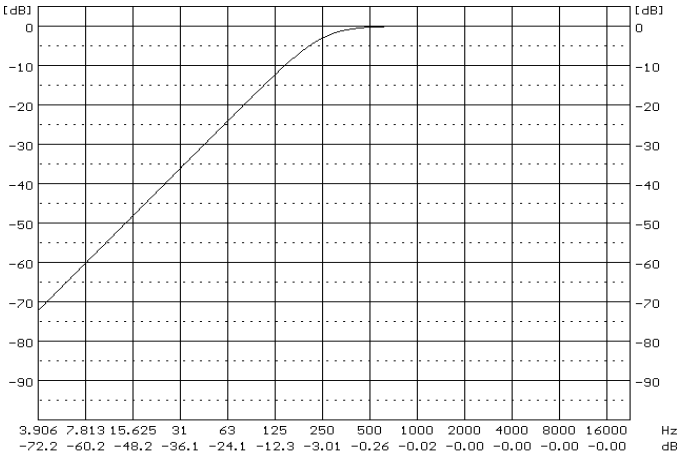
In the case of the high-pass filters, you should determine the **LFC(3dB)** parameter which denotes the **LFC** (**L**ow **F**requency **C**orner) of the **Rx** filter at which the amplitude of the input signal is attenuated two times. Available values are from 100 Hz to 10.0 kHz.



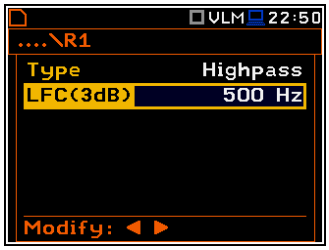


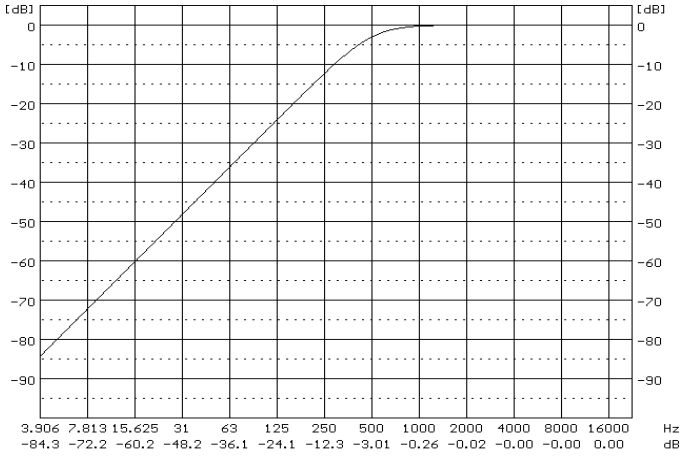
Characteristics of the Highpass filter with the LFC (3dB) = 125 Hz implemented in the instrument



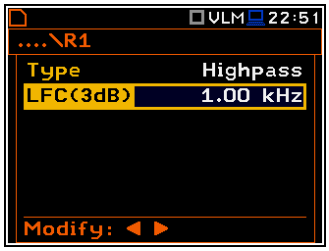


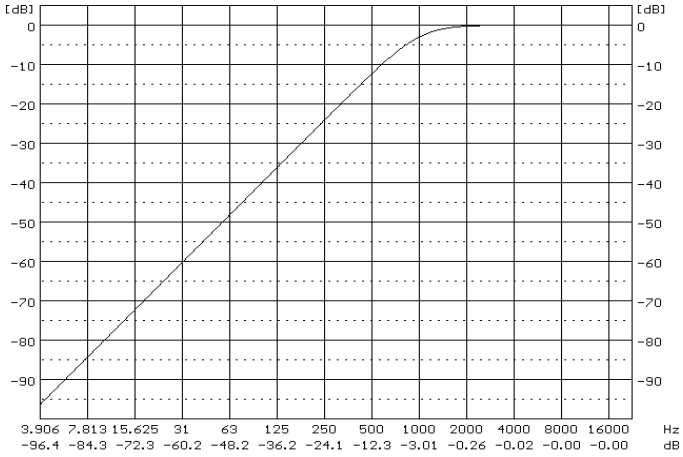
Characteristics of the Highpass filter with the LFC (3dB) = 250 Hz implemented in the instrument



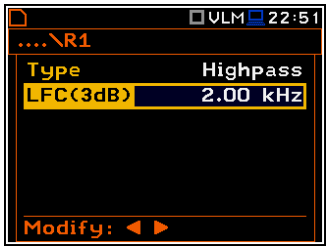


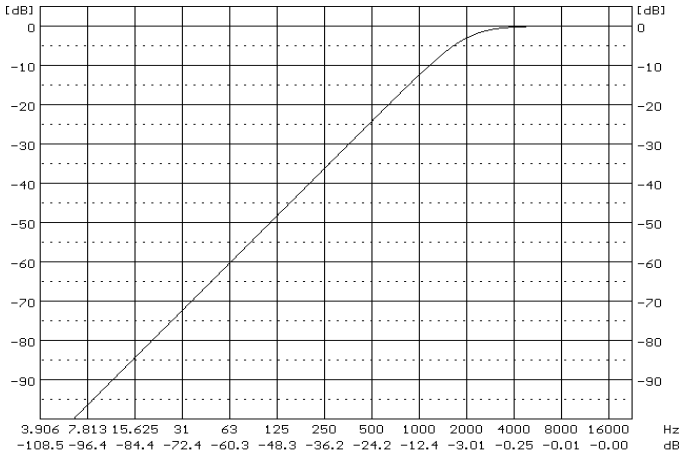
Characteristics of the Highpass filter with the LFC (3dB) = 500 Hz implemented in the instrument



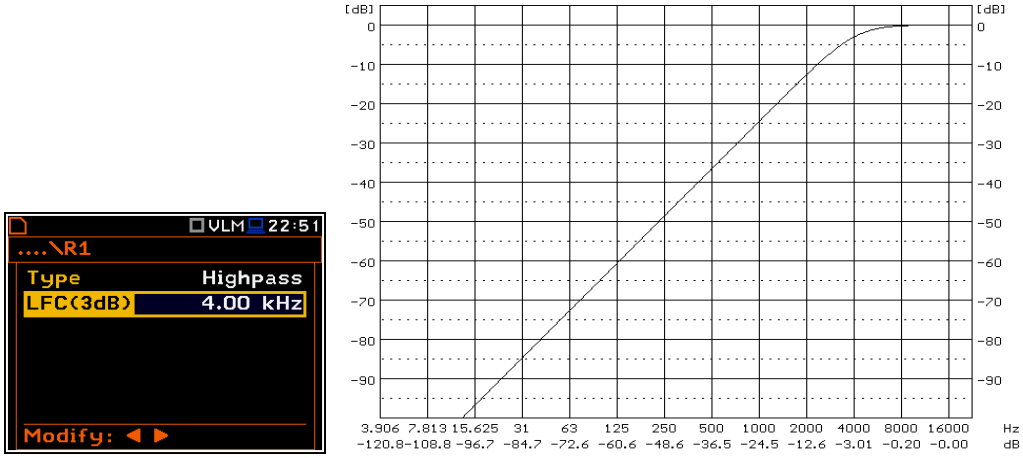


Characteristics of the Highpass filter with the LFC (3dB) = 1.00 kHz implemented in the instrument

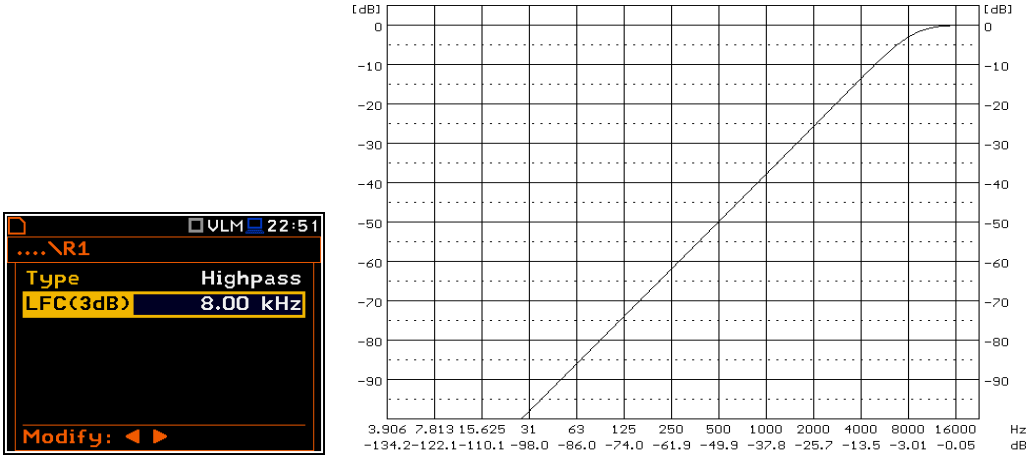




Characteristics of the Highpass filter with the LFC (3dB) = 2.00 kHz implemented in the instrument



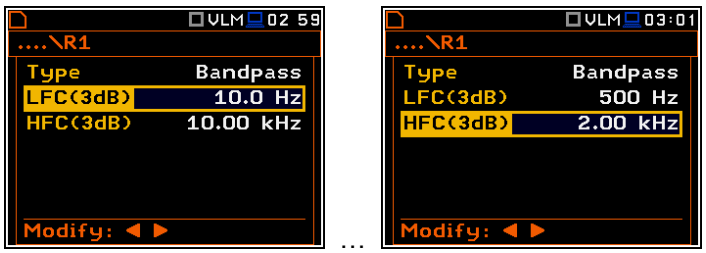
Characteristics of the Highpass filter with the LFC (3dB) = 4.00 kHz implemented in the instrument



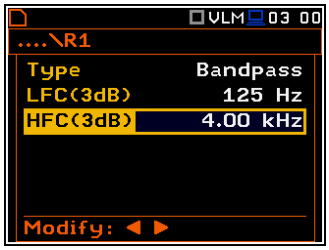
Characteristics of the Highpass filter with the LFC (3dB) = 8.00 kHz implemented in the instrument

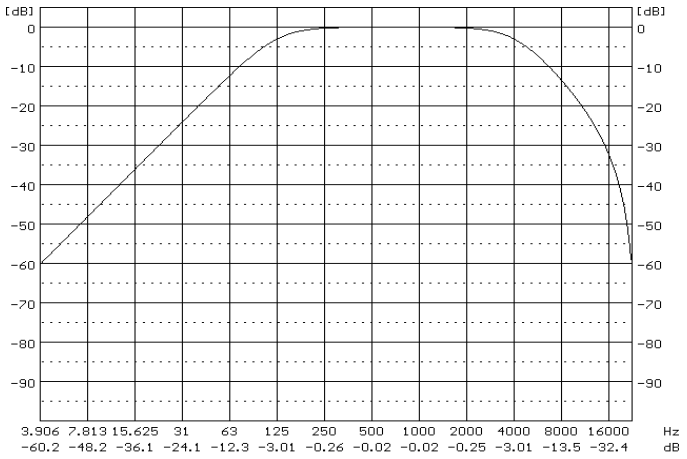
In the case of the **Bandpass** filter, you should determine both, the **LFC(3dB)** and the **HFC(3dB)** parameters which denote frequencies of the **Rx** filter at which the amplitude of the input signal is attenuated two times.

Available values of both parameters are from 100 Hz to 10.0 kHz. The **Bandpass** filter is implemented by the superposition of **Lowpass** and **Highpass** filters. In order to implement a real band-pass filter, the **LFC(3dB)** should be smaller than **HFC(3dB)**. If this condition is not fulfilled the signal is attenuated in the whole frequency band.

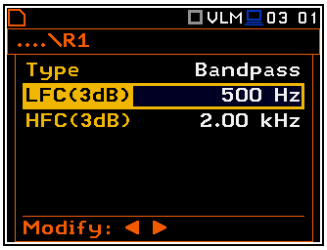


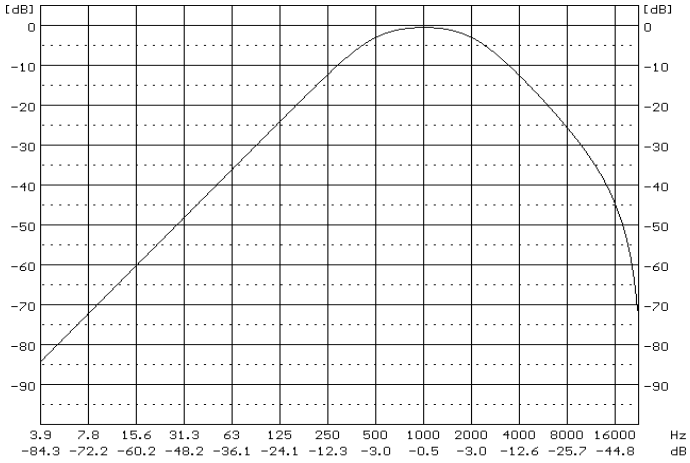
Selection of a wide and narrow Bandpass Real Time Filters





Characteristics of the band-pass filter with the LFC (3dB) = 125 Hz and HFC (3dB) = 4.00 kHz





Characteristics of the band-pass filter with the LFC (3dB) = 500 Hz and HFC (3dB) = 2.00 kHz

C.5. MISCELLANEOUS SPECIFICATION OF SVAN 979

Display

Super contrast OLED color display (320 x 240 pixels).

Memory

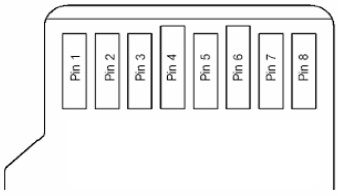
32 MB flash memory and 768 kB of the RAM memory.

FLASH-disk for storing the measurement data files or setup files (ca. 49 % of the installed memory).

Memory card

Can be used typical Micro SD or Micro SDHC cards. Supported for up to 128 GB (provided that card was formatted as FAT32).

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



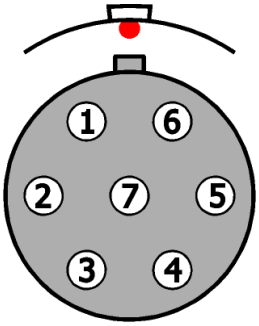
MicroSD contact pad assignment - outer view

Table C.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):



Input connector (receptacle) type of LEMO ENG.1B.307 - outer view

Table C.5.2. Pin out of the LEMO ENG1B307

Contact no.	Signal name
1	Preamplifier temperature meas. Input
2	Power GND
3	+200V Polarisation Voltage
4	Signal Input
5	Extension Cable ID Input
6	+28V Supply Voltage
7	Signal GND
Connector body	Shield / Cable Screen

Power supply

Instrument is dedicated for the operation from the internal replaceable battery.
Power consumption from the 6V source is approx. **190 mA (at + 20°C)**

So, typical operating time from 4 x AA alkaline batteries will be about **9.5 hours**.

SVAN 979 can be also powered from the AA Type rechargeable batteries.

Note: *For temperatures below 0°C operating time may be shortened (depending on the batteries)!*

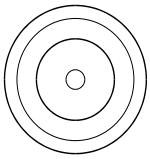
Note: *Using of the USB Flash Disk (memory Stick) will increase power consumption. Maximum power consumption on the USB Host Port might be up top 150 mA. In such a case battery operating time will be reduced to approx. 6 hours!*

Instrument can be also powered from the external source (e.g. SA 17A or car battery) with the DC Voltage from 6 V to 24 V.

Voltage ripple should not exceed ± 5%.

External Power requirement is voltage dependent:

for 6 V - 190 mA DC,
for 24 V - 45 mA DC.

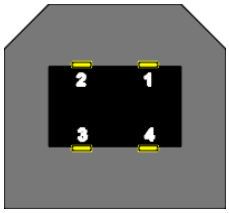


Power Supply connector 5.5 / 2.1 mm (external view)

Table C.5.3. Pin out of the power supply connector

Internal Pin	5.5/2.1
Shield	Ground
1	+ 6 V ÷ 24 V

USB Device port



USB socket (external view)

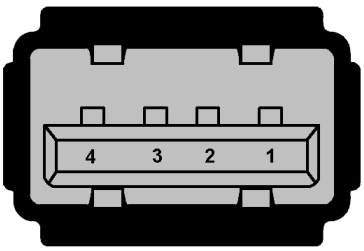
Table C.5.4. Pin-out of the USB-Device connector

Pin number	USB
1	Vbus
2	D-
3	D+
4	GND
Shield	Ground

Serial USB Host port

SVAN 979 Serial Port provides data transfer using RS232 data format but in TTL logic standard

Supported USB disks up to 32 GB.



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 979 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.

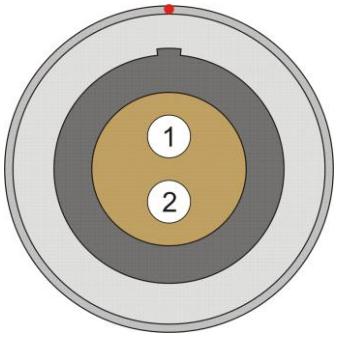
Note: *The SV 55 must be connected to the SVAN 979 USB Host port and proper operation of this port must be set-up in the instrument's setup Menu before!*

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



LEMO type ENG0B302 (outer view)

Table C.5.7. Pin out of the LEMO ENG0B302

Pin Number	Function
1	"GENERATOR" Output
2	"I/O" Input / Output
Chassis	Ground

The user may set-up the I/O mode in the screen <***Menu> / Instrument / Multifunction I/O***:

1. **I/O Mode: Analog Out**. In this mode, analogue signal from the instrument is fed to it's **I/O** connector, with following user-selectable options:

1.1 **Direct** – when this option is selected, the measured signal from the measurement channel is fed to the pin 2 of the **I/O** connector. Output voltage, frequency band and the output impedance are following:

a) Output Voltage:

1) In the **Vibration Meter** and **Direct Vibration** modes, the output voltage is equal to 1.0 V_{RMS} (± 5 %) at 177 dB indication of the instrument, on **High** measurement range and at 160 dB indication of the instrument on **Low** measurement range, when calibration factor is set to 0.0 dB.

2) In the **Sound Meter** mode, the output voltage is equal to 70.7 mV_{RMS} (± 5 %) at 114 dB reference level of the instrument, when the calibration factor is set to 0.0 dB.

3) In the **Direct Sound** mode, the output voltage is equal to 1.0 V_{RMS} (± 5 %) at 137 dB indication of the instrument, on **High** measurement range and at 120 dB indication of the instrument on **Low** measurement range, when calibration factor is set to 0,0 dB.

b) Frequency Band (-3 dB): 1.0 Hz ÷ 22.6 kHz.

c) Output Impedance: 51 Ω / 5%

1.2. **D/A** – when this option is selected, the analogue signal from the internal signal generator of the instrument after digital-to-analogue converter is transmitted to the pin 1 of the **I/O** connector, and the analogue input signal is transmitted to the pin 2 of the **I/O** connector after digital-to-analogue converter.

2. **I/O Mode: Digital In**. When the **Ext. Trigger** function is active, the external triggering of the instrument may be provided. To do this, 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 [2] 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.

3. **I/O Mode: Digital Out**. Two different functions are available in this mode:

3.1. **Function: Trigger Pulse**. When this function is selected, the terminal [2] 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 to 3 V,

c) triggering slope: uprising,

d) output impedance: 51 Ω,

e) duration of the impulse: ca. 40 µsec.

3.2. **Function: Alarm Pulse**. When this function is selected, the terminal [2] 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 [2] 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** parameter defines which level of the signal should be treated as a valid one: **Low** or **High** (“negative” or “positive” logic). When **High** is selected, the output alternates from 0 V to 3 V till measurement result is greater than threshold value,

d) **Source** parameter defines the result, the level of which should be checked and compared with the threshold level for the alarm triggering. One of three results sources may be selected **Leq(1)**, **Peak(1)**, **Max(1)** or **Spl(1)**,

e) **Source Type** parameter defines the type of alarm source (**Current** or **Periodic**), depending on the integration: with 1 second period or with **Integration Period** *(path: <Menu> / Measurement / General Settings)*.

f) **Alarm Level** defines the threshold level for triggering the alarm pulse generation.

Real Time Clock

Built-in real time. Accuracy better than 1 minute/month.

Weight with the battery 600 g (without accelerometer or microphone preamplifier).

Dimensions 42x82x193 mm (without accelerometer or microphone preamplifier).

Electromagnetic Compatibility (EMC)

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

1. For the EMC emissions specification:
   a) according to EN 61672-1:2013, applying test methods in accordance with EN 55032:2015,
   b) according to EN ISO 8041-1:2017 (Chapters 7.5, 12.20.7), applying test methods in accordance with EN 55032:2015,
2. For the EMC immunity specification:
   a) according to EN 61672-1:2013, applying test methods in accordance with IEC 61000-4-2, IEC 61000-4-3:2002 and IEC 61000-4-8.
   b) according to EN ISO 8041-1:2017 (Chapters 7.4, 7.6, 12.20.6, 12.20.8), applying test methods in accordance with IEC 61000-4-2:2001, IEC 61000-4-3:2002 and IEC 61000-4-8.



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

Safety

The product described above is compliant with following standards:

EN 61010-1:2001 and IEC 61010-1:2001

Compliance with EU Directives

CE mark indicates compliance with EMC Directive 89/336/EEC and Low Voltage Directive 2006/95/EC.

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)

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.

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.

[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.

C.6. SPECIFICATION OF THE 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 THE SA 279 OUTDOOR MICROPHONE PROTECTION UNIT

The **SA 279** outdoor protection unit protects the SVAN 979 preamplifier and microphone from weather conditions. The use of the outdoor kit requires an extension cable between the instrument and its preamplifier (**SC 279**). The SA 279 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 279 Assembly Guide to learn how to assemble and disassemble the microphone's outdoor protection.*

***Note:** Using SA 279 changes the frequency response and measurement ranges of SVAN 979. Please check the below given specification.*

Depending on the measurement task SA 279 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 979 with SA 279 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 279, the Microphone Compensation must be set to "SA279 (0°)" or "SA279 (90°)"! (path: <Menu> / Measurement / Compensation Filter).*

Linear Operating Ranges with the **Environmental** filter

Table C.7.1 Self-generated noise for different weighting filters

	Electrical *)			Acoustical compensated		
Weighting filter / Range	A	C	Z	A	C	Z
Low	< 14 dB	< 14 dB	< 21 dB	< 15 dB	< 15 dB	< 23 dB
High	< 21 dB	< 21 dB	< 31 dB	< 23 dB	< 23 dB	< 33 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 50 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	41	120	25	80	25	103	25	117	28	83	50	120
500 Hz	25	116	25	119	25	120	41	120	25	116	25	119	25	120	28	119	50	123
1 kHz	25	120	25	120	25	120	41	120	25	120	25	120	25	120	28	123	50	123
4 kHz	25	121	25	119	25	119	41	120	25	121	25	119	25	119	28	124	50	122
8 kHz	25	119	25	117	25	117	41	120	25	119	25	117	25	117	28	122	50	120
12.5 kHz	25	115	25	114	25	114	41	120	25	115	25	114	25	114	28	118	50	117

Table C.7.3 Linear operating range: “HIGH” with the **Environmental** filter for the sinusoidal signal and microphone sensitivity 50 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	33	97	33	120	33	134	43	137	33	97	33	120	33	134	36	100	70	137
500 Hz	33	133	33	136	33	137	43	137	33	133	33	136	33	137	36	136	70	140
1 kHz	33	137	33	137	33	137	43	137	33	137	33	137	33	137	36	140	70	140
4 kHz	33	138	33	136	33	136	43	137	33	138	33	136	33	136	36	141	70	139
8 kHz	33	136	33	134	33	134	43	137	33	136	33	134	33	134	36	139	70	137
12.5 kHz	33	132	33	131	33	131	43	137	33	132	33	131	33	131	36	135	70	134

Microphone response for **90 deg** incidence angle

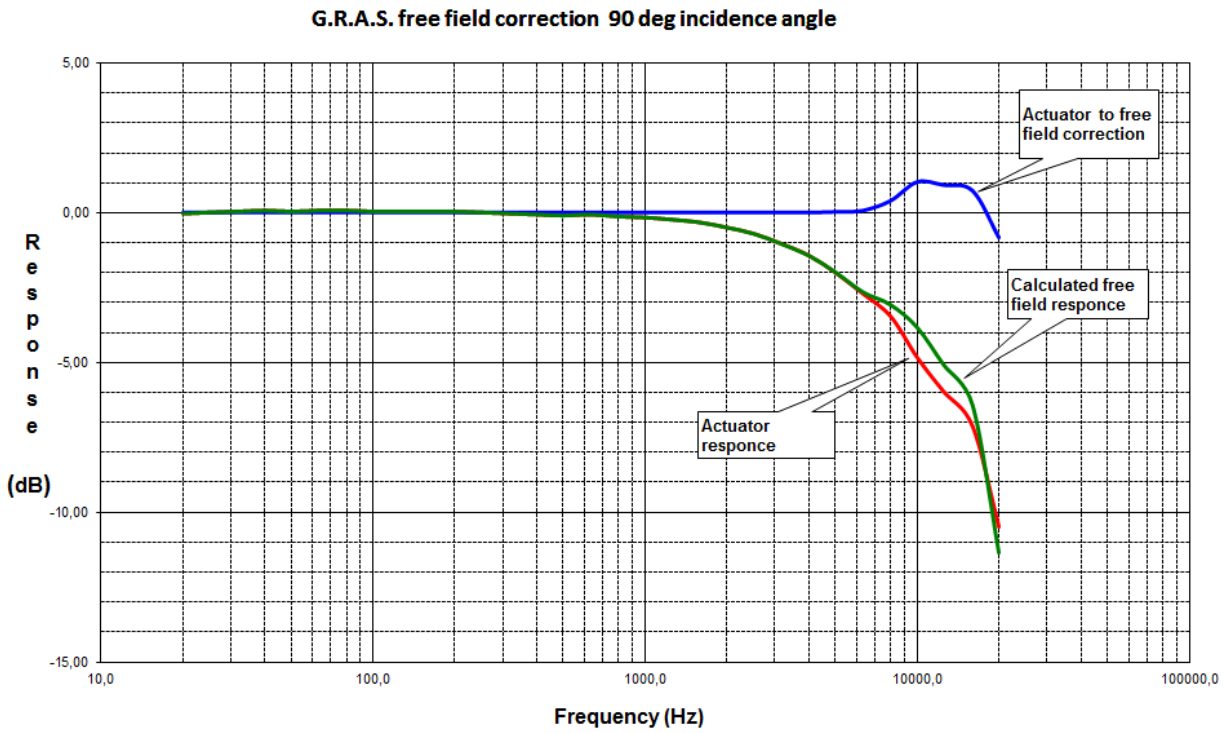


Table C.7. G.R.A.S. 40AE free field correction (**90 deg** incidence angle)

f [Hz]	G.R.A.S. 40AE Actuator to Free Field correction for 90 deg incidence angle	G.R.A.S. 40AE Typical electrostatic actuator response	G.R.A.S. 40AE Free Field response for 90 deg incidence angle
20,0	0,00	-0,03	-0,03
25,0	0,00	0,00	0,00
31,5	0,00	0,03	0,03
40,0	0,00	0,07	0,07
50,0	0,00	0,03	0,03
63,0	0,00	0,07	0,07
80,0	0,00	0,07	0,07
100,0	0,00	0,03	0,03
125,0	0,00	0,03	0,03
160,0	0,00	0,03	0,03
200,0	0,00	0,03	0,03
250,0	0,00	0,00	0,00
315,0	0,00	-0,03	-0,03
400,0	0,00	-0,07	-0,07
500,0	0,00	-0,10	-0,10
630,0	0,00	-0,07	-0,07
800,0	0,00	-0,13	-0,13
1000,0	0,00	-0,17	-0,17
1250,0	0,00	-0,23	-0,23
1600,0	0,00	-0,33	-0,33
2000,0	0,00	-0,50	-0,50
2500,0	0,00	-0,70	-0,70

f [Hz]	G.R.A.S. 40AE Actuator to Free Field correction for 90 deg incidence angle	G.R.A.S. 40AE Typical electrostatic actuator response	G.R.A.S. 40AE Free Field response for 90 deg incidence angle
3150,0	0,00	-1,03	-1,03
4000,0	0,00	-1,43	-1,43
5000,0	0,02	-2,00	-1,98
6300,0	0,06	-2,70	-2,64
8000,0	0,39	-3,47	-3,08
10000,0	1,01	-4,83	-3,82
12500,0	0,91	-5,97	-5,06
16000,0	0,72	-7,13	-6,41
20000,0	-0,83	-10,50	-11,33

Fee field frequency response of SVAN 979 with SA 279 (**90 deg** incidence angle)

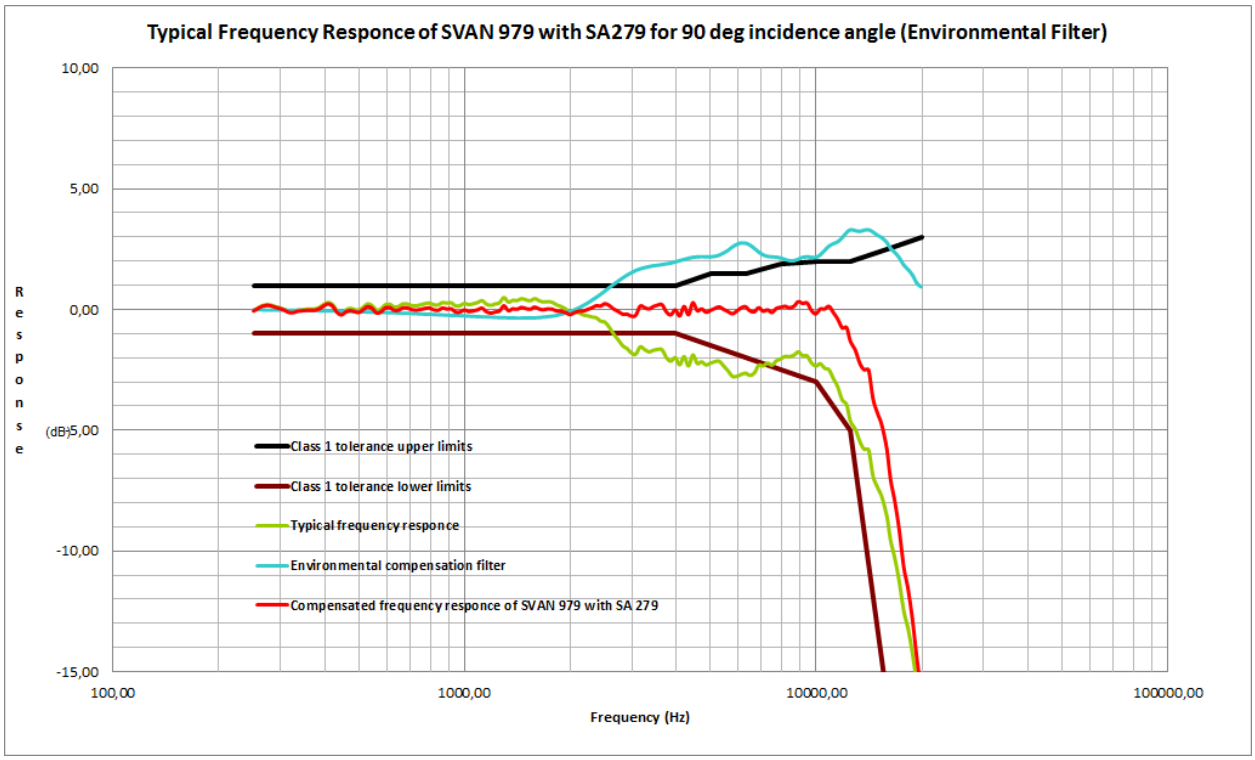


Table C.7.5 Free field frequency response of SVAN 979 with SA 279 (90 deg incidence angle)

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 90 deg incidence angle	Compensation filter "Environmental"	Typical compensated frequency response of SVAN 979 with SA279 for 90 deg incidence angle (Environmental)
251.19	-0,02	-0,03	-0,05
258.52	0,09	-0,03	0,06
266.07	0,18	-0,03	0,15
273.84	0,23	-0,04	0,19
281.84	0,20	-0,04	0,16
290.07	0,14	-0,04	0,10
298.54	0,09	-0,04	0,05
307.26	0,02	-0,04	-0,02

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 90 deg incidence angle	Compensation filter "Environmental"	Typical compensated frequency response of SVAN 979 with SA279 for 90 deg incidence angle (Environmental)
316.23	-0,06	-0,05	-0,11
325.46	-0,07	-0,05	-0,12
334.97	-0,01	-0,05	-0,06
344.75	0,01	-0,05	-0,04
354.81	0,04	-0,06	-0,02
365.17	0,04	-0,06	-0,02
375.84	0,05	-0,06	-0,01
386.81	0,11	-0,07	0,04
398.11	0,23	-0,07	0,16
409.73	0,31	-0,07	0,24
421.70	0,22	-0,08	0,14
434.01	-0,02	-0,08	-0,10
446.68	-0,12	-0,09	-0,21
459.73	0,00	-0,09	-0,09
473.15	0,07	-0,10	-0,03
486.97	0,02	-0,10	-0,08
501.19	0,00	-0,11	-0,11
515.82	0,12	-0,11	0,01
530.88	0,26	-0,12	0,14
546.39	0,18	-0,12	0,06
562.34	0,00	-0,13	-0,13
578.76	0,05	-0,13	-0,08
595.66	0,22	-0,14	0,08
613.06	0,24	-0,15	0,09
630.96	0,13	-0,15	-0,02
649.38	0,14	-0,16	-0,02
668.34	0,25	-0,17	0,08
687.86	0,25	-0,17	0,08
707.95	0,19	-0,18	0,01
728.62	0,17	-0,19	-0,02
749.89	0,21	-0,20	0,01
771.79	0,26	-0,21	0,05
794.33	0,29	-0,21	0,08
817.52	0,22	-0,22	0,00
841.40	0,21	-0,23	-0,02
865.96	0,31	-0,24	0,07
891.25	0,28	-0,25	0,03
917.28	0,30	-0,26	0,04
944.06	0,17	-0,26	-0,09
971.63	0,18	-0,27	-0,09
1000.00	0,28	-0,28	0,00
1029.20	0,22	-0,29	-0,07
1059.25	0,26	-0,30	-0,04
1090.18	0,31	-0,31	0,00
1122.02	0,39	-0,32	0,07
1154.78	0,24	-0,32	-0,08
1188.50	0,19	-0,33	-0,14
1223.21	0,25	-0,34	-0,09
1258.93	0,31	-0,35	-0,04

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 90 deg incidence angle	Compensation filter "Environmental"	Typical compensated frequency response of SVAN 979 with SA279 for 90 deg incidence angle (Environmental)
1295.69	0,52	-0,35	0,17
1333.52	0,33	-0,36	-0,03
1372.46	0,40	-0,36	0,04
1412.54	0,39	-0,37	0,02
1453.78	0,47	-0,37	0,10
1496.24	0,42	-0,37	0,05
1539.93	0,38	-0,36	0,02
1584.89	0,47	-0,36	0,11
1631.17	0,38	-0,35	0,03
1678.80	0,33	-0,33	0,00
1727.83	0,35	-0,31	0,04
1778.28	0,32	-0,29	0,03
1830.21	0,21	-0,26	-0,05
1883.65	0,15	-0,21	-0,06
1938.65	0,05	-0,16	-0,11
1995.26	-0,10	-0,10	-0,20
2053.53	-0,09	-0,03	-0,12
2113.49	-0,11	0,05	-0,06
2175.20	-0,20	0,15	-0,05
2238.72	-0,24	0,25	0,01
2304.09	-0,29	0,37	0,08
2371.37	-0,32	0,49	0,17
2440.62	-0,46	0,62	0,16
2511.89	-0,51	0,76	0,25
2585.23	-0,73	0,90	0,17
2660.73	-1,01	1,04	0,03
2738.42	-1,24	1,17	-0,07
2818.38	-1,48	1,30	-0,18
2900.68	-1,60	1,42	-0,18
2985.38	-1,78	1,52	-0,26
3072.56	-1,83	1,61	-0,22
3162.28	-1,53	1,68	0,15
3254.62	-1,64	1,73	0,09
3349.65	-1,74	1,77	0,03
3447.47	-1,67	1,81	0,14
3548.13	-1,63	1,83	0,20
3651.74	-1,65	1,86	0,21
3758.37	-1,98	1,89	-0,09
3868.12	-2,13	1,92	-0,21
3981.07	-1,97	1,97	0,00
4097.32	-2,27	2,02	-0,25
4216.97	-1,93	2,07	0,14
4340.10	-2,32	2,12	-0,20
4466.84	-1,87	2,16	0,29
4597.27	-2,22	2,18	-0,04
4731.51	-2,15	2,19	0,04
4869.68	-2,28	2,18	-0,10
5011.87	-2,20	2,18	-0,02
5158.22	-2,14	2,20	0,06

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 90 deg incidence angle	Compensation filter "Environmental"	Typical compensated frequency response of SVAN 979 with SA279 for 90 deg incidence angle (Environmental)
5308.84	-2,13	2,25	0,12
5463.87	-2,32	2,34	0,02
5623.41	-2,52	2,45	-0,07
5787.62	-2,75	2,59	-0,16
5956.62	-2,75	2,70	-0,05
6130.56	-2,67	2,76	0,09
6309.57	-2,62	2,75	0,13
6493.82	-2,71	2,67	-0,04
6683.44	-2,61	2,53	-0,08
6878.60	-2,29	2,38	0,09
7079.46	-2,32	2,26	-0,06
7286.18	-2,20	2,20	0,00
7498.94	-2,29	2,18	-0,11
7717.92	-2,11	2,17	0,06
7943.28	-2,03	2,13	0,10
8175.23	-1,92	2,07	0,15
8413.95	-1,94	2,02	0,08
8659.64	-1,87	2,02	0,15
8912.51	-1,74	2,08	0,34
9172.76	-1,90	2,16	0,26
9440.61	-1,90	2,19	0,29
9716.28	-2,19	2,16	-0,03
10000.00	-2,33	2,16	-0,17
10292.01	-2,23	2,26	0,03
10592.54	-2,41	2,45	0,04
10901.84	-2,48	2,63	0,15
11220.18	-2,85	2,73	-0,12
11547.82	-3,20	2,81	-0,39
11885.02	-3,73	2,98	-0,75
12232.07	-3,93	3,19	-0,74
12589.25	-4,61	3,31	-1,30
12956.87	-4,95	3,27	-1,68
13335.21	-5,46	3,24	-2,22
13724.61	-5,78	3,29	-2,49
14125.38	-5,80	3,31	-2,49
14537.84	-6,89	3,21	-3,68
14962.36	-7,35	3,08	-4,27
15399.27	-7,74	2,98	-4,76
15848.93	-8,56	2,78	-5,78
16311.73	-9,56	2,53	-7,03
16788.04	-10,32	2,36	-7,96
17278.26	-11,30	2,14	-9,16
17782.79	-12,49	1,84	-10,65
18302.06	-13,23	1,65	-11,58
18836.49	-14,27	1,42	-12,85
19386.53	-15,53	1,08	-14,45
19952.62	-16,77	0,93	-15,84

Case effect of SA 279 (**90 deg** incidence angle)

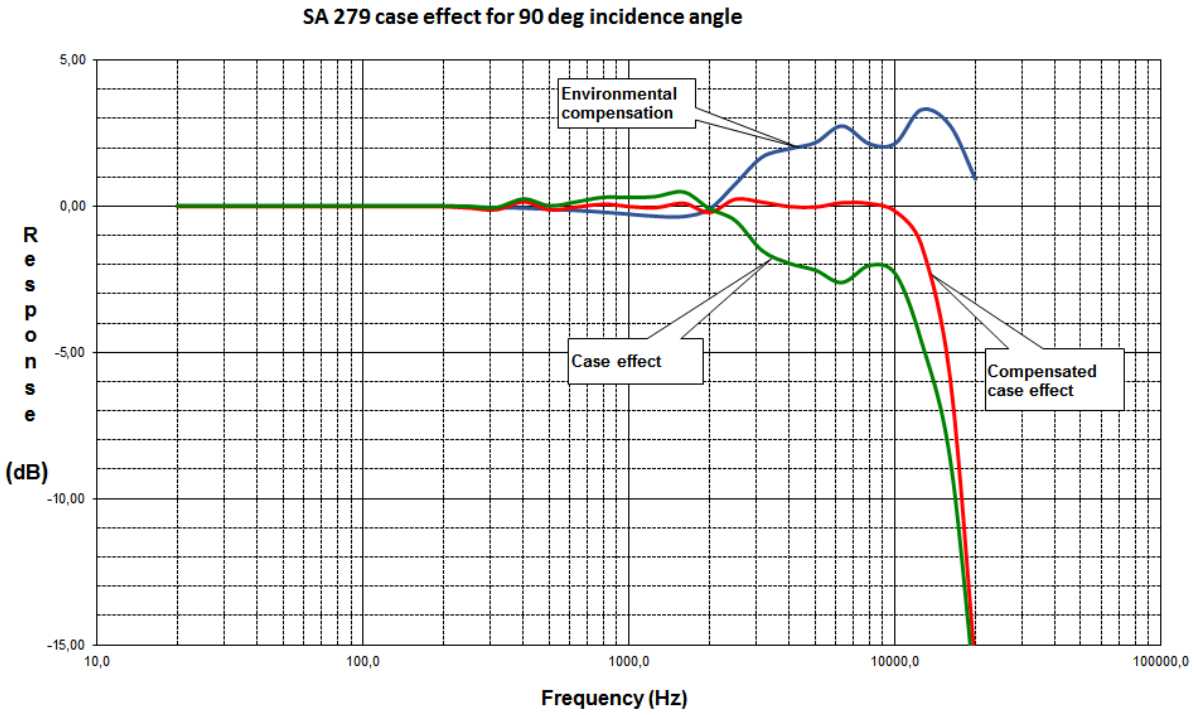


Table C.7.6 G.R.A.S. 40AE frequency response and SA 279 case effect (**90 deg** incidence angle)

f [Hz]	SA 279 Case effect for 90 deg incidence angle	Compensation filter "Environmental"	Compensated case effect for 90 deg incidence angle (Environmental)
20,0	0,00	0,00	0,00
25,0	0,00	0,00	0,00
31,5	0,00	0,00	0,00
40,0	0,00	0,00	0,00
50,0	0,00	0,00	0,00
63,0	0,00	0,00	0,00
80,0	0,00	0,00	0,00
100,0	0,00	0,00	0,00
125,0	0,00	0,00	0,00
160,0	0,00	0,00	0,00
200,0	0,00	0,00	0,00
250,0	-0,02	-0,03	-0,05
315,0	-0,06	-0,05	-0,11
400,0	0,23	-0,07	0,16
500,0	0,00	-0,11	-0,11
630,0	0,13	-0,15	-0,02
800,0	0,29	-0,21	0,08
1000,0	0,28	-0,28	0,00
1250,0	0,31	-0,35	-0,04
1600,0	0,47	-0,36	0,11
2000,0	-0,10	-0,10	-0,20
2500,0	-0,51	0,76	0,25
3150,0	-1,53	1,68	0,15
4000,0	-1,97	1,97	0,00
5000,0	-2,20	2,18	-0,02

f [Hz]	SA 279 Case effect for 90 deg incidence angle	Compensation filter "Environmental"	Compensated case effect for 90 deg incidence angle (Environmental)
6300,0	-2,62	2,75	0,13
8000,0	-2,03	2,13	0,10
10000,0	-2,33	2,16	-0,17
12500,0	-4,61	3,31	-1,30
16000,0	-8,56	2,78	-5,78
20000,0	-16,77	0,93	-15,84

Linear Operating Ranges with the **Airport** filter

Table C.7.7 Self-generated noise for different weighting filters

	Electrical *)			Acoustical compensated		
Weighting filter / Range	**A**	**C**	**Z**	**A**	**C**	**Z**
Low	< 14 dB	< 14 dB	< 21 dB	< 15 dB	< 15 dB	< 23 dB
High	< 21 dB	< 21 dB	< 31 dB	< 23 dB	< 23 dB	< 33 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 50 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	41	120	25	80	25	103	25	117	28	83	50	120
500 Hz	25	116	25	119	25	120	41	120	25	116	25	119	25	120	28	119	50	123
1 kHz	25	120	25	120	25	120	41	120	25	120	25	120	25	120	28	123	50	123
4 kHz	25	121	25	119	25	119	41	120	25	121	25	119	25	119	28	124	50	122
8 kHz	25	119	25	117	25	117	41	120	25	119	25	117	25	117	28	122	50	120
12.5 kHz	25	115	25	114	25	114	41	120	25	115	25	114	25	114	28	118	50	117

Table C.7.9 Linear operating range: "HIGH" with the **Airport** filter for the sinusoidal signal and microphone sensitivity 50 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	33	97	33	120	33	134	43	137	33	97	33	120	33	134	36	100	70	137
500 Hz	33	133	33	136	33	137	43	137	33	133	33	136	33	137	36	136	70	140
1 kHz	33	137	33	137	33	137	43	137	33	137	33	137	33	137	36	140	70	140
4 kHz	33	138	33	136	33	136	43	137	33	138	33	136	33	136	36	141	70	139
8 kHz	33	136	33	134	33	134	43	137	33	136	33	134	33	134	36	139	70	137
12.5 kHz	33	132	33	131	33	131	43	137	33	132	33	131	33	131	36	135	70	134

Free Field Frequency response of SVAN 979 with SA 279 (**0 deg** incidence angle)

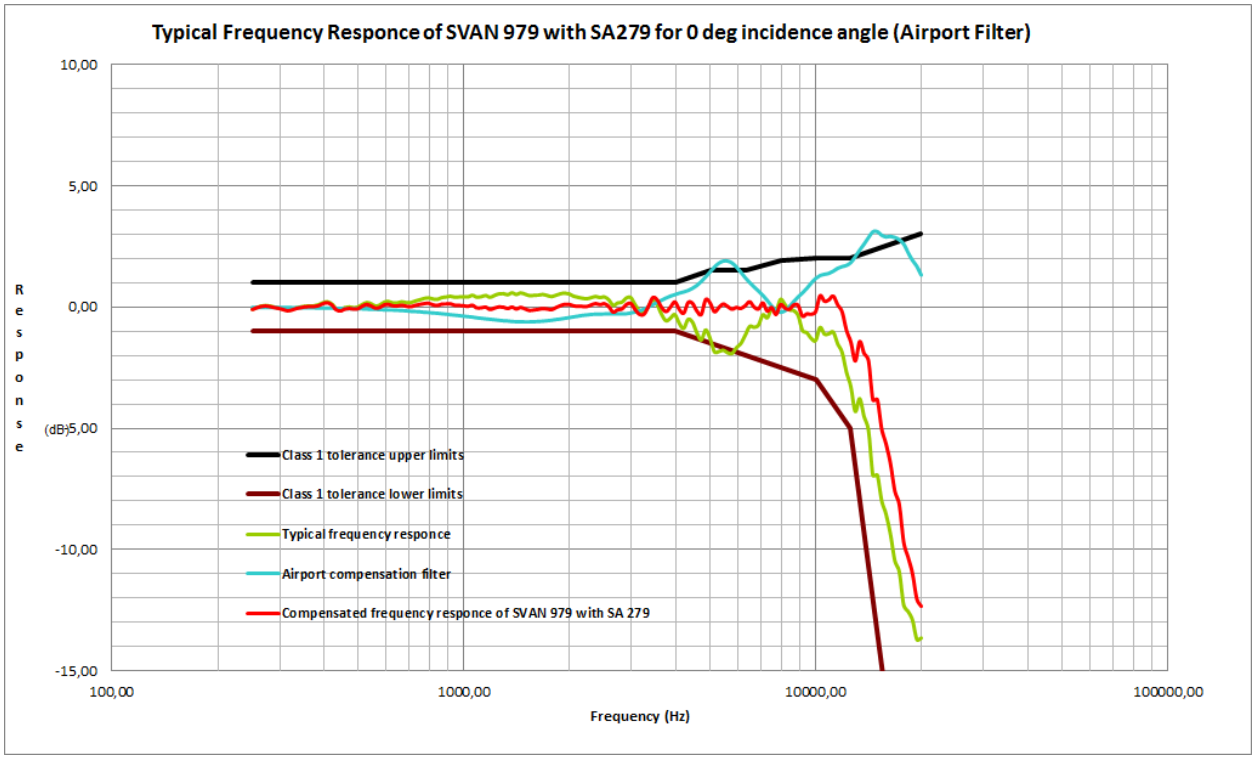


Table C.7.10 Free field frequency response of SVAN 979 with SA 279 (**0 deg** incidence angle)

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 0 deg incidence angle	Compensation filter "Airport"	Typical compensated frequency response of SVAN 979 with SA279 for 0 deg incidence angle (Airport)
251.19	-0,09	-0,01	-0,10
258.52	-0,02	-0,01	-0,03
266.07	0,04	-0,02	0,02
273.84	0,06	-0,02	0,04
281.84	0,04	-0,02	0,02
290.07	0,00	-0,02	-0,02
298.54	-0,04	-0,02	-0,06
307.26	-0,08	-0,02	-0,10
316.23	-0,14	-0,02	-0,16
325.46	-0,10	-0,02	-0,12
334.97	-0,03	-0,03	-0,06
344.75	0,00	-0,03	-0,03
354.81	0,04	-0,03	0,01
365.17	0,04	-0,03	0,01
375.84	0,05	-0,03	0,02
386.81	0,09	-0,04	0,05
398.11	0,17	-0,04	0,13
409.73	0,22	-0,04	0,18
421.70	0,13	-0,04	0,09
434.01	-0,06	-0,05	-0,11
446.68	-0,11	-0,05	-0,16

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 0 deg incidence angle	Compensation filter "Airport"	Typical compensated frequency response of SVAN 979 with SA279 for 0 deg incidence angle (Airport)
459.73	-0,03	-0,06	-0,09
473.15	0,00	-0,06	-0,06
486.97	-0,03	-0,06	-0,09
501.19	0,00	-0,07	-0,07
515.82	0,11	-0,07	0,04
530.88	0,19	-0,08	0,11
546.39	0,13	-0,09	0,04
562.34	0,04	-0,09	-0,05
578.76	0,09	-0,10	-0,01
595.66	0,20	-0,11	0,09
613.06	0,22	-0,12	0,10
630.96	0,17	-0,12	0,05
649.38	0,17	-0,13	0,04
668.34	0,21	-0,14	0,07
687.86	0,18	-0,15	0,03
707.95	0,18	-0,17	0,01
728.62	0,25	-0,18	0,07
749.89	0,30	-0,19	0,11
771.79	0,35	-0,21	0,14
794.33	0,38	-0,22	0,16
817.52	0,33	-0,24	0,09
841.40	0,31	-0,25	0,06
865.96	0,39	-0,27	0,12
891.25	0,41	-0,29	0,12
917.28	0,44	-0,31	0,13
944.06	0,40	-0,33	0,07
971.63	0,42	-0,35	0,07
1000.00	0,42	-0,37	0,05
1029.20	0,42	-0,39	0,03
1059.25	0,48	-0,41	0,07
1090.18	0,40	-0,44	-0,04
1122.02	0,43	-0,46	-0,03
1154.78	0,48	-0,48	0,00
1188.50	0,40	-0,50	-0,10
1223.21	0,47	-0,52	-0,05
1258.93	0,54	-0,54	0,00
1295.69	0,55	-0,56	-0,01
1333.52	0,51	-0,57	-0,06
1372.46	0,58	-0,59	-0,01
1412.54	0,52	-0,60	-0,08
1453.78	0,58	-0,60	-0,02
1496.24	0,53	-0,61	-0,08
1539.93	0,47	-0,61	-0,14
1584.89	0,48	-0,60	-0,12
1631.17	0,49	-0,59	-0,10
1678.80	0,52	-0,58	-0,06
1727.83	0,48	-0,56	-0,08

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 0 deg incidence angle	Compensation filter "Airport"	Typical compensated frequency response of SVAN 979 with SA279 for 0 deg incidence angle (Airport)
1778.28	0,43	-0,54	-0,11
1830.21	0,49	-0,51	-0,02
1883.65	0,55	-0,49	0,06
1938.65	0,57	-0,46	0,11
1995.26	0,54	-0,43	0,11
2053.53	0,45	-0,40	0,05
2113.49	0,40	-0,37	0,03
2175.20	0,36	-0,34	0,02
2238.72	0,34	-0,32	0,02
2304.09	0,39	-0,30	0,09
2371.37	0,43	-0,29	0,14
2440.62	0,39	-0,29	0,10
2511.89	0,42	-0,28	0,14
2585.23	0,29	-0,28	0,01
2660.73	0,06	-0,28	-0,22
2738.42	0,17	-0,28	-0,11
2818.38	0,20	-0,28	-0,08
2900.68	0,37	-0,27	0,10
2985.38	0,39	-0,24	0,15
3072.56	0,09	-0,20	-0,11
3162.28	-0,16	-0,15	-0,31
3254.62	-0,21	-0,08	-0,29
3349.65	0,01	0,01	0,02
3447.47	0,29	0,10	0,39
3548.13	0,09	0,20	0,29
3651.74	-0,31	0,29	-0,02
3758.37	-0,57	0,38	-0,19
3868.12	-0,46	0,46	0,00
3981.07	-0,31	0,52	0,21
4097.32	-0,67	0,58	-0,09
4216.97	-0,89	0,63	-0,26
4340.10	-0,51	0,69	0,18
4466.84	-0,63	0,78	0,15
4597.27	-1,06	0,90	-0,16
4731.51	-1,37	1,06	-0,31
4869.68	-0,95	1,25	0,30
5011.87	-1,29	1,46	0,17
5158.22	-1,85	1,66	-0,19
5308.84	-1,84	1,82	-0,02
5463.87	-1,79	1,91	0,12
5623.41	-1,89	1,91	0,02
5787.62	-1,92	1,83	-0,09
5956.62	-1,68	1,66	-0,02
6130.56	-1,51	1,45	-0,06
6309.57	-1,17	1,22	0,05
6493.82	-0,80	1,02	0,22
6683.44	-0,84	0,84	0,00

f [Hz]	Typical non-compensated frequency response of SVAN 979 with SA 279 for 0 deg incidence angle	Compensation filter "Airport"	Typical compensated frequency response of SVAN 979 with SA279 for 0 deg incidence angle (Airport)
6878.60	-0,75	0,67	-0,08
7079.46	-0,32	0,49	0,17
7286.18	-0,45	0,28	-0,17
7498.94	-0,07	0,05	-0,02
7717.92	-0,18	-0,13	-0,31
7943.28	0,31	-0,21	0,10
8175.23	0,11	-0,15	-0,04
8413.95	-0,11	0,02	-0,09
8659.64	-0,15	0,23	0,08
8912.51	-0,35	0,42	0,07
9172.76	-0,97	0,59	-0,38
9440.61	-1,06	0,78	-0,28
9716.28	-1,30	1,00	-0,30
10000.00	-1,39	1,19	-0,20
10292.01	-0,85	1,31	0,46
10592.54	-1,12	1,36	0,24
10901.84	-1,11	1,40	0,29
11220.18	-1,04	1,49	0,45
11547.82	-1,52	1,61	0,09
11885.02	-1,87	1,68	-0,19
12232.07	-2,69	1,73	-0,96
12589.25	-3,30	1,85	-1,45
12956.87	-4,32	2,09	-2,23
13335.21	-3,79	2,36	-1,43
13724.61	-4,52	2,61	-1,91
14125.38	-5,08	2,88	-2,20
14537.84	-6,95	3,12	-3,83
14962.36	-6,94	3,13	-3,81
15399.27	-8,00	2,98	-5,02
15848.93	-8,56	2,91	-5,65
16311.73	-9,39	2,93	-6,46
16788.04	-10,49	2,89	-7,60
17278.26	-10,94	2,79	-8,15
17782.79	-12,31	2,62	-9,69
18302.06	-12,58	2,26	-10,32
18836.49	-12,93	1,94	-10,99
19386.53	-13,73	1,69	-12,04
19952.62	-13,67	1,33	-12,34

Case effect of SA 279 (**0 deg** incidence angle)

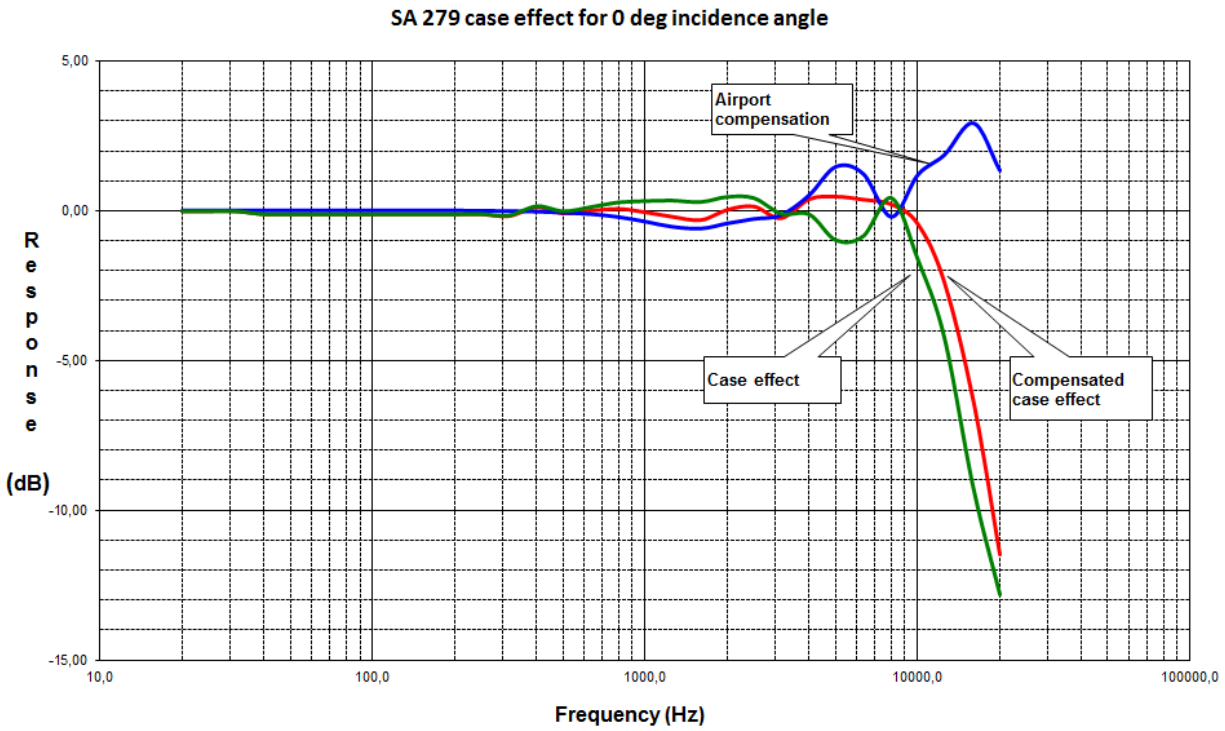


Table C.7.11 SA 279 case effect (**0 deg** incidence angle)

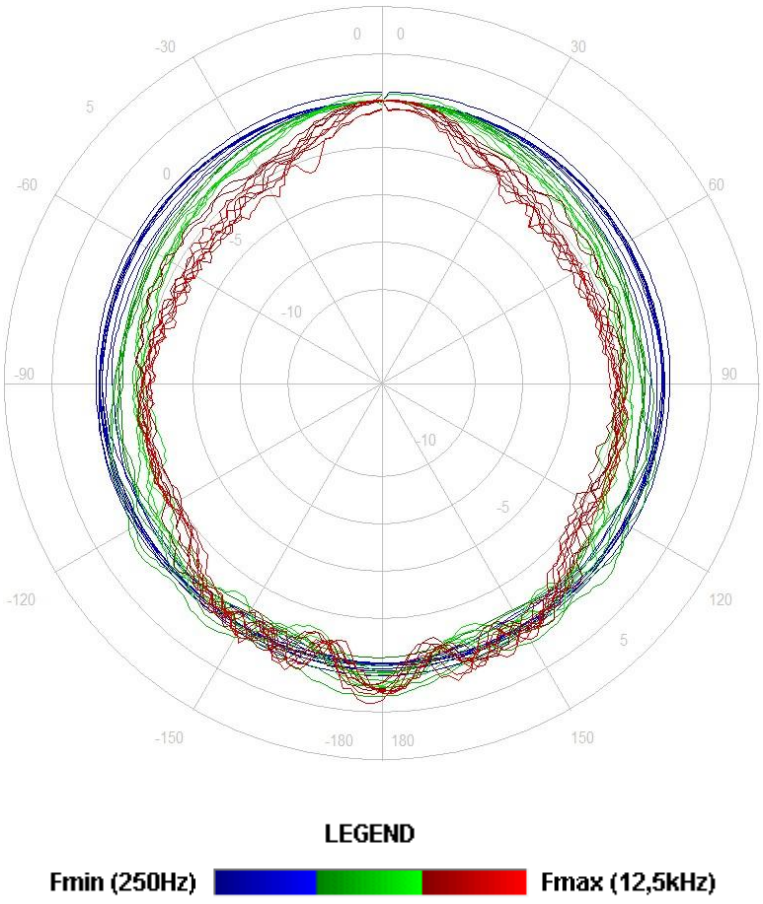
f [Hz]	SA 279 Case effect for 0 deg incidence angle	Compensation filter "Airport"	Compensated case effect for 0 deg incidence angle (Airport)
20,0	0,00	0,00	0,00
25,0	0,00	0,00	0,00
31,5	0,00	0,00	0,00
40,0	-0,10	0,00	-0,10
50,0	-0,10	0,00	-0,10
63,0	-0,10	0,00	-0,10
80,0	-0,10	0,00	-0,10
100,0	-0,10	0,00	-0,10
125,0	-0,10	0,00	-0,10
160,0	-0,10	0,00	-0,10
200,0	-0,10	0,00	-0,10
250,0	-0,09	-0,01	-0,10
315,0	-0,14	-0,02	-0,16
400,0	0,17	-0,04	0,13
500,0	0,00	-0,07	-0,07
630,0	0,14	-0,12	0,02
800,0	0,30	-0,22	0,08
1000,0	0,34	-0,37	-0,03
1250,0	0,36	-0,54	-0,18
1600,0	0,31	-0,60	-0,29

f [Hz]	SA 279 Case effect for 0 deg incidence angle	Compensation filter "Airport"	Compensated case effect for 0 deg incidence angle (Airport)
2000,0	0,48	-0,43	0,05
2500,0	0,44	-0,28	0,16
3150,0	-0,08	-0,15	-0,23
4000,0	-0,11	0,52	0,41
5000,0	-0,97	1,46	0,49
6300,0	-0,83	1,22	0,39
8000,0	0,44	-0,21	0,23
10000,0	-1,62	1,19	-0,43
12500,0	-4,22	1,85	-2,37
16000,0	-9,28	2,91	-6,37
20000,0	-12,82	1,33	-11,49

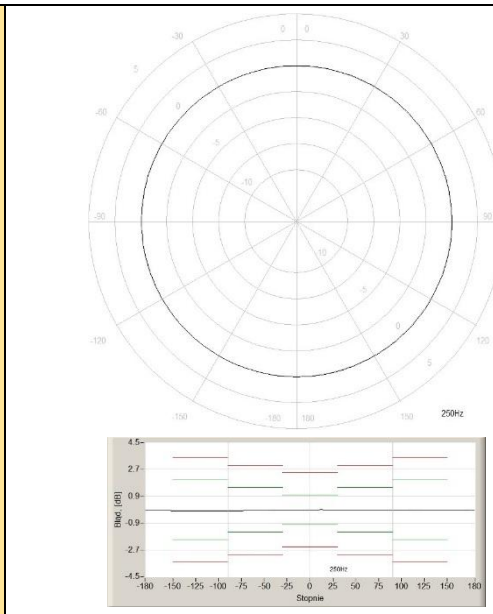
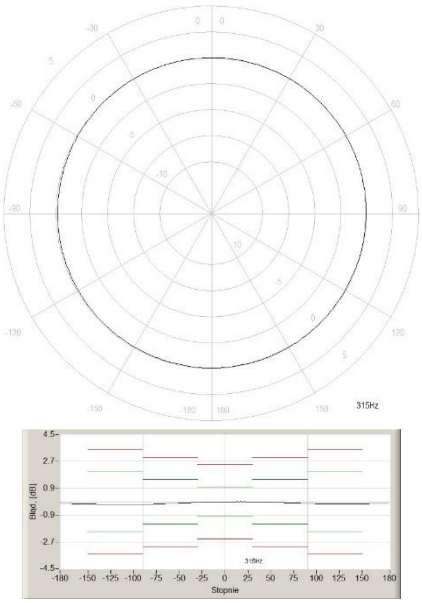
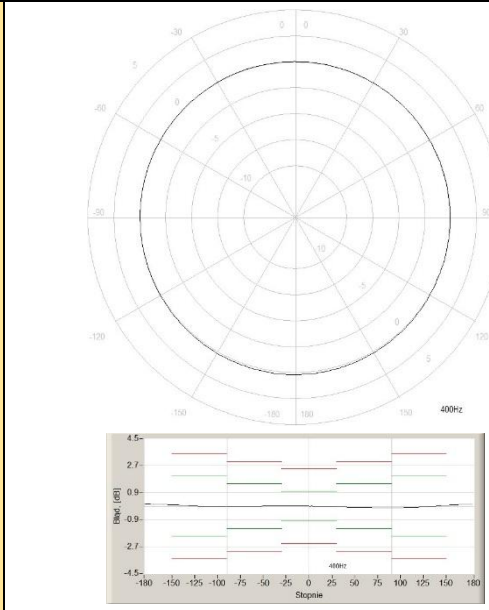
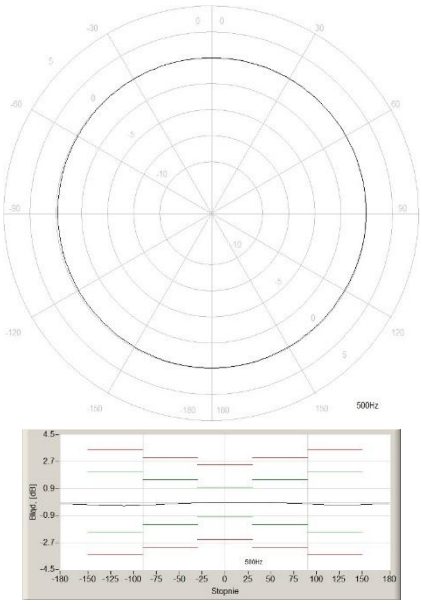
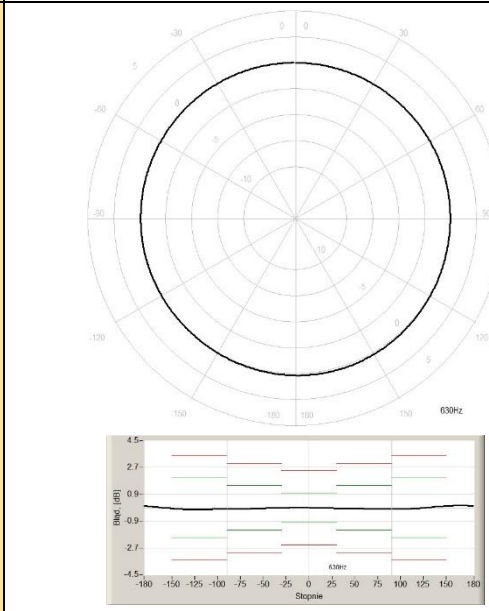
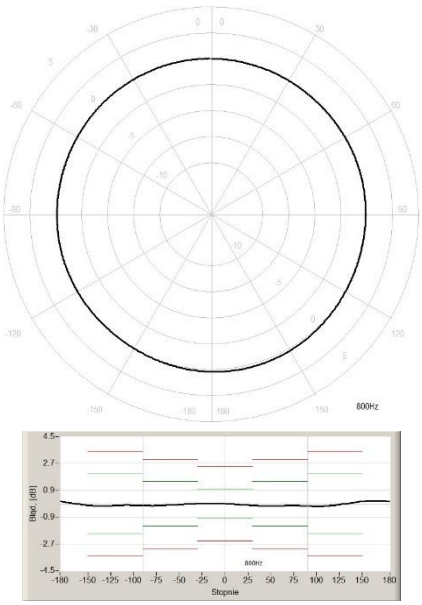
Free Field Directional characteristics of SVAN 979 with SA 279

Directional response for **SVAN 979** with microphone type **G.R.A.S. 40AE,** preamplifier **SV 17** and outdoor microphone kit **SA 279** for specified frequencies:

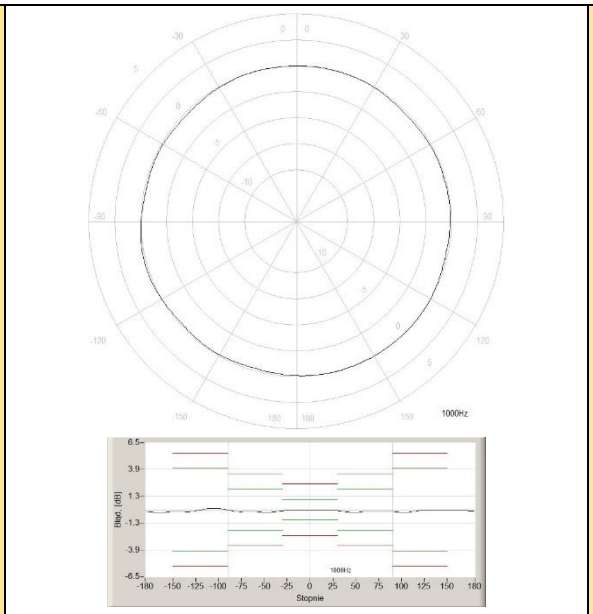
Total directional characteristics



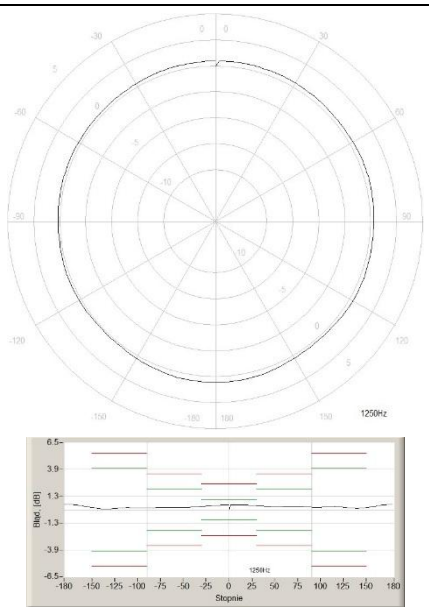
The round charts show the directional characteristic and the charts below shows the errors for particular angles.

250 Hz		**315 Hz**	
400 Hz		**500 Hz**	
630 Hz		**800 Hz**	

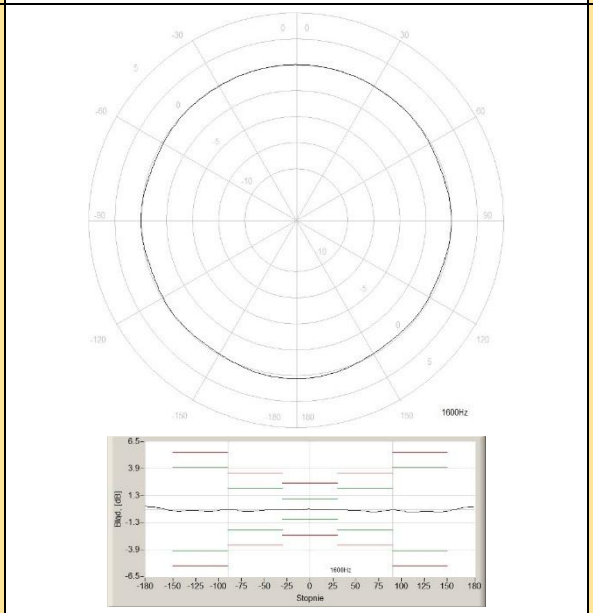
1000 Hz



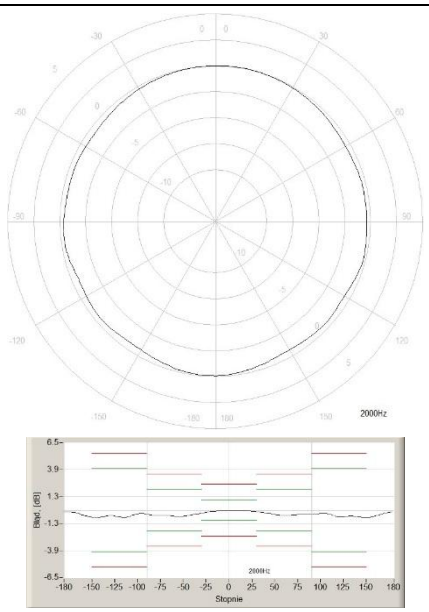
1250 Hz



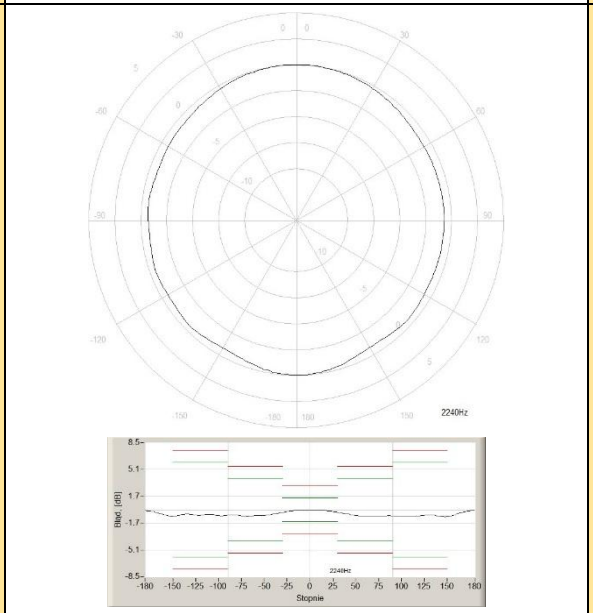
1600 Hz



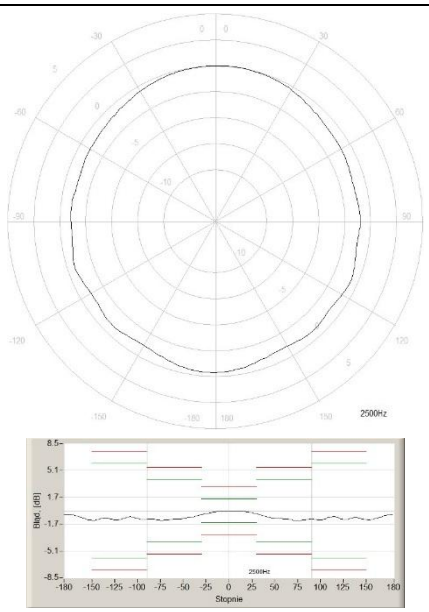
2000 Hz



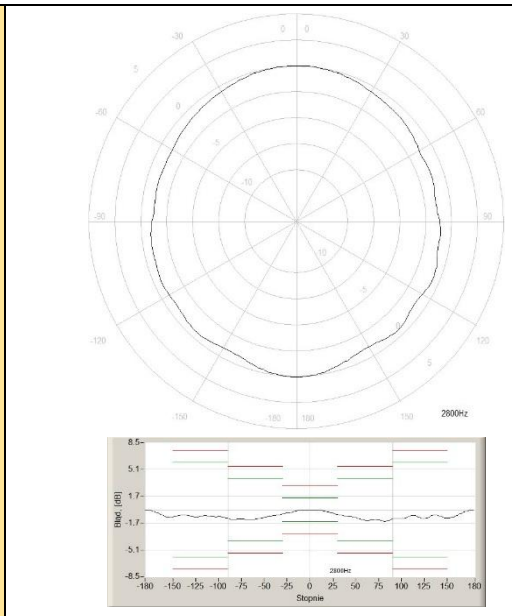
2240 Hz



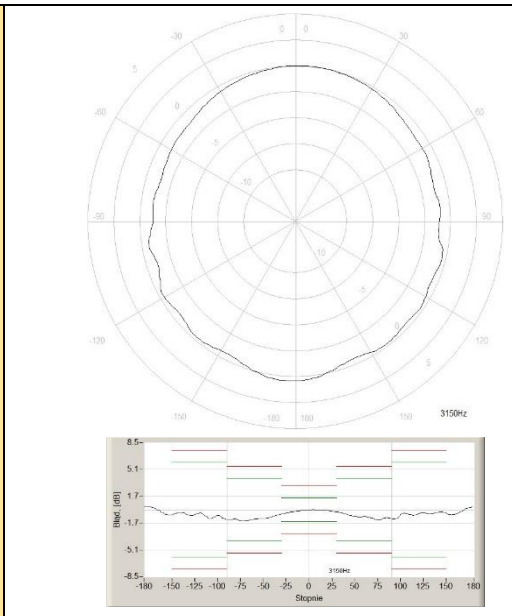
2500 Hz



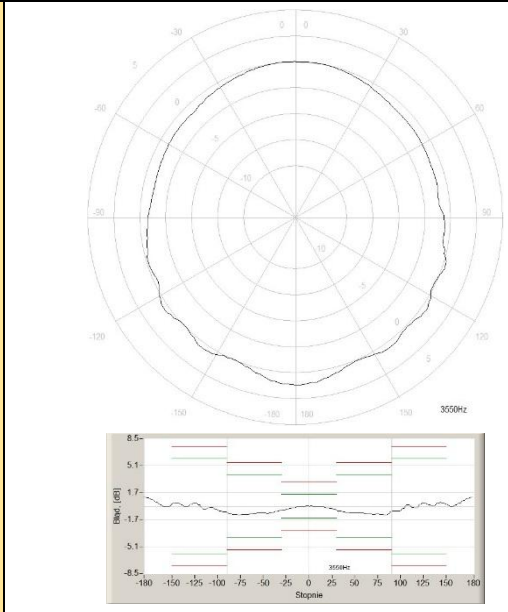
2800 Hz



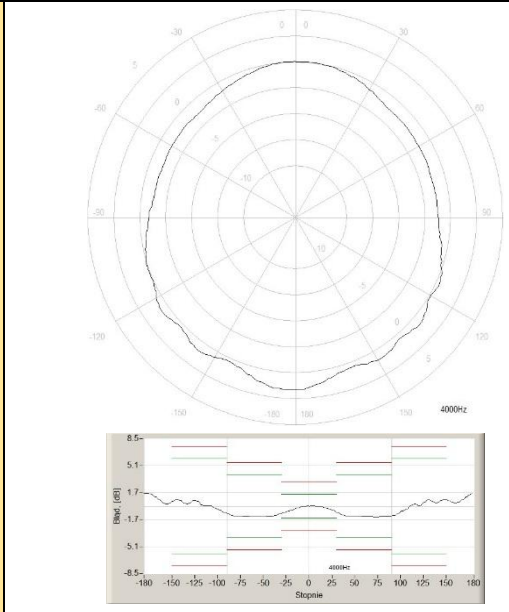
3150 Hz



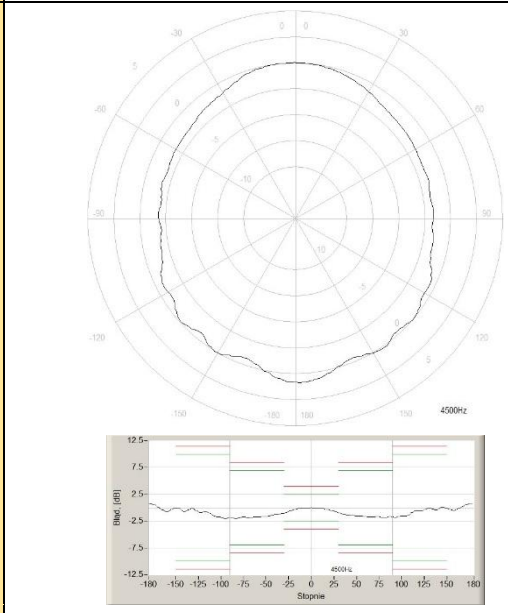
3550 Hz



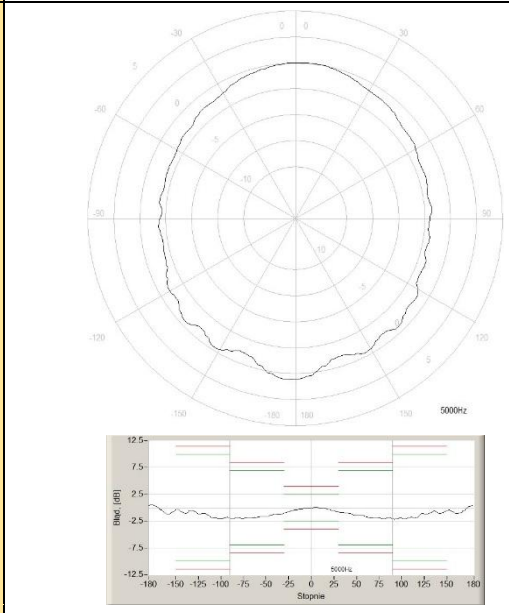
4000 Hz

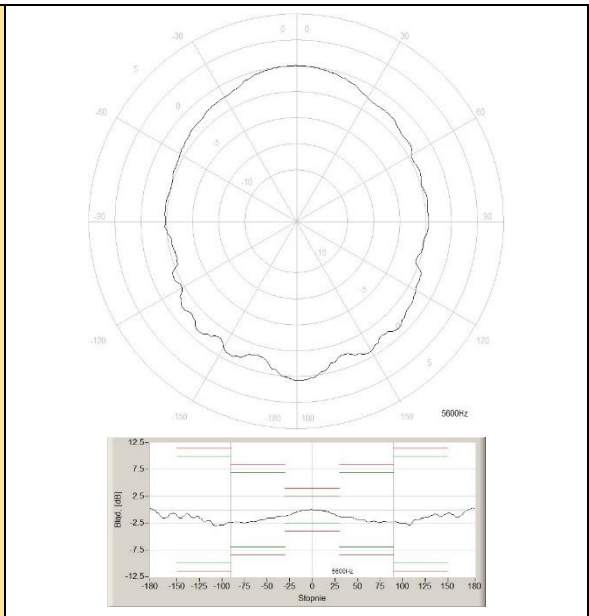
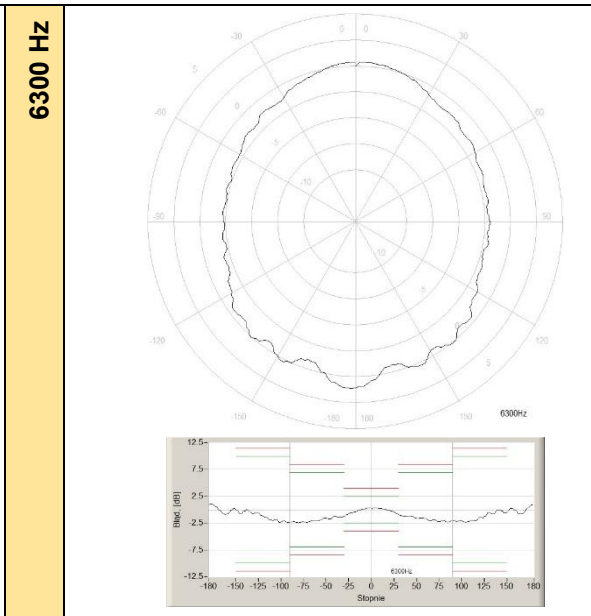
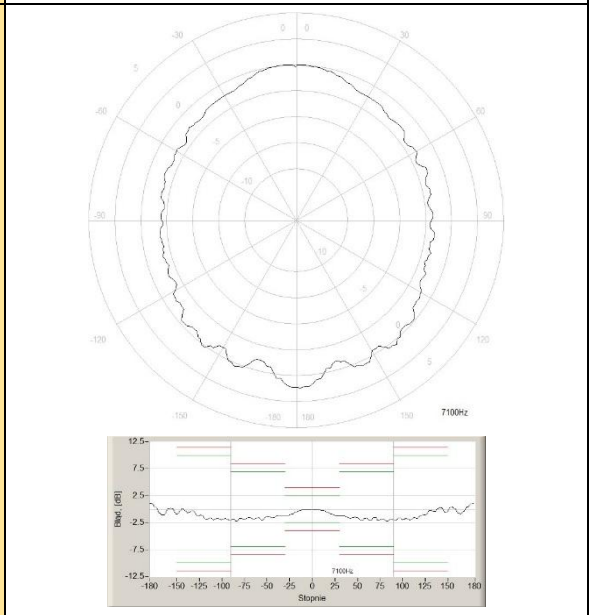
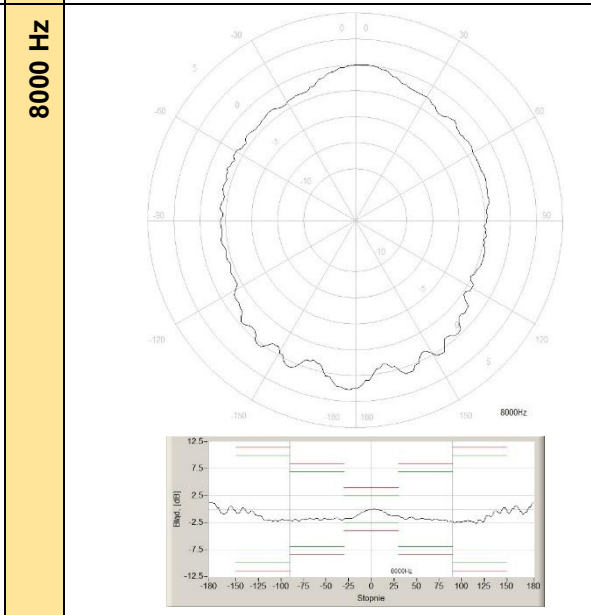
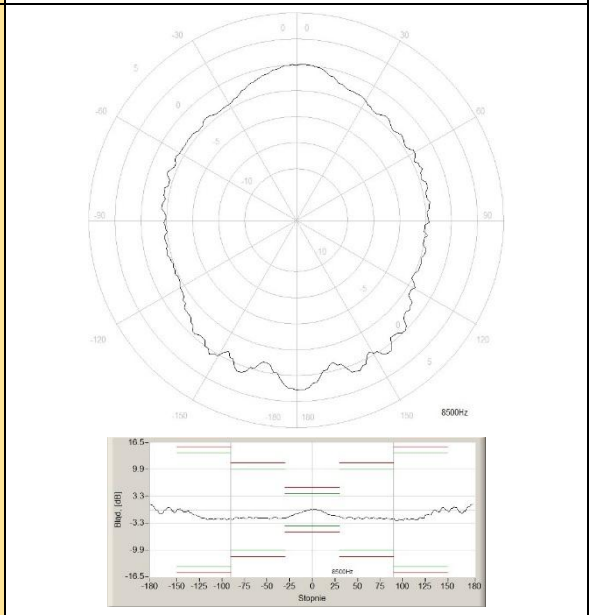
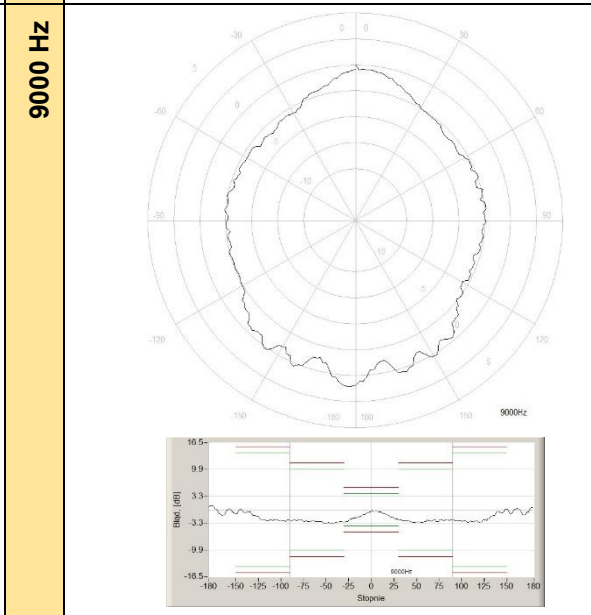


4500 Hz

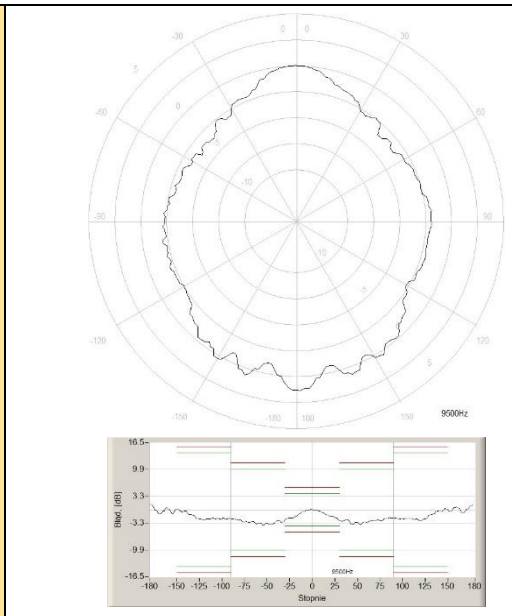


5000 Hz

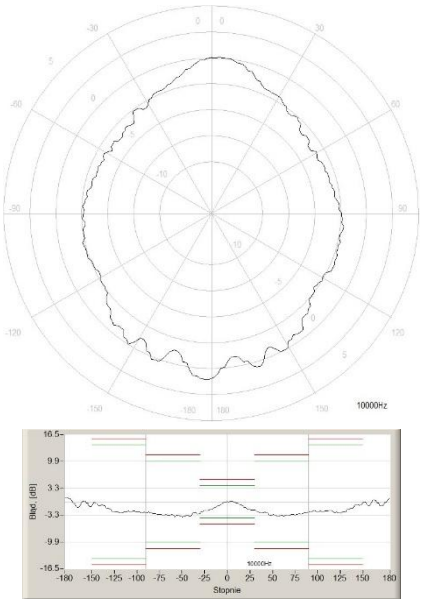


5600 Hz	
6300 Hz	
7100 Hz	
8000 Hz	
8500 Hz	
9000 Hz	

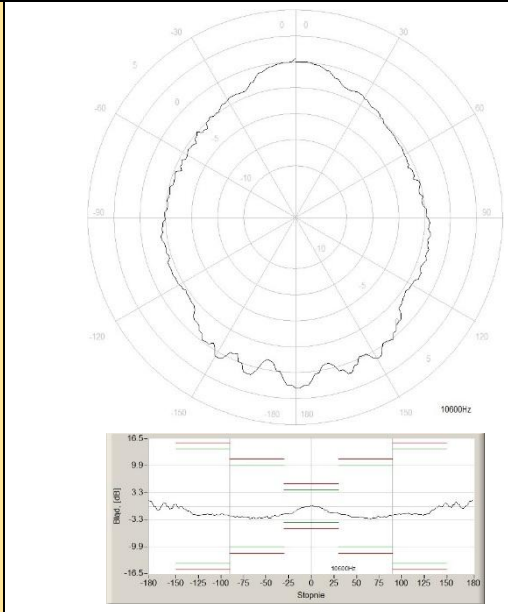
9500 Hz



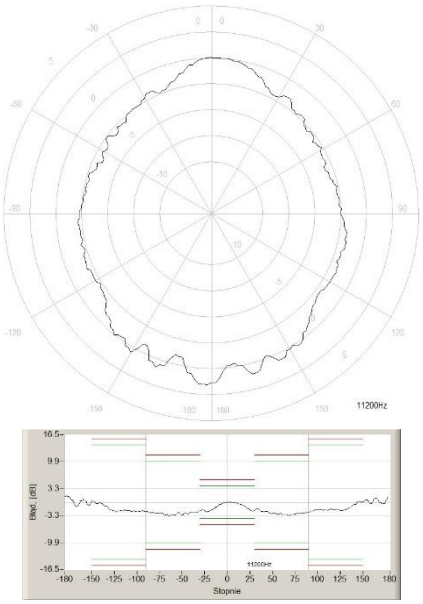
10000 Hz



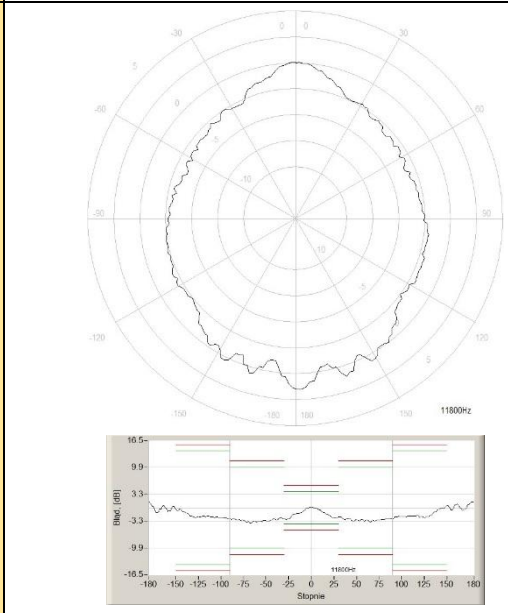
10600 Hz



11200 Hz



11800 Hz



12500 Hz

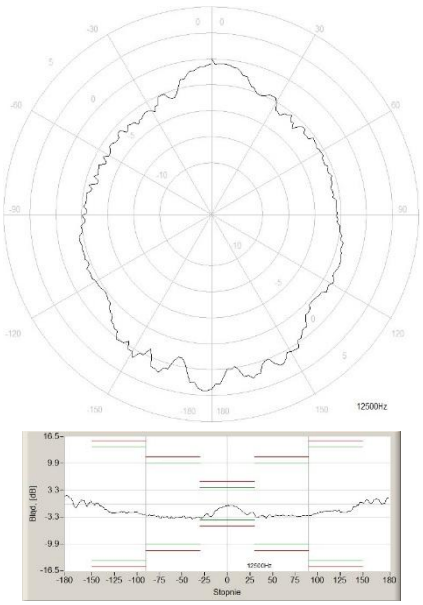


Table C.7.12 Directional response for SVAN 979 with microphone G.R.A.S. 40AE, preamplifier SV 17 and outdoor microphone kit SA 279

f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
250	0,00	0,01	0,00	0,00	-0,01	-0,01	-0,02	-0,03	-0,03	-0,03
315	0,00	0,01	0,01	-0,01	-0,03	-0,06	-0,08	-0,10	-0,12	-0,14
400	0,01	-0,01	-0,04	-0,06	-0,08	-0,10	-0,11	-0,12	-0,12	-0,12
500	-0,01	0,00	-0,01	-0,02	-0,03	-0,05	-0,08	-0,10	-0,13	-0,15
630	-0,01	-0,03	-0,10	-0,23	-0,27	-0,25	-0,17	-0,19	-0,18	-0,27
800	0,46	0,46	0,43	0,37	0,31	0,31	0,33	0,33	0,29	0,24
1000	-0,01	-0,04	-0,07	-0,09	-0,12	-0,19	-0,26	-0,25	-0,15	-0,16
1250	0,00	-0,06	-0,16	-0,27	-0,42	-0,52	-0,52	-0,45	-0,43	-0,43
1600	-0,04	-0,16	-0,34	-0,57	-0,73	-0,81	-0,81	-0,79	-0,78	-0,81
2000	-0,02	-0,13	-0,38	-0,73	-0,97	-1,03	-1,23	-1,27	-1,19	-1,19
2240	-0,08	-0,26	-0,58	-0,80	-1,01	-1,37	-1,38	-1,48	-1,48	-1,13
2500	0,01	-0,12	-0,30	-0,52	-0,85	-0,92	-1,14	-1,29	-1,17	-1,20
2800	-0,02	-0,20	-0,51	-0,78	-0,84	-0,92	-1,02	-1,07	-1,12	-0,63
3150	-0,03	-0,30	-0,79	-1,23	-1,24	-1,29	-1,35	-1,38	-1,31	-1,19
3550	-0,12	-0,45	-0,94	-1,40	-1,50	-1,66	-1,76	-1,87	-1,83	-1,80
4000	0,02	-0,33	-0,81	-0,99	-1,49	-1,70	-1,90	-2,07	-2,06	-2,17
4500	-0,13	-0,57	-1,29	-1,40	-1,83	-2,31	-2,33	-2,50	-2,32	-2,60
5000	0,36	0,21	-0,90	-1,25	-1,62	-1,67	-1,99	-2,22	-2,32	-2,29
5600	-0,20	-0,86	-1,27	-1,53	-1,69	-2,10	-2,14	-2,08	-2,23	-2,09
6300	-0,26	-1,06	-1,30	-1,94	-1,97	-1,96	-1,98	-2,06	-2,37	-2,60
7100	-0,28	-1,35	-1,71	-2,14	-2,26	-2,31	-2,32	-2,33	-2,41	-2,68
8000	-0,59	-1,55	-2,45	-2,72	-3,15	-3,19	-2,87	-2,88	-2,67	-2,90
8500	-0,56	-1,63	-2,74	-2,88	-3,59	-3,57	-3,03	-2,62	-2,17	-2,23
9000	-0,29	-1,44	-2,01	-2,84	-3,41	-3,68	-3,53	-3,30	-3,03	-2,46
9500	-0,31	-1,56	-1,77	-2,33	-2,66	-2,87	-3,15	-3,03	-2,71	-2,18
10000	-0,16	-1,04	-2,16	-2,42	-2,91	-3,06	-3,29	-3,08	-2,73	-2,29
10600	-0,60	-1,92	-2,48	-2,86	-3,22	-3,40	-3,51	-3,08	-2,82	-2,26
11200	-0,70	-2,48	-2,60	-3,43	-3,64	-3,16	-3,08	-3,25	-3,18	-2,86
11800	0,00	0,01	0,00	0,00	-0,01	-0,01	-0,02	-0,03	-0,03	-0,03
12500	0,00	0,01	0,01	-0,01	-0,03	-0,06	-0,08	-0,10	-0,12	-0,14
f [Hz]	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**	**170-180**	**180-190**	**190-200**
250	-0,03	-0,04	-0,03	-0,03	-0,03	-0,03	-0,03	-0,04	-0,05	-0,06
315	-0,15	-0,16	-0,16	-0,16	-0,15	-0,14	-0,13	-0,13	-0,13	-0,14
400	-0,11	-0,09	-0,05	-0,02	0,06	0,09	0,12	0,13	0,14	0,13
500	-0,17	-0,19	-0,19	-0,18	-0,18	-0,16	-0,13	-0,13	-0,13	-0,15
630	-0,27	-0,21	-0,08	-0,03	-0,03	-0,04	-0,08	-0,16	-0,27	-0,29
800	0,29	0,30	0,27	0,17	0,21	0,36	0,47	0,51	0,51	0,46
1000	-0,28	-0,28	-0,23	-0,27	-0,27	-0,17	0,18	0,25	0,25	0,17
1250	-0,40	-0,66	-0,66	-0,65	-0,73	-0,72	-0,52	-0,25	-0,20	-0,44
1600	-0,82	-0,82	-0,76	-0,82	-0,90	-0,84	-0,47	-0,17	-0,32	-0,69
2000	-1,15	-0,97	-1,11	-0,99	-1,16	-1,16	-0,94	-0,56	-0,54	-0,92
2240	-1,10	-1,04	-1,13	-0,79	-1,06	-1,06	-0,61	-0,13	-0,22	-0,76
2500	-0,63	-0,71	-0,53	-0,53	-0,52	-0,64	-0,49	0,37	0,38	-0,33
2800	-0,26	-0,23	0,44	0,42	0,47	0,13	0,87	1,11	1,10	0,61
3150	-0,63	0,26	0,78	0,74	0,87	0,70	1,18	1,60	1,62	1,17
3550	-1,56	-0,90	-0,64	-0,38	-0,14	-0,47	0,57	0,80	0,72	-0,72
4000	-2,11	-1,92	-1,21	-1,05	-1,06	-1,07	-1,09	0,46	0,50	-1,16

4500	-2,88	-1,94	-1,58	-1,20	-1,31	-1,39	-1,39	0,30	-0,96	-1,59
5000	-2,35	-2,10	-1,51	-0,76	-0,64	-0,36	-0,78	1,01	1,06	-0,94
5600	-2,08	-1,72	-1,03	-0,44	-0,57	-0,74	-0,93	1,12	1,10	-1,11
6300	-2,32	-2,68	-2,36	-1,39	-0,74	-0,73	-0,92	1,16	1,28	-0,97
7100	-2,40	-2,58	-2,09	-0,98	-0,55	0,70	-0,88	1,33	1,17	-1,01
8000	-3,11	-3,13	-3,03	-1,55	-0,83	-0,97	-1,24	0,85	0,97	-1,36
8500	-2,23	-2,77	-2,41	-1,23	-0,44	0,69	-0,73	1,28	1,24	-1,09
9000	-2,40	-2,67	-2,86	-2,43	-0,89	-0,97	-1,04	-1,04	1,00	-1,37
9500	-2,00	-2,08	-2,26	-1,24	0,70	0,89	-0,61	1,44	1,14	-1,03
10000	-2,12	-1,86	-2,10	-1,81	-0,50	0,56	0,94	1,29	1,50	-0,97
10600	-2,32	-2,35	-2,51	-1,94	0,55	0,69	0,96	1,46	-1,21	-0,94
11200	-2,14	-1,93	-2,19	-2,21	-0,71	0,97	1,30	1,83	1,98	1,05
11800	-0,03	-0,04	-0,03	-0,03	-0,03	-0,03	-0,03	-0,04	-0,05	-0,06
12500	-0,15	-0,16	-0,16	-0,16	-0,15	-0,14	-0,13	-0,13	-0,13	-0,14
f [Hz]	**200-210**	**210-220**	**220-230**	**230-240**	**240-250**	**250-260**	**260-270**	**270-280**	**280-290**	**290-300**
250	-0,07	-0,08	-0,08	-0,09	-0,09	-0,09	-0,09	-0,08	-0,08	-0,06
315	-0,15	-0,17	-0,18	-0,19	-0,20	-0,20	-0,19	-0,18	-0,16	-0,14
400	0,11	0,09	0,06	0,03	-0,02	-0,03	-0,04	-0,03	-0,02	-0,01
500	-0,17	-0,20	-0,22	-0,23	-0,24	-0,23	-0,22	-0,19	-0,17	-0,15
630	-0,26	-0,18	-0,21	-0,18	0,12	0,13	0,10	-0,19	-0,20	-0,18
800	0,34	0,21	0,09	0,16	0,20	0,19	0,16	0,20	0,23	0,24
1000	-0,17	-0,20	-0,16	-0,17	-0,23	-0,23	-0,09	-0,11	-0,23	-0,24
1250	-0,72	-0,75	-0,64	-0,67	-0,71	-0,60	-0,39	-0,52	-0,52	-0,59
1600	-0,83	-0,82	-0,63	-0,71	-0,69	-0,76	-0,78	-0,69	-0,83	-0,83
2000	-1,22	-1,21	-1,04	-1,19	-1,13	-1,01	-1,12	-1,16	-1,22	-1,18
2240	-0,96	-0,87	-0,87	-0,92	-0,82	-0,90	-1,11	-1,25	-1,22	-1,24
2500	-0,68	-0,59	-0,73	-0,72	-1,10	-1,10	-1,26	-1,26	-1,43	-1,35
2800	0,26	0,44	0,21	0,41	-0,39	-0,53	-0,80	-1,08	-1,10	-1,02
3150	0,61	0,84	0,54	0,73	0,18	-0,40	-0,92	-1,26	-1,33	-1,33
3550	-0,69	-0,70	-0,61	-0,91	-1,40	-1,88	-2,04	-2,00	-1,88	-1,85
4000	-1,16	-1,06	-1,06	-1,18	-1,80	-2,05	-2,06	-2,12	-2,03	-1,90
4500	-1,27	-1,54	-1,58	-2,30	-2,84	-3,02	-2,86	-2,39	-2,51	-2,25
5000	-0,78	-0,77	-0,71	-1,31	-2,06	-2,35	-2,37	-2,45	-2,42	-2,16
5600	-0,87	-0,84	-0,73	-1,61	-2,02	-1,97	-2,10	-2,20	-1,88	-1,87
6300	-0,77	-0,73	-1,04	-1,71	-2,22	-2,22	-2,08	-2,21	-2,00	-2,00
7100	-0,78	-0,53	-1,24	-2,10	-2,46	-2,37	-2,52	-2,41	-2,20	-2,16
8000	-1,10	-0,91	-1,39	-2,41	-2,62	-2,79	-2,89	-2,74	-2,88	-3,04
8500	-0,96	-0,70	-1,80	-2,52	-2,29	-2,37	-2,38	-2,68	-3,15	-3,50
9000	-1,18	-0,95	-2,07	-2,70	-2,80	-2,57	-2,79	-2,95	-3,32	-3,45
9500	-0,77	-0,67	-2,04	-2,34	-2,07	-2,25	-2,47	-2,70	-2,79	-3,14
10000	-0,85	-0,36	-1,90	-2,38	-2,17	-2,31	-2,28	-2,77	-3,09	-3,39
10600	-0,80	-1,25	-2,43	-2,43	-2,33	-2,48	-2,84	-3,04	-3,47	-3,72
11200	0,80	-0,57	-2,06	-2,32	-2,26	-2,22	-2,97	-3,18	-3,60	-3,70
11800	-0,07	-0,08	-0,08	-0,09	-0,09	-0,09	-0,09	-0,08	-0,08	-0,06
12500	-0,15	-0,17	-0,18	-0,19	-0,20	-0,20	-0,19	-0,18	-0,16	-0,14
f [Hz]	**300-310**	**310-320**	**320-330**	**330-340**	**340-350**	**350-360**				
250	-0,05	-0,04	-0,02	-0,01	-0,01	0,00				
315	-0,12	-0,10	-0,07	-0,04	-0,03	-0,01				
400	0,01	0,01	0,02	0,02	0,02	0,01				
500	-0,12	-0,09	-0,07	-0,05	-0,03	-0,02				

630	-0,27	-0,28	-0,21	-0,10	-0,03	-0,03				
800	0,23	0,25	0,32	0,39	0,44	0,46				
1000	-0,15	-0,09	-0,08	-0,06	-0,03	0,01				
1250	-0,61	-0,57	-0,41	-0,25	-0,12	-0,03				
1600	-0,73	-0,69	-0,51	-0,28	-0,11	-0,01				
2000	-1,07	-0,95	-0,73	-0,44	-0,18	-0,04				
2240	-1,18	-0,93	-0,71	-0,50	-0,21	-0,03				
2500	-1,15	-1,11	-0,82	-0,51	-0,26	-0,07				
2800	-0,90	-0,90	-0,70	-0,45	-0,20	0,01				
3150	-1,26	-1,30	-1,16	-0,78	-0,46	-0,08				
3550	-1,69	-1,58	-1,26	-0,91	-0,29	-0,02				
4000	-1,75	-1,61	-1,23	-0,89	-0,40	-0,11				
4500	-1,94	-1,59	-1,31	-1,10	-0,43	-0,04				
5000	-2,00	-1,76	-1,40	-0,87	-0,41	0,36				
5600	-2,03	-1,60	-1,19	-1,15	-0,56	-0,22				
6300	-2,10	-1,96	-2,00	-1,75	-1,46	-0,38				
7100	-2,07	-2,23	-2,14	-1,85	-1,05	-0,32				
8000	-3,41	-3,46	-3,08	-2,91	-1,99	-1,16				
8500	-3,88	-3,70	-3,09	-2,13	-1,66	-0,21				
9000	-3,72	-3,55	-3,01	-2,49	-1,90	-0,65				
9500	-3,07	-2,96	-2,40	-1,90	-1,34	0,32				
10000	-3,19	-2,94	-2,49	-2,38	-1,75	-0,56				
10600	-3,50	-3,33	-3,08	-2,85	-1,51	-0,52				
11200	-3,46	-3,79	-3,72	-3,27	-3,19	-1,07				
11800	-0,05	-0,04	-0,02	-0,01	-0,01	0,00				
12500	-0,12	-0,10	-0,07	-0,04	-0,03	-0,01				

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:

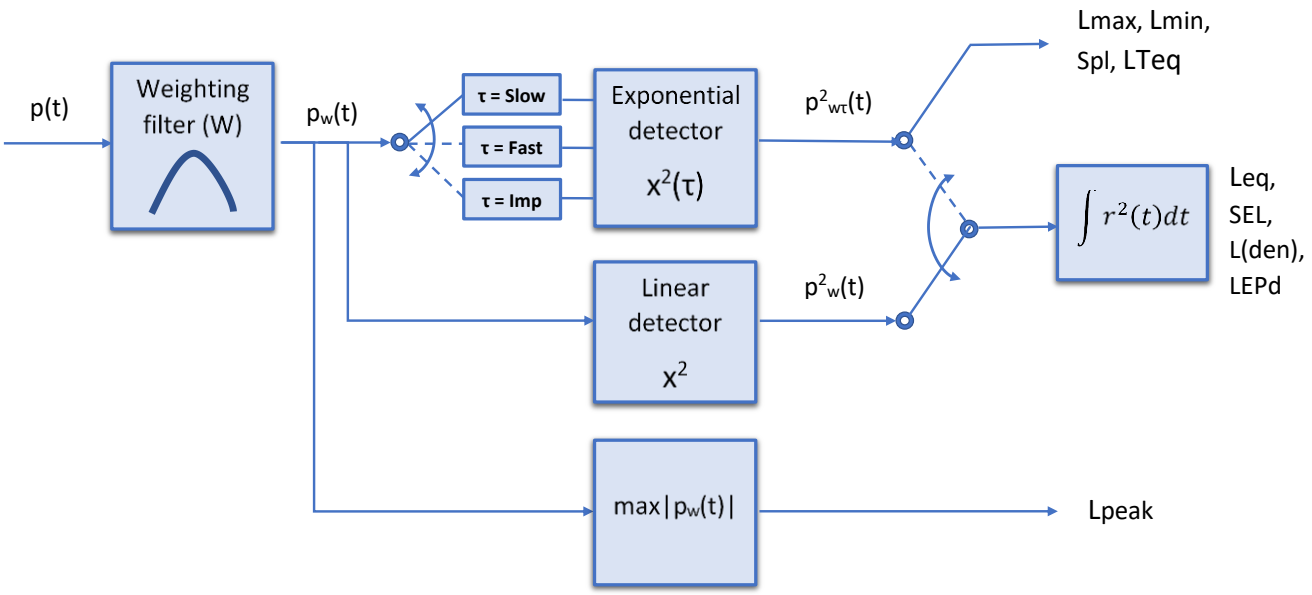
$$r(t) = \begin{cases} p_W(t) & \text{RMS Integration = Lin} \\ p_{W\tau}(t) & \text{RMS Integration = Exp} \end{cases}$$

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**)

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

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

$$LRm = 10 \log \left(\frac{1}{m \times 60s} \int_{T-900}^{T} (r(t)/p_0)^2 dt \right)$$



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**)

$$SEL = 10 \log \left(\int_{0}^{T} (r(t)/p_0)^2 dt \right) = Leq + 10 \log \frac{T}{1s}$$

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**

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

LTeq

The **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: $T_d \neq 0$, $T_e = 0$, $T_n = 0$.

$$Ld = 10 \log \left(\frac{1}{T_d} \int_{T_d} (r_w(t)/p_0)^2 dt \right)$$

Le — **Le** is calculated for: $T_d = 0$, $T_e \neq 0$, $T_n = 0$.

$$Le = 5\ dB + 10 \log \left(\frac{1}{T_e} \int_{T_e} (r_w(t)/p_0)^2 dt \right)$$

Ln — **Ln** is calculated for: $T_d = 0$, $T_e = 0$, $T_n \neq 0$.

$$Ln = 10\ dB + 10 \log \left(\frac{1}{T_n} \int_{T_n} (r_w(t)/p_0)^2 dt \right)$$

Lde — **Lde** is calculated for: $T_d \neq 0$, $T_e \neq 0$, $T_n = 0$.

$$Lde = 10 \log \left[\frac{1}{12+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} \right) \right]$$

Len — **Len** is calculated for: $T_d = 0$, $T_e \neq 0$, $T_n \neq 0$.

$$Len = 10 \log \left[\frac{1}{4+8} \left(4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

Lnd — **Lnd** is calculated for: $T_d \neq 0$, $T_e = 0$, $T_n \neq 0$.

$$Lnd = 10 \log \left[\frac{1}{8+12} \left(8 \cdot 10^{Ln/10} + 12 \cdot 10^{Ld/10} \right) \right]$$

Lden — **Lden** is calculated for: $T_d \neq 0$, $T_e \neq 0$, $T_n \neq 0$.

$$Lden = 10 \log \left[\frac{1}{12+8+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

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:

$$a_{w\tau}(t) = \sqrt{\frac{1}{\tau}\int_{-\infty}^{t} a_w^2(\xi)\, e^{-(t-\xi)/\tau}\, d\xi}\ ,$$

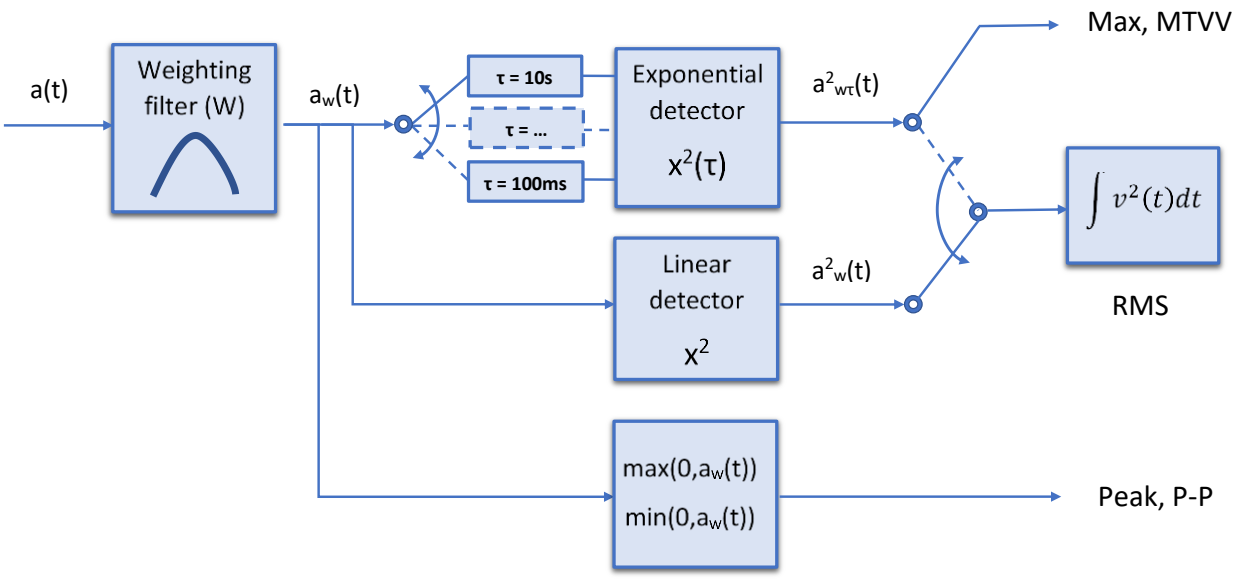
where: ξ – variable of integration.

$v(t)$ — instantaneous vibration signal depends on the **<RMS Integration>** parameter:

$$v(t) = \begin{cases} a_w(t) & \textbf{RMS Integration = Lin} \\ a_{w\tau}(t) & \textbf{RMS Integration = Exp} \end{cases}$$

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**

$$Peak = \max_T \left| a_w(t) \right|$$

P–P Peak-to-peak (**P-P**) result is the difference between highest and lowest value of the signal calculated for the given **T**

$$P-P = \max_T(0, a_w(t)) - \min_T(0, a_w(t))$$

Max Maximal value of the time-weighted signal for current time period of the measurement (**T**)

$$Max = \max_T\left(a_{w\tau}(t)\right)$$

RMS **RMS** (root mean square) result for current time period of the measurement (**T**)

$$RMS = \sqrt{\frac{1}{T}\int_0^T v^2(t)\,dt}$$

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.

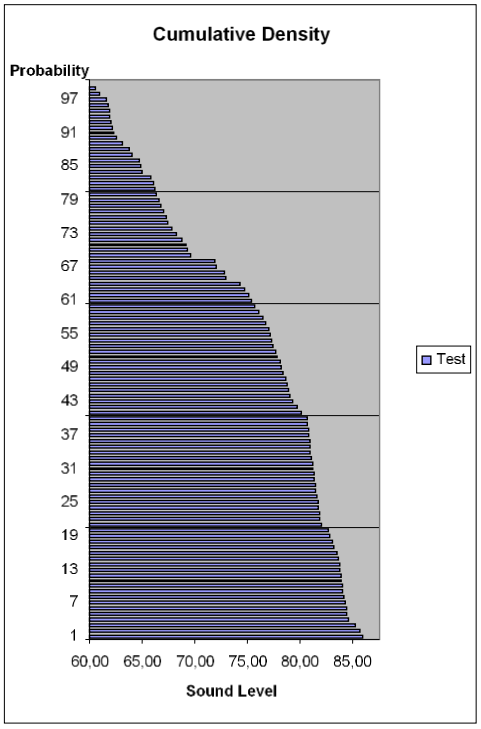
Example:

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):

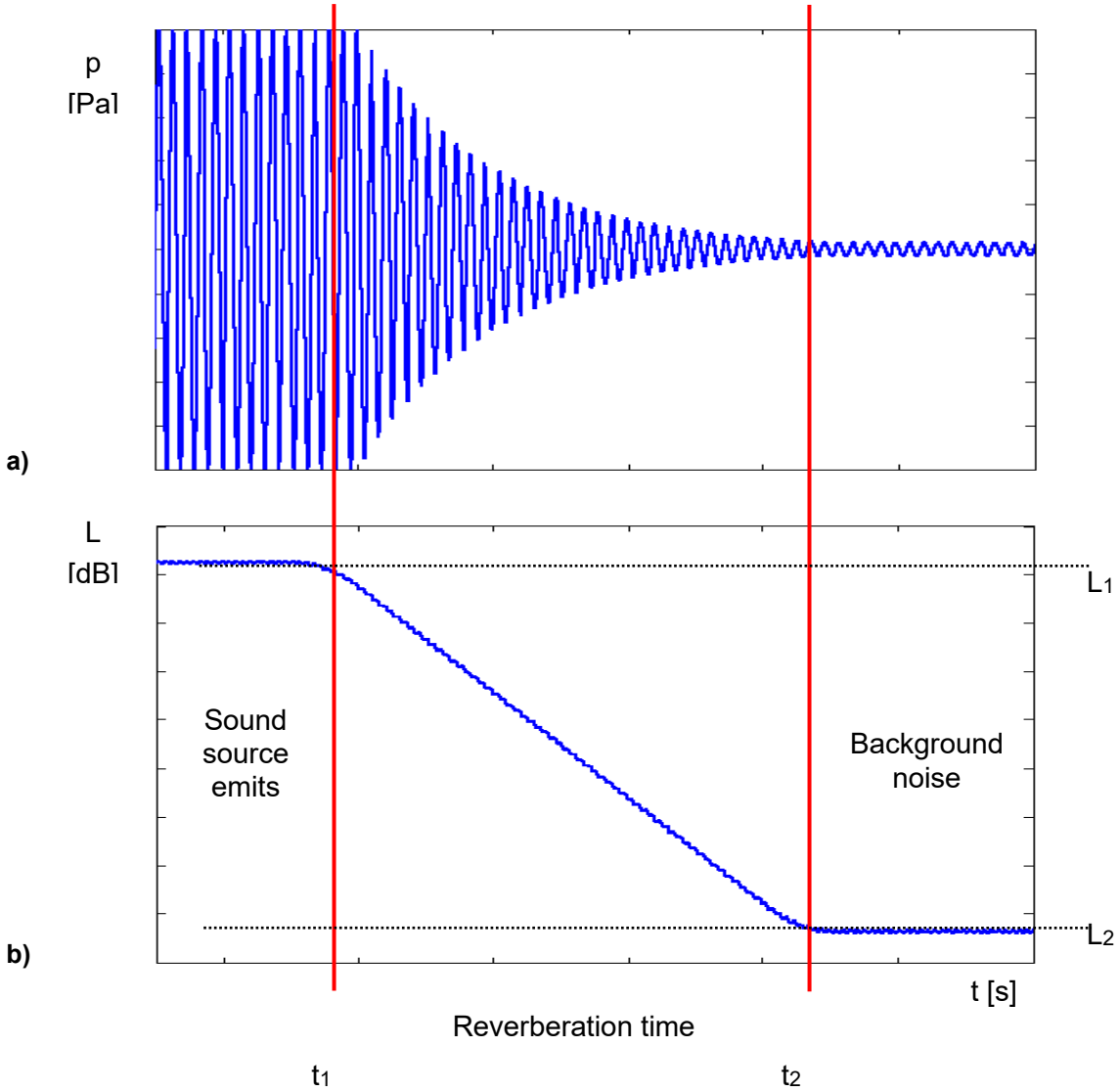


Fig 1. Acoustic pressure versus time (a) and value of the sound pressure level versus time, so-called decay curve (b)

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. RT 60 REVERBERATION TIME DEFINITION AND THE CALCULATION

➢ **EDT (early decay time):**

The EDT decay curve region is pointed out by markers t_1 and t_3 (cf. Fig. 2). It is checked whether the selected decay curve region has proper dynamics for the EDT calculation:

$$L_1 - L_2 >= 10 \text{ dB}$$

$$L_2 - L_3 >= \text{noise margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_1 (with L_1 level) and t_2 (with L_2) are approximated with the straight line ($y = a \cdot x + b$) by the linear regression. Before approximation the EDT value is calculated using the slope coefficient 'a' according to the formula:

$$EDT = -60.0 / a$$

In case of the **decay method**, the EDT value is calculated according to the formula:

$$EDT = 6 \cdot (t_2 - t_1)$$

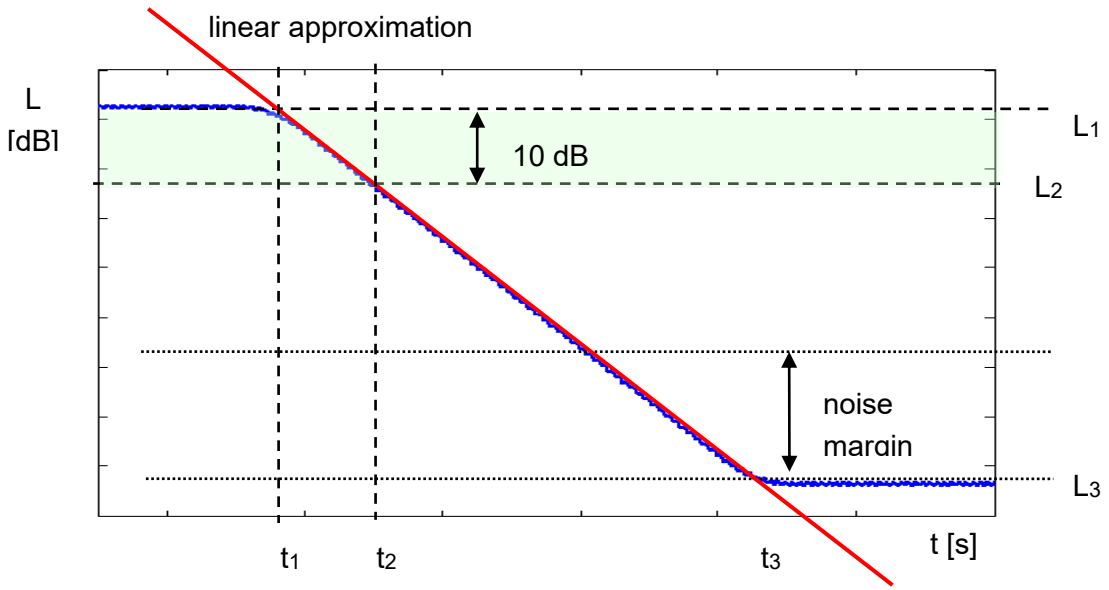


Fig 2. EDT evaluation

➢ **RT 20 (reverberation time calculated with 20 dB dynamics):**

The RT 20 decay curve region is pointed out by markers t_1 and t_4 (cf. Fig. 3). It is checked whether the selected decay curve region has proper dynamics for the RT 20 calculation:

$$L_1 - L_4 > 5 \text{ dB} + 20 \text{ dB} + \text{noise margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_2 and t_3 are approximated with the straight line ($y = a \cdot x + b$) 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:

$$\mathbf{RT\ 20 = 3 \cdot (t_3 - t_2)}$$

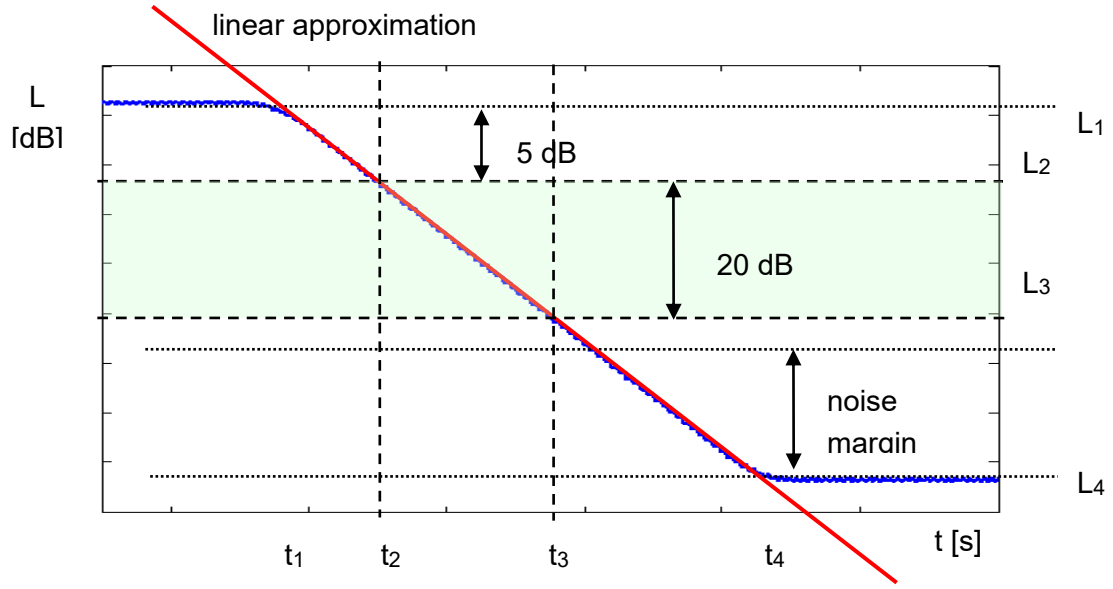


Fig 3. RT 20 evaluation

➢ **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

$$\mathbf{RT\ 30 = 2 \cdot (t_3 - t_2)}$$

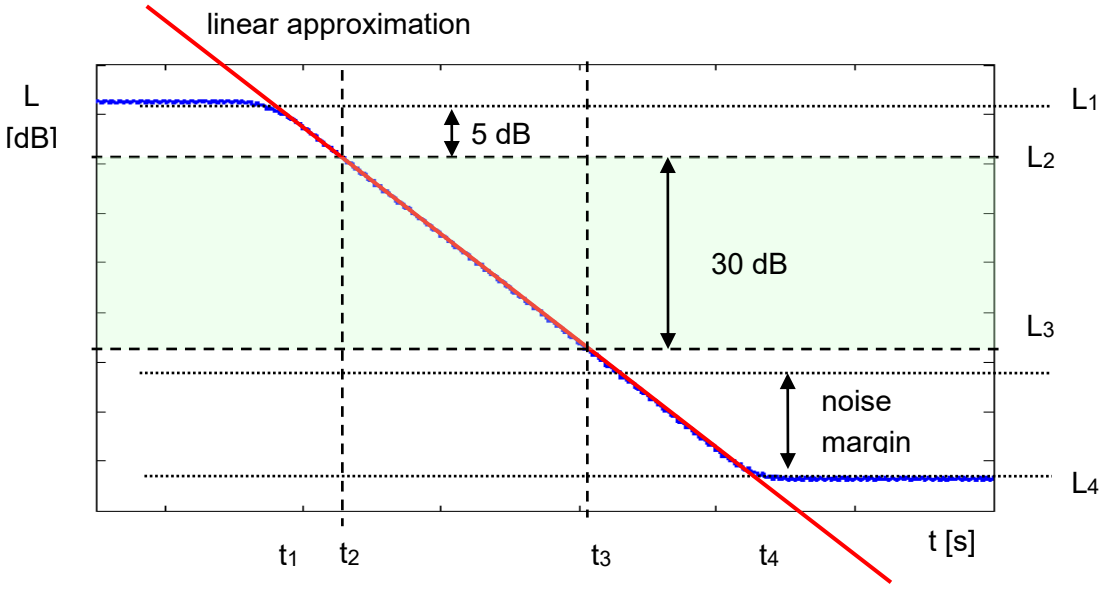


Fig 4. RT 30 evaluation

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.

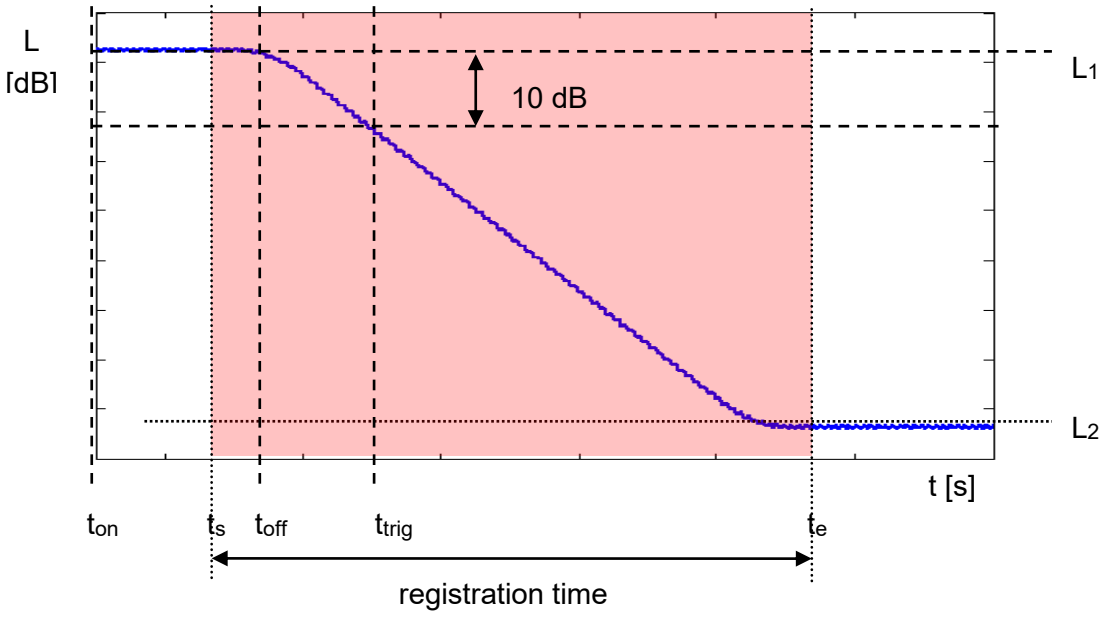


Fig 5. Data recording in the decay method of the reverberation time evaluation

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 **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*

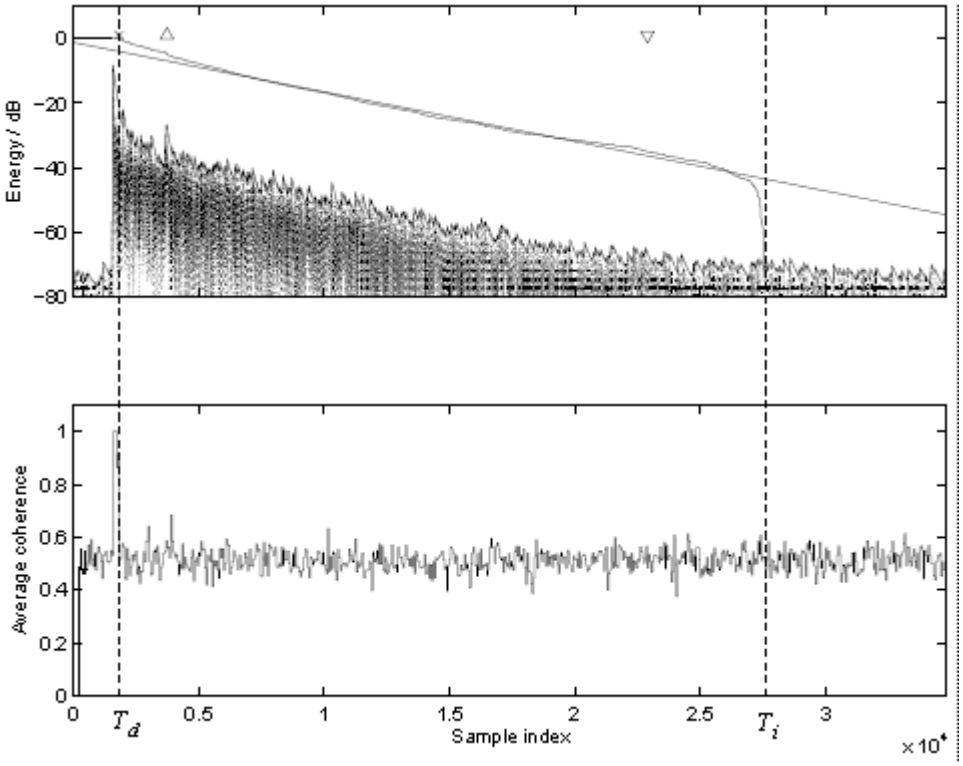


Fig. 6 Example of Schroeder integration with the limits Ti and Td

This RT 60 measurement method requires impulse sound source like pistol, petard or other sound source which emits impulse signal with very high sound pressure level.

The graphical illustration of data registering in this method is presented in Figure 7.

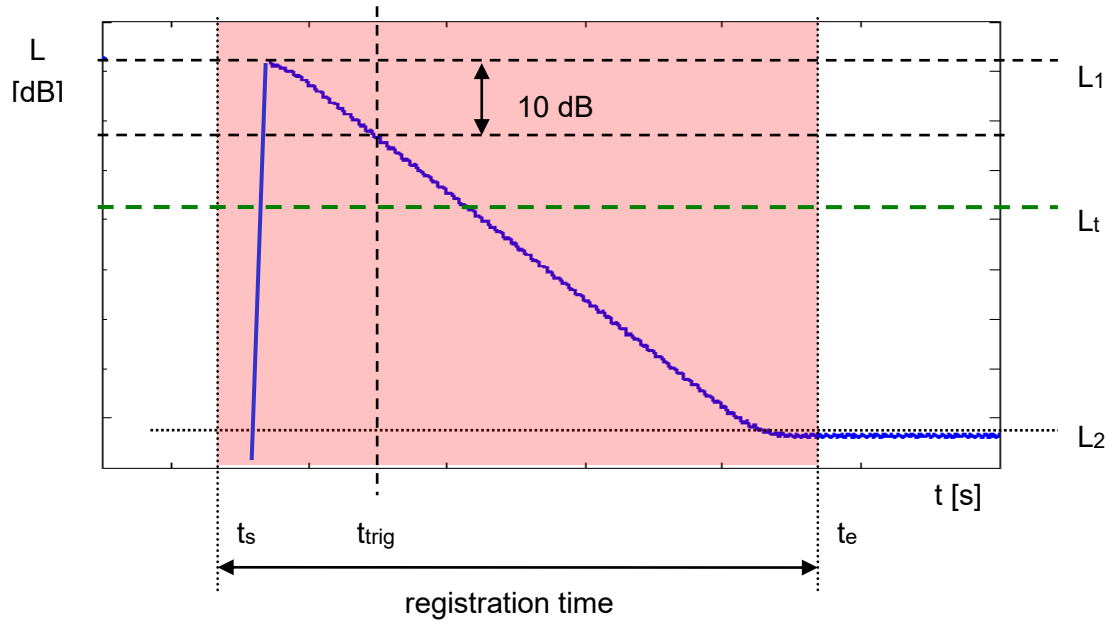


Fig 7. Data recording in the impulse method of the reverberation time evaluation

The measurement time in this method consists of:

- The time before marker t_{trig} in which the SVAN xxx analyser measures the actual sound pressure level and waits for the very high impulse sound pressure level which will fulfil the trigger condition. The trigger conditions will be fulfilled only when emitted impulse has maximal sound pressure level higher than L_t level (cf. Fig. 6). The L_t level in the SVAN xxx analyser is adjusted by parameter **Level** (*path: <Menu> / Measurement / RT60 Settings*).
- The time between markers t_s and t_{trig} registered since the trigger condition fulfilment back till point t_s to allow recognising the beginning of the decay region. In the SVAN xxx instruments this time is equal to the **Time Step** (*path: <Menu> / Measurement / RT60 Settings*) parameter value multiplied by 50.
- The time between markers t_{trig} and t_e registered since t_{trig} forward to record whole decay curve together with significantly long period of the noise level. This time in SVAN xxx instruments is adjusted by **Recording Time** (*path: <Menu> / Measurement / RT60 Settings*) parameter.

The above graph shows that the proper setting of the **Recording Time** value is very important. The registration time has to be long enough to acquire sufficient number of background noise level values. In other case the decay curve region could not be properly analysed or decay region could not fulfil the dynamic condition mentioned above. It is recommended to set the **Recording Time** parameter two times longer than expected reverberation time.

APPENDIX F. OBJECTIVE METHOD FOR ASSESSING THE AUDIBILITY OF TONES IN NOISE – ENGINEERING METHOD (according to ISO/PAS 20065:2016(E))

F.1. INTRODUCTION

This annex provides measurement procedures for verification the presence of audible tones if their presence is in dispute. Based on the prominence of tones, this procedure also provides recommended levels of adjustment. The aim of the objective method is to assess prominence of tones in the same way as listeners do on the average. The method is based on the psychoacoustic concept of critical bands, which are bands defined so that sound outside a critical band does not contribute significantly to the audibility of tones inside that critical band.

The method includes procedures for steady and varying tones, narrow-band noise, low-frequency tones, and the result is a graduated adjustment of 0 dB to 6 dB.

F.2. OBJECTIVE METHOD

F.2.1. General

The method uses the following steps:

1) Narrow-band frequency analysis (FFT analysis)
2) Determination of prominent tones and their audibility, ΔL_i, and the uncertainties σ_i of ΔL_i
3) Grouping the tones inside the common critical bands and recalculating the parameters σ_i and ΔL_i
4) Calculation of the mean audibility, ΔL, and the extended uncertainty, U, of all spectra measured
5) Calculation of the tone adjustment, spectrum penalty, K

F.2.2. Frequency analysis

A narrow-band A-weighted spectrum is measured by linear averaging for 3 s, that is recommended. If the shorter averaged time is used, then the number of spectra shall be merged to receive the 3 s averaged spectrum. Svantek sound measuring instruments do not provide additional spectra merging.

The constant line spacing Δf is equal to 3,125 Hz (the standard requires the line spacing is withing 1,9 – 4 Hz).

The investigation range in Svantek instruments is equal to [50;4575] Hz. The spectrum is measured for the range of [0;5000] Hz.

It is recommended that the measurement results, including the frequency analyser, be presented in dB re 20 µPa, and that Hanning weighting be used as the window function. The distortions of stochastic signals are avoided through weighting Hanning function. The Hanning window is used as well as time window to reduce lateral bands.

NOTE 1. Mean audibility is calculated for the number of spectra that are measured separately.

NOTE 2. The extended uncertainty, U, of the mean audibility, ΔL, with a coverage probability of 90% in a bilateral confidence interval shall not exceed ±1.5 dB. This is generally the case with evaluation of at least 12 time-staggered narrow-band averaged spectra. If there are less than 12 averaged spectra, then the uncertainty shall be taken into consideration.

NOTE 3. With the recommended Hanning time window, the effective analysis bandwidth (or the effective noise bandwidth) is 1.5 times the frequency resolution. The frequency resolution is the distance between the lines in the spectrum.

F.2.3. Determination of prominent tones

Bandwidth and centre frequency of critical bands

The widths Δf_c of the critical band about the tone frequency f_T is given in equation (C.1):

$$\Delta f_c = 25{,}0\,\text{Hz} + 75{,}0\left[1{,}0 + 1{,}4\left(\frac{f_T/\text{Hz}}{1000}\right)^2\right]^{0{,}69}\,\text{Hz} \qquad \text{(C.1)}$$

The corner frequencies can be delivered as given in equations (C.2) and (C.3), since the central frequency of the critical band is a geometric mean of the boundaries:

$$f_1 = \frac{-\Delta f_c}{2} + \frac{\sqrt{\left(\Delta f_c\right)^2 + 4 {f_T}^2}}{2} \qquad \text{(C.2)}$$

$$f_2 = f_1 + \Delta f_c \qquad \text{(C.3)}$$

For the definition of the centre frequency of a critical band, only tones with level higher than the adjoining ones should be regarded as significant.

NOTE. A tonal audibility is performed for a tone only if its distinctness is at least 70%, that means it should satisfy the set of requirements that is given by the following standard together with edge steepness and maximal bandwidth.

Mean narrow-band level of the masking noise, L_s

The mean narrow-band level is derived in an iterative procedure from the lines of the critical band about the line under investigation. The investigation range is determined by boundaries of the critical band of a pending tone.

The procedure commences with the energy averaging of all lines of the critical band with the exception of the central frequency line. The next step is repeating the procedure excluding the lines above the mean level calculated in the previous step by 6 dB.

The mean narrow-band level is given by equation (C.4).

$$L_S = \left[10\lg\left(\frac{1}{M}\sum_{i=1}^{M} 10^{0{,}1 L_i/\text{dB}}\right) + 10\lg\left(\frac{\Delta f}{\Delta f_e}\right)\right]\text{dB} \qquad \text{(C.4)}$$

The procedure ends, if the subsequent mean narrow-band sound level of the masking noise is equal to the calculated in the current calculations loop within a tolerance of ±0.005 dB. The procedure also ends, if the number of lines contributing to the subsequent mean narrow-band level to the right or left of the line under investigation falls below a value of 5.

NOTE 1. The second addend of the equation (C.4) could be simplified and used as a constant summand equal to -1.76 dB. It's possible since we apply the Hanning window, that provides the effective bandwidth Δf_e be 1.5 times the frequency resolution Δf.

NOTE 2. If the iteration is discontinued, because the remaining number of spectral lines to be averaged on one or both sides fall below 5, then the audibility may be somewhat greater than the audibility calculated with this mean narrow-band level.

NOTE 3. In principle, a tone may only be present if the level of the spectral line considered is at least 6 dB greater than the corresponding mean narrow-band level L_s.

Tone level of a tone in a critical band, L_T

The mean narrow-band level is derived in an iterative procedure from the lines of the critical band about the line under investigation.

Neighbouring spectral lines should be used for summation purposes if - they differ from the narrow-band level at a frequency, f_T, by less than 10 dB, and - they differ from the mean narrow-band level, L_S, of the masking noise within the critical band about the tone by more than 6 dB.

In case there are no other spectral lines than the line under investigation meets the requirements, the tone level of a tone is equal to the narrow-band level of the spectral line of this critical band with tone energy, in decibels (dB).

In case there are more spectral lines with tone energy, the tone level of a tone is calculated as in the equation (C.5):

$$L_{\mathrm{T}} = \left[10 \lg\left(\sum_{i=1}^{K} 10^{0,1 L_i / \mathrm{dB}} \right) + 10 \lg\left(\frac{\Delta f}{\Delta f_e} \right) \right] \mathrm{dB} \qquad \text{(C.5)}$$

NOTE 1. The second addend of the equation (C.5) could be simplified and used as a constant summand equal to -1.76 dB. It's possible since we apply the Hanning window, that provides the effective bandwidth Δf_e be 1.5 times the frequency resolution Δf.

NOTE 2. The individual levels of the spectral lines with tone energy also contain energy components of the masking noise. These can generally be neglected.

Distinctness of a tone

The distinctness of a tone depends on the bandwidth of the tone and its edge steepness; if the corresponding criteria are not satisfied then the tone is not audible to individuals with normal hearing.

If a tone based on bandpass noise has a distinctness of 70% relative to that of a sinusoidal tone, then the maximum permitted bandwidth Δf_R as a function of the tone frequency f_T is approximated by equation (C.6):

$$\Delta f_{\mathrm{R}} = 26{,}0\left(1{,}0\,\mathrm{Hz} + 0{,}001 f_{\mathrm{T}}\right) \qquad \text{(C.6)}$$

First criterion: The bandwidth of the tone (the number of spectral lines used in the equation (C.5) multiplied by the line spacing, Δf.) shall not exceed the maximum permitted bandwidth given by equation (C.6).

Second criterion: The edge steepness shall be at least 24 dB/octave. This yields the level differences between the maximum narrow-band level of the tone, L_{Tmax}, and the narrow-band levels of the first spectral line below the tone L_u and above the tone L_o must meet the criteria (C.7) and (C.8):

$$\Delta L_{\mathrm{u}} = \frac{f_{\mathrm{T}}}{2} \frac{L_{\mathrm{Tmax}} - L_{\mathrm{u}}}{f_{\mathrm{T}} - f_{\mathrm{u}}} \geq 24\,\mathrm{dB} \qquad \text{(C.7)}$$

$$\Delta L_{\mathrm{o}} = f_{\mathrm{T}} \frac{L_{\mathrm{Tmax}} - L_{\mathrm{o}}}{f_{\mathrm{o}} - f_{\mathrm{T}}} \geq 24\,\mathrm{dB} \qquad \text{(C.8)}$$

where

f_u is the frequency of the first spectral line below the tone, in Hertz (Hz);

f_o is the frequency of the first spectral line above the tone, in Hertz (Hz);

f_T is the frequency of the maximum narrow-band level, in Hertz (Hz).

Critical band level of the masking noise, L_G, masking index, a_v

The critical band level, L_G, of the masking noise is given by equation (C.9):

$$L_G = L_S + \left[10 \lg\left(\frac{\Delta f_c}{\Delta f}\right)\right] \text{dB} \qquad \text{(C.9)}$$

where

LS is the mean narrow-band level;

Δf_c is the width of the critical band about the tone frequency, f_T, in Hertz (Hz);

Δf is the line spacing (frequency resolution), in Hertz (Hz).

The masking index, a_v, is given by equation (C.10):

$$a_v = \left\{-2 - \lg\left[1 + \left(\frac{f/\text{Hz}}{502}\right)^{2,5}\right]\right\} \text{dB} \qquad \text{(C.10)}$$

where

f is the central frequency of the critical band.

NOTE1. Masking is the raising of the audibility threshold for a sound as a result of the influence of another sound.

The masking threshold, L'_T, is that sound pressure level of a sinusoidal test tone that is required for it to be just perceivable in the presence of a masking noise (critical band level, L_G). The masking threshold is determined in repeated tests in which a group of subjects with normal hearing can just perceive the tone in 50% of the cases.

The masking index, $a_v = L'_T - L_G$, is the difference between the level of the test tone, L'_T, and the critical band level, L_G. At low frequencies, the masking index has a value of approximately −2 dB. Above a transition range between 0.2 kHz and 1 kHz, it falls at a constant logarithmic rate to −6 dB at 20 kHz.

Determination of the decisive audibility of a narrow-band spectrum, ΔL_i

Every tone, that is distinguishable in terms of this standard, has the assigned audibility value, that is calculated as shown in the equation (C.11):

$$\Delta L_j = L_{T,j} - L_{S,j} - 10 \lg\left(\frac{\Delta f_{c_j}}{\Delta f}\right) \text{dB} - a_{v,j} \qquad \text{(C.11)}$$

where

j – index of the next tone under investigation.

Since the all components of the above formula are found according to the previous sections, the decisive audibility of the individual narrow-band spectra can be calculated.

Uncertainty of the audibility ΔL_i, σ_i

Using the Gaussian uncertainty propagation principle, the uncertainty of the audibility could be found as:

$$\sigma_{\Delta L_j} = \sqrt{\left(\frac{\sum_{i=1}^{K} \left(10^{0,1 L_{T_{j,i}}/\mathrm{dB}} \right)^2}{\left(\sum_{i=1}^{K} 10^{0,1 L_{T_{j,i}}/\mathrm{dB}} \right)^2} + \frac{\sum_{i=1}^{M} \left(10^{0,1 L_{S_{j,i}}/\mathrm{dB}} \right)^2}{\left(\sum_{i=1}^{M} 10^{0,1 L_{S_{j,i}}/\mathrm{dB}} \right)^2} \right) \sigma_{L_j}{}^2 + \left(4{,}34 \frac{\Delta f}{\Delta f_{c_j}} \mathrm{dB} \right)^2} \qquad \text{(C.12)}$$

where index i corresponds to the spectral lines around a tone, and index j corresponds to the next tone under investigation.

F.2.4. Grouping the tones

If a number of tones are present in a critical band, then their tone levels, $L_{Tm,n}$ (run index n across all tones in the critical band; H is the number) are summed in terms of energy (equation (C.13)).

$$L_{Tm} = \left[10 \lg \left(\sum_{n=1}^{H} 10^{0,1 L_{Tm,n}/\mathrm{dB}} \right) \right] \mathrm{dB} \qquad \text{(C.13)}$$

where

H is the total number of all tones in the critical band,

$L_{Tm,n}$ is the tone level with the run index *m* across all audible tones and the run index *n* across all tones in the critical band, in decibels (dB).

This tone level, L_{Tm} is used to recalculate the decisive audibility of the critical band.

NOTE 1. It is possible for the energy of individual spectral lines to be assigned to a number of neighbouring tones at the same time. Upon addition of the tone levels of neighbouring tones, the energy of these individual spectral lines may not be summed more than once.

NOTE 2. If the exactly 2 tones appear in one critical band, then they evaluated separately if both lie below 1000 Hz and their frequency difference exceeds certain value, determined in the standard, then the human ear can distinguish them separately.

F.2.5. Calculation of the mean audibility, ΔL, and the extended uncertainty, U, of a number of spectra

When the several averaged spectra are measured, their maximum tone's audibility shall be averaged and the extended uncertainty is calculated.

In each measured spectrum the maximum tone audibility and its uncertainty are chosen for the post-processing step. This audibility is called the decisive audibility of a particular spectrum.

Mean audibility is calculated as shown in the equation (C.14).

$$\Delta L = 10 \lg \left(\frac{1}{J} \sum_{j=1}^{J} 10^{0,1 \Delta L_j/\mathrm{dB}} \right) \mathrm{dB} \qquad \text{(C.14)}$$

where ΔL_j is a decisive audibility of each spectrum and corresponds to the most audible tone.

The extended uncertainty is the uncertainty of the coverage probability region. In this standard the 90% coverage was assumed, hence the coverage factor of 1,645 have to be used. To receive the value of it, the mean averaged estimated value of all sigma shall be recalculated and multiplied by the coverage factor.

NOTE 1. The experience shows that with fluctuating noise, one achieves an extended uncertainty, U, of the audibility, ΔL, of about ±1.5 dB with 12 averages.

NOTE 2 To ensure the above-mentioned uncertainty, ±1.5 dB, it is necessary to have a minimum number of spectra with an averaging time of approximately 3 s. The number of spectra necessary to achieve the above-mentioned uncertainty will depend on the variability of the noises. Investigations have shown that even with strongly fluctuating noises (e.g. wind turbines), the number of spectra necessary does not generally exceed 12.

F.2.5. The tone adjustment

The value of the audibility can be used to determine whether or not a tone is prominent and if a tonal penalty or adjustment is to be allocated to a certain source.

The tone adjustment is the audibility-depending function, that returns 7 different values. The table below shows the corresponding K values:

Mean audibility ΔL in dB	**Tonal adjustment** K_T in dB
$\Delta L \leq 0$	0
$0 < \Delta L \leq 2$	1
$2 < \Delta L \leq 4$	2
$4 < \Delta L \leq 6$	3
$6 < \Delta L \leq 9$	4
$9 < \Delta L \leq 12$	5
$12 < \Delta L$	6

The adjustment, Kt, is the value to be added to the value of L_{Aeq} for a time interval to give the tone-corrected rating level for that interval.

NOTE. Neither ISO/PAS 20065 nor ISO 1996-1 specifies at present how to determine the magnitude of the tonal adjustment, K_T. In the meantime, it is possible to determine K_T from the mean audibility, ΔL, using abowe table. ΔL is defined in ISO/PAS 20065.

F.3 DOCUMENTATION

As documentation for the analysis, the following information shall be given:

a) For the analysis:

- number of averaged spectra, measurement time period and effective analysis bandwidth, line spacing,
- time window (e.g. Hanning), time weighting (Lin), and frequency weighting (A),
- one typical spectrum (at least) with an indication of the position of the critical band and the average noise level in that band.

b) For the calculations in the decisive critical band:

- statement regarding whether the results were obtained by visual inspection (survey method) or by automatic calculation (engineering method),
- frequency limits of the critical band and the range for the visual averaging or linear regression (see C.4.3),
- frequencies and levels of the tones and the total tone level (Ls and Lt re 20 µPa in decibels),
- masking noise level in the critical band (L_G re 20 µPa in decibels),
- audibility of the tones (ΔL_i re 20 µPa in decibels),
- size of the adjustment (K in decibels).

c) For the averaged noise spectrum

- the mean audibility, (ΔL re 20 µPa in decibels),
- the extended uncertainty (U in decibels).

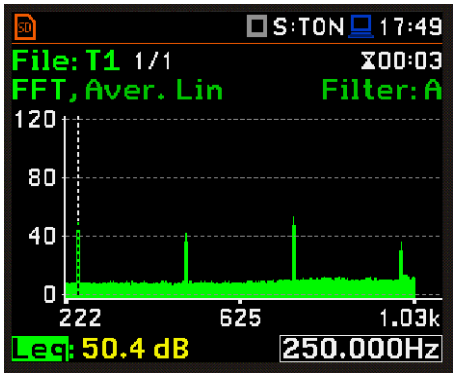
d) A diagrammatic representation of the narrow-band levels across the frequency of the 3-second averaged spectrum with the greatest ΔL.

e) Tones in other critical bands that may cause an adjustment should be mentioned by their frequencies.

F.4 EXAMPLES

The examples in this subclause have been analysed with an manual procedure based on 5 spectra and a measurement time of 3 seconds.

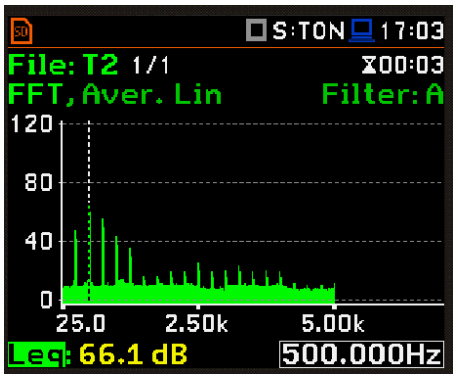
EXAMPLE 1:



Tones found: 7.

- Critical band: 203Hz – 306Hz;
- Tone level, L_T: 50,4 dB;
- Noise level, L_G: 21.3 dB;
- Audibility, L: 31.2 dB
- Tonal adjustment, Kt: 6.0 dB;
- Mean L: 56.8 dB;
- U90%, extended uncertainty: 2.5dB

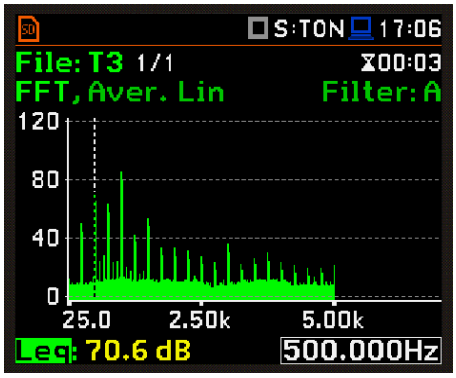
EXAMPLE 2:



Tones found: 6.

- Critical band: 443Hz – 559Hz;
- Tone level, L_T: 66.1 dB;
- Noise level, L_G: 25.3 dB;
- Audibility, L: 43.1 dB
- Tonal adjustment, Kt: 6.0 dB;
- Mean L: 56.8 dB;
- U90%, extended uncertainty: 2.5dB

EXAMPLE 3:

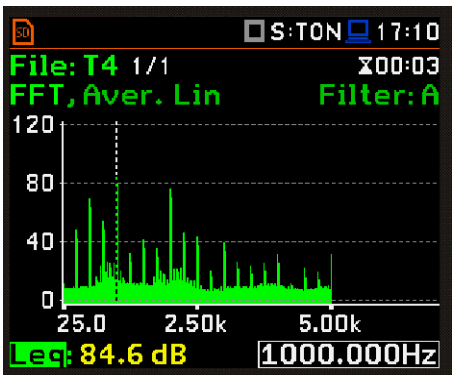


Tones found: 17.

- Critical band: 921Hz – 1.08kHz;
- Tone level, L_T: 85.5 dB;
- Noise level, L_G: 27.8 dB;
- Audibility, L: 60.5 dB
- Tonal adjustment, Kt: 6.0 dB;
- Mean L: 56.8 dB;

U90%, extended uncertainty: 2.5dB

EXAMPLE 4:

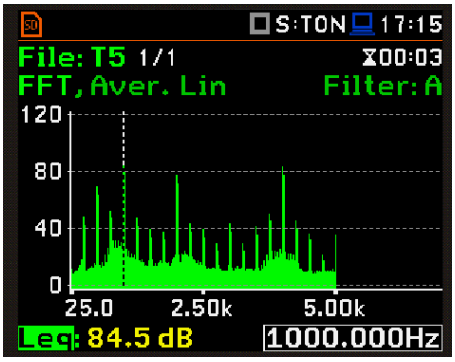


Tones found: 14.

- Critical band: 921Hz – 1.08kHz;
- Tone level, L_T: 84.6 dB;
- Noise level, L_G: 28.4 dB;
- Audibility, L: 59.1 dB
- Tonal adjustment, Kt: 6.0 dB;
- Mean L: 56.8 dB;

U90%, extended uncertainty: 2.5dB

EXAMPLE 5:



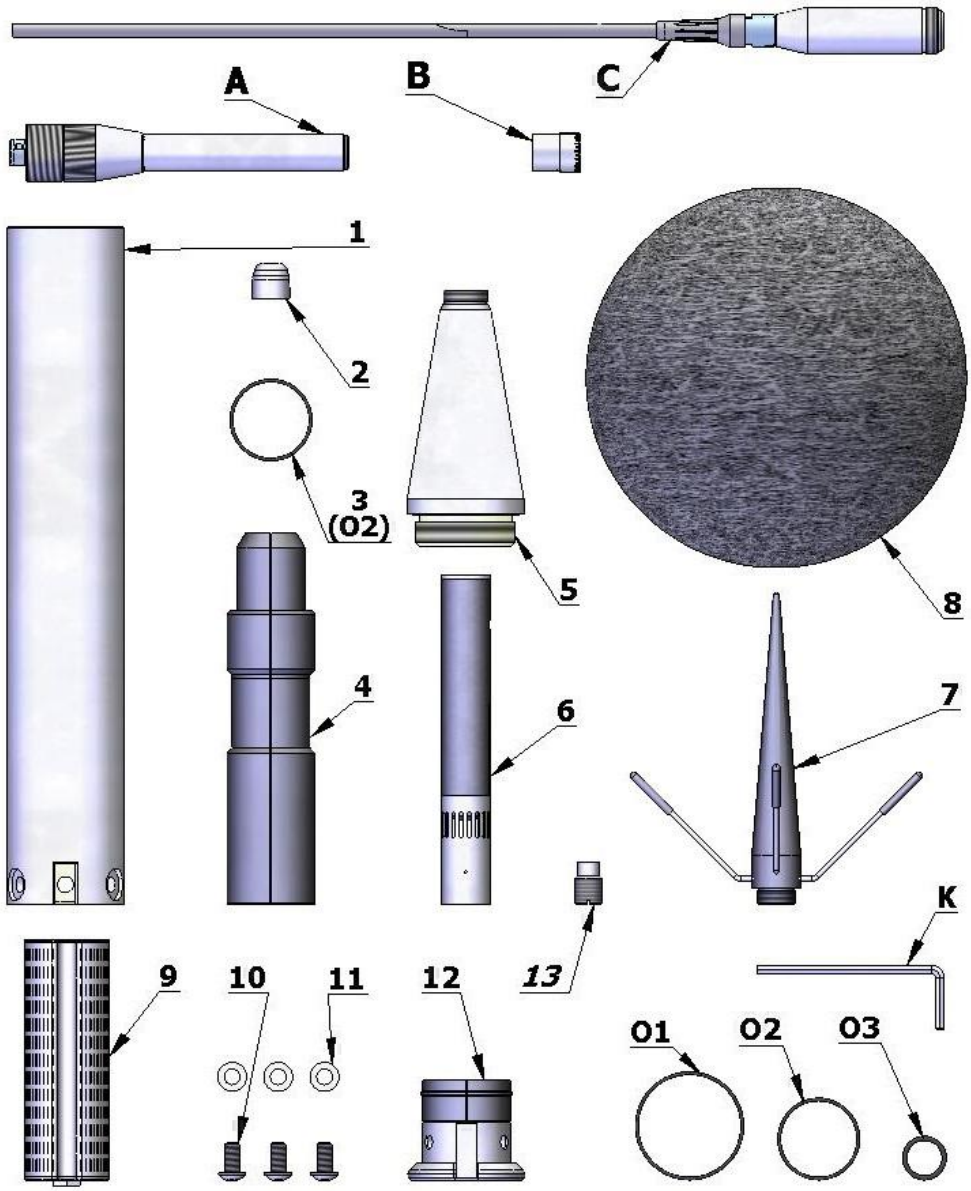
Tones found: 20.

- Critical band: 921Hz – 1.08kHz;
- Tone level, L_T: 84.5 dB;
- Noise level, L_G: 30.7 dB;
- Audibility, L: 56.6 dB
- Tonal adjustment, Kt: 6.0 dB;
- Mean L: 56.8 dB;

U90%, extended uncertainty: 2.5dB

APPENDIX G. SA 279 OUTDOOR MICROPHONE KIT ASSEMBLY GUIDE

G.1. PART SET

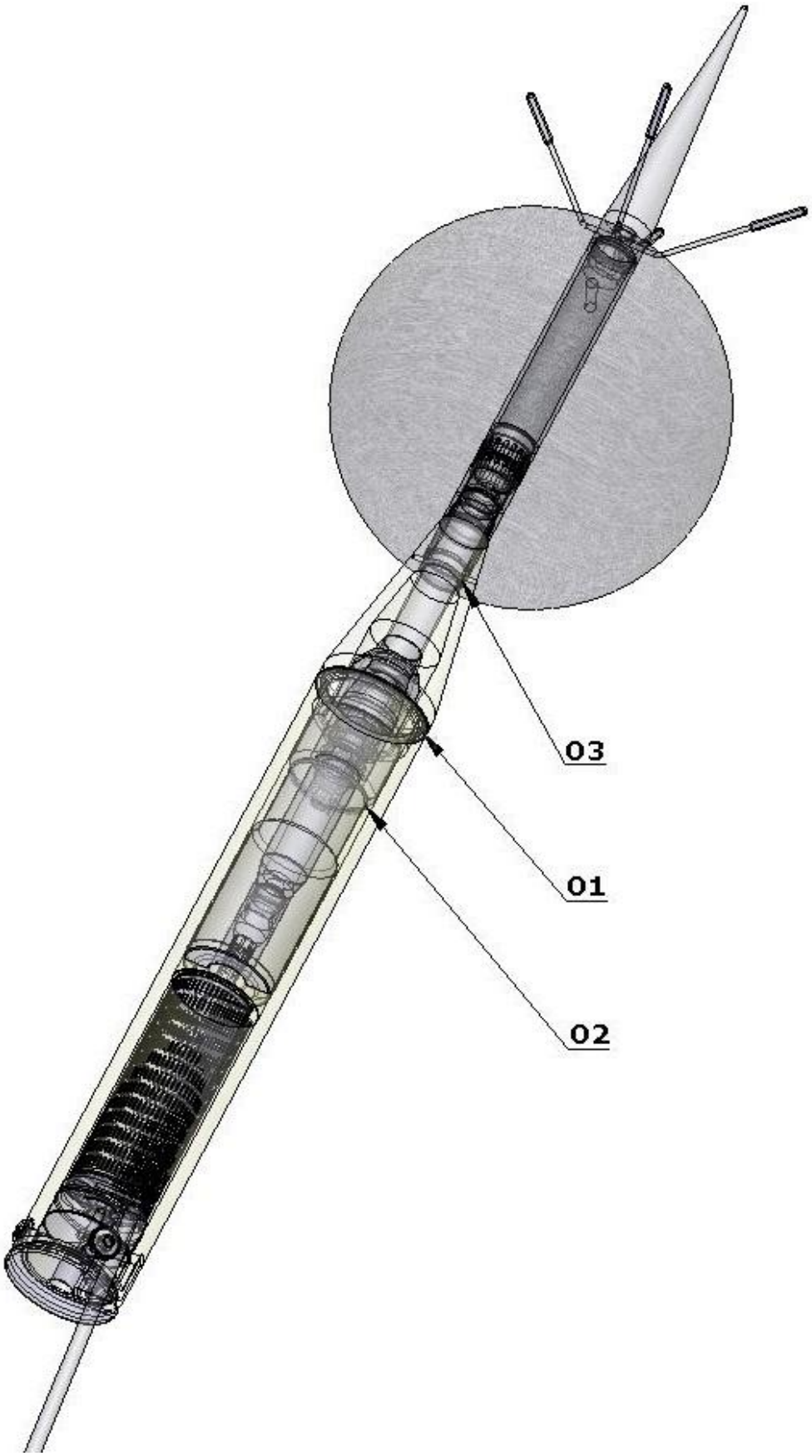


SA 279 kit:
1 - tube
2 - dummy microphone
3 - O-ring type gasket
4 - clamp (2 halves)
5 - upper cone
6 - microphone protecting tube
7 - anti-bird spikes
8 - windscreen (SA 209)
9 - desiccator (not included)
10 - M5x10 hex socket raised screw
11 - washer
12 - bottom
13 - ¼" thread adapter (not included)

Tools:
K - 3mm Allen key

Spare parts:
O1 - O-ring type gasket Ø35x1
O2 - O-ring type gasket Ø26x1
O3 - O-ring type gasket Ø12x1.5

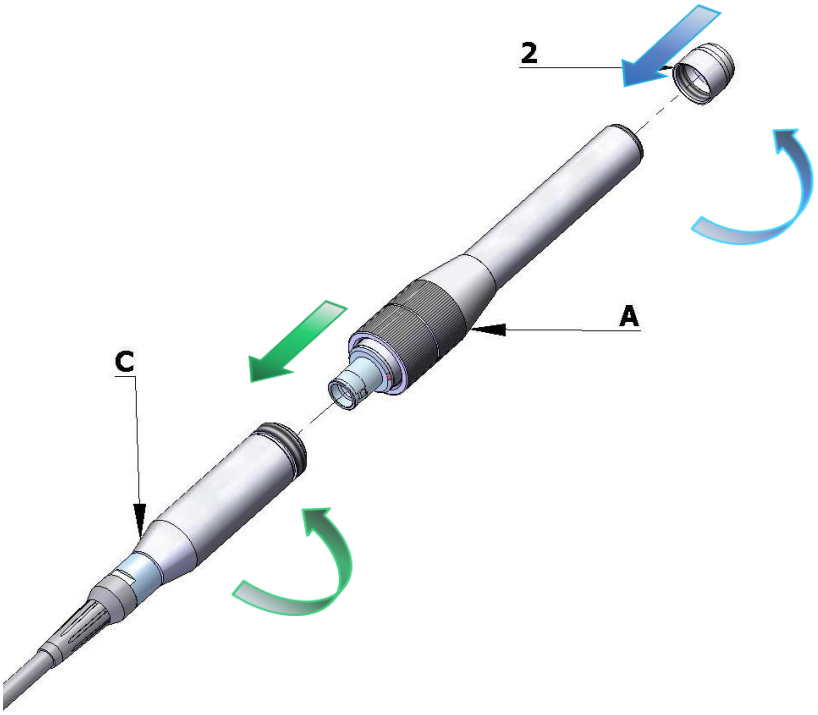
Parts not included:
A – SV 17 preamplifier
B – SV 40AE microphone
C – SC 293



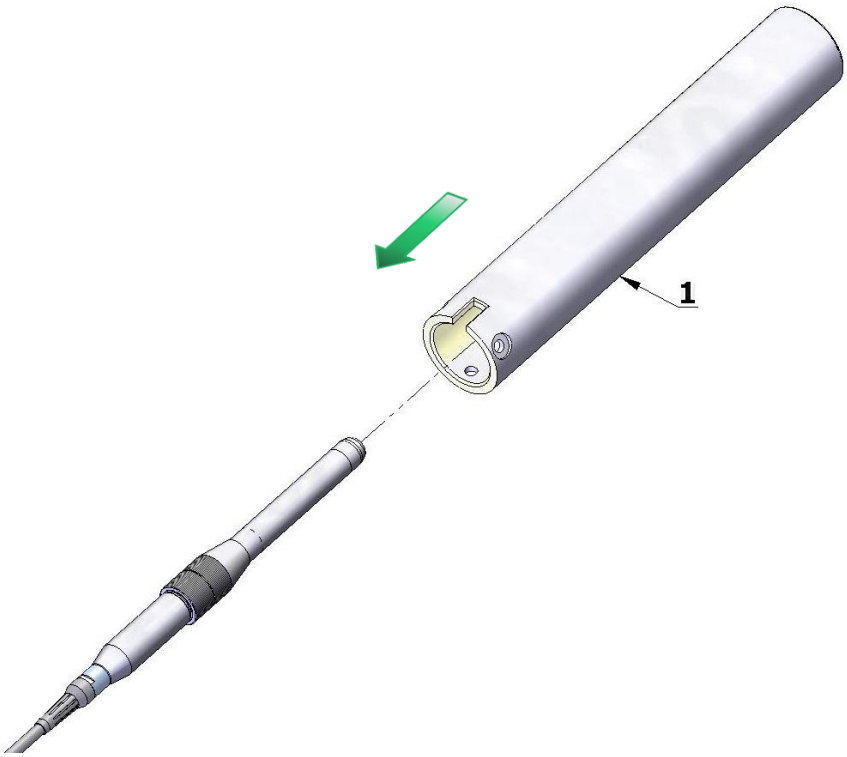
O-ring gasket locations inside

G.2. ASSEMBLY OF SA 279

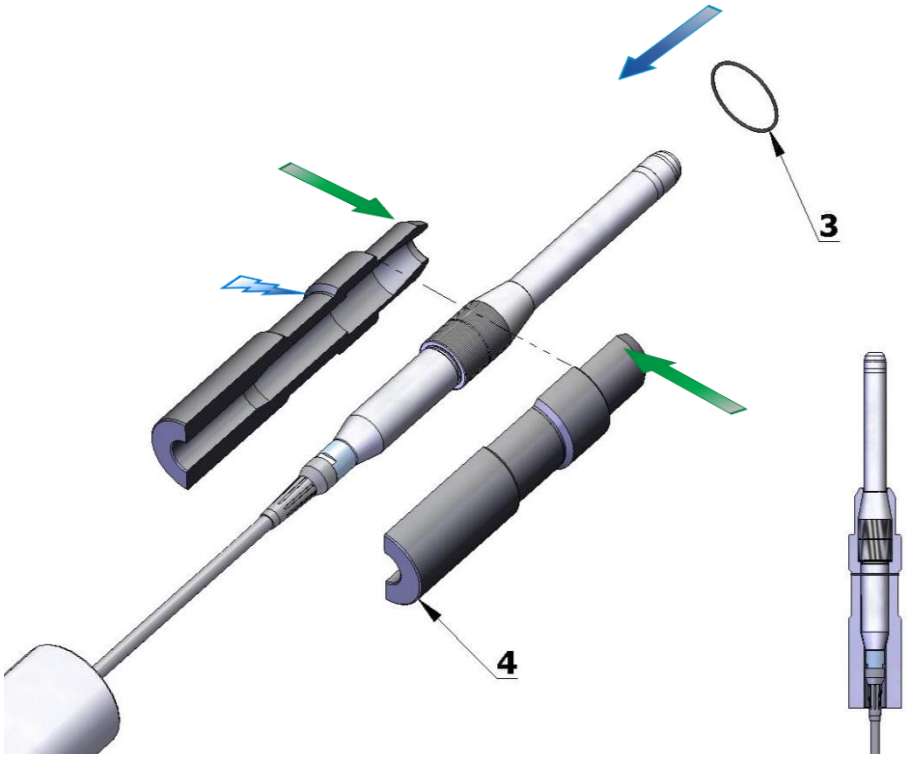
1. Secure preamplifier (**A**) with the dummy microphone (**2**) and connect the cable (**C**).



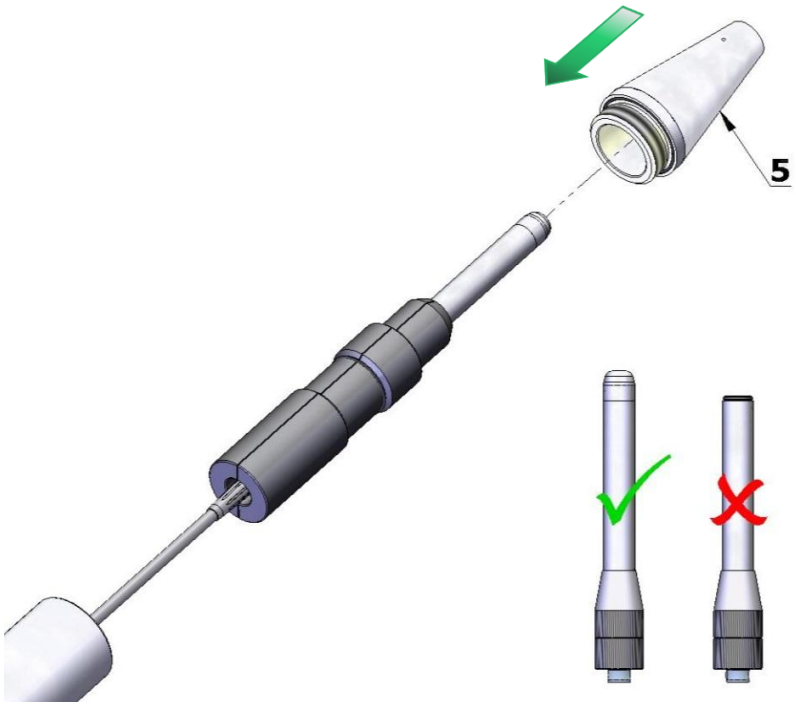
2. Pull tube (**1**) over the cable.



3. Connect the clamp halves (**4**) to the connector and insert O-ring gasket (**3**) on the lightning signed place.

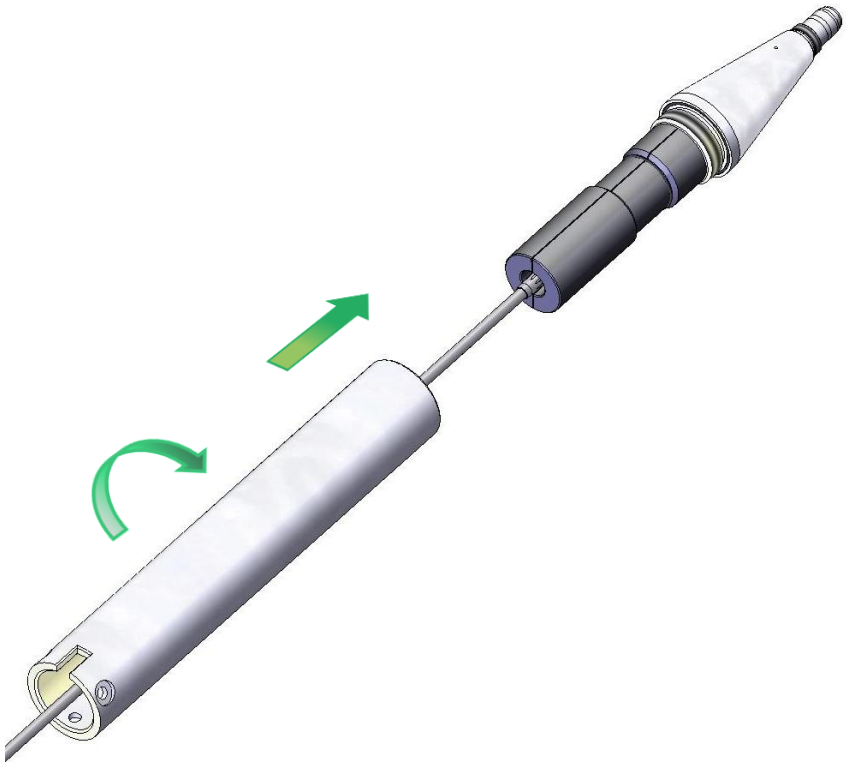


4. Apply the upper, conical part (**5**) on the preamplifier.

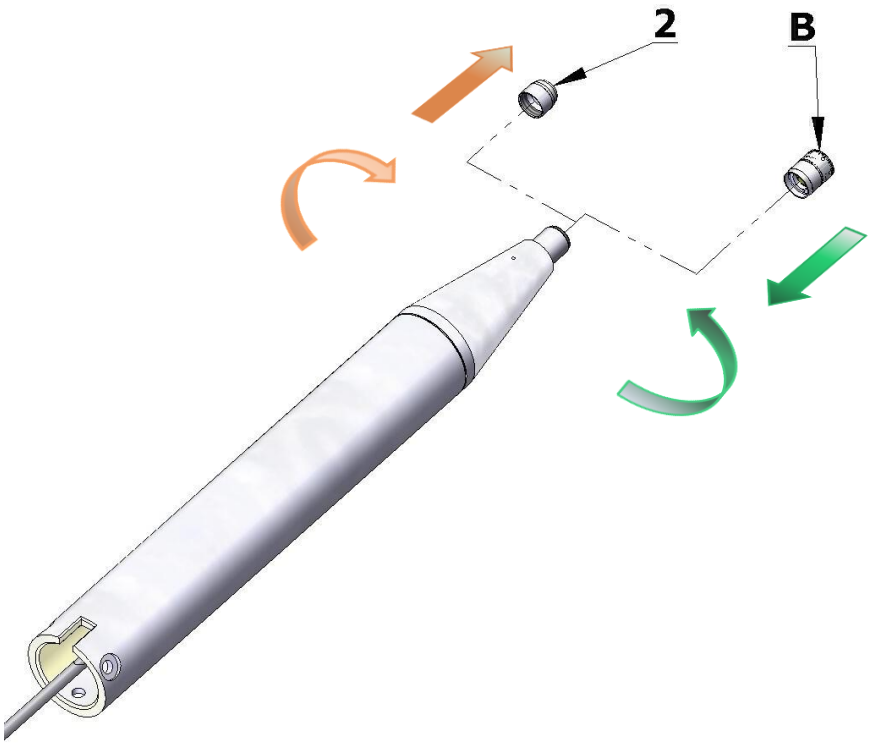


Note: *Do not use preamplifier without the dummy microphone. It can cause damage of the O-ring gasket inside the cone.*

5. Screw the tube on the cone by rotating the tube – so as to not twist the cable.



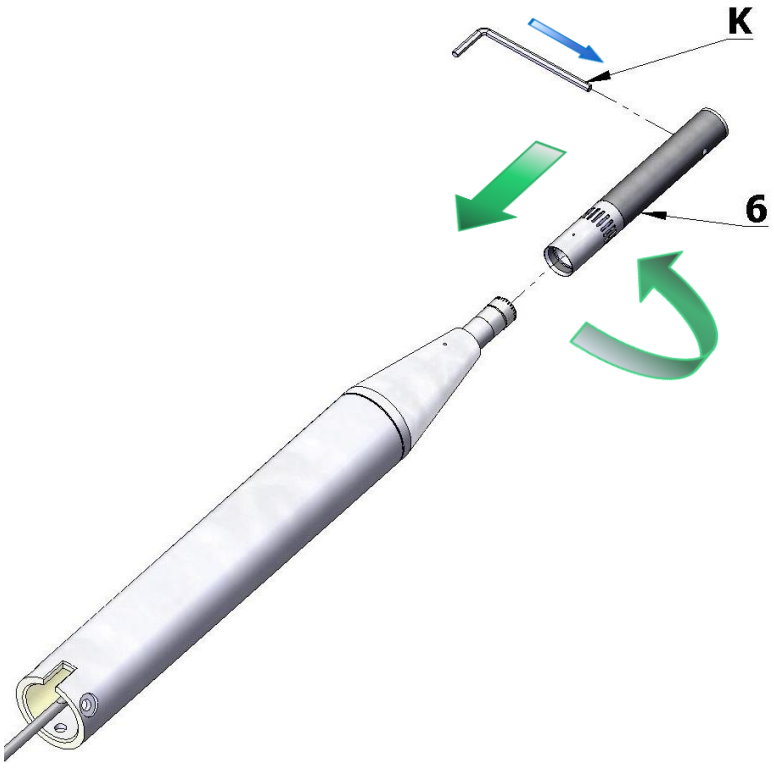
6. Replace the dummy microphone (**2**) with the ½" microphone cartridge (**B**).



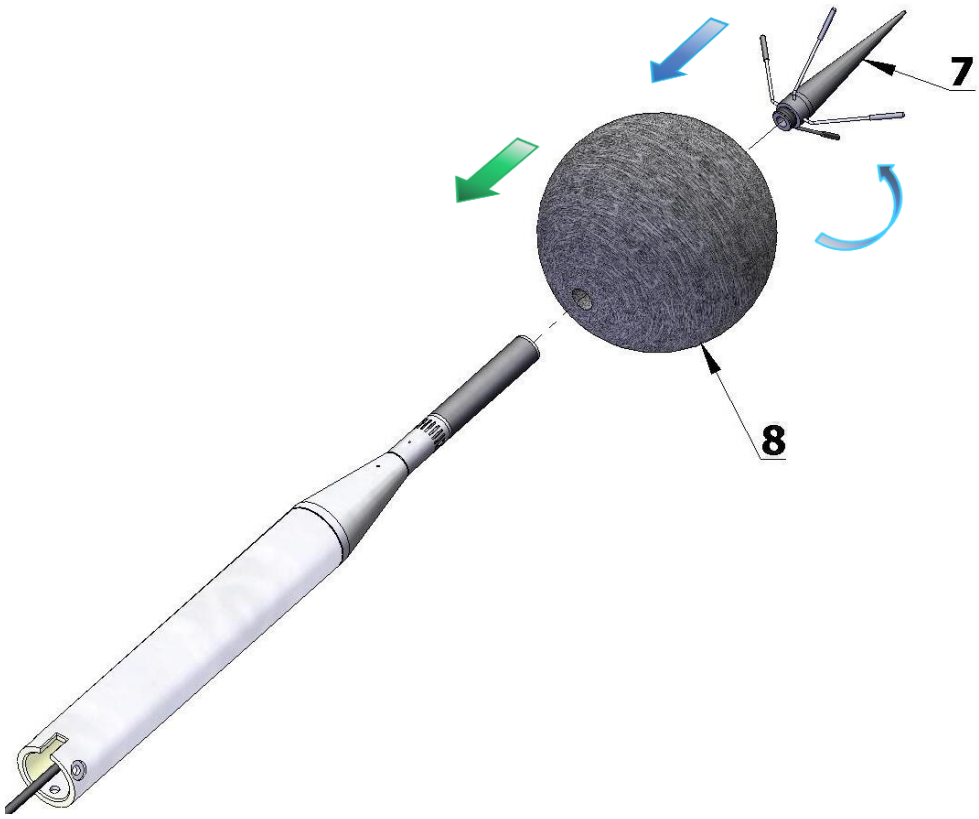
7. Calibrate the complete system using SVANTEK acoustic calibrator.



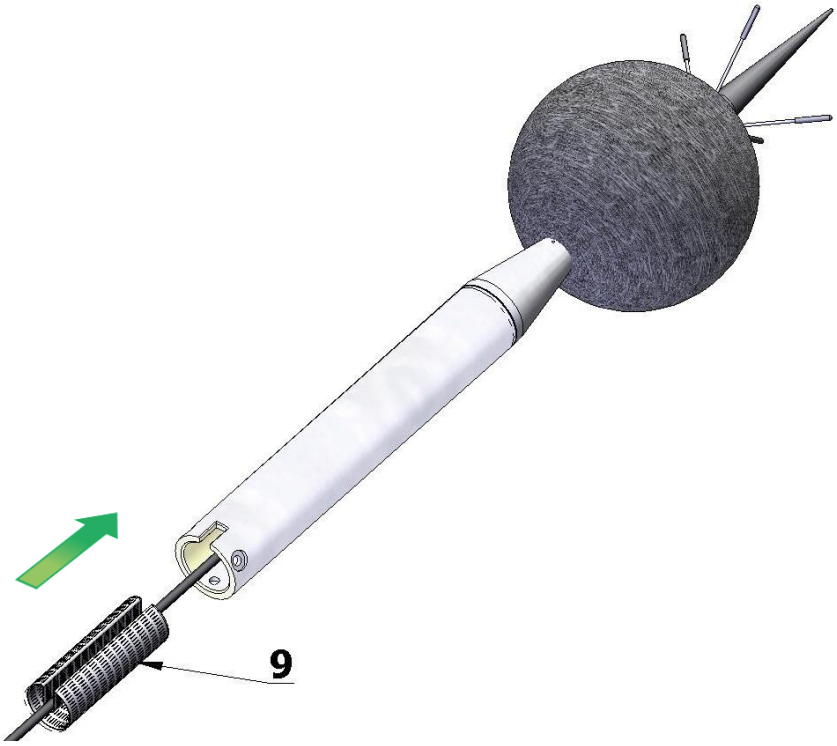
8. Install the microphone protection tube (**6**). Use the Allen key (**K**) as a pin at protecting tube orifice.



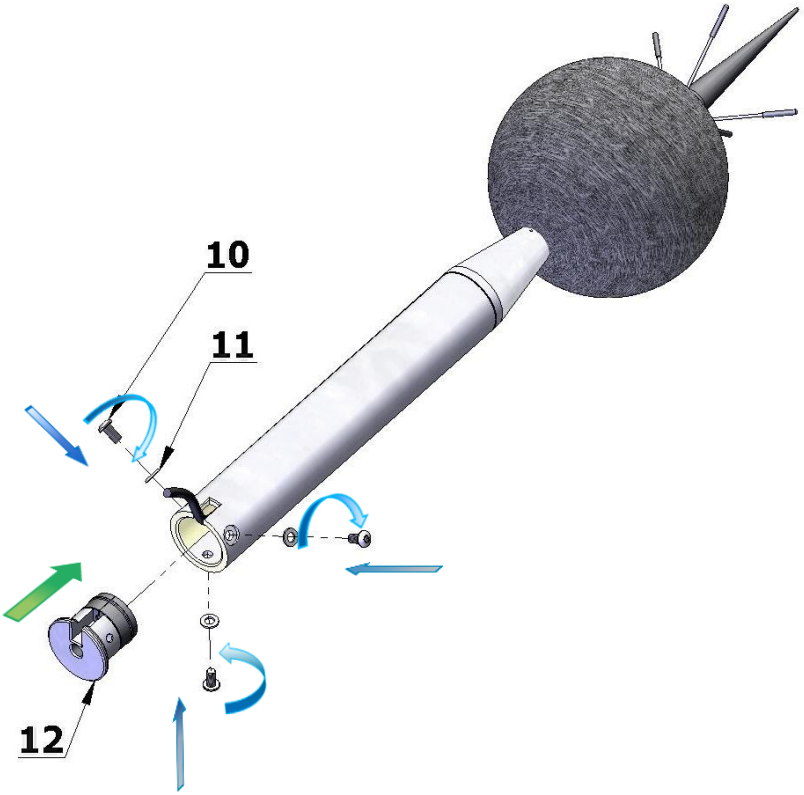
9. Mount windscreen (**8**) and the anti-bird spikes (**7**).



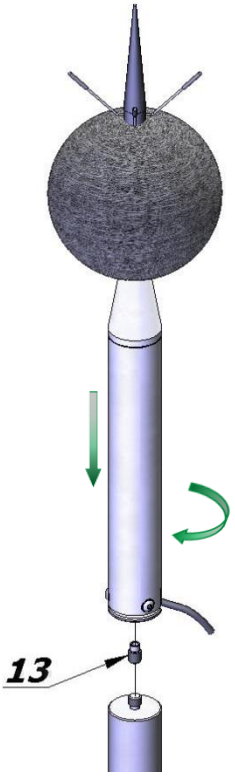
10. Slide the desiccator (**9**) inside the tube.



11. Place the cable in the slot and connect the bottom part (**12**) by three screws (**10**) with washers (**11**). Use the Allen key (**K**).



12. Mount the completed system on the dedicated tripod or pole. Use ¼" thread adapter (**13**) (if necessary) (see last note on next page).

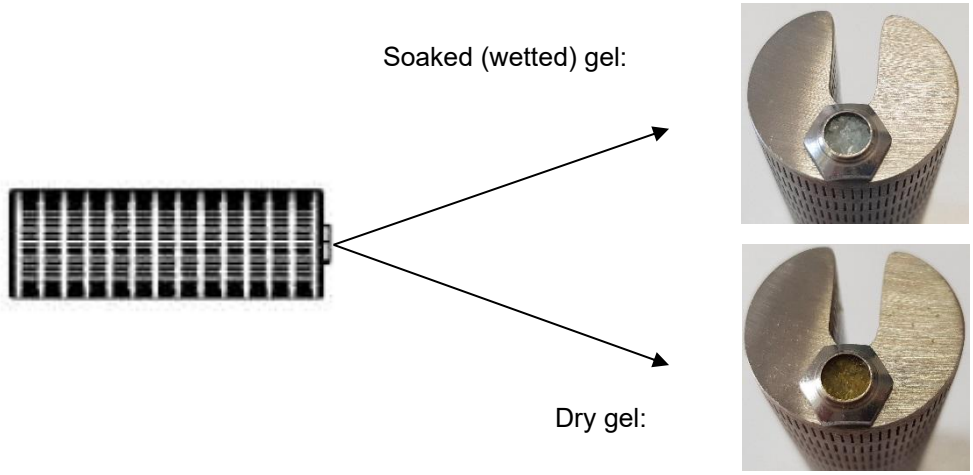


G.3. IMPORTANT NOTES

Note: *The SA 209 foam windscreen (part **8**) protects the microphone against wind and rain. If the SA 209 windscreen is used continuously for a long period of time it is recommended to replace it at least once a year.*

Note: *During continuous usage the SA 209 windscreen is exposed to different weather conditions with possibility of causing physical damage to the foam's structure. Therefore, it is recommended, at least once a quarter (3 months), to check the condition of the windscreen by examining the surface for cracks by squeezing the foam. If cracks or holes are observed, the SA 209 windscreen must be replaced. Take care when examining the foam, as squeezing it too aggressively can damage the surface.*

Colour of the silica gel used in the desiccator (part **9**) when it is dry is amber. If colour of the silica gel turns light grey it means that the gel is soaked (wetted) and the desiccator is not able to absorb more moisture. Colour of the silica gel is visible through the window of the desiccator. If colour of the gel becomes light grey, the desiccator should be regenerated by drying it for 3 hours in temperature of 150°C.



Note*: Desiccator should be inspected at least every 2 weeks, and more often when used in conditions of high air humidity.*

Note: *Desiccator must be stored in a hermetic container when is not installed in SA 279 to prevent absorbing moisture unnecessarily.*

Note: *Tripod or pole with ¼" thread is not recommended for stormy weather.*