SVANTEK

USER MANUAL

SV 200A

NOISE MONITORING STATION

Warsaw, 2019-07-02

Rev. 1.05

Note: *Because of continuous product improvement SVANTEK reserves the right to make changes to product specifications without notice. To download the most up to date user's manual please visit our web site at www.svantek.com. This user's manual presents the firmware revision named 1.04.3 (see the* ***Unit Label*** *review to check version details).*

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

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Technical Support Contact Information:

web: www.svantek.com

e-mail: office@svantek.com.pl

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IMPORTANT NOTES BEFORE USE

- ✓ *While connecting your SV 200A to a PC by the SC 256A cable, first insert the lemo plug into the instrument's MULT. I/O socket and then the USB plug into the PC!*
- ✓ *Monitoring station should not be stored for a long time with discharged Li-Ion batteries. Storing with batteries in discharged condition may damage them. If so, warranty for Li-Ion battery is void.*
- ✓ *If Monitoring station is planned to be stored for a long period of time, it is recommended to charge its battery to 60% capacity. The battery should be charged at least once per 6 months.*
- ✓ *Before installing the station at the measurement site, make sure that the protective caps on the four anti-bird spikes are removed. It is recommended to use the protective caps during transportation and storage or other operations with the instrument like, laboratory calibration, etc. to avoid personal injury.*
- ✓ *Tripod or pole with 3/8" thread is not recommended for permanent installation.*
- ✓ *The windscreen influences the free-field characteristics of the instrument, therefore it is important to check its condition regularly. In the case of visible degradation of the foam surface it must be replaced by the new one.*
- ✓ *Even though the SB 274 power supply unit has a high IP index (Ingress Protection), it is still not recommended to leave it on the ground for safety reasons. Good practice is to mount it on the pole or mast.*
- ✓ *While opening the control panel flap the coin-operated screw should be loosened using, for example, a coin and then unscrewed with fingers until it stops. Opening the flap with the screw left in the intermediate position may damage the varnish of the casing.*
- ✓ *Maximum sound pressure level that can affect the microphone without destroying its membrane is 146 dB.*

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1 INTRODUCTION

The **SV 200A** is a unique Noise Monitoring Terminal (NMT) which includes in a single portable housing: outdoor microphone, sound level meter and 1/1 & 1/3-octave analyser, advanced logger, sound direction detector and communication systems (3G modem, Bluetooth, LAN and WLAN). This system can be easily transported and installed by one person in the field conditions.

The instrument is an ideal choice for an unattended permanent and semi-permanent environmental noise and weather monitoring. Instrument can be used for community and airport noise monitoring.

The system enables easy communication, data download and configuration using PC or mobile device over the Internet or local network.

SV 200A meets Class 1 requirements of IEC 61672-1:2013 standard and provides broad band results with all required weighting filters, 1/1 octave & 1/3-octave spectra with complete statistical analysis.

Instrument can be easily calibrated in-field using sound calibrator. Built-in electrostatic actuator can be activated remotely or periodically in automated mode for self-testing.

SV 200A enables great logging capability which includes time history of broad band results and spectra with two selectable logging steps down to 2 milliseconds and audio recording on trigger of different types. Data are stored in the instrument's memory and can be transferred over the internet on demand or in automatic mode.

Remote communication option for the SvanPC++ software and the SvanNET web-server provides advanced communication with files downloading, data visualization and measurement results exporting. Environmental monitoring option for the SvanPC++ software is dedicated for measurement data management, advanced data processing, analysis, visualization and reporting.

Thanks to robust casing, protection against overheating & humidity condensation, built-in rechargeable battery, this instrument is excellent for permanent installation in all environmental conditions.

Thanks to four MEMS microphones built into the body of SV 200A you can detect the source of the dominant energy occurs in two planes - horizontal "XY" and vertical "Z".

1.1 SOUND LEVEL METER & ANALYZER FEATURES

- noise measurements: **SPL**, **Leq**, **SEL**, **Lden**, **Ltm3**, **Ltm5**, **Lpeak**, **Lmax**, **Lmin** and **LEPd**
- statistics: **Lnn** (L_1 ÷ L_{99}), complete histogram in meter mode and 1/1 & 1/3 octave analysis
- class 1 accuracy in the frequency range **3.5 Hz – 20 kHz** and with 48 kHz sampling rate
- total dynamic measurement range: **25 dBA LEQ ÷ 133 dB PEAK**
- dynamic range: **115 dB**
- parallel **Impulse**, **Fast** and **Slow** detectors for measurements with **A**, **C**, **B** or **Z** weighting filters
- software selectable community and airport **direction characteristics**
- digital **True RMS detector** with peak detection, resolution 0.1 dB
- **1/1 octave** real-time analysis meeting class 1 requirements of IEC 61260-1:2014, frequencies from 31.5 Hz to 16 kHz
- **1/3 octave** real-time analysis meeting Class 1 requirements of IEC 61260-1:2014, frequencies from 20 Hz to 20 kHz
- **audio signal** recording to logger files or separate wav format files on demand with selectable sampling frequency and recording period

1.2 GENERAL FEATURES OF SV 200A

- Noise monitoring terminal fitted in one portable instrument dedicated for unattended permanent and short period noise monitoring
- Integrated, non-removable microphone preamplifier
- Noise measurements meeting IEC 61672-1:2013, class 1 standard
- 1/1 & 1/3 octave real-time analysis
- Audio events and wave recording
- AAC audio compression (future option)
- Statistical analysis with up to 10 percentile values
- Community and airport direction characteristics, software selectable
- Remote, automated system check (built-in acoustic actuator)
- Built-in 16 GB memory
- High efficiency windscreen
- Designed for outdoor use in all weather conditions
- Communication over 3G and WLAN/LAN networks
- GPS module
- Bluetooth module
- eCompass sensor
- Vaisala WXT5xx weather monitoring module support
- Easy connection configuration by means of SVANNET APP software
- Easy remote access over PC or Smartphone by means of SvanNET Web service
- Precise time synchronization and GPS position of the instrument
- Up to 6 days of autonomy operation (internal battery operating time with all radio modules off)
- Advanced software for data processing and reporting SvanPC++_EM
- Li-Ion 72.4 Wh rechargeable battery (non-removable)
- Direct connection of solar panel (without controller) or DC power supply
- Robust design
- Ingress Protection Rating IP 65
- Easy and fast installation in-field
- Directivity of dominant sound source detection

1.3 ACCESSORIES INCLUDED

- **MK 255S** Microtech Gefell, 50 mV/Pa, prepolarised ½" condenser **microphone**
- **SB 274** waterproof external DC **power supply**
- **SA 209** 5" foam windscreen
- **SC 256A** USB cable
- **ST 200A** 4 microphones for noise direction measurements
- Anti-bird spikes
- Extension and microphone protective sleeves
- GSM and WLAN antennas
- Mounting kit
- **SvanPC++_RC** – Remote Communication module for SvanPC++ software (single license)

1.4 ACCESSORIES AVAILABLE (OPTIONAL)

- **SV 36** Class 1 Sound Calibrator 94/114 dB @ 1000 Hz
- **SB 276** solar panel
- **SA 206** 4 m telescopic mast
- **SP 275** weather station based on Vaisala WXT53x module
- **SC 209A** dedicated cable for the SP 275 weather station
- **SP 272** alarm lamp
- **SP 200** LAN adapter
- **SvanPC++_EM** Environmental monitoring module for SvanPC++ software (single license)

1.4.1 SV 36 – Class 1 Sound Calibrator

For results verification purposes, most norms and standards impose the requirement to calibrate the measurement channel before and after each measurement or measurement session.

A sound calibrator is a device which produces an acoustic pressure of defined level and frequency.

SV 36 sound calibrator produces an acoustic pressure of defined level 94/114 dB at a frequency of 1 kHz.

1.4.2 SB 276 - solar panel

The **SB 276** solar panel (40 W, 17.5 V) extends the working time of the monitoring station. Size and weight of the panel enables easy transportation in the dedicated carrying bag.

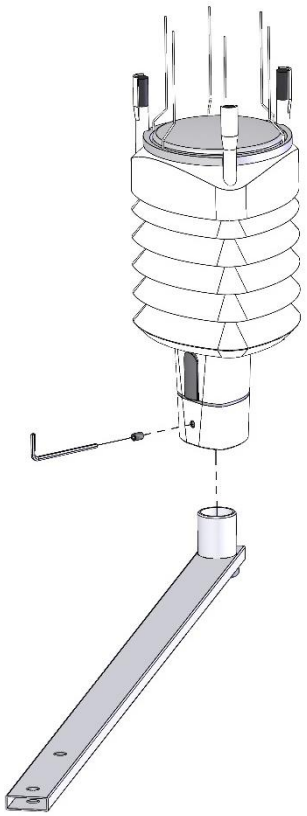
SB 276 does not require additional batteries or external controllers.

SB 276 is equipped with a military standard connector cable for direct connection to the monitoring station.

1.4.3 SA 206 – telescopic mast

The **SA 206** is a Manfrotto 269BU mast with adjustable height from 1.5 meter to 4 meters.

1.4.4 SP 275 - weather station



SP 275 is a Vaisala Weather Transmitter WXT5xx type meteorological station used optionally with the SV 200A monitoring station. It is connected to SV 200A via serial RS 232C interface.

SP 275 measures 6 most essential weather parameters (barometric pressure, humidity, precipitation, temperature, wind speed and direction) and also rain and hail intensity. It is compact and light-weight, has no moving parts, has internal heating and can be easily installed with a one-bolt mounting method.

SP 275 has an automatic control circuit that switches the heating on at low temperatures.

Five measurement weather parameters (barometric pressure, humidity, temperature, wind speed and direction) are transferred from the SP 275 to the monitoring station every second.

Precipitation and 3 values for rain and hail (intensity, accumulation and duration) are transferred, every 10 seconds, only when it is raining or hailing.

SV 200A may save them in the logger file as a **Summary Results** with the **Integration Period** step and as a time-history results with the **Logger Step** (see Chapters 9.8.2 and 9.8.4).

You may switch on or off recording of the Meteo results in the logger file through the SvanPC++ program (see Chapter 9.8.4).

Note: *See also Vaisala WXT5xx User Guide.*

1.4.5 SP 272 – alarm lamp

SP 272 is a type WERMA, LED/Buzzer alarm lamp (12V DC).

The alarm lamp is connecting to the **EXTERNAL INTERFACE** connector instead of the Meteo module.

In this lamp, the buzzer is disabled by default. To enable it:

1. open the case by pushing the black button and turning the plafond and
2. shift the switch to the left.

2 ASSEMBLING THE INSTRUMENT

2.1 RECOMMENDED ORDER OF ASSEMBLY

After unpacking, check the completeness of the set according to Chapter 2.2.

Note: *It is advised to read Chapters 2.3 to 2.9 of the User Manual carefully before assembling.*

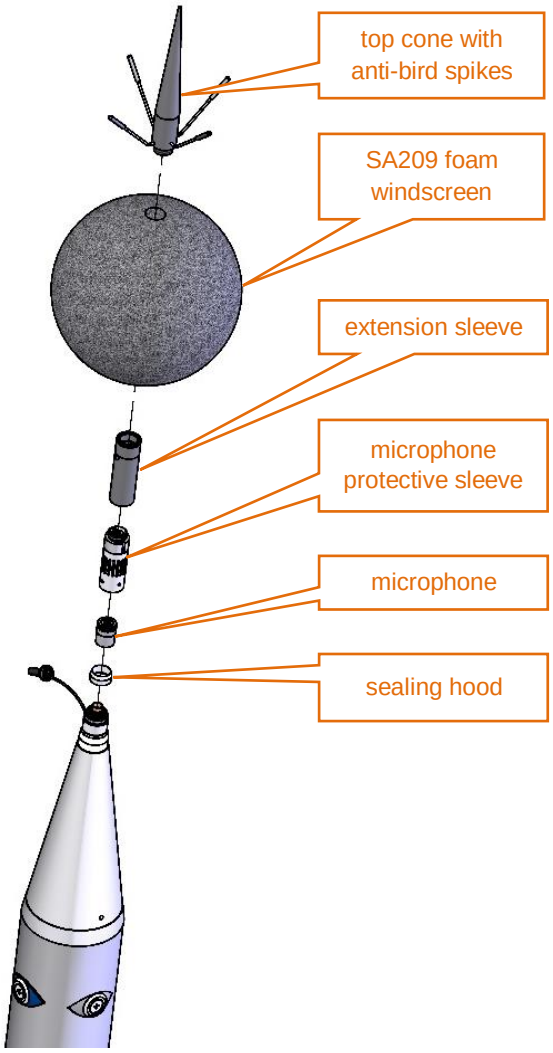
Recommended order of installation:

1. pre-assembling of the SV 200A (see Chapter 2.3),
2. mounting the SV 200A (see Chapter 2.4),
3. power supply installation (see Chapter 2.7),
4. optional meteorological station installation (see Chapter 2.8),
5. arrangement of the cabling (see Chapter 2.9).

2.2 DELIVERED KIT

The kit delivered to the client consists of the following elements:

1. the SV 200A instrument includes next permanently integrated elements:
   - integrated, non-removable microphone preamplifier
   - built-in electrostatic actuator triggered manually or in automatic mode
   - Li-Ion rechargeable battery
   - 16 GB micro SD card
   - 3G modem
   - WLAN module
   - Bluetooth module
   - eCompass sensor
   - GPS receiver
   - control panel
   - 4 x MEMS microphones.
2. and elements that can be disconnected:
   - Microtech Gefell MK 255S, 50 mV/Pa, prepolarised ½" condenser microphone
   - top cone with anti-bird spikes
   - microphone extension sleeve
   - microphone protective sleeve
   - microphone sealing hood
   - SA209 5" foam windscreen
   - 3G antenna
   - WLAN antenna

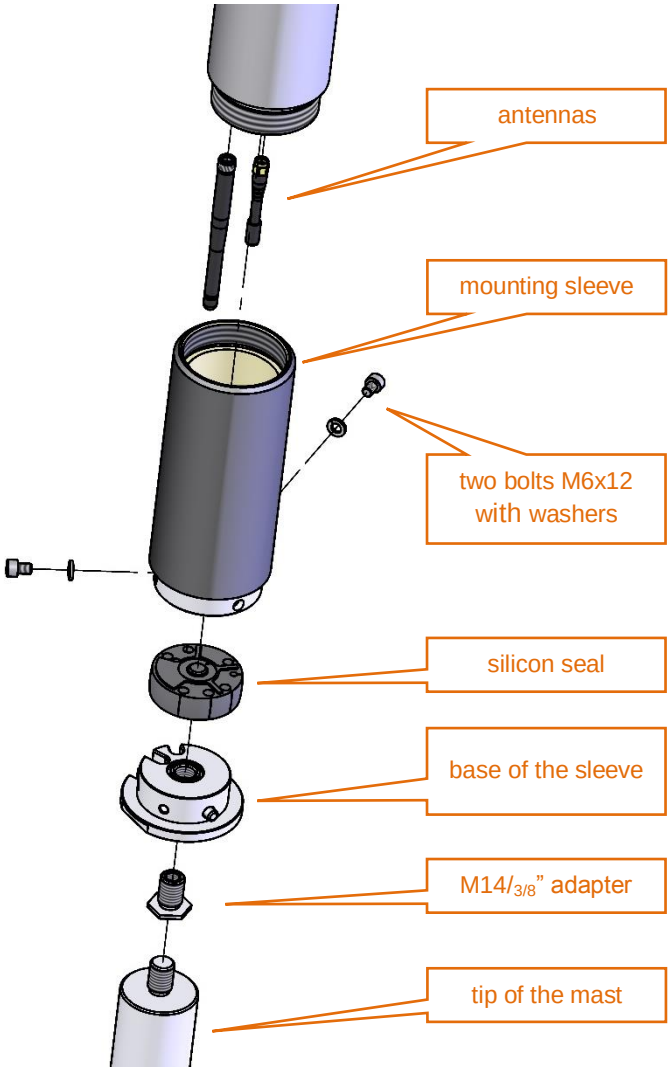


3. SC 256A cable to communicate with SV 200A using USB interface

4. axial mounting kit:
   - mounting sleeve
   - silicon seal
   - base of the sleeve
   - two bolts M6x12 with spring washers
   - M14/3/8” adapter

5. set of tools:
   - special ring spanner 22mm
   - Allen key 3mm
   - Allen key 5mm

6. DC power supply kit:
   - weatherproof DC power unit of the type SB 274
   - set of 4 dowels Φ 10 mm (with screws) for mounting the power unit onto a wall
   - 2 band clips for mounting of the power supply on a mast



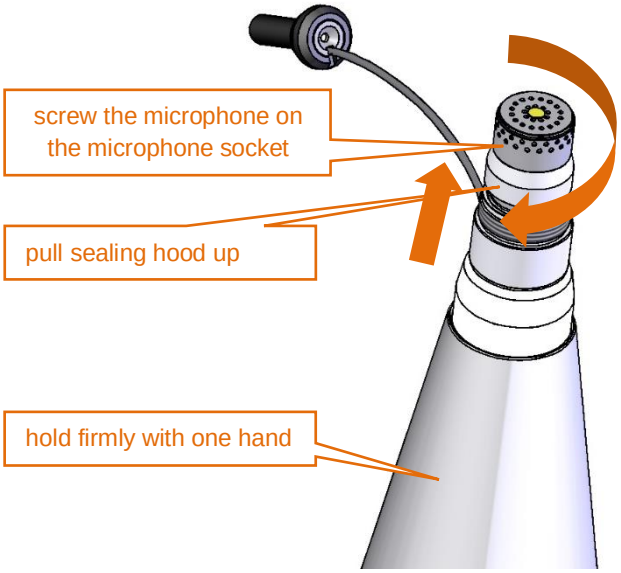
The instrument kit is delivered in the special case, which is dedicated also for storage and transportation of the instrument.

2.3 PRE-ASSEMBLING

Install the microphone and the foam windscreen in the following order:

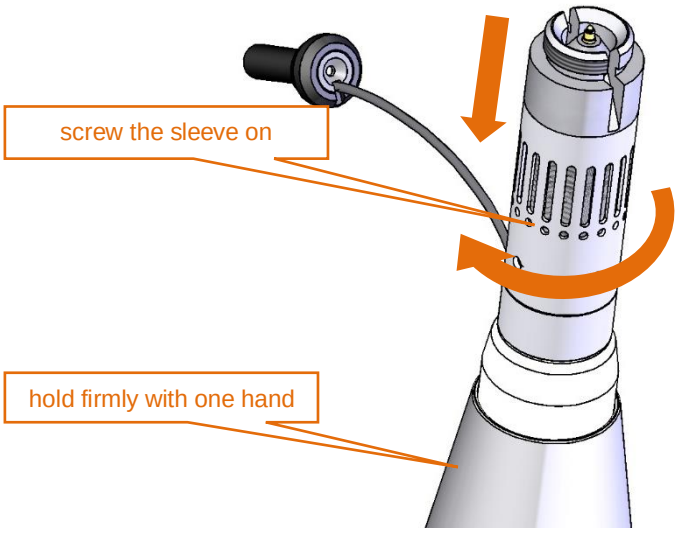
1. Check that SV 200A is switched off. If the device is on, turn it off (see Chapter 3.2)
2. Place SV 200A upright (outer cone facing up) on a stable horizontal flat surface.
3. Take off the protective cap from the microphone socket.

4. Holding outer cone in one hand, use the other hand to screw the microphone on the matching thread extending from the outer cone (rotating the microphone clockwise).
5. The sealing hood should be pulled up to the top (to contact the microphone).



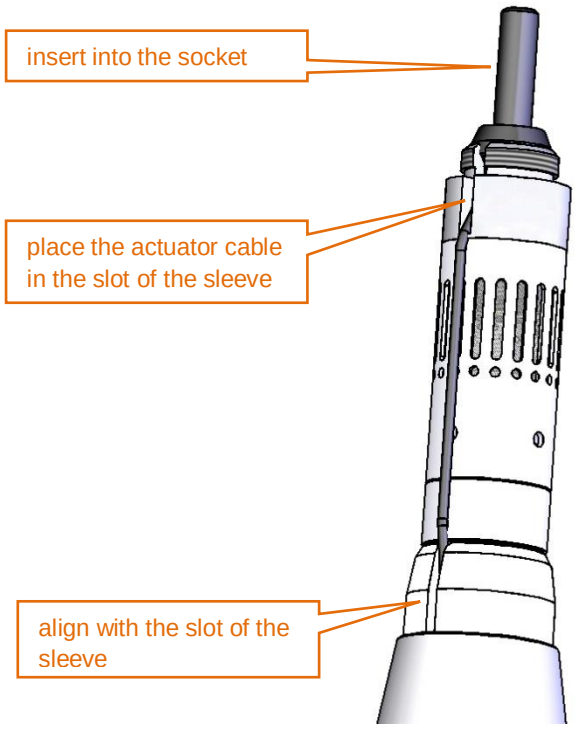
Note: *It is advised to calibrate the SV 200A at this point. For more information see Chapter 0.*

6. Hold the outer cone with one hand, use the other hand to screw on the microphone protective sleeve rotating it clockwise.



7. Align moving ring with the slot of the microphone protective sleeve so that the cable is not bent in any direction. Gently place the actuator located at the end of the cable in the dedicated socket. Put the actuator's cable into the slot of the sleeve.

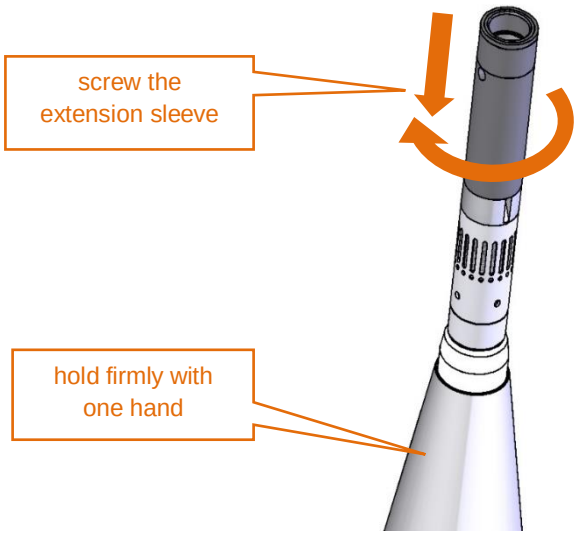
   If the actuator's cable is too long, decrease the length pushing its lower end inside the casing.



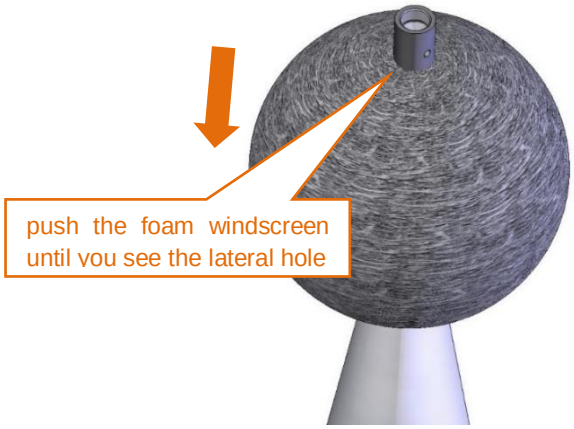
Note: *It is important to keep the microphone protective sleeve still, to protect actuator's cable from damage.*

8. Hold the microphone protective sleeve and the top cone with one hand, use the other hand to screw on the extension sleeve, rotating it clockwise.

   Tighten it to the stop, but "carefully" - too strong tightening can cause loosening of the left screw inside.



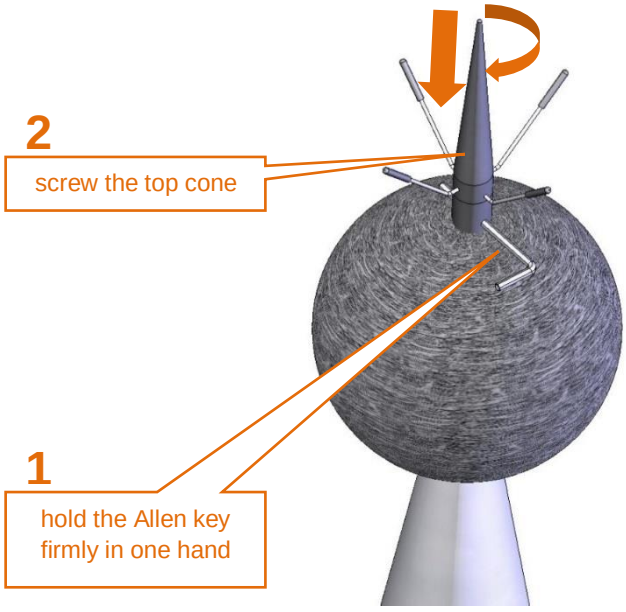
9. Slide the foam windscreen onto the extension sleeve and push the foam until you see the lateral hole.



10. Insert the 3 mm Allen key into the hole.

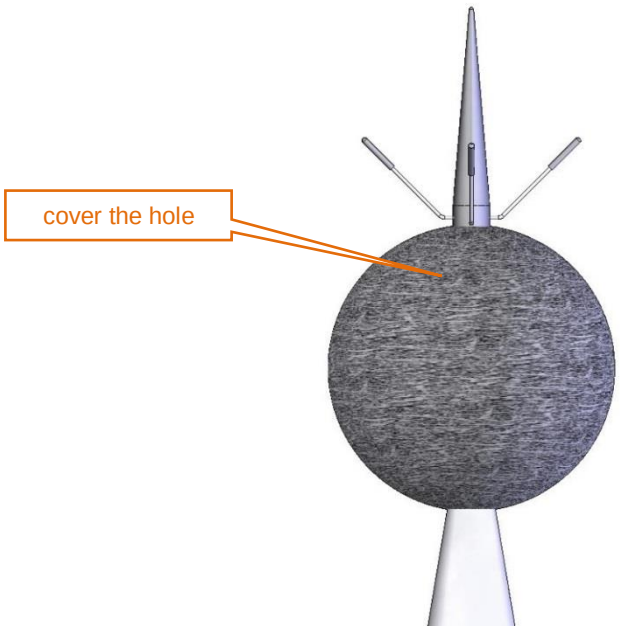
11. Holding the Allen key and the extension sleeve in one hand to keep them still, use the other hand to screw on the top cone with the anti-bird spikes, rotating it clockwise.

    Tighten it to the stop, but "carefully" - too strong tightening can cause loosening of the left screw inside.

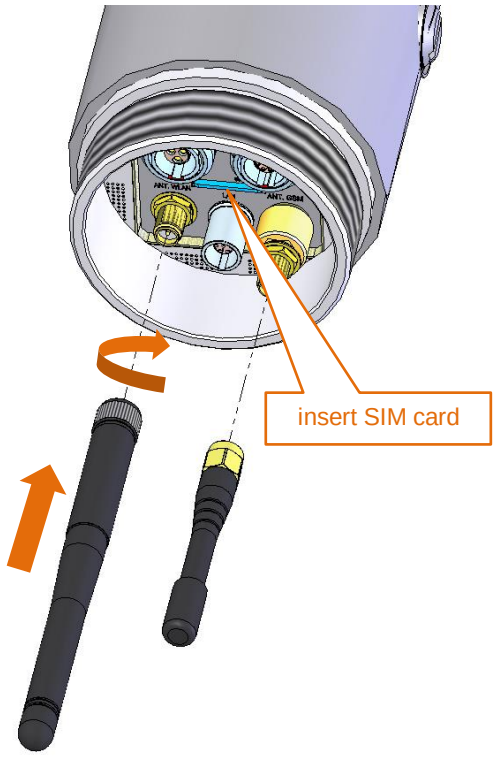


Note: *It is important to keep the extension sleeve still, to protect actuator cable from damage.*

12. Take the Allen key out from the extension sleeve.
13. Move the foam windscreen to the place right under the spikes of the anti-bird device, make sure it covers the microphone protective sleeve.



14. Put the device horizontally to gain an easy access to the socket panel.
15. Make sure that the instrument is switched off!
16. Insert the SIM card into the SIM card slot (according to Chapter 3.1.1).
17. Connect wireless antennas.



The device prepared this way is ready for the configuration of the remote connection (see Chapter 7).

2.4 MOUNTING

The mounting described in this manual is based on the mast type systems, that are recommended by Svantek.

Note: *If other types of mounting than mounting on the mast is going to be applied, consult Svantek, since only recommended type of mounting assures declared acoustical characteristics of the station.*

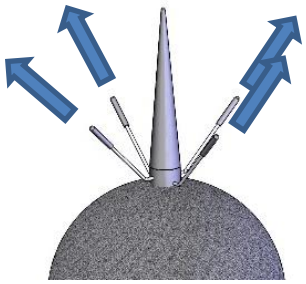
Coaxial mounting of the device on the mast Φ45 mm ended with a bolt M14 is recommended.

Note: *The M14/3/8" adapter is intended for mounting SV 200A on photographic and light tripods. It should not be used for unattended environmental monitoring.*

Note: *Make sure SB 274 power supply unit is not connected to mains before full system installation.*

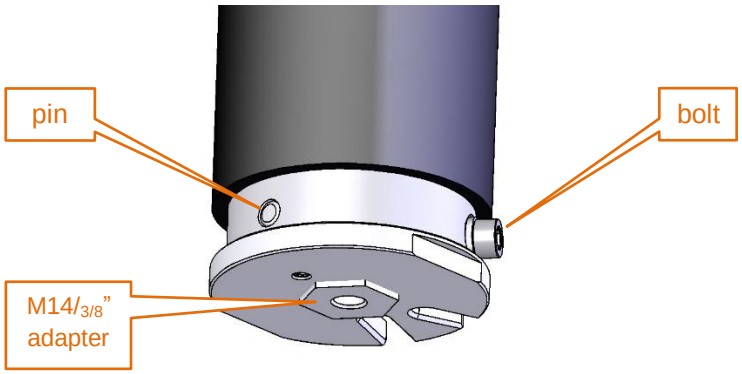
Note: *Before installing the station at the measurement site, make sure that the protective caps on the four anti-bird spikes are removed.*

It is recommended to use the protective caps during transportation.

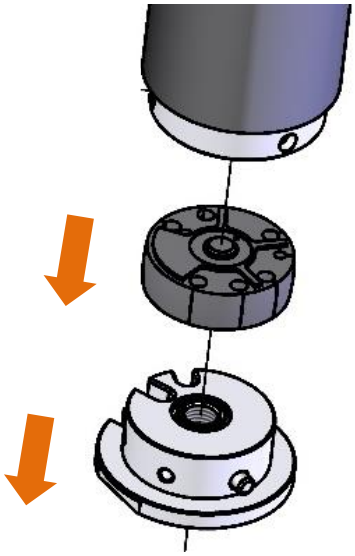


2.4.1 Mounting SV 200A on the mast

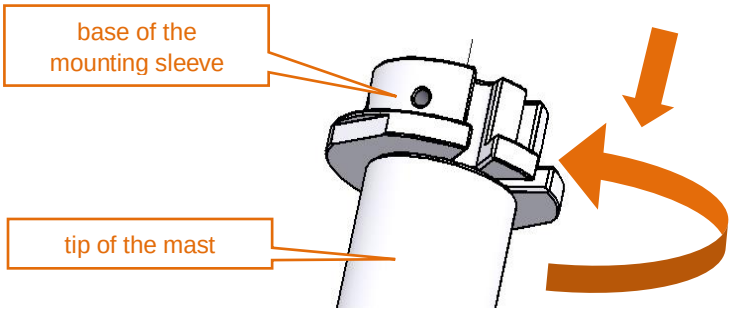
1. Unscrew two bolts attaching the mounting sleeve to its bottom with the 5mm Allen key.
2. Push the pin in the third hole in the bottom using a longer arm of the Allen key and take the bottom off the sleeve.
3. If the mast has M14 thread unscrew the M14/3/8" adapter from the bottom of the mounting sleeve base using the special 22 and 65 mm spanners.



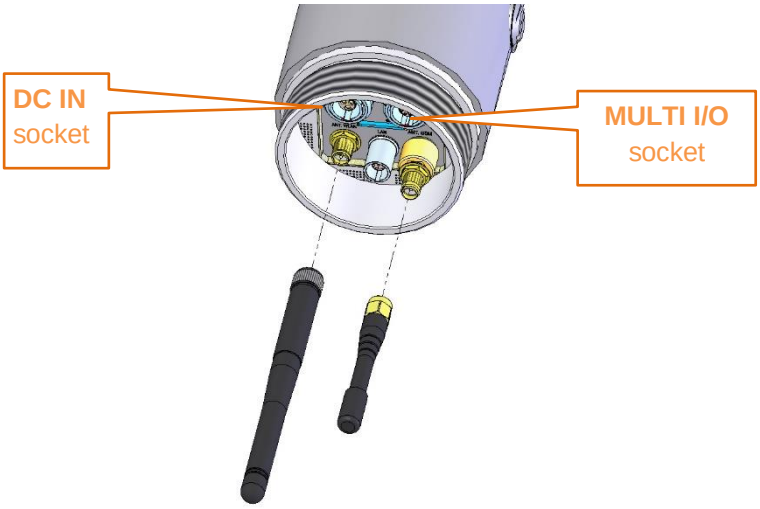
4. Remove the base out of the sleeve.
5. Remove the seal from the cylinder pulling it by the grip.



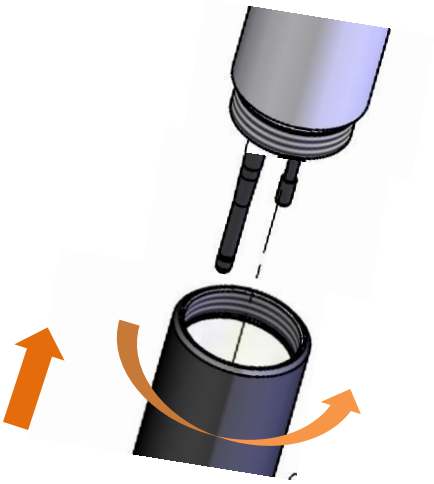
6. Screw the base of the mounting sleeve on the M14 thread of the mast (if you use aligning to the North set see Chapter 2.4.3).
7. If you don't use aligning to the North set tighten the bottom of the mounting sleeve up with the special open spanner 65 mm.



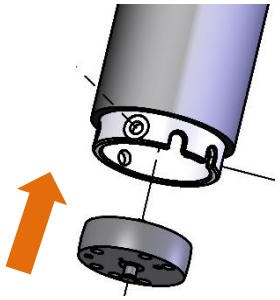
8. Make sure SV 200A is switched off.
9. Plug the power supply cable connector in to the **DC IN** socket on the connector panel.
10. Optionally, plug the lemo connector of the USB, weather station or alarm lamp cable into the **MULTI I/O** socket on the connector panel.
11. Connect antenna(s).



12. Pass the cables through the mounting sleeve and screw the mounting sleeve on the thread of SV 200A.



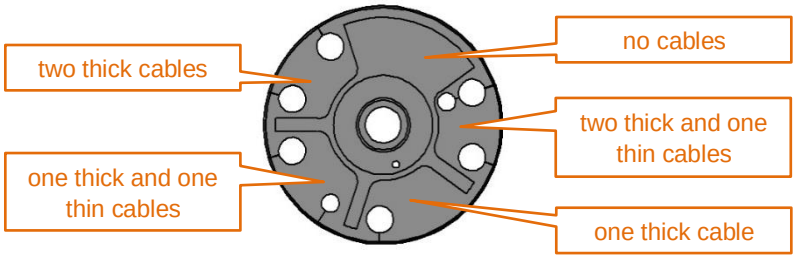
13. Insert the cables into the holes of the seal through the cuts in the seal edge.
14. Insert the seal inside the mounting sleeve until it stops, pushing it by the plastic grip.
15. Holding the seal pull the cables out to the stop.



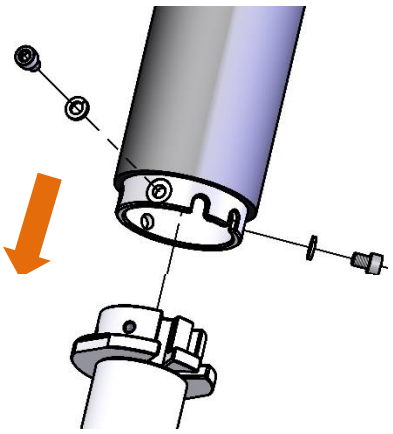
The silicon seal is designed to protect the instrument from atmospheric humidity and what is more important to dump acoustic resonances.

The seal is designed so that 5 positions are foreseen for 5 combinations that can be created from 3 cables.

Each hole has a cut in the seal that enables simple insertion of the cable into the hole.



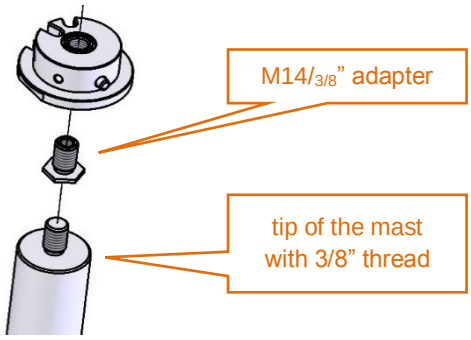
16. Push the pin in the base of the sleeve with 5 mm Allen key.
17. Put the mounting sleeve on the base holding the cables in the slots of the sleeve.
18. When the pin is in the third hole of the sleeve, lay the cables in the slots of the base.
19. Screw both bolts fastening the sleeve to the base using the 5 mm Allen key.



Note: *During laying the cables in the slots, the seal will be positioned so that not used holes will be closed by the base providing reliable tightness and sound insulation of the instrument.*

2.4.2 Mounting on 3/8" thread

To mount SV 200A on the 3/8" thread use the M14/3/8" adapter.



Note: *Tripod or pole with 3/8" thread is not recommended for permanent installation.*

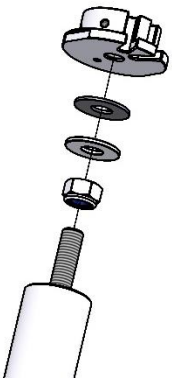
2.4.3 Mounting the SV200A station on the mast aligning to the North

Mast requirement: the length of the threaded bolt should be at least 45 mm.

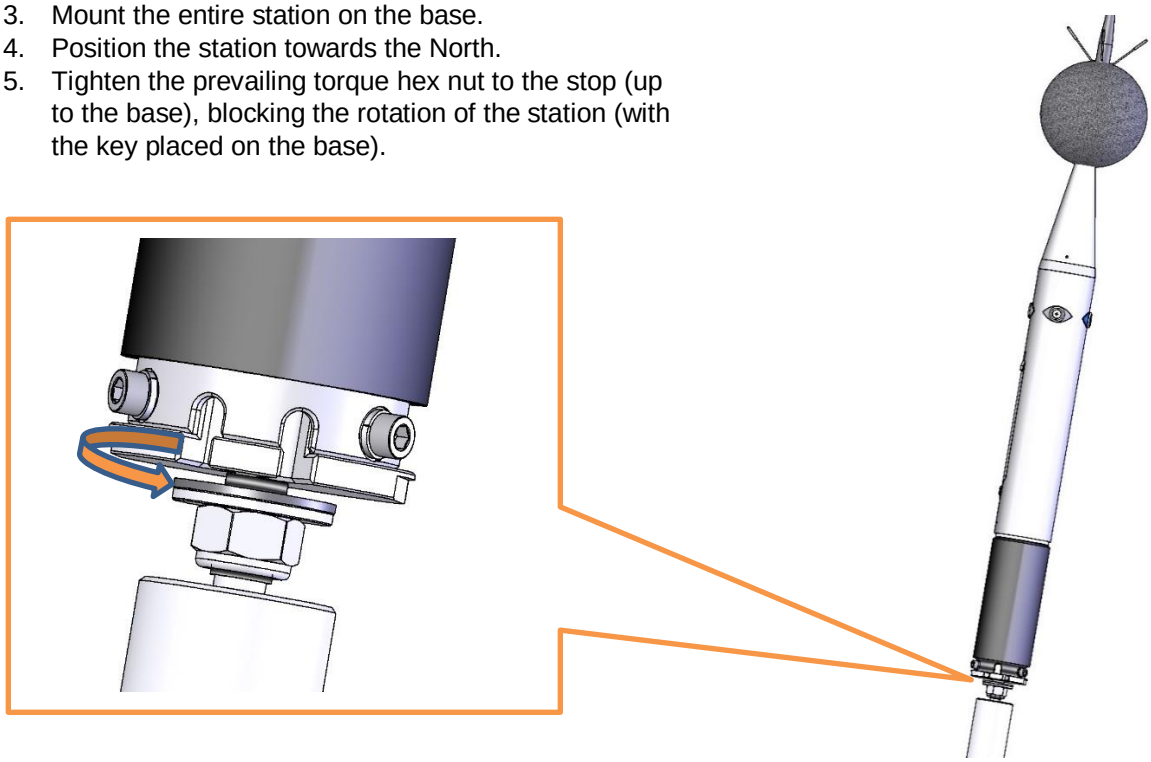
Additional elements: steel washer, rubber washer, prevailing torque hex nut (with plastic insert).

Mounting method:

1. Screw the prevailing torque hex nut (plastic down), apply a steel washer and a rubber washer.
2. Screw the base of the sleeve to the stop (resistance will be on the screw of the sealer inside the base) and unscrew it again by approx. 1 turn.

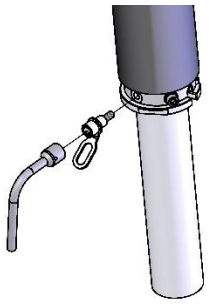


3. Mount the entire station on the base.
4. Position the station towards the North.
5. Tighten the prevailing torque hex nut to the stop (up to the base), blocking the rotation of the station (with the key placed on the base).



2.5 ANTI-THEFT PROTECTION

There is a special swivel eye in the kit that can be used as anti-theft protection of your SV 200A with the use of locking cable. It is necessary to screw it to the base of the sleeve with the special key.



2.6 WINDSCREEN PROTECTION

The SA 209 foam reduces the effect of wind on measurement results.

Note: *The windscreen influences the free-field characteristics of the instrument, therefore it is important to check its condition regularly. In the case of visible degradation of the foam surface it must be replaced by the new one.*

During continuous usage, the SA 209 foam is exposed to different weather conditions with possibility of causing mechanical damage to the foam's structure. Therefore, it is recommended, at least once a quarter (3 months), to check the condition of the foam by examining the surface for cracks by squeezing the foam. If cracks or holes are observed, the SA 209 foam must be replaced.

The SA 209 foam must be replaced whenever squeezing it causes severing of small pieces of its surface.

Replacement of the foam windscreen should be performed according to steps 1 to 5 of Chapter 4.1 and steps 8 to 12 of Chapter 2.3.

2.7 POWER SUPPLY UNIT

SB 274 is a waterproof single output switching power supply which is characterised by:

- Universal AC input / Full range (100 ~ 240 V AC)
- Rated power 40 W
- Built-in active PFC function
- Class 2 power unit
- Protections: Short circuit / Over load / Over voltage / Over temperature
- Fully encapsulated with IP67 waterproof level
- Lemo 1B.303 connector

It is recommended to install the SB 274 power supply unit on a mast, using 2 steel clamps and in the place not exposed to direct sun light.

Note: *See also SB 274 User Manual.*

Note: *Even though the power supply has a high IP index (Ingress Protection), it is still not recommended to leave it on the ground for safety reasons. Good practice is to mount it on the pole or mast.*

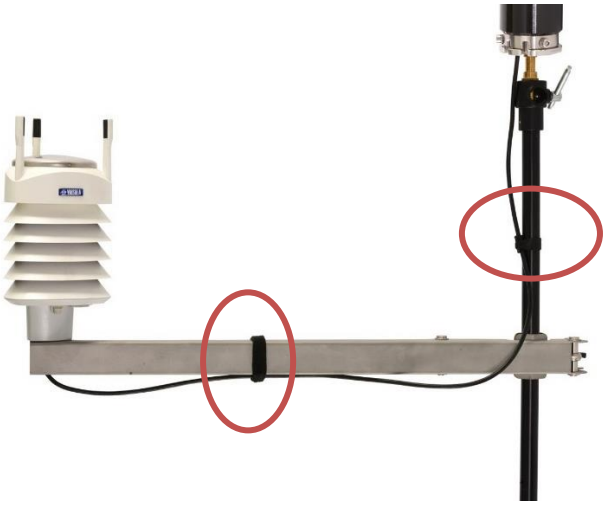
2.8 ASSEMBLING THE SP 275 WEATHER STATION ON THE MAST (OPTIONALLY)

SP 275 is mounted on a meteorological beam that can be installed on the mast below SV 200A. The distance from the beam to the SV 200A device should be as great as possible, but it is limited to the length of the SC 209 cable.

Note: *If your Vaisala Weather Transmitter is equipped with the wind sensor, then it is critical to set the correct sensor orientation. The North direction is marked at the bottom of the weather transmitter. Use real-life compass or mobile app to determine North direction.*

2.9 FINISHING

Attach cables to the mast and the optional meteorological beam. Use some band clips at intervals not greater than 50 cm (20”) on the mast and the cable holders delivered with the kit (Velcro fasteners) on the meteorological beam. Lay the cables so that they are loose at the ends. The loose cable should hang a bit lower than the connector to avoid accumulation of rainwater.

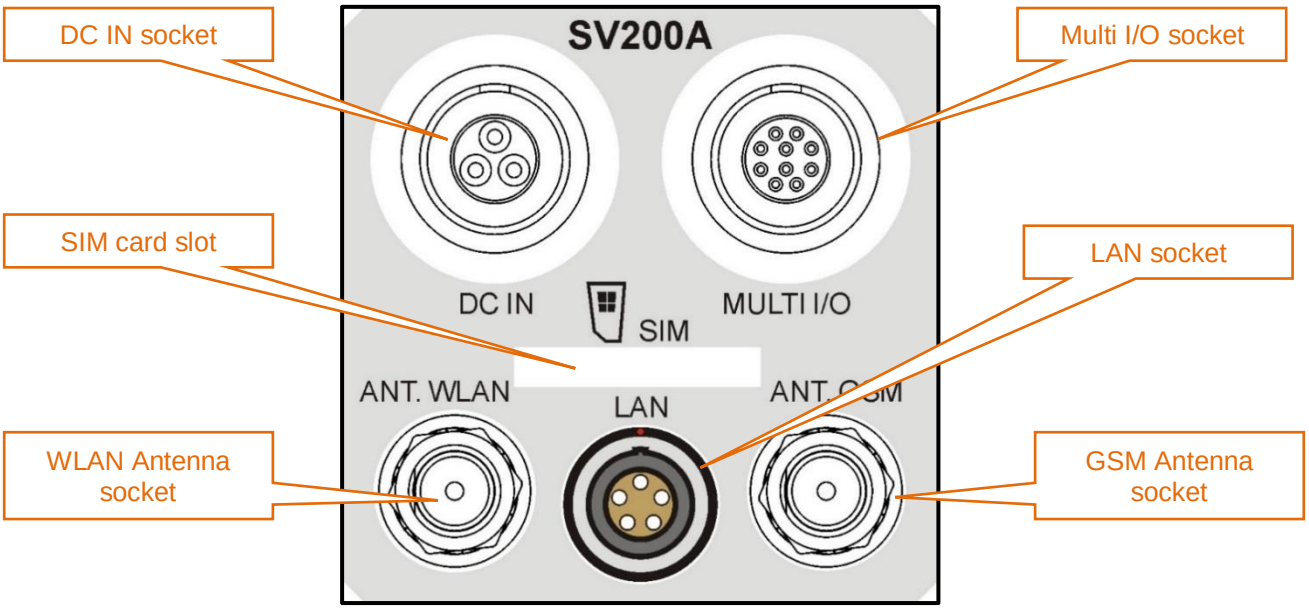


Note: *Fixation of cables is important because loosen cables may generate additional noise. As an alternative way, wrap the cables around the mast.*

In the end of installation connect the SB 274 power supply unit and switch on the station.

3 SV 200A CONNECTORS AND CONTROL PANELS

3.1 CONNECTORS PANEL



3.1.1 SIM card slot

Note: *The SV 200A uses mini SIM card size (25mm x 15mm).*

The SIM card should be inserted into the slot according to the drawing on the panel. Push the card in until you feel a click.

To remove the SIM card from the slot push it until you feel the click and pull the card out. Use tweezers to remove the SIM-card from the slot.

Further information on configuration of the 3G connection can be found in Chapter 6, 7 and 9.3.

3.1.2 DC IN socket

The **DC IN** socket is used to connect an external power source, i.e. included power supply, optional solar panel or external 12-24 V battery.

SV 200A can be powered using one of the following power sources:

- Li-Ion batteries, fitted internally. Operation time with the internal Li-Ion batteries depends on the power consumption:
  - up to 7 days – both modems are off,
  - up to 4 days[2] – only 3G modem is on,
  - up to 2.8 days[2] – only WLAN module is on,
  - up to 3 days[2] – only LAN module is on.
- Included AC power supply unit SB 274. Input 90-305 VAC, output +15 VDC 2.7A, IP67 housing.
- Optional solar panel. MPPV voltage 15-20 V, connected directly to SV 200A, without using power conditioner.
- External DC source. Voltage range 10.5 V – 24 V, e.g. 12 V or 24 V battery.

[2] One-minute data transmission with one hour cycle

The internal battery is charged in a fully automatic cycle, when the instrument is connected to any external power source. SV 200A charges itself regardless of whether it is turned on or off. The weather conditions (i.e. temperature) are taken into account while charging to prevent any damage of the battery caused by charging in too high or too low temperature.

Note: *SV 200A is equipped with the mechanism which protects the internal Li-Ion batteries from damage caused by critical discharge. When the battery is running flat, the instrument is automatically switched off.*

Note: *SV 200A should not be stored for a long time with discharged Li-Ion batteries. Storing batteries in discharged condition may damage them. If so, warranty for Li-Ion battery is void.*

Note: *If SV 200A is planned to be stored for a long period of time, it is recommended to charge its batteries up to 60% of their capacity. Batteries should be charged at least once per 6 months.*

3.1.3 External Communication Interface socket

The **MULT. I/O** socket enables the user to connect the instrument to one of the following devices:

- PC (via USB)
- SP 275 weather station (via RS232)
- alarm lamp (passive, 12V 1A max)
- external trigger (digital input/output signal)

Note: *While connecting your SV 200A to a PC by the SC 256A cable, first insert the lemo plug into the instrument's MULT. I/O socket and then the USB plug into the PC!*

3.1.4 LAN socket

LAN socket is used for connection SV 200A to the local area network using **SP 200** adapter.

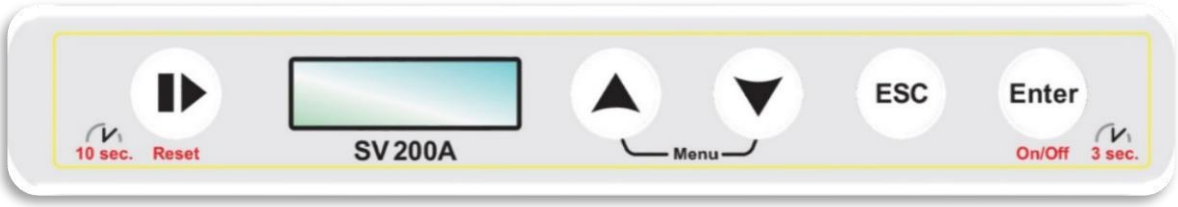
3.1.5 Antenna sockets

There are two antenna sockets: for 3G and WLAN communication.

After plugging the antenna into the socket, the screw should be tightened to light resistance only. Do not over tighten this connector.

3.2 CONTROL PANEL

SV 200A is dedicated for the outdoor monitoring and remote control via mobile 3G network, LAN or WLAN. However, it can be also controlled from the control panel with the use of five keys and a display (128 x 32 pixel resolution).



During outdoor operation, the control panel should be closed by the flap. Closed flap assures protection of the instrument's user interface from environmental impact and, what is more important, assures that acoustical direction characteristics are within declared tolerances.

To uncover the control panel, unscrew the coin-operated screw (with your fingers, or the first turn with the coin and then the fingers) slightly to the stop. If the instrument is in vertical position the flap should slide down and its upper (rectangular) part should slide out from under the eaves. If the flap does not slide down, slightly press the lower part with your finger and move it down. Then turn the flap clockwise (or counter-clockwise).

Note: *The coin-operated screw should be loosened using, for example, a coin and then unscrewed with fingers until it stops. Opening the flap with the screw left in the intermediate position may damage the varnish of the casing.*

To close the control panel, turn the flap so that its upper, rectangular part jumps into the notch of the casing. If the lower part of the flap is pressed against the head of the screw through the inner spring, it should be lightly pressed (so as not to damage the lacquer on the flap). Move the flap up (with your finger) by pressing it all the time so that the upper part of the flap is hidden under the notch. Tighten the screw to the stop (finger, possibly the last rotation by the coin) by pressing the flap all the time.

Note: *Operate carefully so that the metal edges of the flap do not damage the varnish on the surface of the casing, especially at the edge of the notch.*

Five control keys enable following functions:

Enter (3 sec.)
- turning On/Off the instrument when holding 3 sec,
- opening a position in the menu list,
- entering editing mode for the parameter,
- confirming made changes,
- changing main results/status views,

ESC
- returning to the upper menu list,
- exiting the current parameter edition without saving changes,
- changing measurement/status views,

(10 sec.)
- starting or stopping measurements,
- resetting the instrument when holding 10 sec,
- starting the calibration,
- staring the system check,

,
- selecting position in the menu or parameter list,
- changing the parameter value,
- opening the Menu by pressing both keys simultaneously,
- changing profiles/results in the measurement view.

Note: *Pressing and holding*  *and*  *keys simultaneously during the instruments switching on longer than 3 seconds, starts the BOOTSTRAP mode of SV 200A, used for firmware update (see Chapter 10).*

Note: *Pressing and holding*  *during the firmware booting when Svantek icon appears, enables loading factory settings before the instrument's start. This* ***Factory Settings*** *function will reset all settings including communication one.*

4 CALIBRATION

The instrument is factory calibrated with the supplied microphone for the reference environmental conditions (see Appendix C). The microphone sensitivity is a function of the temperature, ambient pressure and humidity, and when the absolute sound pressure level value is required, the absolute calibration of the measurement channel should be performed.

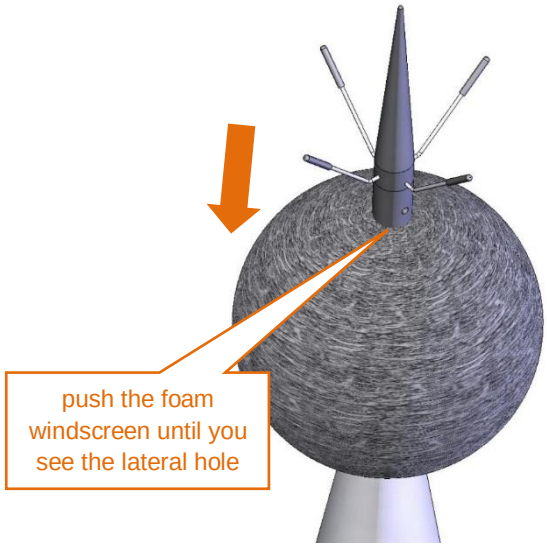
4.1 PREPARATION FOR CALIBRATION

If the SV 200A instrument is assembled and needs calibration, it is necessary to disassemble following parts of SV 200A:

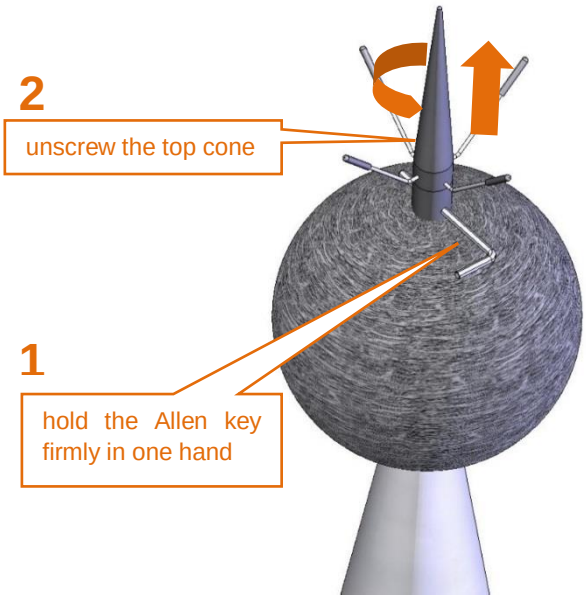
- con nozzle,
- SA 209 foam windscreen,
- extension sleeve,
- microphone protective sleeve.

To access the microphone, do what follows:

1. Push the foam windscreen until you see the lateral hole.



2. Insert the 3 mm Allen key into the hole.
3. Holding the Allen key and the extension sleeve in one hand to keep them still, use the other hand to unscrew the top cone with the anti-bird spikes, rotating it counter-clockwise.

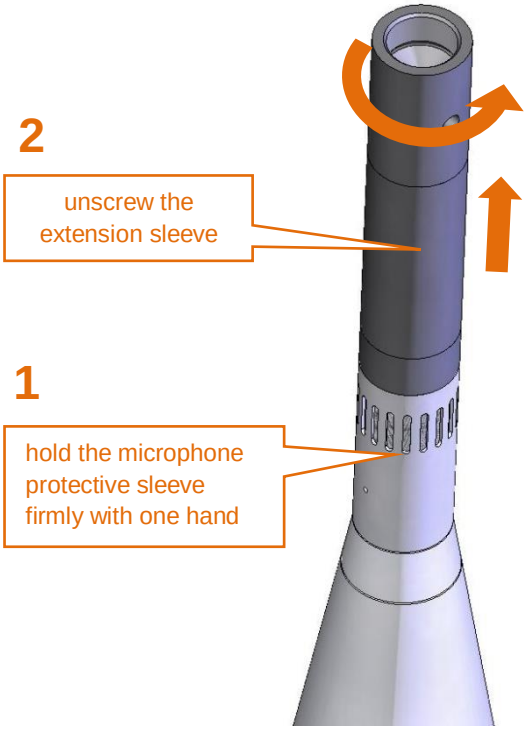


Note: *It is important to keep the extension sleeve still, to protect actuator cable from damage.*

4. Take the Allen key out from the extension sleeve.

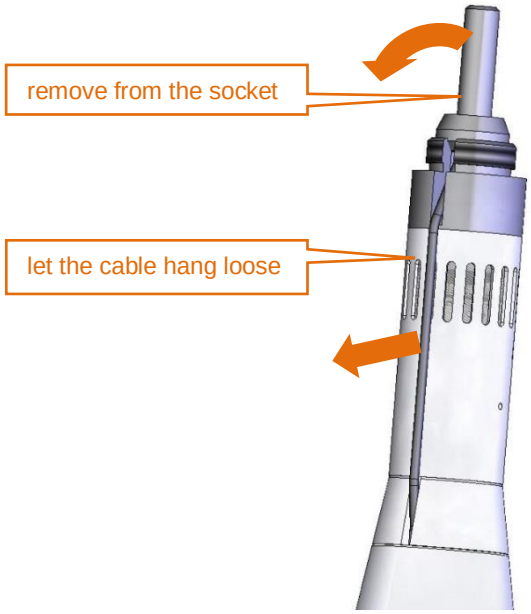
5. Take the foam windscreen off the extension sleeve.

6. Hold the microphone protective sleeve and the outer cone with one hand, use the other hand to unscrew the extension sleeve, rotating it counter-clockwise.

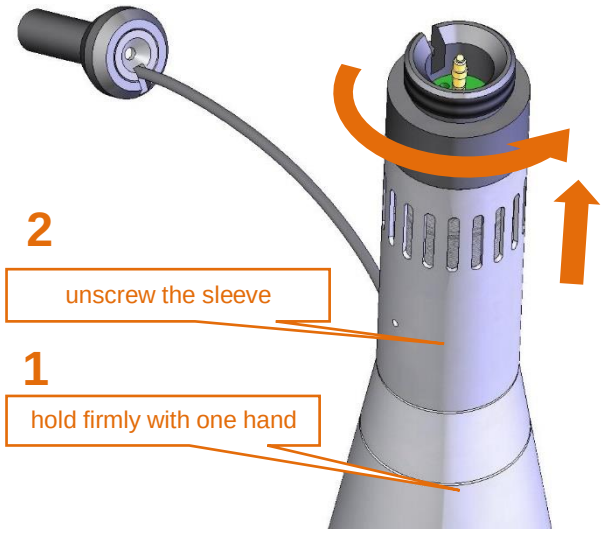


Note: *It is important to keep the microphone protective sleeve still, to protect actuator cable from damage.*

7. Gently remove the actuator form the socket. Let the cable hang loose.



8. Take the outer cone with one hand, use the other hand to unscrew the microphone protective sleeve rotating it counter-clockwise.



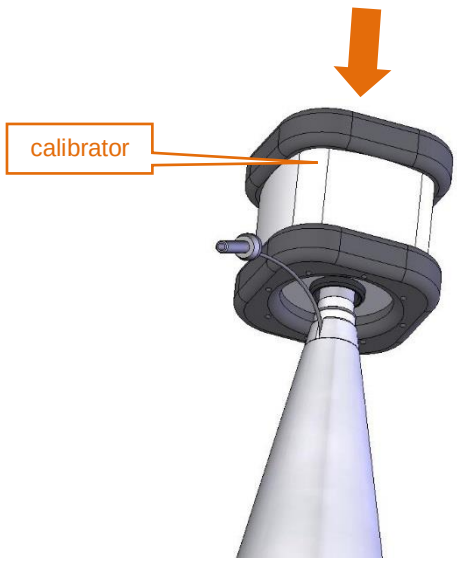
9. Attach the sound calibrator (SV 36 or equivalent 114 dB/1000 Hz) carefully on the microphone.

10. Switch on the calibrator and wait for the tone to stabilize (according to the calibrator specification) before starting the calibration measurement.

11. Perform the calibration measurement – see Chapter 4.2 and 4.3.

12. Take the calibrator off after the calibration.

13. Assemble SV 200A according to Chapter 2.3.



Note: *During the calibration measurement, the level of external disturbances (acoustic noise or vibrations) should not exceed a value of 20 dB below the level of signal generated by the calibrator (94 dB when using a calibrator that generates 114 dB).*

Note: *It is also possible to use an electro-mechanical pistonphone, which generates the signal (ca 124 dB) or different type of sound calibrator dedicated for ½" microphones. In any case, before starting the calibration measurement, you should set in the instrument the level of the signal, which is stated in the certificate of the calibrator.*

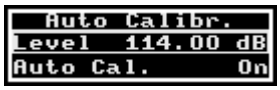
4.2 AUTOMATIC CALIBRATION

Automatic calibration feature was implemented to make calibration as easy as possible and to allow technical personnel to perform a calibration of SV 200A with minimum knowledge and with minimum steps. Automatic calibration doesn't require usage of any interface with SV 200A.

Note: *Automatic Calibration feature is switched off by default. You can switch this feature on from the control panel or via applicable software (see Chapter 5.1, 8.4.1 and 9.8.11)*

When the automatic calibration is switched on, the instrument periodically compares the measured Leq(C) level averaged by 1 second with the calibration level set up by the user. To perform the automatic calibration, follow next steps:

1. Attach the calibrator to the microphone and switch it on (if the used calibrator doesn't have switch-on automatic feature).
2. Switching the calibrator on begins the Automatic Calibration process if the difference between the calibration **Level** value set up in the Auto Calibration screen and the signal level generated by the calibrator is **±5dB**.



3. During the calibration measurement, the level of the calibration signal will be displayed. If three consecutive 1-second results are stable within ±0.1dB margin, the calibration measurement is stopped, and the calibration factor is calculated.

4. If new calibration factor is in the range ±3dB, Automatic Calibration will be successful, and new calibration factor will be saved and displayed. From that moment, new calibration factor will be the current calibration factor without confirmation from the user.

5. If the calculated calibration factor is out of the range ±3dB, Automatic Calibration will fail and the message "Failed!" will appear on the display. In such case the new calibration factor will not be saved and the calibration factor just before the calibration will still be valid.

6. Detach the calibrator from the microphone. After detaching the calibrator from the microphone SV 200A returns to its previous state.

During the automatic calibration, main measurements are stopped (if were running) and the outdoor filter is turned off. After removing the calibrator from the microphone, main measurements will restart after 1 minute (auto-start security mechanism) with switched on outdoor filter.

Note: *Running main measurements are always stopped during automatic calibration procedure.*

4.3 CALIBRATION WITH THE USE OF THE CONTROL PANEL

The calibration via the control panel (manual calibration) gives the user an option to decide whether the new calibration factor should replace the current one.

Note: *Before proceeding with the manual calibration you should be sure that the Automatic calibration is Off (see Chapter 4.2).*

To perform the manual calibration, follow next steps:

1. Uncover the control panel of SV 200A by unlocking and shifting the control panel flap.

2. Press the ▼ and ▲ keys simultaneously to open the Menu window of the panel display**.**

3. Press the Enter key to open the **Function** position, select the **Calibration** position with the ▼ key and press the Enter key to open it.

Enter

4. Press the Enter key to open the **By Measurement** position and set up the required calibration **Level** according to the calibration card of your calibrator. Press the Enter key to confirm the new calibration level.

5. Attach the calibrator on the microphone and switch it on (if the used calibrator doesn't have switch-on automatic feature).

6. Start the calibration measurement by pressing the ▮▶ key. During the calibration measurement, the level of the calibration signal will be displayed. If three consecutive 1-second results are stable within **±0.1dB** margin, the calibration measurement is stopped, and the calibration factor is calculated. Otherwise the instrument will stop the measurement and display the message "Failed!" after 10 seconds from the calibration measurement start.

7. The successful calibration will result in calculation of the new calibration **Factor**, which should be confirmed (**Yes**) with the Enter key or rejected (**No**) with the ESC key. After confirmation, the calculated calibration factor will be the current calibration factor.

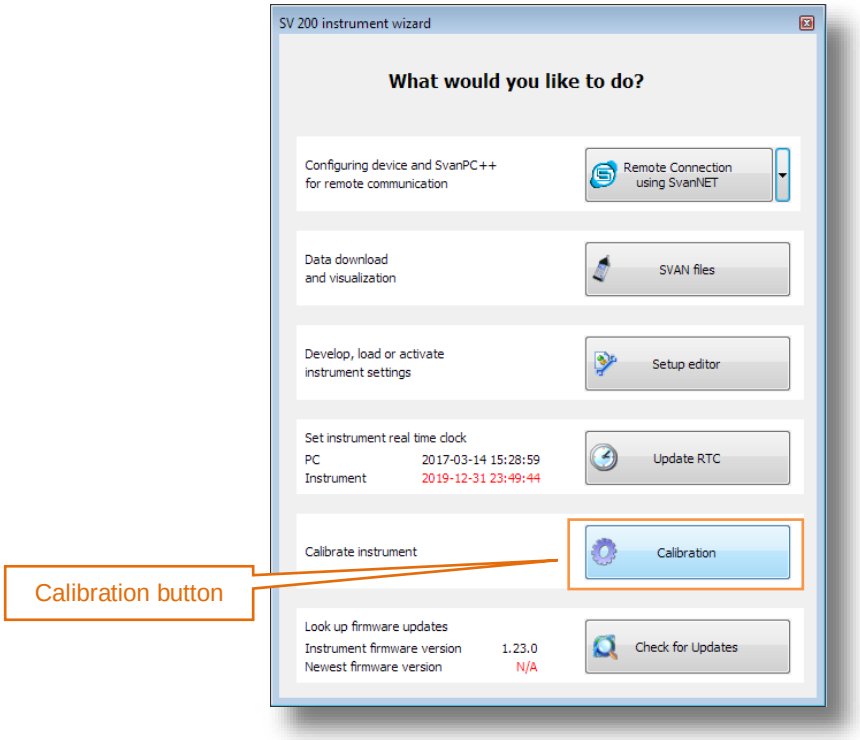
8. If the calculated calibration factor is out of the range **±20dB**, the calibration will fail and the message "Failed!" will appear on the display.

9. Detach the calibrator from the microphone.

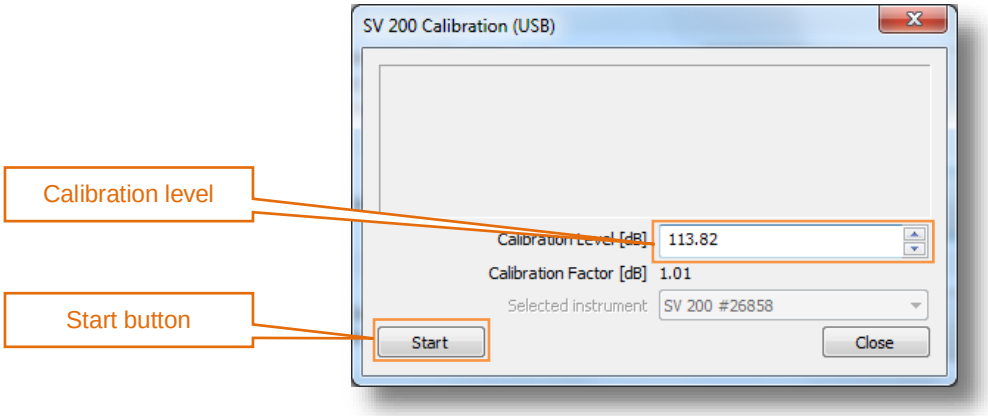
4.4 CALIBRATION WITH THE USE OF SVANPC++ AND USB CONNECTION

1 Connect SV 200A with the PC using SC 256A cable and start **SvanPC++**.

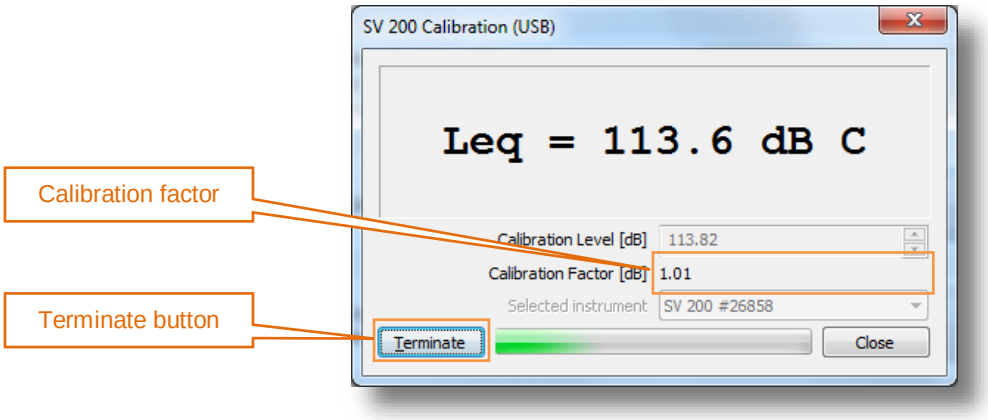
2 When **SV 200A instrument wizard** appears on the screen, click **Calibration.**



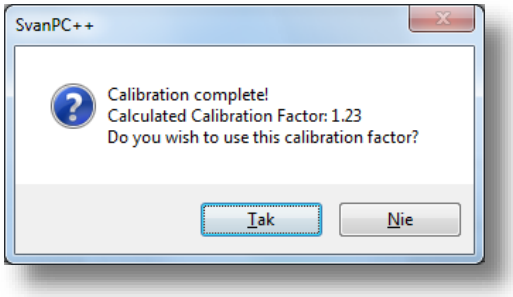
3 Set desired calibration level in the **SV 200A Calibration** window.



4 Attach the calibrator on the microphone, switch it on (if the used calibrator doesn't have switch-on automatic feature) and start the calibration measurement by pressing the **Start** button. The successful calibration will result in calculation of the **Calibration Factor**. Calibration measurement can be terminated by pressing the **Terminate** button.



5 Confirm obtained calibration factor by clicking **Yes**. New calibration factor will replace the previous one in the instrument's memory and will be applied to all subsequent measurement results.



4.5 SYSTEM CHECK WITH THE USE OF ELECTROSTATIC ACTUATOR

The electrostatic actuator is used for remote system check of the instrument, which enables checking the acoustical measurement input of the instrument.

The System Check procedure consists of a sequence of measurements of background noise and a level generated by the electrostatic actuator (94dB). The measurement of background noise is carried out before and after the measurement of a signal level from the actuator. It is assumed that a one-second RMS(C) of the background noise measured for 3 consecutive seconds must be at least 20 dB lower than the nominal level generated by the electrostatic actuator (94dB). If this condition is not met, system check is unsuccessful. If the background condition is met, the station switches on the actuator and waits for stable one-second RMS(C) values with an accuracy of ±0.1dB. The stabilized RMS(C) value of the signal from the actuator cannot deviate from the nominal value (94dB) more than ±1dB. The system check result (OK or Failed) together with the measured levels the background noise and the signal from the actuator is recorded in the calibration and system check history file. The duration of the system check sequence is typically <15s and can be extended up to <25s in the case of longer stabilization period of the RMS(C) generated by the actuator. In the case of the automatic system check function, when the test result is negative, it is repeated 4 times more every 1 minute to obtain a positive test result. If the result is still negative, subsequent attempts are abandoned to the next planned system check.

The measurements are paused for the duration of the system check procedure (active pause).

Note: *Unlike Calibration procedure, system check does not change the calibration factor of the instrument.*

The electrostatic actuator generates 1 kHz tone equivalent to sound pressure level of 94 dB (re. 20 µPa).

It can be turned on or off and programmed remotely by the user:

- via SvanNET Web service, in the **Status** tool (see Chapter 8.3) or
- via SVAN PC++ Remote Control software, in the **Live Results** window (see Chapter 9.6).

Auto System Check feature of SV 200A enables configuring and scheduling automatic check of the instrument:

- via SvanNET Web service, in the **Automatic system check** panel (see Chapter 8.4.1) or
- via SvanPC++ Remote Control software, in the **Automatic system check** panel (see Chapter 9.8.11).

5 OPTIONS OF THE STATION CONTROL

Prior to start operating SV 200A it is necessary to assemble the instrument according to the instructions in Chapter 2, connect the power source if required and switch the instrument on by pressing the Enter key and holding it min 3 sec.

Basic control operations include:

- Measurements start/stop
- Measurement results viewing
- System checking/calibration
- Files downloading/uploading
- Instrument/measurement configuration
- Firmware upgrading.

Most of these operations can be performed manually using the instrument's **Control panel**.

However, SV 200A is dedicated for the outdoor monitoring and must be controlled remotely via mobile network with the use of internal 3G modem, via LAN or WLAN with the use of the internal WLAN module.

SVANTEK offers two tools which enable remote functionality: **SvanPC++_RC** software and **SvanNET** web-service.

SvanPC++_RC is a standard Svantek SvanPC++ software for Windows augmented by Remote Communication module (**RC**). This software is dedicated to all types of communication channels of mobile network as well as for WLAN. SvanPC++ enables advanced data processing and reporting.

SvanNET is a user-friendly web-service enabling most of basic operations. This software doesn't require installation on a PC and can be used on any PC and mobile device via standard Internet browser.

5.1 SV 200A MANUAL CONTROL VIA CONTROL PANEL

When SV 200A is turned on, the measurement Start and Stop is done with key. The running measurement is signalled by live dots underlining of the displayed result.

After pressing start key, the measurement delay is counting down and after this the measurement starts.

5.1.1 Measurement results viewing

The View mode is a way in which the measurement parameters are presented. In other words, when you change the View mode, specific measurement parameters and status information will be presented in different manner. The View modes can be changed with the Enter or ESC key.

SV 200A has the following View modes:

- Charging view mode,
- Running SPL view mode (active only when measurements are stopped),
- Basic view mode,
- Large view mode,
- Vertical view mode,
- Powering status view mode,
- Communication information view mode.

Charging view mode

Charging view became active when the external power supply is connected to switched off SV 200A. Just after connection of the external power supply the big battery icon with percentage of charging is displayed and after 10 seconds the floating battery icon appears instead of big battery icon.

If power supply unit is disconnected SV 200A will be switched off after a short period.

If in this mode, USB cable is connected to the PC or the Enter key is pressed SV 200A will start executing firmware program and finally enter the Running SPL view.

Running SPL view mode

Running SPL view is used when the measurement is not running, e.g. when the instrument is in standby mode before or after the measurement. In this mode, the current SPL result is calculated and displayed, but not stored in the instrument's memory. The purpose of this is to give the user a first indication of the noise level. In this view mode the instrument behaves as a simple general-purpose sound level meter.

Basic view mode

The measurement result and its value are displayed in the left part of the screen. In the right part of the screen, battery icon, real time and profile number are displayed.

The required measurement result is selected with the ▼ or ▲ key.

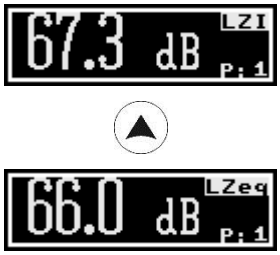
In the right upper corner of the screen, two icons are displayed:

- "battery" icon, showing the status of the internal battery or
- "lighting" icon, showing the status of the external power supply

and

- "clock" icon and real time beneath it or
- "sandglass" icon and elapsed measurement time beneath it.

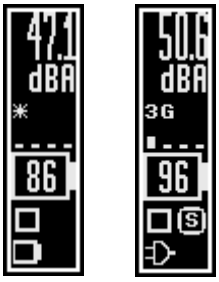
Large view mode



The measurement result is displayed with big font in the left part of the screen. In the right part of the screen, the measurement result name and profile number are displayed.

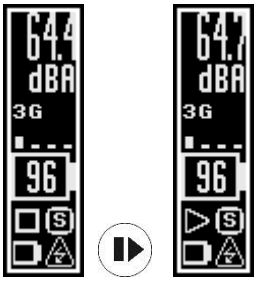
The required measurement result can be selected with the ▼ or ▲ key.

Vertical view mode

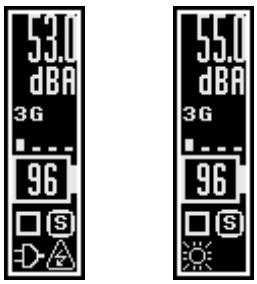


The measurement result is displayed in a way to enable reading when the instrument is in the vertical position. Below the result, information about the instrument status is displayed in the form of icons regarding:

- connection status:
  - no active interface {*},
  - active interface {**2G/3G**, **WI** (WLAN infrastructure mode), **WA** (WLAN access point mode) and **LN** (LAN mode)},
  - radio signal power { , , , , },
  - connection to the remote peer { (SnanNET), (remote server, e.g. SvanPC++)},

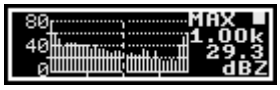


- internal battery capacity {  },
- measurement status:
  - measurement is stopped {  },
  - measurement is running {blinking  /  },
- power source:
  - internal battery {  },
  - solar panel {  },
  - power supply unit or external DC source {  },
  - power over Ethernet { PoE },
  - USB power { USB },
- other statuses:
  - switched on actuator {  },
  - active GPS {  , blinking when GPS is not fixed }.



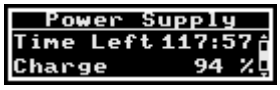
Spectrum view mode

1/1 or 1/3 spectra are displayed for **LEQ** and **MAX** band results together with three TOTAL values (**TOT A**, **TOT C** and **TOT Z**). The cursor shows the result for the band or the result for TOTAL value: central band frequency, result in dB (for LEQ spectra) and filter (A, C, B, Z) (for MAX spectra). The cursor position can be changed with the  or  key.



Power Supply status view presents:

- type of the power **Source**: internal **Battery**, power supply unit (**Mains**), **Solar** panel, **USB** or from the Ethernet (**PoE**),
- charging **Status**: **Charging** or **Not Charging**,
- estimated working time without charging or time to full charging of the internal batteries (**Time Left**),
- the battery **Charge** status in %,
- battery **Capacity** in Ah,
- battery temperature in °C (**Temp.**).



Communication information presents:

- **Interface** type: **2G/3G**, **LAN**, **WLAN**, **BT** (Bluetooth),
- Connection **Status**: **None** (if the modem is switched off), **Init OK** (if the modem is switched on, but there is no connection), **Internet** (if the instrument is connected to the Internet), **Connected** (if connection with remote peer, but not SvanNET, has been established), **SvanNET** (if the instrument has established connection with the SvanNET web-service),
- **Signal** level (RSSI) in dBm or **None**,
- **Traffic** (amount of sent and received bytes since modem on),
- Modem **Manufacturer**,
- Modem **Model**,
- Internal firmware **Revision** of the modem,
- **IMEI** number of the modem,
- **MAC** address of the WLAN module.

5.1.2 Configuration Menu

The instrument control panel enables limited tools for configuration the instrument and measurements. The configuration can be performed through the instrument's **Menu**, which is opened by simultaneous pressing of the ▼ and ▲ keys and consists of several configuration sections:

- **Function**, which enables selecting of the measurement function or performing calibration;
- **Measurement**, which enables configuring measurements,
- **Display**, which enables configuring automatic switching off the screen;
- **Instrument**, which enables configuring the instrument's real-time clock and viewing instrument's serial number and firmware version;
- **Auxiliary Setup**, which enables selecting of the interface language and recovering factory settings.

The required section can be selected with the ▼ or ▲ key and opened with the Enter key. Using the ESC key you can exit the current section.

In the **Menu** screens, you can:

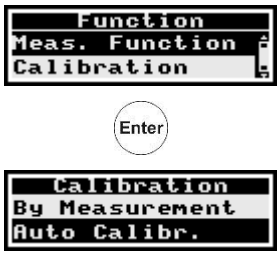
- select the required position with the ▼ or ▲ key,
- open new screen of the selected position with the Enter key,
- return to the upper menu with the ESC key,
- make selected parameter ready for changing with the Enter key,
- select parameter value with the ▼ or ▲ key,
- confirm changes with the Enter key,
- exit the current screen with parameters unchanged with the ESC key.

For example, to switch auto calibration, you should select the **Auto Cal.** position, press the Enter key and select **On** or **Off** with the ▼ or ▲ key. To confirm the selection, press Enter, and press ESC to exit the **Auto Calibration** screen.

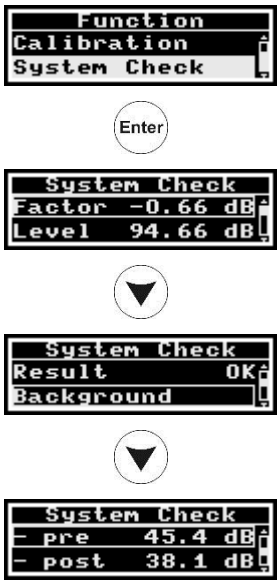
Function section contains positions:

- **Measurement Function**, which enables selecting of the measurement function: **Level Meter**, **1/1 Octave** or **1/3 Octave**.

- **Calibration**, which enables performing calibration **By Measurement** using a sound calibrator and switching on/off the **Auto Calibration**.



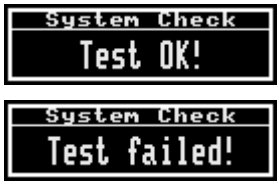
- Position **System Check**, which enables checking the measurement path using the built-in electrostatic actuator. The System Check screen shows the result of the previous system check:
  - calculated **Factor**,
  - measured **Level** of the actuator signal,
  - **Result** of the checking: **OK** (if **Factor** is within ±1 dB) or **Failed**,
  - **Background** noise before (**- pre**) and after (**- post**) the measurement,
  - **Date** and **Time** of the system check performance.



After pressing the key the instrument starts measurement and measures:

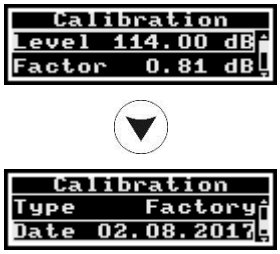
  - background noise level (**- pre**) for 3 seconds,
  - level of actuator (**Level**) during next 5 seconds and
  - background noise level (**- post**) during next 3 seconds.

The result of the system check will be displayed after the measurement: "**Test OK!**" or "**Test Failed!**"



In the **Calibration** list:

- Position **By Measurement** allows to:
  - view information about the last calibration: **Level** of the calibration signal, calibration **Factor** value, calibration **Type** (**Factory**, **Manual**, **Auto** or **Remote**), calibration **Date** and **Time**;



The **Factory** calibration is the default calibration and you can always come back to it after **Factory Settings** command.

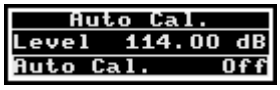
Other calibration type is defined automatically depending on how the last calibration was performed.

- set the **Level** of the calibration signal, according to the used calibrator, by pressing the Enter key on the **Level** position, changing the level with the ▼ or ▲ key and confirming made changes with the Enter key,

- and perform calibration measurement by pressing the ▮▶ key (considering that the sound calibrator is attached!). During the calibration measurement, the level of the calibration signal will be displayed.

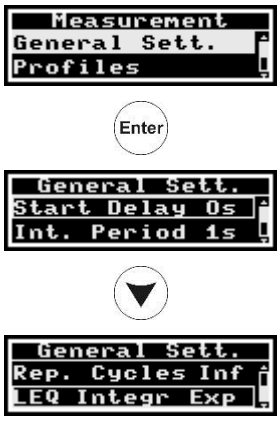
After the calibration measurement, the new calibration factor should be confirmed (**Yes**) by the Enter key or rejected (**No**) by the ESC key.

- Position **Auto Cal.** opens a screen in which you can change the level of the calibrator signal and switch **On** or **Off** the auto calibration function. If Auto Calibration is switched on the calibration measurement will start automatically after the instrument detects the stable noise level, equal to the defined in the **Level** position ±5dB.

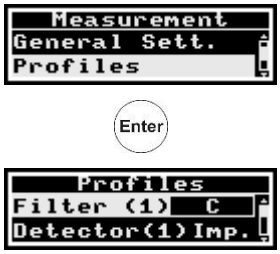


Measurement section contains positions:

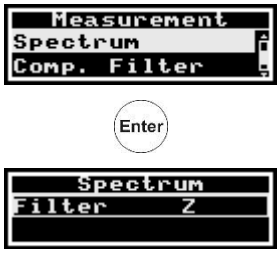
- **General Settings**, which enables setting of the general measurement parameters: measurement **Start Delay** (the delay after pressing the ▮▶ key and the measurement real start), **Integration Period**, number of measurement **Repetition Cycles** (if **Infinite** is selected the measurements will be repeated until the ▮▶ key will be pressed) and type of the **LEQ Integration** (**Linear** or **Exponential**).



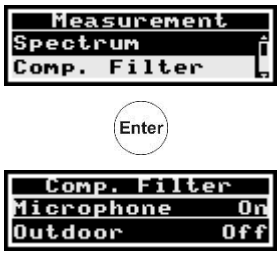
- **Profiles**, which enables setting for each measurement profile input **Filter** and exponential LEQ **Detector** time constant.
  - **Filter** can be **A**, **C** (type 1 according to IEC 651 and IEC 61672-1:2013), **B** (type 1 according to IEC 651) or **Z** (type 1 according to IEC 61672-1:2013),
  - **Detector** type can be: **Impulse**, **Fast** or **Slow**.



- **Spectrum**, which enables setting of:
  - weighting filter for the 1/1 Octave and 1/3 Octave analysis: **Z**, **A**, **C** or **B**,
  - **Detector** type: **Linear**, **Fast** or **Slow**.



- **Compensation Filter**, which enables setting of the compensation filter: **Microphone** (for laboratory purposes only) and **Outdoor** (**Environmental**, **Airport** or **Off** (none)).



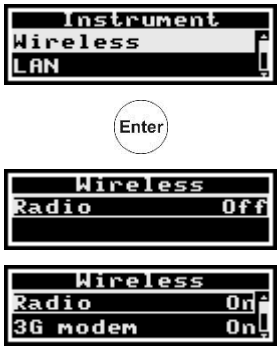
Display section contains positions:

- **Screen Off**, which enables setting the period of the screen switching off after last use of any key. Selecting **Off** disables this function;
- **Auto Rotate**, if switched **On**, activates the proper view on the screen: vertical view mode in the situation when the instrument is in vertical position or any other views when the instrument is in horizontal position.

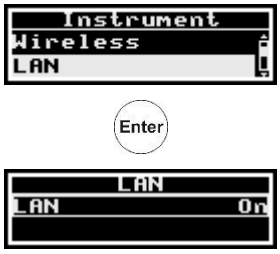
Instrument section contains positions:

- **Wireless**, which enables switching on/off all communication modules (**Radio**) and activating wireless communication modules (**3G modem**, **WLAN Mode** or **Bluetooth**) and **GPS** in the case the **Radio** position is **On**.

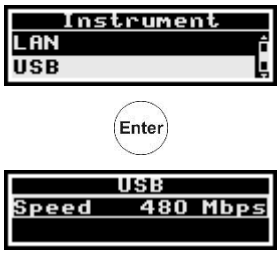
  WLAN Mode switches on/off the mode of the WLAN interface to access point (**WA**), infrastructure (**WI**).



- **LAN**, which enables activating the LAN interface.

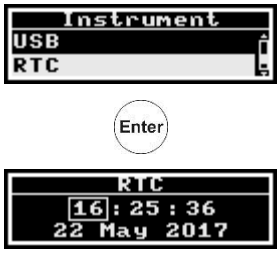


- **USB**, which enables configuring the transmission speed of USB port: **12 Mbps** or **480 Mbps**.



- **RTC**, which enables setting the internal real-time clock of the instrument.

For setting the RTC, it is necessary to select one of the field in the RTC screen (hh:mm:ss) and press the Enter key, as a result of which the selected field changes it's background to the white. Select the necessary hour, minute or second with the ▼ or ▲ key and confirm made changes by the Enter key.



- **Unit Label**, which enables viewing:
  - instrument's type, serial number and firmware version,
  - instrument's class and standards, it confirms.

Auxiliary Setup section contains positions:

- **Language**, which enables selecting the interface language,
- **Factory Settings**, which enables recovering factory settings (including the factory calibration factor).

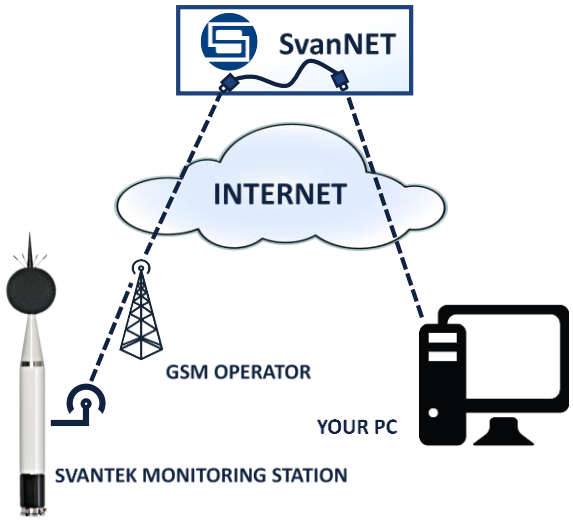
5.2 SV 200A REMOTE CONTROL VIA SVANNET WEB-SERVICE

SvanNET is a web-service that simplifies the remote connection between PC and Svantek monitoring stations.

SvanNET connection maintains all type of SIM cards for a 3G modem regardless of having a public or private IP.

The connection over the SvanNET allows users to:

- use a mobile phone or tablet to watch real time measurement results,
- download files and reconfigure the station,
- download files and reconfigure the station using SvanPC++_RC module,



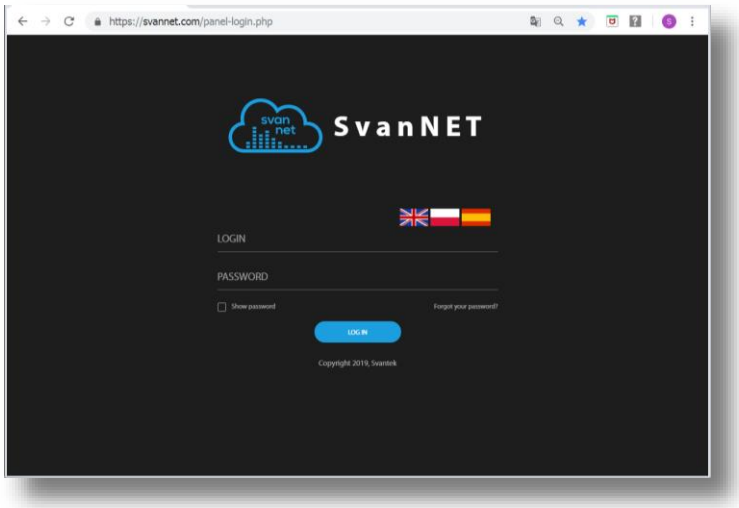
- use the SvanPC++_RC application based on MS Windows® for automatic control of noise monitoring stations, data archiving, automatic web publication, etc.

Note: *Establishing 3G connection requires usage of the SIM card with no PIN protection and activated Internet access. Installation of the SIM card is described in Chapter 3.1.1.*

Before you start using the SvanNET web-service:

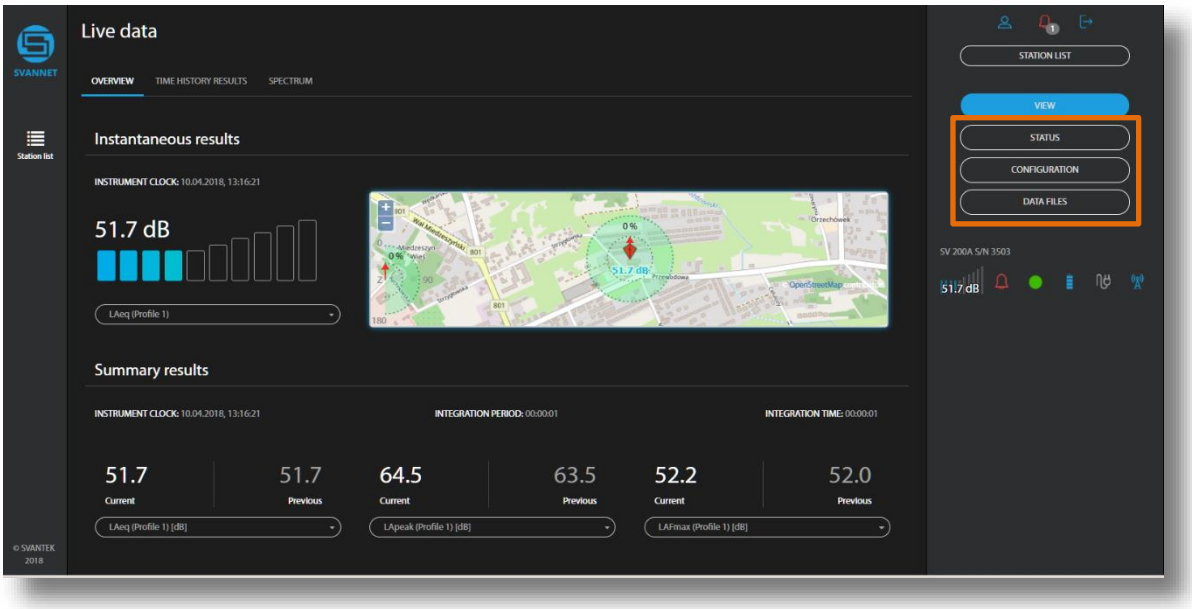
1. Check that your local distributor has created the SvanNET account for you and assigned your station to your SvanNET account.
2. Check the Access Point Name (APN). The default setting for the APN is "internet". It is possible that your Internet provider is using a different APN. In this case, the APN must be entered manually via SvanPC++ software.
3. Check the connection with SvanNET. Successful connection with SvanNET is indicated by the icon on the SV 200A display.

4. To access SvanNET, log in to your account at: https://www.svannet.com/panel-login.php



Before logging, select your language.

Once logged in, you can use the web-service to view data and control the monitoring station: start/stop measurements (**STATUS** button), configure the station (**CONFIGURATION** button) and download files (**DATA FILES** button).



SvanNET functionality is described in detail in Chapter 8.

5.3 SV 200A REMOTE CONTROL VIA SVANPC++_RC PROGRAM

SvanPC++ is a program that enables different remote-control options of the SV 200A from your PC:

- with the use of USB connection,
- with the use of Internet connection via 3G modem,
- with the use of LAN or WLAN connections.

SvanPC++ is free of charge program, that every user can download from SVANTEK web-site. SvanPC++ maintains USB connection with SV 200A. Whereas all types of wireless connections require activation of the **Remote Communication** module (**RC**).

Remote control of the SV 200A via SvanPC++_RC is described in Chapter 0.

6 REMOTE COMMUNICATION

SV 200A is equipped with three modules that can maintain remote communication with the instrument:

- GSM modem (3G),
- WLAN/ LAN module and
- Bluetooth module.

There is dedicated software that supports remote communication with SV 200A:

- SvanPC++_RC for remote configuration, remote control, data retrieving and data processing,
- SvanNET web-service for remote control and data retrieving,
- Svannet App for remote communication configuration.

6.1 MAIN COMMUNICATION CHANNEL

Main communication channel is the TCP/IP connection (a lossless data exchange protocol) that can be used to exchange commands as specified by Appendix A to SV 200A User Manual. SvanPC++ assures this connection and provides data download, configuration, performance validation and measurement start/stop.

Main communication channel of SV 200A can be established by one of two available methods: TCP/IP Client or TCP/IP Server. The SV 200A stations firmware version 1.03.4 does not support SSL (Secure Socket Layer) connections.

The **TCP Client** is a mode of main communication channel in which SV 200A is configured to initiate connection to a designated address (*remote host*). SV 200A attempts to establish a TCP/IP connection to a designated address on a designated port (*Data Port*) automatically. Should the connection be established successfully, SV 200A can exchange commands with the remote server. Should the connection attempt fail or is broken by the *remote host*, SV 200A will attempt to reconnect again. To prevent the connections from going *idle* (a state in which the TCP/IP connection seems to be active, but no data can be transferred), the station maintains the connection to the server by sending small packages of data at keep alive period (which by default is one minute). If the transfer is not properly acknowledged by the other party, the connection will be terminated.

Note: *TCP Client mode is used in the SvanNET web-service. SvanPC++_RC supports all modes of TCP/IP connection.*

SV 200A uses the TCP Client mode to connect to SvanNET (this is the default setting of the station) or another user defined server. The user also connects to SvanNET via web browser or SvanPC ++, and the service creates a "bridge" between the station and the user. In this case for 3G communication there are no restrictions on the SIM-card tariff (no public IP address is required) and simple internet access is enough. The essence of SvanNET is to simplify the procedures and requirements necessary for the connection.

TCP Server is a mode in which SV 200A is configured to act as a server for incoming connections. SV 200A is waiting for the first connection to be established on a designated port (called *Data Port*; default 8000). Such connection can come from any application - an initiator of the TCP/IP connection (such as SvanPC++) called *remote peer*. For 3G communication this mode requires the SIM-card with a *public address* (called *public IP*).

6.2 SMS / E-MAIL ALARMING

SMS/E-mail alarming functionality allows SV 200A to inform the user about different events eg. exceeded thresholds, low battery etc. by SMS and/or E-mail notification. SV 200A can send an SMS to a defined number(s) and/or an E-mail to a defined address(es) with alarm and its details.

SV 200A has implemented advanced alarm mode. Advanced alarms configuration can be performed using SvanNET or SvanPC++ application in Station Configuration of the Remote Communication Center (see Chapter 9.8.12). The E-mail alarming uses SvanNET e-mails feature to send e-mails. The benefits of SvanNET e-mails is that the user does not required to have any e-mail client account on SMTP server and that e-mails are SSL encrypted. The content of the message is created automatically.

Note: *SvanNET e-mail service uses SSL connection.*

It should be noted that SMS alarming does not require the internet connection and, as such, the SIM-card does not require any data transfer plan as sending SMS messages is done entirely over GSM network. E-mails still require access to the internet.

6.3 INTERFACE CAPABILITIES OF 3G MODEM

The 3G modem enables a wide spectrum of interfacing capabilities using GSM based internet access. The 3G modem offers the main communication channel, SvanNET e-mail functionalities and SMS alarms notifications.

6.4 INTERFACE CAPABILITIES OF WLAN/LAN MODULE

SV 200A is equipped with the WLAN/LAN module, which uses a different method of remote connection. Rather than establishing connection to the internet via GSM operator, it connects directly to Local Area Network via the Ethernet cable (LAN) or wireless communication (WLAN). The user needs to provide a networking environment for the instrument to connect to.

The WLAN/LAN module can be configured to work in one of two modes: Wireless (default) or Wired.

Wireless connection requires no cables, although it still needs to remain in close proximity to the devices (normally 100m at the open area) it is intended to connect with (as per limitation of the wireless connection protocol). When properly configured, the module will remain connected to the designated network when powered up. The wireless connection can be set up in two ways: Access Point (default) or Infrastructure.

Access Point connection method allows direct wireless connection to a computer equipped with a wireless communication module. To establish the connection with SV 200A it is necessary to find the network with SSID “SV200A_#xxxxx” (xxxxx is a SV 200A serial number) on your PC and connect to it using a password. Default password is “Svantek”.

Infrastructure connection, rather than being a direct wireless link between the computer and SV 200A, facilitates a standalone, dedicated device called ***Access Point*** to which all wireless devices connect to. This requires SV 200A to be configured to connect to such Access Point using its SSID (network name) and security settings. The module will remain connected to the network once properly configured.

Wired connection requires physical link to the LAN network. Upon connection, the WLAN/LAN module will become a part of the Local Area Network, and all PCs that also are members of the network will be able to connect to it.

Note: *In any given moment, the WLAN/LAN module can only work in Wired or in Wireless mode. For example, connecting Ethernet cable while the module is configured for Wireless will have no effect.*

The WLAN/LAN module offers main communication channel and SvanNET e-mail functionalities. Details of the connections’ behaviour depend on the WLAN/LAN settings, allowing the configuration of **TCP Server** and **TCP Client** modes.

In local area network environment (wired or wireless) SV 200A provides a broadcast packet to identify itself in the network subnet. It uses UDP protocol and port 7000 to send a packet eg. “#1,U200A,N12345,I192.168.1.1,P8000;” see Appendix A for details about #1 protocol description. The packet is sent every 5 seconds.

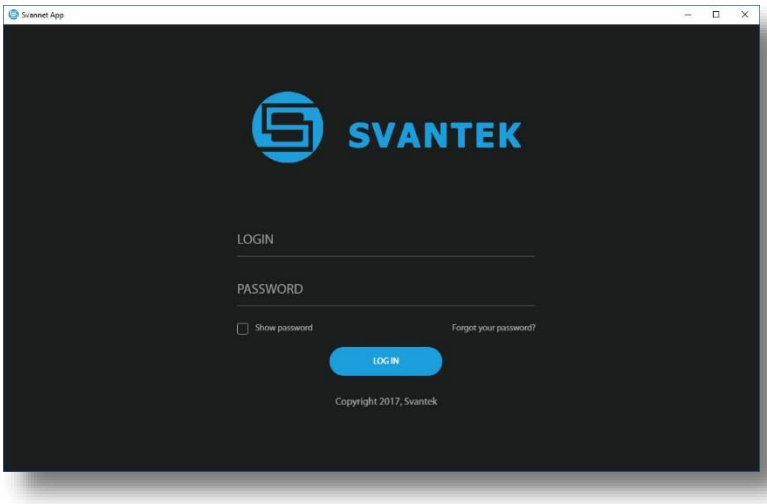
6.5 INTERFACE CAPABILITIES OF BLUETOOTH MODULE

SV 200A has the built-in Bluetooth Low Energy module compliant with the Bluetooth 4.0 standard. Data exchange between the instrument and external devices is performed using the Bluetooth Low Energy Svantek proprietary characteristics.

7 CONFIGURATION OF THE REMOTE CONNECTION – SVANNET APP

SVANNET APP is a tool that enables automatic configuring the remote connection of your SV 200A with the SvanNET web-service and SvanPC++.

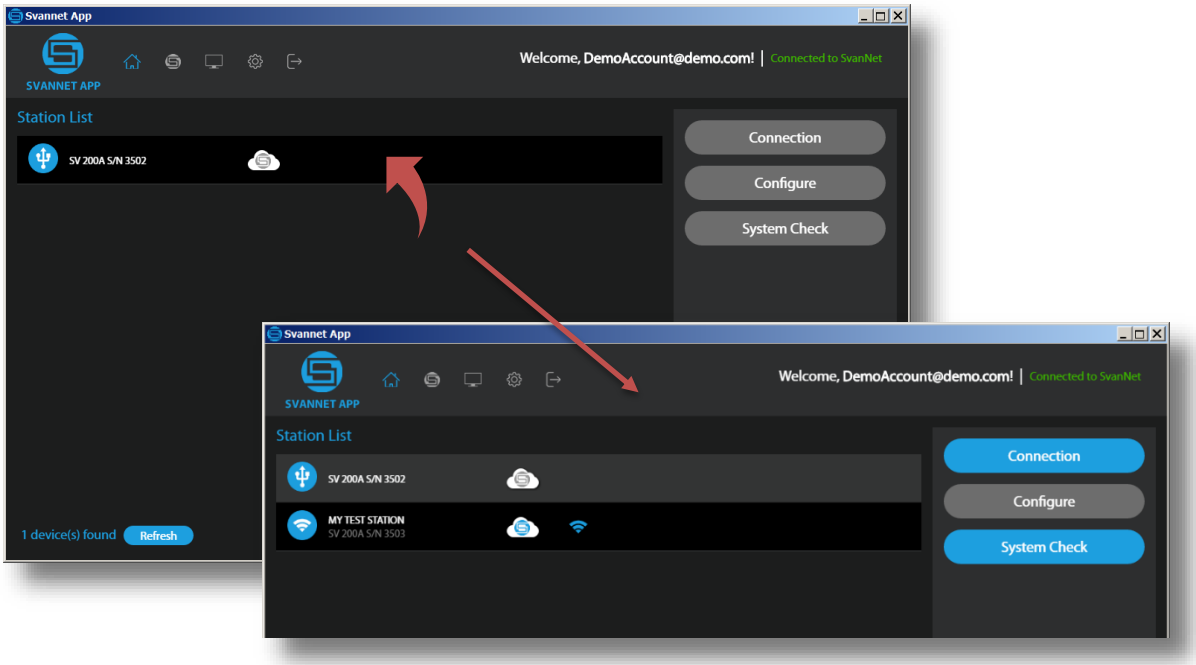
To start configuration, it is necessary to connect your SV 200A to your PC by means of the USB cable or connect it to the Access Point with SSID "SV200A_#xxxxx" and run the SVANNET APP program.



***Note:** To have access to **SVANNET APP** the local SVANTEK distributer should create the user's account and assign monitoring stations to it.*

After logging, the screen with all connected Svantek instruments will appear.

Select the instrument you wish to connect by clicking on the left-hand box. Some buttons from the right side will change their colours from grey to blue depending on connection status with the SvanNET web-service. Blue colour means active status of the screen element (button, icon).

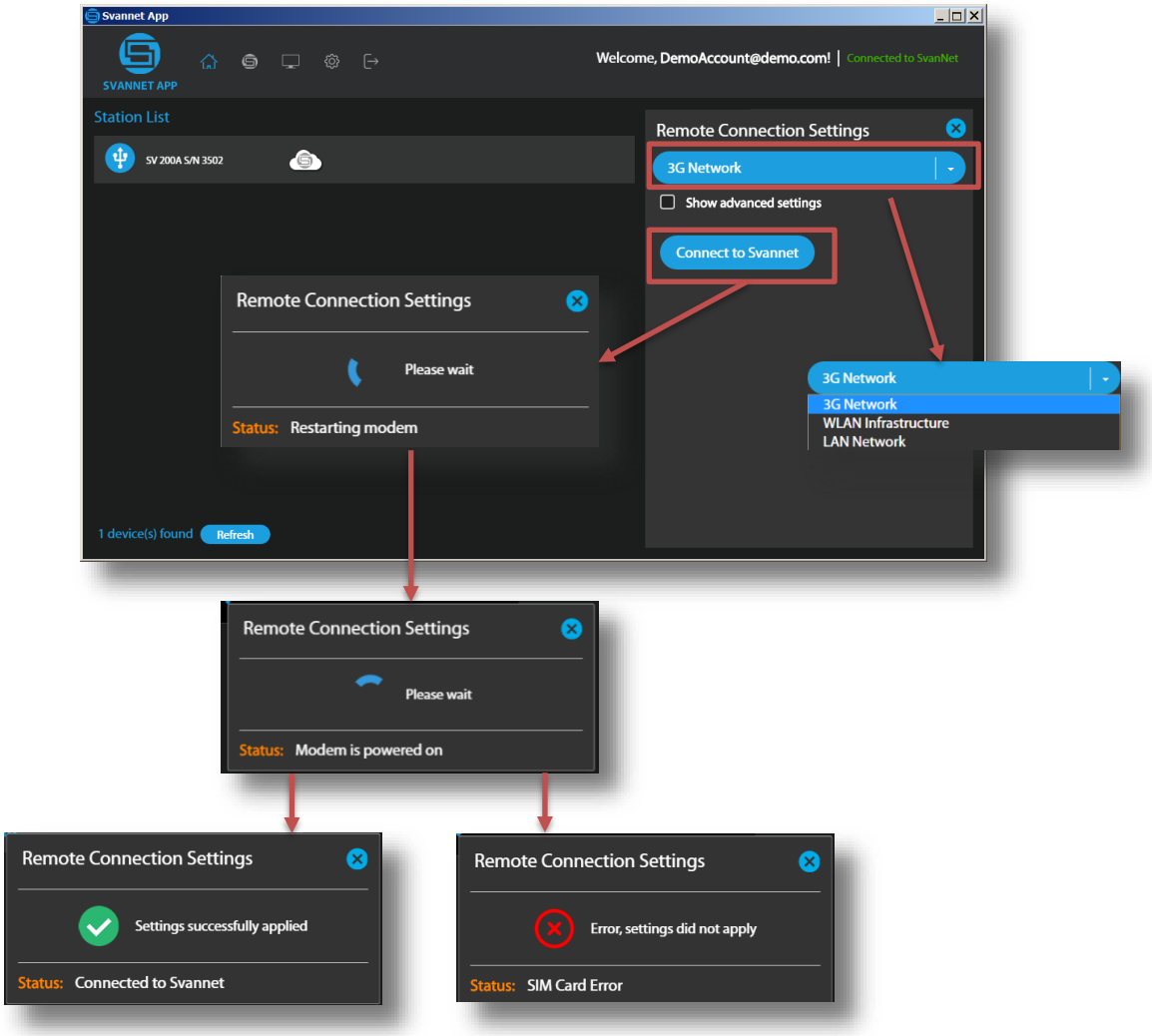


If your instrument is not connected to the SvanNET web-service by means of 3G, LAN or WLAN the **Configure** button will not be active.

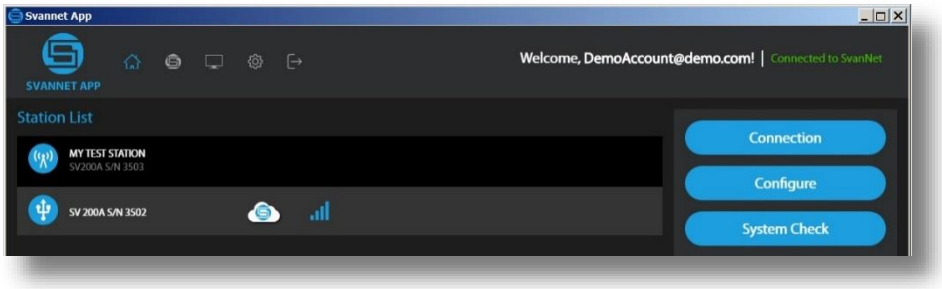
Refresh button is used for searching the stations connected to the PC by USB, WLAN or visible as Access Point. Searching lasts for 30 seconds and during searching the button is changed to **Stop**. You can stop searching at any time by clicking the **Stop** button.

7.1 CONFIGURATION OF THE SV 200A CONNECTIONS

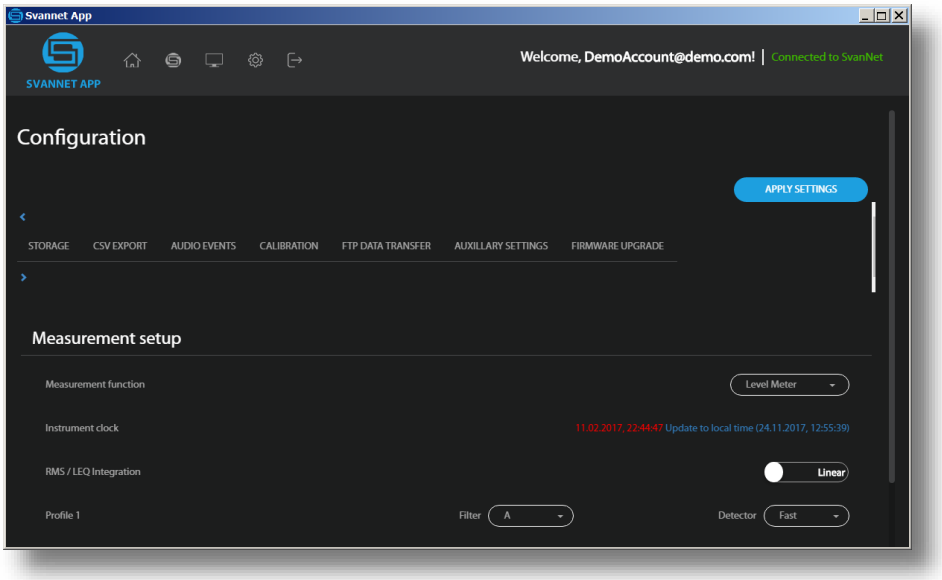
Click on the Connection button and the **Remote Connection Settings** sidebar will change its view, offering selection of the connection type: **3G Network** (with the use of the 3G modem), **WLAN Infrastructure** and **LAN Network** (with the use of the WLAN/LAN module) and the button that connects the station to the Internet (**Connect to Svannet** or **Connect to Other Server**).



If connection is successful, the Configure button changes its colour to the blue one.



If you click on the Configure button the program will open the SvanNET Configuration section where you can configure the SV 200A settings.

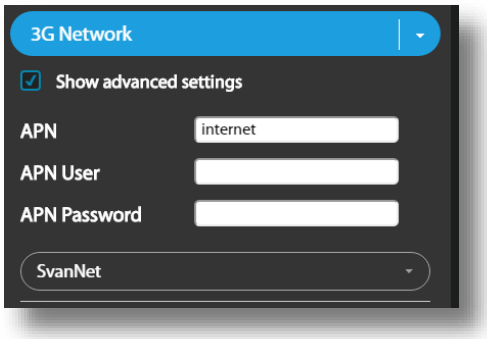


To return to the SVANNET APP press the  icon or SVANNET APP logo.

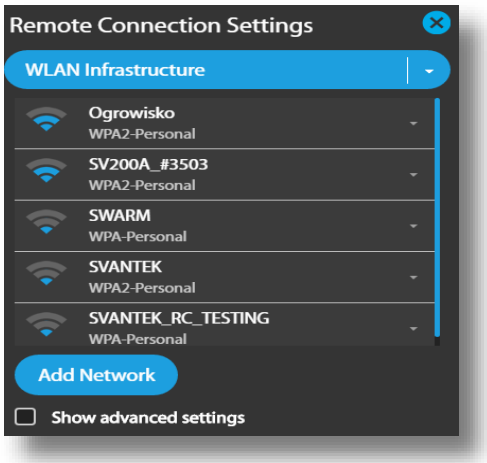
7.1.1 Remote Communication Settings

By default, the **3G Network** connection type and the connection to the SvanNet web-service configuration (**Connect to SvanNET**) is proposed. After clicking the **Show Advanced settings** tick box additional settings will appear.

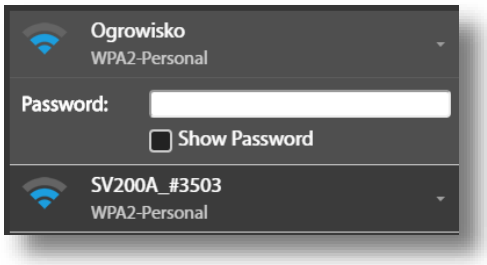
If the **3G Network** connection is selected, advanced settings will consist of: **APN** name, **APN User** name and **APN Password**.



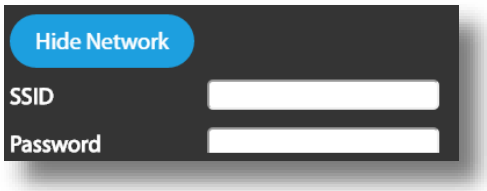
If the **WLAN Infrastructure** connection is selected, the program will show the list of available WLAN networks.



If you click on the selected network, it will drop down letting you to key in the network **Password**.

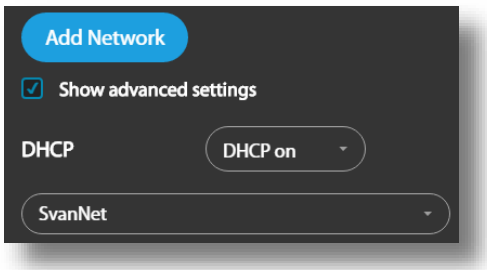


Clicking on the **Add Network** button you will be able to define: Service Set Identifier (**SSID**) and the network **Password**.



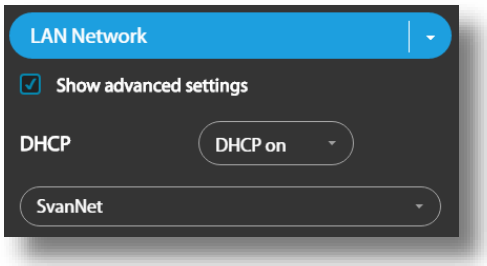
Clicking on the **Show Advanced Settings** tick box you can switch on or off the Dynamic Host Configuration Protocol (**DHCP**).

Usually **DHCP** should be **On**.



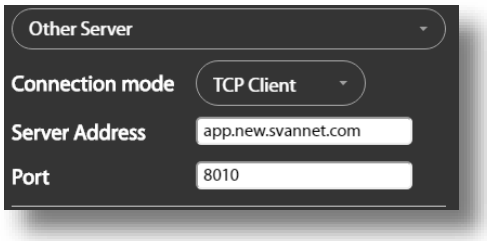
The **LAN Network** connection doesn't require any parameters to configure except Dynamic Host Configuration Protocol (**DHCP**), which can be switched on or off after clicking on the **Show Advanced Settings** tick box.

Usually **DHCP** should be **On**.



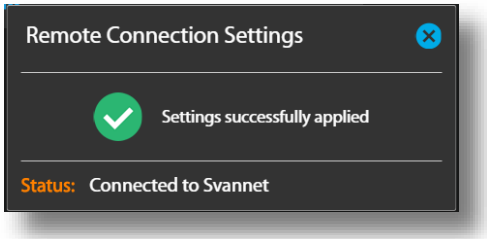
By selecting **Other Server**, the dropdown menu appears in which you can select: **TCP Server** or **TCP Client** (**Connection mode**), remote address for TCP/IP client connection (**Server Address**) and **Port** for this connection.

.



To set the selected connection press the 

button. In case of successful connection, the message "Settings successfully applied!" appears.

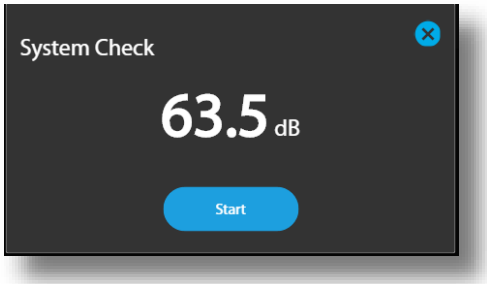


7.2 SV 200A System Check

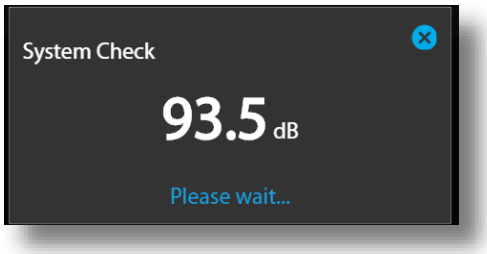
Click on the 

button if you wish to perform the System check.

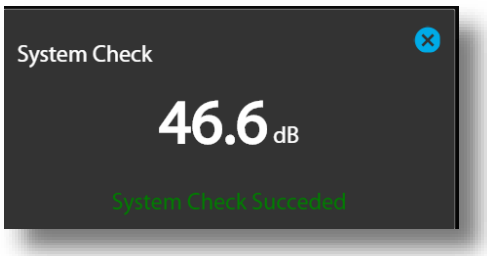
The **System Check** pop-up window with the current SPL result will appear.



Press Start button and SV 200A will pause the running measurement, switch on the electrostatic actuator, measure its level and display it in the **System Check** pop-up window.

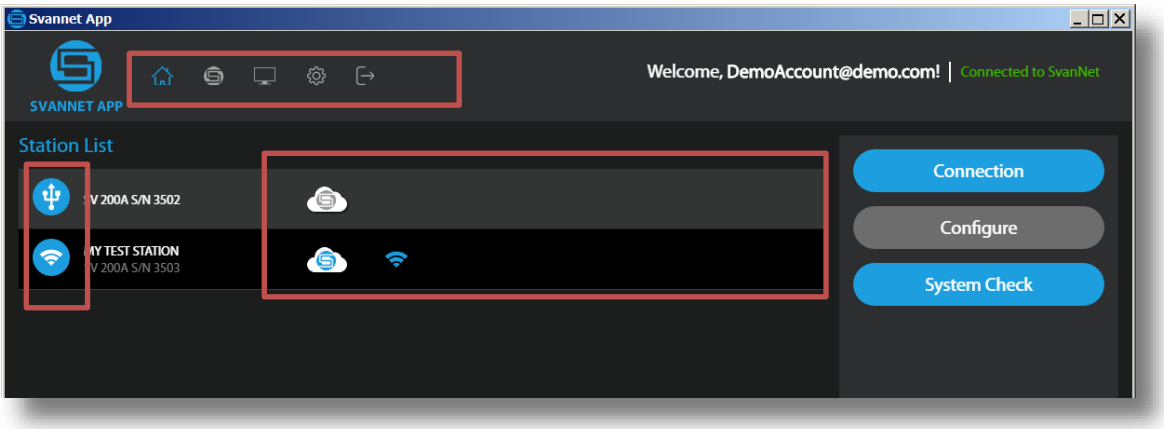


After finishing system checking the current SPL result will be displayed in the **System Check** pop-up window with the message "**System Check Successful**".



7.3 Icons of SVANNET APP

Other functions of SVANNET APP relate to icons-buttons, located in the upper line of the window.



 - returning to the main screen

 - opening the SvanPC++ program

 - opening the SvanNET web-service

 - application settings

 - exiting SVANNET APP

Icons in the instrument's line have informative nature. Icon located at the left side of the instrument's bar informs about the instrument connection type with the PC:

 - USB connection,

 - WLAN connection,

 - LAN connection,

 - Access Point connection.

First icon at the right side of the bar line informs about state of connection with the SvanNET web-service:

 - not connected,

 - connected.

Second icon at the right side of the bar line informs about connection type with the SvanNET web-service:

 - 3G connection,

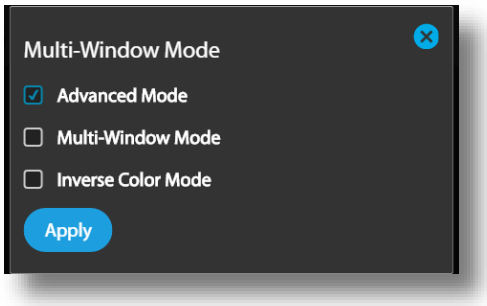
 - WLAN connection,

 - LAN connection.

7.4 ADVANCED MODE

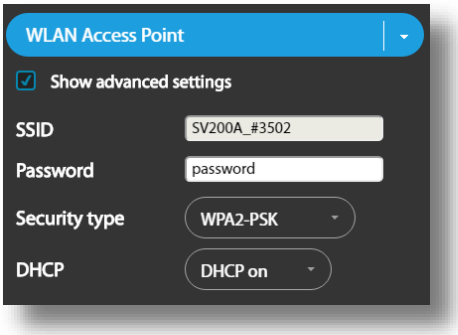
If you click on the  button the pop-up window appears in which you can select the **Advanced Mode** of this application.

Advanced mode allows in addition to three types of connection, described earlier, configure the forth one - **WLAN Access Point** connection.



If **WLAN Access Point** connection is selected, in advanced settings you will be asked to define: service set identifier (**SSID**), **Password**, **Security type** (**Open**, **WEP-64bit**, **WEP-128bit**, **WPA-PSK** or **WPA2-PSK**) and the Dynamic Host Configuration Protocol (**DHCP**).

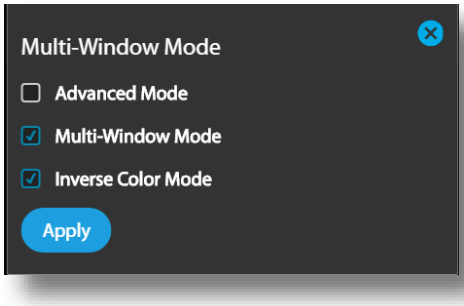
Usually **DHCP** should be **On**.



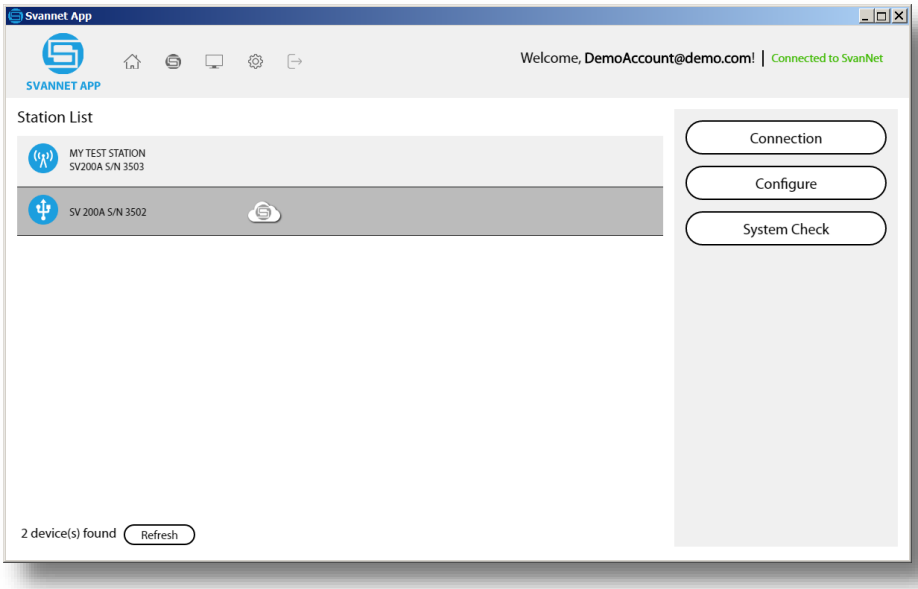
7.5 OTHER OPTIONS

Other positions in the application settings enable selecting **Multi-Window Mode** or **Inverse Color Mode**.

In the **Multi-Window Mode**, the SvanNET Configuration section will appear in the separate window.



The **Inverse Color Mode** screen is presented below.



8 SVANNET WEB-SERVICE

When enabled, and the instrument is properly configured, **SvanNET** Web-service offers you simple access to the instrument's settings, results and status information.

To start use SvanNET the user should browse https://svannet.com and log-in on it.

Note: *To have access to the* ***SvanNET*** *web-service the local SVANTEK distributer should create the user's account and assign monitoring stations to it.*

The SvanNET interface depends on the package of tools assigned to your account and access level and includes:

– projects tools (**Project list**)

– individual stations tools (**Station list**).

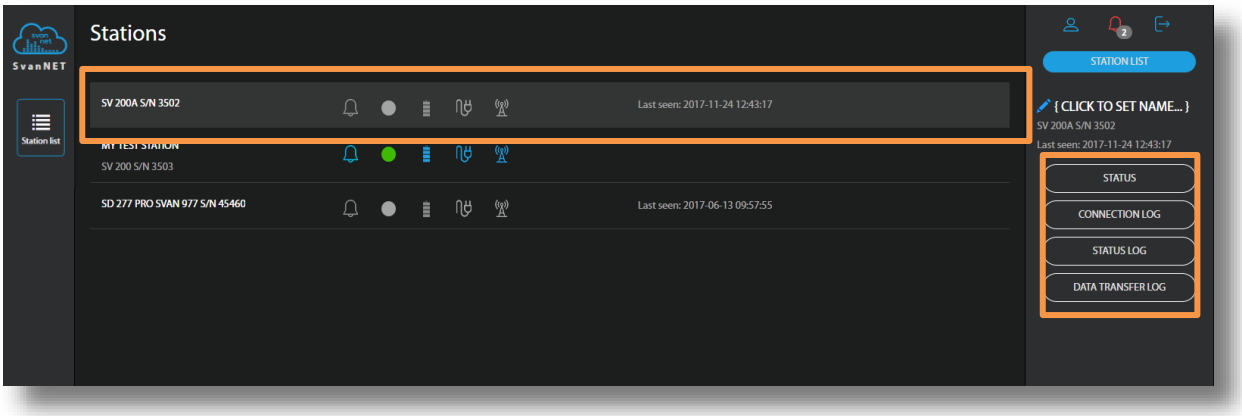
If you have extended SvanNET package, you can use both tools. If you have standard SvanNET package, only Station list tool is available.

Note*: This manual describes only the* ***Station list*** *tools. To get more information about* ***Project list*** *see SvanNET User Manual.*

8.1 STATION LIST VIEW

Station list displays all stations assigned to your account – turned on and off. When you click the station, it becomes active and the tools at the right panel will be dedicated to this particular station.

If the selected station is turned off clicking one of the buttons in the right-side panel you can check the station status (**STATUS**) and open three logs: **CONNECTION LOG**, **STATUS LOG** and **DATA TRANSFER LOG**.



If you click the left field of the grey bar the label with station information appears.

If the selected station is turned on you can additionally open the WEB-interface (by pressing the **WEB INTERFACE** button) from which you can control the station and configure it.

The station bar except station name with serial number includes five icons that indicate station state. When station is disconnected from SvanNET all icons are of grey colour.

If you click the station name, station information will be displayed.

If you click the icon, this icon status information will be displayed.

The status icons on the station bar have following meanings:

Warning about emergency situations: blue - everything is OK, red – unregular event is happening.

Information about the communication with the station: green - correct, in progress; yellow - the station doesn't respond to the command for a long time; red – the station is not connected to SvanNET.

Battery status. When you click this icon, information about charging level will be displayed.

External power source status: blue – the instrument is powered by the external source, grey - there is no external power. When you click this icon, information about external source will be displayed.

Connection status. When you click this icon, information about connection status and signal strength will be displayed.

The Tool panel provides some functions for station control. To switch the function, point cursor on the appropriate button (it will change its colour to blue) and click it.

The blue **STATION LIST** button just informs you that you are in the Station view.

You can set the new station name instead of the default clicking  .

The **WEB INTERFACE** button switches you to the Live data view (see Chapter 8.2) in which you can view measurement results and use additional tools to configure station parameters, download data files, start/stop measurements and perform station checking. This button is available for the stations connected to SvanNET.

The **STATUS** button switches you to the Station status view (see Chapter 8.1.1) in which you can check the station status and configure status alarms.

The **STATUS LOG** button switches you to the Status log view (see Chapter 8.1.2) in which you can check the power source (type and charge level), memory free space, GSM signal quality and history of system checking.

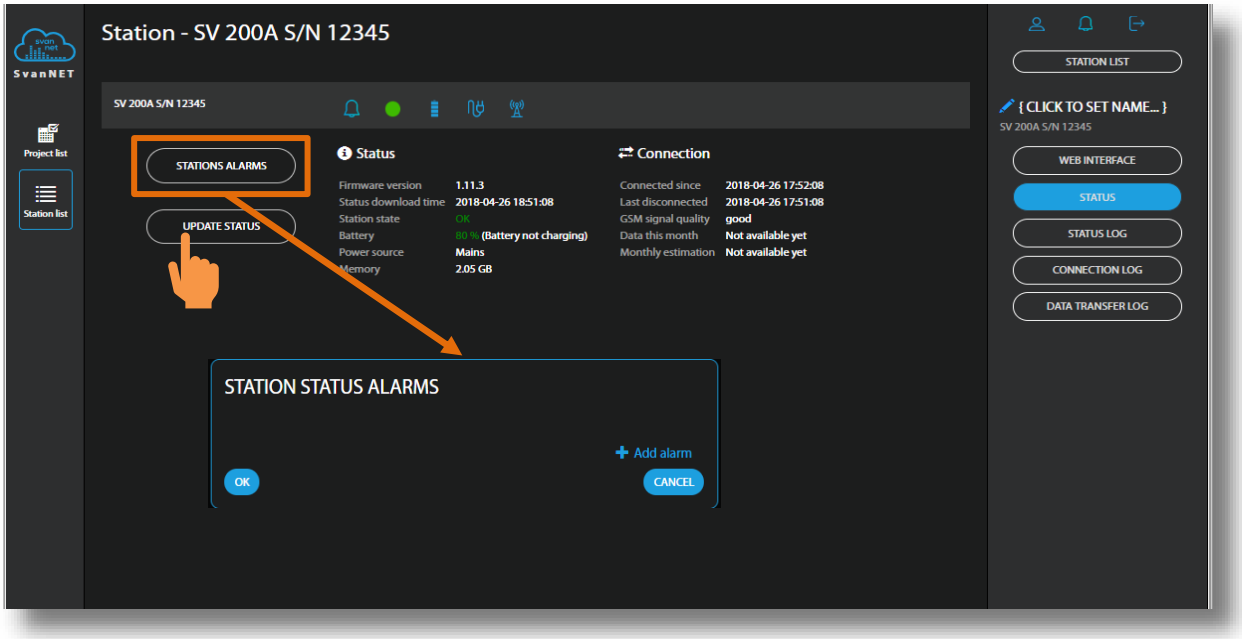
The **CONNECTION LOG** button switches you to the Connection log view (see Chapter 8.1.2) in which you can check the history of station connections.

The **DATA TRANSFER LOG** button switches you to the Data transfer log view (see Chapter 8.1.2) in which you can check the history of data transfers (uploads).

8.1.1 STATUS view

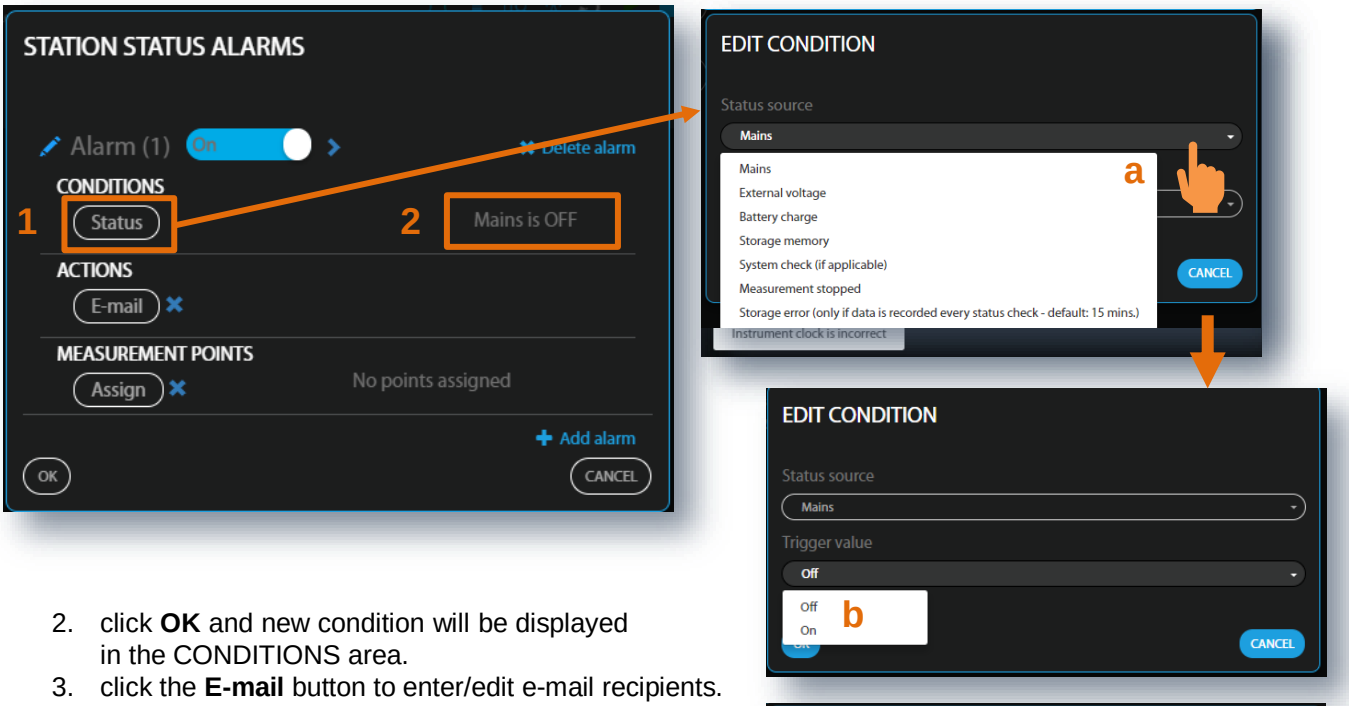
In the STATUS view you can check the station status (firmware version, battery charging, memory etc.), its connection status and configure stations alarms.

- To update instrument's status, click the **UPDATE STATUS** button.
- To configure status alarms Conditions and related Actions for the measurement points, click the **STATIONS ALARMS** button.

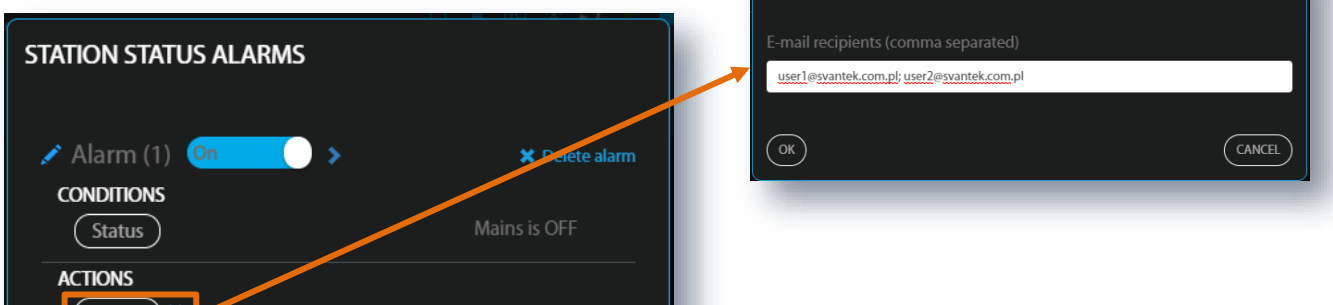


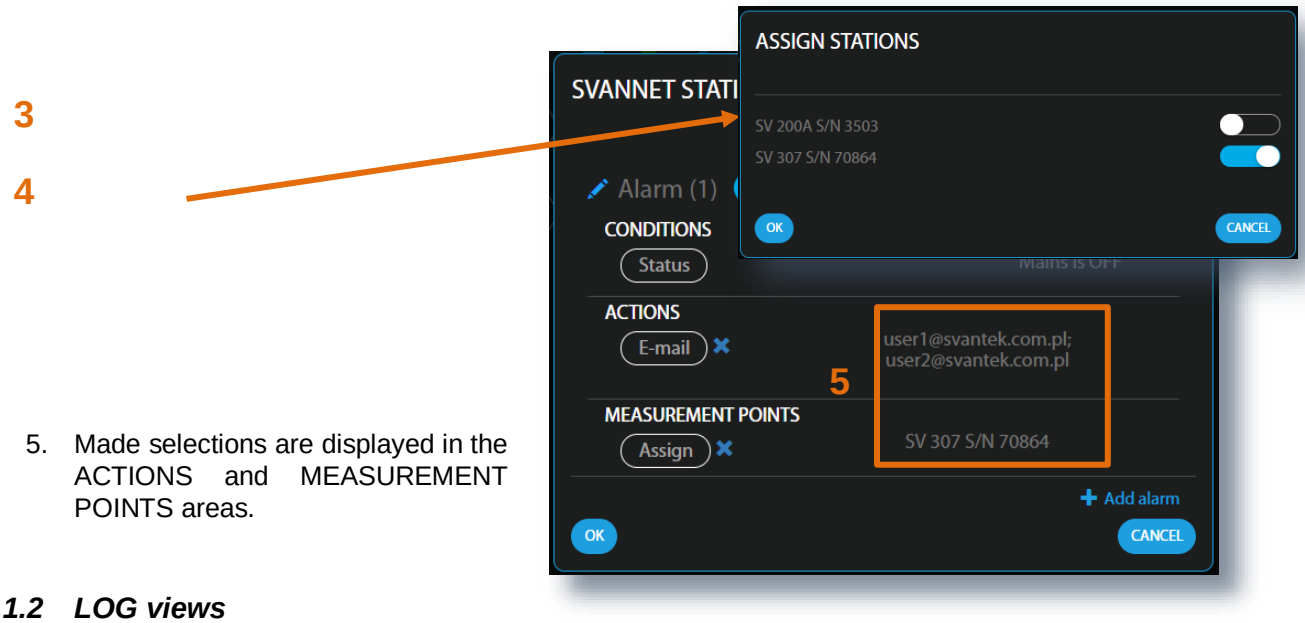
Click **+Add alarm** in the STATIONS STATUS ALARMS pop-up box and new Alarm with CONDITIONS, ACTIONS and MEASUREMENT POINTS areas will appear. Alarms are based on CONDITIONS and relate to ACTIONS, that are default e-mails to the specified recipients, and refer to MEASUREMENT POINTS. To configure Alarm:

1. click the **Status** button and in the EDIT CONDITIONS pop-up box:
   a. select **Status source**: **Mains**, **External voltage**, **Battery charge**, **Storage memory**, **System check** or other positions,
   b. click the **Trigger value** selector and choose the required threshold level for the selected **Status source**.



2. click **OK** and new condition will be displayed in the CONDITIONS area.
3. click the **E-mail** button to enter/edit e-mail recipients.
4. click the **Assign** button to refer alarm to the station(s).



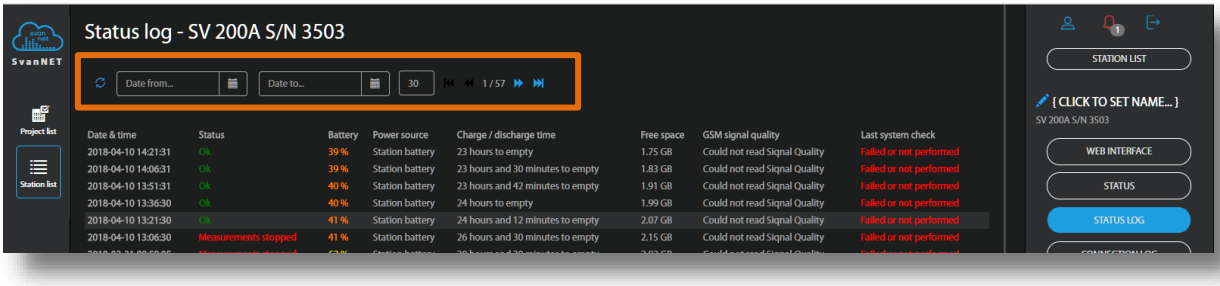


5. Made selections are displayed in the ACTIONS and MEASUREMENT POINTS areas.

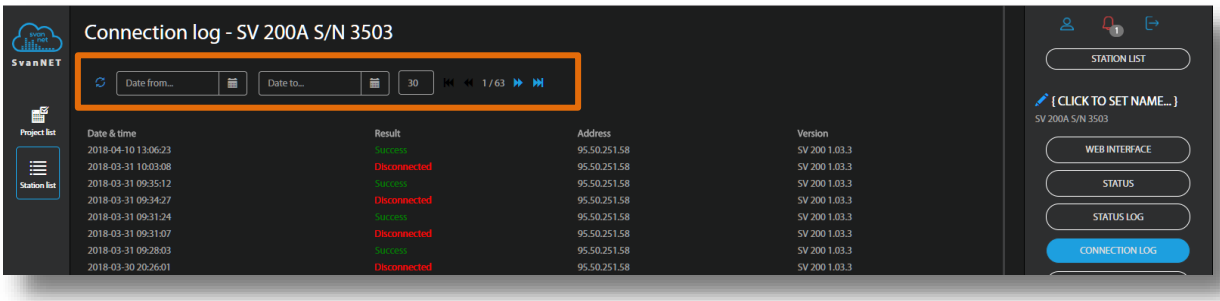
8.1.2 LOG views

There are three station logs, that register system events, connections and data transfer:

- Status log which registers power source (type and charge level), memory free space, GSM signal quality and system check history,
  In the upper line you can: refresh the log, select the required period of records to be displayed and rewind records.



- **Data Connection log** which registers history of station connections.
  In the upper line you can: refresh the log, select the required period of records to be displayed and rewind records.



- **Data transfer log** which registers history of data transfers (uploads).
  In the upper line you can: refresh the log, select the required period of records to be displayed and select the period for data transfer presentation: Monthly, Weekly, Daily or Hourly.

8.2 WEB INTERFACE VIEW

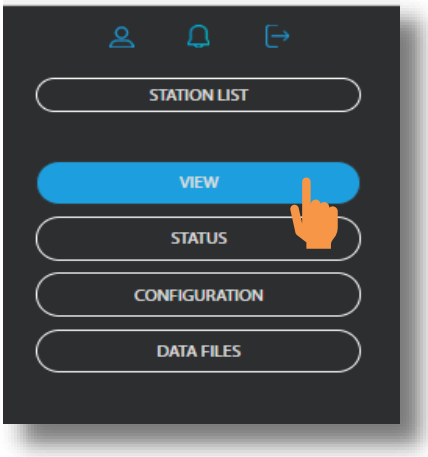
The **WEB INTERFACE** view is available for the stations connected to SvanNET and enables: measurement results viewing, station parameters configuring, data files downloading, measurements start/stop and station checking.

The **VIEW** button switches you to the **Live data** view (see Chapter 8.2.1) in which you can view broadband results, 1/1 or 1/3-octave spectra and time-history results.

The **STATUS** button switches you to the station status view (see Chapter 8.3) in which you can check the station status and start/stop measurements.

The **CONFIGURATION** button switches you to the station **Configuration** view (see Chapter 8.4.1) in which you can configure measurement and instrument parameters.

The **DATA FILES** button switches you to the **Storage** view (see Chapter 8.4) in which you can download files manually.



***Note**: Content of the **Configuration** tabs depends on the selected parameters. The task of this manual is not the presentation of all possible combinations of parameters, but an indication of the principles of working with SvanNET.*

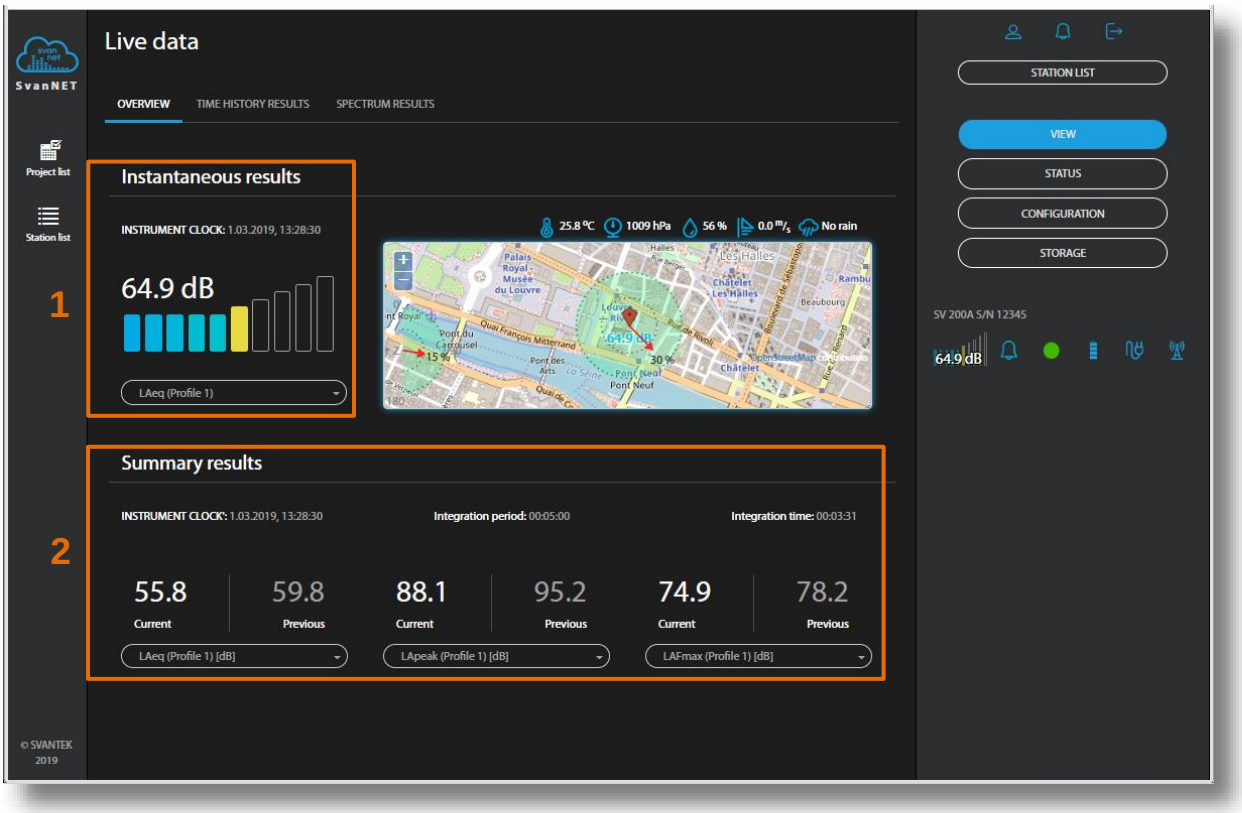
8.2.1 Live data view

The **Live data** view includes three tabs: **OVERVIEW**, **TIME HISTORY RESULTS** and **SPECTRUM RESULTS**.

The **OVERVIEW** tab displays current broadband results:

1. **Instantaneous Results**, measured by 1-second period and
2. **Summary Results** (**Current** and **Previous**) measured in the selected profiles by the "Integration Time" period.

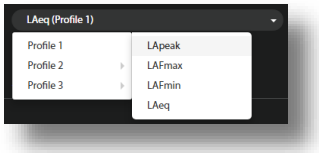
The map field is used to show the instrument's position and meteorological data.



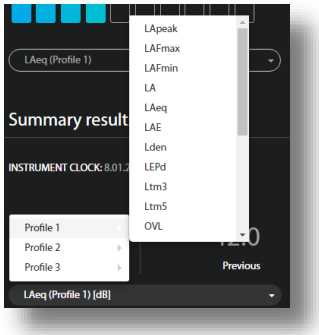
The **Current** Summary results are updated every second and present the result measured by **Integration time**. The **Previous** Summary results show result measured by **Integration period**.

The type of the measured result with the used filter and detector as well as the profile in which this result is measured is presented in the selector field below the result value. Click the result selector field to select new profile and measured result:

- for **Instantaneous results**, you can choose a result from the list: **Lpeak**, **Lmax**, **Lmin** or **Leq**.



- for **Summary results**, you can choose a result from the list: **Lpeak**, **Lmax**, **Lmin**, **LA**, **Leq**, **LAE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **OVL** and ten statistical level results (Lnn).



Such results as **Lpeak**, **Lmax**, **Lmin** or **Leq** include in their names filter abbreviation (**A**, **B** or **Z**) and **Lmax**, **Lmin** results include also detector type abbreviation (**F**=Fast, **S**=Slow, **I**=Impulse).

All measured results are dscribed and formulaes are presented in the Appendix D to this manual.

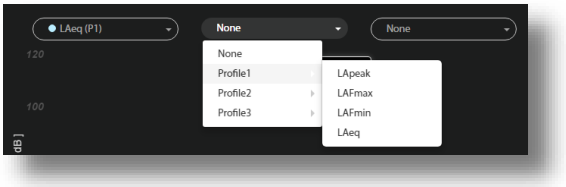
***Note**: The Instantaneous results are not saved in the instrument's files, while the Summary results can be saved if the **Save summary results** option is switched on in the STORAGE tab.*

The **TIME HISTORY RESULTS** tab displays the time history of the selected measurement results.

In this tab you can:

1. Choose results for simultaneous displaying with the use of selector buttons (Leq, Lpeak, Lmax and Lmin) measured in profiles with weighting filters (A, B, C or Z) and detectors (Fast, Slow or Impulse).
2. Change the time range for presentation of results.
3. Point your mouse cursor on the plot to readout the values for this time point.
4. Scroll the time window over the time history.

There are four results (**Leq**, **Lpeak**, **Lmax** and **Lmin**) measured with appropriate weighting filters and detector types and available for each measurement profile from the pop-down list.



The **SPECTRUM RESULTS** tab displays current 1/1 or 1/3-octave Instant and Averaged results (LZeq) and three Total results. In this tab, you can:

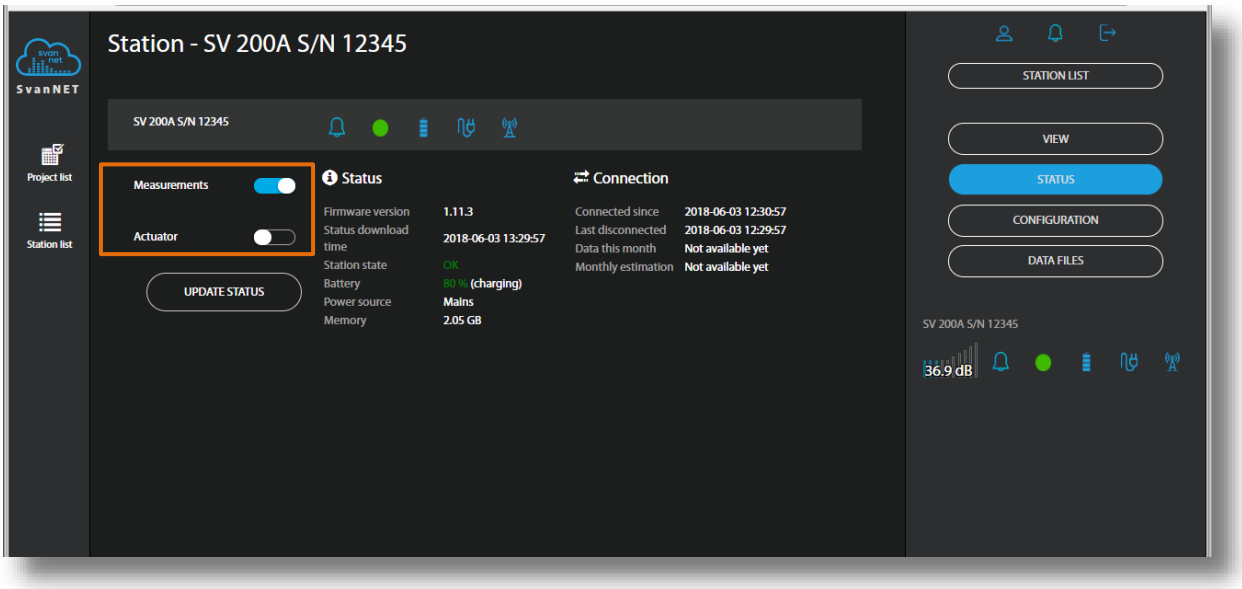
1. Point your mouse cursor on the plot to readout the values of instantaneous and averaged results for each 1/1 or 1/3-octave band.
2. Point your mouse cursor on the last three bars of the plot to readout the values of instantaneous and averaged three Total results.

Note: *Spectra can only be displayed, when the* ***Octave 1/1*** *or* ***Octave 1/3*** *measurement functions has been selected in the* ***Configuration → Measurement setup*** *tab.*

8.3 STATUS VIEW

If you click on the **STATUS** button being in the **WEB INTERFACE** mode, you will shift to the **Status** view which is similar to the above (see Chapter 8.1.1).

Difference is that instead Alarm setting in this view you can start/stop measurements and the actuator for system checks.

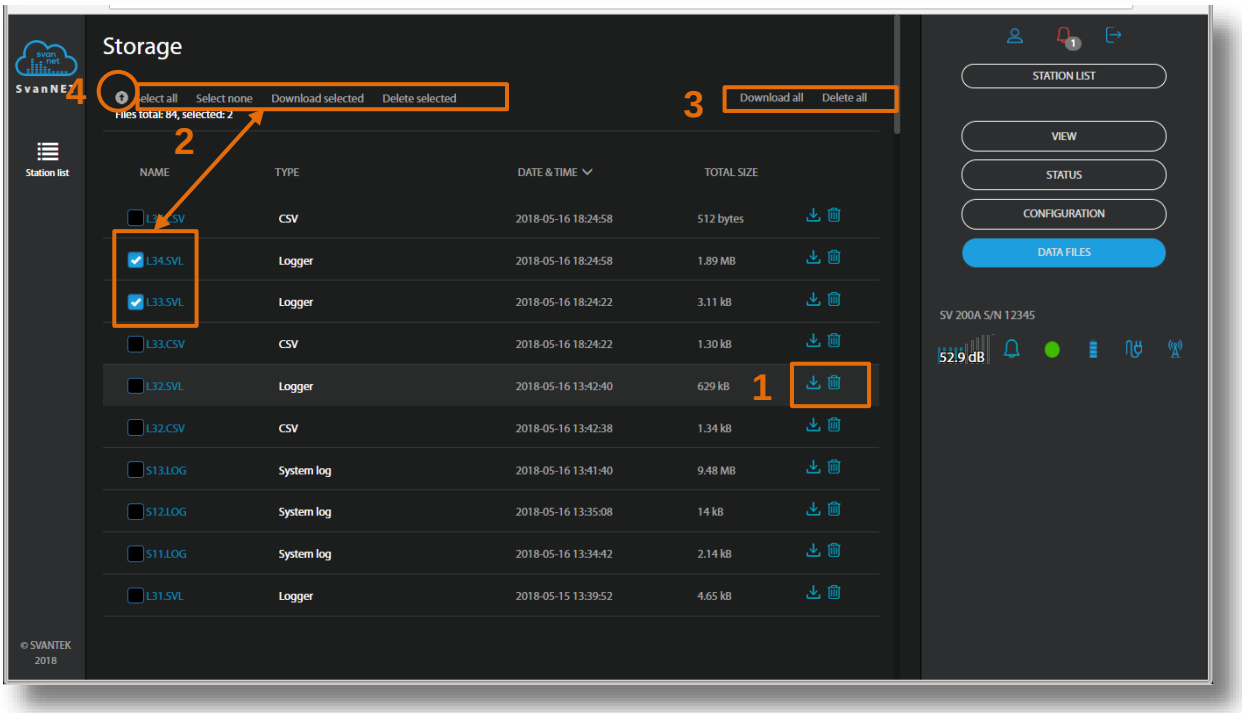


8.4 STORAGE VIEW

If you click the **DATA FILES** button being in the **WEB INTERFACE** mode, you will shift to the **Storage** view which presents a list of files saved in the instrument's SD-card memory. The list includes only files from a single directory on the memory card and it initially shows the content of the current working directory.

In the **Storage** window, you can:

1. Download or delete individual files by clicking the righthand icons on the file line
2. Select several files and download or delete selected files
3. Download or delete all files
4. Navigate through the folder structure by clicking the "folder up" button.



8.4.1 Configuration views

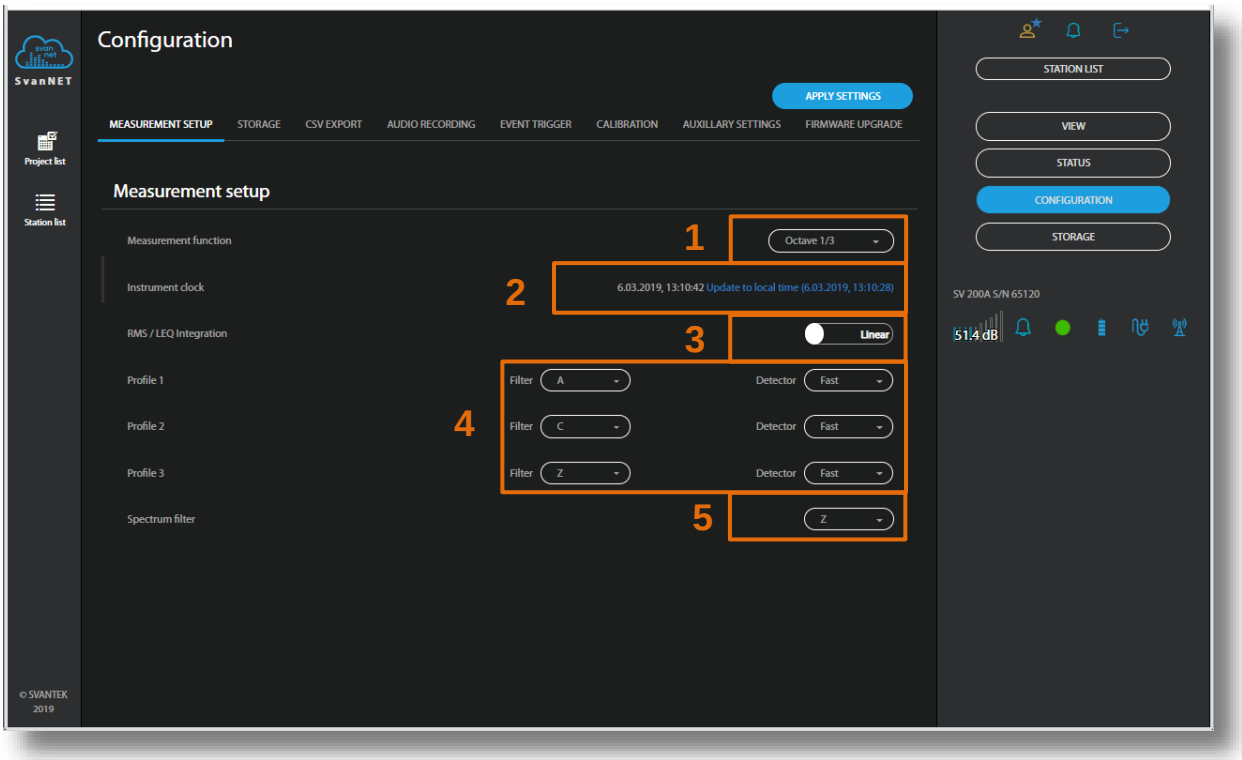
The **Configuration** view consists of several tabs that enable configuring measurement parameters (**MEASUREMENT SETUP**), data saving (**STORAGE**), export of measurement data into CSV files (**CSV EXPORT**), audio recording (**AUDIO RECORDING**), events triggering (**EVENT TRIGGERS**), calibration of the instrument (**CALIBRATION**), auxiliary settings (**AUXILIARY SETTINGS**) and performing the firmware upgrade (**FIRMWARE UPGRADE**).

To load the new configuration to the station, click the APPLY SETTINGS button.

MEASUREMENT SETUP tab

In the **MEASUREMENT SETUP** tab, you can:

1. Select the **Measurement function**: **Level Meter**, **Octave 1/1**, **Octave 1/3**
2. Update the **Instrument clock**
3. Select the type of **RMS/Leq Integration**: **Linear** or **Exponential**
4. Select **Filter** (**Z**, **A**, **C**) and **Detector** type (**Impulse**, **Fast**, **Slow**) for profiles
5. Select **Filter** for the spectrum (position appears when the **Octave 1/1** or **Octave 1/3** function is selected).



RMS/Leq Integration defines the detector type for the calculations of the **Leq**, **LEPd**, **Lnn** and **SEL** measurement functions. **Linear** integration is required when you wish to obtain the true RMS value of the measured signal. When this option is selected the values of the **Leq**, **LEPd**, **Lnn** and **SEL** functions do not depend on the detector time constant (**Fast**, **Slow** or **Impulse**), defined for the profiles.

Exponential integration is required in some standards for **Leq** measurements. When this option is selected the values of the **Leq**, **LEPd**, **Lnn** and **SEL** measurement results depend on the detector time constant (**Fast**, **Slow** or **Impulse**), defined for the profiles.

Such measurement results like **Lmax**, **Lmin**, **Ltm3** or **Ltm5** are always calculated with the **Exponential** integration and selected time constants. And vice versa, such results as **Lpeak** don't use integration at all.

***Note**: Definitions and formulae for measurement functions are presented in Appendix D.*

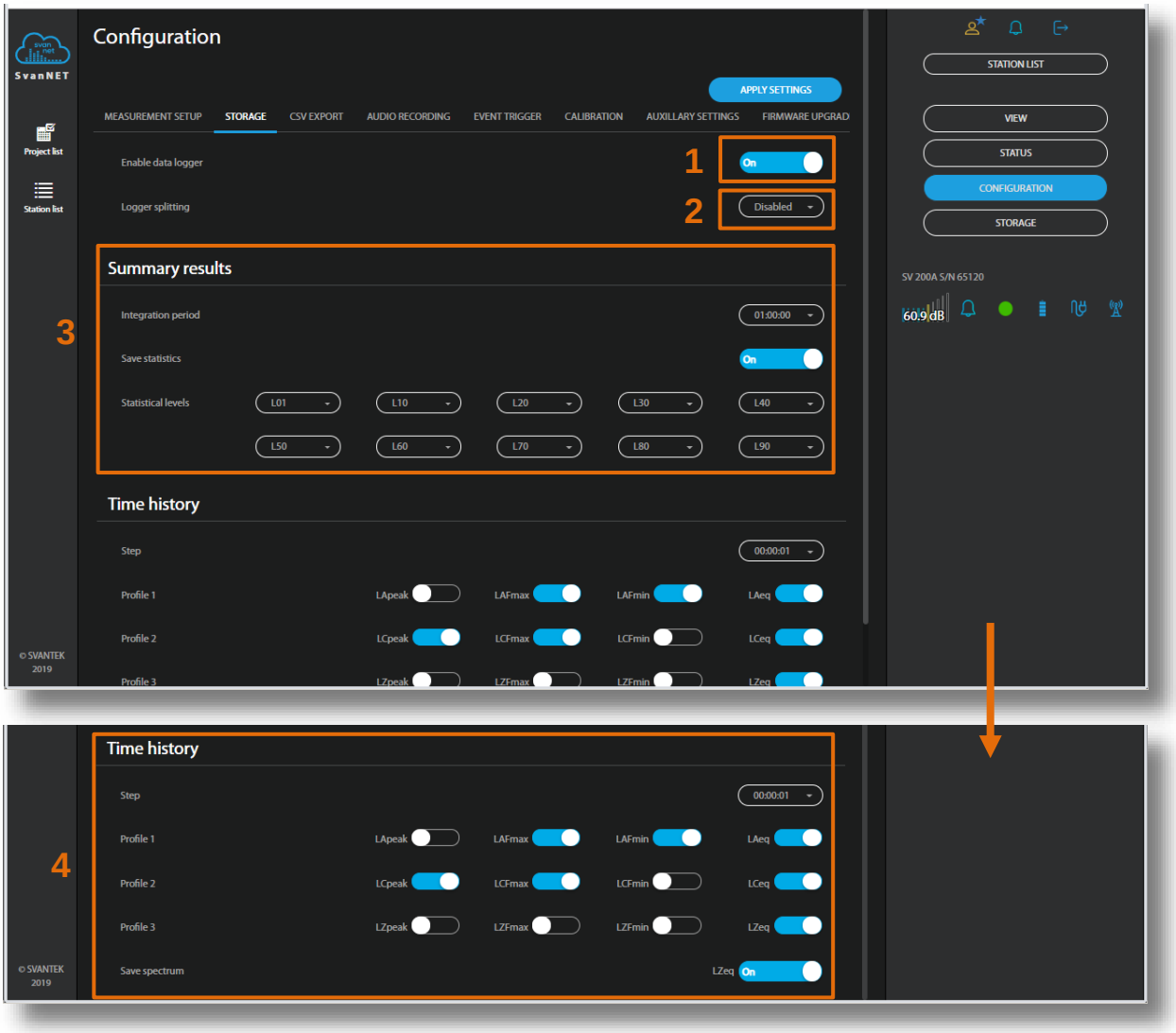
Filter means a frequency weighting filter applied for all measurement results calculated for individual profiles or for the spectrum:

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

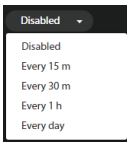
STORAGE tab

In the **STORAGE** tab, you can:

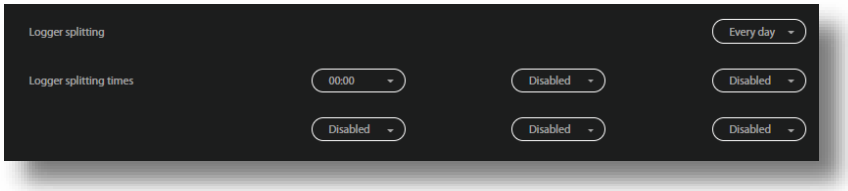
1. Enable data logging
2. Program splitting of the logger file
3. Configure the **Summary results** parameters: measurement time and step of saving (**Integration period**) and switch on/off saving of statistics (**Save statistics**)
4. Configure saving of the **Time history** in a file: step of saving (**Step**) and selecting the results to be saved as a Time history for three profiles: Lpeak, Lmax, Lmin and Leq, 1/1 or 1/3-octave spectra (**Save spectrum**) and results taken from the weather station (**Save meteo**).



The **Logger splitting** position enables splitting of the time history files and selecting the splitting mode: **Every 15 m**, **Every 30 m**, **Every 1 h** and **Every day**.

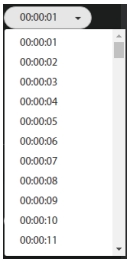


If **Every day** is selected, you can then define up to six points during a day when splitting will take place.



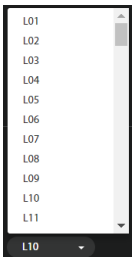
Integration period defines the period during which the signal is being measured (averaged) and recorded in the file as the set of Summary Results.

The integration period can be selected in the pop-up list in the range from 1s to 24h.



If you switch on the **Save statistics** button, you can define ten statistical noise levels, named from **L01** to **L99**, to be calculated, displayed and saved in the file as Summary results.

Statistical noise level **Lnn** is a level in dB which was exceeded during **nn** percent of the Integration period. Statistical noise levels are calculated from a histogram, created on the base of 100ms Leq results (see Appendix D).



***Note**: To ensure saving of **Summary results** you should switch on the **Time history** saving, since Summary results are saved in the same file with Time history results.*

***Note**: All files with measurement result are automatically named in accordance with the rule: some prefix (string of letters) is added with a number (string of digits) which is increased by one for the new created files. Default prefix is "L" and it can be changed via SvanPC++.*

If the Octave 1/1 or Octave 1/3 function is selected, you can also switch on spectrum saving (**Save spectrum** button) as a time history with the same logger **Step**.

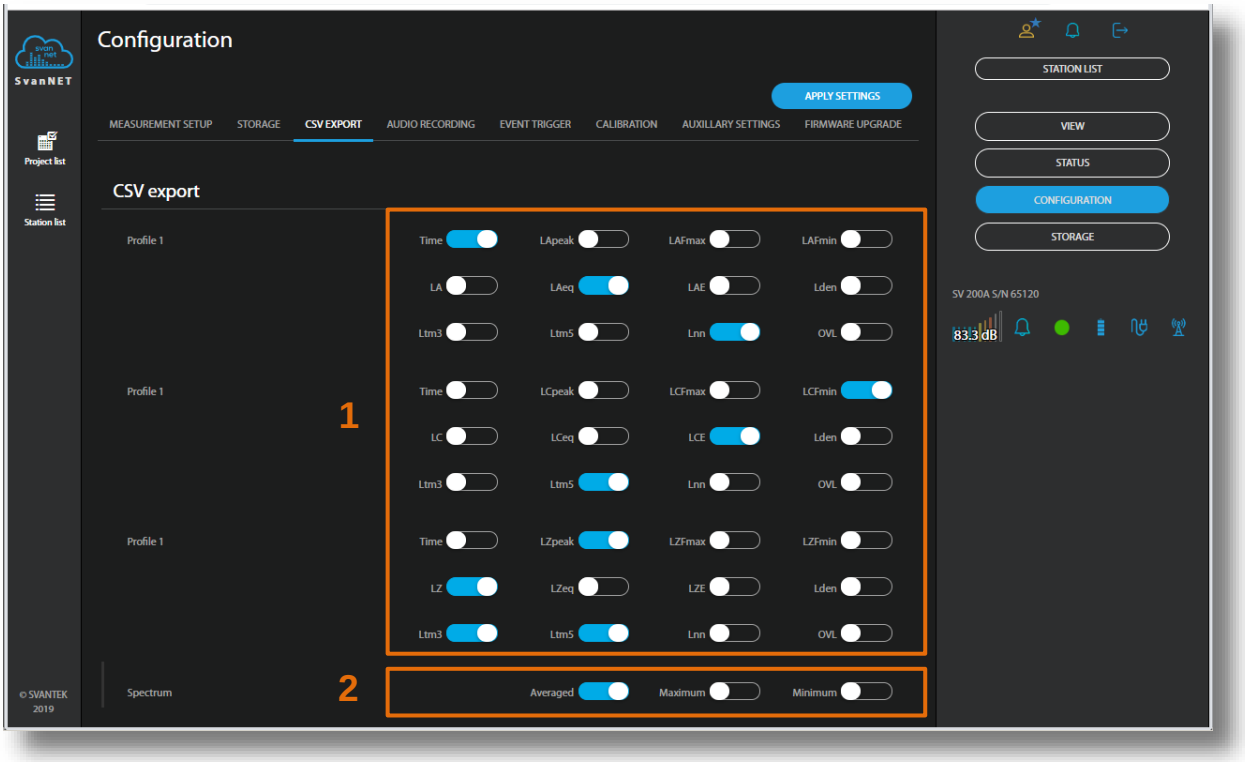
Step can be selected from the row: 10, 20, 50, 100, 200 and 500 milliseconds, from 1 second to 59 seconds, from 1 minute to 59 minutes and 1 hour.

CSV EXPORT tab

The **CSV EXPORT** tab enables configuring direct export of measurement data into CSV files (Comma Separated Values) and saving them on the instrument's SD card.

In this tab, you can:

1. Select results to be exported for each profile individually.
2. Select **Maximum**, **Minimum** and **Averaged** spectra for each integration period if the **Octave 1/1** or **Octave 1/3** function is enabled.



The CSV file structure is presented in the table below.

Section	File contents

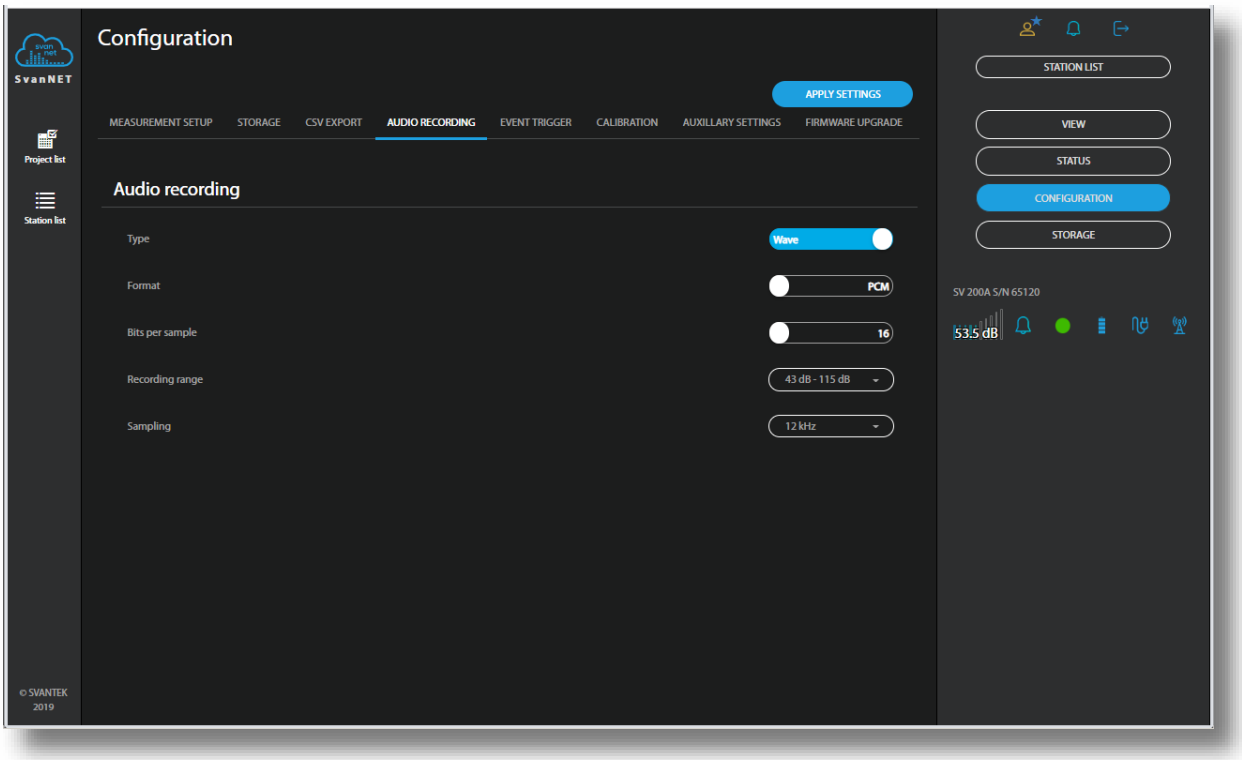
File header	// **
	// CSV file version, 1.18
	// Created, 11/01/2015, 20:43:24
	// Unit, 200, SN, 26858
	// Firmware, 1.20.7, 14/11/2014
	// Corresponding logger file name, L1.SVL
	// Device function, SLM
	// Integration time, 00:00:01
	// Leq integration, linear
	// Outdoor filter, environmental
	// Profile 1, A, FAST
	// Profile 2, C, FAST
	// Profile 3, Z, FAST
	// Statistical levels, 1, 10, 20, 30, 40, 50, 60, 70, 80, 90
	// CSV save mask, 0FFF, 0FFF, 0FFF, 7
	// SLM results, profile 1, TIME, PEAK, MAX, MIN, SPL, LEQ, SEL, Lden, Ltm3, Ltm5, Lnn, OVL
	// SLM results, profile 2, TIME, PEAK, MAX, MIN, SPL, LEQ, SEL, Lden, Ltm3, Ltm5, Lnn, OVL
	// SLM results, profile 3, TIME, PEAK, MAX, MIN, SPL, LEQ, SEL, Lden, Ltm3, Ltm5, Lnn, OVL
	// **

Record number	// Record No, 1
Time sgnature	DT, 11/01/2015, 20:43:25
Measurement data	P1, 1, 56.0, 42.7, 39.6, 42.7, 41.5, 41.5, 46.5, 42.7, 42.7, 42.9, 42.8, 42.6, 42.4, 42.2, 42.0, 41.0, 40.5, 40.0, 38.5, 0 P2, 1, 62.3, 53.9, 47.8, 53.9, 49.8, 49.8, 54.8, 53.9, 53.9, 51.9, 51.5, 51.0, 50.5, 50.0, 49.5, 49.0, 48.5, 48.0, 47.5, 0 P3, 1, 66.7, 59.0, 47.3, 59.0, 57.5, 57.5, 62.5, 59.0, 59.0, 59.9, 59.0, 58.5, 58.0, 57.7, 57.5, 57.2, 57.0, 56.6, 56.3, 0
Record number	// Record No, 2
Time sgnature	DT, 11/01/2015, 20:43:26
Measurement data	P1, 1, 56.9, 45.4, 41.4, 45.4, 42.8, 42.8, 47.8, 45.4, 45.4, 46.9, 46.0, 43.0, 42.7, 42.5, 42.2, 42.0, 41.6, 41.3, 41.0, 0 P2, 1, 63.3, 52.6, 47.9, 52.6, 50.4, 50.4, 55.4, 52.6, 52.6, 53.9, 53.6, 53.3, 53.0, 48.7, 48.5, 48.2, 48.0, 47.6, 47.3, 0 P3, 1, 67.8, 59.2, 54.0, 59.2, 56.6, 56.6, 61.6, 59.2, 59.2, 59.9, 59.5, 59.0, 57.0, 55.6, 55.3, 55.0, 54.6, 54.3, 54.0, 0
Record number	// Record No, 3
Time sgnature	DT, 11/01/2015, 20:43:27
Measurement data	P1, 1, 57.6, 41.7, 37.6, 41.7, 39.1, 39.1, 44.1, 41.7, 41.7, 42.9, 42.0, 41.0, 39.0, 38.7, 38.5, 38.2, 38.0, 37.5, 37.0, 0 P2, 1, 62.9, 53.2, 49.6, 53.2, 50.9, 50.9, 55.9, 53.2, 53.2, 54.9, 54.0, 50.8, 50.7, 50.5, 50.4, 50.2, 50.1, 50.0, 49.5, 0 P3, 1, 68.9, 64.0, 56.9, 64.0, 61.9, 61.9, 66.9, 64.0, 64.0, 63.9, 63.6, 63.3, 63.0, 62.0, 61.6, 61.3, 61.0, 60.5, 60.0, 0
...	...

Note: *CSV files can be quite large, and it is advised to use this feature when absolutely necessary.*

AUDIO RECORDING tab

In the **AUDIO RECORDING** tab, you can configure an audio recording, which can be recorded on the result file together with Time history and Summary results, or in a separate *.wav type file. For this purpose, switch **Type** button to **Events** or **Wave**.



In this tab you can configure four parameters of audio recording: **Format** of the file in the case of Wave recording (**PCM** or **Extensible**), **Bits per sample** (**16** or **24**), **Recording range** (from **28 dB – 100 dB** to **68 dB - 140 dB**) and **Sampling** frequency (**12kHz**, **24kHz** and **48kHz**).

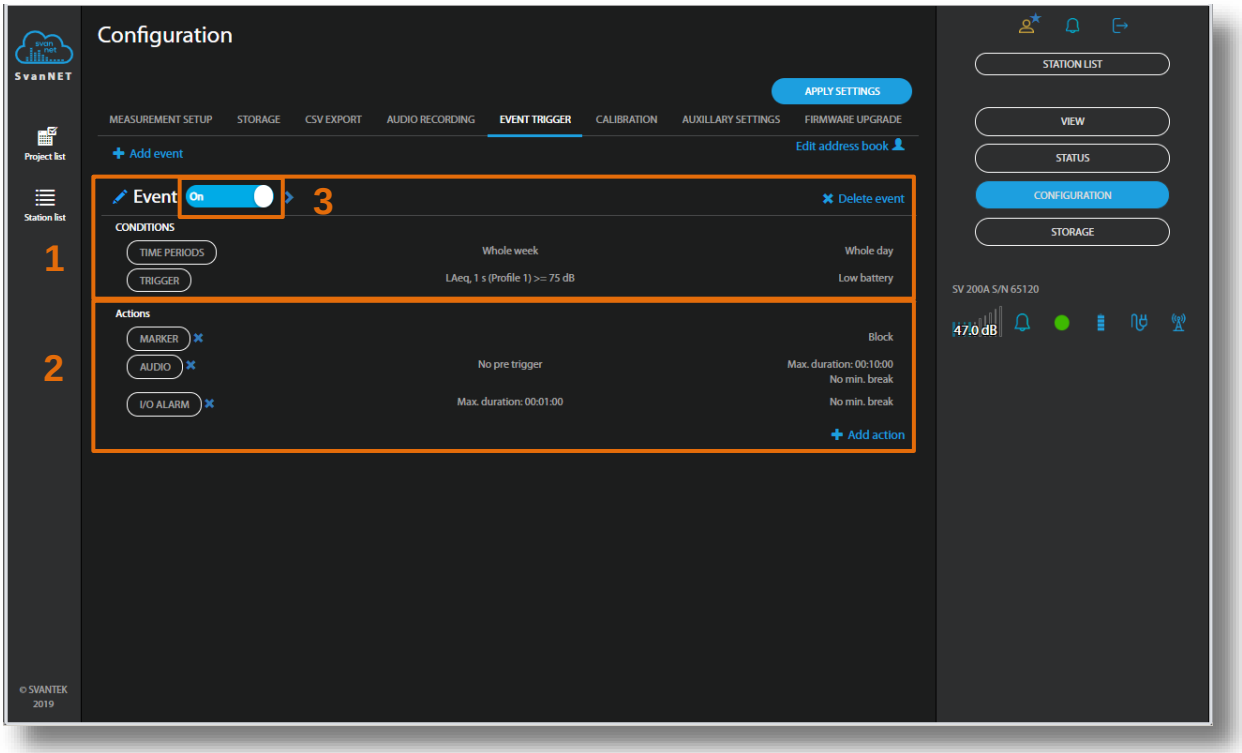
Choosing of higher sampling rate ensures recording of higher frequencies but at the same time increases file size.

The audio recording trigger is configured in the **EVENT TRIGGERS** tab.

EVENT TRIGGERS tab

In the **EVENT TRIGGERS** tab, you can configure events for triggering markers, audio recording and alarms.

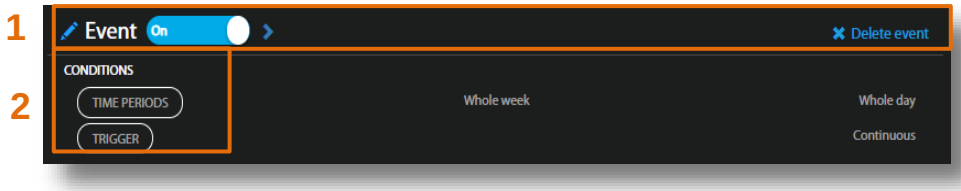
1. Events are specified as a combination of superimposed **CONDITIONS** (logical AND) such as specific time intervals (**Time periods**) in which measurement threshold levels are exceed or system events occur (**Triggers**).
2. Each Event may be connected with special triggers (**Actions**) such as: marker recording to the logger file (**MARKER**), audio signal recording to the logger file or wave file (**AUDIO**), generation of the alarm signal on the I/O socket (**I/O ALARM**), alarm SMS sending (**SMS ALARM**) or alarm e-mail sending (**E-MAIL ALARM**).
3. Switch off the Event without deleting it. The Event becomes inactive, but you can switch it on when needed.



Creating Events

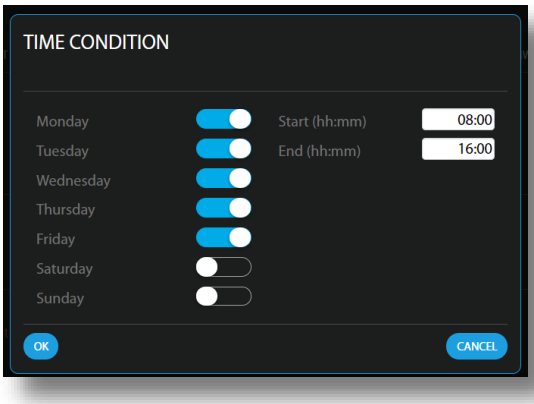
To create new event, click the + Add event field. The new **Event** area will appear in which you can:

1. rename the event, switch it on/off or delete it, clicking on the appropriate field in the area,
2. configure conditions, clicking on the appropriate button.

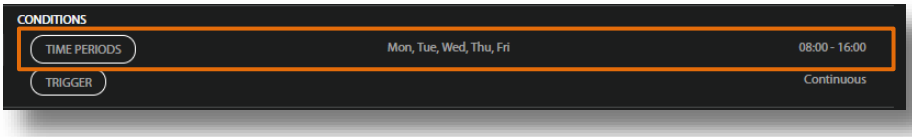


If you click the **TIME PERIODS** button the **TIME CONDITION** configuration box will pop-up.

In this box, you can select days and periods for events registration.

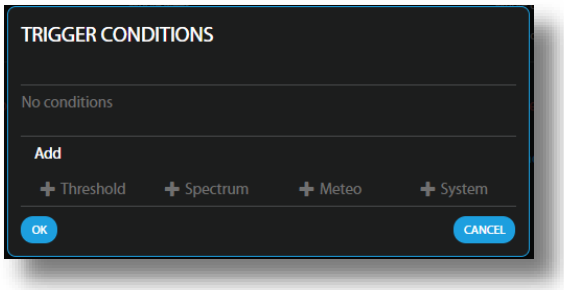


After confirmation (**OK**) the pop-up box closes, and the selection will be presented in the line of the **TIME PERIODS** button.

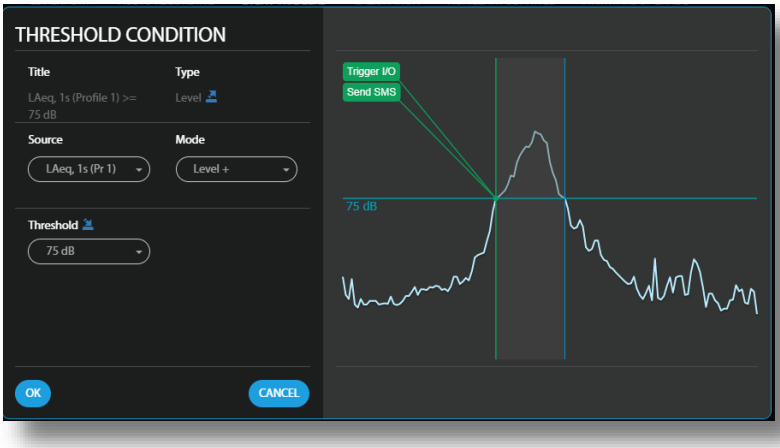


If you click the **TRIGGER** button, the **TRIGGER CONDITIONS** configuration box will pop-up.

In this box, you can add the condition type: **Threshold**, **Spectrum**, **Meteo** and **System**.

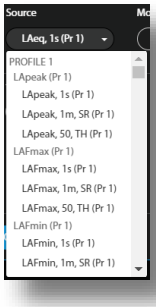


The **Threshold** condition can be of **Level+** or **Level-** type (**Mode**). The condition is fulfilled during the period in which the controlled value of the selected result (**Source**) will be higher/lower than the **Threshold** level.



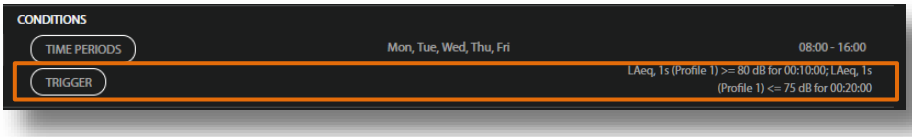
You can select as a **Source** different results (**Leq**, **Lpeak**, **Lmax**, **Lmin**, etc.) for three profiles (**Pr 1**, **Pr 2** and **Pr 3**), measured by: **1s**, integration period (for example, **1m, SR**) or time-history step (for example, **50, TH**).

In the right-hand example, **1m, SR** means that the Integration period for the Summary results was set to 1 minute, while **50, TH** means that the Step for the time-history was set to 50 milliseconds.



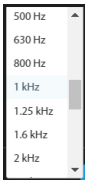
If you expand the **Threshold** by clicking the Threshold field, you can define **Start** and **Stop** threshold levels and delays (**Min. duration**) of start and stop.

After confirmation (**OK**) the pop-up box closes, and the selection will be presented in the line of the **TRIGGER** button.



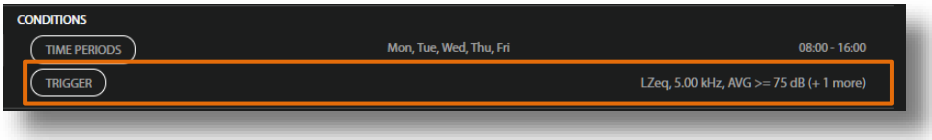
In the **SPECTRUM CONDITION** pop-up box, you can define a mask for thirty one 1/3 octave bands spectrum and three Total results. If the measured spectrum (**AVERAGED**, **INSTANT**, **MAX** or **MIN**) will show the excess of the levels (**Level + Mode**) or the lowering of the levels (**Level - Mode**) defined for the mask, then the condition will be active during **Min. duration** time.

To start mask creation, click the + Add freq / total field and select the spectrum frequency or the Total result.



Then select the threshold level for that frequency/Total in the **Thresholds** position.

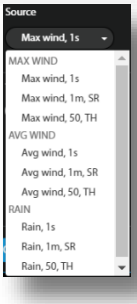
After confirmation (**OK**) the pop-up box closes, and the selection will be presented in the line of the **TRIGGER** button.



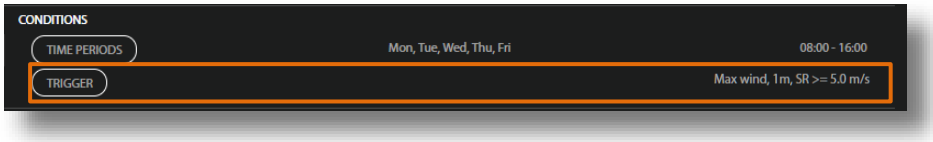
The **Meteo** condition is similar to the **Threshold** one and can be of **Level+** or **Level-** type (**Mode**) and defines period during which the controlled value of the selected result (**Source**) will be higher/lower than the **Threshold** level.

You can select as a **Source** different results (**Max wind**, **Avg wind** and **Rain**) measured by: **1s**, Summary results Integration period (for example, **1m, SR**) or Time History step (for example, **50, TH**).

In the right-hand example, **1m, SR** means that the Integration period was set to 1 minute, while **50, TH** means that the Step for the Time-history was set to 50 milliseconds.

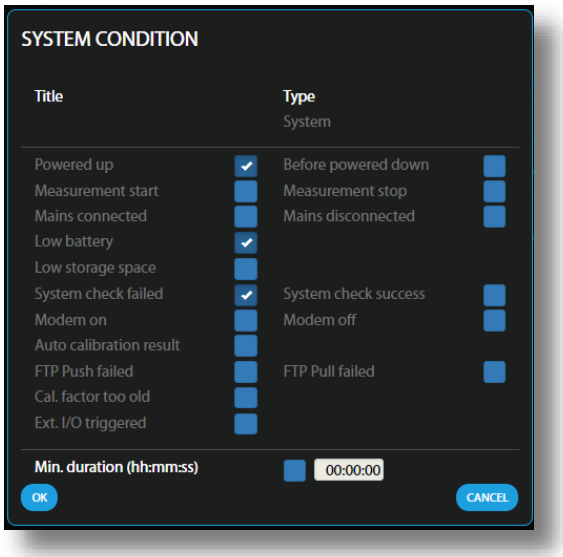


After confirmation (**OK**) the pop-up box closes, and the selection will be presented in the line of the **TRIGGER** button.

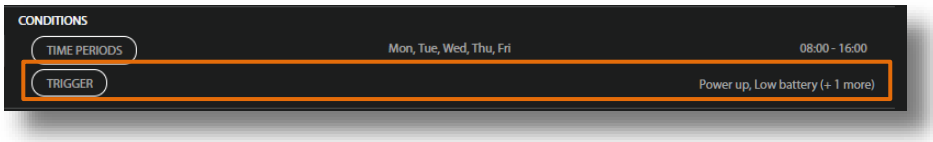


In the **SYSTEM CONDITION** pop-up box, you can select conditions that describe behaviour of the system, such as: **Low battery**, **Low storage space** etc.; and define duration during which these conditions will be active (**Min. duration**).

The **Min. duration** parameter defines minimum time during which the Condition is active. If during this time the new condition will be fixed, the duration will be prolonged to another **Min. duration** time and so on.

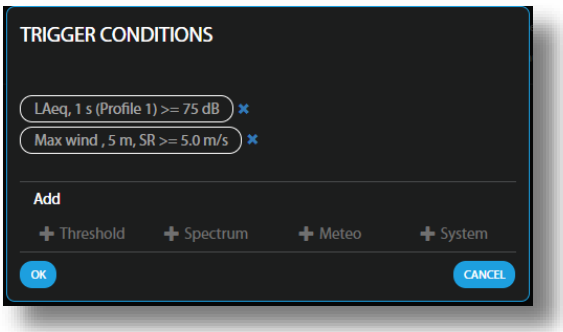


After confirmation (**OK**) the pop-up box closes, and the selection will be presented in the line of the **TRIGGER** button.

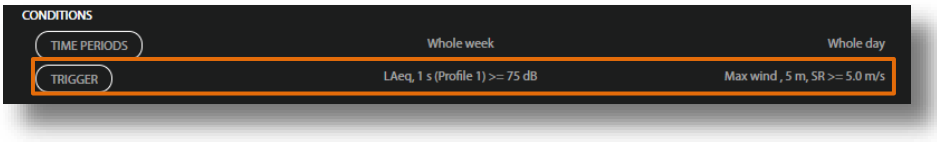


You can select several **Trigger** conditions for the Event.

All conditions have the AND logic, e.g. are superimposed.

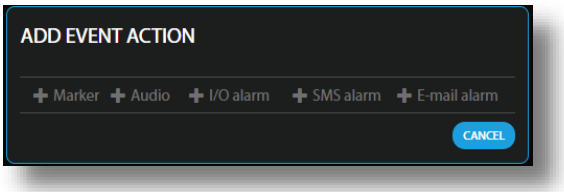


After confirmation (**OK**) the pop-up box closes, and the selection will be presented in the line of the **TRIGGER** button.



Creating Actions

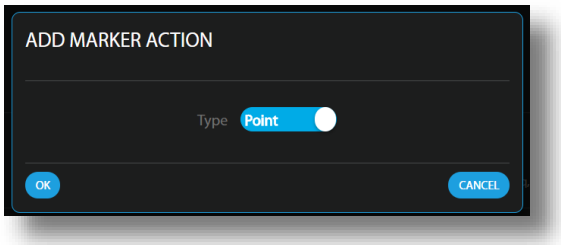
To create new action, click the + Add action field and in the **ADD EVENT ACTION** pop-up box, click the action you wish to add and to configure: **Marker**, **Audio**, **I/O alarm**, **SMS alarm** or **E-mail alarm**.



After occurrence of the event, actions will be performed during the time the event is active, at its beginning or at the end depending on the action type.

The **Marker** action registers a marker in the logger file.

The Marker can be **Point** or **Block** type. The Point marker means, that it will be registered only at the beginning of the Event. The Block marker will be registered at the beginning and at the end of the Event.

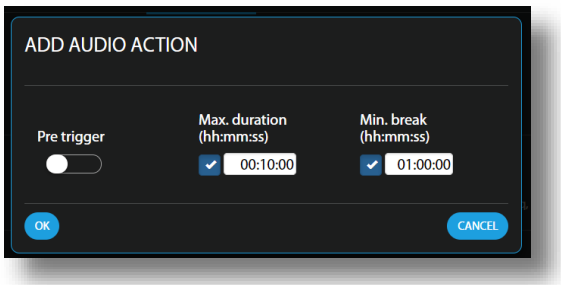


The **Audio** action starts an audio recording in the logger file (Event recording) or in the WAV type file (Wave recording).

Max. duration defines maximum time of recording after the event start.

Min. break defines the minimum time break between two consequent records.

Pre trigger enables earlier start of recording with respect to the event start.



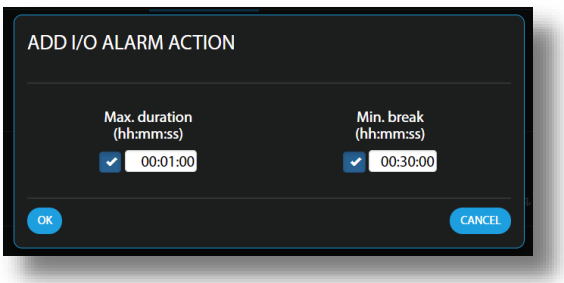
The period of such recording depends on the sample frequency and bits per sample. The maximum pre-trigger period is:

- for 24 bits per sample: **5s** for 48 kHz, **10s** for 24 kHz and **20s** for 12 kHz.
- for 16 bits per sample: **8s** for 48 kHz, **15s** for 24 kHz and **30s** for 12 kHz.

The **I/O alarm** action starts an alarm signal at the MULTI I/O socket output to which some alarm device can be connected (for example, alarm lamp).

Max. duration defines maximum time of alarm signal after the event start.

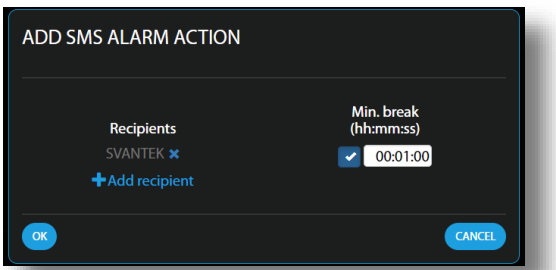
Min. break defines the minimum time break between two consequent alarms.



The **SMS alarm** action sends the SMS note to the defined recipient's phones, which are selected from the **ADDRESS BOOK**.

Min. break defines the minimum time break between two consequent SMSs.

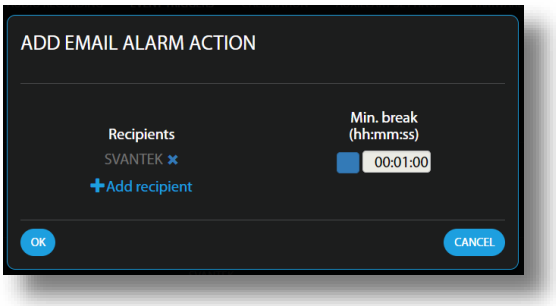
The SMS text is generated automatically in accordance with the event definition.



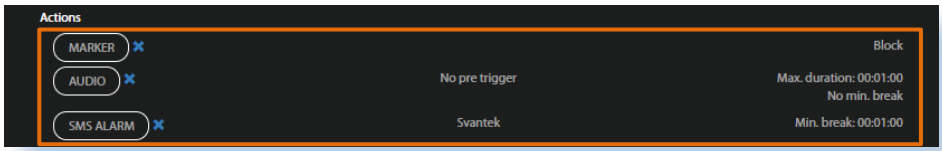
The **E-mail alarm** action sends the E-mail note to the defined recipient's addresses, which are selected from the **ADDRESS BOOK**.

Min. break defines the minimum time break between two consequent E-mails.

The E-mail text is generated automatically in accordance with the event definition.



After confirmation (**OK**) the pop-up window closes, and the selection will be presented in the lines of the appropriate button of the **Actions** section.



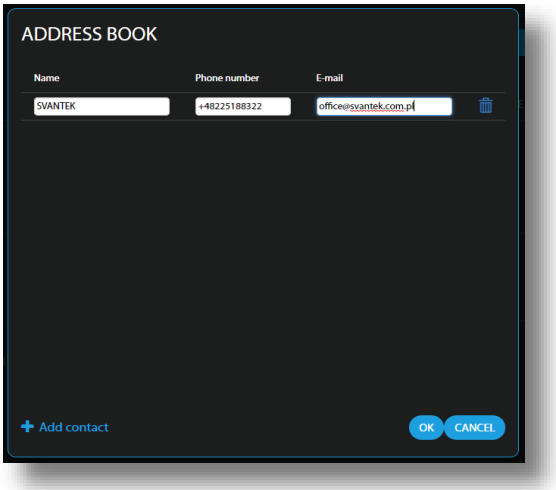
Address book

The **ADDRESS BOOK** pop-up window appears in the SMS and E-mail alarm actions pop-up windows when you click on the Add recipient field.

In this case you should select the required address and click OK.

You can add the contact by clicking on the Add contact field.

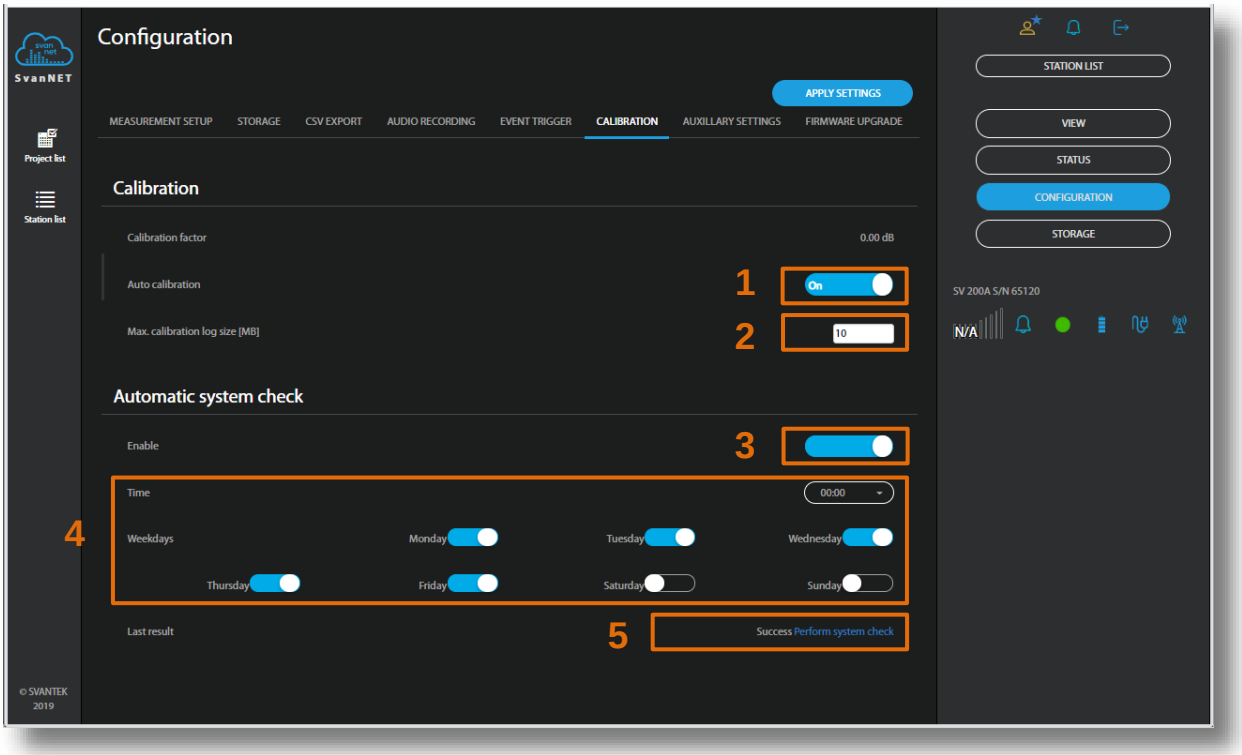
You can **Edit address book** from the **EVENT TRIGGER** tab of the **Configuration** view.



CALIBRATION tab

In the **CALIBRATION** tab, you can:

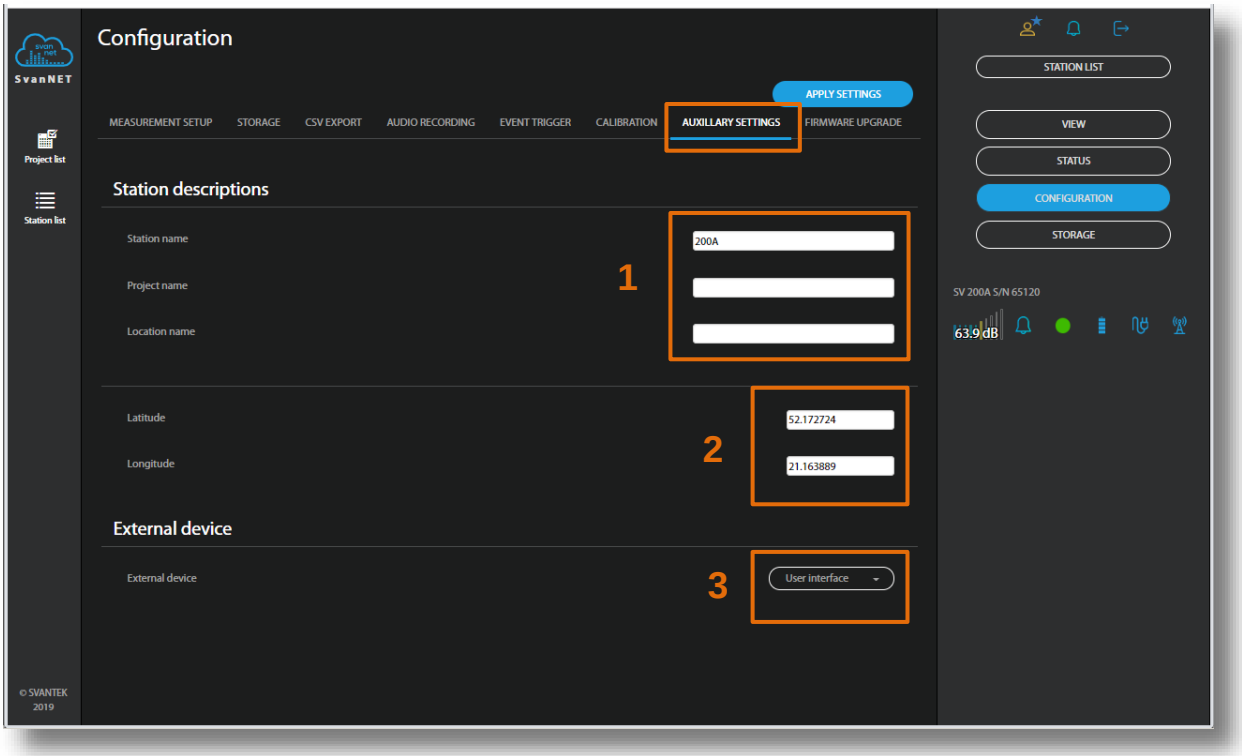
1. Switch on the **Auto calibration** function,
2. Define the **Maximum calibration log size in MB**,
3. Switch on the **Automatic system check** (**Enabled** button) and
4. Set time and days of the week when system check is going to be performed,
5. Manually **Perform system check now**.



When the **Automatic system check** feature is enabled the calibration factor of the instrument will be periodically verified using built-in electrostatic actuator.

Note: *System check cannot be considered as a calibration. Calibration factor will not be updated during* ***Automatic system check*** *procedure.*

AUXILIARY SETTINGS tab



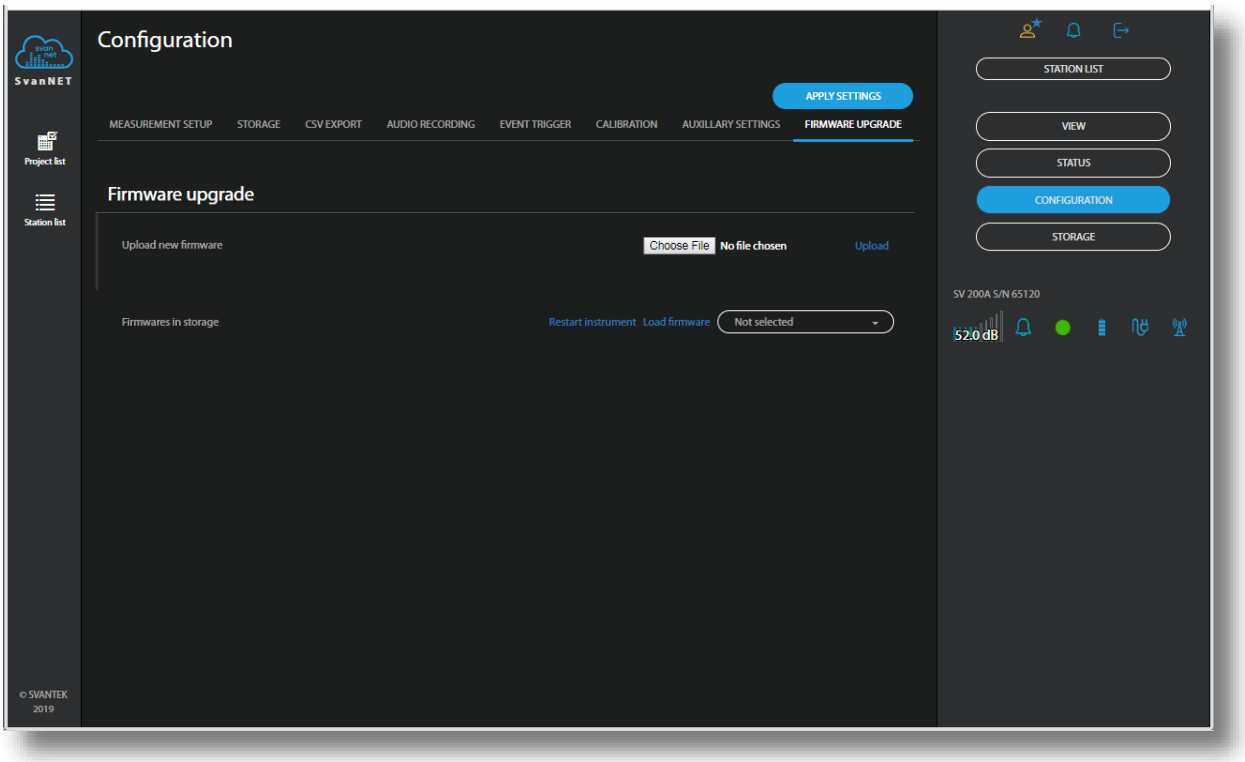
In the **AUXILIARY SETTINGS** tab, you can:

1. enter **Station description**: **Station name**, **Project name** and **Location name**,
2. enter the instrument's geographical location in **Latitude** and **Longitude** coordinates (if GPS is switched on),
3. select the External device: weather station (**Meteo-SP 275**), **GPS** or **User interface**.

8.4.2 FIRMWARE UPGRADE tab

In the **FIRMWARE UPGRADE** tab, you can upload new firmware on the instrument's SD card and perform upgrade process remotely.

Complete upgrade process is described in detail in Chapter 11.2. Before upgrading it is essential that the proper firmware file is downloaded from SVANTEK website.



9 SVANPC++ SOFTWARE

SV 200A can be fully controlled via **SvanPC++** software, which provides also wide spectrum of data post-processing and reporting functions.

Note: *All SvanPC++ functions are well described in the SvanPC++ User Manual. In the current manual only most useful and instrument specific functions and screens are described.*

SV 200A needs to be connected to the computer running SVAN PC++ either by USB cable, 3G, WLAN or LAN connection. In all cases except USB, SvanPC++ should be supplemented with the **Remote Communication** module.

9.1 SVANPC++ SOFTWARE INSTALLATION AND ACTIVATION

To configure SV 200A for the first time the user should use Svan PC++ software on your PC. It allows easy control of each function of the instrument and manage whole noise monitoring station systems consisting of more than one SV 200A device.

1. Make sure that your PC has active Internet connection if you wish to use SV 200A via the Internet. PC should have Windows operating system. Minimum system requirements: 1GHz CPU, 1 GB RAM (2GB RAM for x64 system), 20 GB HDD, 1024x768 display.
2. Download and install Svan PC++ software and Svantek **USB Drivers** from http://svantek.com/lang-en/support/software.html.
3. Prepare the activation key for the **Remote Communication** (RC) module, that has been provided with the device.
4. On the Help menu click *Enter Activation Keys…* option and enter the key to activate the Remote Communication module.
5. Your Svan PC++ software is ready to use with SV 200A.

Note: *Remote Communication module should be activated for each individual SVANTEK device. Remember to enter activation key for any new device you wish to manage with the RC module.*

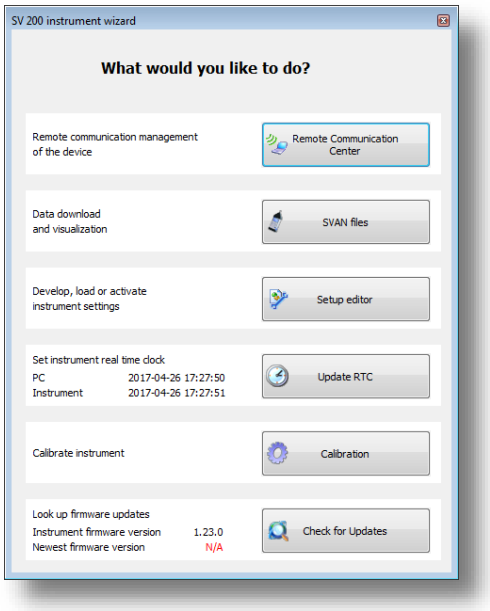
9.2 SV 200A CONTROL VIA USB INTERFACE

Although SV 200A is dedicated to wireless remote control it can be also easily configured and controlled via the USB interface. The USB interface or WLAN in AP mode should be used for the first wireless communication configuration. The USB interface can also be used in emergency, when wireless connection was broken or when for some reason wireless communication is not possible or in situations when the measurement process doesn't require wireless control of the instrument.

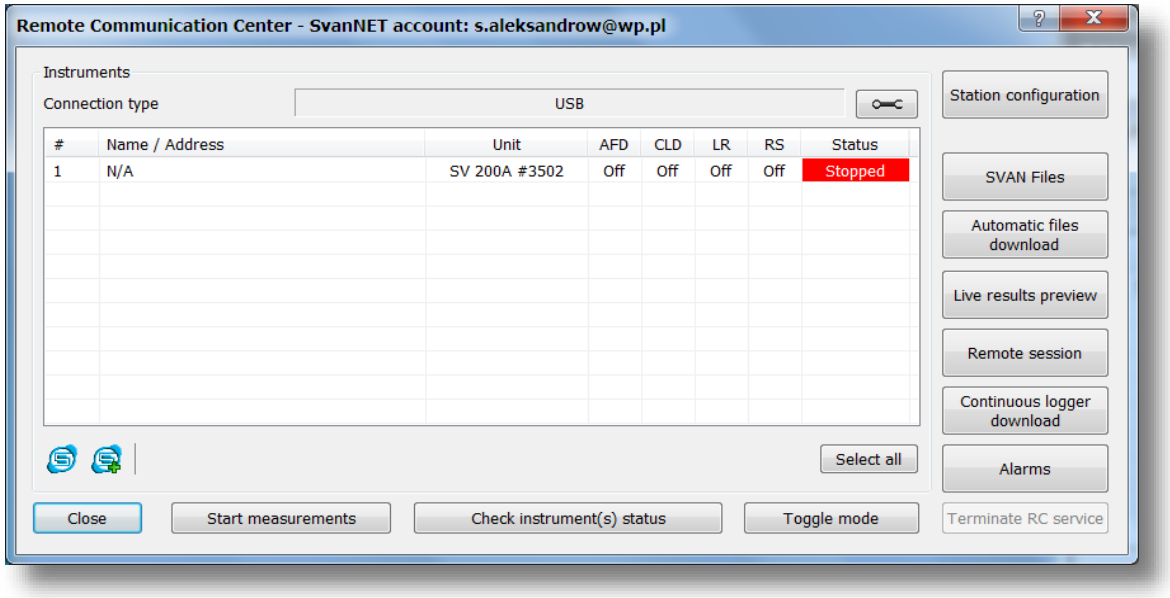
The philosophy of the instrument control from SvanPC++ either via USB or via wireless communication is generally the same. Therefore, this manual will be concentrated mostly on wireless instrument control.

After connecting the instrument to the computer with running Svan PC++ by SC 256A USB cable the **SV 200 instrument wizard** window appears on the screen. It enables you to:

- Manage the instrument remotely (**Remote Connection Center** button)
- Manage the instruments' file structure (**SVAN files** button)
- Unload, upload and edit the instrument's setup files (**Setup editor** button)
- Set the instruments' real time clock to be equal with computer clock (**Update RTC** button)
- Calibrate the instrument (**Calibration** button)
- Check the firmware updates (**Check for Updates** button)



After pressing the **Remote Communication Center** button, the **Remote Communication Center** panel, which assures full instrument control, will appear.



9.3 CONFIGURING WIRELESS CONNECTION

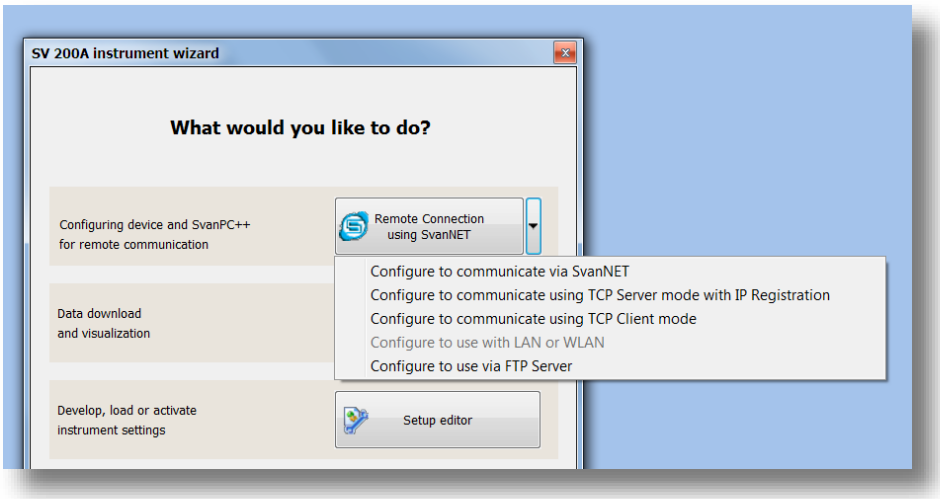
SV 200A is equipped with internal 3G modem and LAN/WLAN module which enable wireless remote control of the instrument and downloading measurement files, managing configuration, sending alarm e-mails, etc. To access SV 200A remotely, the instrument first must be properly configured via the USB connection.

All types of connections can be configured via **SV 200A instrument wizard**, which is described below, or via the **Remote communication** tab (see Chapter 9.8.9) in the **Station(s) configuration** section.

Note: *SVANTEK does not provide a SIM-card for the instrument. It is necessary to purchase the SIM-card with* ***data plan****. If the instrument is intended for constant monitoring, choose service provider that ensures good reception at the measurement point.*

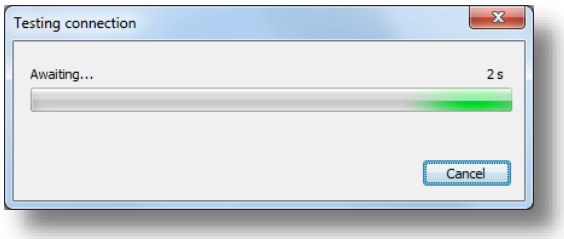
Note: *Make sure the SIM-card has deactivated PIN-code before insertion into SV 200A.*

1. Connect the instrument to the PC with the SC 256A USB cable.
2. In the **SV 200A instrument wizard** window, click the **Remote Connection using SvanNET** button or right-hand button which opens the pop-up list of other connections configurations. The **Remote Connection using SvanNET** button enables creating and managing connection with the SvanNET web-service, easiest way of remote control of all type of stations with 3G modems and any type of SIM-card credentials.

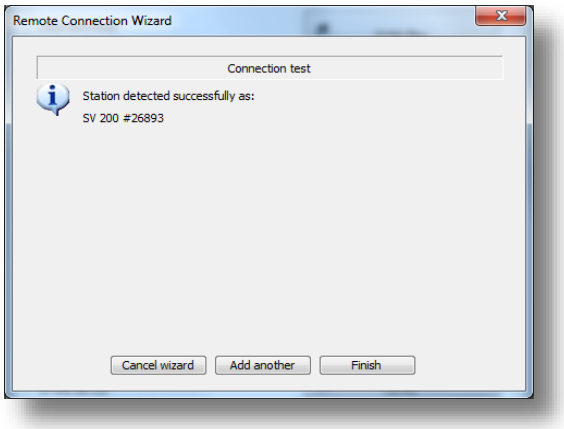


3. Every position opens the **Remote Connection Wizard** window in which you can add new station. First position opens the same window that the **Remote Connection using SvanNET** button. All **Remote Connection Wizard** windows are well self-described, so you should only fill the required fields based on the GSM provider information.

4. After entering all the required information SvanPC++ will check connection settings. Wait until process is finished. It may take few minutes.



5. After finishing configuration, you can exit the wizard or add another instrument.

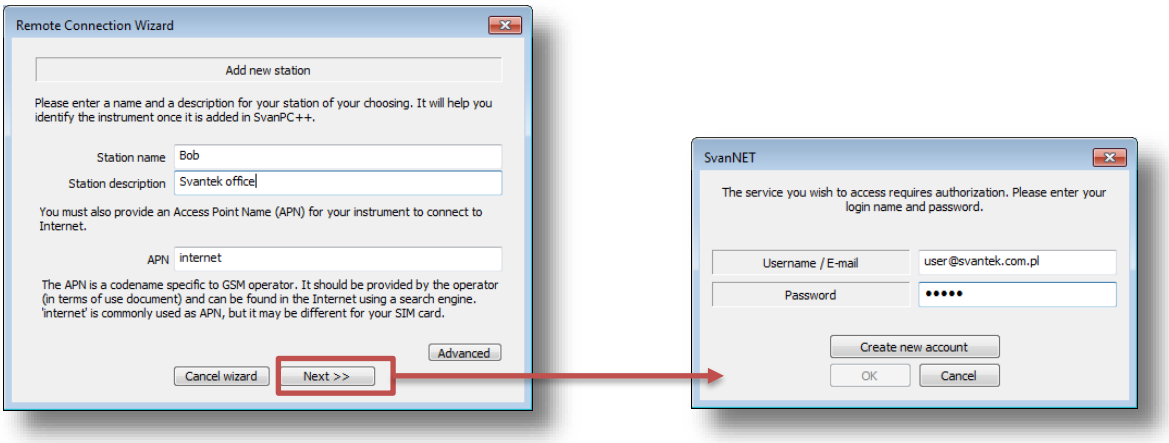


9.3.1 Connections via 3G modem

As was said above the **Remote Connection using SvanNET** mode is the simplest way to install wireless communication. All other modes require more efforts and are not recommended by the producer. If you wish to use other modes, you must refer to the SvanPC++ User Manual for details.

You can enter **Station name** and **Station description** for easy instrument identification after the wizard is finished. **APN** is mandatory field required to set up the connection. APN value is specific for each mobile operator, who should deliver such information.

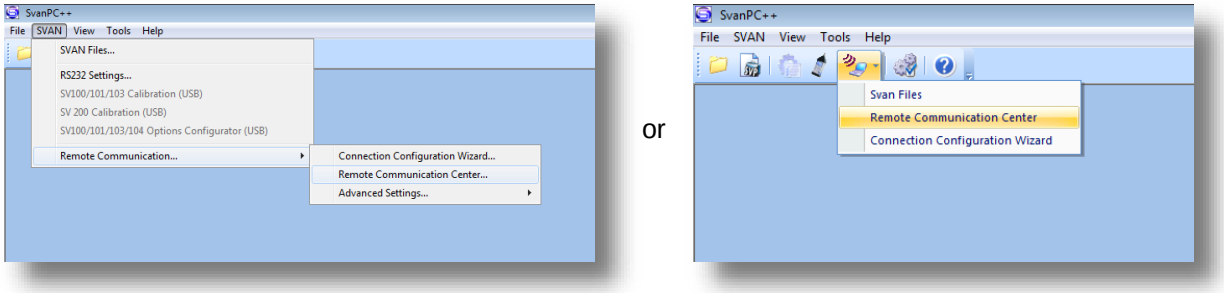
After filling in the required fields in the **Remote Connection Wizard**, press the **Next>>** button and enter the login and the password of your registered account.



Press the **OK** button and SvanPC++ will run connection settings (step 4 of above procedure).

9.4 CONNECTING TO THE STATION

1. Open the **Remote Communication Center** window in SVAN PC++.



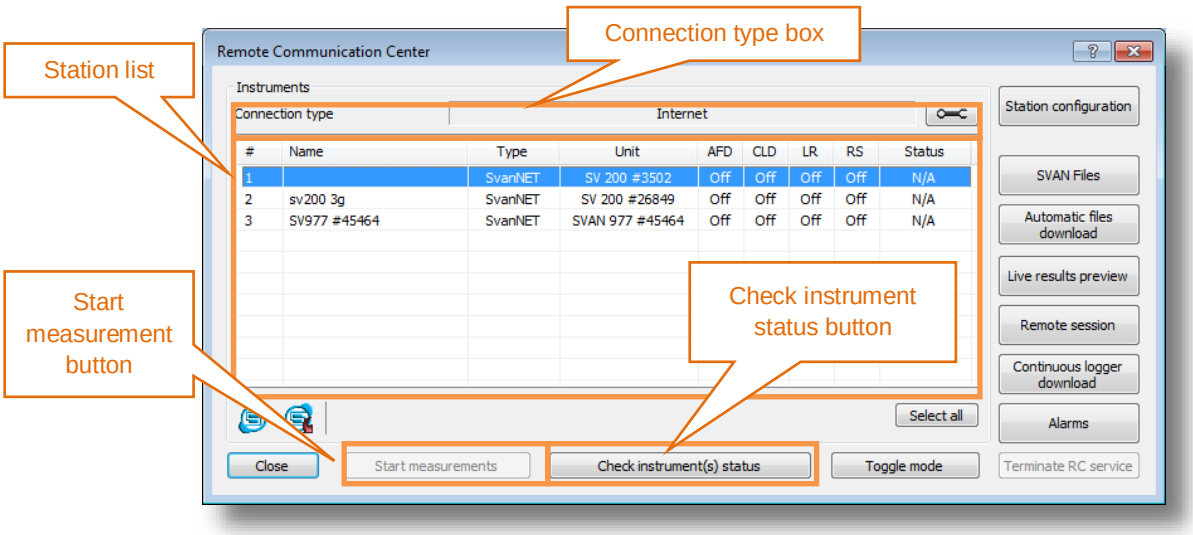
2. Make sure that suitable **Connection type** is chosen. The default connection type is ***Internet***, however when the instrument is connected to the PC by the USB cable, connection type is automatically changed to ***USB***.
3. Choose the instrument in the station list.
4. Click **Station configuration** button.

9.5 STARTING MEASUREMENTS

Note: *SV 200A provides AutoStart feature. If the instrument is idle for 60 s the measurement is automatically started. The AutoStart function is inactive in the case: USB is connected, or logging is switched off.*

To start the measurement, perform next steps:

1. Make sure that the instrument is turned on.
2. Open **Remote Communication Center**.
3. Make sure appropriate **Connection type** is selected. If you wish to communicate with the instrument via the 3G, WLAN or LAN connection, select **Internet**. If you wish to communicate with the instrument via the USB cable, select **USB**.

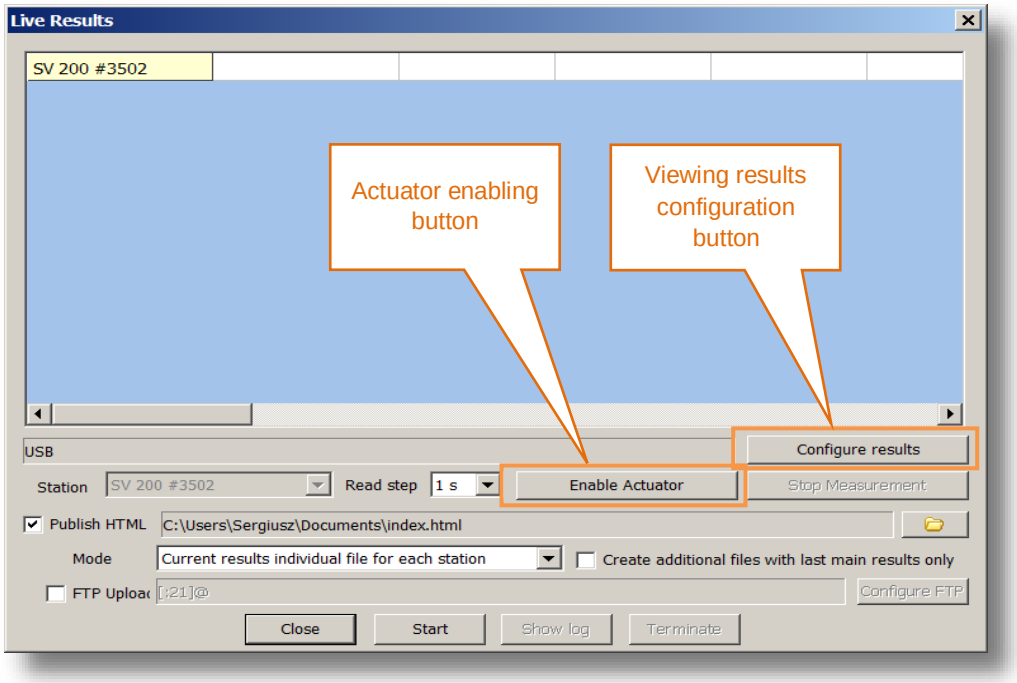


4. Select the station in the **Station list** box.
5. Check the state of the instrument by clicking **Check instrument(s) status**. When the instrument status is known, the **Start measurement** button becomes enabled.
6. Click the **Start measurement** button.

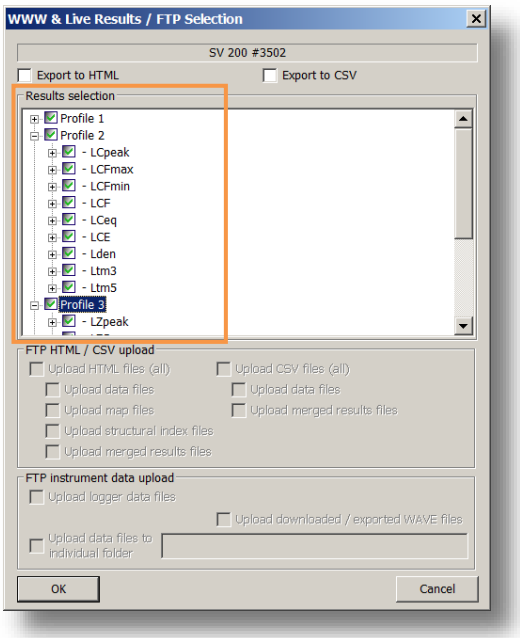
9.6 VIEWING LIVE RESULTS

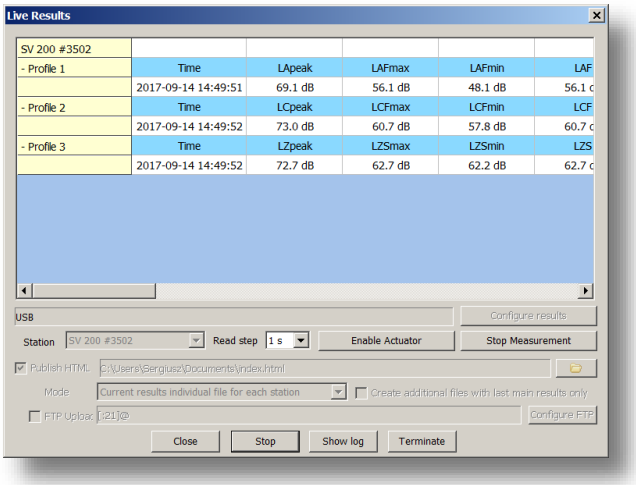
It is possible to observe live results. For this:

1. Click on the **Live results preview** button on the **Remote Communication Center** panel.



2. Click on the **Configure results** button to select results for viewing in the **WWW & Live Results / FTP Selection** window and return to the **Live Results** window by clicking the **OK** button. Then press the **Start** button in the **Live Results** window to start results presentation.



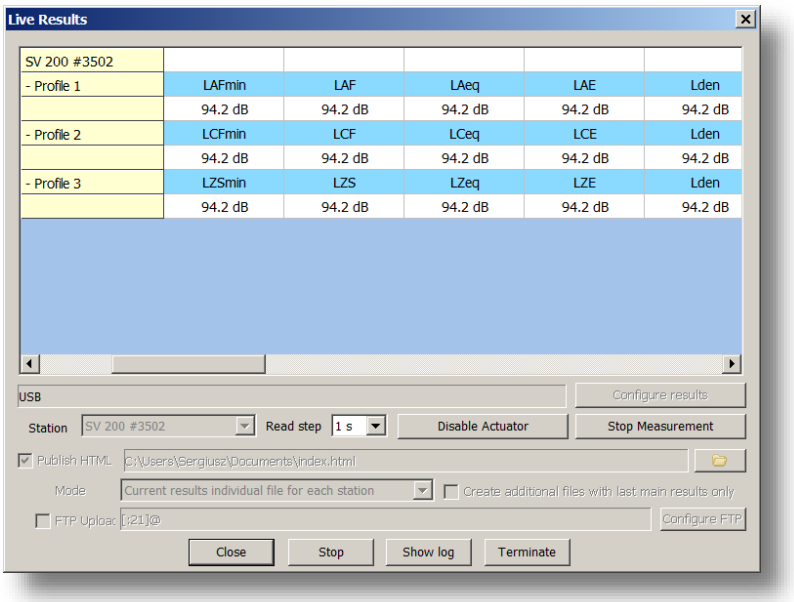


In the **Live Results** window, you can also:

1. change the step of data readout (**Read step** button),
2. start or stop measurements (**Start Measurement** / **Stop Measurement** button),

3. view system log information (**Show log** button),
4. terminate the Live view session (**Terminate** button),
5. enable the SV 200A actuator and perform the instrument's check (**Enable Actuator** button).

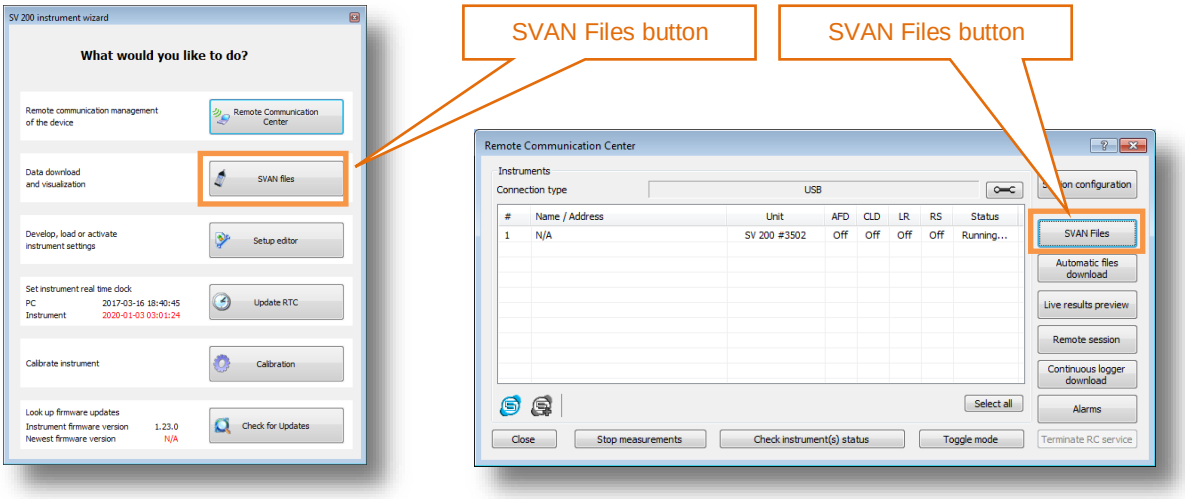
After enabling the actuator, the instrument starts measuring of the signal, generated by the actuator at the level of 94 dB. If **Read step** is equal to **1s** then it is possible to observe the measured actuator level.



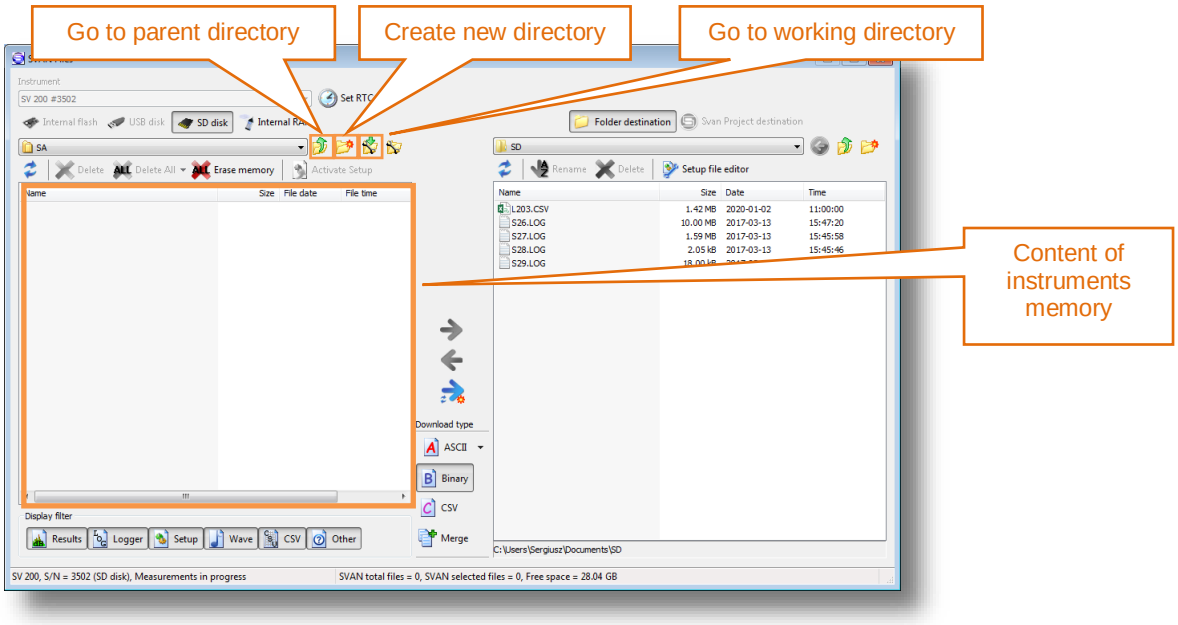
9.7 CHANGING THE WORKING DIRECTORY

Working directory is a folder on the SD-card in which all the measurement files are stored.

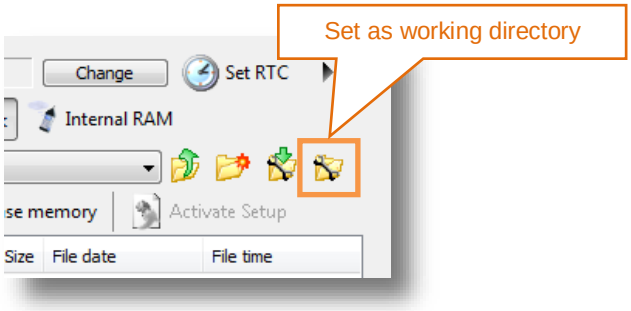
Changing the working directory can be done with the **SVAN Files** feature of the SvanPC++ software either via **SV 200 Instrument wizard** or via **Remote Communication Center**.



1. Make sure a measurement is not in progress.
2. Open the **SVAN Files** window and navigate to the desired directory using the left panel. The left panel displays contents of the instrument's memory. Create a new directory if necessary.



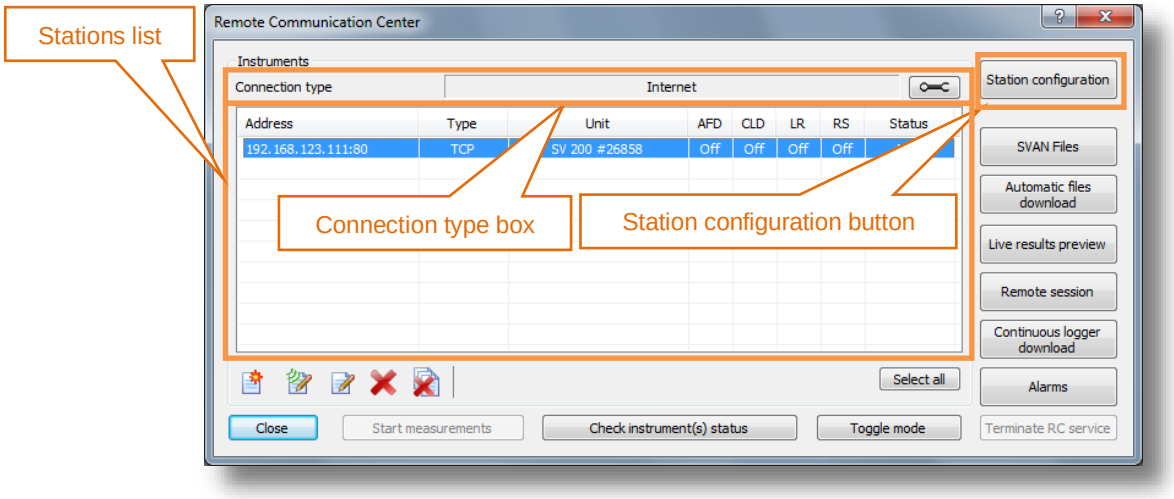
1. Click the **Set as working directory** button.
2. Working directory of SV 200A is now set. All result files will be stored in the selected directory.



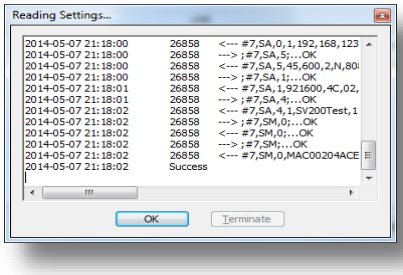
9.8 STATION CONFIGURATION

To configure the station or measurement parameters:

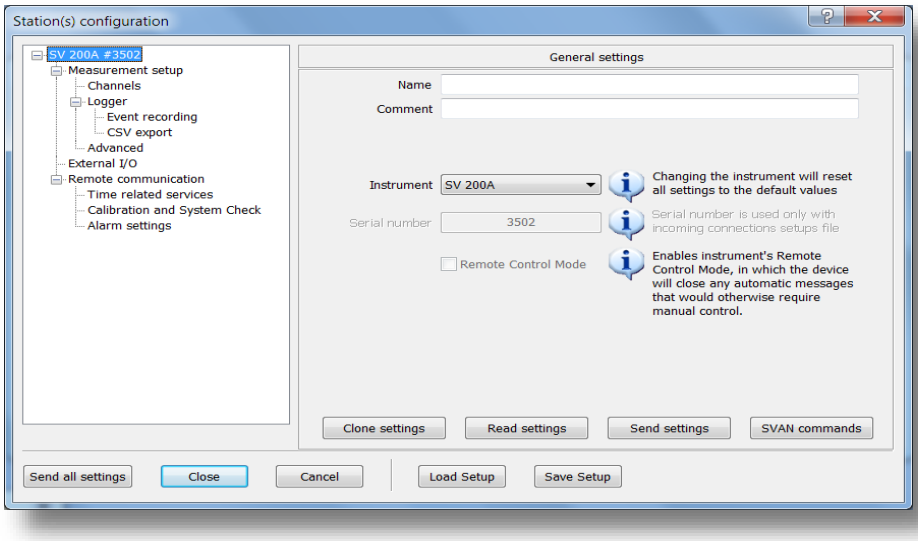
1. Activate **Remote Communication Center** panel
2. Select the **Internet** or **USB** connection type
3. Select the station from the Station list and
4. Press the **Station configuration** button.



5. Wait until instrument's settings are downloaded, which will be signalized by *Success* written in the last line of the **Reading Settings…** box. Click OK to proceed.



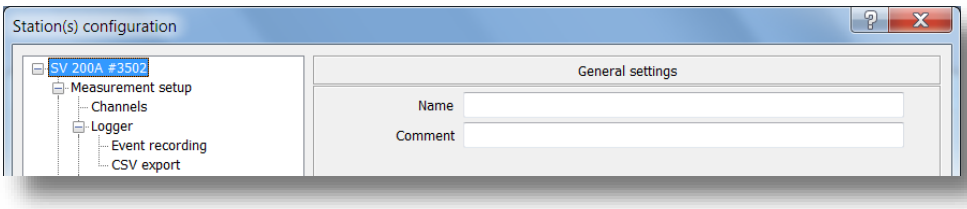
6. **Station(s) configuration** window will appear. It allows the user to modify general instrument settings, measurement setup, external I/O setup, internet services and system events settings. Remote communication setup is available only for USB connection.



Note: *The* ***Station(s) configuration*** *window enables configuring only general instrument settings. The* ***SVAN Files*** *window with the use of* ***Svan file editor*** *function enables the full range of settings – see "SvanPC++ User Manual".*

9.8.1 General settings

In the **General settings** tab, you can enter **Name** and **Comment** to the station. This can be useful while using many measurement devices.

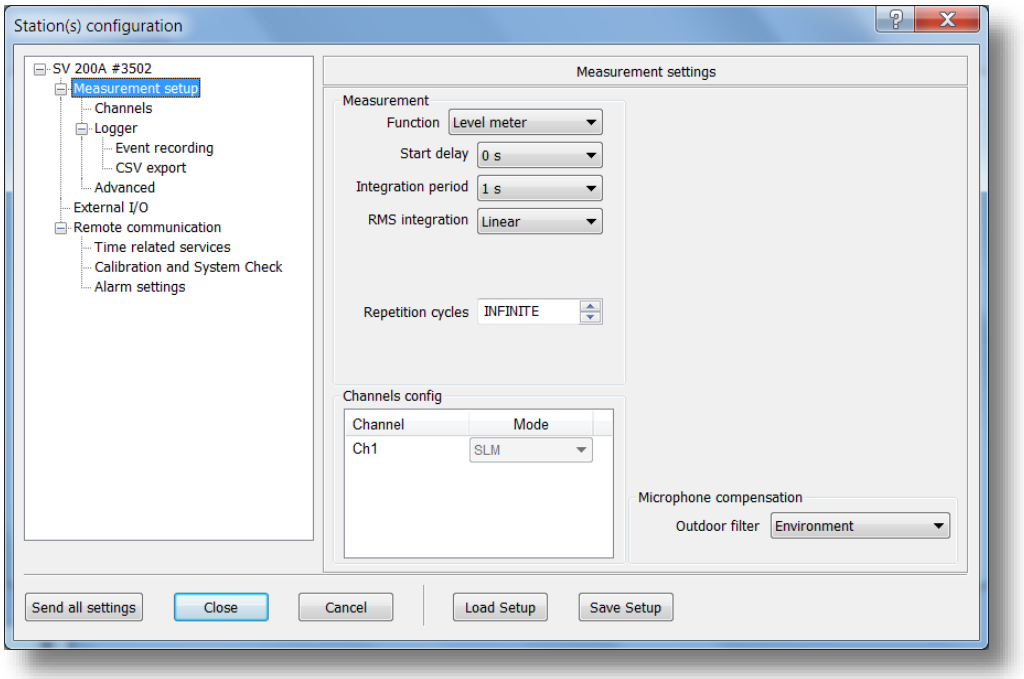


Note: Name *appears on the Station list of the SvanNET web-service.*

9.8.2 Measurement setup

The **Measurement setup** tab consists of the following parameters: measurement function (**Function**: ***Level meter***, ***1/1 Octave*** or ***1/3 Octave***), delay of the measurement start (**Start delay**), integration period/measurement run time (**Integration period**: ***INFINITE***, ***1 s ÷ 24 h***), RMS detector type

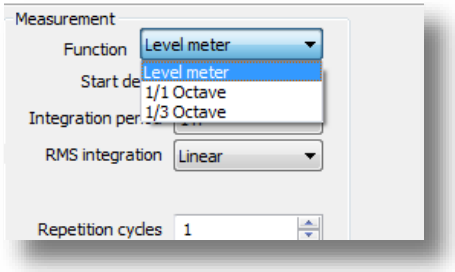
(**RMS integration**), number of repetitions of measurement cycles (**Repetition cycles**), microphone compensation (**Outdoor filte**r) and configuration of channels input (**Channels config**), which in the case of SV 200A is set to sound measurement (**SLM**) and cannot be changed.



Measurement function

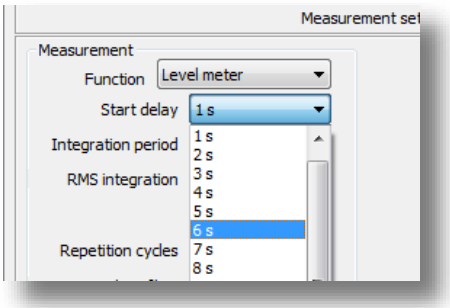
The main function of the instrument is the measurement of Sound pressure broad band level (**Level meter**). The **Level meter** function provides you with functions meeting the standard IEC 61672-1:2013 for class 1 accuracy.

You may also use 1/1 and 1/3 real time octave band frequency analysis (**1/1 Octave** and **1/3 Octave**). These functions extend the main Level Meter functions of the instrument, because the selected 1/1 and 1/3 octave analysis is performed along with all calculations of Level Meter.



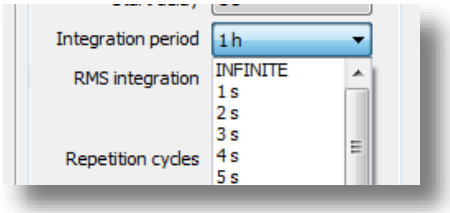
Start delay

The **Start delay** position defines the delay period from the moment of clicking the **Start measurements** button to the measurement start (digital filters of the instrument constantly analyse the input signal even when the measurement is stopped). This delay period can be set from **0 s** to **60 s**.



Integration period

The **Integration Period** position defines the period during which the signal is being measured (averaged) and measured results stored as the set of Summary Results.

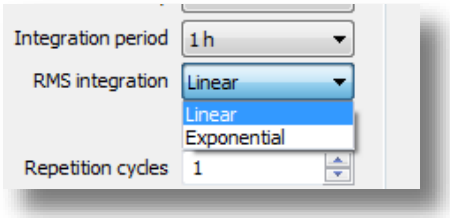


The measurement will stop automatically after this period. When the **Repetition cycle** is greater than one, the measurement will start again.

When **INFINITE** is selected, the measurement will run until the user stops it manually.

RMS Integration

The **RMS Integration** position defines the detector type for calculation of the **Leq**, **LEPd**, **Lnn** and **SEL** results. Two options are available: **Linear** and **Exponential**. The formulae used for results calculation are given in Appendix D.

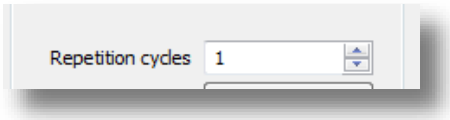


The **Linear** integration is used when it is required to obtain the true RMS value of the measured signal. When this option is selected the value of the **Leq**, **LEPd**, **Lnn** and **SEL** results do not depend on the detector time constant: **Fast**, **Slow** or **Impulse**.

The **Exponential** integration enables fulfilling the requirements of other standards for the time averaged **Leq** measurements. When this option is selected value of the **Leq**, **LEPd**, **Lnn** and **SEL** functions depends on the detector time constant: **Fast**, **Slow** or **Impulse**.

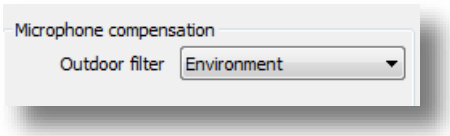
Repetition cycles

The **Repetition cycles** position defines the number of cycles (with the measurement period defined by **Integration Period**) to be performed by the instrument. The **Repetition cycles** number values are within limits [INFINITE, 1, 1000]. **INFINITE** means that the instrument will repeat the measurements until it will be stopped manually.



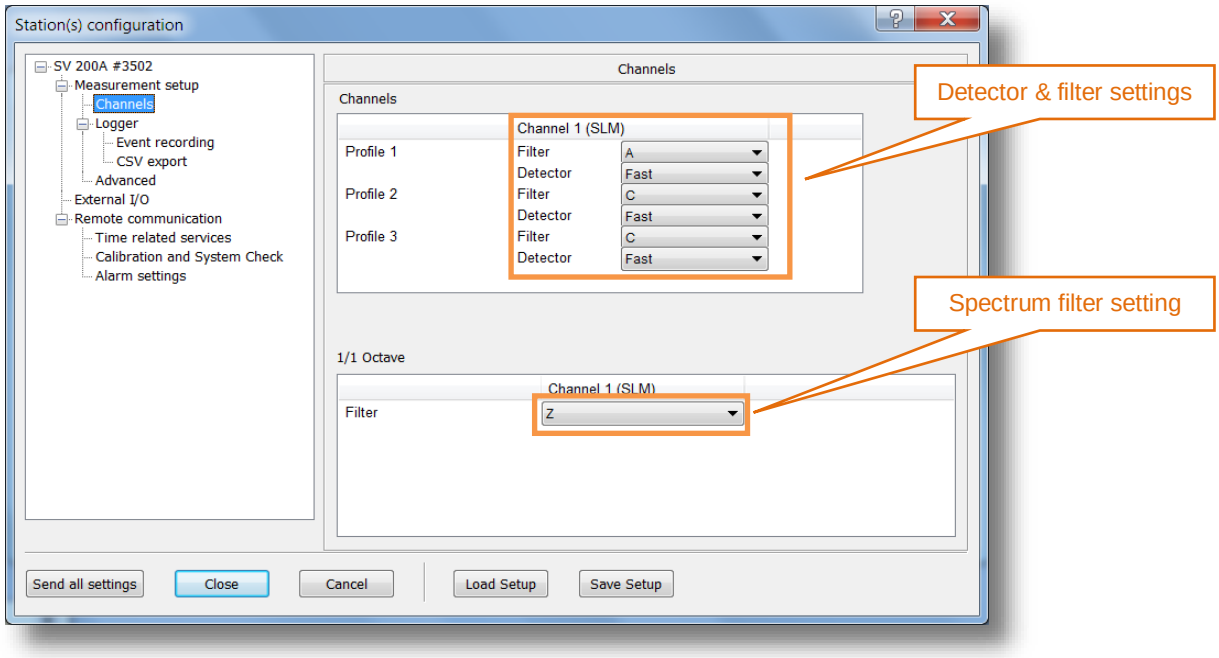
Outdoor filter

The **Outdoor filter** setting enables selecting the appropriate compensation filter. The characteristics of the outdoor filter depend on the application: **Environment** (acoustic signal is parallel to the microphone's grid) or **Airport** (acoustic signal is perpendicular to the microphone's grid). The frequency characteristics of the filters are given in Appendix C.



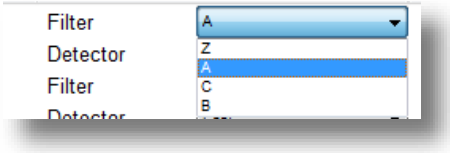
9.8.3 Channels

In this tab, filter and RMS detector can be selected for each acoustic profile individually. Due to this, three results with different filter and detector can be obtained simultaneously. When ***1/1 Octave*** or ***1/3 Octave*** functions are selected, frequency weighting filter for 1/1 & 1/3 octave analysis can also be defined.



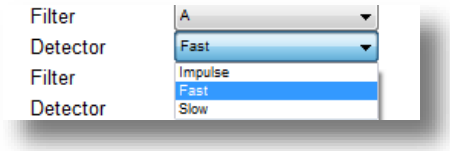
Weighting filter

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



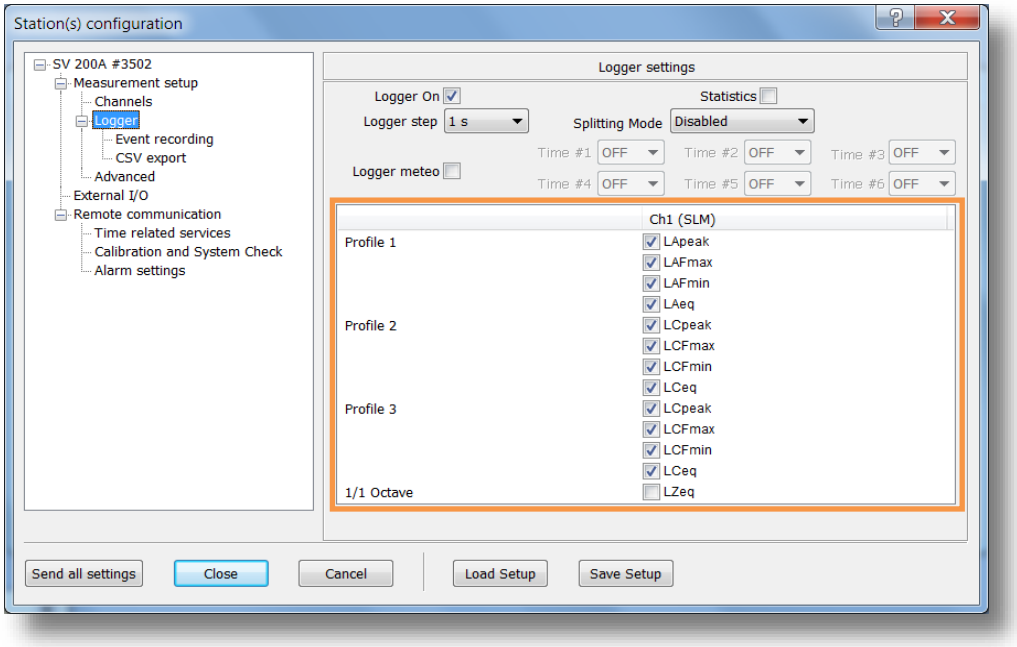
RMS detector

The following RMS detectors are available in the instrument: **Impulse**, **Fast** and **Slow**.



9.8.4 Logger settings

This tab enables setting the logger function, e.g. recording of the time history of measured results, and consists of the following parameters: time history activation (**Logger On**), time history step (**Logger step**), activation of recording of parameters taken from meteorological station (**Logger meteo**), splitting of logger records (**Splitting Mode**) and logged results selection.

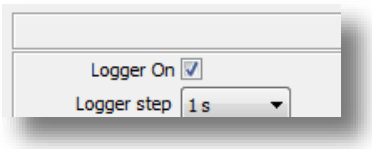


Time history results are saved in a file with automatically defined name, which consists of a prefix (a string of letters) and a number (string of digits). New time history is recorded in a new file, which name is generated on the inherit principle – new file name has the same prefix as the previous file, but it's number is increasing by one.

Note: *The **Station(s) configuration** window doesn't allow changing names of the logger files. But you can do it in the **SVAN Files** window with the help of the **Setup file editor** function – see "SvanPC++ User Manual".*

Logger On

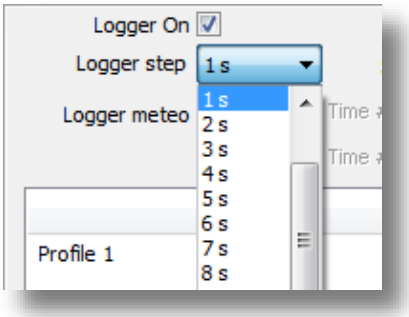
The **Logger On** position switches on/off the functionality, which enables saving selected results from three user profiles with the **Logger step** and Summary results with the step specified by the **Integration period** parameter.



Note: *When **Logger On** is deselected, no measurement results will be stored in the SV 200A memory. Usually this setting should be on.*

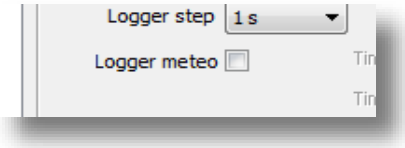
Logger step

The **Logger step** defines the period of logger results integration/measurement and logging in the logger file. It can be set from 2 milliseconds to 1 second in 1, 2, 5 sequences, from 1 second to 59 second, from 1 minute to 59 minutes and 1 hour.



Logger meteo

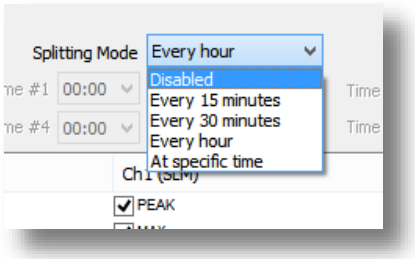
The **Logger meteo** check-box controls saving results from the **SP 275** weather station (supplied as an option). The results are saved with the **Logger step** period, unless it is smaller than 1s. In such case, weather data will be stored in the result file each second.



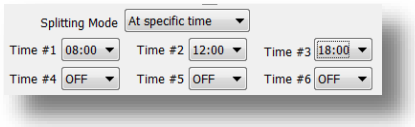
SP 275 enables recording humidity, pressure, temperature, wind speed and direction values as well as rain and hail intensity.

Splitting mode

The **Splitting mode** selector enables choosing maximum length of each partial results file. If in the moment of splitting the measurement is still carried out, the partial results file is closed, and the results are saved in the next partial results file.

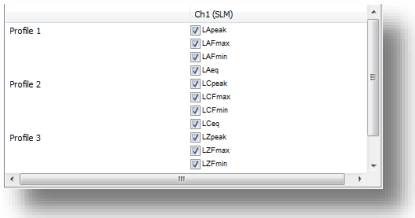


At specific time option splits files at a specified time of a day. It is possible to define up to six settings.



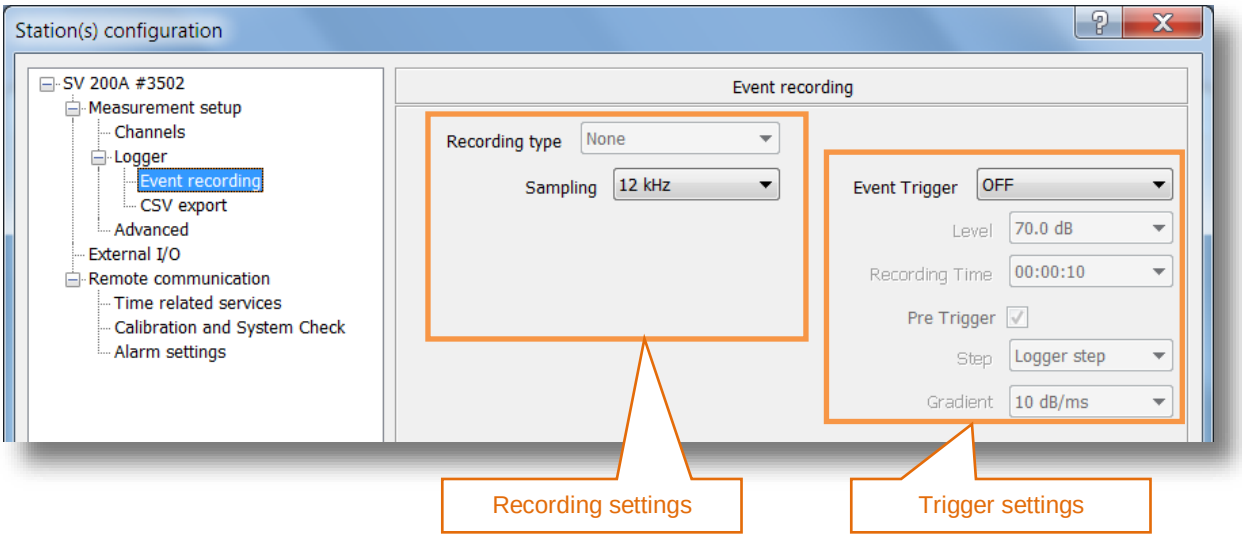
Logger results

The **Logger Results** list enables selecting the results for three independent user defined profiles, which will be recorded to the logger file during the measurement. Measurement parameters for each profile are defined in the **Channels** section.



9.8.5 Event recording

The **Event Recording** functionality enables activating event waveform signal recording in the instrument's memory and setting recording parameters.

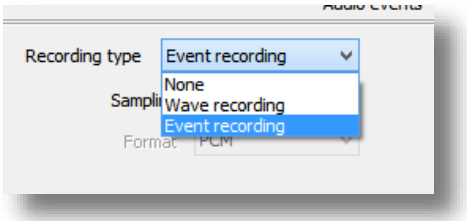


Recording type

The **Recording type** position enables choosing the way the recording is going to be stored.

Wave recording will be stored on the SD-card in form of a separate PCM (*.wav) file along with logger files.

Event recording will be stored inside logger files. Audio recording in a logger file is indicated as an **Audio** marker.



The event recording can be later exported from the logger file to the PCM format.

Wave recording results are saved in a file with automatically defined name, which consists of a prefix (a string of letters) and a number (string of digits). Name of the new Wave file is generated on the inherit principle – new file name has the same prefix as the previous file, but it's number is increasing by one.

Note: *The **Station(s) configuration** window doesn't allow to change the name of the Wave files. But you can do it in the **SVAN Files** window with the help of **Setup file editor** function – see "SvanPC++ User Manual".*

Note: *PCM audio recordings take up a lot of storage space and also transmission bandwidth during data downloading.*

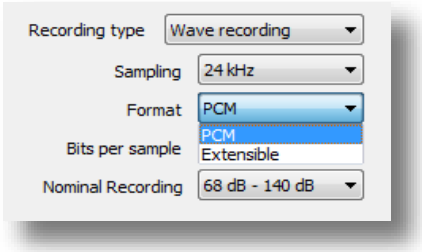
Recording settings

The **Recording settings** section enables choosing a sampling frequency and a format (only available in the **Wave recording** mode) of the recording.

It is possible to select one of the three sampling rates: **12 kHz**, **24 kHz** or **48 kHz**. Higher sampling rate ensures recording of higher resolution but at the same time increases file size.

The **Format** position enables selecting the format of the recorded file: **PCM** or **Extensible**.

The **Bits per sample** position enables selecting 16 or 24 bits per sample.

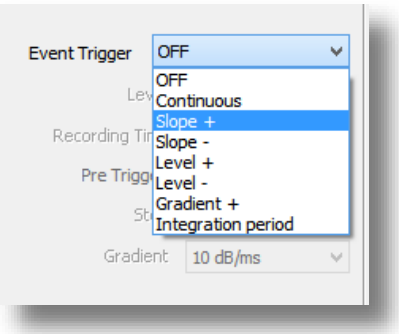


Trigger parameters

The **Event Trigger** position enables selecting the recording trigger type.

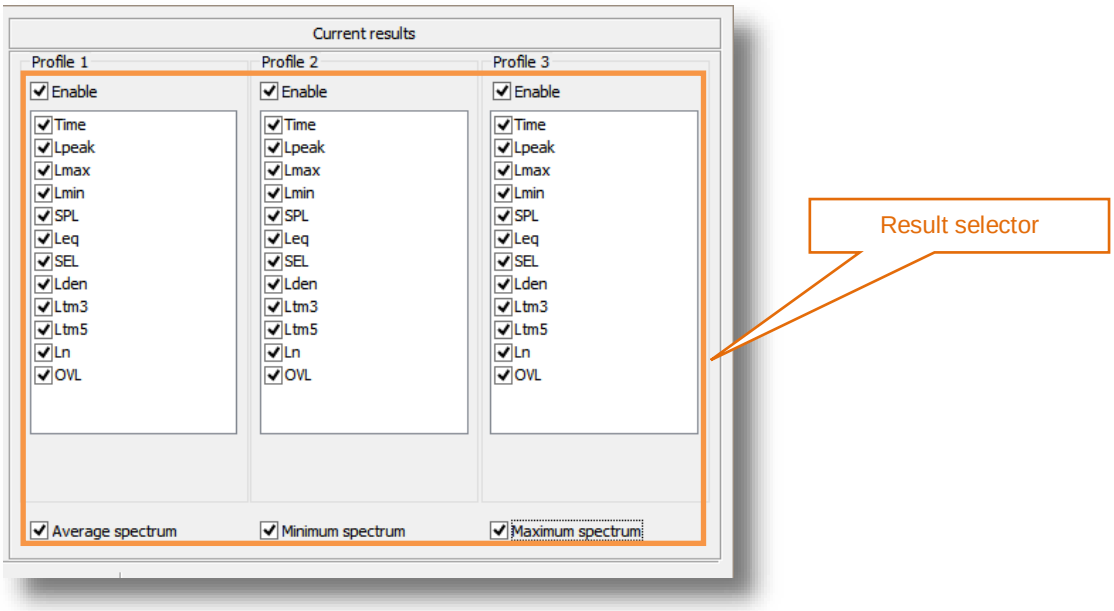
Triggering is switched on if one of its seven available types is selected: **Continuous**, **Slope +**, **Slope –**, **Level +**, **Level –**, **Gradient +** or **Integration period** (see Chapter 8.4.1).

When the **Continuous** trigger is active, whole measurements will be recorded.



9.8.6 CSV export

The **CSV export** functionality allows direct export of measurement data into CSV files stored on the instrument's SD-card. The **Current results** tab enables selecting results to be exported from each profile individually. Maximum, minimum and average spectra for each integration period can also be exported.



The file structure of a generated CSV is shown in the table below.

Section	File contents

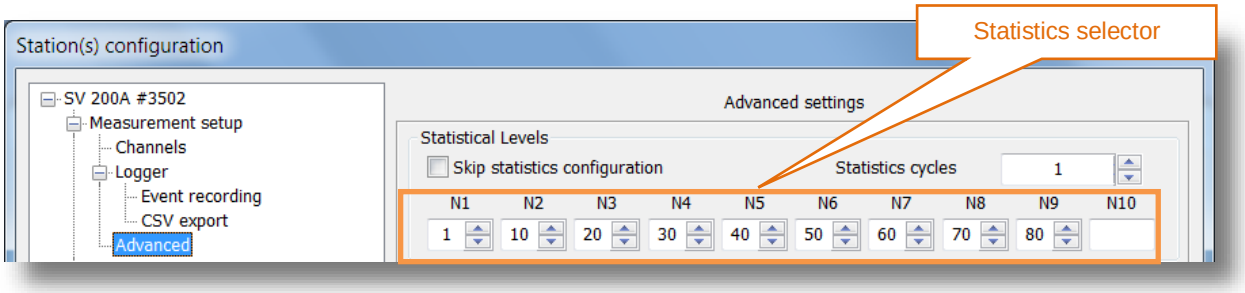
File header	// **
	// CSV file version, 1.18
	// Created, 11/01/2015, 20:43:24
	// Unit, 200, SN, 26858
	// Firmware, 1.20.7, 14/11/2014
	// Corresponding logger file name, L1.SVL
	// Device function, SLM
	// Integration time, 00:00:01
	// Leq integration, linear
	// Outdoor filter, environmental
	// Profile 1, A, FAST
	// Profile 2, C, FAST
	// Profile 3, Z, FAST
	// Statistical levels, 1, 10, 20, 30, 40, 50, 60, 70, 80, 90
	// CSV save mask, 0FFF, 0FFF, 0FFF, 7
	// SLM results, profile 1, TIME, PEAK, MAX, MIN, SPL, LEQ, SEL, Lden, Ltm3, Ltm5, Lnn, OVL
	// SLM results, profile 2, TIME, PEAK, MAX, MIN, SPL, LEQ, SEL, Lden, Ltm3, Ltm5, Lnn, OVL
	// SLM results, profile 3, TIME, PEAK, MAX, MIN, SPL, LEQ, SEL, Lden, Ltm3, Ltm5, Lnn, OVL
	// **

Record number	// Record No, 1
Time signature	DT, 11/01/2015, 20:43:25
Measurement data	P1, 1, 56.0, 42.7, 39.6, 42.7, 41.5, 41.5, 46.5, 42.7, 42.7, 42.9, 42.8, 42.6, 42.4, 42.2, 42.0, 41.0, 40.5, 40.0, 38.5, 0 P2, 1, 62.3, 53.9, 47.8, 53.9, 49.8, 49.8, 54.8, 53.9, 53.9, 51.9, 51.5, 51.0, 50.5, 50.0, 49.5, 49.0, 48.5, 48.0, 47.5, 0 P3, 1, 66.7, 59.0, 47.3, 59.0, 57.5, 57.5, 62.5, 59.0, 59.0, 59.9, 59.0, 58.5, 58.0, 57.7, 57.5, 57.2, 57.0, 56.6, 56.3, 0
Record number	// Record No, 2
Time signature	DT, 11/01/2015, 20:43:26
Measurement data	P1, 1, 56.9, 45.4, 41.4, 45.4, 42.8, 42.8, 47.8, 45.4, 45.4, 46.9, 46.0, 43.0, 42.7, 42.5, 42.2, 42.0, 41.6, 41.3, 41.0, 0 P2, 1, 63.3, 52.6, 47.9, 52.6, 50.4, 50.4, 55.4, 52.6, 52.6, 53.9, 53.6, 53.3, 53.0, 48.7, 48.5, 48.2, 48.0, 47.6, 47.3, 0 P3, 1, 67.8, 59.2, 54.0, 59.2, 56.6, 56.6, 61.6, 59.2, 59.2, 59.9, 59.5, 59.0, 57.0, 55.6, 55.3, 55.0, 54.6, 54.3, 54.0, 0
Record number	// Record No, 3
Time signature	DT, 11/01/2015, 20:43:27
Measurement data	P1, 1, 57.6, 41.7, 37.6, 41.7, 39.1, 39.1, 44.1, 41.7, 41.7, 42.9, 42.0, 41.0, 39.0, 38.7, 38.5, 38.2, 38.0, 37.5, 37.0, 0 P2, 1, 62.9, 53.2, 49.6, 53.2, 50.9, 50.9, 55.9, 53.2, 53.2, 54.9, 54.0, 50.8, 50.7, 50.5, 50.4, 50.2, 50.1, 50.0, 49.5, 0 P3, 1, 68.9, 64.0, 56.9, 64.0, 61.9, 61.9, 66.9, 64.0, 64.0, 63.9, 63.6, 63.3, 63.0, 62.0, 61.6, 61.3, 61.0, 60.5, 60.0, 0
…	…

Note: *CSV files take up a lot of storage space and transmission bandwidth during data downloading.*

9.8.7 Advanced settings

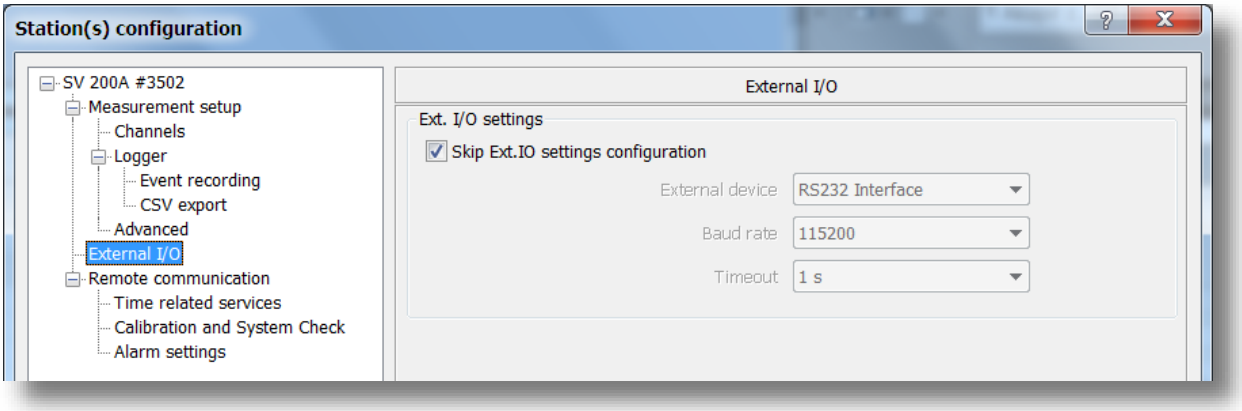
The **Advanced settings** tab enables defining ten statistical levels, named from **N1** to **N10**, to be calculated and saved in the results files.



All values must be in the integer range of 1 to 99. Each value can be set independently from the others.

9.8.8 External I/O

The **External I/O** tab allows you to select the device connected to SV 200A via the **MULTI I/O** socket.

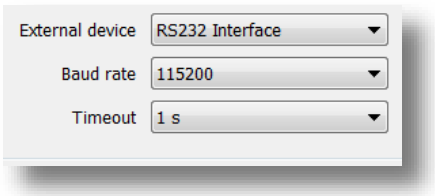


The **External device** selector list contains devices that are connected via the **MULTI I/O** socket.

- **RS 232 Interface**,
- **Meteo-SP 275** denotes SP 275 meteo module.

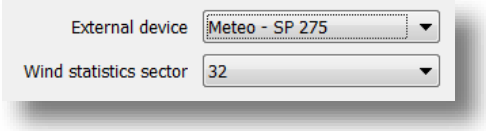
Selecting either one of the devices alters the content of positions for the selected external device.

The **RS 232 Interface** configuration requires setting two additional parameters: **Baud rate** and **Timeout**.



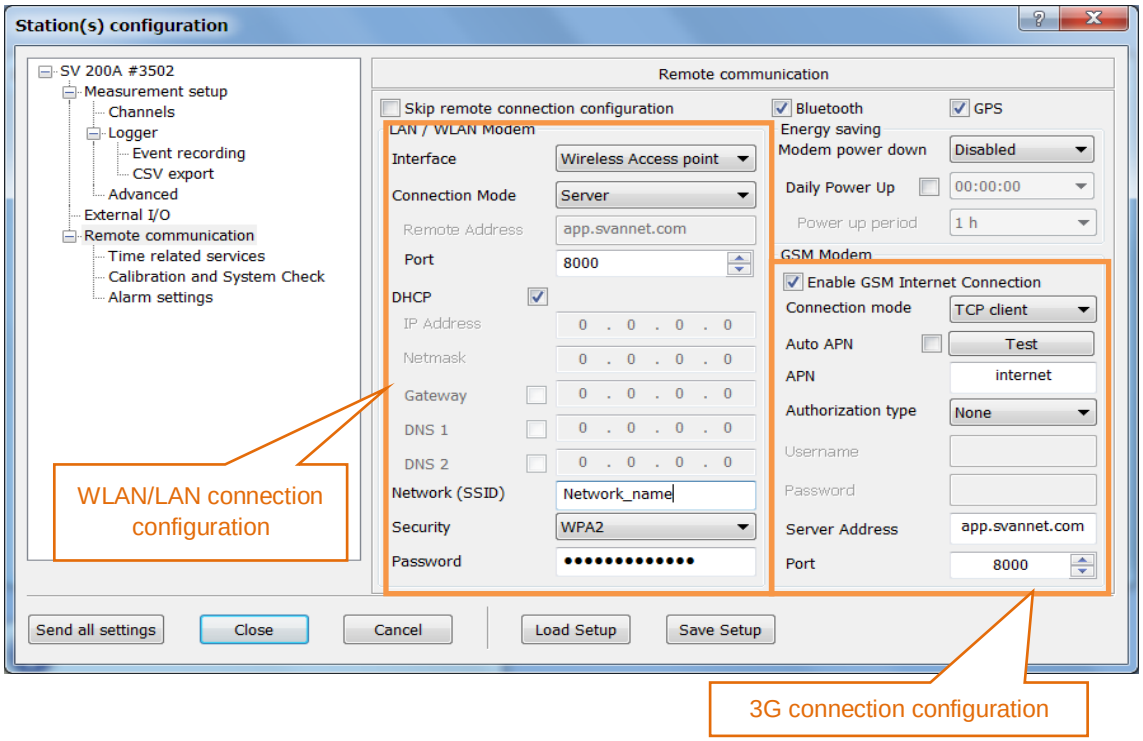
The **Meteo** option requires setting the number of **Wind statistics sectors**.

Wind statistics include wind direction, maximum wind speed and average wind speed distributions.



9.8.9 Remote communication

The **Remote communication** tab enables configuring a remote communication with SV 200A via 3G or WLAN/LAN. Also, some other additional functions can be configured in this tab: Bluetooth, GPS and energy saving by means of switching off powering of modems or enabling powering during defined time window.

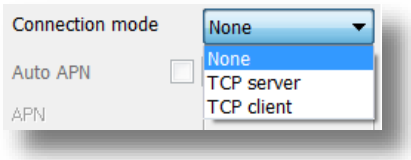


Note: *Use this tab carefully, because if you make improper changings and send new settings to your SV 200A, your Internet connection may not work. And what is worse you will not be able to change settings remotely!*

The connection configuration can be also done through the **Instrument wizard** panel (see Chapter 9.3). The **Remote communication** tab allows configuring all communication types in one place.

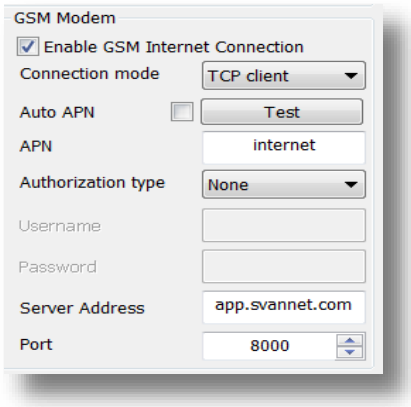
GSM Modem configuration

Connection mode defines the type of TCP/IP connection: **TCP server** or **TCP client**. If it is **None**, there is no connection with the Internet.



Typical GSM Modem configuration for connection with the SvanNET web-service is presented right-hand.

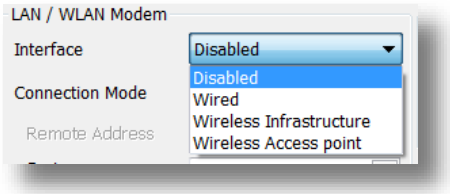
Other configurations are dedicated to the specific user needs or GSM operator conditions in some countries (please refer your local GSM operator for details).

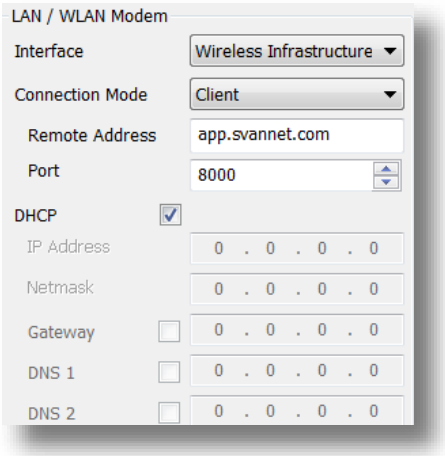


LAN / WLAN Modem configuration

Configuration of the WLAN/LAN module should start from selection of the **Interface** type:

- **Disabled** means that WLAN/LAN module is switched off.
- **Wired** means that SV 200A should be connected to the Local Area Network (LAN) via the SP 200 adapter, connected to the LAN socket.
- **Wireless Infrastructure** means that SV 200A should be connected to the existing wireless network.
- **Wireless Access point** means that SV 200A should work as a wireless router.





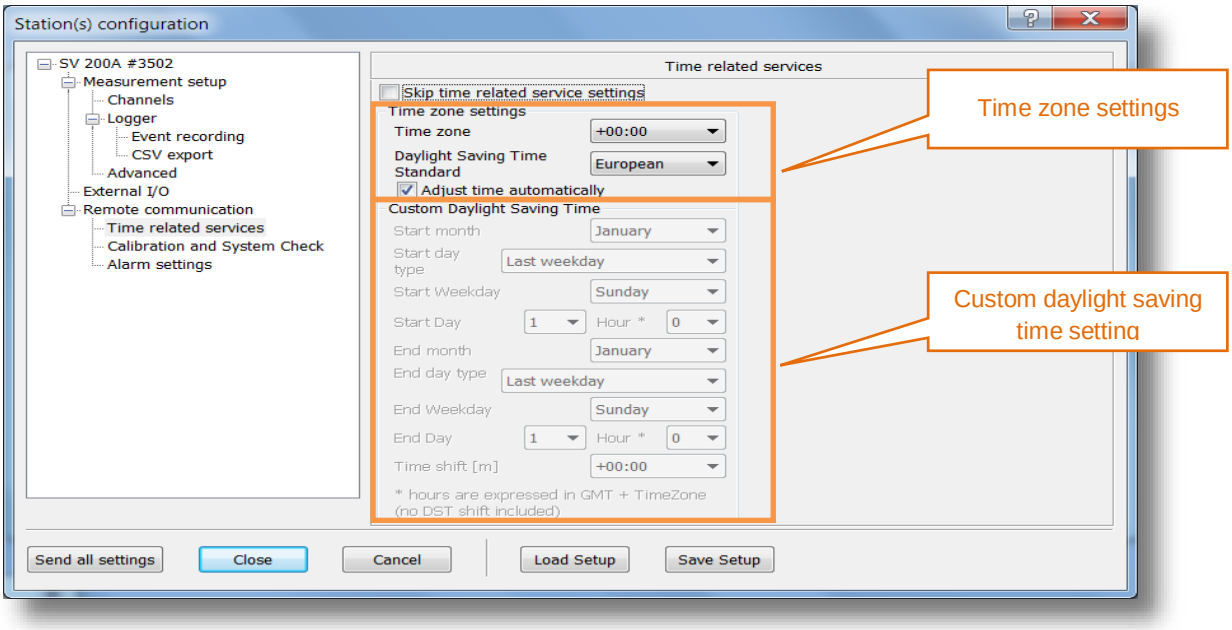
Typical **Wireless Infrastructure** configuration for connection with the SvanNET web-service is presented right-hand.

Other settings are dedicated to the specific user needs and should be configured by local IT specialist.

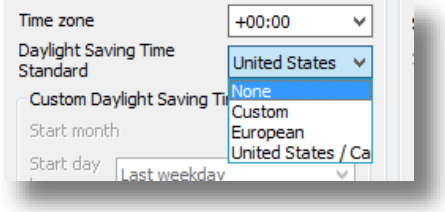
Network (SSID), **Security** and **Password** positions should be configured based on used wireless network specific parameters.

9.8.10 Time synchronization

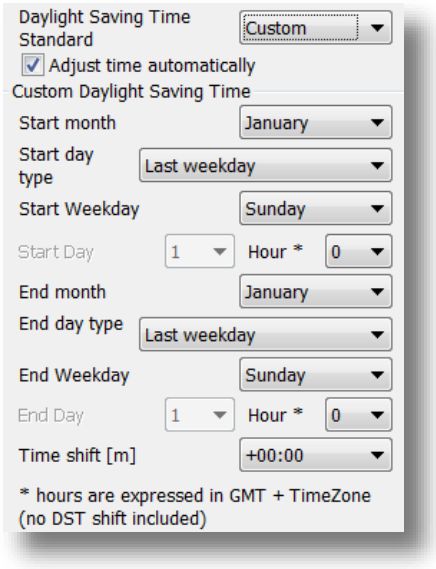
SV 200A offers sophisticated time synchronization features, including automatic and manual daylight-saving time adjustments.



In the **Time zone settings** section you can select suitable **Time zone** and **Daylight Saving Time Standard**. European and US/Canadian standards are implemented in the instrument.



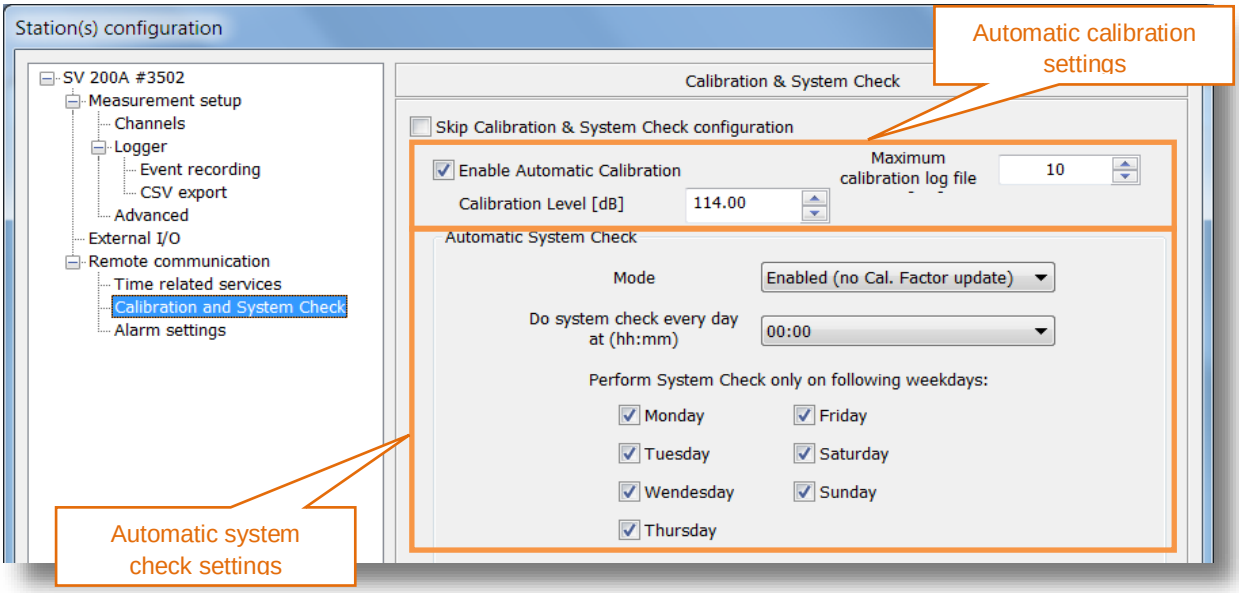
If different daylight-saving time rules should be applied, select **Custom** and fill in **Custom Daylight Saving Time** section.



***Note:** There are four time-synchronization servers predefined in **Time synchronization settings**. Do not change these settings unless the servers are unavailable in the instrument's network or a custom server is needed.*

9.8.11 Calibration & System Check

SV 200A is fitted with an **Automatic calibration** and **Automatic system check** features. The **Calibration & System Check** section enables configuring these features.



Automatic calibration

When the **Automatic calibration** is enabled, mounting on the instrument's microphone and switching on the sound calibrator automatically starts the calibration procedure.

Such operation requires typing the **Calibration Level** from the calibration certificate of the used calibrator. For more information about the automatic calibration feature see Chapter 4.2.

***Note:** Defined Calibration Level remains constant. Remember to perform calibration with the sound calibrator generating the same level as the configured calibration level.*

Automatic system check

When the **Automatic system check** feature is enabled the calibration factor of the instrument will be periodically verified using built-in electrostatic actuator. You can specify the hour and a weekday of the automatic system checks.

To activate the automatic system check, select **Enabled (no Cal. Factor update)** option from the **Mode** dropdown list.

To schedule automatic system checks, choose weekday and select time of the system check from the **Do system check every day at (hh:mm)** dropdown list.

Note: *System check cannot be considered as a calibration. Calibration factor will not be updated during* ***Automatic System Check*** *procedure.*

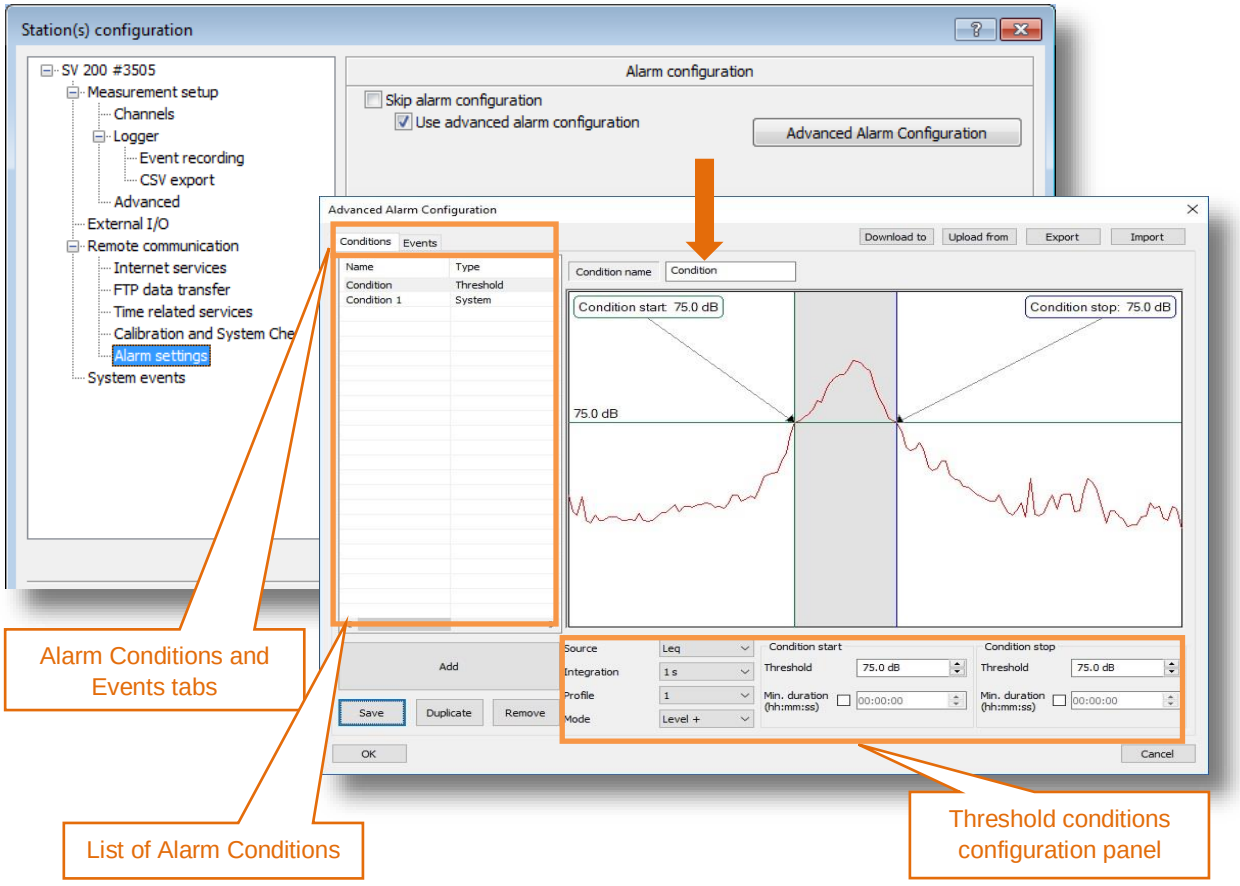
Note: *Measurements are not stopped for the* ***Automatic System Check*** *procedure.*

Calibration logging

Results of calibration (both manual and automatic) and automatic system check are stored in the calibration and system check history file on the instrument's SD-card. Log file name is *C.TXT*. The file can be downloaded to the PC and then opened in any text editor, such as MS Notepad. Maximum allowed size of log file is specified in the **Maximum calibration log file size [MB]** position.

9.8.12 Alarm settings

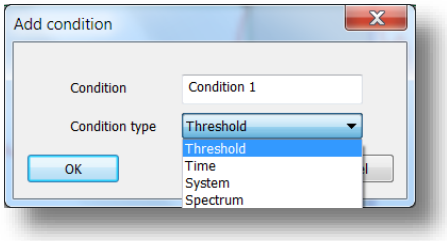
In the **Alarm configuration** section, press **Advanced Alarm Configuration** button to configure alarm functionality of SV 200A. In the **Advanced Alarm Configuration** window, you can define and configure the set of alarm **Conditions** and **Events**.



9.8.12.1 Alarm Conditions

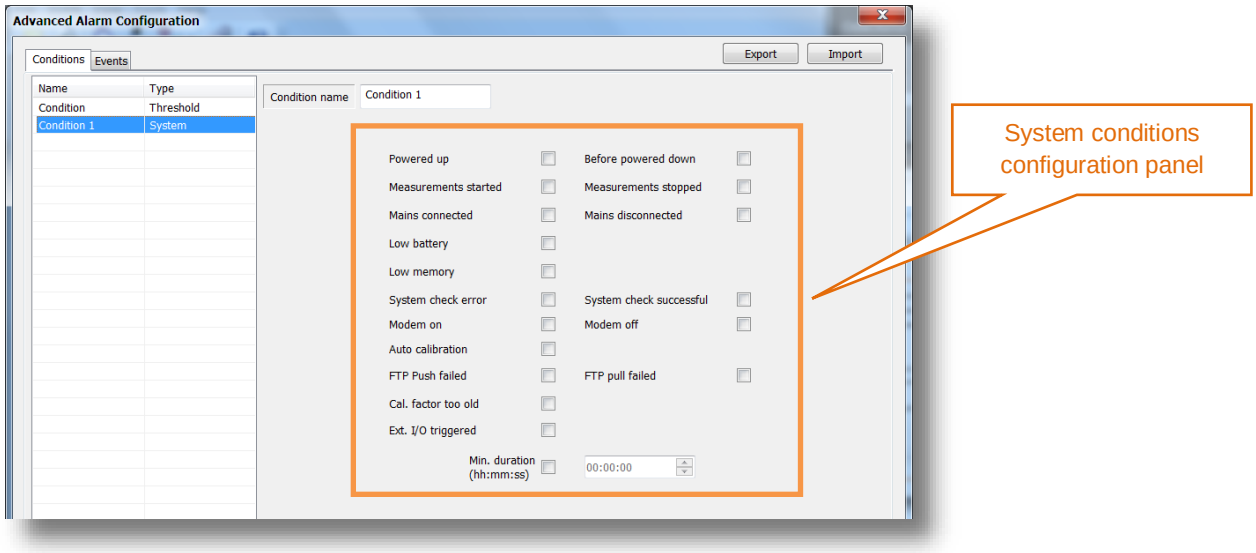
The **Conditions** tab enables configuring different types of alarm condition: **Threshold**, **Time**, **System**, **Spectrum** and **Meteo**. Already created alarm conditions are presented in the list on the right-side of the **Advanced Alarm Configuration** window. If you click on the specific alarm condition you will be able to configure it in the right part of the window.

To create a new condition, click **Add** button and select a new condition from the pop-down list.



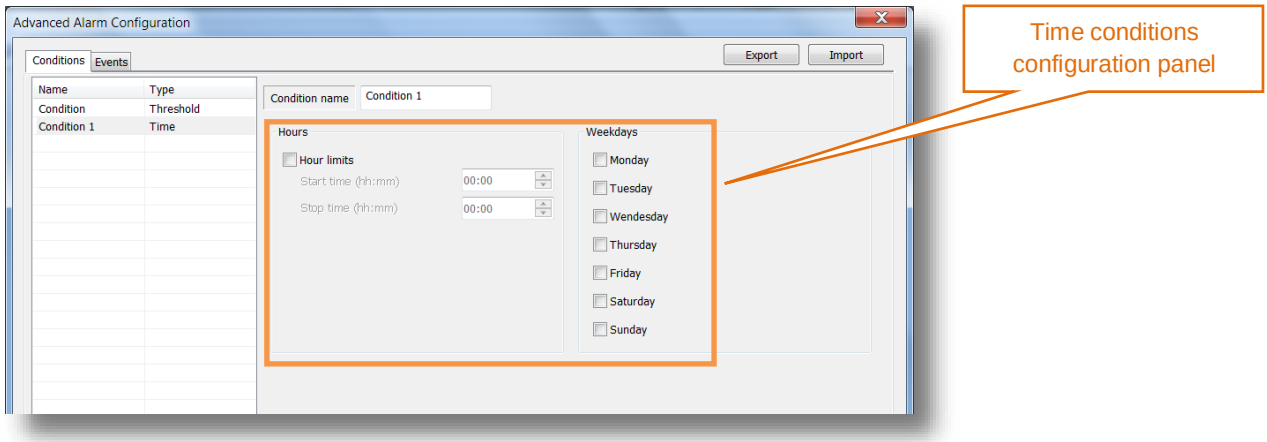
The **Threshold** condition is based on comparison with the **Threshold** level such results as **Leq**, **Lpeak**, **Lmax** or **Lmin** (**Source**), calculated with weighting filter and LEQ detector for the selected **Profile** and averaged during the **Integration** period. Two **Modes** are available: **Level+** and **Level-**. The Threshold levels define the moment of the start/end of the condition. Additionally, you can set the **Minimum Duration** time, which delays the condition start/end. The period when the condition is met is marked by between-cursors of grey colour on the graph.

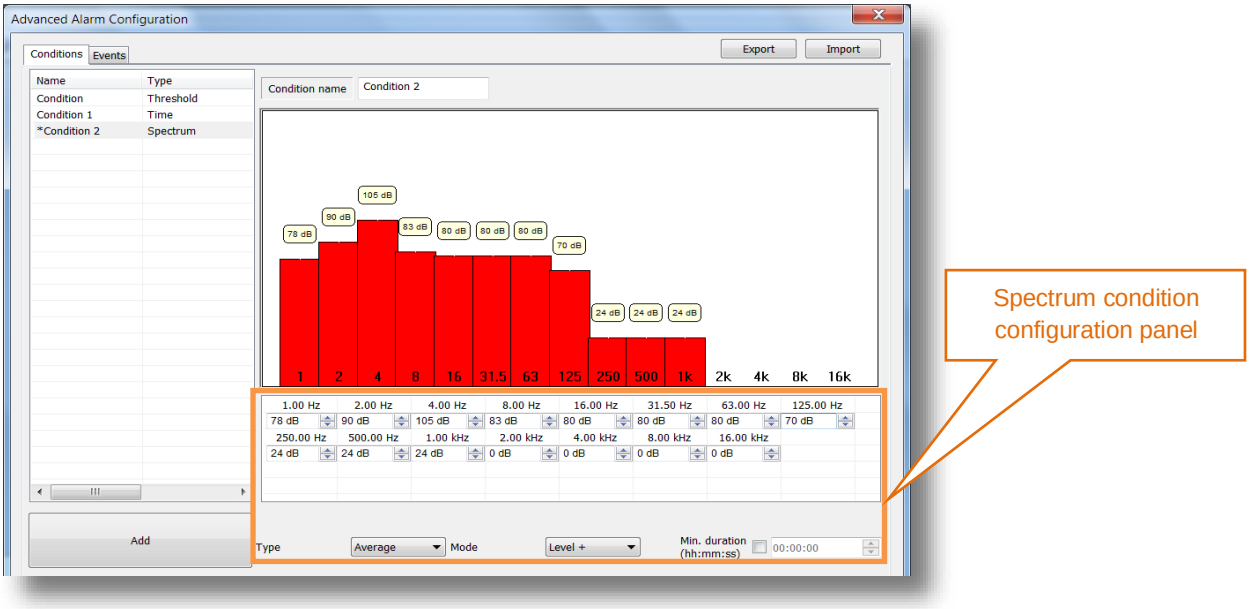
The **System** condition relates to system events, defined in the window below.



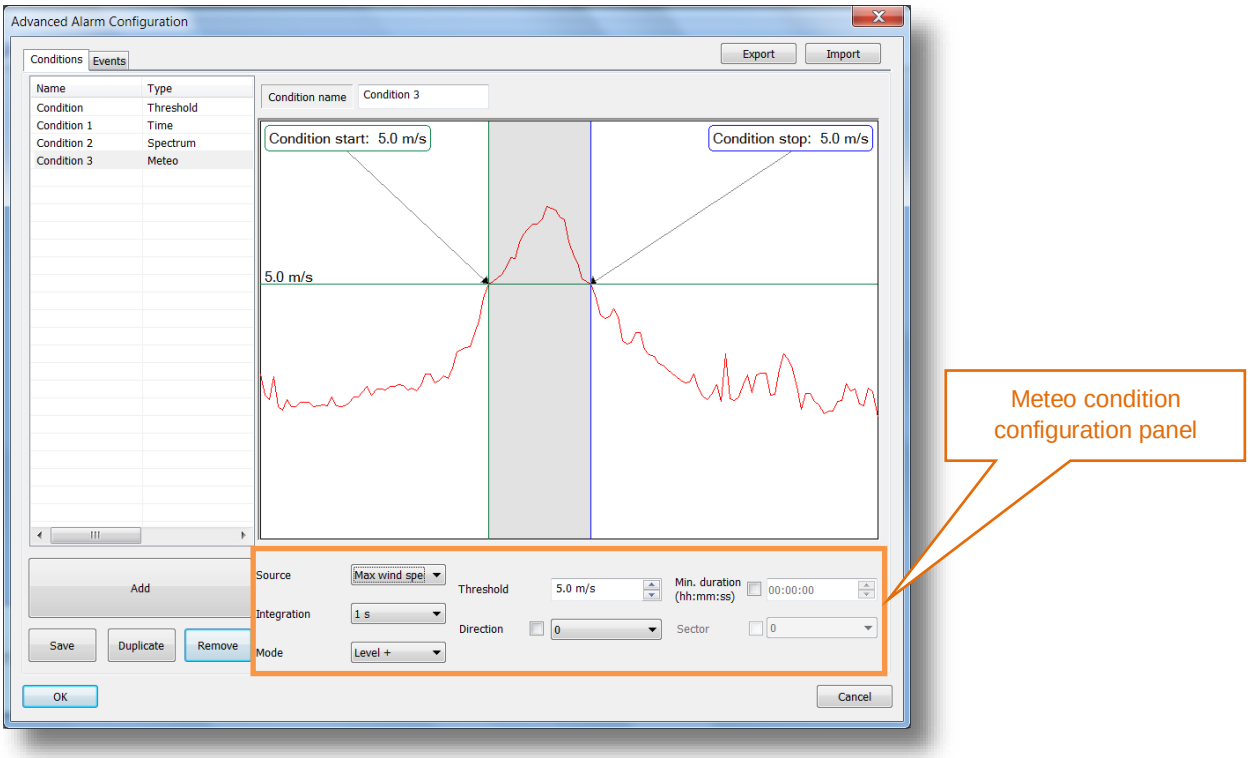
The **Time** condition is based on periods, defined for weekdays.

The **Spectrum** condition is based on comparison of spectrum of selected **Type** with the mask – threshold levels for octave bands.



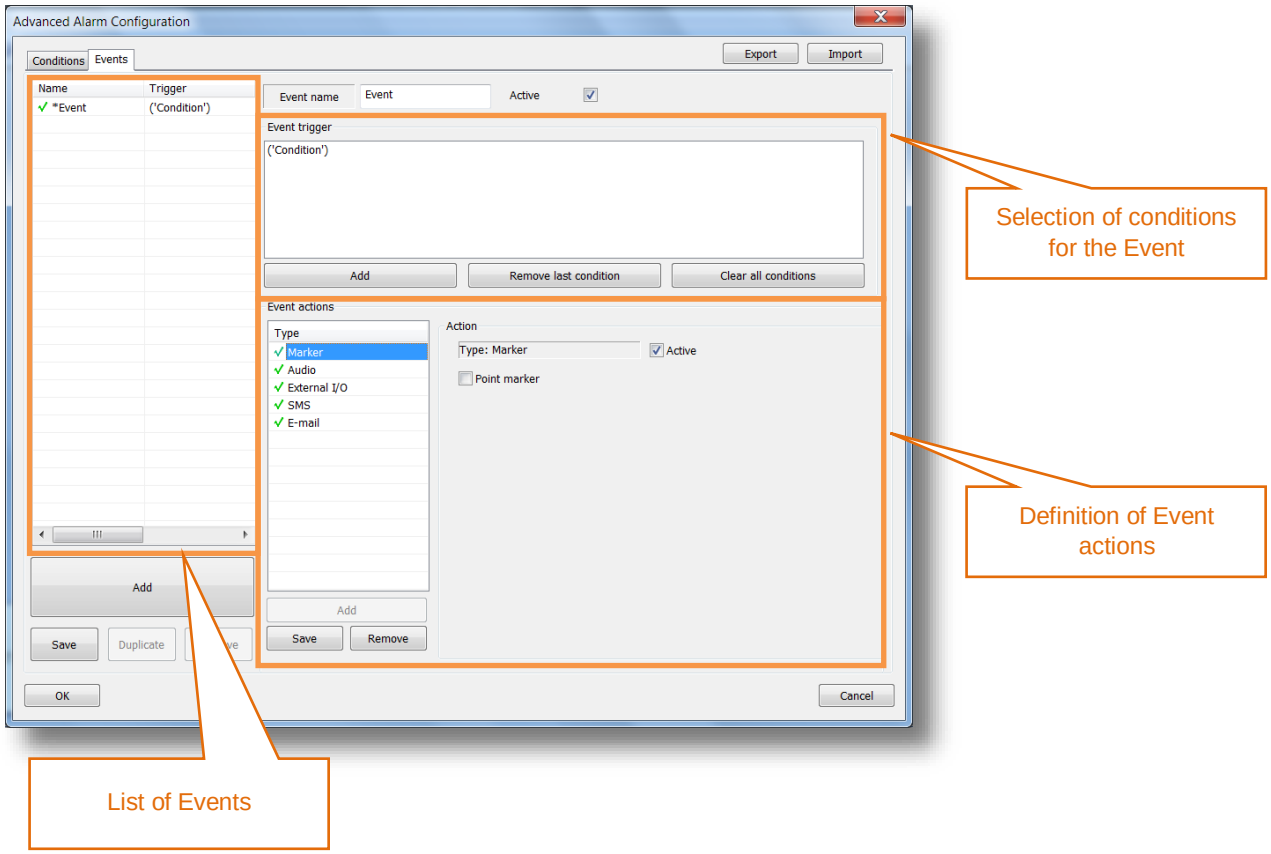


The **Meteo** condition is similar to the **Threshold** condition and based on comparison with the **Threshold** level meteorological results (Max wind speed etc.) selected in the **Source** field, averaged during the **Integration** period. Two **Modes** are available: **Level+** and **Level-**.

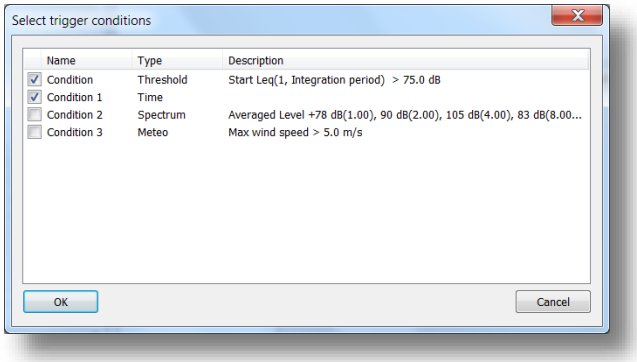


9.8.12.2 Alarm Events

The next step after defining the conditions is creating **Events**. Events are created in the **Events** tab on the base of single or multiple conditions. To add the new **Event**, press the big **Add** button beneath the event list in the left part of the window.



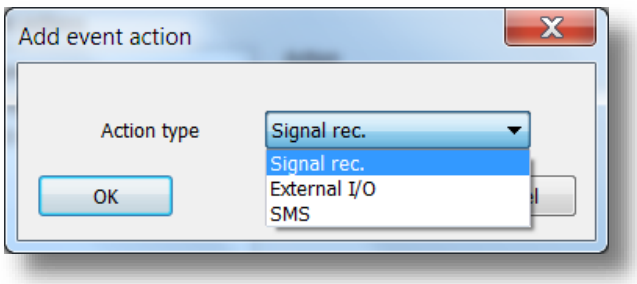
The condition selection is done in the window that appears after clicking on the **Add** button in the **Event trigger** field.



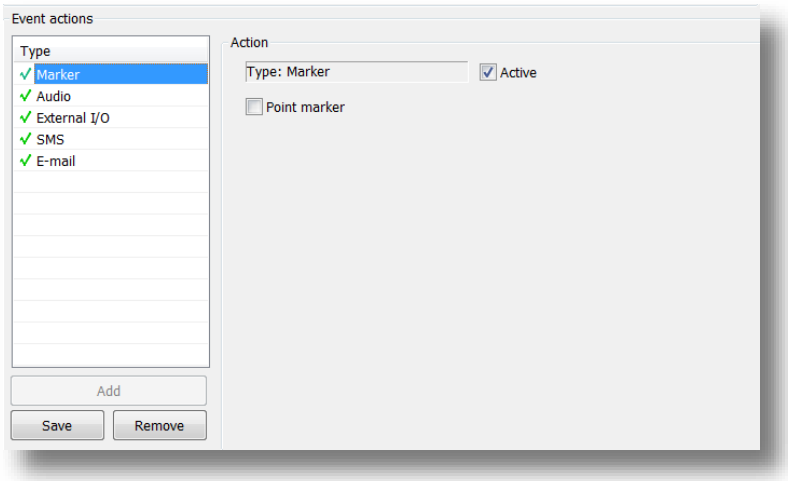
9.8.12.3 Event actions

For each event a set of actions can be defined: **Marker**, **Audio**, **External I/O**, **SMS** or **E-mail**.

The action selection is done in the window that appears after clicking on the **Add** button in the **Event actions** field.



The **Marker** action means that during alarm event the alarm marker will be registered in the logger file at the beginning and at the end of the Event. The **Point marker**¸ which is registered in the logger file only at the beginning of the Event, can be also selected.

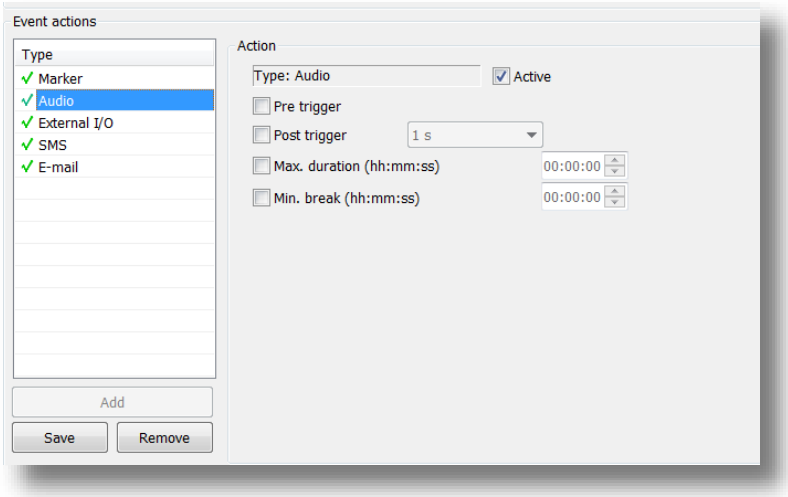


The **Audio** action means that the alarm event will trigger the audio signal recording.

The audio signal recording can be configured to start before the trigger (**Pre trigger**) and stop after the trigger condition disappears (**Post trigger**).

Maximum duration limits the audio recording regardless of the event duration.

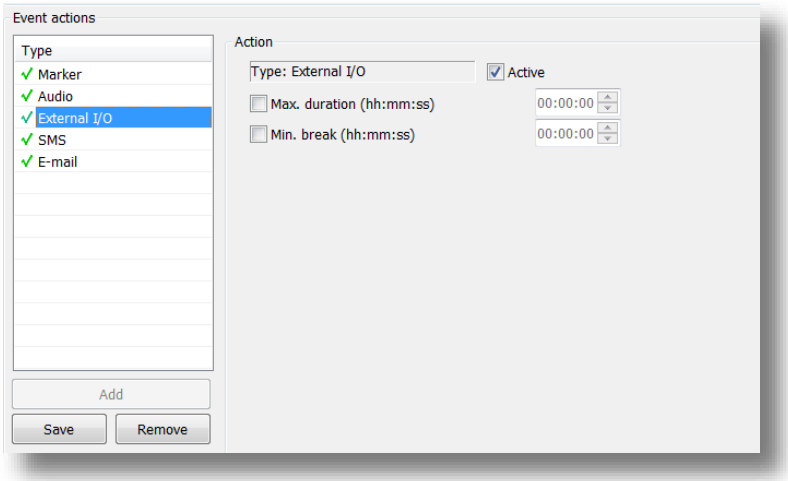
Minimum break defines the minimum period of trigger inactivity after start of the event. This parameter damps so called pulse alarms.



The **External I/O** action means that the alarm event will switch on the alarm signal generation on the **MULT. I/O** socket.

Maximum duration limits the signal generation period regardless of event duration.

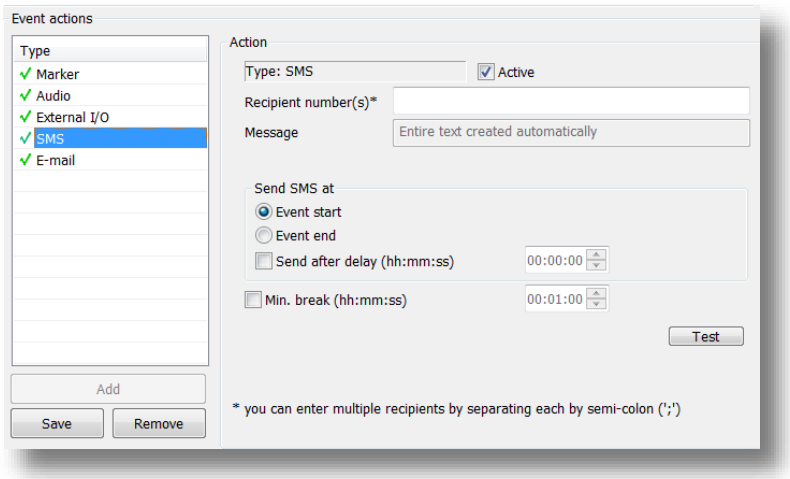
Minimum break defines the minimum period of signal trigger inactivity after start of the event. This parameter damps so called pulse alarms.



The **SMS** action means that the SMS with special message will be sent to a series of numbers.

The SMS can be send on alarm event start/end or after certain delay.

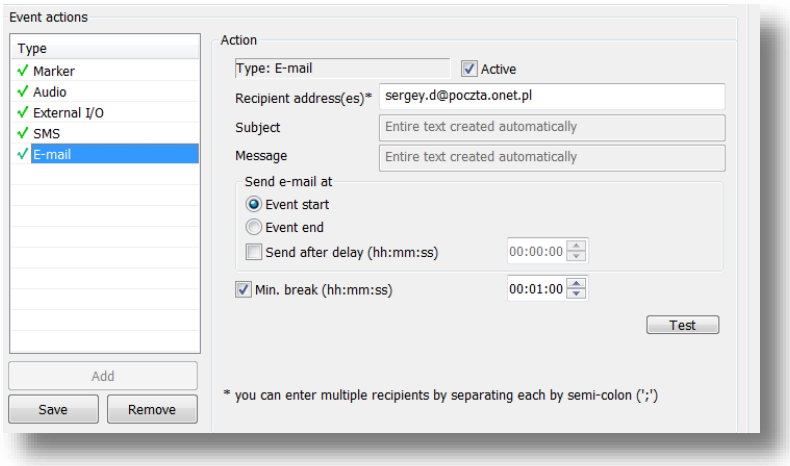
Minimum break defines the minimum period of trigger inactivity after start of the event. This parameter damps so called pulse alarms.



The **E-mail** action means that the E-mail with special message will be sent to a series of addresses.

The E-mail can be send on alarm event start/end or after certain delay.

Minimum break defines the minimum period of trigger inactivity after start of the event. This parameter damps so called pulse alarms.

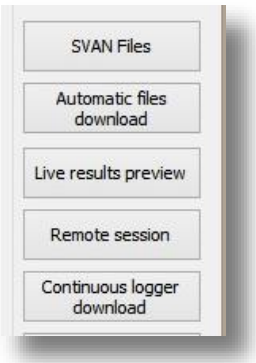


9.9 DATA COLLECTING

SvanPC++ with Remote Communication module offers the most versatile configuration and control of the instrument, data collecting as well as publishing and presentation features. The RC module can cooperate in a variety of modes and communication protocols.

The **Remote Communication** module can operate in four different data collecting modes:

- **SVAN Files** for direct, manual data download
- **Automatic Files Download** (**AFD**) for automatic data download in specified time periods
- **Continuous Logger Download** (**CLD**) for constant data download
- **Live Results Preview** for real-time data publishing and presentation

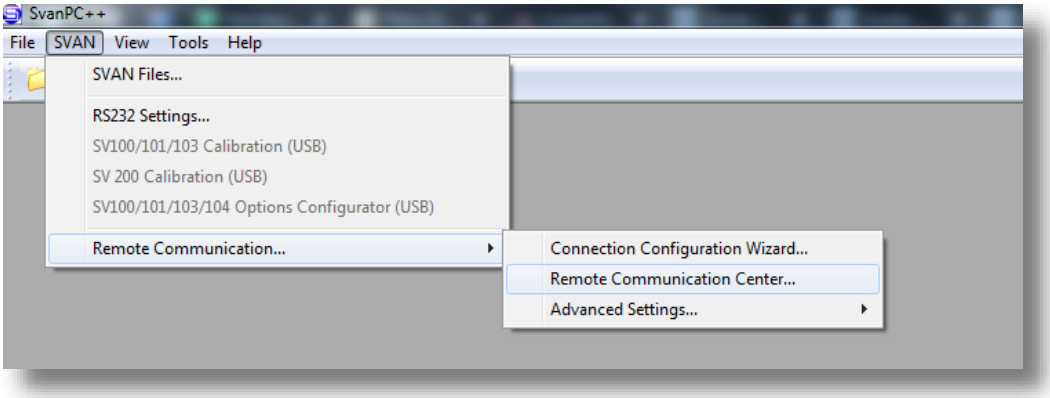


***Note: Remote session** mode is now obsolete and not supported. Using **Remote session** mode is not recommended.*

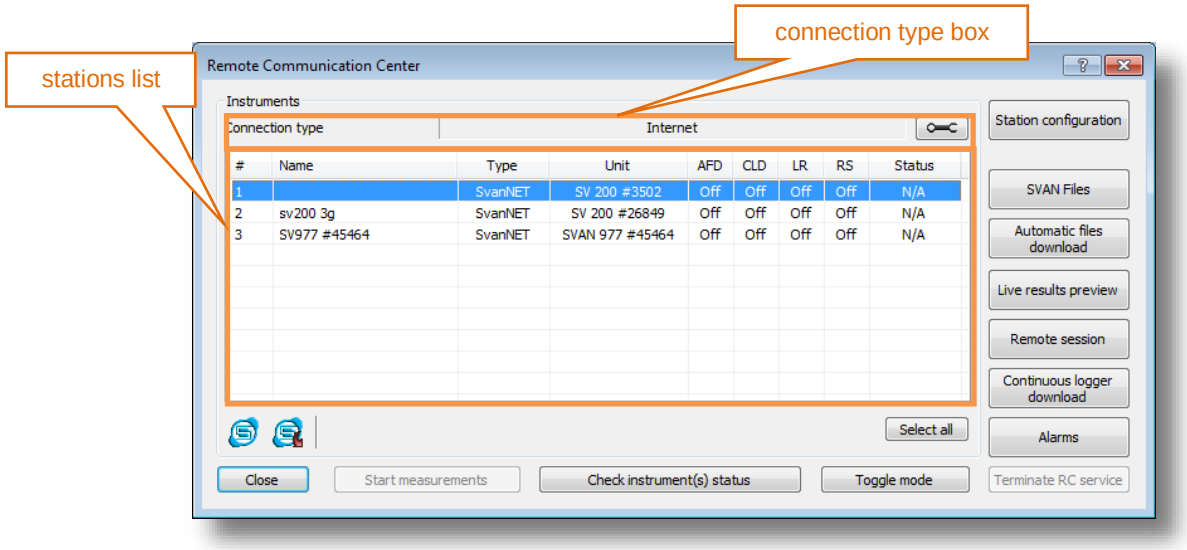
9.9.1 Start working with Remote Communication Center

The Remote Communication Module is controlled from the **Remote Communication Center** window.

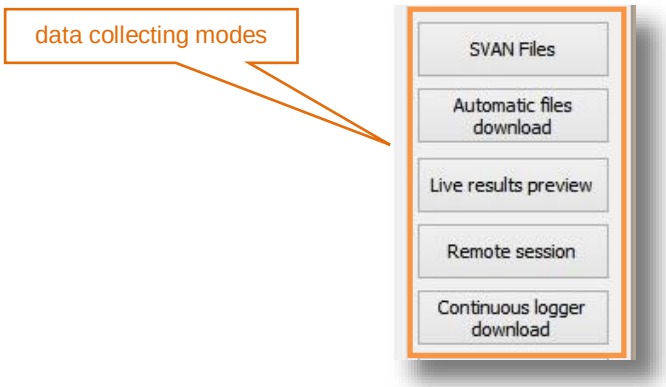
1. To access the **Remote Communication Center** window, locate suitable menu in SvanPC++.



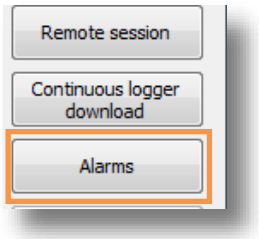
2. Make sure that suitable **Connection type** is chosen. The default connection type is *Internet* however when the instrument is connected to the PC via the USB cable, connection type is automatically changed to *USB*.
3. Choose the instrument you wish to manage in **Stations list**. To select multiple instruments, use *Ctrl+Click* combination.



4. Click the button starting the desired data collecting mode.



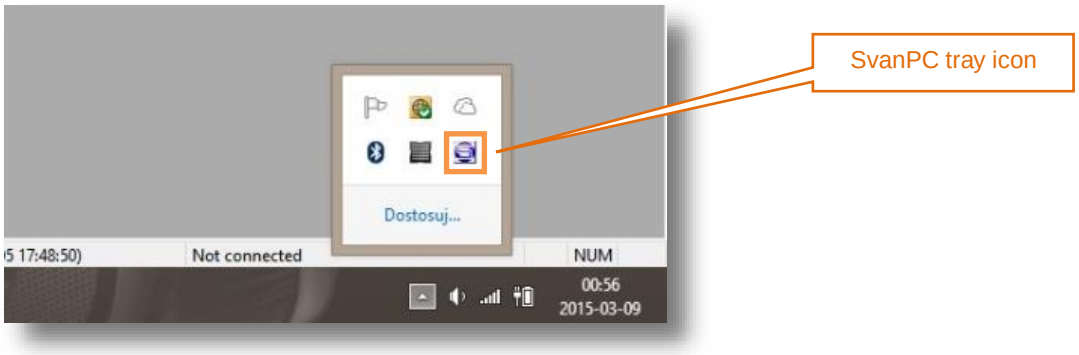
5. SvanPC++ can generate alarms, which are additional to the SV 200A instrument's alarms. To configure SvanPC++ alarms click the Alarm button (see Chapter 9.9.7).



9.9.2 Remote Communication Service

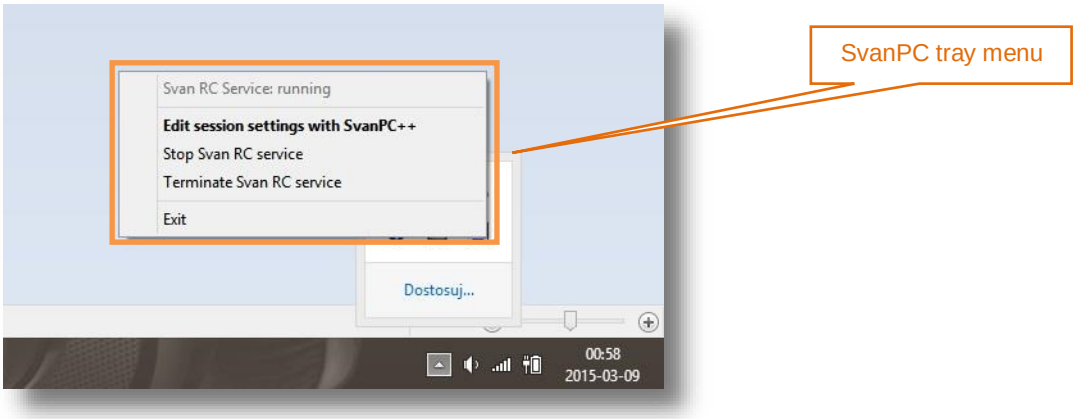
Automatic Files Download (AFD), Continuous Logger Download (CLD) and Live Results Preview run within **Remote Communication Service**. It is a program operating in background regardless of whether SvanPC++ is running or not. The user doesn't even have to be logged in his Windows user profile. All data collecting features of SvanPC++ are active once set up.

Remote Communication Service automatically resumes to its previous state after booting the PC.



The state of the **Remote Communication Service** can be easily monitored with SvanPC tray icon. It becomes active when SvanPC++ application is not running.

Right-click on the icon expands the menu, allowing the user to view the RC Service status, edit settings (after opening the SvanPC++ window), stop the service while waiting for all download tasks to finish or terminate it immediately.

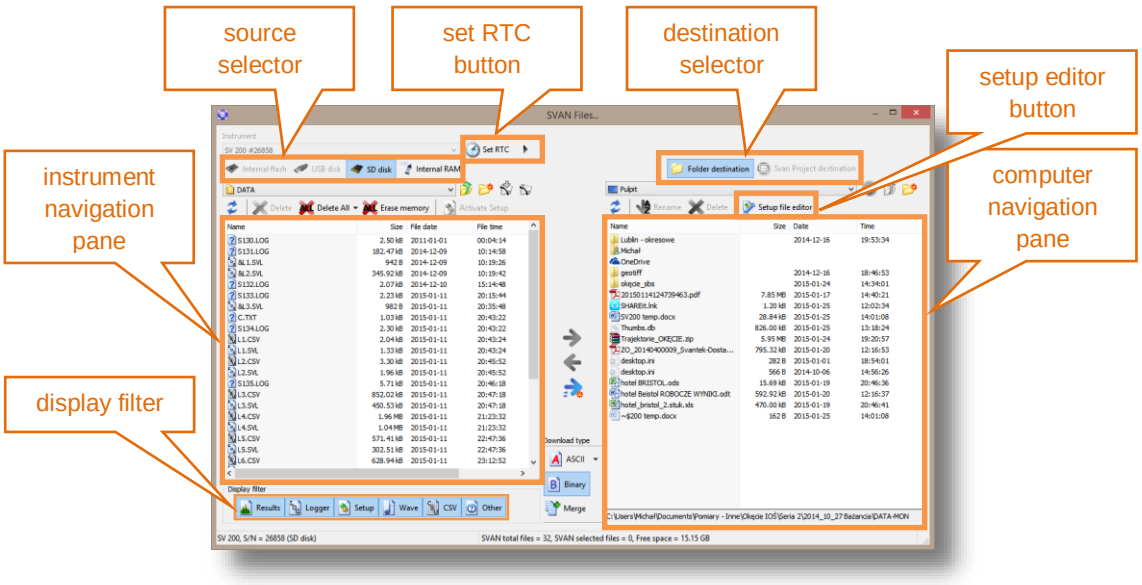


Double-clicking the SvanPC tray icon open SvanPC++ window enabling the user to edit the session's settings.

Note: *Changing* ***Remote Communication Session*** *settings requires administrative privileges.*

9.9.3 SVAN Files

SVAN Files is the simplest data collecting mode available in the **RC** module. This mode is suitable for browsing the contents of the SV 200A SD-card (including working directory), downloading or deleting files, changing the working directory of the instrument (see Chapter 9.7) and WEB interface files update.

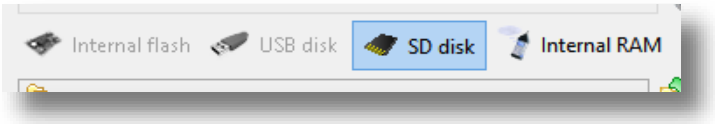


***Note:** More information on **SVAN Files** can be found in SvanPC++ User Manual available online: http://svantek.com/lang-en/support/19/svanpc_software.html#PDF.*

Browsing the contents of the device

SVAN Files window contains two main panes. The left pane displays contents of the instrument's memory. The right pane is used to browse local PC files.

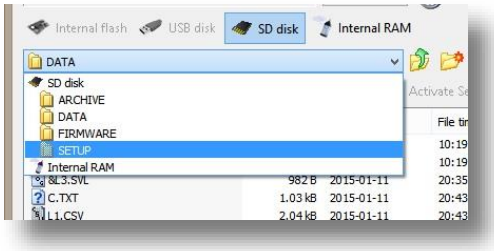
Source selector enables the user to change source of files to display in the instrument navigation pane. In case of SV 200A there are two sources available: SD disk and Internal RAM. No measurement data can be stored in the Internal RAM memory of the instrument.



***Note:** Choosing **Internal RAM** data source enables accessing the settings file with **Setup file editor** button. The file contains current detailed setup of the instrument and should not be modified unless necessary.*

By default, SD-card contains following directories:

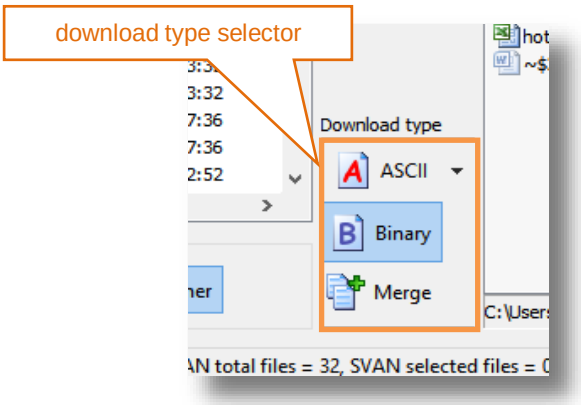
- **ARCHIVE**, where old measurement files can be stored,
- **DATA**, which is default working directory of the instrument,
- **FIRMWARE**, which contains firmware packages uploaded via WEB interface,
- **SETUP**, which contains setup files created by users.

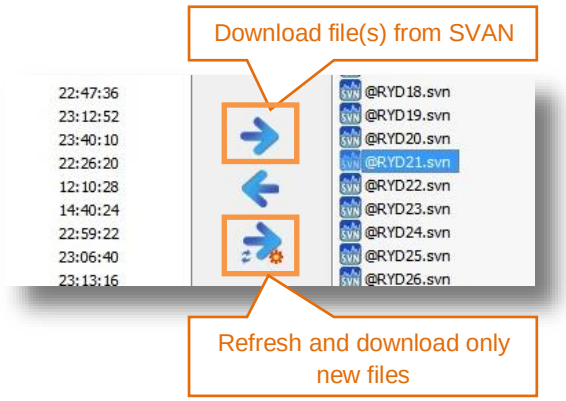


The **Display filter** can be used for selecting specific types of files to be displayed in the navigation pane.

Downloading files

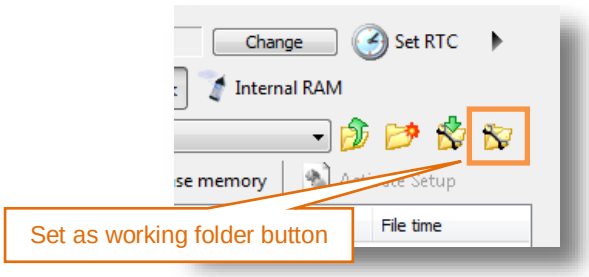
1. In the **instrument pane** navigate to the directory where necessary measurement files are stored. By default, **SVAN Files** display current working directory of the instrument.
2. Select the **Download type**. By default, binary **SVL** files are downloaded, however **CSV** files are also available. Click expand button to see the details. Automatic merging is possible for binary files. Use **Merge** option to download one file containing data from all selected files.
3. Select the files to download and click **Download file(s) from SVAN** button to copy files from instrument's memory to the PC. Multiple files can be selected using Ctrl and Shift buttons.
4. **Refresh and download only new files** button can be used to synchronize content of the instrument's memory with the local folder. Click that button to quickly download all files displayed in the instrument navigation pane.





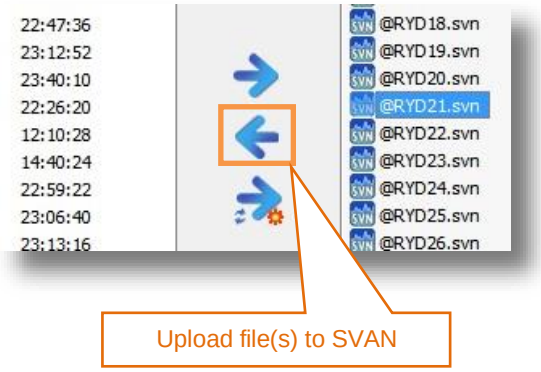
Changing the working directory

1. Navigate to the desired directory using the left pane. Create new directory if necessary.
2. Click **Set as working folder** button.



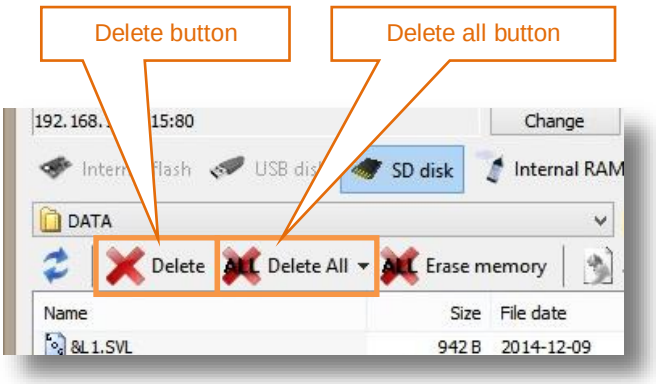
Uploading files

1. In the **instrument pane** navigate to the desired directory. By default, **SVAN Files** display current working directory of the instrument.
2. Files can be uploaded only to the current working directory of the instrument. Set the current directory to be the working directory.
3. Select the files to upload in the right pane and click **Upload file(s) to SVAN** button to copy files from to the PC instrument's memory. Multiple files can be selected using Ctrl and Shift buttons.



Deleting files

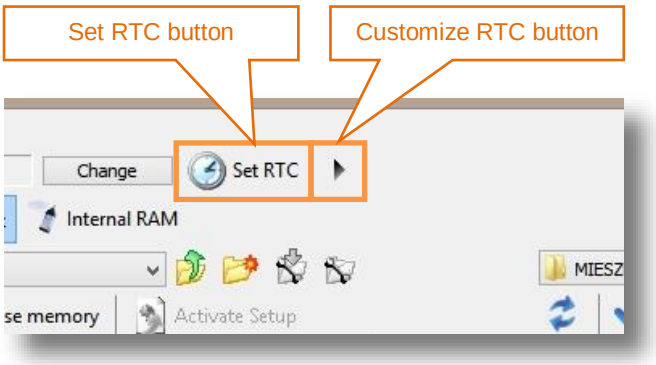
1. In the **instrument pane** navigate to the desired directory. By default, **SVAN Files** display current working directory of the instrument.
2. If all SVAN files (logger and setup) are to be deleted click **Delete All** button.
3. If only selected files or files other than SVAN files are to be deleted, select them (multiple files can be selected using *Ctrl* or *Shift* buttons, all files can be selected with *Ctrl+A* combination) and click **Delete** button.



Updating RTC

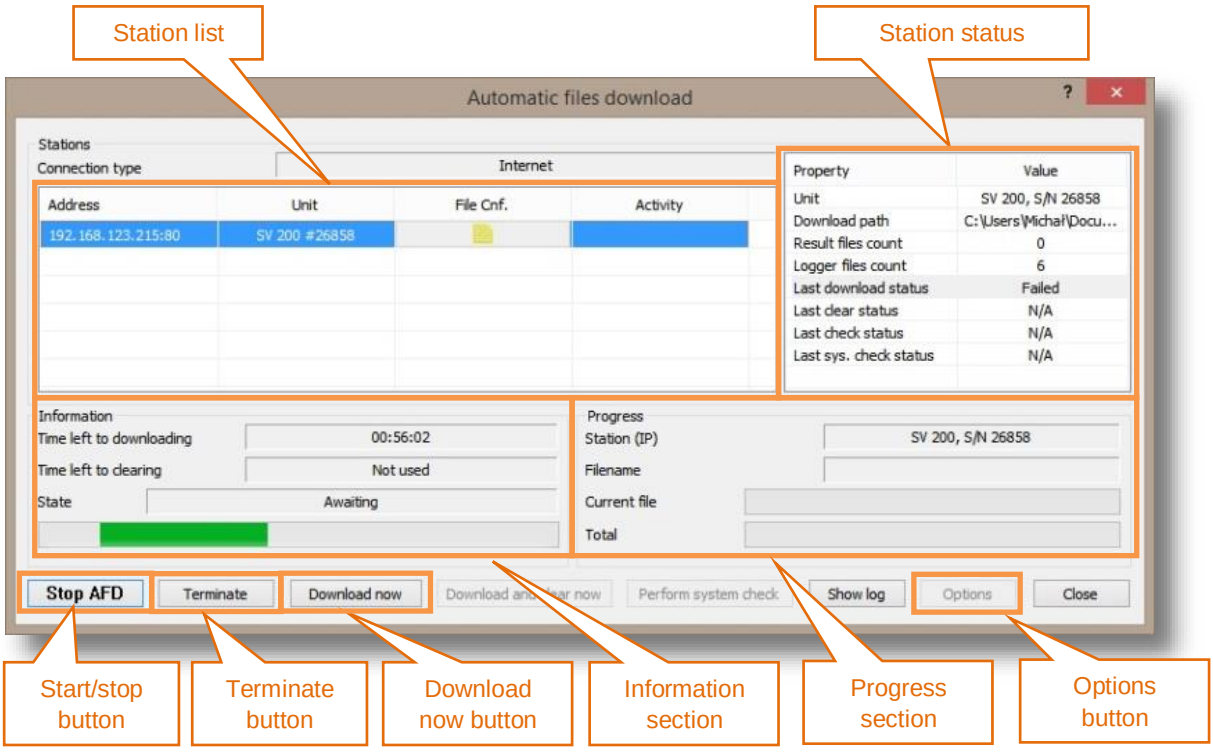
SVAN Files enables setting the real time clock (**RTC**) of SV 200A. Current PC time can be set as well as manually selected value.

To synchronize SV 200A time with the current PC time click **Set RTC** button. To enter other value click **Customize RTC** button.



9.9.4 Automatic Files Downloading

AFD (Automatic Files Download) is most commonly used data collecting method. In this mode SvanPC++ automatically downloads data from any number of the SV 200A monitoring stations and stores it in selected local or remote directory.



Besides downloading files **AFD** performs other tasks such as:

- checking station status and sending notifications when one of the instruments requires attention,
- automatic time synchronization,
- remote system check with in-built electrostatic actuator,
- verification of instrument's setups,
- deleting already downloaded files,
- publishing measurement data on the web server as a HTML file,
- uploading measurement files on the FTP server.

Note: *More information on* ***Automatic Files Download*** *can be found in SvanPC++ User Manual: http://svantek.com/lang-en/support/19/svanpc_software.html#PDF.*

Basic information

Automatic Files Download runs as a Windows service. It does not require SvanPC++ application to be running. Windows user who runs the **AFD** does not have to be logged on the PC. **AFD** automatically resumes to its previous state after booting the PC.

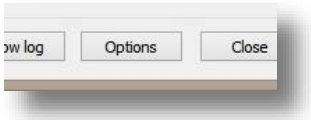
The **AFD** window displays the list of stations running in the **AFD** mode. For selected instrument station status information is available. It displays basic information (instrument's serial number and download path), downloads statistics and summary for last downloading, clearing, settings and system checks.

Information section displays time left for downloading and time left for clearing. These values depend on **Downloading period** and **Clearing period** settings, described below. Also, current state of the **AFD** module is displayed.

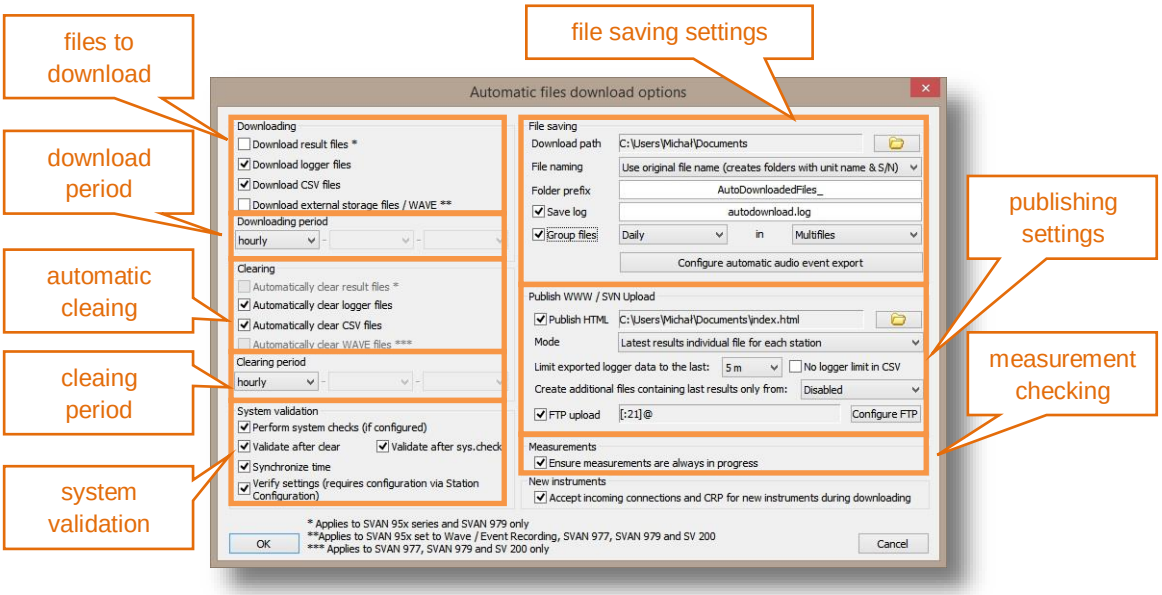
Progress section refers to the station selected in **station list**. It displays stations type and serial number and the name of the file currently being downloaded.

Configuration

To configure **Automatic Files Download** session settings click **Options** button. Automatic files download options window will appear allowing the user to make necessary adjustments.



Options button is only active when the **AFD** is not running.



Downloading enables choosing which files are going to be downloaded with **AFD**. Logger files containing measurement results are most commonly used.

Note: CSV and WAVE files contain raw, uncompressed data. Make sure that bandwidth is sufficient. If 3G modem is used, make sure that SIM-card data plan covers large transfers.

Downloading period setting determines how often data from SV 200A will be downloaded to the PC. Five different periods can be chosen: **hourly**, **daily** (at specified hour), **weekly** (at specified weekday, at specified hour), **monthly** (at specified day of month, at specified hour) and **custom** (specified time interval between downloads). These settings applie only when **Files to download** are selected.

Automatic cleaning enables choosing which files are going to be erased from the instrument's memory after downloading.

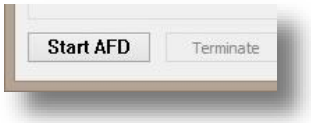
Cleaning period determines how often data from SV 200A will be erased. Five different periods can be chosen: **hourly**, **daily** (at specified hour), **weekly** (at specified weekday, at specified hour), **monthly** (at specified day of month, at specified hour) and **custom** (specified time interval between downloads). This setting applies only when **Automatic cleaning** is active. Files are erased from the instrument only after they had been previously downloaded with **AFD**.

System validation section enables configuring the following settings:

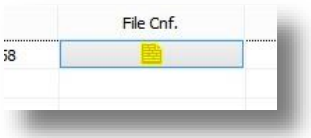
- system checks with built-in electrostatic actuator,
- validation of instrument settings after cleaning measurement files,
- validation of instrument settings after performing system check (if enabled),
- automatic synchronization of real time clock,
- verification of instrument settings.

Starting session

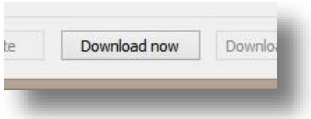
To start **Automatic Files Download** session, click **Start AFD** button. The **AFD** session will start with global settings configured in the **Options** window. Download will begin after the time defined in **Downloading period** is over.



It is also possible to override global file saving settings of **AFD** session by clicking the **File Conf.** button next to each individual station in the **Station list**.



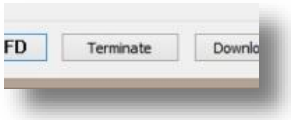
To start the **Automatic Files Download** session and download files from SV 200A, immediately click **Download now** button.



Stopping session

To finish the **Automatic Files Download** session after downloading all measurement files, click the **Stop AFD** button.

To terminate the **Automatic Files Download** session immediately, without downloading all measurement files, click the **Terminate** button.



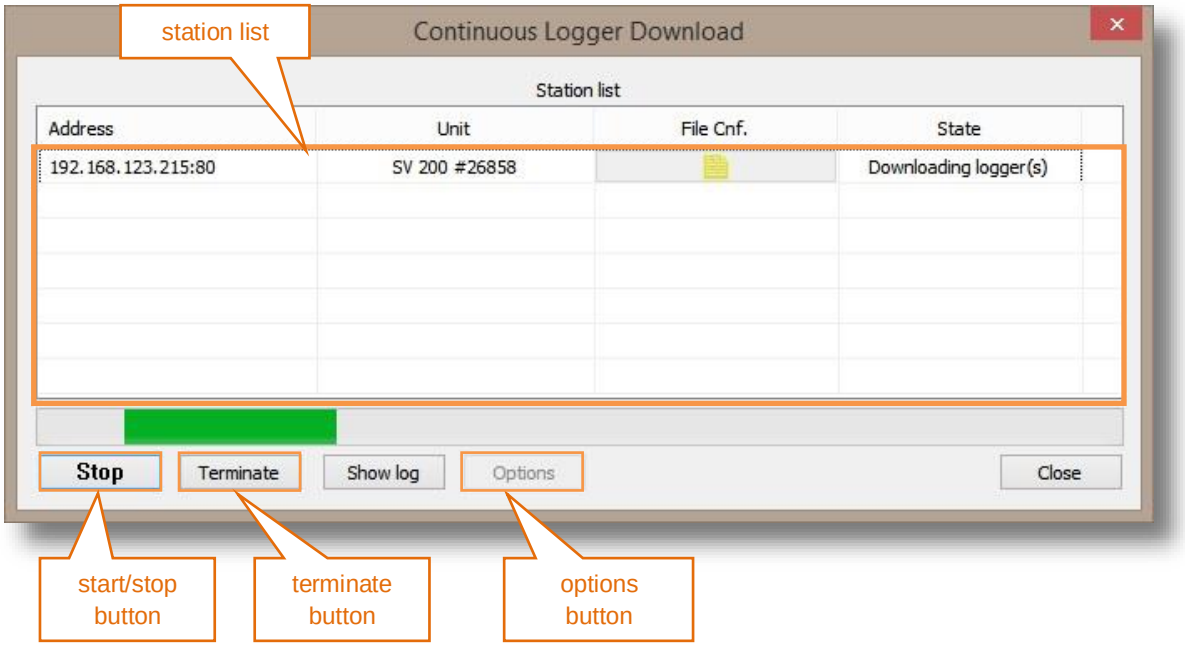
Note: Terminating session may cause some measurement files to be incomplete. However, after restarting the session downloading will resume.

9.9.5 Continuous Logger Download

CLD (Continuous Logger Download) mode is used for continuous downloading of measurement data from SV 200A. Measurement results can be presented in real time while saving in the selected local or remote directory. In this mode the logger (SVL) files are downloaded only.

Besides downloading files **CLD** performs other tasks such as:

- checking station status and sending notifications when one of the instruments requires attention,
- automatic time synchronization,
- remote system check with in-built electrostatic actuator,
- verification of instrument's setups,
- deleting already downloaded files,
- publishing measurement data on the web server as a HTML file,
- uploading measurement files on the FTP server.



Note: *More information on* **Continuous Logger Download** *can be found in the SvanPC++ User Manual available online:*

http://svantek.com/lang-en/support/19/svanpc_software.html#PDF.

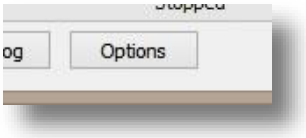
Basic information

Continuous Logger Download (**CLD**) runs as a Windows service. It does not require the SvanPC++ application to be running. Windows user who runs the **CLD** does not have to be logged on the PC. **CLD** automatically resumes to its previous state after booting the PC.

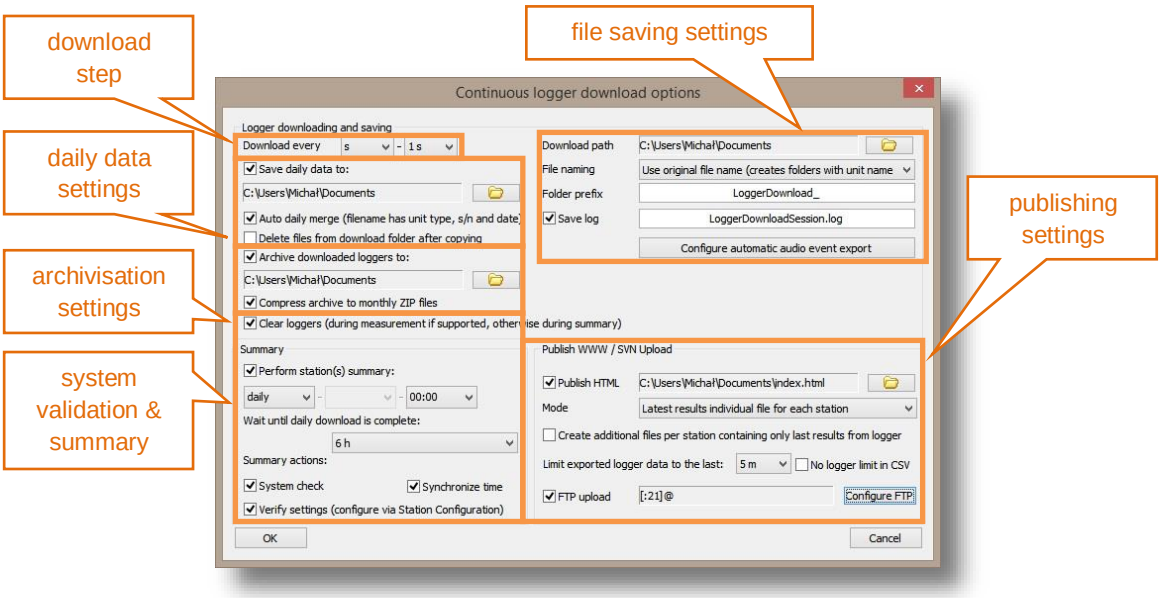
CLD window displays list of stations running in the **CLD** mode along with the current state of each station. The progress bar indicates activity of the **CLD** mode.

Configuration

To configure **Continuous Logger Download** session settings, click **Options** button. Continuous logger download options window will appear allowing you to make necessary adjustments.



Options button is only active when **CLD** is not running.



Download step determines how often data from SV 200A will be downloaded to the PC.

File saving settings enable configuring basic settings for files download such as download path, file naming rules and writing session log.

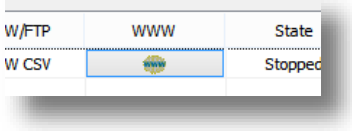
Daily data settings enable configuring the path where files downloaded from the instrument will be copied after each day of measurements. Files may be automatically merged, if more than one file is generated throughout the day.

Archivisation settings enable configuring the path where all downloaded files are copied for archivisation purposes. Files may be compressed into monthly zip file.

The **System validation & summary** section enables configuring the following settings:

- time of station summary (hourly, daily, weekly or monthly)
- clearing downloaded loggers from the instrument during measurements
- system checks with built-in electrostatic actuator,
- automatic synchronization of real time clock,
- verification of instrument settings during station summary.

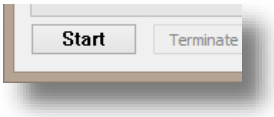
The **Publish WWW/SVN Upload** section enables configuring basic settings for HTML publishing of the results and FTP uploads. Detailed settings can be configured for each individual station by clicking WWW button which becomes visible in the station list.



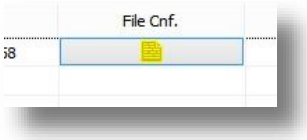
The **Configure FTP** button enables configuring the FTP server which is going to be used for data upload.

Starting session

To start the **Continuous Logger Download** (CLD) session click **the Start** button. The CLD session will start immediately with global settings configured in the **Options** window.

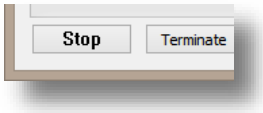


It is also possible to override global file saving settings of the CLD session by clicking the **File Conf.** button next to each individual station in the **Station list**.

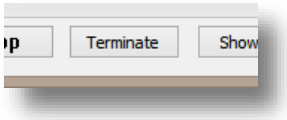


Stopping session

To finish the CLD session after downloading all measurement files, click the **Stop** button.



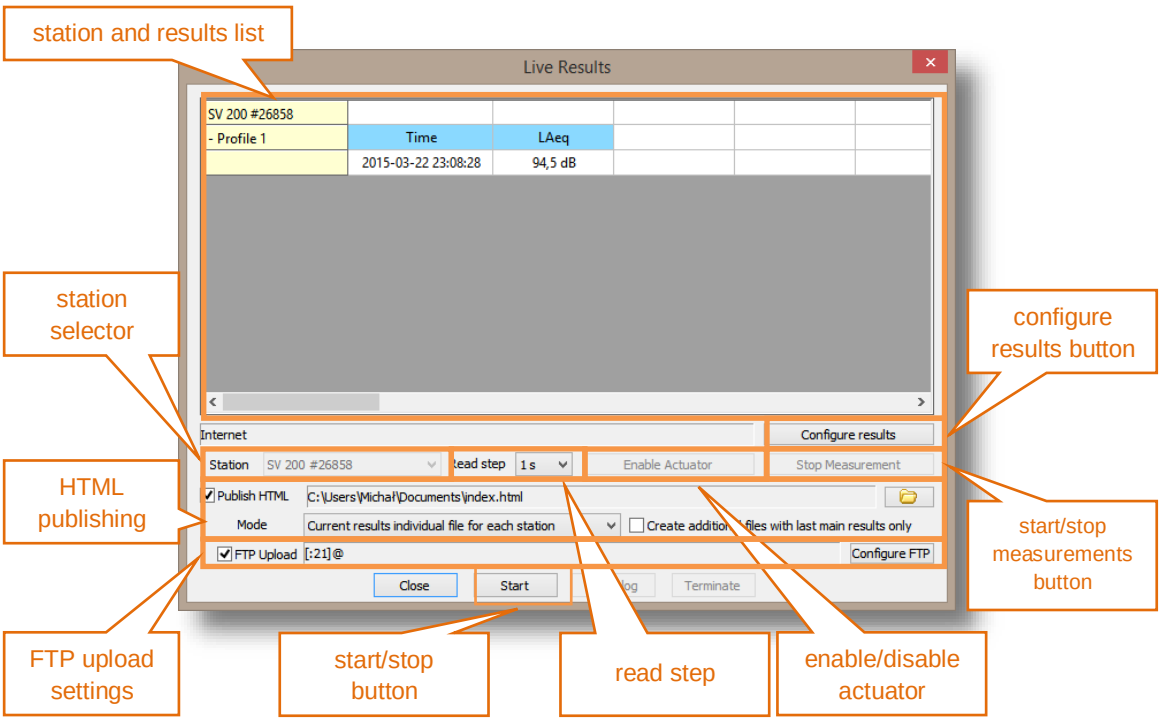
To terminate the CLD session immediately, without downloading all measurement files, click the **Terminate** button.



Note: *Terminating session may cause some measurement files to be incomplete. However, after restarting the session downloading will resume*.

9.9.6 Live Results

The **Live Results** (LR) mode is used to easily view current SV 200A results without necessity to save the measurement files on the computer. This mode is capable of publishing HTML results on the WEB server and also uploading measurement files from the instrument directly on the FTP server.



Note: *More information on* **Live Results** *can be found in the SvanPC++ User Manual available online:*

http://svantek.com/lang-en/support/19/svanpc_software.html#PDF.

Basic information

The **Live Results** mode runs as a Windows service. It does not require SvanPC++ application to be running. Windows user who runs the LR does not have to be logged on the PC. LR automatically resumes to its previous state after booting the PC.

Live Results window displays list of stations running in LR mode along with the results selected for display.

Configuration

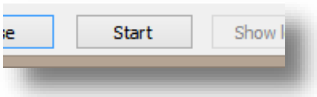
You can configure results that are to be displayed for each station separately. The station currently being configured can be selected in the **Station** combo-box. Results are displayed with seven possible time intervals: 1 s, 2 s, 5 s, 10 s, 20 s, 30 and 60 s. This setting is controlled by **Read step** combo-box. **Read step** setting can be altered regardless of the **Live Results** session being started.

With the **Live Results** mode stopped you can select particular results for displaying after clicking the **Configure results** button.

The **HTML publishing** section enables configuring the path of HTML and CSV files containing current measurement results.

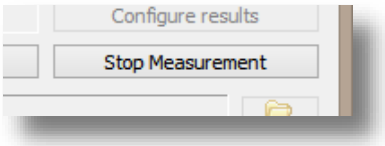
Starting session

To start the **Live Results** session click **Start** button. The LR session will start immediately.



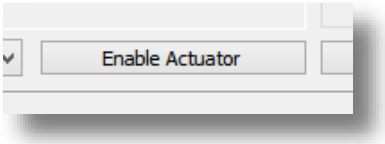
Measurement status control

While the **Live Results** session is active the **Start/stop measurement** button allows you to start or stop measurement manually.



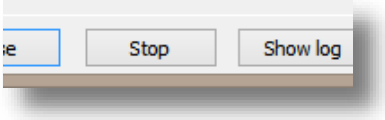
Actuator control

While the **Live Results** session is active the **Enable/disable actuator** button allows you to control the state of the built-in electrostatic actuator manually. After the actuator has been enabled you can read the result thereby conducting manual system check.



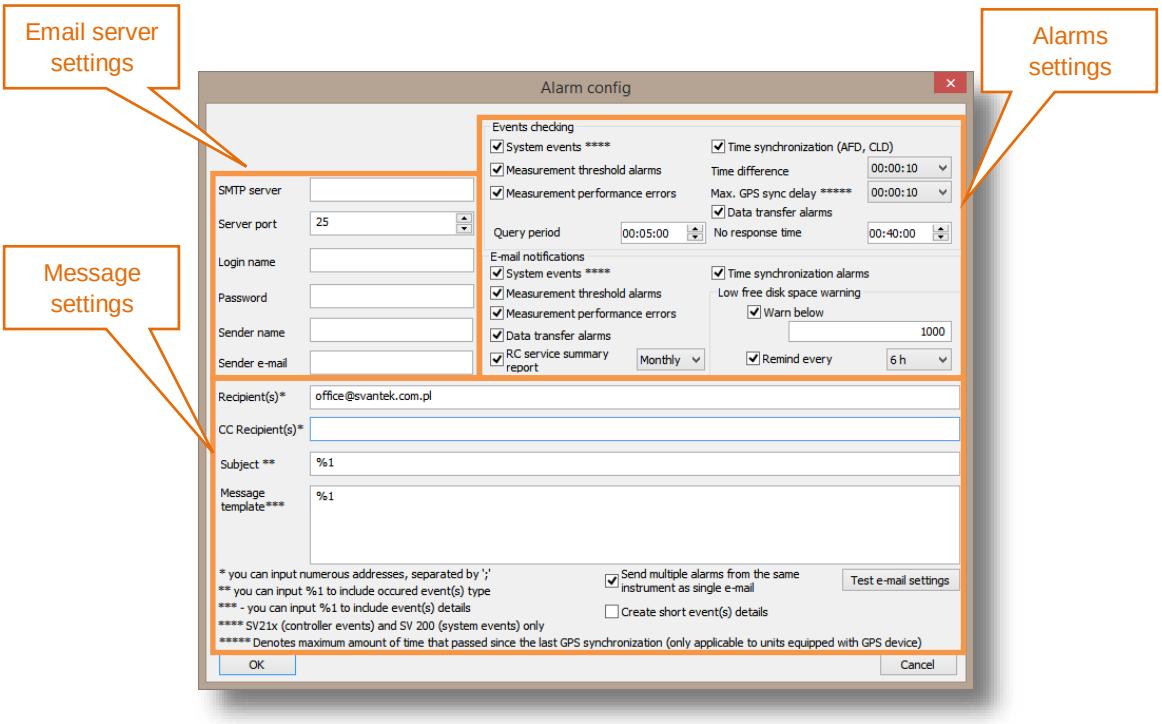
Stopping session

To finish **Live Results** click the **Stop** button. The session will end immediately.



9.9.7 Alarms

The SvanPC++ Remote Communication **Alarms** window enables configuring customized email notifications for certain events.



With **Alarms** you can be informed about following events:

- System events, such as disconnecting and reconnecting to the network, losses of external power, exceeding maximum temperature inside the station etc.
- Measurement performance events, such as failed system check, stopped measurements etc.
- Time synchronization errors
- Low disk space.

The e-mail alarming requires the credentials of the e-mail server to be used for it, including the SMPT server name, port number, sender name, login and password. Alarm messages can be sent to multiple recipients simultaneously.

Current implementation of the functionality does not support SSL (Secure Socket Layer) connections to e-mail servers – the user is expected to use an account on a non-secured SMTP server.

Note: *More information on* **Alarms** *can be found in SvanPC++ help file available online:*

http://svantek.com/lang-en/support/19/svanpc_software.html#PDF.

10 NOISE SOURCE DIRECTION DETERMINATION

The noise source direction determination algorithm applied in SV 200A is based on the phase shift of the signals between the individual microphones of the system (4 x MEMS microphones) placed around the case of SV 200A. Its main idea is to detect the source of the dominant energy in a given time interval. Detection occurs in two planes - horizontal "XY" and vertical "Z". The user receives information about the direction of the noise source with the dominant energy along with the percentage of that energy in the whole signal and the distribution of total energy as a function of the angle.

The module is designed to detect sources at a minimum distance of 2 m. The user should also install the device so that the reflecting surfaces (nearby objects) are in the greatest distances.

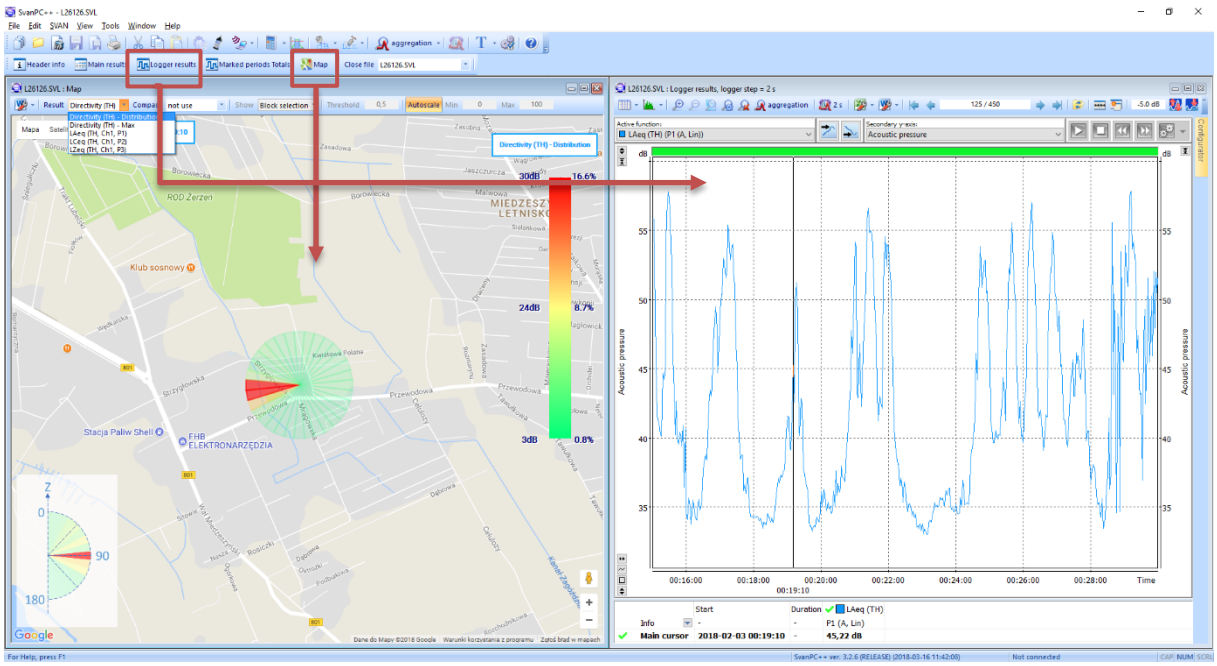
SV 200A records into the logger file acoustic energy distribution for the "**XY**" and "**Z**" planes with the **Logger Step**.

Energy in a given direction is expressed in % of the total energy in all directions.

Direction is the angle of the deviation:

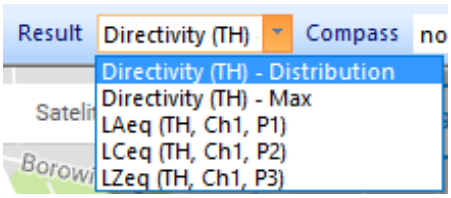
- for "XY" plane - from the north direction clockwise in the range from 0 to 359 degrees;
- for "Z" plane - from the vertical direction in the range from 0 to 180 degrees (top = 0 degrees, bottom = 180 degrees).

You can observe logger results with directional characteristics and also map with the SV 200A localization and direction of the noise or its distribution in SvanPC++ by clicking on appropriate buttons: **Logger results** and **Map**.

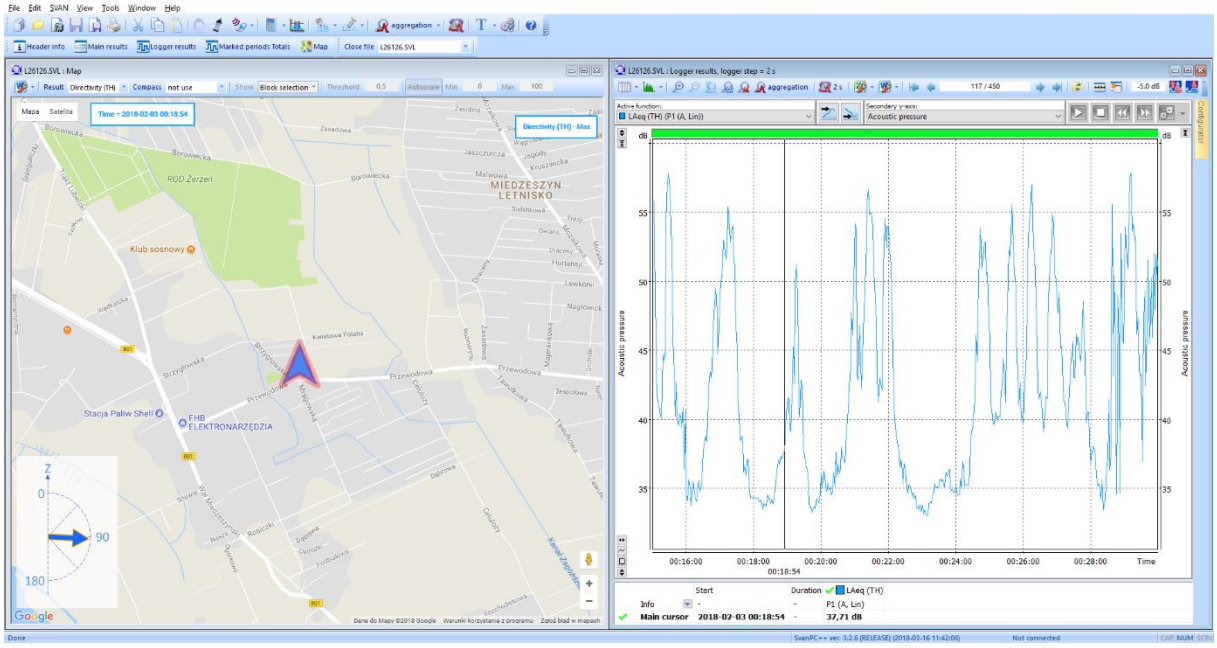


The direction or distribution of the noise on the map corresponds to the time of the cursor position on the **Logger results** screen.

You can select between presentation of noise distribution of noise (**Directivity (TH) – Distribution**) and presentation of the direction of maximum energy (**Directivity (TH) – Max**).

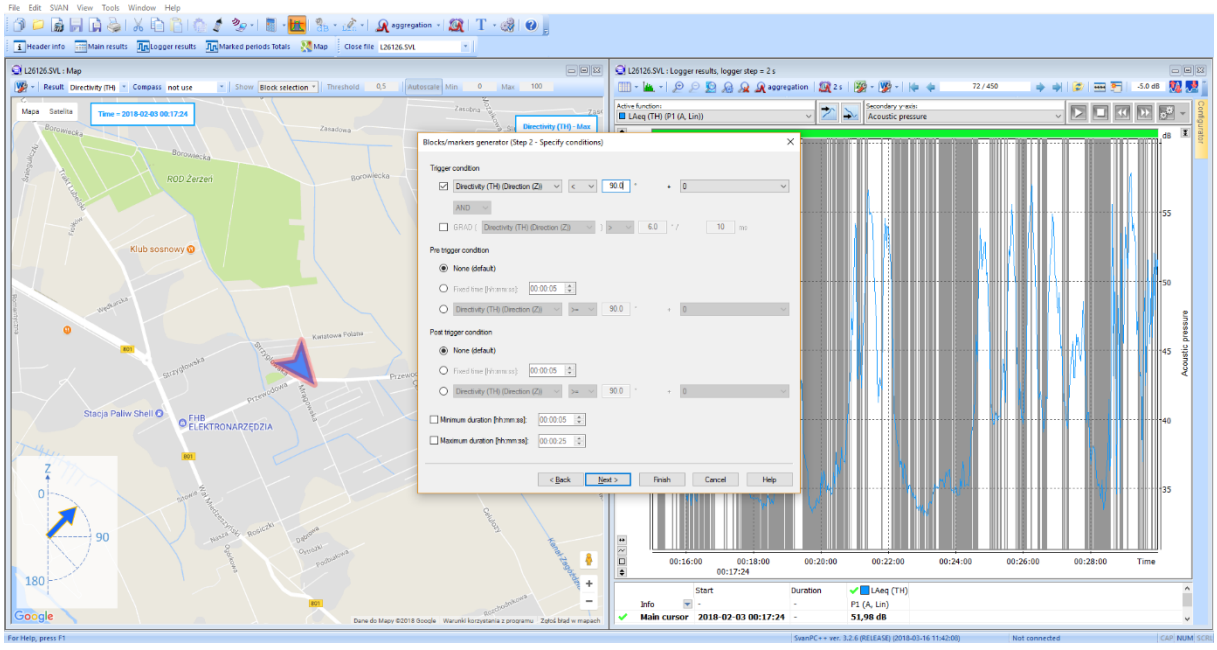


In the case of direction of maximum energy, the arrow points on the source of the maximum energy.



The directivity function enables you some important instruments for the noise evaluation.

For example, you can select all results in the time-history when the sound direction was in specified range. If you wish to filter all results with maximum energy coming from above, you should select **Directivity (TH) (Direction Z)) < 90º**. Press Finish button and all blocks with history results conforming this condition will be marked with grey colour.



11 INSTRUMENT UPGRADE

There are three separate programs loaded into the instrument's memory:

1. FIRMWARE,
2. BOOTSTRAP,
3. HARDBOOT.

The **FIRMWARE** is a program dedicated for the main processor of the instrument which maintains functions in relation to the user interface, measurements, files and communication. SVANTEK constantly improves functionalities of their instruments, so it is recommended to install the most recent firmware upgrade.

The **BOOTSTRAP** is a program for the main processor dedicated for the **FIRMWARE** upgrade.

The **HARDBOOT** is inerasable program designed to conduct the upgrade or repair process of the **BOOTSTRAP** only.

The user can upgrade **FIRMWARE** and **BOOTSTRAP** programs of the SV 200A instrument.

11.1 INSTRUMENT UPGRADE VIA USB CABLE

To upgrade the **FIRMWARE** program the **BOOTSTRAP** mode should be entered.

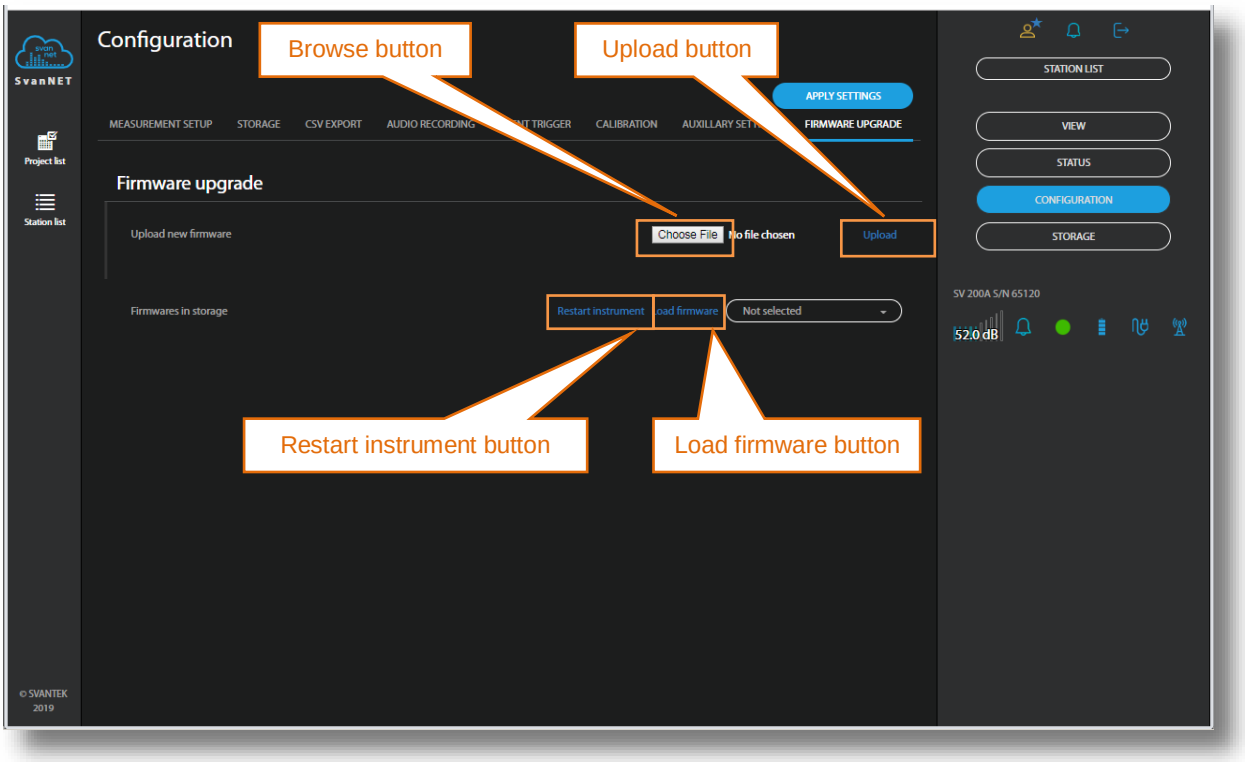
1. Switch the instrument off if it is switched on.
2. Connect SV 200A to the PC using SC 256A cable.
3. Press and hold the ▲ key and switch on the instrument, shortly pressing simultaneously the Enter key. That boots the instrument into **BOOTSTRAP** mode.
4. Run batch file from the upgrade package on your PC.

Upgrade of the **BOOTSTRAP** program is conducted through the **HARDBOOT** service program. It can be done via the USB cable only.

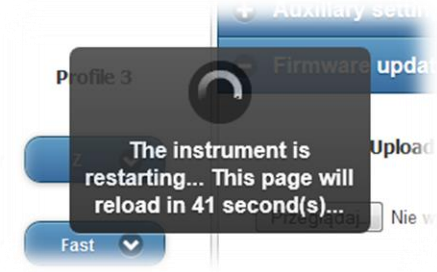
5. Switch the instrument off if it is switched on.
6. Connect SV 200A to the PC using provided the SC 256A cable.
7. Press and hold the ▼ and ▲ keys simultaneously and switch on the instrument, shortly pressing simultaneously the Enter key. That boots the instrument into **HARDBOOT** mode.
8. Run batch file included in the upgrade package on your PC.

11.2 FIRMWARE UPGRADE VIA SVANNET WEB-SERVICE

1. Open the **Configuration** page in the SvanNET web-service.
2. Make sure the measurement is stopped.
3. Open **Firmware upgrade** section.



4. To load firmware, click the **Browse** button and locate firmware *.bin file on the PC.
5. Upload the selected file by clicking the **Upload** button.
6. After the upload is finished select new firmware package in the firmware selector.
7. Click the **Load firmware** button.
8. Click the **Restart instrument** button to finalize the process and wait 60 seconds for the connection to renew. The measurements will start automatically.



Note: *Downloading of new firmware does not erase communication settings such as APN, SSID, password, etc. Other measurement settings like measurement function, integration time, filters, detectors in profiles etc. are set to default values.*

12 MAINTENANCE

12.1 TRANSPORTATION AND STORAGE

For transportation or storage purpose, we recommend using the packaging provided by the manufacturer.

12.2 CLEANING

Clean the surface of the instrument with damp soft cloth.

Note: *Do not allow the water ingress into the bottom panel. It can damage SV 200A!*

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.*

12.3 RESETTING THE INSTRUMENT

- **SYSTEM RESET:** internal software reset clears any setup configuration and brings back the default **Factory Settings** (see Chapter 5.1.2).
- **HARDWARE RESET:** internal hardware reset, no user data is changed. Make sure the battery is not exhausted, and the unit is turned off. Press and hold the 10 sec. key for more than 10 seconds, and then release it. Turn on the instrument as usually by pressing the Enter 3 sec. key for more than 3 seconds (see Chapter 3.2).

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!

12.4 TROUBLESHOOTING

- In the case your instrument does not respond proceed with hardware reset of the instrument (see Chapter 12.3).
- In the 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's website.

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

Office hours are 8:00 a.m. to 4:00 p.m. Central European Time.

- E-mail at office@svantek.com
- Internet at www.svantek.com
- Address:

SVANTEK Sp. z o.o.

Strzygłowska 81

04-872 Warszawa,

Poland

Appendix A. REMOTE CONTROL (firmware revision 1.x.x)

Under development

Appendix B. DATA FILE STRUCTURES

There is a number of files generated by the SV 200A instrument automatically and saved in the internal non-removable SD-card. Some of these files are binary, other are ASCII one. In the case of SV 200A (the internal file system rev. **1.03**), there are five different types of files:

- **SVL** - a binary file which contains miscellaneous results (cf. B.1 and B.2);
- **CSV** - an ASCII file which contains miscellaneous results (cf. B.3);
- **SVT** - a binary file with instrument's setup data (cf. B.4).
- **SVA** - an ASCII XML file with advanced alarm setup data (cf. B.5)
- **TXT** - an ASCII file named "C*.txt" which contains calibration and system check history data (cf. B.6)
- **LOG** - an ASCII file which contains miscellaneous information about instrument's status used for debugging purpose (cf. B.7**Błąd! Nie można odnaleźć źródła odwołania.**)

B.1 GENERAL STRUCTURE OF THE SVL FILE

Each SVL file containing data from the SV 200A instrument consists of several blocks and logger records. A block is rather a header with static information which usually appears at the beginning of the file or data which may present anywhere in the file. Each block has its unique ID and length specified. A logger record can be a time history (TH) results block, record of audio data, marker information, pause information or a special block containing summary results (SR), meteo data, GPS data etc.

Each file has the following obligatory blocks:

- SvanPC++ file header (cf. Table B.1.1)
- file header (cf. Table B.1.2);
- instrument and internal software specifications (cf. Table B.1.3);
- user's text (a header) stored together with the measurement data (cf. Table B.1.4);
- parameters and global settings, common for all profiles (cf. Table B.1.5);
- parameters for measurement trigger (cf. Table B.1.6);
- parameters for logger trigger (cf. Table B.1.7);
- parameters for Time-domain signal recording (cf. Table B.1.8);
- parameters for Wave-file recording (cf. Table B.1.9);
- Extended I/O settings (cf. Table B.1.10);
- special settings for profiles (cf. Table B.1.11);
- RTF parameters (cf. Table B.1.12);
- main results saved as Summary Results (SR) Record (cf. Table B.1.13);
- header of the file from the logger (cf. Table B.1.20);
- contents of the file from the logger (cf. Table B.1.21);

Other blocks of the file structure are not obligatory. They depend on the instrument's current mode and connected accessories. These blocks are as follows:

- statistical levels saved in the Summary Results record (cf. Table B.1.14);
- header of the statistical analysis (cf. Table B.1.15);
- results of the statistical analysis (cf. Table B.1.16);
- 1/1 OCTAVE analysis results saved in the Summary Results record (cf. Table B.1.17);
- 1/3 OCTAVE analysis results saved in the Summary Results record (cf. Table B.1.18);
- settings of the instrument saved in the setup file (cf. Table B.1.19);
- Meteo data - (cf. Table B.1.22);
- Alarm parameters - (cf. Table B.1.23);

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

Table B.1.1. SvanPC file header

Word number	Name	Comment
0..2	"SvanPC"	reserved
3	26	reserved
4	32	reserved
5	3	reserved
6..15	Reserved	reserved
…	…	…

Table B.1.2. File header

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

Table B.1.3. Unit and software specification

Word number	Name	Comment
0	0xnn02	[02, nn=specification's length]
1	UnitNumberL	unit number (least significant word)
2	UnitType	type of the unit: 200
3	SoftwareVersion	software version: 101
4	SoftwareIssueDate	software issue date
5	DeviceMode	mode of the instrument
6	UnitSubtype	subtype of the unit: 2 - SV 200A
7	FileSysVersion	file system version
8	LevelMetVersion	level meter version:101
9	SoftwareSubversion	software subversion: 01
10	UnitNumberH	unit number (most significant word)
…		…

Table B.1.4. USER's text

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

Table B.1.5. Parameters and global settings

Word number	Name	Comment
0	0xnn04	[04, nn=block's length]
1	MeasureStartDate	measure start date (cf. App. B.5)
2	MeasureStartTime	measure start time (cf. App. B.5)
3	DeviceFunction	device function: 1 - **SOUND LEVEL METER**, 2 - **1/1 OCTAVE** analyser, 3 - **1/3 OCTAVE** analyser
4	MeasureInput	measurement input type: 2 - **Microphone**
5	Range	measurement range: 2 - **SINGLE**
6	UnitFlags	unit flags: b1 - if set to 1: overload occurred b9 – measurement start synchronized with GPS other bits - reserved
7	RepCycle	repetition cycle: 0 - infinity nnnn - number of repetitions $\in(1 \div 1000)$
8	NofProf	number of profiles (3)
9	StartDelay	start delay time
10..11	IntTimeSec	integration time specified in seconds
12		reserved
13	LeqInt	detector's type in the **LEQ** function: 0 - **LINEAR**, 1 - **EXPONENT.**
14	SpectrumFilter	**1/1** or **1/3 OCTAVE** analysis filter: 1 - **Z**, 2 - **A**, 3 - **C**
15	SpectrumBuff	**1/1** or **1/3 OCTAVE** logger: 0 - off, 8 - logger with **LEQ** values in other cases reserved
16	SpectrumDetector	**1/1** or **1/3 OCTAVE** analysis detector: 0 - **LIN.**, 1 - **FAST**, 2 - **SLOW**
17	StartSync	Synchronization the start of measurement with RTC -1 - synchronization to **1 sec**. 0 - switched off. 1 - synchronization to **1 min**. 15 - synchronization to **15 min**. 30 - synchronization to **30 min**. 60 - synchronization to **1 hour**.
18		reserved
19		reserved

20	CalibrType	last calibration type: 0 - none, 1 - auto (using auto-calibration feature), 2 - remote (using remote #1,Q command), 3 - factory, 4 - system check (using built-in actuator), 5 - manual (using MENU->Function->Calibration->By Measurement)
21	CalibrDate	last calibration date
22	CalibrTime	last calibration time
23		reserved
24		reserved
25	OutdoorFilter	outdoor filter: 0 - **OFF**, 1 - **ON**
26	OutdoorType	outdoor filter type: 0 - **ENVIRONMENT**, 1 - **AIRPORT**
27	MicComp	temperature compensation for microphone: 0 - switched off, 1- switched on
28		reserved
29		reserved
30		reserved
31	SplitMode	Logger files splitting mode: 0 - off. -1 - The file is created for each measurement cycle. 15 - The file is created every 15 min synchronized to RTC. 30 - The file is created every 30 min synchronized to RTC. 60 - The file is created every 1 hour synchronized to RTC. 1440 - The file is created on the specified times.
32	SplitTime[1]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
33	SplitTime[2]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
34	SplitTime[3]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
35	SplitTime[4]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.

36	SplitTime[5]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
37	SplitTime[6]	Logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
38	GpsLastSyncTime	The time [s] between clock synchronization from GPS module and the start of measurement. 0xffff - no synchronization
39	StatisticsCycles	Number of IntTimes statistics are calculated for 1:32767
40..41	MeasureStartTimeMs	measurement start time in milliseconds
42	NofDirDistXY	number of elements for directivity distribution vector for X-Y axis
43	NofDirDistZ	number of elements for directivity distribution vector for Z axis
44..47		reserved
…		

Table B.1.6. MEASUREMENT TRIGGER parameters

Word number	Name	Comment
0	0xnn2B	[2B, nn=block's length]
1	TriggerMode	trigger mode: 0 - **OFF**, 2 - measurement on trigger **SLOPE+** 3 - measurement on trigger **SLOPE–** 4 - measurement on trigger **LEVEL+** 5 - measurement on trigger **LEVEL–** 6 - measurement on trigger **GRAD+** 7 - measurement on trigger **EXT I/O**
2	TriggerSource	source of the triggering signal: 0 - **RMS(1)** the **RMS** result from the first profile
3	TriggerLevel	level of triggering: 25 ÷ 130 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms (*10)
5	TriggerPre	reserved
6	TriggerPost	reserved
7	TriggerSampling	reserved
8	TriggerRecTime	reserved
9	TriggerStep	reserved
10	TriggerFilter	reserved
11	TriggerBitsPerSample	reserved
12	Range	reserved
…		

Table B.1.7. LOGGER TRIGGER parameters

Word number	Name	Comment
0	0xnn2C	[2C, nn=block's length]
1	TriggerMode	trigger mode: 0 - **OFF**, 4 - measurement on trigger **LEVEL+**, 5 - measurement on trigger **LEVEL–**
2	TriggerSource	source of the triggering signal: 0 - **RMS(1)** the **RMS** result from the first profile
3	TriggerLev	level of triggering: 25 ÷ 130 dB (*10)
4	TriggerGrad	reserved
5	TriggerPre	number of the records taken into account before the fulfilment of the triggering condition ∈(1 ÷ 50)
6	TriggerPost	number of the records taken into account after the fulfilment of the triggering condition ∈(1 ÷ 200)
7	TriggerSampling	reserved
8	TriggerRecTime	reserved
9	TriggerStep	reserved
10	TriggerFilter	reserved
11	TriggerBitsPerSample	reserved
12	Range	reserved
…		

Table B.1.8. Time-domain signal recording parameters

Word number	Name	Comment
0	0xnn31	[31, nn=block's length]
1	TriggerMode	trigger mode: 0 - **OFF**, 1 - recording whole measurement 2 - recording on trigger **SLOPE+** 3 - recording on trigger **SLOPE–** 4 - recording on trigger **LEVEL+** 5 - recording on trigger **LEVEL–** 6 - recording on trigger **GRAD+** 8 - recording on **Integration Period** trigger 9 - recording on **Remote Command** trigger
2	TriggerSource	source of the triggering signal: 0 - **RMS(1)** the **RMS** result from the first profile in the case of TriggerMode=**SLOPE+** or **SLOPE–**: 1 - **External IO**
3	TriggerLevel	level of triggering: 25 ÷ 130 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms (*10)
5	TriggerPre	pre-trigger time given in 10ms
6	TriggerPost	reserved
7	TriggerSampling	sampling frequency in 10 Hz

8	TriggerRecTime	recording time of single data block: 0 - recording to the end of measurement 1..28800 (sec)
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	filter type: 1 - **Z**, 2 - **A**, 3 - **C**
11	TriggerBitsPerSample	bits per sample: 16 or 24
12	Range	range value for audio signals, [dB]
…		

Table B.1.9. Wave-file recording parameters

Word number	Name	Comment
0	0xnn2D	[2D, nn=block's length]
1	TriggerMode	trigger mode: 0 - **OFF**, 1 - recording whole measurement 2 - recording on trigger **SLOPE+** 3 - recording on trigger **SLOPE–** 4 - recording on trigger **LEVEL+** 5 - recording on trigger **LEVEL–** 6 - recording on trigger **GRAD+** 8 - recording on **Integration Period** trigger 9 - recording on **Remote Command** trigger
2	TriggerSource	source of the triggering signal: 0 - **RMS(1)** the **RMS** result from the first profile
3	TriggerLevel	level of triggering: 25 ÷ 130 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms (*10)
5	TriggerPre	pre-trigger time given in 10ms
6	TriggerPost	reserved
7	TriggerSampling	sampling frequency in 10 Hz
8	TriggerRecTime	recording time of single data block: 0 - recording to the end of measurement 1..28800 (sec)
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	filter type: 1 - **Z**, 2 - **A**, 3 - **C**
11	TriggerBitsPerSample	bits per sample: 16 or 24
12	Range	range value for audio signals, [dB]
…		

Table B.1.10. EXTended I/O parameters

Word number	Name	Comment
0	0xnn2E	[2E, nn=block's length]
1	Mode	mode: 0 - **OFF**, 1 - **DIGITAL IN**, 2 - **DIGITAL OUT**
2	Function	in the case of **DIGITAL IN**: 0 - **EXTERNAL TRIGGER** in the case of **DIGITAL OUT**: 0 -**TRIG. PULSE**, 1 - **ALARM PULSE** in other cases reserved
3	ActiveLevel	in the case of **DIGITAL OUT** and **ALARM PULSE**: 0 - **LOW**, 1 - **HIGH** in other cases reserved
4	Source	in the case of **DIGITAL OUT** and **ALARM PULSE**: 0 - **PEAK(1)**, 1 - **SPL(1)**, 2 - **LEQ(1)** in other cases reserved
5	AlarmLevel	in the case of **DIGITAL OUT** and **ALARM PULSE**: 30 ÷ 130 dB (*10) in other cases reserved
6	Device	device connected to EXT I/O RS232 interface: 0 - **RS232 Interface**, 1 - **Meteo (SV205B)** 2 - **reserved** 3 - **Meteo (SV209 or SP275)**
7	Reserved	reserved
8	Reserved	reserved
9	Polarisation/Slope	in the case of **DIGITAL OUT** and **TRIG. PULSE**: Polarisation (0 - **POSITIVE**, 1 - **NEGATIVE**) in the case of **DIGITAL IN** Slope (0 - **POSITIVE**, 1 - **NEGATIVE**) in other cases reserved
...		

Table B.1.11. Special settings for profiles

Word number	Name	Comment
0	0xnn05	[05, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm06	[06, mm=sub-block's length]
3	DetectorP[1]	detector type in the 1st profile: 0 - **IMP.**, 1 - **FAST**, 2 - **SLOW**
4	FilterP[1]	filter type in the 1st profile: 1 - **Z**, 2 - **A**, 3 - **C**

5	BufferP[1]	logger contents in the 1st profile defined as a sum of: 0 - none, 1 - **PEAK**, 2 - **MAX**, 4 - **MIN**, 8 - **RMS**
6	CalibrFactor[1]	calibration factor (*10 dB) in the 1st profile
7	ProfileFlags[1]	flags in the 1st profile
8	0xmm06	[06, mm=sub-block's length]
9	DetectorP[2]	detector type in the 2nd profile: 0 - **IMP.**, 1 - **FAST**, 2 - **SLOW**
10	FilterP[2]	filter type in the 2nd profile: 1 - **Z**, 2 - **A**, 3 - **C**
11	BufferP[2]	logger contents in the 2nd profile defined as a sum of: 0 - none, 1 - **PEAK**, 2 - **MAX**, 4 - **MIN**, 8 - **RMS**
12	CalibrFactor[2]	calibration factor (*10 dB) in the 2nd profile
13	ProfileFlags[2]	flags in the 2nd profile
14	0xmm06	[06, mm=sub-block's length]
15	DetectorP[3]	detector type in the 3rd profile: 0 - **IMP.**, 1 - **FAST**, 2 - **SLOW**
16	FilterP[3]	filter type in the 3rd profile: 1 - **Z**, 2 - **A**, 3 - **C**
17	BufferP[3]	logger contents in the 3rd profile defined as a sum of: 0 - none, 1 - **PEAK**, 2 - **MAX**, 4 - **MIN**, 8 - **RMS**
18	CalibrFactor[3]	calibration factor (*10 dB) in the 3rd profile
19	ProfileFlags[3]	flags in the 3rd profile
…		

Table B.1.12. RTF parameters (reserved)

Word number	Name	Comment
0	0xnn21	[21, nn=block's length]
1	Type [1]	reserved
2	Rank [1]	reserved
3..4	Lower pole [1]	reserved
5..6	Upper pole [1]	reserved

7	Type [2]	reserved
8	Rank [2]	reserved
9..10	Lower pole [2]	reserved
11..12	Upper pole [2]	reserved
13	Type [3]	reserved
14	Rank [3]	reserved
15..16	Lower pole [3]	reserved
17..18	Upper pole [3]	reserved

Table B.1.13. Main results

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	**PEAK** value in the 1st profile
6	Result[1][2]	**SEL** value in the 1st profile
7	Result[1][3]	maximal value (**MAX**) in the 1st profile
8	Result[1][4]	minimal value (**MIN**) in the 1st profile
9	Result[1][5]	**SPL** value in the 1st profile
10	Result[1][6]	**LEQ** value in the 1st profile
11	Result[1][7]	**Lden** value in the 1st profile
12	Result[1][8]	**Ltm3** value in the 1st profile
13	Result[1][9]	**Ltm5** value in the 1st profile
14	Result[1][10]	reserved
15	Result[1][11]	reserved
16	UnderRes[1]	under-range value in the 1st profile
17	UnitFlags	flags word for measurement cycle (definition in table B.1.5)
18	0xmm08	[08, mm=sub-block's length]
19..20	OVL	overload time
21	Result[2][1]	**PEAK** value in the 2nd profile
22	Result[2][2]	**SEL** value in the 2nd profile
23	Result[2][3]	maximal value (**MAX**) in the 2nd profile
24	Result[2][4]	minimal value (**MIN**) in the 2nd profile
25	Result[2][5]	**SPL** value in the 2nd profile
26	Result[2][6]	**LEQ** value in the 2nd profile
27	Result[2][7]	**Lden** value in the 2nd profile
28	Result[2][8]	**Ltm3** value in the 2nd profile
29	Result[2][9]	**Ltm5** value in the 2nd profile
30	Result[2][10]	reserved
31	Result[2][11]	reserved
32	UnderRes[2]	under-range value in the 2nd profile
33	UnitFlags	flags word for measurement cycle (definition in table B.1.5)
34	0xmm08	[08, mm=sub-block's length]

35..36	Reserved	reserved
37	Result[3][1]	**PEAK** value in the 3rd profile
38	Result[3][2]	**SEL** value in the 3rd profile
39	Result[3][3]	maximal value (**MAX**) in the 3rd profile
40	Result[3][4]	minimal value (**MIN**) in the 3rd profile
41	Result[3][5]	**SPL** value in the 3rd profile
42	Result[3][6]	**LEQ** value in the 3rd profile
43	Result[3][7]	**Lden** value in the 3rd profile
44	Result[3][8]	**Ltm3** value in the 3rd profile
45	Result[3][9]	**Ltm5** value in the 3rd profile
46	Result[3][10]	reserved
47	Result[3][11]	reserved
48	UnderRes[3]	under-range value in the 3rd profile
49	UnitFlags	flags word for measurement cycle (definition in table B.1.5)
…	…	…

Table B.1.14. Statistical levels

Word number	Name	Comment
0	0xnn17	[17, nn=block's length]
1	0xpprr	[pp=used_profile, rr=profile's mask]
2	N_stat_level	number of statistical levels = N
3+i*(pp+1)	nn[i]	number of the **Lnn** statistics; i=0..N-1
3+i*(pp+1)+p	**Lnn**[i,p]	value of the **Lnn** statistics for profile p (p=1..pp) (*100 dB)
…	…	…

Table B.1.15. Header of the statistical analysis (the presence depends on the SAVE STAT. position)

Word number	Name	Comment
0	0xnn09	[09, nn=block's length]
1	0x0703	[03=number of profiles, 07=active profiles mask]
2	0xmm0A	[0A, mm=sub-block's length]
3	NofClasses[1]	number of classes in the first profile (120)
4	BottomClass[1]	bottom class boundary (*10 dB) in the first profile
5	ClassWidth[1]	class width (*10 dB) in the first profile
6	0xmm0A	[0A, mm=sub-block's length]
7	NofClasses[2]	number of classes in the second profile (120)
8	BottomClass[2]	bottom class boundary (*10 dB) in the second profile
9	ClassWidth[2]	class width (*10 dB) in the second profile
10	0xmm0A	[0A, mm=sub-block's length]
11	NofClasses[3]	number of classes in the third profile (120)
12	BottomClass[3]	bottom class boundary (*10 dB) in the third profile
13	ClassWidth[3]	class width (*10 dB) in the third profile
…	…	…

Table B.1.16. Results of the statistical analysis

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

Table B.1.17. 1/1 OCTAVE analysis results

Word number	Name	Comment
0	0xnn0E, 0xnn26, 0xnn27	[block_id, nn=block_length] 0xnn**OE** - averaged spectrum results, 0xnn**26** - min. spectrum results, 0xnn**27** - max. spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	the lowest **1/1 OCTAVE** frequency (*100 Hz): 3150 (**AUDIO BAND**)
3	NOct	number of **1/1 OCTAVE** values: 10 (**AUDIO BAND**)
4	NOctTot	number of **TOTAL** values: 3
5÷20	Octave[i]	1/1 octave[i] value (*10 dB); i=1÷NOct+NoctTot (1÷13)
…	…	…

Table B.1.18. 1/3 OCTAVE analysis results

Word number	Name	Comment
0	0xnn10, 0xnn28, 0xnn29	[block_id, nn=block_length] 0xnn**10** - averaged spectrum results, 0xnn**28** - min. spectrum results, 0xnn**29** - max. spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz): 2000 (**AUDIO BAND**)
3	NTer	number of **1/3 OCTAVE** values: 31 (**AUDIO BAND**)
4	NTerTot	number of **TOTAL** values: 3
5÷50	Tercje[i]	1/3 octave[i] value (*10 dB); i=1÷NTer+NTerTot (1÷34)
…	…	…

Table B.1.19. SETUP file

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

Table B.1.20. Header of the file from the logger

Word number	Name	Comment
0	0xnn0F	[0F, nn=header's length]
1	BuffTSec	logger time step - full seconds part
2	BuffTMilisec	logger time step - milliseconds part
3	LowestFreq	the lowest **1/1 OCTAVE** or **1/3 OCTAVE** frequency (*100 Hz)
4	NOctTer	number of **1/1 OCTAVE** or **1/3 OCTAVE** results
5	NOctTerTot	number of **TOTAL** values
6..7	BuffLength	logger length (bytes)
8..9	RecsInBuff	number of records in the logger
10..11	RecsInObserv	number of records in the observation period equal to: number of records in the logger + number of records not saved
12..13	AudioRecords	number of audio records in the logger
14	MStUnitNumber	monitoring station unit number (ignored if 0xFFFF)
15	MStUnitType	type of the monitoring station: 205 (SV 205B), 209 (SV 209) (ignored if 0xFFFF)
16	MStSoftwareVersion	monitoring station software version (ignored if 0xFFFF)
17..18	MStIntTimeSec	integration period of meteo results in seconds (ignored if 0xFFFF)
19	MStCalDate	last calibration date (ignored if 0xFFFF)
…	…	…

Note: *The current logger time step in seconds can be obtained from the formulae:*

T = BuffTSec + BuffTMillisec / 1000

Table B.1.21. Contents of the file from the logger

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

Table B.1.22. METEO data

Word number	Name	Comment
0	0xnn2A	[**2A** = id, nn = block's length]
1	BlockLength	block length
2	UnitNumber	unit number

3	UnitType	type of the unit: 205 (for SV 205B), 209 (for SV 209 and SP 275)
4	SoftwareVersion	software version
5..6	IntTimeSec	integration time specified in seconds
7	Temperature	temperature [*10 °C]
8	Pressure	pressure [hPa]
9	Humidity	humidity [*10 %]
10	AvgWindSpeed	average wind speed [*10 m/s]
11	WindDirection	wind direction for max wind speed [°] (0xFFFF if direction is unavailable)
12	MaxWindSpeed	max wind speed [*10 m/s] (ignored if WindDirection is unavailable)
13..14	WindDirTotalPuffs	wind direction distribution vector number of total wind puffs
15	NofWindDir	wind direction distribution vector number of elements
16 .. 16+NofWindDir-1	WindDir[i]	WindDir[i] value [*10 %]
16+NofWindDir	NofWindMax	max wind speed distribution vector number of elements
17+NofWindDir ... 17+NofWindDir+ NofWindMax-1	WindMax[i]	WindMax[i] value [*10 m/s]
17+NofWindDir+ NofWindMax	NofWindAvg	avg wind speed distribution vector number of elements
18+NofWindDir+ NofWindMax ... 18+NofWindDir+ NofWindMax+ NofWindAvg-1	WindAvg[i]	WindAvg[i] value [*10 m/s]
18+NofWindDir+ NofWindMax+ NofWindAvg	RainDetection	Rain detection flag
18+NofWindDir+ NofWindMax+ NofWindAvg + 1	RainAcc	Rain Accumulation [*100 mm]
18+NofWindDir+ NofWindMax+ NofWindAvg + 2	RainDuration	Rain Duration [s]
18+NofWindDir+ NofWindMax+ NofWindAvg + 3	RainIntens	Rain Intensity [mm/h]
18+NofWindDir+ NofWindMax+ NofWindAvg + 4	RainPeakIntens	Rain Peak Intensity [mm/h]

18+NofWindDir+ NofWindMax+ NofWindAvg + 5	HailAcc	Hail Accumulation [*100 mm]
18+NofWindDir+ NofWindMax+ NofWindAvg + 6	HailDuration	Hail Duration [s]
18+NofWindDir+ NofWindMax+ NofWindAvg + 7	HailIntens	Hail Intensity [mm/h]
18+NofWindDir+ NofWindMax+ NofWindAvg + 8	HailPeakIntens	Hail Peak Intensity [mm/h]
...	...	...

Table B.1.23. Alarm parameters

Word number	Name	Comment
0	0x0060	[**60** = id, 00 = block's length in the second word]
1	BlockLength	Block's length
2	EventCount	Number of events
3+(7*i)..7+(7*i)	MarkerName[i]	Marker name of i-th event (16 characters length)
8+(7*n)	Reserved	
9+(7*n)	MarkerPoint[i]	Marker point of i-th event: 0 – Off 1 – On
…	…	…

B.2 RECORDS IN THE SVL LOGGER FILE

Records with results and the records with states of the markers as well as the records with breaks in the results registration are saved in the logger files.

B.2.1 Record with the results

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

(1) results of the measurement from the first profile if the corresponding **LOGGER** position was active (BufferP [1] in Table B.1.11); up to four words are written:

<result1> - **PEAK** result, depending on the value of BufferP[1] (cf. Table B.1.11)
<result2> - **MAX** result, depending on the value of BufferP[1] (cf. Table B.1.11)
<result3> - **MIN** result, depending on the value of BufferP[1] (cf. Table B.1.11)
<result4> - **RMS** result, depending on the value of BufferP[1] (cf. Table B.1.11)

(2) results of the measurement from the second profile if the corresponding **LOGGER** position was active (BufferP [2] in Table B.1.11); up to four words are written:

<result1> - **PEAK** result, depending on the value of BufferP[2] (cf. Table B.1.11)
<result2> - **MAX** result, depending on the value of BufferP[2] (cf. Table B.1.11)
<result3> - **MIN** result, depending on the value of BufferP[2] (cf. Table B.1.11)
<result4> - **RMS** result, depending on the value of BufferP[2] (cf. Table B.1.11)

(3) results of the measurement from the third profile if the corresponding **LOGGER** position was active (BufferP [3] in Table B.1.11); up to four words are written:

<result1> - **PEAK** result, depending on the value of BufferP[3] (cf. Table B.1.11)
<result2> - **MAX** result, depending on the value of BufferP[3] (cf. Table B.1.11)
<result3> - **MIN** result, depending on the value of BufferP[3] (cf. Table B.1.11)
<result4> - **RMS** result, depending on the value of BufferP[3] (cf. Table B.1.11)

(4) results of **1/1 OCTAVE** analysis if **1/1 OCTAVE** analysis was selected as the measurement function and the **LOGGER** was active (SpectrumBuff in Table B.1.5); the sequence of words is written:

<flags> <Octave[1]> <Octave[2]> ÷. <Octave[NOct+NOctTot]>
where:
flags = 1- overload detected, 0 - the overload not detected
Octave[i] - result of **1/1 OCTAVE** analysis (*10 dB); i = 1÷NOct+NOctTot (1÷13)

(5) results of **1/3 OCTAVE** analysis if **1/3 OCTAVE** analysis was selected as the measurement function and **LOGGER** was active (SpectrumBuff in Table B.1.5); the sequence of words is written:

<flags> <Terave[1]> <Terave [2]> ÷. <Terave[NT]>
where:
flags = 1- overload detected, 0 - the overload not detected
Terave[i] - result of **1/3 OCTAVE** analysis (*10 dB); i = 1÷NT (1÷34)

B.2.2 Record with the state of the markers

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

<0x8nnn>

in which 12 bits nnn denote the state of the markers:
b11 = state of #12 marker
b10 = state of #11 marker
...
b1 = state of #2 marker
b0 = state of #1 marker

B.2.3 Record with the breaks in the results registration

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

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

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

B.2.4 Record with the breaks account PAUSE in the results registration

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

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

in which ii, jj, kk, nn bytes denote 4-bytes counter duration of PAUSE in milliseconds:
nnkkjjii (ii is the least significant byte, nn - the most significant byte).

B.2.5 Record with the wave file name

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

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

in which:
aa - size of records,
bb cc dd ee ff gg hh ii - 8-bytes name of wave file name

B.2.6 Record with Summary Results

The format of the data frame is as follows:

HS	L (optional)	D	L (optional)	HE

where:

HS starting header (1 word)
L length of the block (field is optional and occurs only when b7..b0 in header are set to zero)
D Summary Data:
- Main results (cf. 0)
- Statistical levels (optional, cf. Table B.1.14)
- 1/1 OCTAVE analysis results (optional, cf. 0)
- 1/3 OCTAVE analysis results (optional, cf. Table B.1.18)

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

The HEADER format is as follows:

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

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:
0 - HS
1 - HE
b10 - 0
b9 - 1
b8 - 1
b15÷b8 - HS (0xC3), HE (0xCB)
b7÷b0 - length of the block (if zero length of the block is saved in additional word L)

B.2.7 Record with audio data

This record exists only in the case when the **EVENT RECORDING** function is active (Table B.1.8). Samples of the signal, taken in the periods from 1 second to 60 seconds, are saved in the blocks. Each lock is divided into frames, which are stored in a file among the logger results. The frame starting block and the frame ending it are marked with the set b10 and b9 bits in the header of the frame, respectively. It happens in the case of stopping the recording that the ending frame does not exist.

The format of the data frame is as follows:

HS	L	S	L	HE

where:

HS starting header (1 word)
L block length (1 word), expressed in words (4 + (number of samples)*1.5)
S samples of the measured signal (in the case of SV 200 each sample is written according to BitsPerSample parameter; the recording starts with the least significant byte)
HE ending header (1 word), which differs from the HS only on b11 bit (thanks to it, it is possible to analyse the recorded file starting from its end)

The HEADER format is as follows:

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

where:

b15 - 1
b14 - 0
b13 - 0
b12 - 1, bits b15 ÷ b12 = 9 constitute the marker of the frame
b11 - header type:
0 - HS
1 - HE
b10 - 1 denotes the first frame in the block
b9 - 1 denotes the last frame in the block
b7 - 1 denotes an error (the samples were overwritten in the cycle buffer, which means that the recording in the analysed block is not correct)
b8, b6÷b0 – reserved

B.2.8 Record with the meteo data

Word number	Name	Comment
0	0xC1nn	nn= size of records
1	Temperature	temperature [*10 °C]
2	Pressure	pressure [hPa]
3	Humidity	humidity [*10 %]
4	AvgWindSpeed	average wind speed [*10 m/s]
5	WindDirection	wind direction for max wind speed [°] (0xFFFF if direction is unavailable)
6	MaxWindSpeed	max wind speed [*10 m/s] (ignored if WindDirection is unavailable)
7..8	WindDirTotalPuffs	wind direction distribution vector number of total wind puffs
9	RainDetection	rain detection flag
10	RainAcc	Rain Accumulation [*100 mm]
11	RainDuration	Rain Duration [s]
12	RainIntens	Rain Intensity [mm/h]

13	RainPeakIntens	Rain Peak Intensity [mm/h]
14	HailAcc	Hail Accumulation [hits/cm2]
15	HailDuration	Hail Duration [s]
16	HailIntens	Hail Intensity [hit/(cm2*h)]
17	HailPeakIntens	Hail Peak Intensity [hit/(cm2*h)]
18	0xC9nn	nn = size of records
…	…	…

B.2.9 Record with system check data

Word number	Name	Comment
0	0xC701	record ID (start)
1	Length	length of the block together with IDs, [words]
2	Type	system check type: 4 - system check (built-in actuator)
3	Date	date of the performed system check
4	Time	time of the performed system check
5	Result	result of the system check: 0 - failed 1 - OK
6	Factor	system check factor, [*100 dB]
7	Level	measured level of system check, [*100 dB]
8	PreBackGround	maximum level of the background noise measured before actuator was turned on, [*10 dB]. This is a maximum value of three 1s measurements of RMS(C)
9	PostBackGround	maximum level of the background noise measured after actuator was turned off, [*10 dB]. This is a maximum value of three 1s measurements of RMS(C)
10	Assigned	was the result of the system check assigned to calibration factor? 0 - No 1 - Yes
11	Length	length of the block together with IDs, [words]
12	0xCF01	record ID (end)
…	…	…

B.2.10 Record with remote marker data

Word number	Name	Comment
0	0xC702	record ID (start)
1	Length	length of the block together with IDs, [words]
2	MarkerNr	Number of the marker (1-16, 0 - end of all block markers when MarkerType=2)
3	MarkerType	Type of the marker: 0 - point 1 - block (start) 2 - block (end)

4	MarkerNameLen	Marker Name Length in words. Field is optional and is absent for MarkerType = 2.
5..5+MarkerNameLen	MarkerName	Name of the marker. In case of odd number of MarkerName bytes last byte is 0x00. Field is optional and is absent for MarkerType = 2.
5+MarkerNameLen+1	Length	length of the block together with IDs, [words]
5+MarkerNameLen+2	0xCF02	record ID (end)
…	…	…

B.2.11 Record with the state of the alarm markers

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

<0xC5nn>
<AlarmMarkerStateP>
<AlarmMarkerState>
<AlarmMarkerSMS>
<AlarmMarkerEmail>
<0xCDnn>

in which:
nn - size of records,
Each of word <AlarmMarkerStateP>, <AlarmMarkerState>, <AlarmMarkerSMS> and <AlarmMarkerEmail> denotes the state of the markers:
b15 = state of #16 alarm marker
...
b1 = state of #2 alarm marker
b0 = state of #1 alarm marker
<AlarmMarkerStateP> denotes the state of point markers
<AlarmMarkerState> denotes the state of continuous markers
<AlarmMarkerSMS> denotes the state of SMS markers
<AlarmMarkerEmail> denotes the state of Email markers

B.2.12 Record with the directivity results

Word number	Name	Comment
0	0xC706	record ID (start)
1	Length	length of the block together with IDs, [words]
2	eCompassCorr	eCompass result which is a deviation from North direction [-179°-180°]. This value should be treated as a correction for DirectionXY result
3	DirectionXY	direction of the maximum energy noise source for X-Y axis [0-359°]. -1 value means no dominant direction
4	EnergyXY	energy calculated for DirectionXY to entire energy ratio [*10000]
5	DirectionZ	direction of the maximum energy noise source for Z axis [0-180°]. -1 value means no dominant direction
6	EnergyZ	energy calculated for DirectionZ to entire energy ratio [*10000]
7	EnergyDistXY[i]	energy distribution calculated for i-direction to entire energy ratio for X-Y axis [*10000]

7+NofDirDistXY	EnergyDistZ[i]	energy distribution calculated for i-direction to entire energy ratio for Z axis [*10000]
7+NofDirDistXY +NofDirDistZ	Length	length of the block together with IDs, [words]
7+NofDirDistXY +NofDirDistZ+1	0xCF06	record ID (end)
…	…	…

B.2.13 Record with GPS data

The value equal to -12288 (0xd000) denotes the undefined value.

Word number	Name	Comment
0	0xC703	record ID (start)
1	Length	length of the block together with IDs, [words]
2	Quality	Signal quality: 0 - GPS_NOT_FIX (no signal) 1 - GPS_FIX 2 - GPS_FIX_DIF
3	Time.Sec	Seconds part of time
4	Time.Min	Minutes part of time
5	Time.Hour	Hours part of time
6	Date.Day	Day
7	Date.Month	Month
8	Date.Year	Year
9	Latitude.Deg	Degree part of latitude
10	Latitude.Min	Minutes part of latitude
11	Latitude.Sec	Seconds part of latitude
12	Latitude.MiliSec	Miliseconds part of latitude
13	Latitude.Dir	Latitude direction: N, S
14	Longitude.Deg	Degree part of longitude
15	Longitude.Min	Minutes part of longitude
16	Longitude.Sec	Seconds part of longitude
17	Longitude.MiliSec	Miliseconds part of longitude
18	Longitude.Dir	Longitude direction: E, W
19	Altitude	Altitude (meters)
20	Altitude.10	Decimal part of altitude
21	Speed	Speed * 100 (km/h)
22	Heading	degree * 10
23	HDOP	Horizontal Dilution of Precision * 10
24	Length	length of the block together with IDs, [words]
25	0xCF03	record ID (end)
…	…	….

B.3 STRUCTURE OF THE CSV FILE

TBD

B.4 STRUCTURE OF THE SVT FILE

File header - cf. Tab. B.1.1.
Unit and software specification - cf. Tab. B.1.2.
SETUP DATA - cf. Tab. B.1.20
File-end-marker - cf. Tab. B.1.23.

B.5 STRUCTURE OF THE SVA FILE

TBD

B.6 STRUCTURE OF THE TXT FILE

TBD

B.7 STRUCTURE OF THE LOG FILE

TBD

B.8 DATE AND TIME

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

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

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

Appendix C. TECHNICAL SPECIFICATIONS

C.1 SPECIFICATION OF SV 200A IN THE STANDARD CONFIGURATION

The SV 200A instrument with all listed below accessories meets requirements of the IEC 61672-1:2013 for the Class 1 instruments.

The configuration of the complete SLM and its normal mode of operation:

SV 200A	sound analyser with built-in microphone preamplifier, MK 255S, prepolarised free-field microphone (1/2", nominal sensitivity 50 mV/Pa) and SA 209 windscreen

Accessories included in SV 200A instrument set:

SB 274	power supply unit (IP66)
SC 256A	USB cable
Antennas	GSM, WLAN

Accessories available:

SV 36 or SV 36	sound calibrator, **B&K 4231** (or equivalent)
SA 209	windscreen
SB 270	solar panel
SP 200	adapter for the LAN network
SA 206	Manfrotto telescopic mast

Measured quantities

The measured quantities in the sound meter mode are: **SPL**, **Leq**, **SEL**, **Lden**, **Ltm3**, **Ltm5**, **Lpeak**, **Lmax**, **Lmin, Lnn**.
The definitions for measured quantities are given in Appendix D.

Additional features (see Chapter C.1)

Overload indication

Under-range indication

Battery state indication

GPS positioning and time synchronization

Temperature, pressure and humidity sensors

Noise sources direction determination

Electrostatic actuator for system check

Bluetooth module

3G modem

WLAN/LAN module

Conformance testing

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

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

Electrical substitute for the microphone — To obtain a BNC Class electrical input, the microphone must be replaced by an electrical microphone impedance ST 02 with the serial capacitance 18 pF +/- 10%.

Note: *For the conformance of electrical tests, the Microphone Compensation must be set to "OFF"! (path: <Menu> / Measurement / Compensation Filter).*

Note: *For the conformance of acoustical tests, the Microphone Compensation must be set to "On"! (path: <Menu> / Measurement / Compensation Filter).*

Periodical test upper frequency — 8 kHz

Linear Operating Range

Table C.1.1. Linear operating 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	25	90	25	113	25	127	30	130	25	90	25	113	25	127	28	93	50	130
500 Hz	25	126	25	129	25	130	30	130	25	126	25	129	25	130	28	129	50	133
1 kHz	25	130	25	130	25	130	30	130	25	130	25	130	25	130	28	133	50	133
4 kHz	25	131	25	129	25	129	30	130	25	131	25	129	25	129	28	134	50	133
8 kHz	25	129	25	127	25	127	30	130	25	129	25	127	25	127	28	132	50	130
12.5 kHz	25	125	25	124	25	124	30	130	25	125	25	124	25	124	28	128	50	127

Note: *For the signals with the crest factor* ***n >1.41*** *upper measuring range of the RMS (****LEQ*** *and* ***SPL****) is reduced. The valid upper limit can be calculated according to the below given formula:* $A_n = 130 - 20\log(n/\sqrt{2})$, *where* ***A*** *is the upper limit for the sinusoidal signal.*

Example: For the crest factor ***n = 10*** *the upper limit is* A_{10} = ***113 dB****.*

The starting point at which tests of level linearity shall begin is — 114.0 dB.

Measuring frequency range of the acoustic pressure (-3 dB) — 3,5 Hz ÷ 20 000 Hz.

Basic measurement error of the acoustic pressure — < 0.7 dB (measured for the reference conditions, see below).

Weighting filters (see C.3)

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

Table C.1.2. Self-generated noise for different weighting filters

	Electrical *)			**Acoustical compensated**		
Weighting filter	**A**	**C**	**Z**	**A**	**C**	**Z**
Noise	< 13 dB	< 14 dB	< 15 dB	< 15 dB	< 15 dB	< 20 dB

*) measured with the **ST 02** microphone equivalent impedance **18 pF +/-10%**

Special filters (see Section C.1)

Frequency response of SV 200A 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

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 60804:2000 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 free field 114.0 dB (see MK 255S free field correction table below)

Microphone

MK 255S	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 sound pressure level that can affect the microphone without destroying its membrane is 146 dB.*

Table C.1.3. MK 255S 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	0.0	0.0	0.0	0.0	0.0
	Frequency [Hz]																
	1000	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**	**12500**	**16000**	**20000**			
	0.0	0,01	0,09	0,23	0,40	0,55	0,91	1,60	2,41	3,54	4,96	6,81	9,31	10,99			

Typical Free Field frequency response of the microphone

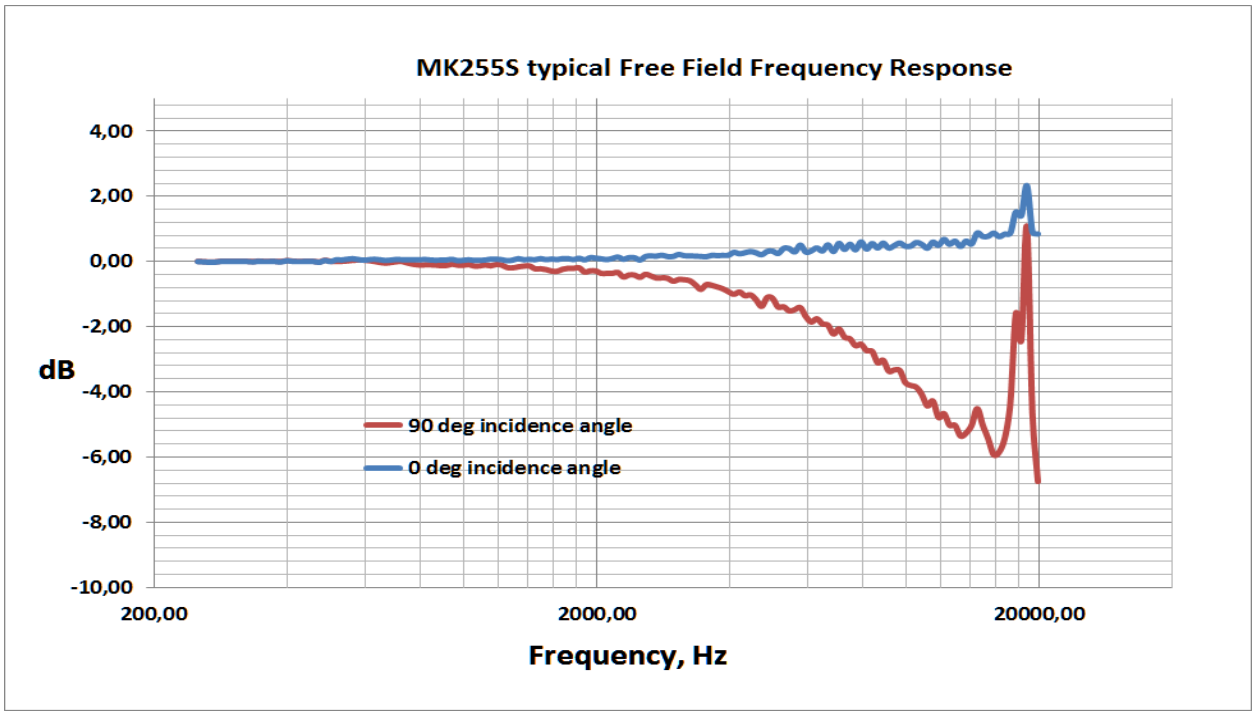


Table C.1.4. MK 255S free field response for 0 deg and 90 deg incidence angle

f [Hz]	0 deg incidence angle	90 deg incidence angle	f [Hz]	0 deg incidence angle	90 deg incidence angle
251.19	0,00	0,00	**2304.09**	0,07	-0,48
258.52	-0,01	-0,01	**2371.37**	0,12	-0,42
266.07	-0,02	-0,02	**2440.62**	0,12	-0,42
273.84	-0,02	-0,02	**2511.89**	0,05	-0,49
281.84	0,00	0,00	**2585.23**	0,16	-0,40
290.07	0,00	0,00	**2660.73**	0,17	-0,45
298.54	0,00	0,00	**2738.42**	0,17	-0,51
307.26	0,00	0,00	**2818.38**	0,20	-0,51
316.23	0,00	0,00	**2900.68**	0,15	-0,52
325.46	0,00	0,00	**2985.38**	0,16	-0,61
334.97	-0,01	-0,01	**3072.56**	0,22	-0,56
344.75	0,01	0,01	**3162.28**	0,18	-0,56
354.81	0,00	0,00	**3254.62**	0,18	-0,59
365.17	0,00	0,00	**3349.65**	0,17	-0,72
375.84	0,00	0,00	**3447.47**	0,16	-0,86
386.81	-0,01	-0,01	**3548.13**	0,15	-0,71
398.11	0,02	0,02	**3651.74**	0,19	-0,74
409.73	0,01	0,01	**3758.37**	0,18	-0,78
421.70	0,00	0,00	**3868.12**	0,19	-0,84
434.01	0,00	0,00	**3981.07**	0,19	-0,93
446.68	0,00	0,00	**4097.32**	0,29	-1,01
459.73	0,00	0,00	**4216.97**	0,24	-0,94
473.15	-0,02	-0,02	**4340.10**	0,27	-1,05
486.97	0,03	0,03	**4466.84**	0,31	-1,03
501.19	0,00	0,00	**4597.27**	0,27	-1,17
515.82	0,05	-0,01	**4731.51**	0,21	-1,38
530.88	0,05	0,00	**4869.68**	0,31	-1,11
546.39	0,07	0,01	**5011.87**	0,32	-1,14
562.34	0,09	0,03	**5158.22**	0,25	-1,40
578.76	0,06	0,04	**5308.84**	0,41	-1,39
595.66	0,04	0,03	**5463.87**	0,40	-1,52
613.06	0,06	0,02	**5623.41**	0,30	-1,48
630.96	0,07	-0,01	**5787.62**	0,50	-1,41
649.38	0,06	-0,04	**5956.62**	0,29	-1,69
668.34	0,03	-0,06	**6130.56**	0,33	-1,86
687.86	0,05	-0,04	**6309.57**	0,42	-1,76
707.95	0,07	-0,01	**6493.82**	0,33	-1,91
728.62	0,06	-0,01	**6683.44**	0,51	-1,95
749.89	0,06	-0,06	**6878.60**	0,31	-2,22
771.79	0,05	-0,09	**7079.46**	0,56	-2,07
794.33	0,05	-0,11	**7286.18**	0,37	-2,32
817.52	0,07	-0,11	**7498.94**	0,53	-2,37
841.40	0,05	-0,11	**7717.92**	0,36	-2,58
865.96	0,04	-0,12	**7943.28**	0,61	-2,53
891.25	0,05	-0,13	**8175.23**	0,38	-2,73

f [Hz]	0 deg incidence angle	90 deg incidence angle	f [Hz]	0 deg incidence angle	90 deg incidence angle
917.28	0,05	-0,13	**8413.95**	0,55	-2,76
944.06	0,07	-0,09	**8659.64**	0,42	-3,10
971.63	0,03	-0,12	**8912.51**	0,57	-3,03
1000.00	0,04	-0,12	**9172.76**	0,41	-3,36
1029.20	0,06	-0,10	**9440.61**	0,49	-3,32
1059.25	0,04	-0,14	**9716.28**	0,57	-3,34
1090.18	0,04	-0,14	**10000.00**	0,47	-3,71
1122.02	0,05	-0,11	**10292.01**	0,48	-3,80
1154.78	0,08	-0,14	**10592.54**	0,59	-3,85
1188.50	0,07	-0,10	**10901.84**	0,53	-4,08
1223.21	0,06	-0,12	**11220.18**	0,41	-4,43
1258.93	0,03	-0,19	**11547.82**	0,60	-4,27
1295.69	0,05	-0,20	**11885.02**	0,50	-4,78
1333.52	0,09	-0,17	**12232.07**	0,68	-4,66
1372.46	0,06	-0,15	**12589.25**	0,53	-5,01
1412.54	0,07	-0,14	**12956.87**	0,63	-5,02
1453.78	0,06	-0,23	**13335.21**	0,47	-5,34
1496.24	0,09	-0,23	**13724.61**	0,63	-5,25
1539.93	0,06	-0,25	**14125.38**	0,54	-5,02
1584.89	0,08	-0,30	**14537.84**	0,88	-4,51
1631.17	0,06	-0,31	**14962.36**	0,77	-5,01
1678.80	0,09	-0,24	**15399.27**	0,78	-5,43
1727.83	0,09	-0,21	**15848.93**	0,87	-5,92
1778.28	0,06	-0,22	**16311.73**	0,76	-5,83
1830.21	0,10	-0,20	**16788.04**	0,84	-5,41
1883.65	0,05	-0,33	**17278.26**	0,87	-4,34
1938.65	0,12	-0,29	**17782.79**	1,52	-1,60
1995.26	0,11	-0,30	**18302.06**	1,41	-2,39
2053.53	0,09	-0,37	**18836.49**	2,34	1,05
2113.49	0,06	-0,37	**19386.53**	0,91	-4,61
2175.20	0,10	-0,37	**19952.62**	0,85	-6,74
2238.72	0,14	-0,34			

Preamplifier

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)
Auto-start time	1 min. (for 0.1 dB accuracy)

Typical stabilization time after change in environmental conditions 1 minute

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.

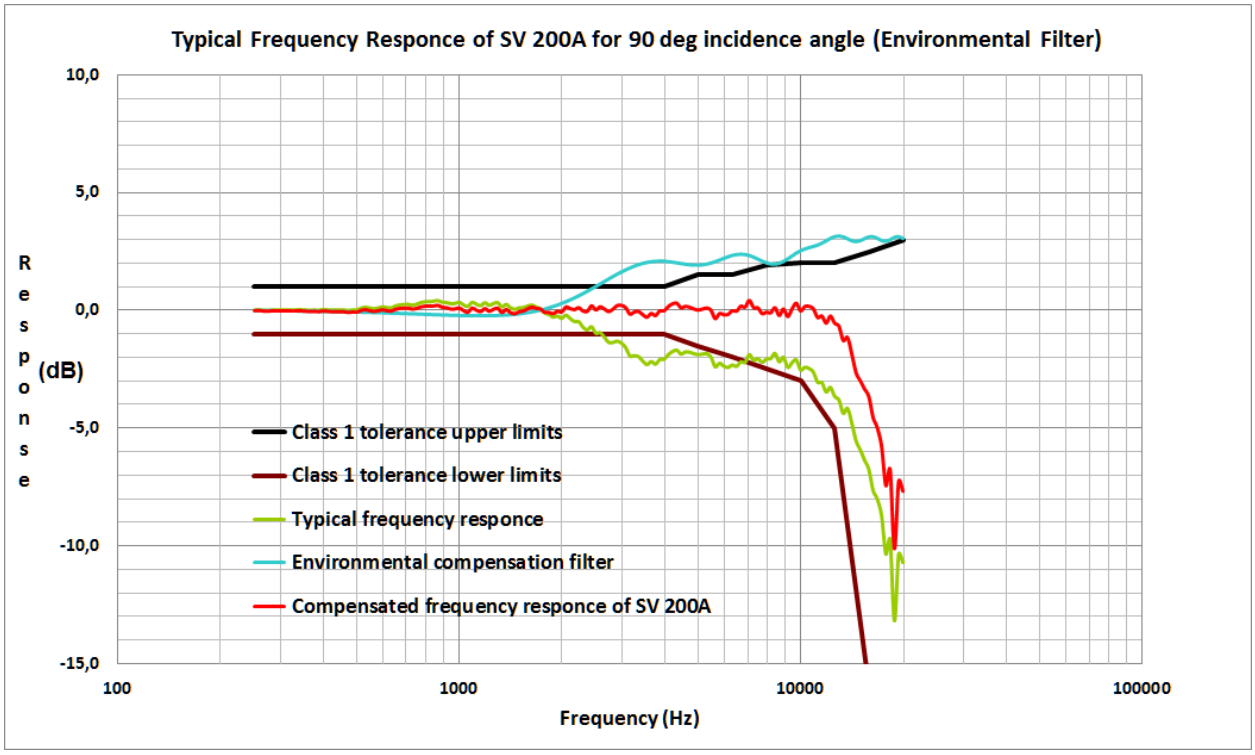
Effect of electrostatic discharge	meets requirements of IEC 61672-1:2013

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 -30°C to + 60°C
Storage	from -40°C to + 60°C
Humidity	90% RH in 40°C (not-condensed)
Battery state indication	0-100% of the battery state of charge

Free Field Frequency response of SV 200A



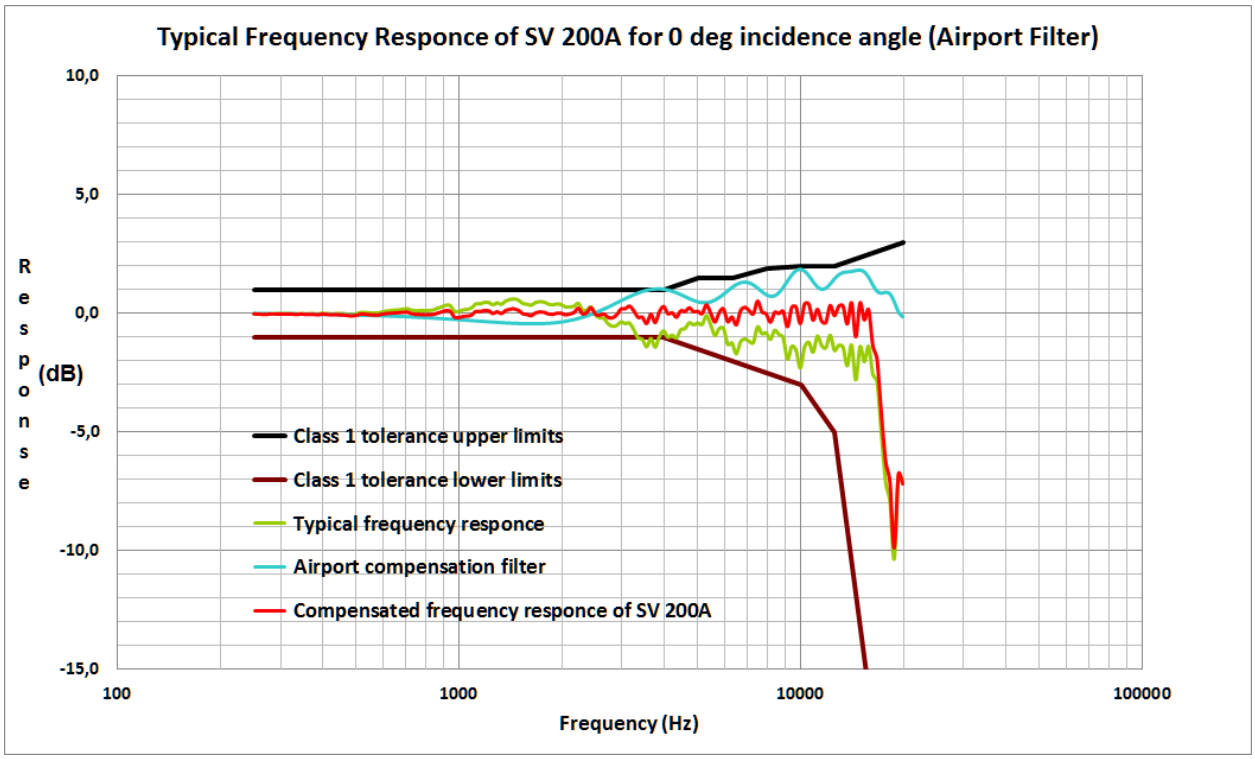


Table C.1.5. SV 200A frequency response

f [Hz]	Typical non-compensated frequency response	Compensation filter (Environmental)	Typical compensated frequency response	Typical non-compensated frequency response	Compensation filter (Airport)	Typical compensated frequency response
	90 deg incidence angle			0 deg incidence angle		
251.19	0,00	-0,02	-0,02	0,00	-0,03	-0,03
258.52	-0,01	-0,02	-0,03	0,01	-0,03	-0,02
266.07	-0,02	-0,02	-0,04	-0,01	-0,03	-0,04
273.84	-0,02	-0,03	-0,05	-0,02	-0,03	-0,05
281.84	0,00	-0,03	-0,03	0,00	-0,03	-0,03
290.07	0,00	-0,03	-0,03	0,00	-0,03	-0,03
298.54	0,00	-0,03	-0,03	0,00	-0,04	-0,04
307.26	0,00	-0,03	-0,03	0,00	-0,04	-0,04
316.23	0,00	-0,03	-0,03	0,01	-0,04	-0,03
325.46	0,00	-0,04	-0,04	0,00	-0,04	-0,04
334.97	-0,01	-0,04	-0,05	0,01	-0,05	-0,04
344.75	0,01	-0,04	-0,03	0,01	-0,05	-0,04
354.81	0,00	-0,04	-0,04	0,00	-0,05	-0,05
365.17	0,00	-0,05	-0,05	-0,01	-0,05	-0,06
375.84	0,00	-0,05	-0,05	0,00	-0,06	-0,06
386.81	-0,01	-0,05	-0,06	-0,01	-0,06	-0,07
398.11	0,02	-0,05	-0,03	0,02	-0,06	-0,04
409.73	0,01	-0,06	-0,05	0,01	-0,06	-0,05
421.70	0,00	-0,06	-0,06	0,00	-0,07	-0,07
434.01	0,00	-0,06	-0,06	0,00	-0,07	-0,07
446.68	0,00	-0,07	-0,07	0,00	-0,08	-0,08
459.73	0,00	-0,07	-0,07	0,00	-0,08	-0,08
473.15	-0,02	-0,08	-0,10	-0,02	-0,08	-0,10
486.97	-0,03	-0,08	-0,11	0,00	-0,09	-0,08
501.19	0,00	-0,08	-0,08	0,00	-0,09	-0,09
515.82	0,05	-0,09	-0,04	0,08	-0,10	-0,02
530.88	0,06	-0,09	-0,04	0,12	-0,10	0,01
546.39	0,04	-0,10	-0,06	0,08	-0,11	-0,03
562.34	0,04	-0,10	-0,07	0,05	-0,11	-0,06
578.76	0,03	-0,11	-0,08	0,09	-0,12	-0,03
595.66	0,07	-0,12	-0,04	0,13	-0,12	0,01
613.06	0,11	-0,12	-0,01	0,10	-0,13	-0,03
630.96	0,13	-0,13	0,00	0,09	-0,13	-0,04
649.38	0,15	-0,14	0,02	0,17	-0,14	0,03
668.34	0,17	-0,14	0,03	0,22	-0,15	0,07
687.86	0,20	-0,15	0,05	0,24	-0,15	0,08
707.95	0,20	-0,16	0,05	0,24	-0,16	0,08
728.62	0,15	-0,17	-0,02	0,21	-0,17	0,04
749.89	0,12	-0,18	-0,05	0,24	-0,17	0,07

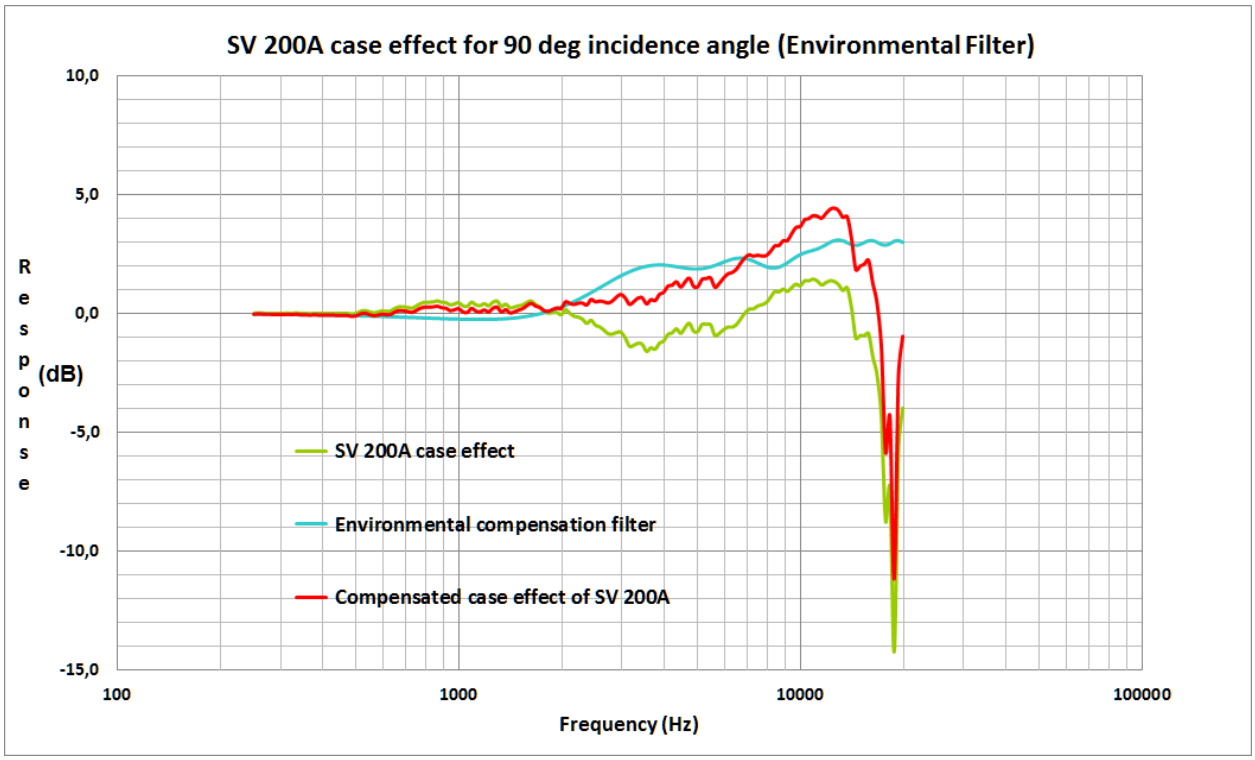
f [Hz]	Typical non-compensated frequency response	Compensation filter (Environmental)	Typical compensated frequency response	Typical non-compensated frequency response	Compensation filter (Airport)	Typical compensated frequency response
	90 deg incidence angle			0 deg incidence angle		
771.79	0,13	-0,18	-0,05	0,31	-0,18	0,13
794.33	0,13	-0,19	-0,06	0,35	-0,19	0,16
817.52	0,14	-0,20	-0,06	0,35	-0,19	0,16
841.40	0,16	-0,21	-0,05	0,37	-0,20	0,17
865.96	0,23	-0,22	0,01	0,40	-0,21	0,20
891.25	0,29	-0,24	0,06	0,33	-0,21	0,12
917.28	0,36	-0,25	0,11	0,32	-0,22	0,10
944.06	0,34	-0,26	0,08	0,27	-0,23	0,04
971.63	0,11	-0,27	-0,16	0,28	-0,23	0,05
1000.00	0,09	-0,28	-0,19	0,32	-0,24	0,09
1029.20	0,16	-0,29	-0,13	0,21	-0,24	-0,03
1059.25	0,18	-0,31	-0,12	0,15	-0,24	-0,09
1090.18	0,25	-0,32	-0,07	0,32	-0,25	0,08
1122.02	0,41	-0,33	0,08	0,24	-0,25	0,00
1154.78	0,42	-0,35	0,07	0,18	-0,25	-0,07
1188.50	0,48	-0,36	0,12	0,31	-0,25	0,06
1223.21	0,48	-0,37	0,11	0,20	-0,25	-0,05
1258.93	0,38	-0,38	-0,01	0,27	-0,24	0,03
1295.69	0,46	-0,40	0,06	0,31	-0,24	0,07
1333.52	0,40	-0,41	-0,01	0,13	-0,23	-0,10
1372.46	0,53	-0,42	0,12	0,24	-0,22	0,02
1412.54	0,60	-0,43	0,17	0,09	-0,20	-0,11
1453.78	0,62	-0,44	0,19	0,03	-0,19	-0,16
1496.24	0,57	-0,44	0,13	0,09	-0,17	-0,08
1539.93	0,43	-0,45	-0,02	0,11	-0,14	-0,04
1584.89	0,40	-0,45	-0,05	0,16	-0,12	0,05
1631.17	0,36	-0,46	-0,09	0,21	-0,09	0,13
1678.80	0,47	-0,46	0,02	0,12	-0,05	0,07
1727.83	0,51	-0,45	0,06	0,05	-0,01	0,04
1778.28	0,49	-0,45	0,04	-0,13	0,04	-0,09
1830.21	0,41	-0,44	-0,03	-0,19	0,09	-0,10
1883.65	0,37	-0,42	-0,05	-0,30	0,15	-0,16
1938.65	0,41	-0,40	0,01	-0,26	0,21	-0,05
1995.26	0,38	-0,38	0,00	-0,36	0,28	-0,08
2053.53	0,28	-0,35	-0,07	-0,22	0,35	0,13
2113.49	0,29	-0,32	-0,03	-0,36	0,43	0,06
2175.20	0,31	-0,28	0,04	-0,49	0,51	0,02
2238.72	0,44	-0,23	0,21	-0,50	0,60	0,10
2304.09	0,16	-0,18	-0,02	-0,73	0,69	-0,04
2371.37	0,16	-0,12	0,04	-0,85	0,79	-0,06

f [Hz]	Typical non-compensated frequency response	Compensation filter (Environmental)	Typical compensated frequency response	Typical non-compensated frequency response	Compensation filter (Airport)	Typical compensated frequency response
	90 deg incidence angle			0 deg incidence angle		
2440.62	0,29	-0,06	0,23	-0,71	0,89	0,18
2511.89	-0,05	0,01	-0,03	-0,99	1,00	0,00
2585.23	-0,17	0,09	-0,08	-0,96	1,10	0,13
2660.73	-0,20	0,17	-0,03	-1,16	1,21	0,05
2738.42	-0,43	0,26	-0,17	-1,37	1,31	-0,06
2818.38	-0,54	0,34	-0,19	-1,38	1,41	0,03
2900.68	-0,50	0,43	-0,06	-1,33	1,51	0,19
2985.38	-0,35	0,53	0,18	-1,41	1,61	0,20
3072.56	-0,42	0,61	0,20	-1,60	1,70	0,10
3162.28	-0,40	0,70	0,30	-1,95	1,78	-0,17
3254.62	-0,67	0,78	0,11	-1,94	1,86	-0,09
3349.65	-1,02	0,85	-0,17	-1,98	1,92	-0,06
3447.47	-1,08	0,92	-0,16	-2,17	1,97	-0,20
3548.13	-1,40	0,97	-0,43	-2,32	2,02	-0,30
3651.74	-1,05	1,01	-0,04	-2,19	2,05	-0,14
3758.37	-1,42	1,03	-0,39	-2,30	2,06	-0,24
3868.12	-0,97	1,03	0,06	-2,10	2,07	-0,04
3981.07	-0,73	1,02	0,29	-2,09	2,06	-0,03
4097.32	-1,00	0,98	-0,02	-1,90	2,05	0,15
4216.97	-0,90	0,93	0,03	-1,76	2,03	0,26
4340.10	-1,03	0,86	-0,17	-1,71	2,00	0,29
4466.84	-0,68	0,78	0,11	-1,87	1,97	0,09
4597.27	-0,63	0,70	0,07	-1,78	1,94	0,16
4731.51	-0,38	0,61	0,23	-1,80	1,92	0,12
4869.68	-0,47	0,54	0,07	-1,86	1,90	0,04
5011.87	-0,40	0,48	0,08	-1,90	1,90	0,00
5158.22	-0,46	0,44	-0,02	-1,87	1,91	0,04
5308.84	-0,08	0,44	0,36	-1,86	1,94	0,09
5463.87	-0,46	0,48	0,02	-2,00	1,99	-0,01
5623.41	-0,92	0,55	-0,36	-2,41	2,05	-0,37
5787.62	-0,63	0,66	0,03	-2,26	2,12	-0,15
5956.62	-0,61	0,80	0,19	-2,39	2,19	-0,20
6130.56	-1,30	0,95	-0,35	-2,44	2,26	-0,19
6309.57	-1,24	1,09	-0,15	-2,34	2,31	-0,03
6493.82	-1,69	1,21	-0,48	-2,40	2,35	-0,05
6683.44	-1,19	1,29	0,10	-2,20	2,36	0,16
6878.60	-1,07	1,32	0,25	-2,23	2,35	0,12
7079.46	-1,17	1,29	0,12	-1,90	2,31	0,41
7286.18	-1,22	1,20	-0,03	-2,14	2,24	0,10
7498.94	-0,55	1,07	0,52	-2,07	2,16	0,09

f [Hz]	Typical non-compensated frequency response	Compensation filter (Environmental)	Typical compensated frequency response	Typical non-compensated frequency response	Compensation filter (Airport)	Typical compensated frequency response
	90 deg incidence angle			0 deg incidence angle		
7717.92	-0,85	0,92	0,07	-2,22	2,07	-0,15
7943.28	-0,81	0,79	-0,02	-2,09	2,00	-0,09
8175.23	-1,08	0,72	-0,37	-2,06	1,95	-0,12
8413.95	-0,70	0,74	0,04	-1,84	1,94	0,09
8659.64	-0,88	0,87	-0,01	-2,21	1,97	-0,23
8912.51	-1,01	1,09	0,08	-2,01	2,05	0,04
9172.76	-1,93	1,36	-0,56	-2,44	2,16	-0,27
9440.61	-1,38	1,62	0,24	-2,24	2,29	0,05
9716.28	-1,53	1,80	0,27	-2,12	2,41	0,29
10000.00	-2,30	1,86	-0,43	-2,55	2,51	-0,04
10292.01	-1,40	1,79	0,39	-2,43	2,59	0,15
10592.54	-1,21	1,59	0,39	-2,49	2,64	0,16
10901.84	-1,63	1,34	-0,29	-2,64	2,69	0,05
11220.18	-0,95	1,12	0,17	-3,07	2,75	-0,32
11547.82	-1,34	1,01	-0,33	-3,08	2,83	-0,25
11885.02	-1,44	1,06	-0,38	-3,48	2,93	-0,55
12232.07	-0,91	1,24	0,33	-3,29	3,03	-0,26
12589.25	-1,55	1,45	-0,09	-3,67	3,11	-0,56
12956.87	-1,34	1,63	0,29	-3,82	3,13	-0,69
13335.21	-1,41	1,72	0,32	-4,39	3,10	-1,29
13724.61	-2,20	1,75	-0,45	-4,18	3,02	-1,17
14125.38	-1,32	1,77	0,45	-4,79	2,94	-1,86
14537.84	-2,80	1,81	-0,99	-5,55	2,90	-2,65
14962.36	-1,39	1,83	0,44	-5,94	2,94	-3,00
15399.27	-2,03	1,75	-0,28	-6,37	3,03	-3,35
15848.93	-1,38	1,53	0,15	-6,78	3,10	-3,68
16311.73	-2,57	1,20	-1,37	-7,67	3,10	-4,56
16788.04	-2,90	0,93	-1,97	-8,03	3,03	-5,00
17278.26	-5,11	0,84	-4,26	-8,75	2,94	-5,80
17782.79	-7,13	0,89	-6,24	-10,36	2,91	-7,45
18302.06	-7,94	0,82	-7,13	-9,76	2,98	-6,78
18836.49	-10,37	0,49	-9,88	-13,20	3,07	-10,13
19386.53	-6,81	0,04	-6,77	-10,37	3,10	-7,27
19952.62	-7,03	-0,16	-7,18	-10,72	3,03	-7,69

Case effect

Effect of reflections and diffraction of the acoustic plane wave from the case of SV 200A (“case effect”)



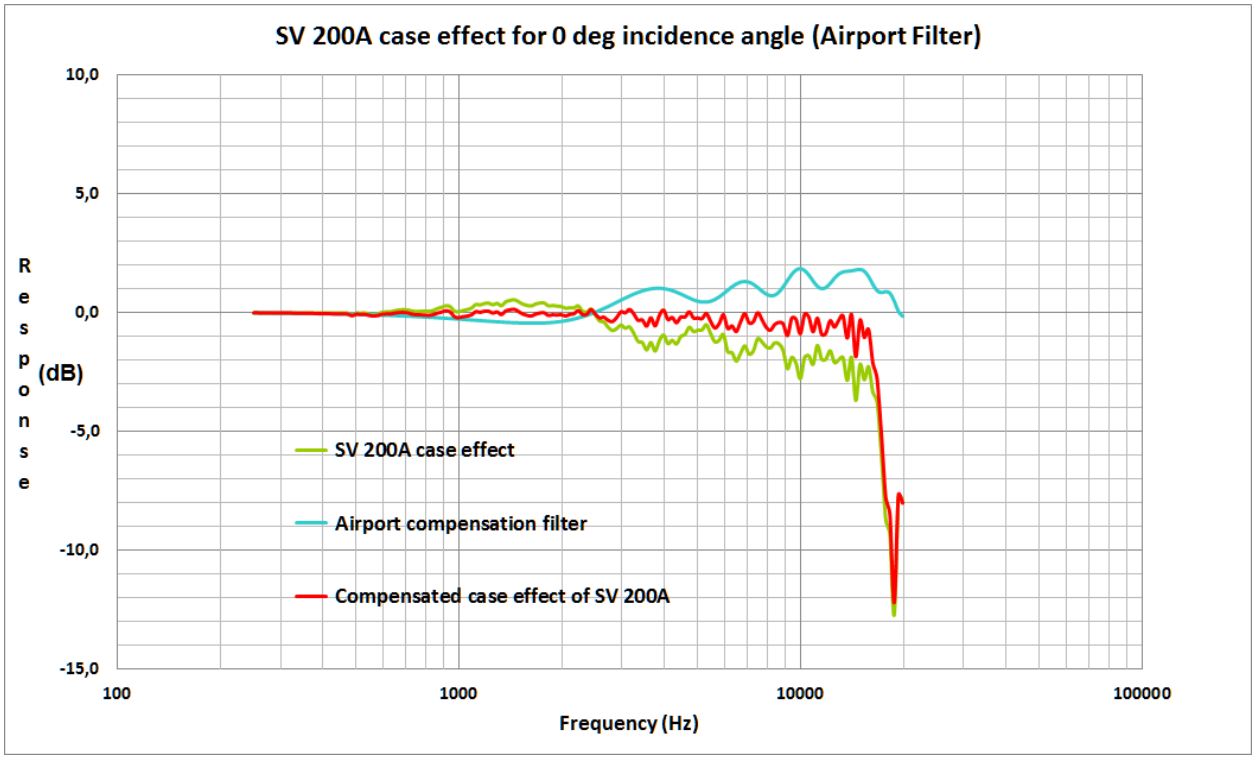


Table C.1.6. SV 200A case effect

f [Hz]	SV 200A Case effect	Compensation filter (Environmental)	SV 200A Compensated case effect	SV 200A Case effect	Compensation filter (Airport)	SV 200A Compensated case effect
	90 deg incidence angle			0 deg incidence angle		
251.19	0,00	-0,03	-0,03	0,00	-0,02	-0,02
258.52	0,02	-0,03	-0,01	0,00	-0,02	-0,02
266.07	0,01	-0,03	-0,02	0,00	-0,02	-0,02
273.84	0,00	-0,03	-0,03	0,00	-0,03	-0,03
281.84	0,00	-0,03	-0,03	0,00	-0,03	-0,03
290.07	0,00	-0,03	-0,03	0,00	-0,03	-0,03
298.54	0,00	-0,04	-0,04	0,00	-0,03	-0,03
307.26	0,00	-0,04	-0,04	0,00	-0,03	-0,03
316.23	0,01	-0,04	-0,03	0,00	-0,03	-0,03
325.46	0,00	-0,04	-0,04	0,00	-0,04	-0,04
334.97	0,02	-0,05	-0,03	0,00	-0,04	-0,04
344.75	0,00	-0,05	-0,05	0,00	-0,04	-0,04
354.81	0,00	-0,05	-0,05	0,00	-0,04	-0,04
365.17	-0,01	-0,05	-0,06	0,00	-0,05	-0,05
375.84	0,00	-0,06	-0,06	0,00	-0,05	-0,05
386.81	0,00	-0,06	-0,06	0,00	-0,05	-0,05
398.11	0,00	-0,06	-0,06	0,00	-0,05	-0,05
409.73	0,00	-0,06	-0,06	0,00	-0,06	-0,06
421.70	0,00	-0,07	-0,07	0,00	-0,06	-0,06
434.01	0,00	-0,07	-0,07	0,00	-0,06	-0,06
446.68	0,00	-0,08	-0,08	0,00	-0,07	-0,07
459.73	0,00	-0,08	-0,08	0,00	-0,07	-0,07
473.15	0,00	-0,08	-0,08	0,00	-0,08	-0,08
486.97	-0,03	-0,09	-0,12	-0,07	-0,08	-0,15
501.19	0,00	-0,09	-0,09	0,00	-0,08	-0,08
515.82	0,09	-0,10	-0,01	0,00	-0,09	-0,09
530.88	0,12	-0,10	0,02	0,01	-0,09	-0,09
546.39	0,07	-0,11	-0,04	-0,03	-0,10	-0,13
562.34	0,02	-0,11	-0,09	-0,05	-0,10	-0,16
578.76	0,05	-0,12	-0,07	-0,03	-0,11	-0,14
595.66	0,10	-0,12	-0,02	0,03	-0,12	-0,09
613.06	0,08	-0,13	-0,05	0,05	-0,12	-0,07
630.96	0,10	-0,13	-0,04	0,06	-0,13	-0,07
649.38	0,20	-0,14	0,06	0,10	-0,14	-0,04
668.34	0,27	-0,15	0,13	0,13	-0,14	-0,01
687.86	0,27	-0,15	0,12	0,14	-0,15	-0,01
707.95	0,25	-0,16	0,09	0,14	-0,16	-0,02
728.62	0,21	-0,17	0,05	0,09	-0,17	-0,08
749.89	0,30	-0,17	0,13	0,07	-0,18	-0,11

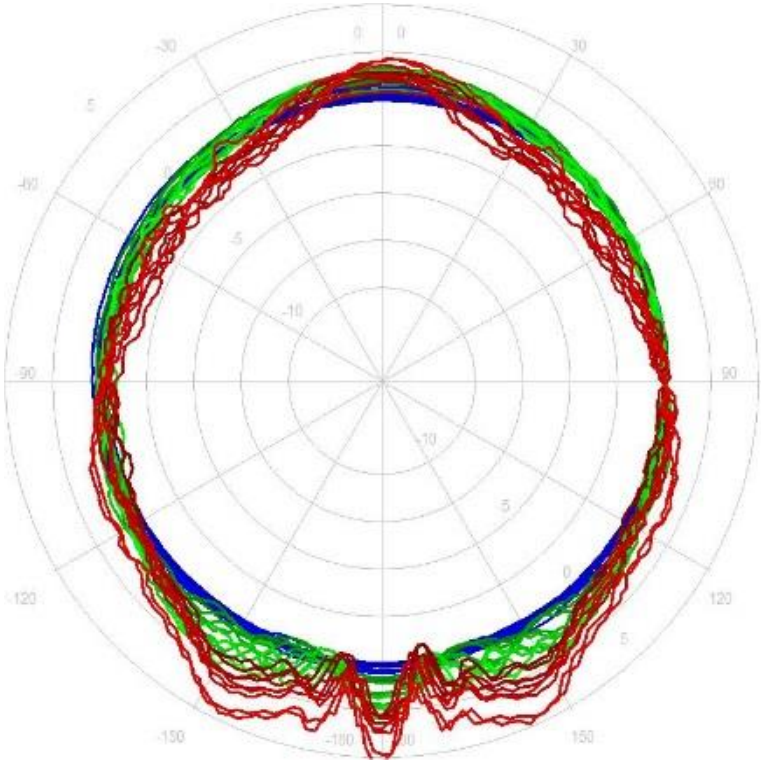
f [Hz]	SV 200A Case effect	Compensation filter (Environmental)	SV 200A Compensated case effect	SV 200A Case effect	Compensation filter (Airport)	SV 200A Compensated case effect
	90 deg incidence angle			0 deg incidence angle		
771.79	0,41	-0,18	0,23	0,08	-0,18	-0,11
794.33	0,46	-0,19	0,28	0,07	-0,19	-0,12
817.52	0,46	-0,19	0,27	0,07	-0,20	-0,13
841.40	0,48	-0,20	0,28	0,11	-0,21	-0,10
865.96	0,52	-0,21	0,31	0,19	-0,22	-0,03
891.25	0,46	-0,21	0,25	0,24	-0,24	0,01
917.28	0,44	-0,22	0,23	0,31	-0,25	0,07
944.06	0,35	-0,23	0,13	0,27	-0,26	0,01
971.63	0,39	-0,23	0,16	0,08	-0,27	-0,19
1000.00	0,44	-0,24	0,21	0,06	-0,28	-0,23
1029.20	0,31	-0,24	0,07	0,11	-0,29	-0,19
1059.25	0,29	-0,24	0,05	0,15	-0,31	-0,16
1090.18	0,47	-0,25	0,22	0,21	-0,32	-0,11
1122.02	0,36	-0,25	0,11	0,36	-0,33	0,03
1154.78	0,32	-0,25	0,07	0,34	-0,35	0,00
1188.50	0,40	-0,25	0,16	0,40	-0,36	0,04
1223.21	0,31	-0,25	0,07	0,42	-0,37	0,05
1258.93	0,47	-0,24	0,23	0,35	-0,38	-0,03
1295.69	0,51	-0,24	0,27	0,41	-0,40	0,01
1333.52	0,29	-0,23	0,07	0,31	-0,41	-0,10
1372.46	0,38	-0,22	0,17	0,48	-0,42	0,06
1412.54	0,23	-0,20	0,03	0,53	-0,43	0,10
1453.78	0,26	-0,19	0,07	0,56	-0,44	0,13
1496.24	0,31	-0,17	0,15	0,48	-0,44	0,04
1539.93	0,36	-0,14	0,21	0,37	-0,45	-0,08
1584.89	0,46	-0,12	0,35	0,32	-0,45	-0,13
1631.17	0,52	-0,09	0,43	0,30	-0,46	-0,16
1678.80	0,36	-0,05	0,32	0,38	-0,46	-0,07
1727.83	0,27	-0,01	0,26	0,42	-0,45	-0,03
1778.28	0,09	0,04	0,13	0,43	-0,45	-0,02
1830.21	0,01	0,09	0,10	0,30	-0,44	-0,13
1883.65	0,03	0,15	0,18	0,32	-0,42	-0,10
1938.65	0,03	0,21	0,24	0,29	-0,40	-0,11
1995.26	-0,06	0,28	0,21	0,28	-0,38	-0,10
2053.53	0,15	0,35	0,50	0,20	-0,35	-0,15
2113.49	0,00	0,43	0,43	0,23	-0,32	-0,09
2175.20	-0,12	0,51	0,39	0,22	-0,28	-0,06
2238.72	-0,16	0,60	0,44	0,30	-0,23	0,07
2304.09	-0,25	0,69	0,44	0,08	-0,18	-0,10
2371.37	-0,43	0,79	0,36	0,03	-0,12	-0,09

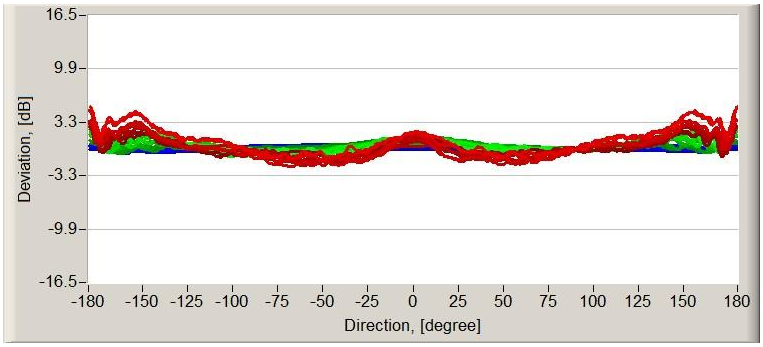
f [Hz]	SV 200A Case effect	Compensation filter (Environmental)	SV 200A Compensated case effect	SV 200A Case effect	Compensation filter (Airport)	SV 200A Compensated case effect
	90 deg incidence angle			0 deg incidence angle		
2440.62	-0,29	0,89	0,60	0,17	-0,06	0,11
2511.89	-0,50	1,00	0,50	-0,09	0,01	-0,08
2585.23	-0,57	1,10	0,53	-0,33	0,09	-0,24
2660.73	-0,71	1,21	0,50	-0,38	0,17	-0,21
2738.42	-0,86	1,31	0,45	-0,60	0,26	-0,34
2818.38	-0,88	1,41	0,54	-0,73	0,34	-0,39
2900.68	-0,80	1,51	0,71	-0,65	0,43	-0,22
2985.38	-0,80	1,61	0,81	-0,50	0,53	0,02
3072.56	-1,04	1,70	0,66	-0,64	0,61	-0,03
3162.28	-1,39	1,78	0,39	-0,58	0,70	0,12
3254.62	-1,35	1,86	0,51	-0,85	0,78	-0,07
3349.65	-1,26	1,92	0,66	-1,19	0,85	-0,34
3447.47	-1,31	1,97	0,66	-1,24	0,92	-0,32
3548.13	-1,61	2,02	0,41	-1,55	0,97	-0,58
3651.74	-1,45	2,05	0,59	-1,24	1,01	-0,23
3758.37	-1,52	2,06	0,55	-1,60	1,03	-0,57
3868.12	-1,26	2,07	0,81	-1,16	1,03	-0,13
3981.07	-1,16	2,06	0,90	-0,92	1,02	0,09
4097.32	-0,89	2,05	1,16	-1,29	0,98	-0,30
4216.97	-0,82	2,03	1,20	-1,14	0,93	-0,21
4340.10	-0,65	2,00	1,34	-1,30	0,86	-0,44
4466.84	-0,85	1,97	1,12	-0,98	0,78	-0,20
4597.27	-0,61	1,94	1,33	-0,90	0,70	-0,20
4731.51	-0,42	1,92	1,50	-0,59	0,61	0,02
4869.68	-0,75	1,90	1,15	-0,78	0,54	-0,24
5011.87	-0,76	1,90	1,14	-0,72	0,48	-0,24
5158.22	-0,47	1,91	1,44	-0,71	0,44	-0,27
5308.84	-0,47	1,94	1,48	-0,49	0,44	-0,05
5463.87	-0,48	1,99	1,51	-0,86	0,48	-0,39
5623.41	-0,93	2,05	1,11	-1,21	0,55	-0,66
5787.62	-0,85	2,12	1,27	-1,14	0,66	-0,48
5956.62	-0,70	2,19	1,49	-0,90	0,80	-0,10
6130.56	-0,58	2,26	1,67	-1,63	0,95	-0,68
6309.57	-0,58	2,31	1,73	-1,66	1,09	-0,57
6493.82	-0,48	2,35	1,87	-2,02	1,21	-0,81
6683.44	-0,25	2,36	2,12	-1,70	1,29	-0,41
6878.60	0,00	2,35	2,35	-1,38	1,32	-0,06
7079.46	0,17	2,31	2,48	-1,73	1,29	-0,44
7286.18	0,18	2,24	2,42	-1,60	1,20	-0,40
7498.94	0,31	2,16	2,46	-1,08	1,07	-0,02
7717.92	0,36	2,07	2,43	-1,21	0,92	-0,30

f [Hz]	SV 200A Case effect	Compensation filter (Environmental)	SV 200A Compensated case effect	SV 200A Case effect	Compensation filter (Airport)	SV 200A Compensated case effect
	90 deg incidence angle			0 deg incidence angle		
7943.28	0,45	2,00	2,44	-1,41	0,79	-0,63
8175.23	0,67	1,95	2,62	-1,47	0,72	-0,75
8413.95	0,91	1,94	2,85	-1,25	0,74	-0,51
8659.64	0,90	1,97	2,87	-1,30	0,87	-0,43
8912.51	1,02	2,05	3,07	-1,58	1,09	-0,49
9172.76	0,92	2,16	3,09	-2,34	1,36	-0,98
9440.61	1,08	2,29	3,37	-1,87	1,62	-0,25
9716.28	1,22	2,41	3,63	-2,10	1,80	-0,30
10000.00	1,16	2,51	3,67	-2,77	1,86	-0,90
10292.01	1,36	2,59	3,95	-1,88	1,79	-0,09
10592.54	1,37	2,64	4,01	-1,79	1,59	-0,20
10901.84	1,44	2,69	4,13	-2,16	1,34	-0,82
11220.18	1,36	2,75	4,11	-1,36	1,12	-0,24
11547.82	1,19	2,83	4,02	-1,94	1,01	-0,93
11885.02	1,29	2,93	4,22	-1,94	1,06	-0,88
12232.07	1,37	3,03	4,40	-1,59	1,24	-0,35
12589.25	1,34	3,11	4,45	-2,08	1,45	-0,62
12956.87	1,20	3,13	4,33	-1,97	1,63	-0,34
13335.21	0,96	3,10	4,05	-1,87	1,72	-0,15
13724.61	1,07	3,02	4,09	-2,83	1,75	-1,08
14125.38	0,22	2,94	3,16	-1,86	1,77	-0,09
14537.84	-1,05	2,90	1,85	-3,67	1,81	-1,87
14962.36	-0,94	2,94	2,00	-2,16	1,83	-0,33
15399.27	-0,94	3,03	2,08	-2,81	1,75	-1,06
15848.93	-0,86	3,10	2,24	-2,25	1,53	-0,73
16311.73	-1,83	3,10	1,27	-3,33	1,20	-2,14
16788.04	-2,62	3,03	0,41	-3,74	0,93	-2,81
17278.26	-4,41	2,94	-1,46	-5,98	0,84	-5,14
17782.79	-8,76	2,91	-5,85	-8,65	0,89	-7,77
18302.06	-7,36	2,98	-4,39	-9,35	0,82	-8,54
18836.49	-14,25	3,07	-11,18	-12,70	0,49	-12,22
19386.53	-5,76	3,10	-2,66	-7,72	0,04	-7,68
19952.62	-3,99	3,03	-0,96	-7,87	-0,16	-8,03

Directional characteristics of the SV 200A

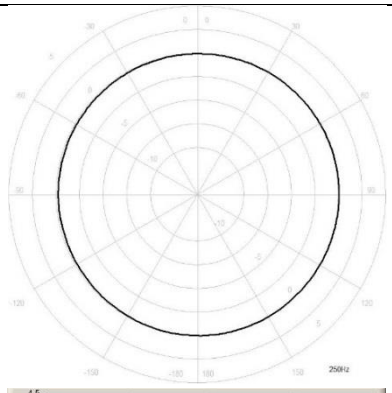
Combined directional characteristics



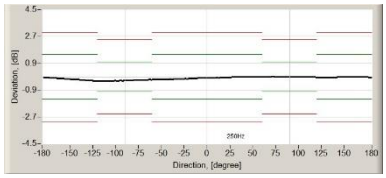


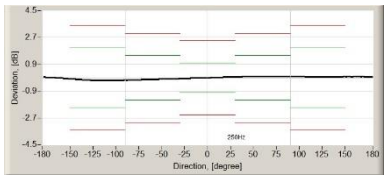
Below the directional characteristics and tolerances for 90 degree an 0 degree incidental angles are presented.

250 Hz



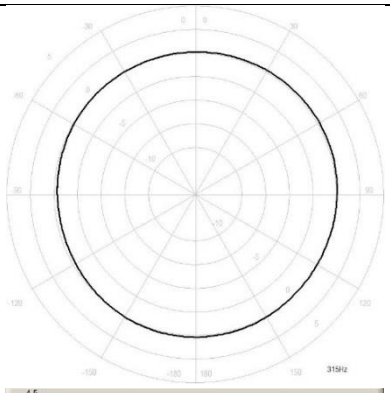
90 deg



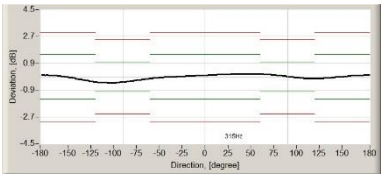


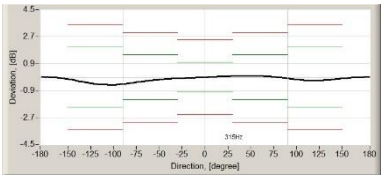
0 deg

315 Hz



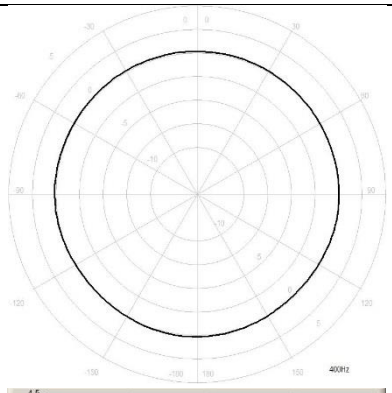
90 deg



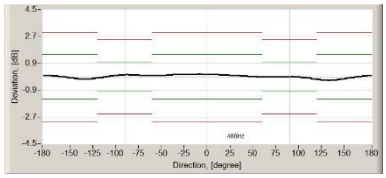


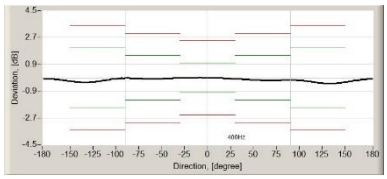
0 deg

400 Hz



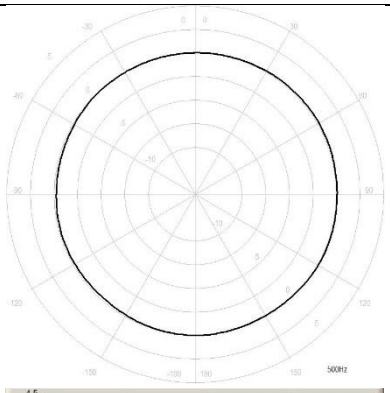
90 deg



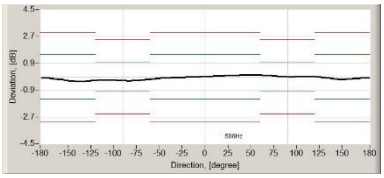


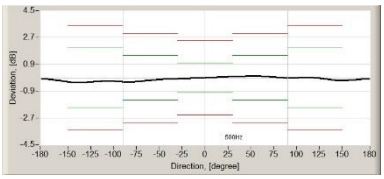
0 deg

500 Hz



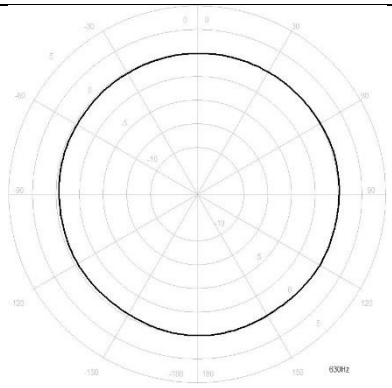
90 deg



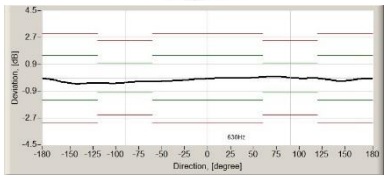


0 deg

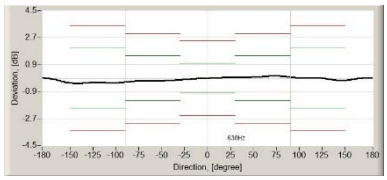
630 Hz



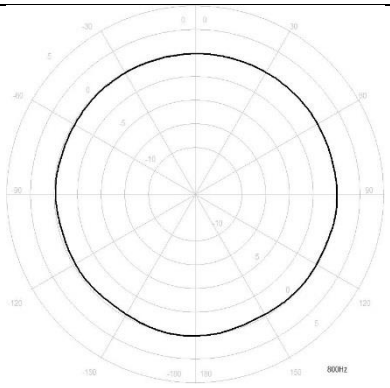
90 deg



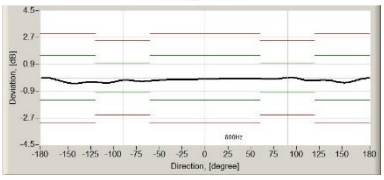
0 deg



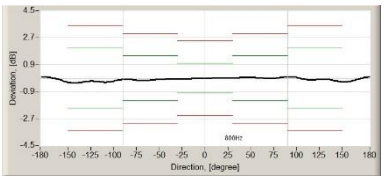
800 Hz



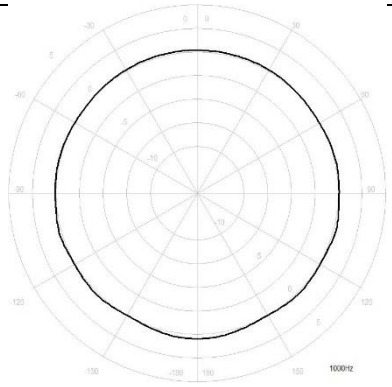
90 deg



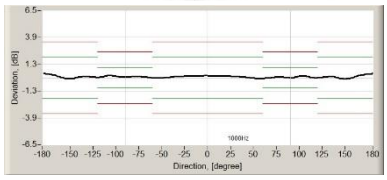
0 deg



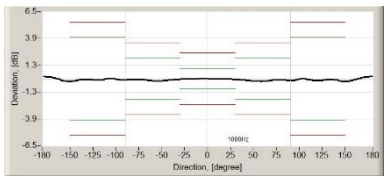
1000 Hz



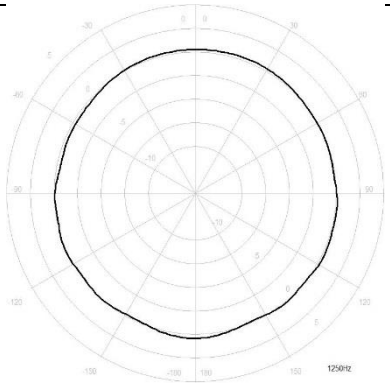
90 deg



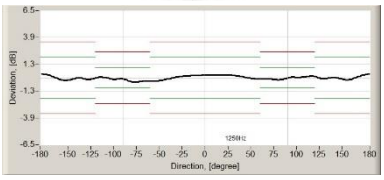
0 deg



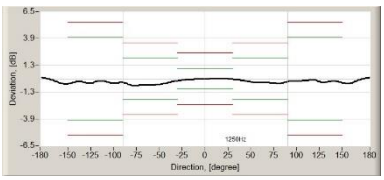
1250 Hz



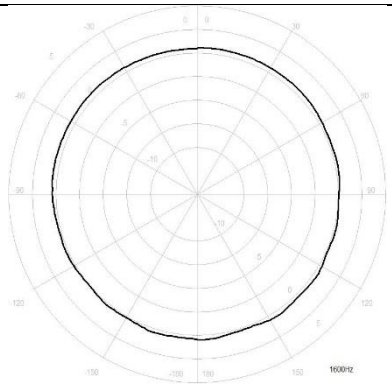
90 deg



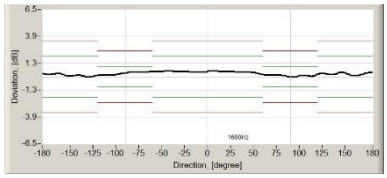
0 deg



1600 Hz



90 deg



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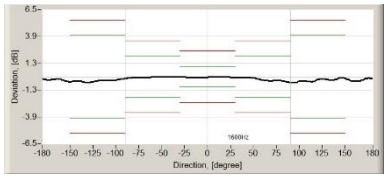
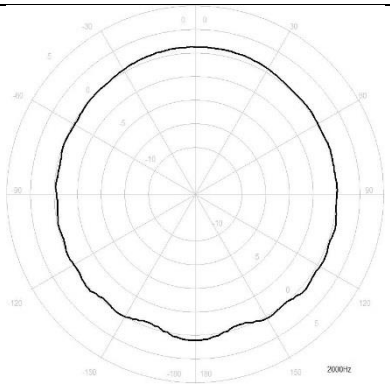
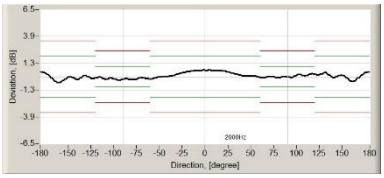


2000 Hz



90 deg



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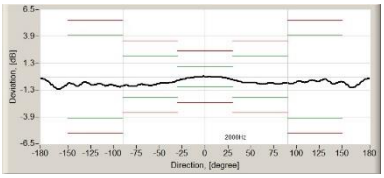
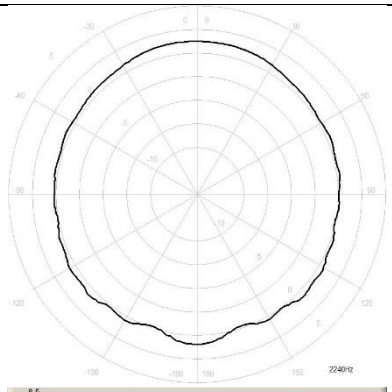
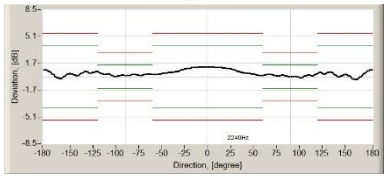


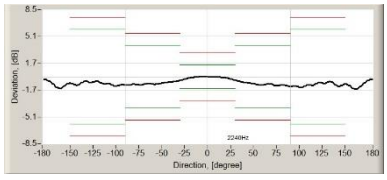
2240 Hz



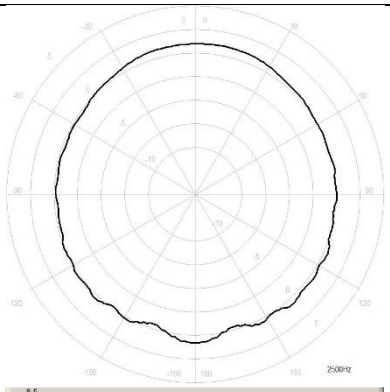
90 deg



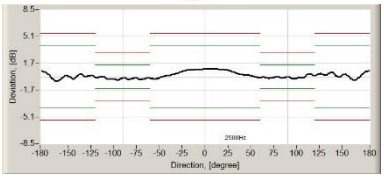
0 deg



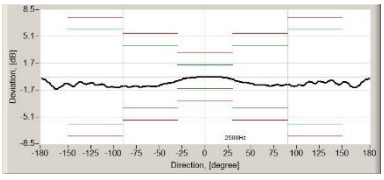
2500 Hz



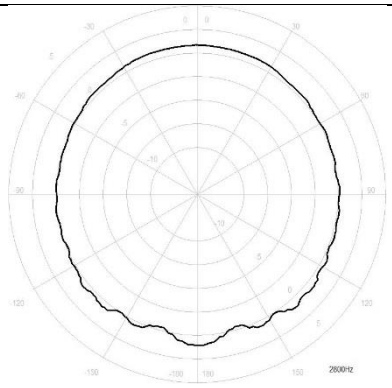
90 deg



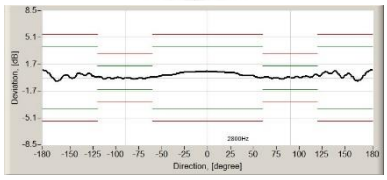
0 deg

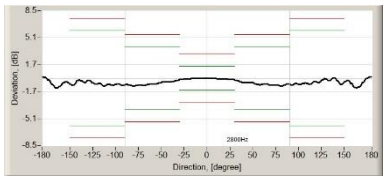


2800 Hz



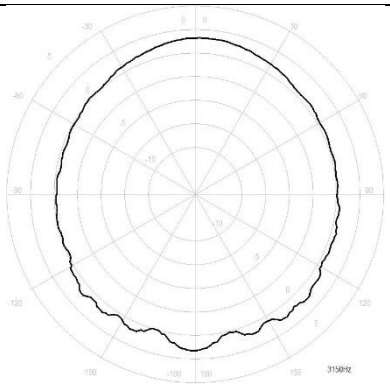
90 deg



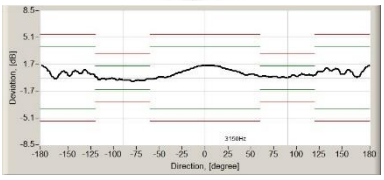


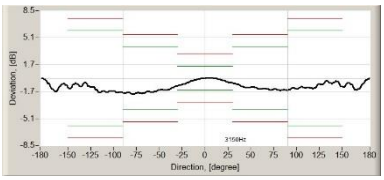
0 deg

3150 Hz



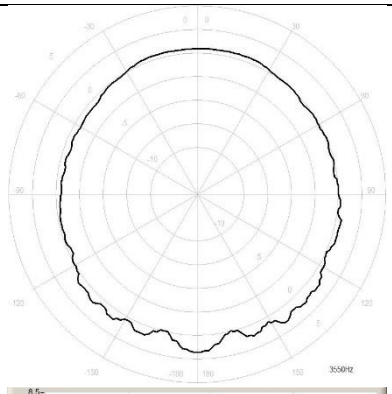
90 deg



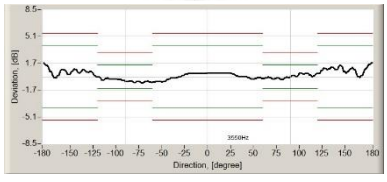


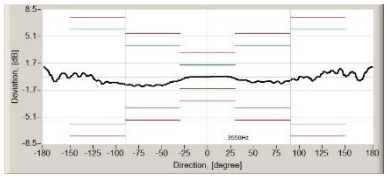
0 deg

3550 Hz



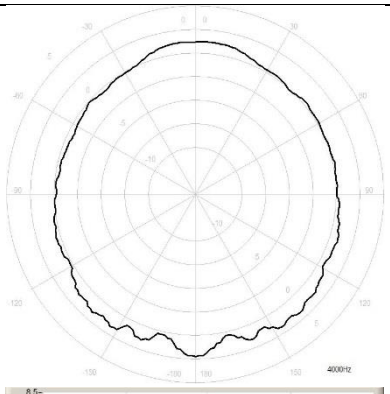
90 deg



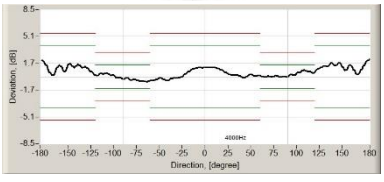


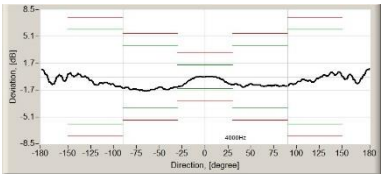
0 deg

4000 Hz



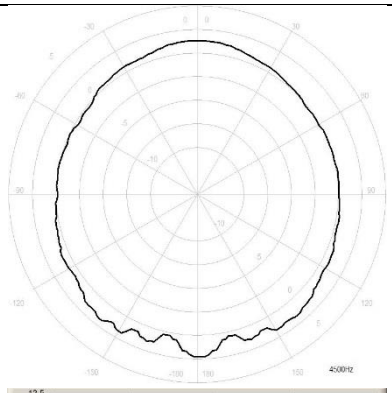
90 deg



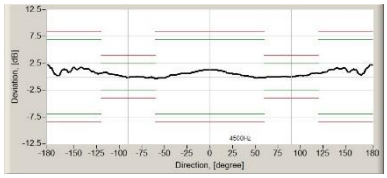


0 deg

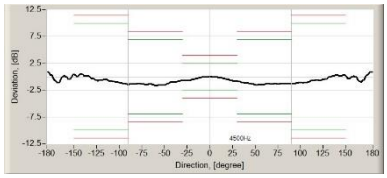
4500 Hz



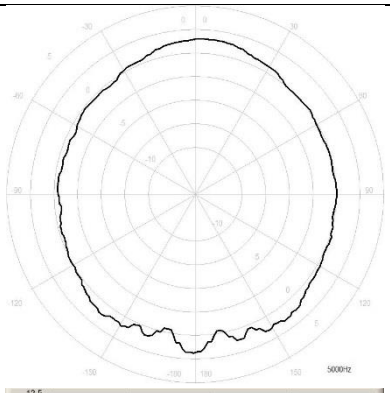
90 deg



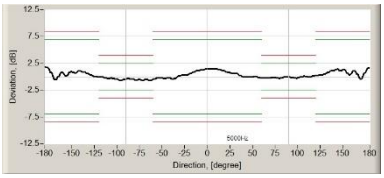
0 deg



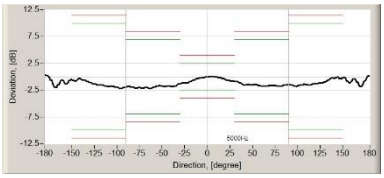
5000 Hz



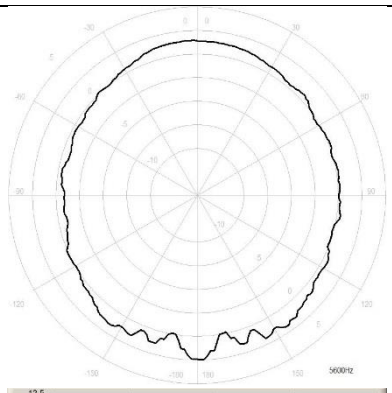
90 deg



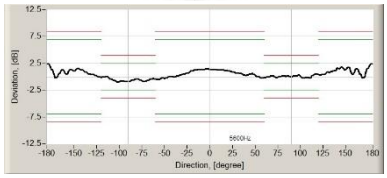
0 deg



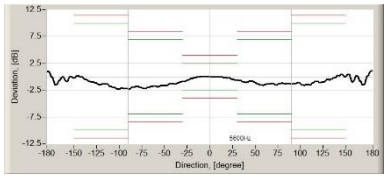
5600 Hz



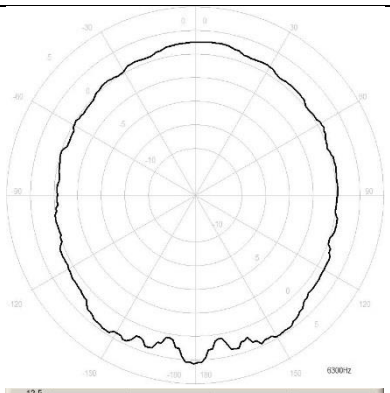
90 deg



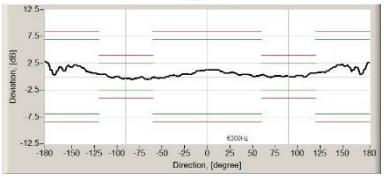
0 deg



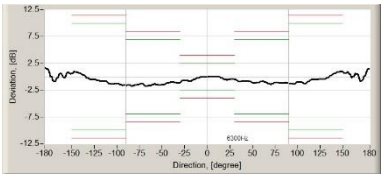
6300 Hz



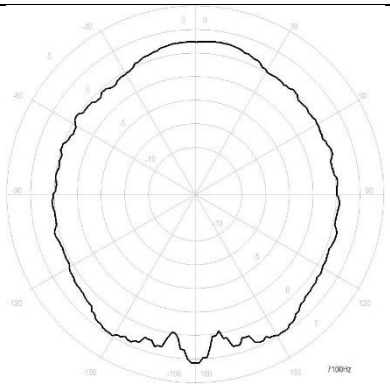
90 deg



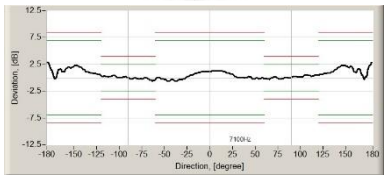
0 deg

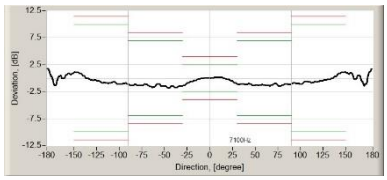


7100 Hz



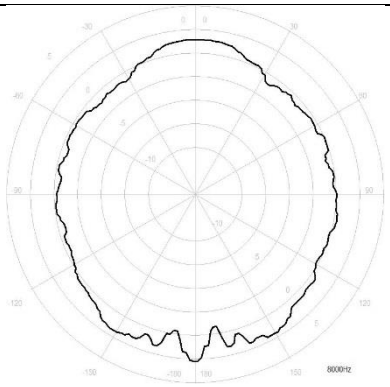
90 deg



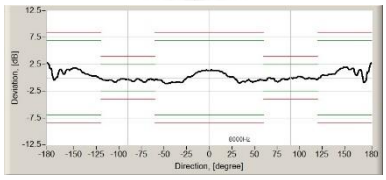


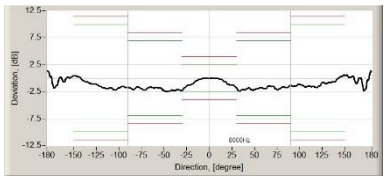
0 deg

8000 Hz



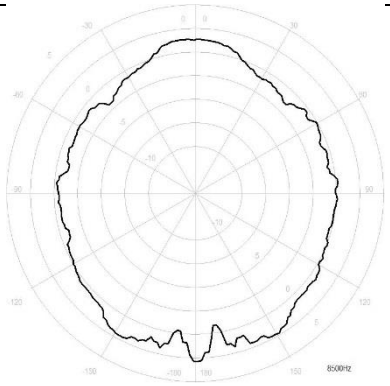
90 deg





0 deg

8500 Hz



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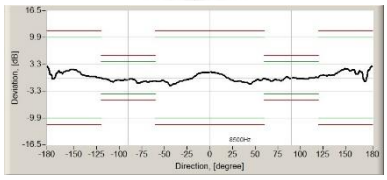
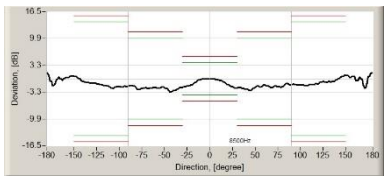
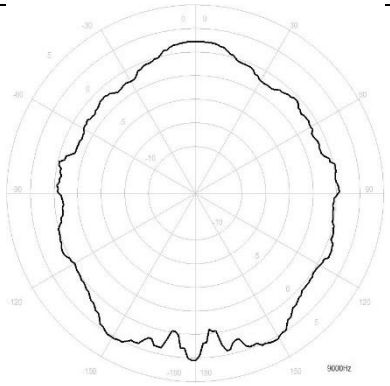


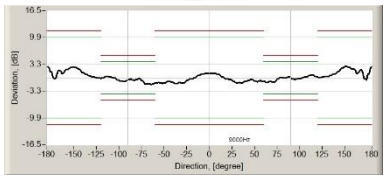


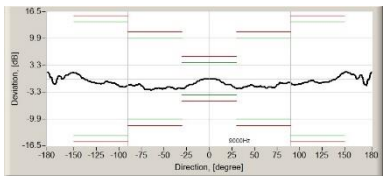
0 deg

9000 Hz



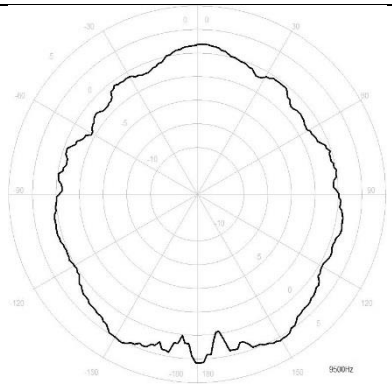
90 deg



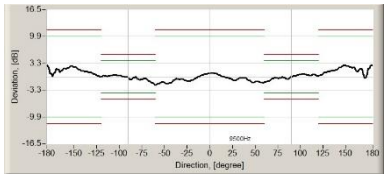


0 deg

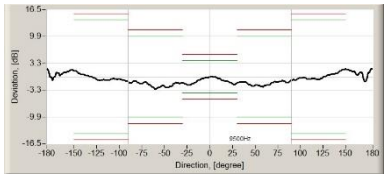
9500 Hz



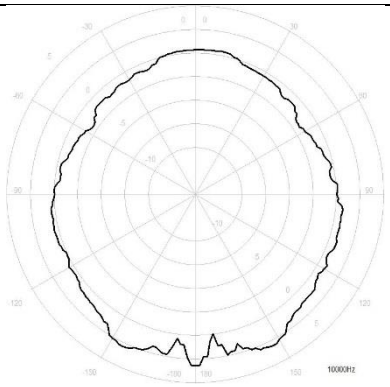
90 deg



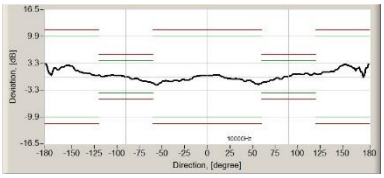
0 deg



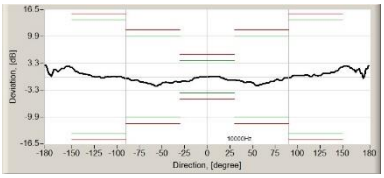
10000 Hz



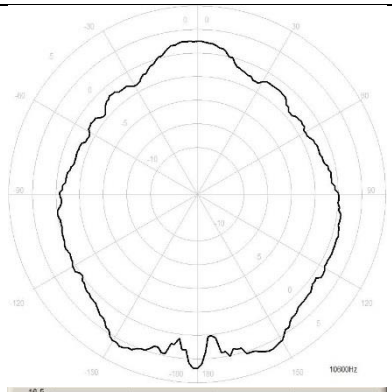
90 deg



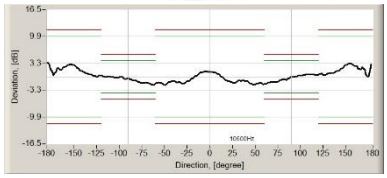
0 deg



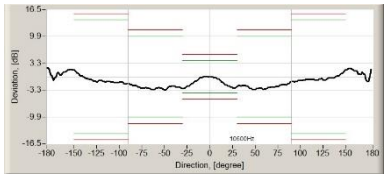
10600 Hz



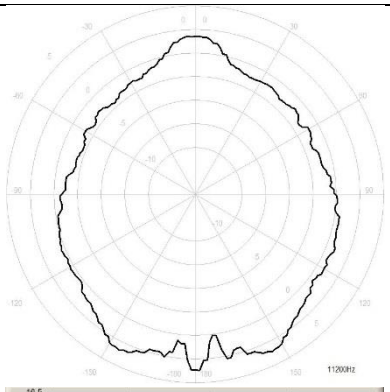
90 deg



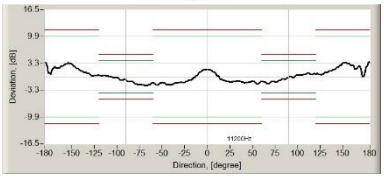
0 deg



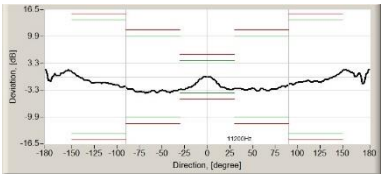
11200 Hz



90 deg



0 deg



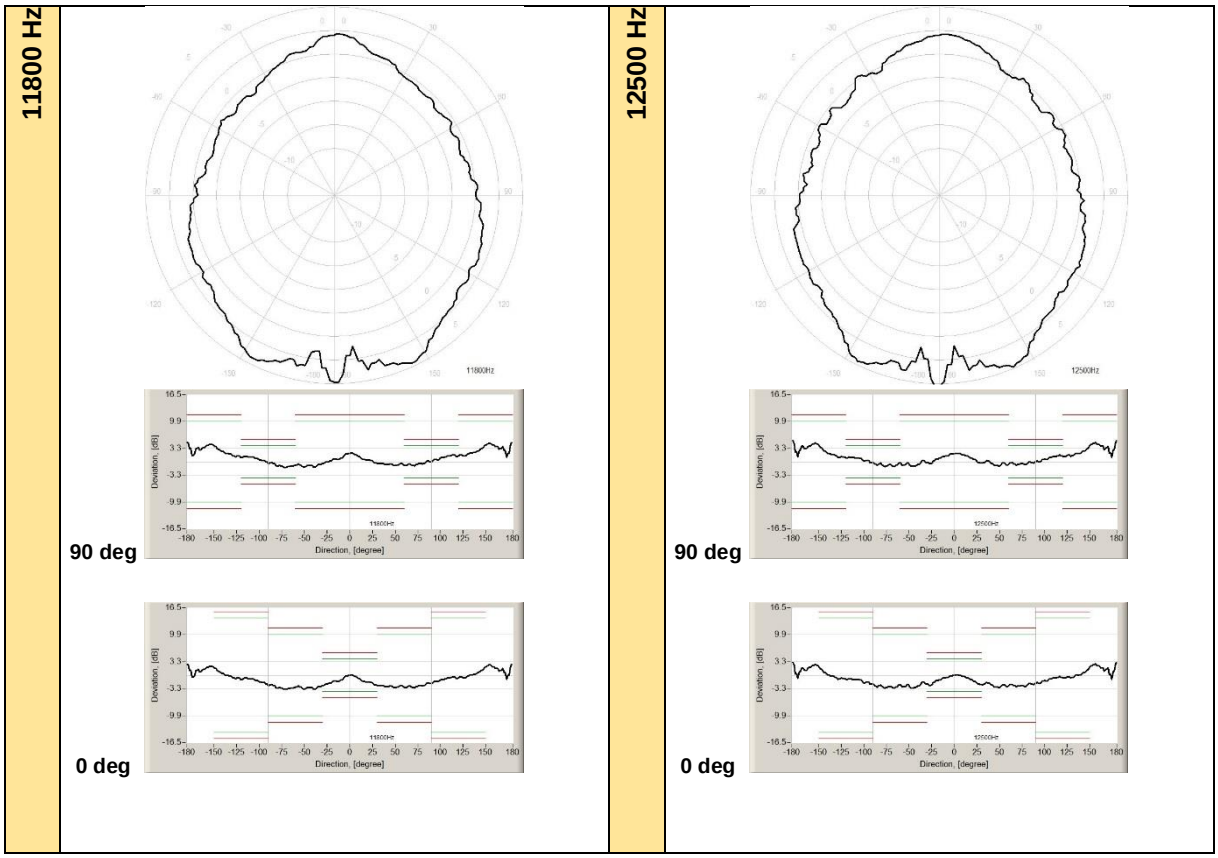


Table C.1.7. Directional response for SV 200A

f [Hz]	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
250	0,03	0,04	0,06	0,07	0,08	0,09	0,09	0,1	0,09	0,08
315	0,03	0,04	0,07	0,08	0,09	0,09	0,07	0,04	-0,1	-0,15
400	-0,02	-0,05	-0,08	-0,11	-0,14	-0,17	-0,18	-0,18	-0,16	-0,17
500	0,03	0,05	0,08	0,1	0,11	0,11	0,1	0,06	-0,01	-0,01
630	0,03	0,04	0,04	0,05	0,07	0,11	0,15	0,15	0,12	0,05
800	0,01	0,02	0,02	0,04	0,04	0,04	-0,01	0,02	0,08	0,09
1000	-0,01	-0,02	-0,06	-0,13	-0,22	-0,25	-0,24	-0,14	-0,18	-0,18
1250	0,02	0,02	-0,03	-0,15	-0,33	-0,38	-0,37	-0,46	-0,45	-0,22
1600	0	-0,03	-0,06	-0,07	-0,14	-0,31	-0,39	-0,38	-0,57	-0,57
2000	0,01	-0,09	-0,26	-0,55	-0,56	-0,69	-0,71	-0,72	-0,71	-0,68
2240	-0,03	-0,16	-0,39	-0,76	-0,89	-1,07	-0,99	-1,13	-1,22	-1,34
2500	0	-0,07	-0,36	-0,71	-0,89	-1,07	-1,18	-1,17	-1,14	-1,27
2800	-0,07	-0,12	-0,23	-0,55	-0,61	-0,83	-0,89	-1,01	-0,97	-0,85
3150	-0,04	-0,29	-0,62	-1,02	-1,19	-1,37	-1,45	-1,51	-1,56	-1,44
3550	0,01	0,03	-0,25	-0,44	-0,76	-0,66	-0,7	-0,83	-0,81	-0,43
4000	0,02	-0,5	-0,97	-1,28	-1,28	-1,07	-1,24	-1,22	-1,2	-1
4500	-0,16	-0,55	-0,8	-1,19	-1,52	-1,52	-1,39	-1,35	-1,31	-1,23
5000	-0,05	-0,58	-0,86	-1,52	-1,53	-1,7	-1,76	-1,77	-1,71	-1,78
5600	-0,06	-0,28	-0,65	-1,11	-1,18	-1,6	-1,46	-1,5	-1,35	-1,34
6300	0,06	-0,52	-0,57	-0,89	-1,2	-1,2	-1,42	-1,25	-1,24	-1,32
7100	0,16	-0,26	-1,12	-1,21	-1,35	-1,36	-1,44	-1,41	-1,31	-1,05
8000	-0,12	-1,13	-1,75	-2,42	-2,26	-2,05	-1,96	-2,18	-1,77	-1,51
8500	-0,38	-1,45	-2,33	-2,53	-2,92	-2,08	-2,13	-2,16	-1,54	-1,56
9000	-0,34	-1,44	-2,35	-2,36	-1,92	-2,1	-2,23	-2,12	-1,19	-1,5
9500	-0,46	-1,19	-1,9	-1,54	-2,32	-2,48	-2,21	-1,34	-1,48	-0,77
10000	0,06	-0,68	-0,85	-1,28	-1,59	-2,22	-1,79	-1,16	-0,93	0,34

10600	-0,55	-2,29	-2,8	-2,31	-3,18	-3,09	-3,07	-2,58	-1,99	-1,31
11200	-1,61	-2,82	-3,1	-3,31	-3,26	-3,53	-3,45	-3,03	-2,49	-1,93
11800	-0,85	-1,63	-2,49	-2,79	-3,01	-3,01	-3,01	-3,12	-2,53	-2,01
12500	-0,33	-1,3	-2,3	-2,44	-3,06	-2,8	-2,93	-2,74	-2,44	-2,03
f [Hz]	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**	**170-180**	**180-190**	**190-200**
250	0,07	0,06	0,05	0,05	0,07	0,07	0,07	0,06	0,04	-0,03
315	-0,21	-0,23	-0,22	-0,2	-0,15	-0,08	-0,02	0,02	0,01	-0,05
400	-0,26	-0,34	-0,39	-0,4	-0,37	-0,28	-0,18	-0,11	-0,1	-0,15
500	0,02	0,02	-0,07	-0,14	-0,18	-0,18	-0,14	-0,1	-0,12	-0,18
630	0,03	0,03	-0,05	-0,15	-0,16	-0,14	-0,05	0,02	-0,05	-0,21
800	-0,09	-0,12	-0,1	-0,14	-0,25	-0,26	-0,15	0,08	0,08	-0,09
1000	-0,09	-0,18	-0,17	-0,14	-0,29	-0,27	0,11	0,21	0,21	-0,15
1250	-0,23	-0,15	-0,35	-0,33	-0,43	-0,47	-0,35	0,1	0,09	-0,42
1600	-0,48	-0,5	-0,29	-0,31	-0,19	-0,41	-0,41	-0,21	-0,3	-0,25
2000	-0,54	-0,52	-0,47	-0,7	-0,69	-1,07	-1,02	-0,45	-0,58	-1,19
2240	-1,36	-1,1	-0,84	-1,02	-1,22	-1,58	-1,55	-0,79	-0,95	-1,47
2500	-1,12	-0,84	-0,77	-0,73	-1,02	-1,24	-1,4	-0,64	-0,95	-1,54
2800	-0,77	-0,8	-0,57	-0,28	-0,82	-1,2	-1,25	-0,27	-0,79	-1,26
3150	-1,38	-1,36	-0,9	-0,73	-1,1	-1,1	-1,51	-0,76	-1,04	-1,66
3550	-0,22	-0,51	0,65	0,77	0,98	0,69	-0,55	1,27	1,17	-0,6
4000	-0,62	-0,69	0,21	0,55	0,58	-0,38	-0,89	0,99	0,92	-0,97
4500	-1,14	-0,7	-0,69	0,33	0,33	-0,37	-0,96	0,9	-1,1	-1,05
5000	-1,65	-1,51	-1,25	-0,78	-0,41	-1,17	-1,86	-1,45	-1,95	-1,97
5600	-1,6	-1,54	-1,04	-0,62	0,43	-0,95	-1,56	1,04	-1,48	-1,37
6300	-1,29	-0,85	-0,48	0,62	1,02	0,96	-0,84	1,64	1,44	-0,89
7100	-1,04	-0,87	-0,52	0,66	1,14	0,96	-1,47	1,73	1,73	0,62
8000	-1,61	-1,7	-1,48	-0,79	0,59	0,57	-2,25	-2,25	-1,83	-1,35
8500	-1,72	-1,47	-0,91	-0,79	0,89	0,83	-2,23	-2,23	-1,73	-0,45
9000	-1,27	-1,01	-1,06	-0,82	1,62	1,62	0,87	-1,65	1,35	0,9
9500	-0,6	-0,68	-0,47	0,81	1,9	1,77	-1,22	1,92	1,2	1,11
10000	0,44	0,53	0,81	0,99	2,45	2,64	2,02	2,78	2,78	2,1
10600	-0,94	-0,77	-0,85	-0,37	1,68	2	1,41	2,2	2,2	1,2
11200	-1,35	-1,26	-1,4	-0,7	1,62	1,79	0,98	1,84	-1,2	0,91
11800	-1,02	-0,77	-0,65	0,62	2,07	2,48	1,72	2,71	2,51	1,68
12500	-1,46	-0,69	-0,72	-0,53	2,27	2,77	1,84	3,21	2,35	1,89
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	-0,13	-0,16	-0,18	-0,19	-0,19	-0,18	-0,17	-0,14	-0,12
315	-0,13	-0,24	-0,36	-0,44	-0,5	-0,52	-0,51	-0,45	-0,38	-0,29
400	-0,23	-0,3	-0,31	-0,3	-0,24	-0,14	-0,06	-0,05	-0,07	-0,08
500	-0,27	-0,33	-0,33	-0,3	-0,26	-0,23	-0,27	-0,28	-0,27	-0,23
630	-0,31	-0,35	-0,34	-0,3	-0,31	-0,32	-0,31	-0,26	-0,2	-0,18
800	-0,27	-0,32	-0,29	-0,22	-0,27	-0,27	-0,16	-0,1	-0,16	-0,16
1000	-0,27	-0,26	-0,09	-0,14	-0,14	-0,06	-0,11	-0,1	-0,11	-0,2
1250	-0,52	-0,46	-0,41	-0,43	-0,28	-0,42	-0,42	-0,66	-0,67	-0,6
1600	-0,49	-0,46	-0,57	-0,56	-0,38	-0,38	-0,28	-0,16	-0,07	-0,06
2000	-1,13	-0,9	-0,88	-0,8	-0,88	-0,86	-0,98	-0,92	-0,92	-0,85
2240	-1,37	-1,1	-0,73	-0,75	-0,91	-1,2	-1,11	-1,08	-1,05	-0,93
2500	-1,39	-1,24	-0,96	-1,06	-1,06	-1,29	-1,39	-1,3	-1,32	-1,27
2800	-0,76	-0,91	-0,51	-0,75	-0,98	-0,92	-0,94	-1	-0,91	-0,91
3150	-1,18	-1,33	-1,04	-1,44	-1,8	-1,76	-1,87	-2,02	-2,02	-1,9
3550	0,44	0,5	0,45	-0,51	-0,9	-0,77	-1,07	-1,17	-1,23	-1,18
4000	-0,51	0,51	0,26	-0,98	-1,02	-1,03	-1,46	-1,62	-1,72	-1,83
4500	-0,46	0,48	-0,34	-0,77	-0,77	-1,19	-1,47	-1,38	-1,49	-1,66
5000	-1,35	-0,75	-1,11	-1,55	-1,85	-1,93	-2,2	-2,06	-2,15	-2,21

5600	-0,88	-0,19	-0,96	-1,46	-1,78	-2,31	-2,25	-2,25	-2,2	-2,03
6300	0,83	0,94	-0,47	-0,81	-1,26	-1,4	-1,62	-1,71	-1,7	-1,71
7100	1,17	1,11	0,39	-0,87	-0,99	-1,11	-1,12	-1,4	-1,4	-1,72
8000	0,41	-0,43	-1,06	-1,69	-1,95	-2,19	-1,71	-2,09	-2,18	-1,89
8500	0,71	-0,72	-1,02	-1,6	-2,32	-2,39	-2,03	-2,66	-2,69	-2,39
9000	1,55	1,48	-0,87	-1,3	-1,12	-1,88	-2,04	-1,8	-2,63	-2,76
9500	1,69	1,47	0,39	-0,94	-0,84	-0,62	-1,28	-1,56	-1,71	-2,98
10000	2,5	2,08	0,75	0,32	-0,32	0,09	-0,39	-0,92	-1,44	-1,91
10600	1,85	1,42	-0,76	-1,31	-1,35	-1,46	-1,8	-2,5	-2,76	-3,21
11200	1,61	0,88	-1,31	-1,55	-1,62	-2,02	-2,72	-3,61	-3,97	-3,95
11800	2,2	1,68	-0,72	-0,99	-0,97	-1,65	-2,63	-3,19	-3,46	-3,27
12500	2,6	1,49	-1,01	-1,04	-1,06	-1,89	-2,22	-3	-3,26	-3,14
f [Hz]	**300-310**	**310-320**	**320-330**	**330-340**	**340-350**	**350-360**				
250	-0,11	-0,1	-0,08	-0,05	-0,03	-0,01				
315	-0,21	-0,15	-0,12	-0,08	-0,05	-0,03				
400	-0,08	-0,06	-0,04	-0,01	0,01	0,01				
500	-0,16	-0,11	-0,09	-0,06	-0,04	-0,02				
630	-0,18	-0,17	-0,14	-0,11	-0,06	-0,03				
800	-0,12	-0,08	-0,05	-0,04	-0,04	-0,03				
1000	-0,21	-0,19	-0,1	-0,04	-0,01	0,02				
1250	-0,59	-0,52	-0,36	-0,15	-0,08	-0,03				
1600	-0,04	-0,01	-0,03	-0,06	-0,08	-0,1				
2000	-0,84	-0,63	-0,58	-0,31	-0,13	0,06				
2240	-0,96	-0,8	-0,66	-0,39	-0,1	0,02				
2500	-1,24	-1	-0,8	-0,4	-0,15	-0,06				
2800	-0,72	-0,47	-0,43	-0,18	-0,07	0,03				
3150	-1,74	-1,5	-1,43	-0,86	-0,56	-0,14				
3550	-1,16	-1,08	-0,65	-0,28	-0,05	-0,04				
4000	-1,64	-1,64	-1,54	-1,27	-0,48	-0,06				
4500	-1,66	-1,44	-0,95	-0,7	-0,53	-0,08				
5000	-1,92	-1,87	-1,87	-1,18	-0,9	-0,27				
5600	-1,89	-1,62	-1,34	-0,86	-0,2	0,08				
6300	-1,59	-1,45	-1,17	-0,79	-0,79	-0,13				
7100	-1,44	-1,78	-1,77	-1,34	-0,51	0,06				
8000	-2,25	-2,52	-2,33	-1,77	-1,07	-0,13				
8500	-2,32	-3,27	-2,73	-1,97	-1,27	-0,1				
9000	-2,57	-2,38	-2,56	-2,37	-1,38	-0,21				
9500	-2,77	-2,62	-1,61	-2	-1,69	-0,45				
10000	-2,32	-1,57	-1,49	-1,2	-0,89	-0,1				
10600	-3,3	-3,01	-2,94	-2,81	-1,39	-0,08				
11200	-3,84	-3,85	-3,69	-3,21	-2,59	-0,55				
11800	-3,41	-3,38	-3,38	-2,37	-1,51	-1,18				
12500	-2,89	-3,13	-2,68	-2,49	-1,35	-0,54				

C.2 SPECIFICATION OF THE SV 200A 1/1 AND 1/3 OCTAVE ANALYSIS

The **SV 200A** instrument can analyse sound in 1/1 or 1/3 octave bands. Built in filters operate in real time meeting the international IEC 61260-1:2014 standard.

Note: *Simultaneously to the frequency analysis SV 200A operates as Sound Level Meter! See Chapter C.1 for specification.*

Signal input

- SV 200A microphone input throughout ST02 adapter
- Maximum input voltage: the **SV 200A** meets the requirements of IEC 348 for the 2nd class device. The input voltage shall not exceed the limits between -15 V and +15 V.
- Impedance: ≥ 10 GΩ , ≤ 2 pF

Linear Operating Range

Table C.2.1. Linear operating range

Weighting	**Linear operating range** (with 10 dB margin from noise) (**RMS** for the sinusoidal signal at reference conditions @ 1 kHz, 0.0 dB calibration factor)	
A	from 18 μV_{RMS}	to 3.15 V_{RMS}
B	from 18 μV_{RMS}	to 3.15 V_{RMS}
C	from 18 μV_{RMS}	to 3.15 V_{RMS}
Z	from 25 μV_{RMS}	to 3.15 V_{RMS}

Table C.2.2. Peak for the sinusoidal signal 1 kHz, at reference conditions (@ 114 dB indication)

Peak for the sinusoidal signal **1 kHz**, at reference conditions @ 1 kHz (0.0 dB calibration factor)	
Weighting	**Max Peak value**
A	0.707 V
B	0.707 V
C	0.707 V
Z	0.707 V

Measuring frequency range 1.0 Hz ÷ 22.4 kHz with the **Z** filter (-3 dB)

Centre Frequency Ranges for 1/1 Octave 31.5 Hz ÷ 16 kHz

Centre Frequency Ranges for 1/3 Octave 20 Hz ÷ 20 kHz

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)

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 — 114dB
- Reference temperature — +20°C
- Reference relative humidity — 65 %

Calibration (electrical)

Calibration level — 0.5 V_{RMS} (@ 114 dB indication)

Basic accuracy — < ± 0.2 dB (for the temperature T=+23°C ± 5°C for sinusoidal signal 120 dB_{RMS} in the band 10 Hz ÷ 20 kHz with the **Z** input filter)

Measurement error in the full temperature range

< ± 0.1 dB (when the temperature is from -10°C to +50°C for the sinusoidal signal 120 dB_{RMS} in the band 10 Hz ÷ 20 kHz with the **Z** input filter).

Overload detector

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

Warm-up time / Auto-start delay — 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
Analogue to digital converter	1 x 24 bit resolution
Input attenuator accuracy	± 0.1 dB (for f = 1 kHz and T = +23°C)
Internal oscillator accuracy	0.01 % (for f = 1 kHz and T = +23°C).

Digital Filters

Weighting filters

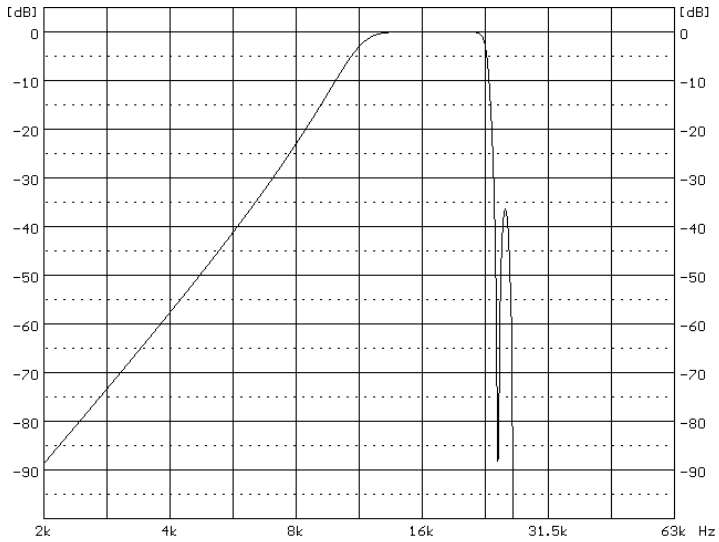
- A meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “A” filter,
- C meeting requirements of the IEC 61672-1;2013 standard for the Class 1 “C” filter,
- Z meeting requirements of the IEC 61672-1;2013 standard for the Class 1 “Z“ filter,
- B meeting IEC 651 for the Type 1 filter

See part C.3 for the A , C, B and Z filters characteristics,

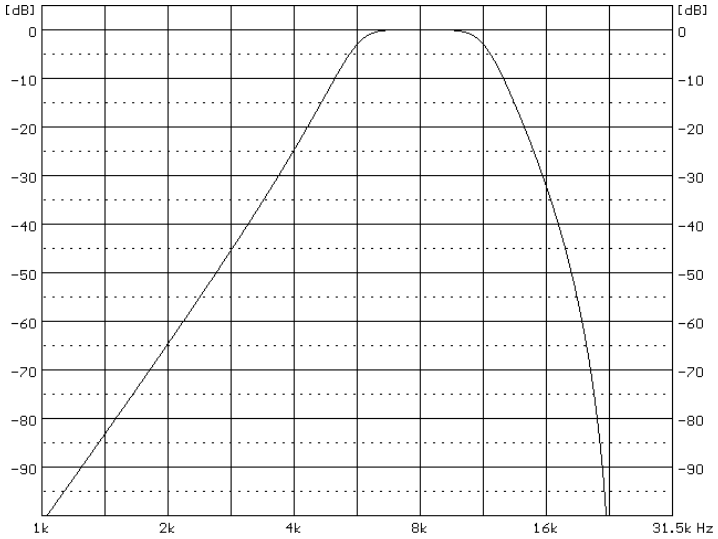
Noise voltage measured, equivalent impedance -adapter Class of ST02 and 50 Ω input impedance, 20kHz Bandwidth.

- ”A” weighting < 5.6 μV_{RMS}
- “B” weighting < 5.6 μV_{RMS}
- ”C” weighting < 5.6 μV_{RMS}
- ”Z” weighting < 7.9 μV_{RMS}.

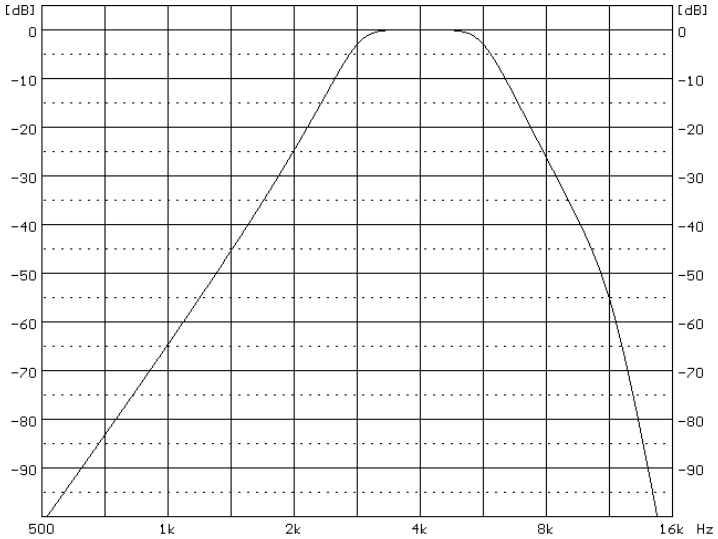
1/1 Octave filters 10 filters with centre frequencies from 31.5 Hz to 16 kHz (base 10), meeting the IEC 61260-1:2014 standard for Class 1



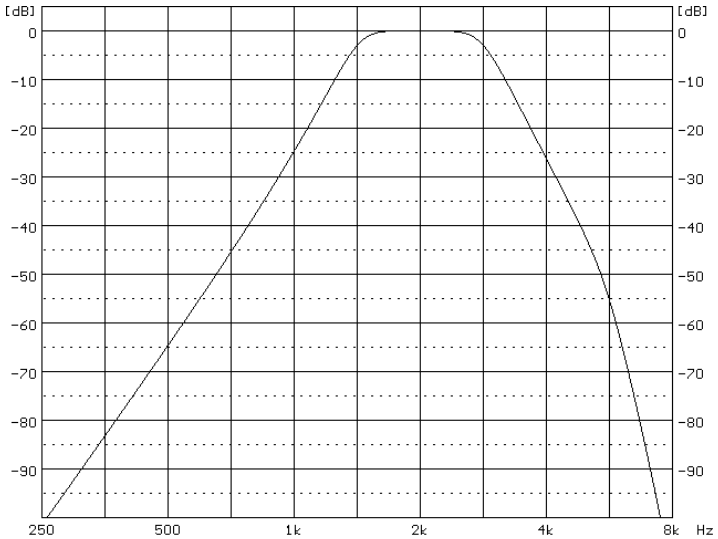
16.0 kHz 1/1 octave filter



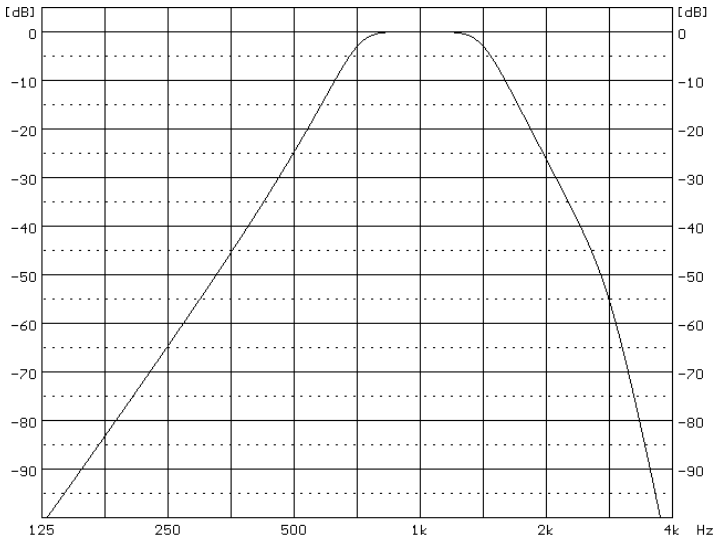
8.0 kHz 1/1 octave filter



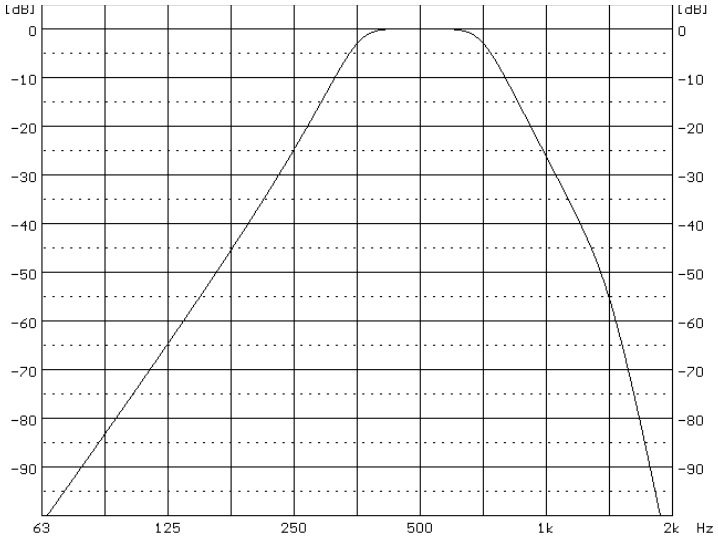
4.0 kHz 1/1 octave filter



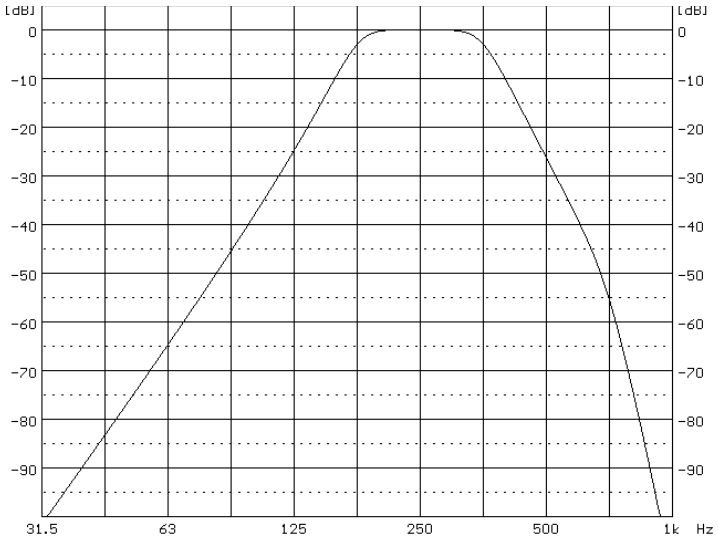
2.0 kHz 1/1 octave filter



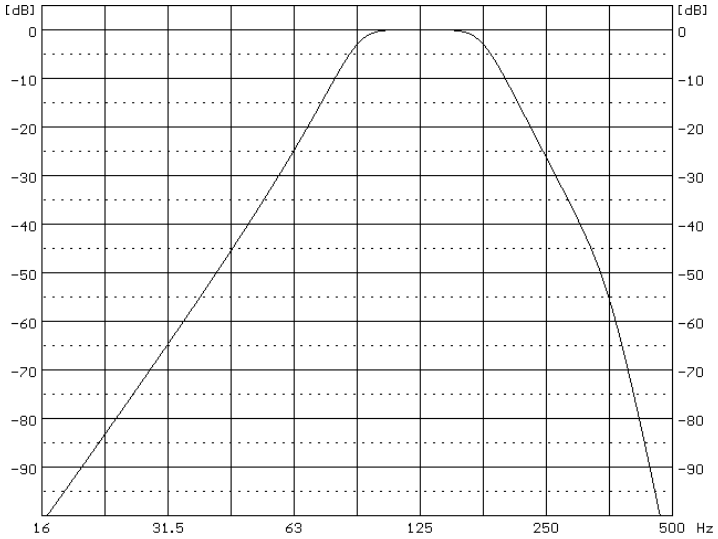
1.0 kHz 1/1 octave filter



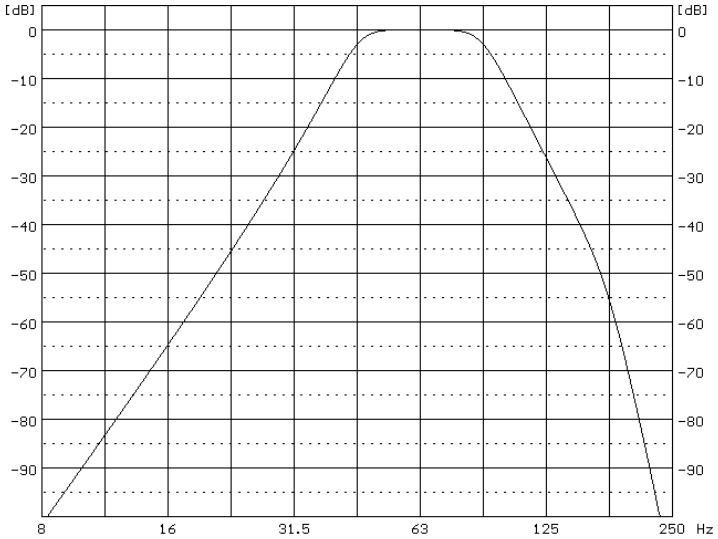
500 Hz 1/1 octave filter



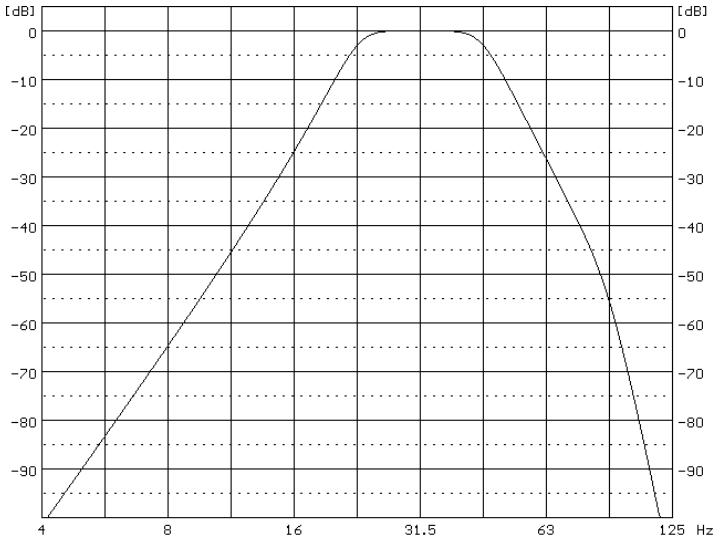
250 Hz 1/1 octave filter



125 Hz 1/1 octave filter

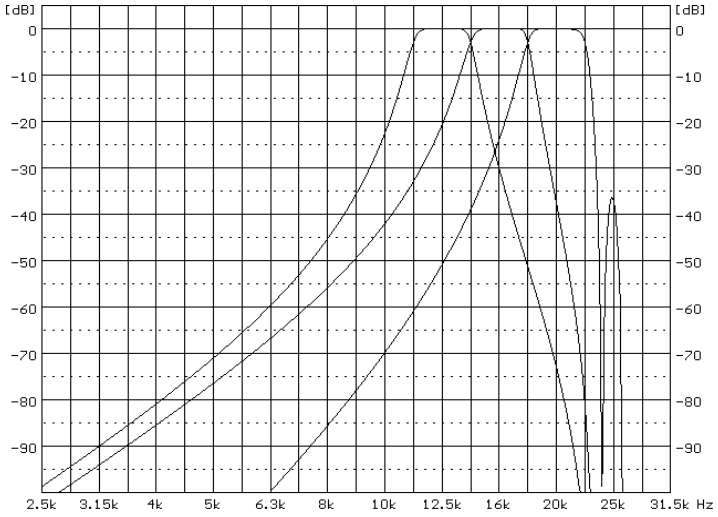


63.0 Hz 1/1 octave filter

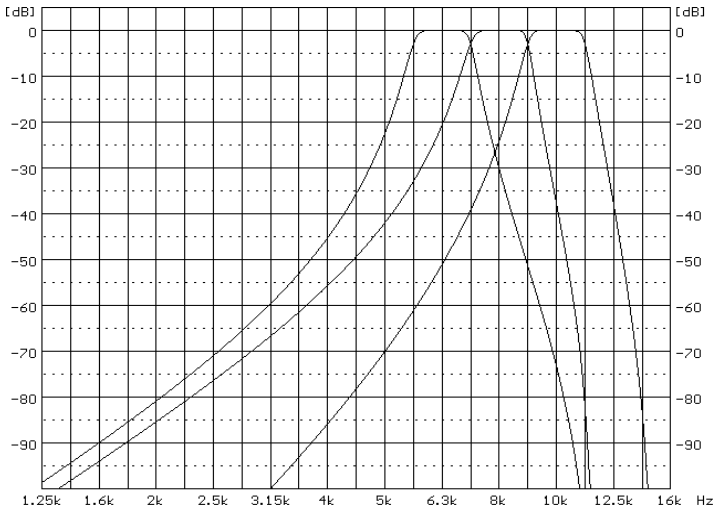


31.5 Hz 1/1 octave filter

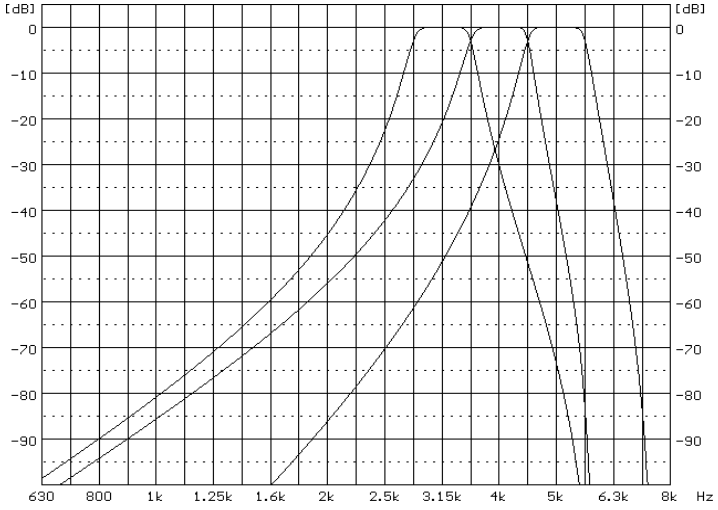
1/3 Octave filters 31 filters with centre frequencies from 20 Hz to 20 kHz (base 10), meeting the IEC 61260-1:2014 standard for Class 1



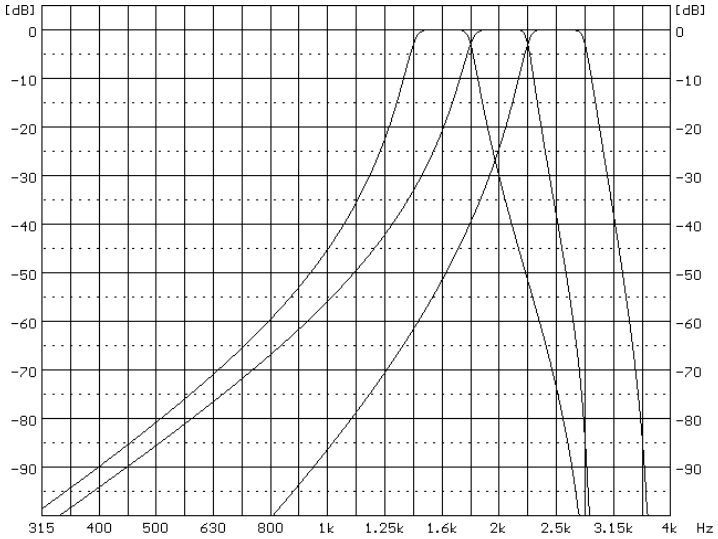
1/3 octave filters for 16.0 kHz 1/1 octave filter



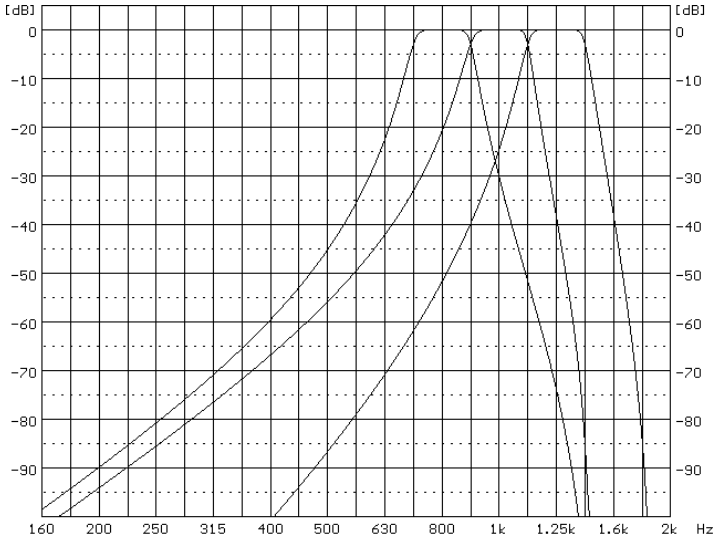
1/3 octave filters for 8.0 kHz 1/1 octave filter



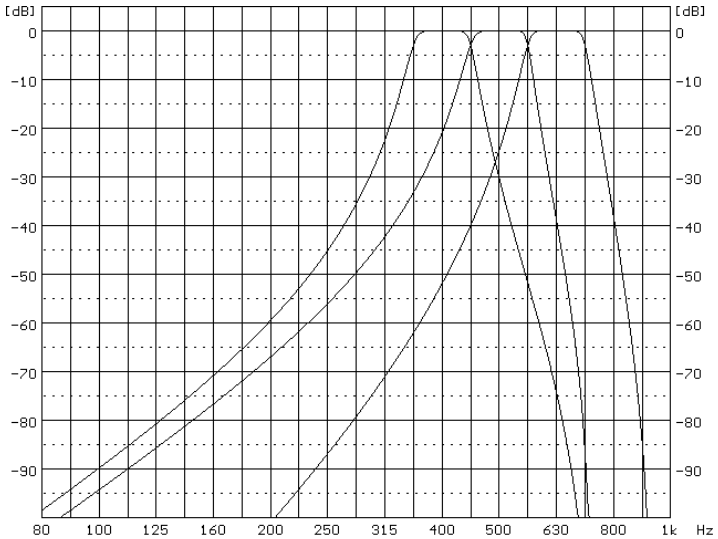
1/3 octave filters for 4.0 kHz 1/1 octave filter



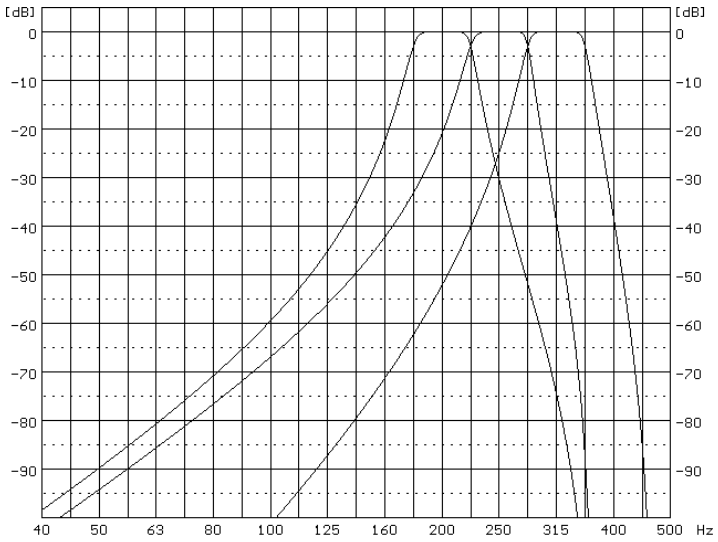
1/3 octave filters for 2.0 kHz 1/1 octave filter



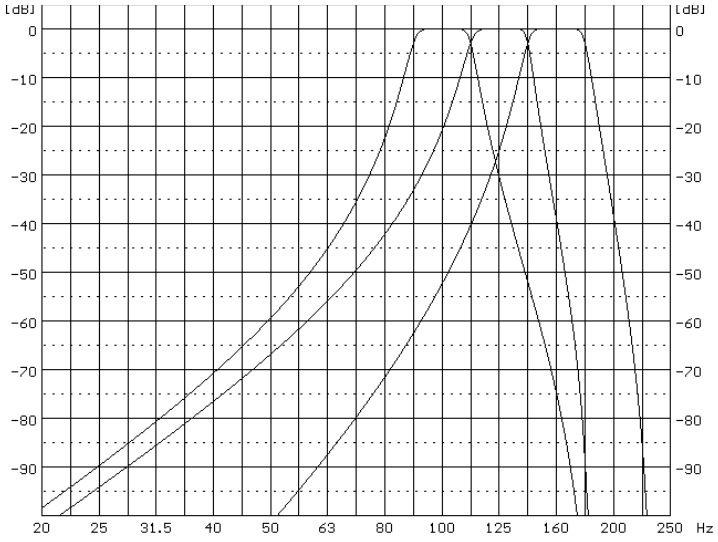
1/3 octave filters for 1.00 kHz 1/1 octave filter



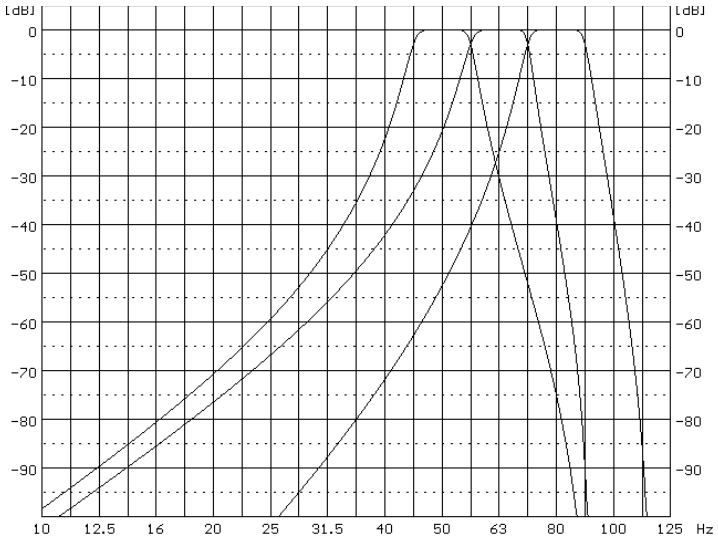
1/3 octave filters for 500 Hz 1/1 octave filter



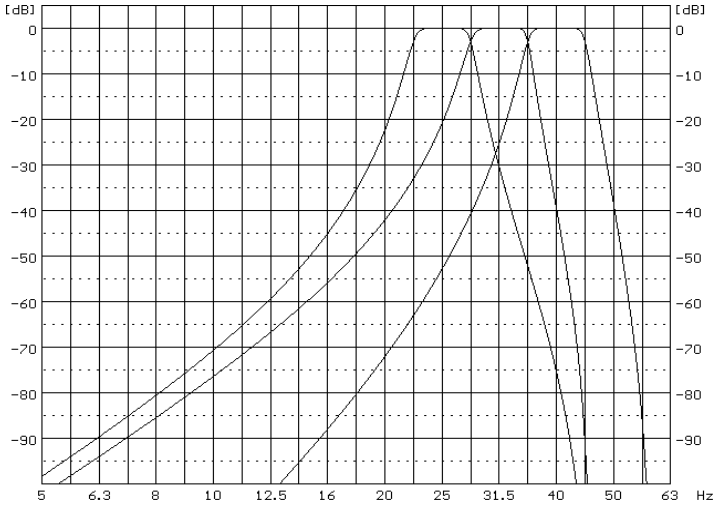
1/3 octave filters for 250 Hz 1/1 octave filter



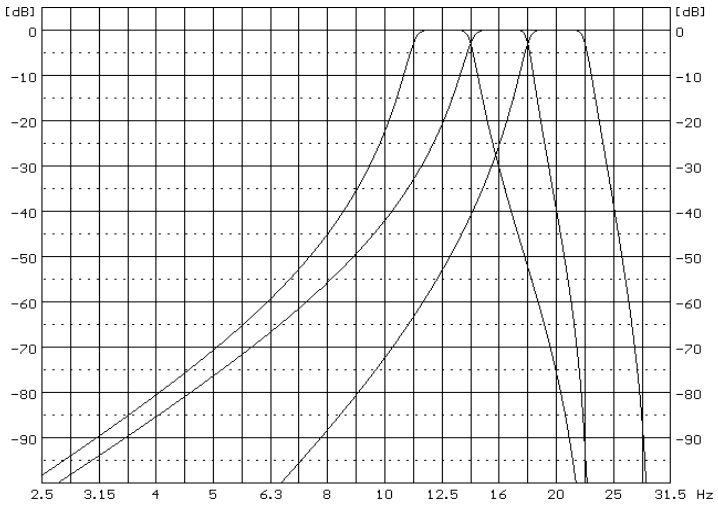
1/3 octave filters for 125 Hz 1/1 octave filter



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



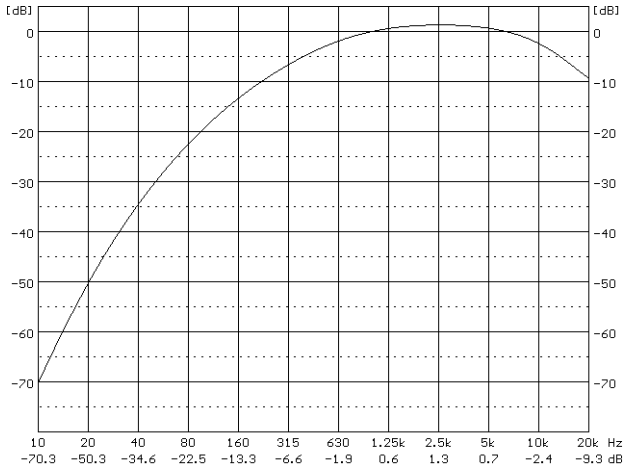
1/3 octave filters for 31.5 Hz 1/1 octave filter



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

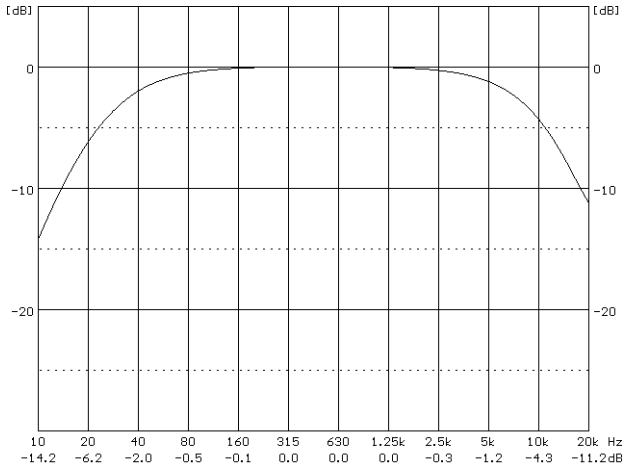
C.3 FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED BROADBAND DIGITAL FILTERS

"A" filter Class 1 according to the IEC 651 and IEC 61672-1:2013 standard.



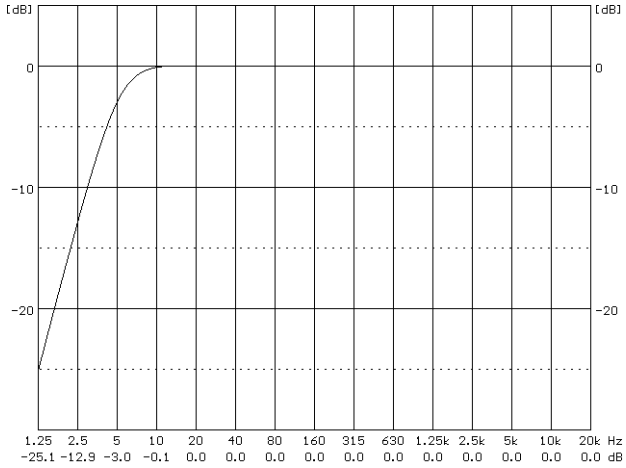
"A" filter characteristic

“C” filter Class 1 according to the IEC 651 and IEC 61672-1:2013 standard.



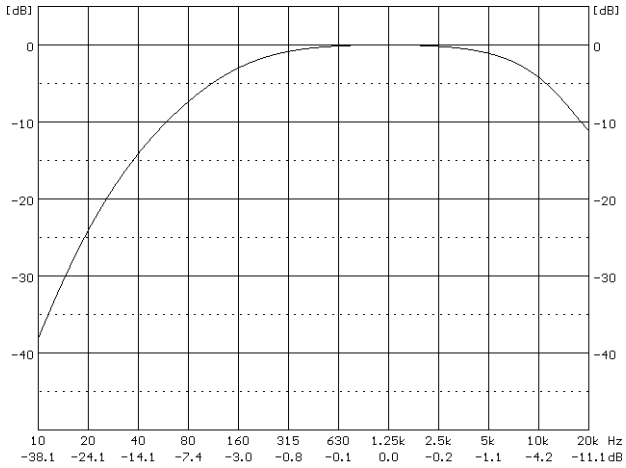
“C” filter characteristic

“Z” filter Class 1 according to the IEC 61672-1:2013 standard.



“Z” filter characteristic

“B” filter Class 1 according to the IEC 651 standard



“B” filter characteristic

C.4 MISCELLANEOUS SPECIFICATION OF SV 200A

Display

Super contrast OLED monochrome white display (128 x 32 pixels).

Memory

2 MB of the RAM memory.

4 MB of the FLASH memory allocated to the program.

16 GB built-in, non-removable micro SD or SDHC industrial grade card (supported for up to 128 GB).

Internal sensors

Temperature	measurement range: -30° to +100°, typical accuracy ±0.3°
Pressure	measurement range: 50 kPa to 115 kPa, typical accuracy ±1 kPa (uncalibrated)
Humidity	measurement range: 0% to 100%, typical accuracy ±3%
Noise sources direction determination	frequency range: 50 Hz to 700 Hz**,** typical accuracy ±10° for all X, Y and Z directions

Internal battery (non-removable)

Li-Ion rechargeable battery	10.8V, 6.7 Ah / 72.4 Wh, electronically protected (short circuit / over load / over voltage / over temperature)

Table C.4.1. SV 200A operation time with a fully charged battery *)

SV 200A operation mode		Power consumption mW	Operation time	
			hours	days
All transmission modules are switched off		410	177	7.3
3G modem	always on 1/60 **)	700	103	4.3
	periodic on 1/24 ***)	440	164	6.8
WLAN module	always on 1/60 **)	1085	66	2,7
	periodic on 1/24 ***)	440	164	6.8
LAN module	always on 1/60 **)	875	82	3.4
	periodic on 1/24 ***)	430	169	7.0

*) Measurement conditions: nominal battery capacity (72.4 Wh), T=20°C, measurements are running, Logger Step=1s, Integration Period=1s (no matter which Function is selected), USB is disconnected, directivity measurements are off, OLED display is off, microphone heater is off, battery heater is off

**) Modem/module is constantly switched on, one minute data transmission in one hour

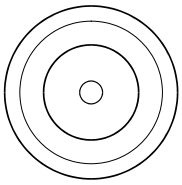
***) Modem/module is normally switched off, and is switched on for an hour in a day

Build-in electrostatic actuator

Frequency	sinusoidal wave 1 kHz.
Nominal level	94.0±0.1 dB (factory calibrated).
Duration	13 s (max 25 s).
Criterium for successful check	actuator level: 94.0±1 dB, background noise: < 74dB.

Microphone input

The input of the measured signal taken form the ½" microphone:



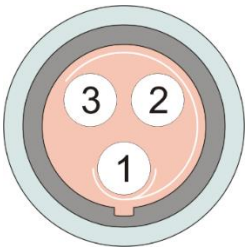
½" microphone connector (external view)

Table C.4.2. Pin out of the microphone connector

Pin number	Connector
Central	Input
Shield	Ground

Power supply (DC IN connector)

SV 200A is intended to work with the external power supply unit SB 274 or solar panel SB 276 for permanent noise monitoring. SB 274 power supply unit 100-240 V AC / 15 V DC, 2.5 A.



DC IN connector (front view)

Table C.4.3. Pin-out of the DC IN connector

Pin number	Signal name	**SB 274** power supply	**SB 276** solar panel	external DC connection (e.g. 12V acc.)
1	DC_IN-	GND	V-	V-
2	SOL_ID-	-	V-	-
3	DC_IN+	"+15V"	V+	V+

Alternative power sources (not included)

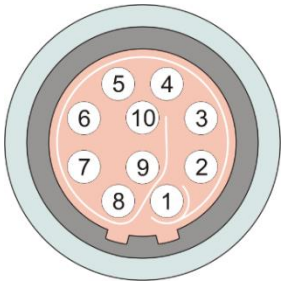
- Solar panel — MPPT voltage 15.0V ÷ 20.0V, OCV < 28V

Note: *Solar panel must have enough power to supply system continuously (all seasons)! For example, to supply SV200A continuously a minimum 130W solar panel is necessary for use in Warsaw, Poland. Please contact Svantek while planning to use solar panel power supply.*

- External DC source accumulator — voltage range 10.5V – 24V, e.g. 12V or 24V

External interface (MULTI I/O connector)

MULTI I/O connector has several interfaces, such as: USB 2.0, RS232, UART (TTL level), digital I/O pin and 12V, 1A power source.



MULTI I/O connector (front view)

Table C.4.4. Pin-out of the MULTI I/O connector

Pin number	Signal name	SC 256A (USB)	SP 275 (meteo)	RS232 device	UART device	Alarm lamp	External trigger
1	reserved *)	-	-	-	-	-	-
2	RX_RXD	-	RxD	RxD	-	-	-
3	RS_TXD	-	TxD	TxD	-	-	-
4	reserved *)	-	-	-	-	-	-
5	EXT_INT	USB+5V	-	-	-	-	EXT_INT-
6	reserved *)	-	-	-	-	-	-
7	EXT_12V **)	-	V+	-	-	V+	-
8	EXT_GND	GND	GND	GND	GND	GND	GND
9	USB_D-	D-	-	-	TxD	-	-
10	USB_D+	D+	-	-	RxD	-	-

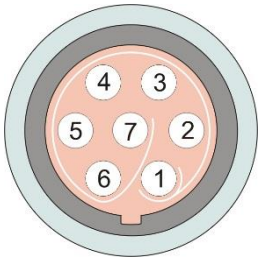
*) do not connect these pins

**) Power supply delivered from the SV 200A to a device 12V, 1A max

Note: *While connecting your SV 200A to a PC by the SC 256A cable, first insert the lemo plug into the instrument's MULT. I/O socket and then the USB plug into the PC!*

LAN connector

The LAN connector is used for connection of the SV 200A to the LAN through the SP 200 adapter.



LAN connector (front view)

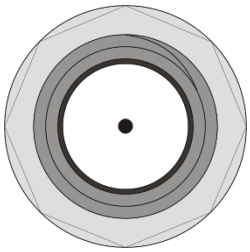
Table C.4.5. Pin-out of the LAN connector

Pin number	Signal
1	RD+
2	RD-
3	TD+
4	TD-
5	+3V3
6	POE_V+
7	POE_GND

Note: *When connecting to the LAN always use the SP 200 adapter!*

WLAN antenna connector

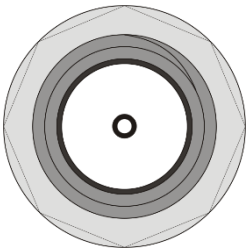
Recommended WLAN antenna: band 2.4GHz, gain 2.0dBi, impedance 50Ω, omni-directional, 1.4 wavelength dipole configuration. SV 200A is equipped with Pulse W1030 antenna of Pulse Finland Oy.



WLAN antenna connector – SMA-RP (front view)

GSM/UMTS antenna connector

The recommended GSM/UMTS antenna: bands 850 / 900 / 1800 / 1900/ 2100 MHz, gain 1.0-2.5 dBi max, impedance 50Ω, omni-directional, dipole configuration. SV 200A is equipped with Pulse W1910 antenna of Pulse Finland Oy.



GSM antenna connector – SMA (front view)

Real Time Clock

Built-in real time. Accuracy better than 1 minute/month.

Weight with the battery	2.8 kg
Dimensions	700 mm length; 70 mm diameter excluding windscreen (windscreen diameter 130 mm)

Compatibility (EMC)

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

1. 2014/53/UE RED (Radio Equipment Devices) Directive including EMC requirements
2. EMC emissions specification:
   a) according to EN-61672-1 (Chapter 5.18) and EN-61672-2 (Chapter 9), applying test methods in accordance with CISPR 22:1997, Clause 10 and CISPR 16-1:1999,
   b) according to EN ISO8041: 2005 (Chapters 7.5, 12.20.7), applying test methods in accordance with CISPR 22: 2003, Clause 10 and CISPR 16-1-1,
3. EMC immunity specification:
   a) according to EN-61672-1 (Chapters 6.5 and 6.6) and EN-61672-2 (Chapter 7.9 and 7.10), applying test methods in accordance with IEC 61000-4-2, IEC 61000-4-3:2002 and IEC 61000-4-8.
   b) according to EN ISO8041: 2005 (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:

1. 2014/53/UE RED (Radio Equipment Devices) Directive including safety requirements
2. EN 61010-1:2011

Compliance with EU Directives

CE mark indicates compliance with 2014/53/UE RED (Radio Equipment Devices) Directive.

GSM/UMTS modem

SV 200A has a built-in Telit HE910-D modem. The HE910-D is a 3G global module that features high-speed HSUPA/HSDPA connectivity while still leveraging backwards compatibility with GSM/GPRS and EDGE networks.

Some of the module features are:

- Quad Band GSM: 850/900/1800/1900 MHz
- UMTS/HSPA bands: 800/850/900/AWS1700/1900/2100 MHz
- HSPA+ data up to 21.0 Mbps downlink / 5.76 Mbps uplink
- WCDMA up to 384kbps downlink/uplink
- Output power
  - Class 4 (2W) @ 850/900 MHz, GSM
  - Class 1 (1W) @ 1800/1900 MHz, GSM
  - Class E2 (0.5W) @ 850/900 MHz, EDGE
  - Class E2 (0.4W) @ 1800/1900 MHz, EDGE
  - Class 3 (0.25W) @ 850/900/1700/1900/2100 MHz, WCDMA
- Sensitivity:
  - 109 dBm (typ.) @ 850/900 MHz (GSM)
  - 110 dBm (typ.) @ 1800/1900 MHz (GSM)
  - 111 dBm (typ.) @ 850/900/1700/1900/2100 MHz (WCDMA)
- Advanced E-GPRS/WCDMA/HSDPA/HSUPA Software protocol stack (Layer 1 to 3) – Version: 3GPP Release 7
- Control via AT commands according to 3GPP TS27.005, 27.007 and Telit customized AT commands
- Embedded TCP/IP stack, including TCP, IP, UDP, and FTP protocols

Approvals of the module:

- Fully type approved confirming with RED directive
- CE, GCF (Global and EUx variants)
- FCC, IC, PTCRB (NAx variants)
- RoHS and REACH (all versions)

FCC and IC

This product contains an FCC and Industry Canada certified 2.5G, 3.5G wireless transmission module:

- FCC ID: RI7HE910
- Industry Canada ID: 5131A-HE910
- Producer: Telit Communications S.p.A.
- Model: HE910-D

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

WLAN/LAN module

SV 200A has built-in Connect One iW-SMG2SMT-EX WLAN/LAN module. The iW-SMG2SMT-EX is a highly integrated 802.11b/g/n wireless module which adds WLAN/LAN connectivity to SV 200A instrument.

Key features of the module are:

- Standards supported: IEEE 802.11b/g/n
- Frequency: Europe – 2.412-2.472 GHz
  USA – 2.412-2.462 GHz
  Japan – 2.412–2.484 GHz
- Channels: Europe – 13 channels
  USA – 11 channels
  Japan – 14 channels
- Transmit Power Levels (typ): 802.11b 17 dBm
  802.11g 14 dBm
  802.11n 12 dBm
- Receiver Minimum Input Level Sensitivity (typ):
  802.11b (Data Rate = 11Mbps PER < 8%) -87 dBm
  802.11b (Data Rate = 1Mbps PER < 8%) -94 dBm
  802.11g (Data Rate = 54Mbps PER <10%) -73 dBm
  802.11g (Data Rate = 6Mbps PER <10%) -86 dBm
  802.11n (MCS0 PER <10%) -86 dBm
  802.11n (MCS7 PER <10%) -70 dBm
- Maximum Transmit Rate: 802.11b 11 Mbps
  802.11g 54 Mbps
  802.11n @ (MCS7, HT20) 72.2 Mbps
- Supports Ethernet connectivity
- Built-in TCP/IP protocol stack and web-based application framework
- Multiple internet protocols: ARP, ICMP, IP, UDP, TCP, DHCP, DNS, NTP, SMTP, POP3, MIME, HTTP, FTP and TELNET
- Security protocols: SSL3/TLS1, HTTPS, FTPS, RSA, AES-128/256, 3DES, RC-4, SHA-1, MD-5, WEP, WPA/WPA2 (PSK and Enterprise)
- Host data rates up to 3Mbps using UART serial interface
- Optional configuration and firmware upgrade through a web interface

Certifications

- Radio & EMC:
  - USA: FCC Modular Approval; CFR Title 47 FCC Part 15, Subpart B and C
  - Canada: Industry Canada Module Approval; Industry Canada ICES-003, RSS-Gen, RSS-210
  - EU: 2014/53/UE RED (Radio Equipment Devices) Directive
- Safety:
  - UL 60950
  - CAN/CSA-C22.2 No. 60950
  - 2014/53/UE RED (Radio Equipment Devices) Directive

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.(*)

Wireless Bluetooth®[3] 4.0

This instrument supports wireless connection via Fully Qualified Bluetooth system v2.0 + EDR, CE and FCC. This connectivity is compatible with mobile and PC devices that support Bluetooth® 2.0.

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

- Bluetooth version: 4.0
- Operating frequency range: 2.402 – 2.480 GHz
- Transmit power (max): 8 dBm
- Sensitivity: standard mode -92 dBm
high gain mode -98 dBm
- Channels: 40
- Modulation: GFSK
- Internal antenna gain: 0 dBi
- Range: up to 450 m line-of-sight and depending on local RF conditions.

Certifications

FCC and IC

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

- FCC ID: QOQBLE121LR
- Industry Canada ID: 5123A-BGTBLE121LR
- Producer: Silicon Laboratories
- Model: BLE121LR-A-M256K Smart Long Range 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.

[3] "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.

- 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.

GPS

The instrument has a built-in A2235-H GPS module of Maestro Wireless Solutions (HK) Ltd. intended for logging position and time definition.
GPS is an antenna module with SiRF Star IV ROM based chip and an on-board integrated antenna.

- Position Accuracy (horizontal): < 2.5 m CEP (autonomous),
- Tracking Sensitivity: -163dBm
- Time accuracy: <1µs (directly depends on position deviation)

Directivity

Table C.4.6. Parameters of signals

	Direction XY	**Direction Z**
Band	50 -2500 [Hz]	50 -2500 [Hz]
Minimum level of RMS	40 [dB]	40 [dB]
Maximum level of RMS	130 [dB]	130 [dB]

Table C.4.7. Resolution and measurement accuracy

	Direction XY	**Direction Z**
Resolution	1 deg	1 deg
Accuracy	+/-10 deg	+/- 10 deg

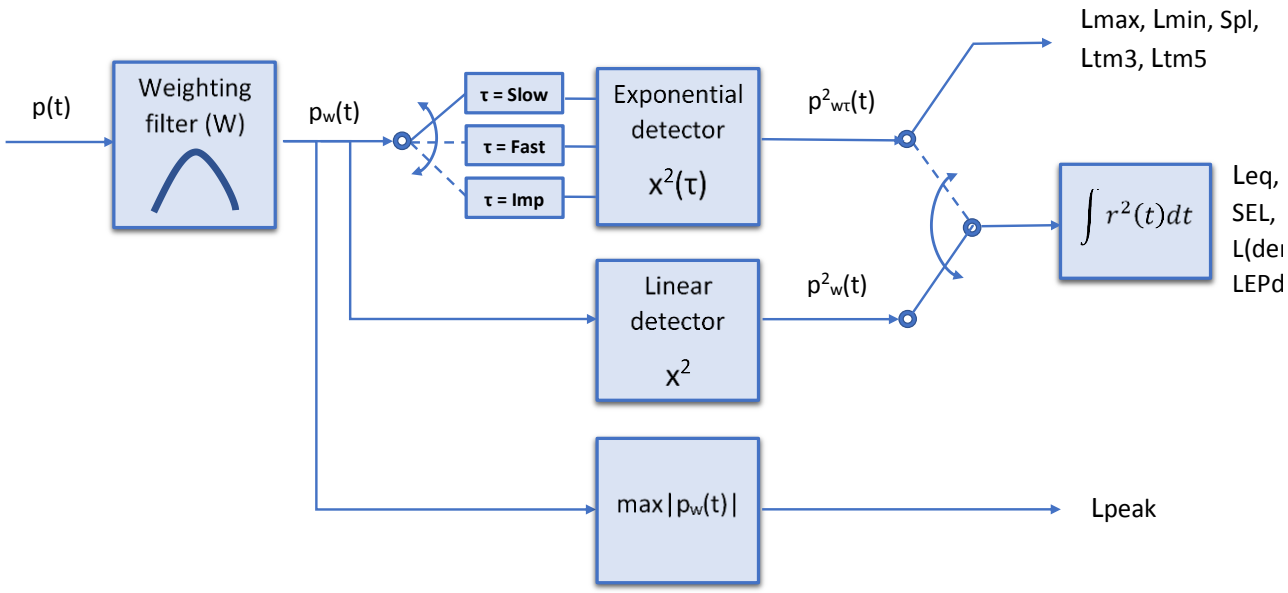
Appendix D. DEFINITIONS AND FORMULAE OF MEASURED VALUES

D.1 BASIC TERMS AND DEFINITIONS

T	Current time period of the measurement in seconds.
T_1	Last second of the measurement.
T_e	Exposure time in seconds (time period during which a person is exposed to the action of noise). This parameter can be set in the **Exposure Time** setup (**Measurement** menu). The available values are from 1 minute to 12 hours with 1 minute step.
T_{8h}	Time period equal to 8 hours (28 800 seconds).
τ	Exponential time constant in seconds for the giving time-weighting. Three time 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** or **Z**.
$p_W(t)$	Instantaneous frequency-weighted sound pressure with the weighting filter **W**. Sound pressure is expressed in pascals (Pa).
$p_{W\tau}(t)$	Instantaneous frequency and time-weighted sound pressure with the weighting filter **W** and time constant τ calculated from the equation: $p_{W\tau}(t) = \sqrt{\frac{1}{\tau}\int_{-\infty}^{t} p_W^2(\xi)\, e^{-(t-\xi)/\tau}\, d\xi}$ where: ξ – variable of integration.
$r(t)$	Instantaneous sound pressure depends on the <**RMS Integration>** parameter: $r(t) = \begin{cases} p_W(t) & \text{RMS Integration = Lin} \\ p_{W\tau}(t) & \text{RMS Integration = Exp} \end{cases}$
p_0	Reference value (20 μPa).
$\log(x)$	Logarithm of x to the base 10.

D.2 DEFINITIONS AND FORMULAS OF THE 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**)

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

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

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

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

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

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

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

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

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

L(A/C/Z)eq

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

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

L(A/C/Z)E

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

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

L(den)

Only one result from: **Ld**, **Le**, **Ln**, **Lde**, **Len**, **Lnd**, and **Lden** is available in the instrument. It depends on the day and night time in which the measurement was performed. Day and night time depend on the **<Day Time Limits>** option (**6h-18h** or **7h-19h**).

If **<6h-18h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 6 am and ends at 6 pm,

T_e (evening-time) starts from 6 pm and ends at 10 pm,

T_n (night-time) starts at 10 pm and ends at 6 am.

If **<7h-19h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 7 am and ends at 7 pm,

T_e (evening-time) starts from 7 pm and ends at 11 pm,

T_n (night-time) starts at 11 pm and ends at 7 am.

Ld

Ld is calculated for: $T_d \neq 0$, $T_e = 0$, $T_n = 0$.

$$Ld = 10 \log \left(\frac{1}{T_d} \int_{T_d} \left(r_w(t)/p_0 \right)^2 dt \right)$$

Le

Le is calculated for: $T_d = 0$, $T_e \neq 0$, $T_n = 0$.

$$Le = 5\ dB + 10 \log \left(\frac{1}{T_e} \int_{T_e} \left(r_w(t)/p_0 \right)^2 dt \right)$$

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: $T_d \neq 0$, $T_e \neq 0$, $T_n \neq 0$.

$$Lden = 10\log\left[\frac{1}{12+8+4}\left(12\cdot 10^{Ld/10} + 4\cdot 10^{Le/10} + 8\cdot 10^{Ln/10}\right)\right]$$

LEPd

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

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

Ltm3 and **Ltm5**

The **Ltm3** and **Ltm5** 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.

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 **Lnn** or position parameters of the distribution.

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

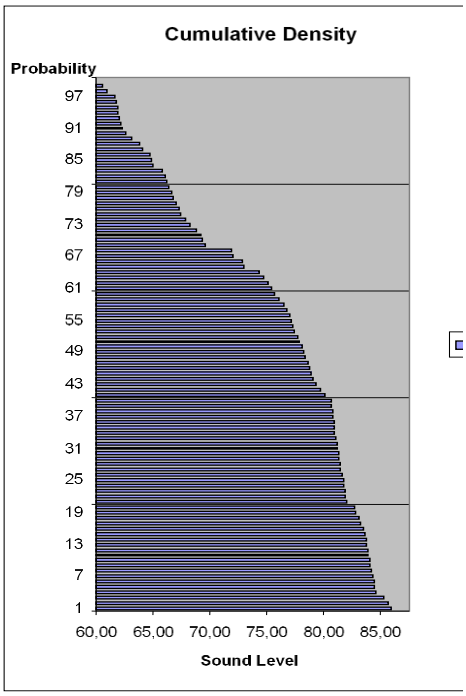
Example:

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

The cumulative density function for the exemplary data is presented in Figure on the right side. In order to determine the **Lnn** 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