SVANTEK

USER MANUAL

SV 111

VIBRATION CALIBRATOR

Warsaw, 2018-12-19

Rev. 01.02

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 1.16.1.*

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

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

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1. General safety summary

Review the following safety precautions to avoid injury and prevent from damaging this product or other products connected with it. To avoid potential hazards, use this product only as specified. Qualified personnel should only perform the service procedures.

Warnings, precautions and maintenance:

- Before using the calibrator be sure that the shaker shipping lock is detached. Starting the vibration calibrator with the shipping lock may destroy it.
- Use a proper AC/DC adapter, specified for this product and certified for the country of its use.
- Keep the product's surfaces clean and dry.
- Even when the device is not in use it is recommended to charge the battery once a month to keep it in good condition.
- It is recommended to carry out a technical inspection and recalibration of the device every 12 months to ensure accurate calibration level.
- Recalibration can be made by the calibration laboratory. If there is no possibility to recalibrate the device by calibration laboratory the device should be send to the manufacturer.
- All maintenance work and repairs can only be done by the personnel trained by the manufacturer.
- Handle with care.

Safety terms and symbols:

Symbol	Symbol meaning
	Do not throw into standard municipal waste containers. The user is obliged to deliver used equipment to the manufacturer or to the recycling collection point.
	This product can be recycled
	This product has met EU consumer safety, health or environmental requirements

2. Calibration

One of the fundamental questions, that are most frequently asked while taking a measurement, is whether its result is accurate. Proceeding, with a measurement without having a positive answer to this question, may result in obtaining data of no practical use and wasting our time. However, we may easily obtain the answer by performing a calibration of the vibration level meter using a vibration calibrator. This device should be used before every set of measurements.
The vibration calibrator is a device, which produces the vibration of the defined levels and frequency. It allows to calibrate the vibration meter in comparative way.
Calibration procedure is also the best way for the complete measuring system (Meter, Cable and Transducer connected together) check. This is an essential action for the reliable measurements performed in the field!

3. Accuracy of calibration

Each measurement performed by any measurement device is burdened with an error. Result obtained from such measurement is only an estimate of the real value of the measured quantity. Hence, the purpose of calibration is to limit this inevitable error to a certain acceptable level. Maximum absolute value of the error of generated vibration signals is called the tolerance and is strictly defined by the standard ISO8041:2005.

4. SV111 model information

The model SV111 is a Portable Vibration Calibrator. It is designed to check/calibrate various types of vibration level meters according to the ISO 8041:2005.
Three standard frequencies 15.92 Hz, 79.58 and 159.2 Hz (plus one more extra 636,6Hz) combined with high loading mass brings opportunity to calibrate almost any existing transducer.
Because of its dedicated adapters, SV111 allows to take measurements in three directions. So, to calibrate effectively tri-axial transducers!
Because of its own internal rechargeable battery, it is a truly mobile and flexible device designed to use either in a laboratory or during fieldwork.
The unique feature of SV111 is capability to calibrate complete “seat accelerometer”, without necessity to extract accelerometer form the rubber cushion!
The robust case allows placing the calibrator directly on the ground, what is extremely useful in the field applications. Built in electronic leveling system helps with correct positioning of the device for correct vibration calibration. Leveling of the SV111 is important for keeping transversal vibrations levels within tolerances specified by the ISO8041:2005.

5. Unpacking and Inspecting the package contents

Despite careful packing, the risk of the device damage cannot be entirely eliminated. Upon delivery, please make sure that the device is not damaged and verify that you received the ordered equipment and optional accessories (if ordered). In case of any problems, please contact an authorized Svantek representative, the service staff or the manufacturer directly. The complete set includes the following items:

- SV111 Vibration calibrator
- SA 33 AC/DC adapter

Before using the device:

- Be sure that the shaker shipping lock is detached. Starting the vibration calibrator with the shipping lock may destroy it.

To detach the shaker shipping lock, unscrew four bolts with the hex wrench and two screwdriver tips attached to the magnet. Screw the central bolt into the loose sleeve.

Don’t throw away the transport lock with three bolts because it is necessary to secure the shaker during transportation.

- Charge SV111 to the full. In order to charge the battery, connect SA33 AC/DC adapter plug to SV111 EXT_DC supply socket and then connect it to the mains.

The SA33 AC/DC adapter is placed in the charger slot.

- If the device has been kept or transported in low temperature (below 0 °C), it is recommended to leave it for a few hours in the room temperature before connecting it to the power supply. If any steam condensation appears, it is recommended not to connect the device to the mains electricity for 4 to 8 hours until the exterior surface is dry.

6. Optional accessories

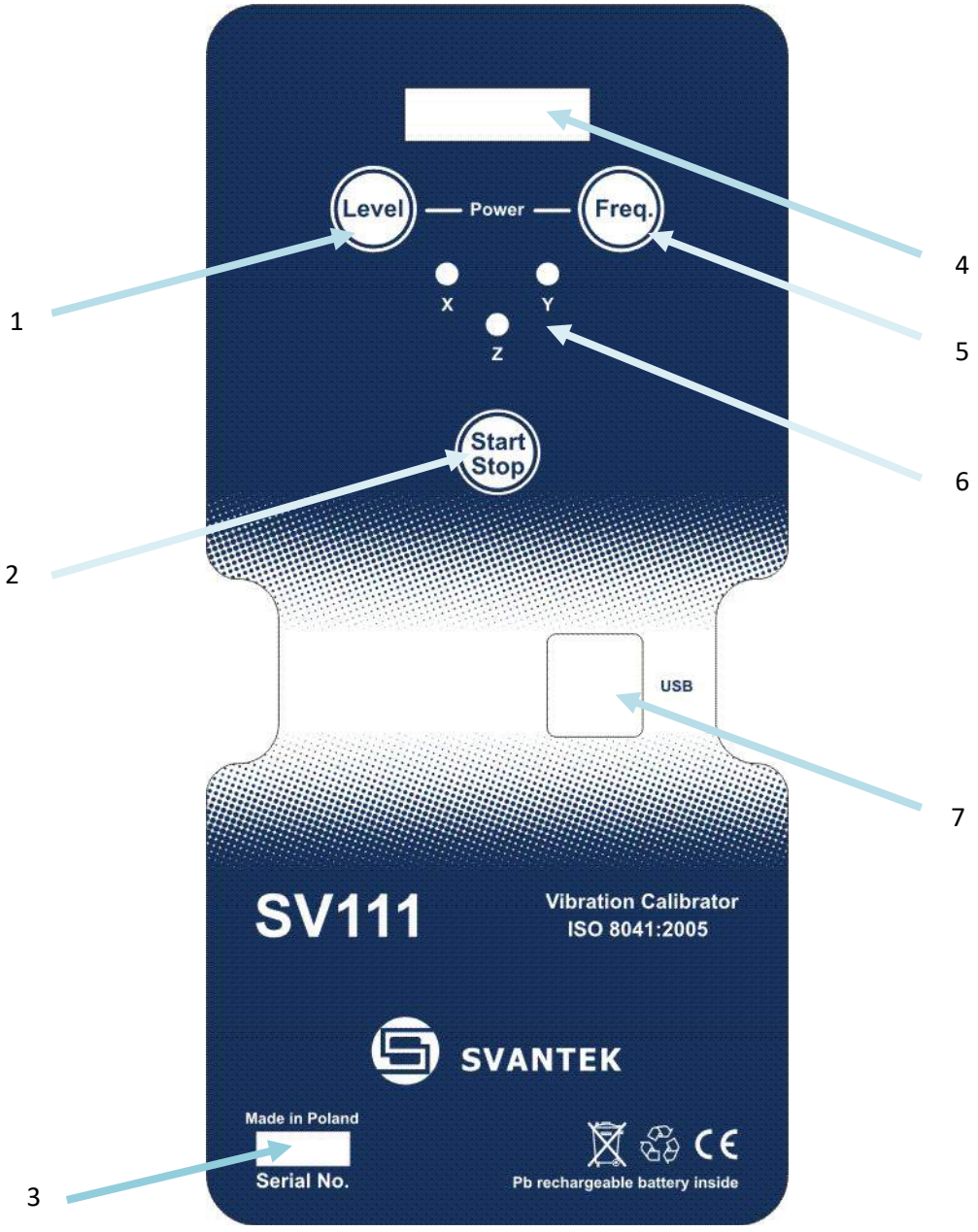
The SV111 calibrator set doesn't include the SA105 adapter used for calibration of the SV105B hand-arm transducers and the SA44 adapter for calibration of the SV 3023M2 transducers. These adapters are optional and should be ordered separately.

7. SV111 vibration calibrator

SV111 vibration calibrator

1.Magnet with two screwdriver tips; 2.Adapter; 3.Hex wrench slot with support sleeves; 4.Charger slot; 5.Shaker; 6.Transportation lock; 7.Support; 8.Fastening screw; 9.Display; 10.Keyboard; 11.EXT_DC supply socket; 12.USB port;

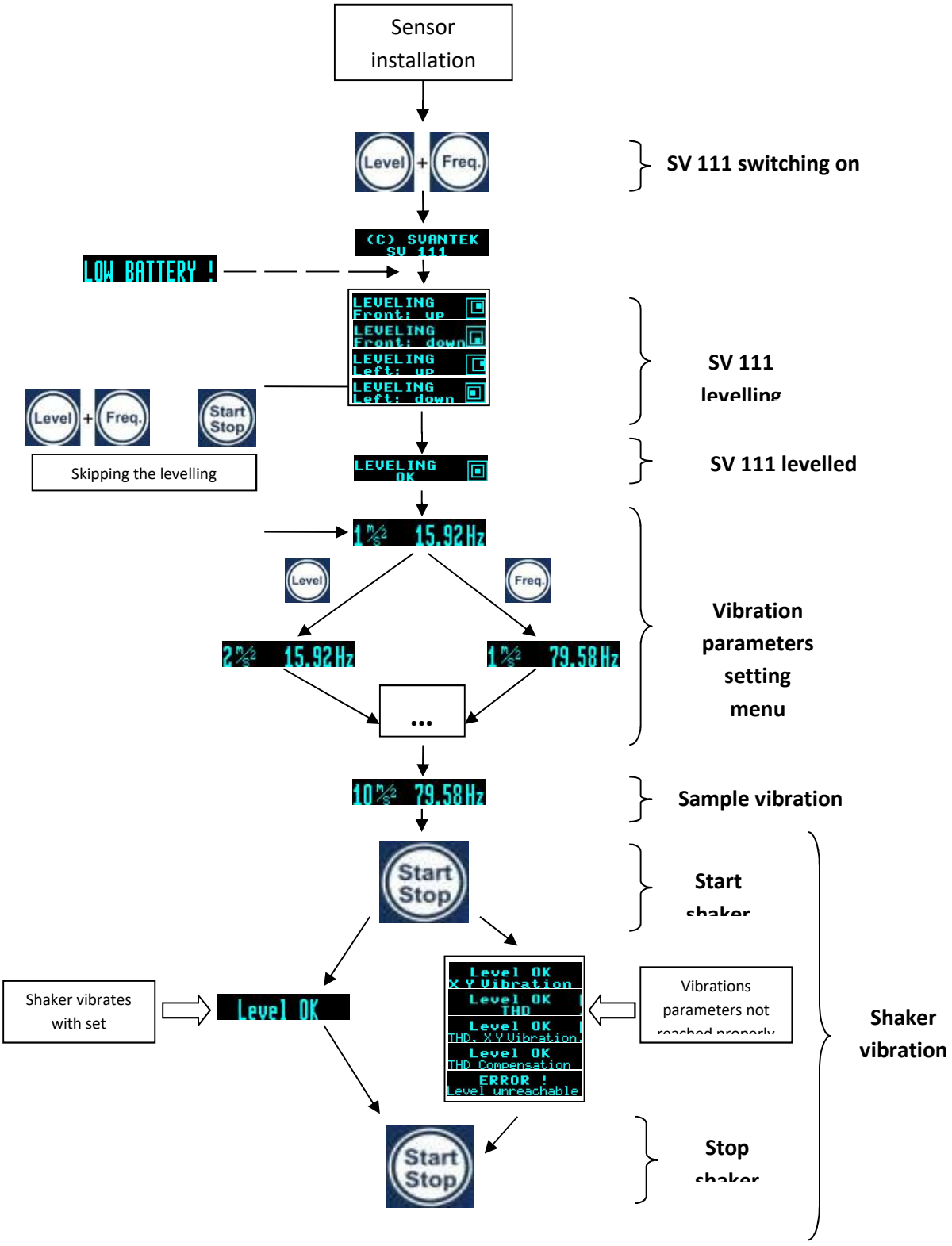
8. Control panel



SV111 control panel

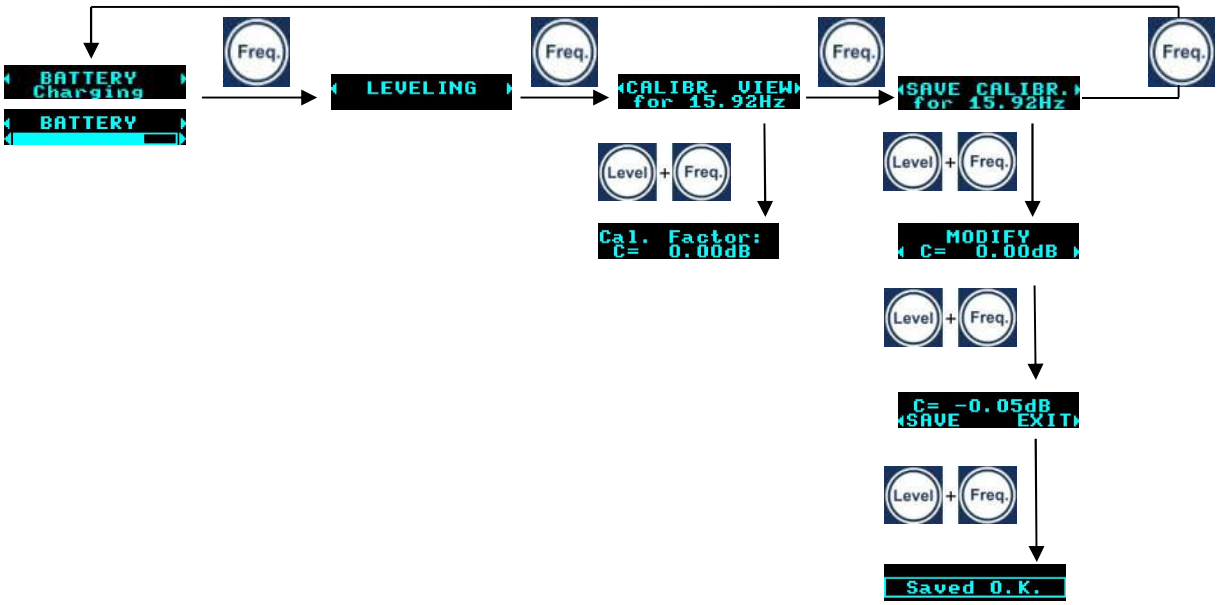
1.Vibrations level button/Power on button A; 2.Start/Stop button; 3.Serial number box; 4.Display box; 5.Vibration frequency button/Power button B; 6. Spirit level; 7.USB port

9. Operating diagram



10. Submenu diagram

- Program submenu can be reached from “Vibrations parameters setting menu” by pressing 



- To return to “Vibrations parameters setting menu” press 

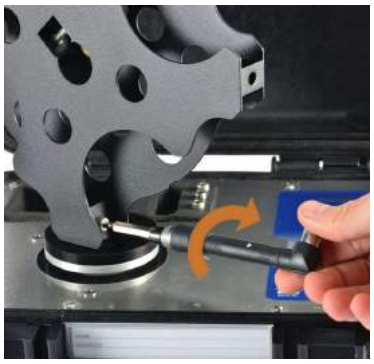
11. Installation of the whole-body sensor

The whole-body sensor can be tested/calibrated at 15.92 Hz only!

- dismantle the adapter from the case cover and screw it to the shaker with one or more bolts (one central bolt should be sufficient for the system check)


- dismantle the support system from the case holder, put it on the adapter and tight the fixing bolt:





- unscrew the central screw of the whole-body sensor and install the sensor on the support system screwing them altogether:



- position the sensor according to the calibrated axis (channel) and tight the fixing bolt:

- put the support system with the tested sensor in the horizontal position on the adapter and tight the fixing bolt:

12. Installation of the SV 105 Hand-Arm sensor

The SV 105 Hand-Arm sensor should be calibrated at 79,58 Hz only.

- unscrew the fixing screw with the special screwdriver (included in the SV105 set), detach the sensor from the belt holder and screw the sensor to the calibration adapter with the special screw (included in the SV105 set):



To avoid malfunction of the sensor, use the fixing screws delivered with the kit - marked with the 'B' on the collar.

The older version of hand adapter kits uses different size screw therefore use of fixing screws from different kits may cause a malfunction of the sensor.

In case the fixing screws are lost, please contact your local distributor or send an e-mail to office@svantek.com.

To avoid malfunction of the sensor during in-situ check and periodical verification use 'CAL ONLY' fixing screw. 'CAL ONLY' fixing screws (2 pcs) are included in the SA 105B adapter kit

SA 105B adapter is only compatible with SV 105B, SV 105BF and SV 107B sensors.

The older version of hand adapters SV 105A, SV 105AF, SV 107B are compatible with the screw.

SA 105B adapter is only compatible with SV 105B, SV 105BF and SV 107B sensors.

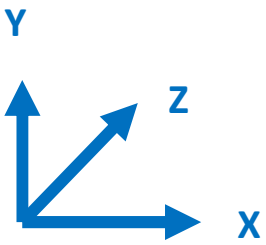
In case the fixing screws are lost, please contact your local distributor or send an e-mail to office@svantek.com.

- install the calibration adapter with the vibration sensor to the calibrator's shaker using special stud (included in the SA105 set):



Installation of the sensor at the calibration adapter should be as shown below. Only in this way you can calibrate all axe in accordance with presented arrows:



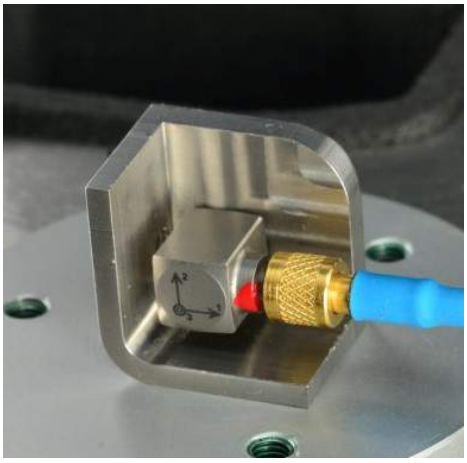


- positioning of the adapter with the sensor for calibration of the X-axis, Y-axis and Z-axis should be as per photos below

13.Installation of the SV 3023M2 accelerometer

The SV 3023M2 accelerometer is mounted on the shaker with special adapter (SA 44). The SA 44 adapter set includes two studs M5/M5 and M5/M3. The M5/M3 stud is used for fixing the accelerometer to the adapter. Another M5/M5 stud is used for fixing adapter with the accelerometer to the shaker.

The SA 44 adapter allows to calibrate the SV 3023M2 accelerometer in all directions.



14. Installation of the general-purpose accelerometer

The general-purpose accelerometer (for example, SV 80) is mounted directly on the shaker with special stud, normally included in the accelerometer set.

15. Programming

- Switch on power by pressing two buttons at the same time for a while

- The device type information will be displayed

- When the battery level is low, 'LOW BATTERY' is displayed every 30 sec.

- Level the device according to the spirit level information.
  - Move front side up
  - Move front side down
  - Move left side up
  - Move left side down

- When the level is reached the information 'levelling ok' is projected on the display for 5 seconds, then automatically switches to vibrations parameters setting menu

It is possible to skip leveling process, but it is strongly recommended to proceed the

leveling process before every calibration.

Spirit level can be launched anytime using the program submenu.

- After leveling, the device displays the default vibrations parameters values

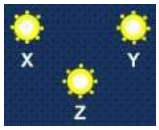
- You can change values by pressing the 'Freq.' button in the following order: 15,92; 79,58; 159,2; 636,6 Hz

- Depending on settled frequency value, vibration level can be set according the table bellow

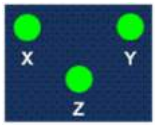
Frequency	15,92	79,58	159,2 Hz	636,6	Hz
Level	1,2	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	1	$\frac{m}{s^2}$

- When vibration parameters are set, run the shaker by pressing 'Start/Stop' button.

During leveling of the calibrator, the diodes are blinking yellow (orange)



- When the vibrations are steady, the diodes are lighting with continuous green light and the information 'Level OK' is projected on the display



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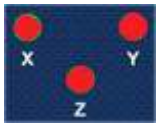
- In special cases described below some diodes may have red lights. The explanation of red diodes is displayed on the screen.



THD (Total harmonic distortion) – means that the harmonics on Z axis exceed threshold 5% (-26 dB) of reference vibration level.

For example: When the vibrations are set with ≈16 Hz, 1 m/s^2 (120 dB), then the total vibrations amount with frequencies n*16 HZ (32, 48, 64, 80,...) cannot be higher than 0,95 m/s^2(94 dB)

SV 111 is compensating harmonic distortion

X Y Vibration means that vibrations' level in X or Y (corresponding diode is lighting red) direction are higher than 10% (-20dB) of vibrations level generated in Z direction

This means that both kinds of mistakes were made at the same time.

The device cannot reach set parameters, and the device stops generating the vibrations

- While the shaker is working, set parameters can be checked by pressing either the 'Level' or 'Freq.' button: Set parameters will be displayed by 5 seconds

- To stop the shaker, press the 'Start/Stop' button

- Switch off by pressing two power buttons at the same time for a while

16. General Care and Cleaning

- Remove the sensor and switch the device off
- Disconnect the device from the power supply.
- Wipe the device's surface with the cloth damped with the mixture of warm water and detergent.
- After cleaning, wipe the device with dry cloth and wait until the surface is completely dry.
- Do not immerse the device in any fluids as this may damage the device and cause electrical shock. Only the external parts of the device should be cleaned

17. Technical data

Calibration signal parameters					
Frequency	15,92	79,58	159,2 Hz	636,6	**Hz**
Vibration accelerations (RMS)	1	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	1	$\frac{\mathbf{m}}{\mathbf{s^2}}$
Vibration velocities (rms)	10	2, 4, 6, 8 10, 12, 14, 16, 18 20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	0.25	$\frac{\mathbf{mm}}{\mathbf{s}}$
Vibration displacement (rms)	100	4, 8, 12, 16, 20, 24, 28, 32, 36, 40	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	0.0625	**µm**
Amplitude error	Less than ± 3%				
Frequency error	Less than ± 0,05%				
Transverse vibration	Less than 10% of main direction				
Harmonic distortion	<5	<3	<3	<3%	**%**
General					
Maximum weight of tested object	1000	300	200	200	**g**
Sensor mounting	Threaded hole M5 x 12 mm; Seat adapter for SV 100, SV 38, SV 38V Mounting disc for attaching with Beeswax or SA 38 adapter				
Levelling off time	Typically 15 ÷ 20 seconds, 60 seconds max				
Working conditions					
Temperature range	-10°C ÷ 50°C				
Humidity range	25% ÷ 85%				
Power supply					
Battery type	Rechargeable 6V/12Ah				
Continuous operating time	Up to 20 hours				
Automatic switch off	From 5 to 60 minutes adjustable				
Charging time	Less than 10hours				
Power supply for charger	15 W; 8÷24 V				
Overall weight and dimensions					
Weight	6,5 kg (incl. battery)				
Dimensions	395 x 270 x 194 mm				

Appendix A Recalibration

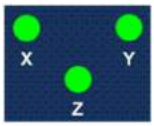
Recalibrations have to be done for all frequencies with vibration level set as shown in the table below:

Frequency	Vibration level
15.92 Hz	1m/s^2
79.58 Hz	10m/s^2
159.2 Hz	10m/s^2
636.6 Hz	1m/s^2

Recalibration for frequency 15.92 Hz:

- Install the reference sensor and start the shaker with 15.92 Hz and 1m/s^2 vibrations parameters.

- Wait until the vibrations are steady (diodes are lighting with green continuous light and information “Level OK” is displayed).



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- Read the vibrations level value from the reference sensor. When it is the same as the set one skip to the next frequency. When it differs it is necessary to enter/modify the calibration coefficient.

- Stop the sharer by pressing the ‘Start/Stop’ button

- When the device is idle press the ‘Level’ and ‘Freq.’ buttons at the same time to enter the submenu.

- First position displayed in submenu will be the battery current status

- The submenu positions can be changed by pressing either the ‘Level’ or ‘Freq.’ button

Further submenu positions displayed are:

- Leveling

- Calibration coefficient that was previously entered

- Position where the new calibration coefficient can be set

- Checking currently entered calibration coefficient:
  - when the ‘CALIBR. VIEW’ is displayed
  - press the ‘Level’ and ‘Freq.’ buttons at the same time

  - Currently entered value will be displayed on the screen

- Changing the calibration coefficient
  - When a notice <SAVE CALIBR.> is displayed

  - Press the ‘Level’ and ‘Freq.’ buttons at the same time

- Then modification screen will be displayed.

- To decrease currently displayed value by 0,05 dB, press the 'Level' button

- To increase the currently displayed value by 0,05 dB, press the 'Freq.' button

- Currently set value will be displayed on the screen.

- To confirm the set value, press the 'Level' and 'Freq.' at the same time.

- To save the set value, press 'Level'

- To exit without saving, press 'Freq.'

- After saving confirming screen will be displayed

As the calibration coefficient is set, it is recommended to repeat the measurement with reference sensor.

Appendix B Defining calibration coefficient

Use one of formulas bellow:

- $C = 20 \log_{10} \frac{A}{A_0}$ **[dB]**

Where:

A – reference sensor vibration level

A_0 – selected vibration level of the calibrator

- **C = Ar – Ac,**

Where:

Ac- selected vibration level of the calibrator [dB]

Ar – reference sensor vibration level [dB].