SVANTEK

USER MANUAL

SV 110

PORTABLE VIBRATION CALIBRATOR

Warsaw, 2024-08-28
Rev. 1.03

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Note: *Battery level indicator - To improve the accuracy of the remaining battery level indicator, operate the unit until the battery is fully discharged, then proceed with a full charge via the mini-USB port. This procedure is recommended before first use. Repeat this procedure after every few months of use to maintain a more accurate battery level indicator.*

Note: *Due to our policy of continuous product improvement, SVANTEK reserves the right to change product specifications without notice. To download the latest user manual, please visit our website at www.svantek.com.*
This manual refers to firmware revision named ***1.02.x****.*
Subsequent software revisions (marked with higher numbers) may change the appearance of some of the displays described in this manual.

WEEE Notice: *Do not dispose of this product with unsorted municipal waste at the end of its life. Instead, return it to an authorised collection point for recycling. This will help to protect the environment.*

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Technical Support Contact Information:

web: www.svantek.com/contact

CONTENTS

1 General safety summary

Review the following safety precautions to avoid injury or damage of this device or other products connected to it. To avoid potential hazards, use this device only as specified. Service procedures should be performed by qualified personnel only.

Warnings, precautions and maintenance:

- Use an AC/DC adapter specified for this product and certified for the country in which it will be used.
- Keep the surfaces of the device clean and dry.
- Even when the device is not in use, it is recommended that you 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 an accurate calibration level.
- Recalibration can be carried out by a calibration laboratory. If it is not possible to have the device recalibrated by a calibration laboratory, the device should be returned to the manufacturer.
- All servicing and repairs must be carried out by personnel trained by the manufacturer.
- Handle with care.

Safety terms and symbols:

Symbol	Symbol meaning
	Do not throw dispose of in normal municipal waste containers. The user is obliged to return used equipment to the manufacturer or to a recycling collection point.
	This product is recyclable.
CE	This product has passed EU consumer safety, health or environmental requirements.

2 Calibration

One of the fundamental questions most often asked when taking a measurement is whether the 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 can easily obtain the answer by calibrating the vibration level meter using a vibration calibrator. This should be done before each set of measurements.

The vibration calibrator is a device that produces the vibration of a defined level and frequency. It allows you to calibrate the vibration meter in a comparative way.

The calibration procedure is also the best way to check the complete measuring system (meter, cable and transducer connected together). This is essential for the reliable measurements in the field!

3 Accuracy of calibration

Every measurement made by any instrument is subject to error. The result of such a measurement is only an estimate of the real value of the measured quantity. Therefore, the purpose of calibration is to limit this unavoidable error to a certain acceptable level. The maximum absolute value of the error of the generated vibration signals is called the tolerance and is strictly defined by the ISO 8041-1:2017 standard.

4 SV 110 model information

- The SV 110 is a hand-held vibration calibrator designed for the verification of machine sensors as the on-site checks of human vibration accelerometers in accordance with ISO 8041-1:2017.
- The two standard frequencies of 79.58 and 159.2 Hz provide the opportunity to calibrate a wide range of existing transducers with a maximum load of 0.3 kg.
- Depending on the frequency selected, the user can select the level of the calibration from 1 m/s^2 to 10 m/s^2.
- With its own internal rechargeable battery, it is a truly mobile and flexible device designed for use in the laboratory or in the field.

- The light weight of the calibrator makes it possible to calibrate transducers in the field without having to carry them around.
- Two diodes indicate external vertical and horizontal vibrations that may affect the tolerances specified by ISO 8041:2017.
- Accelerometers are conveniently mounted using either a mounting stud, mounting disc or special adapters.
- The calibrator has built-in rechargeable batteries that provide 12 hours of continuous operation*.
- The calibrator has a rugged housing with the leather cover for hand-arm use in the field.

*) Forf 79.58 Hz frequency and accelerometer weight less than 200 g. For other frequencies and/or accelerometer weights, the continuous operating time will be shorter.

5 Unpacking and inspecting the package contents

If the device has been stored or transported in a low temperature (below 0°C), it is recommended that it be left at room temperature for a few hours before being connected to the power supply.

***Note**: If steam condensation occurs, do not turn on or connect the device to an external power source for 4 to 8 hours until the exterior surface is dry!*

Despite careful packaging, the risk of damage to the device cannot be completely eliminated. On delivery, please check that the device is undamaged and that you have received all the equipment and optional accessories (if ordered). In case of any problems, please contact an authorised Svantek representative, the service staff or the manufacturer directly.

Before using the device for the first time, to fully charge the battery, connect the charger/power supply plug to the SV 110 USB socket and then to the mains.

The complete set includes the following items:

- **SV 110** Portable Vibration Calibrator including charger/power supply
- **SC 56** mini-USB 2.0 cable
- **SA 81** leather cover

Optional adapters:

- **SA 105** adapter for SV 105
- **SA 155** adapter for SV 150 and SV 151
- **SA 40** adapter for SV 207A, Dytran 3233A, SV 39A, Dytran 3143M1
- **SA 44** adapter for SV 50, Dytran 3023M2

6 Getting started

The following figure shows the controls and connections of the SV 110:

SV 110 vibration calibrator
1-Shaker; 2-Aluminum casing; 3-Display; 4-Keyboard; 5-USB port; 6-Rubber covers; 7-External vibration diodes.

In accordance with the requirements of ISO 8041-1:2017, the calibrator's built-in reference accelerometer measures the cross-axis (transverse) vibrations to detect any interference with the calibration signal. Transverse vibration errors are indicated by two LEDs on the calibrator housing. This unique solution ensures stability of both the calibration level and frequency, regardless of the mass of the tested accelerometer.

7 Manual control of the calibrator

The calibrator's keypad has been designed to be minimal, yet highly ergonomic and easy to use, providing effective operating features. This reduces the number of control buttons on the instrument to just three.

SV 110 keyboard

1-Display, 2-Vibrations level key; 3-Start/Stop key; 4-Charge diode;; 5-Vibration frequency key; 6-Battery diode; 7-USB port.

General key functions:

- Start/stop the calibrator and shaker with the **<Start/Stop>** key.
- Enter/exit Menu mode by simultaneously pressing the **<Level>** and **<Freq.>** keys.
- Scroll through the Menu lists using the **<Level>** and **<Freq.>** keys.
- Open the sub-menu by pressing the **<Start/Stop>** key at the selected position.
- Increase/decrease the value of the signal level, frequency and calibration factor.

7.1 Turning on/off

TURNING ON: To switch the on, the operator should press and hold the **<Start/Stop>** key for a few seconds. The device will switch on and run a self-test routine (during which time the manufacturer's logo, device name and firmware version will be displayed).

The SV 110 displays the amplitude and frequency of the shaker when ready to operate:

TURNING OFF: To turn off the device, the operator should press and hold the **<Start/Stop>** key for a few seconds, during which time countdown will be displayed ("Shutting down" 3… 2… 1…). This gives you time to decide if you really want to turn off the SV 110. If you release the key too early, SV 110 will return to the last **VIEW** mode displayed.

Note: *When the battery capacity is low, SV 110 will display a warning screen and indicate this with red or yellow LED lights. The "Low Battery!" or "Warning! Low Battery!" messages appear when the shaker is stopped or in operation.*

7.2 Menu content

The menu is easy to use, with three keys and a small OLED display. The **Menu** list consists of six items: **Sensor Type**, **Units**, **Frequency Units**, **Calibration**, **Battery**, **USB charging** and **Unit Label**.

To enter **Menu** mode, press the **<Level>** and **<Freq.>** keys simultaneously. The **<Level>** and **<Freq.>** keys allow you to scroll up and down the **Menu** list. To open the sub-menu, press the **<Start/Stop>** key at the selected item.

<Start/Stop>

<Level>

Sensor type selection

The Sensor Type item allows you to select the type of sensor being used: **Accelerometer**, **Velocity** or **Displacement** transducer.

For each sensor type and frequency there is a dedicated set of shaker amplitudes (see chapter "Technical data"):

For **79.58Hz**:

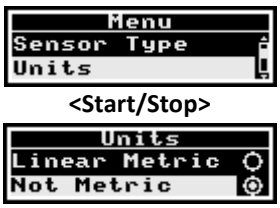
- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 m/s^2
- 2, 4, 6, 8 10, 12, 14, 16, 18, 20 mm/s
- 4, 8, 12, 16, 20, 24, 28, 32, 36, 40 µm.

For **159.2Hz**:

- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 m/s^2
- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 mm/s
- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 µm.

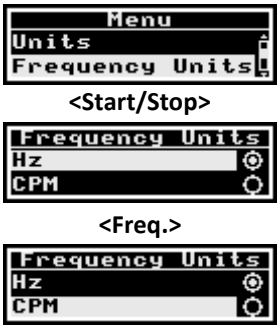
Measurement units selection

The **Units** item allows you to select the measurement units: **Linear Metric** or **Not Metric**.



Frequency units selection

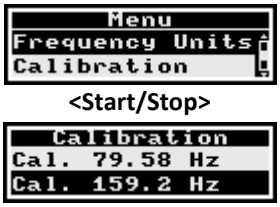
The **Frequency Units** item allows you to select the frequency units: **Hz** or **CPM** (Cycles per minute).



The screen on the right shows the mode with **Non Metric** units and **CPM** frequency.

Setting the calibration factor

The **Calibration** item allows you to set the calibration factor for different calibration frequencies: **79.58Hz** and **159.2Hz**.



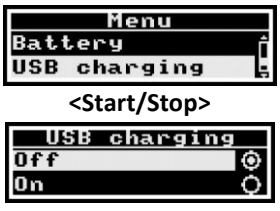
If you decide to change the calibration factor, press the **<Freq.>** key and adjust the calibration **Factor** using the **<Level>** (**"-"**) or **<Freq.>** (**"+"**) keys.

Battery check

The **Battery** item allows you to check the battery status.

USB charging

The **USB charging** item allows you to enable or disable charging from "weak USB power sources". With **USB charging** disabled, the calibrator can only be charged from the charger/power supply and cannot be charged from other USB sources such as a PC.



Unit specific information

The **Unit Label** item allows you to read the unit specific information, e.g.:

- Protected manufacturer name: SVANTEK (C)
- Device name: SV 110
- Device serial number: SN 3500
- Firmware version: 1.02.1
- CRC(OK): 8BD4
- Standards to which the device conforms: ISO 8041-1:2017

8 Performing calibration

- Prepare and install the calibrated sensor according to Chapters 8.1 – 8.2.
- Switch on the calibrator by pressing and holding the **<Start/Stop>** key. The SV 110 will display the amplitude and frequency of the shaker when ready to operate.

- Press the **<Freq.>** key to select the shaker frequency: **79.58Hz** or **159.2Hz**.
- Press the **<Level>** key to select the shaker amplitude, e.g. for an acceleration sensor: **1m/s²**, **2m/s²**, **3m/s²**, **4m/s²**, **5m/s²**, **6m/s²**, **7m/s²**, **8m/s²**, **9 m/s²** or **10m/s²**.
- When the frequency and amplitude are set, start the shaker by pressing the **<Start/Stop>** key.
- Place the calibrator on a rigid surface or hold it in your hand. Wait until the diodes stop flashing yellow. This indicates that the calibration process will not be affected by external vibrations.

  Placing the calibrator on the surface may cause transverse vibrations, which will be indicated by the right LED flashing red.

- The X and Y LEDs will flash yellow when the device is stabilising in the Z-axis direction. The LEDs will stop flashing when the required level is reached.

- If the X and Y LEDs are solid red, it means that the level of external vibration in the X or Y direction is greater than 10% (-20 dB) of the vibration level generated by the shaker in the Z direction. When the external vibration is stabilised, the LEDs will change to green. A stable condition is also indicated by the message “Level OK”.

- When the device reaches the calibration level, the X, Y vibration level is displayed as a % of the Z vibration level generated by the shaker, but only if this level exceeds the 10% value.

THD compensation

THD (Total Harmonic Distortion) means that the harmonics on the Z-axis exceed the threshold of 3% (-30,5 dB) of the reference vibration level. In this case the Z LED will start flashing red.

For example, if the vibration is set at ≈80 Hz, 1 m/s^2 (120 dB), the total vibration level at frequencies n*16 HZ (160, 240, 320, 400,...) cannot exceed 0,03 m/s^2 (89,5 dB).

- If the device detects a high THD level at 79.58 Hz, it will attempt to compensate. If compensation is possible, the message “THD Compensation” will appear.

- If compensation fails, or if a high THD level is detected at 159.2 Hz but the device can reach the calibration level, the message “Level OK, High THD!” will appears.

- If the device cannot reach the calibration level at the required frequency, the message “Level unreachable” will appear and calibration will be stopped. The user will be prompted to exit this screen.

- The internal temperature of the calibrator is constantly monitored and if it exceeds a certain dangerous level, the device will automatically stop the shaker. Such a situation may be an accelerometer that is too heavy. In this case the message “High temperature” will appear and the user should wait until the temperature of the instrument has normalised and continue the calibration.

- To stop the shaker, press the **<Start/Stop>** key.
- Switch of the calibrator by pressing the **<Start/Stop>** key for a few seconds during which a countdown (“Shutting down” 3… 2… 1…) is displayed.

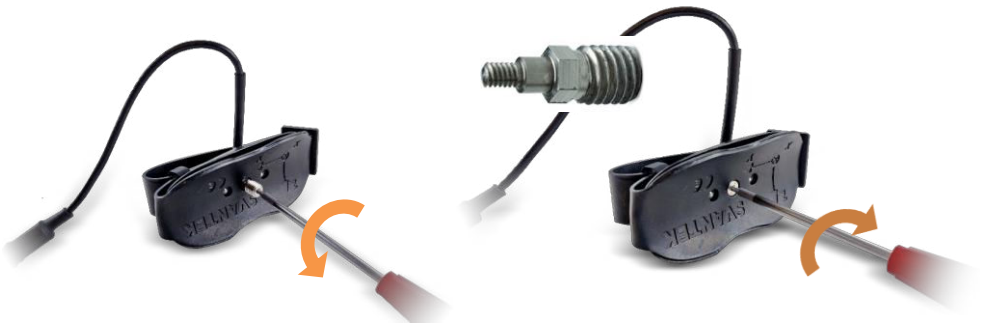
8.1 Calibration of the SV 105 Hand-Arm sensor

Note: *The SV 105 Hand-Arm sensors should only be calibrated at 79,58 Hz.*

Note: *The description of the calibration of the SV 105 Hand-Arm sensors is based on the* ***SV 105D*** *modification using the* ***SA 105D*** *dedicated adapter. This adapter is compatible with all previous modifications of SV 105. At the same time, all previous modifications of SV 105 can be calibrated using their specific adapters and the calibration description given in the previous SV 110 user manuals.*

To perform calibration of the SV 105D Hand-Arm sensor, use the **SA 150** belt with the greatest curvature.

- Screw the SA 150 belt to the SV 105D sensor with the special screw from the SV 105D kit, using a special 1.5mm Allen screwdriver (both included in the SV 105D kit). If the belt was screwed to the sensor with the normal screw, it is necessary to unscrew it and screw in the new screw from the SV 105D kit.



- Place the twisted sensor and strap on the SA 105 adapter (the SV 105D must be positioned so that the cable faces the side of the adapter without the tapped hole). The adapter has a nut that tightens the SV 105D sensor to the SA 105D adapter when twisted. To prevent the strap from dangling, it should be positioned as shown below.

- Attach the calibration adapter with the vibration sensor to the calibrator shaker using the special stud (included in the SA 105 kit):

The positioning of the adapter with the sensor for calibration of the X-axis, Y-axis and Z-axis should be as shown below. Use the appropriate hole in the adapter for the stud.

8.2 Calibration of the general-purpose accelerometer

The general-purpose accelerometer (e.g. SV 80) is mounted directly to the shaker using a magnet adapter or a special stud, included in the accelerometer kit.

9 General care and cleaning

- Remove the sensor and switch off the device.
- Disconnect the power supply.
- Wipe the surface of the device with a cloth moistened with a mixture of warm water and detergent.
- After cleaning, wipe the device with a dry cloth and wait until the surface is completely dry.
- Do not immerse the device in liquids as this may damage the device and cause electric shock. Only the exterior of the device should be cleaned.

10 Charging

The SV 110 instrument is equipped with an internal charger so that the internal batteries can be charged directly from the USB power supply (USP port) or from a charger/power supply.

Note: *It is recommended to charge the calibrator using the supplied charger/power supply! Charging via the USB port is optional and is switched off by default. To charge the calibrator via the USB port, it is necessary to have a USB port with 500mA current.*

When SV 110 is connected to a USB port or USB charger, SV 110 will automatically switch on during charging and display the charge level of the internal battery. SV 110 will display 'Fully charged' when charging is complete. A full charge from the charger/power supply should take approximately 5 hours from a fully discharged state. Charging from via the USB port is much slower and takes approximately 10 hours from a fully discharged state. A fully charged device has enough power to run for up to 12 hours.

Note: *Only use high quality USB cables. Many inferior cables do not provide low resistance, which prevents the internal batteries from charging properly.*

11 Recalibration of SV 110

Recalibration is required at all frequencies where the vibration level is set according to the table below:

Frequency	Vibrations level
79.58 Hz	10m/s^2
159.2 Hz	10m/s^2

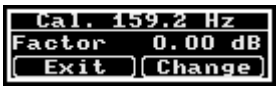
Recalibration for frequency 159.2 Hz:

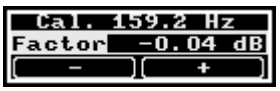
- Install the reference sensor and start the shaker with vibration parameters of **159.2Hz** and **10m/s^2**.

- Wait until the vibration is steady (the LEDs are lit with a steady green light and the message "**Level OK**" is displayed).

- Read the vibration level value from the reference sensor. If it is the same as the one set, move to the next frequency. If it is different, it is necessary to enter/modify the calibration factor.
- Stop the shaker by pressing the **<Start/Stop>** key.

- When the device is stopped, press the **<Level>** and **<Freq.>** keys at the same time to enter the menu.
- Select the type of the sensor in the **Sensor Type** item: **Accelerometer**, **Velocity** or **Displacement**.
- Use the **<Level>** key to select the **Calibration** item.
- Use the **<Level>** key to select the desired shaker frequency.
- Press the **<Start/Stop>** key to enter the **Calibration** menu.
- Press the **<Freq.>** (“**Change**”) key and select the new calibration **Factor** using the **<Level>** (“**-**“) or **<Freq.>** (“**+**”) key.
- Press the **<Start/Stop>** key to accept the new calibration factor and exit the **Calibration** menu.





Note: *As the calibration factor is set, it is recommended to repeat the measurement with the reference sensor.*

Definition of the calibration factor

Use one of the formulae below:

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

where:

A – standard sensor vibration level [dB]

A_0 – set vibration level of the calibrated device [dB]

$$\mathbf{C = Ar - Ac}$$

where:

Ac – set vibration level of the calibrated device [dB]

Ar – standard sensor vibration level [dB].

12 Technical data

Generated reference (calibration) signals			
Frequency	79,58	159,2 Hz	
Vibration accelerations (RMS)	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	$\frac{m}{s^2}$
Vibration velocities (RMS)	2; 4; 6; 8; 10; 12; 14; 16; 18; 20	2; 4; 6; 8; 10; 12; 14; 16; 18; 20	$\frac{mm}{s}$
Vibration displacement (RMS)	4; 8; 12; 16; 20; 24; 28; 32; 36; 40	4; 8; 12; 16; 20; 24; 28; 32; 36; 40	**µm**
Amplitude error	**Less than ± 3%**		
Frequency error	**Less than ± 0,5%**		
Transverse vibration	**Less than 10% of main direction**		
Harmonic distortion	<3		**%**
Warm up time	< 10		**s**
General			
Maximum loading mass	300	200	**g**
Sensor mounting	Threaded hole M5 x 6 mm; Mounting disc for attaching with Beeswax or SA 38 adapter		
Levelling time	Typically 5 ÷ 20 seconds,		
Working conditions			
Temperature range	-10°C ÷ 50°C		
Humidity range	25% ÷ 85%		
Power supply			
Battery type	NIMH Rechargeable 7.2V/2.2 Ah		
Battery operating time	Loading mass and operating frequency depended. Up to 12 hours (110g@79,6Hz)		
Automatic switch off	From 5 to 60 minutes adjustable		
Charging time	5 hours (with SA 54) or 10 hours (with USB)		
Charger	Original (5V / 2.1A) or mini USB 500 mA HUB		
Overall weight and dimensions			
Weight	1,25 kg (incl. battery)		
Dimensions	65 x 65 x 168 mm		

13 Declaration of Conformity

SVANTEK

INSTRUMENTATION FOR SOUND & VIBRATION
MEASUREMENTS AND ANALYSIS

ISO 9001
ZETOM-CERT

EU Declaration of Conformity

No. SV110-CE-EN/06/2019

Manufacturer:	**SVANTEK Sp. z o. o**
Address:	Strzyglowska 81 04-872 Warszawa Poland
Kind of product:	VIBRATION CALIBRATOR
Type:	**SV 110**

Directive: **Electromagnetic Compatibility Directive (EMC) 2014/30/EU**

Standards: EN 61326-1:2013 Measurement equipment: EMC emission and immunity

EN 55011:2016 Radio-frequency disturbance characteristics - Limits and methods of measurement

Auxiliary industry standards:

ISO 8041-1:2017 Human response to vibration -- Measuring instrumentation -- Part 1: General purpose vibration meters

I, the undersigned authorised manufacturer representative, declare that this declaration is issued under the sole responsibility of the manufacturer, and that the object of the declaration described above is in conformity with the relevant Union harmonization legislation.

Place of issue: **Warsaw, Poland**

Date of issue: 7 06 2019

Wiesław Barwicz, General Manager ..... (signature)

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