



# USER MANUAL



# SV 110

## PORTABLE VIBRATION CALIBRATOR



**Notice:** *Battery power indicator - To improve accuracy of remaining battery life indicator, run the instrument until it is fully discharged; then proceed with a full charge via the mini USB port. The procedure is recommended before first use. Repeat this procedure every few months of use to maintain more accurate current battery condition indication.*



**Notice:** *On account 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](http://www.svantek.com). This user's manual presents the firmware revision named 1.02.1 (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.*



**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.*

#### Trademarks

Microsoft and Windows are registered trademarks of Microsoft Corporation

#### Copyright © 2015, SVANTEK sp. z o.o.

All rights reserved. No part of this publication may be reproduced or distributed in any form, or by any means, without prior written consent from SVANTEK, Warsaw, Poland

## CONTENTS

1. General safety summary .....	4
2. Calibration .....	4
3. Accuracy of calibration .....	5
4. SV110 model information .....	5
5. Unpacking and Inspecting the package contents.....	6
6. Getting started .....	7
7. Manual control of the calibrator .....	8
7.1. Turning on/off .....	8
7.2. Menu content.....	9
8. Calibration .....	11
9. General Care and Cleaning .....	13
10. Charging.....	14
11. Technical data.....	16
12. Recalibration of SV110 .....	14
Document history.....	17




## 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:

- 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 state
- 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 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 the generated vibration signals is called the tolerance and is strictly defined by the standard ISO8041:2005.

### 4. SV110 model information

- The SV 110 is a hand-held vibration calibrator designed for verification of machine sensors as well as on-site checks of human vibration accelerometers in accordance to ISO 8041:2005.
- The two standard frequencies 79.58 and 159.2 Hz brings opportunity to calibrate wide range of an existing transducers with maximum load of 0.3 kg.
- Depending on the selected frequency, the user can select the level of the calibration from 1 m/s<sup>2</sup> to 10 m/s<sup>2</sup>.
- 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 light weight of the calibrator allows to perform transducers calibration in the field conditions keeping it in hands.
- Two diodes indicate the external vertical and horizontal vibration that can affect the tolerances specified by the ISO8041:2005.
- Accelerometers are conveniently attached using either a mounting stud, a mounting disc or a dedicated adapters.
- The calibrator has built-in rechargeable batteries that power it for 12 hours of continuous operation\*.
- The calibrator has a robust casing with the leather cover for hand-arm in field use.



\*) In case of 79.58 Hz frequency and accelerometer weight less than 200g. For other frequency and/or accelerometer weight continuous operation time will be shorter.

## 5. Unpacking and Inspecting the package contents

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 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.

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.

Before the first use of the device, in order to charge the battery completely, connect **SA 54** AC/DC adapter plug to SV110 USB socket and then connect it to electrical mains.

The complete set includes the following items:

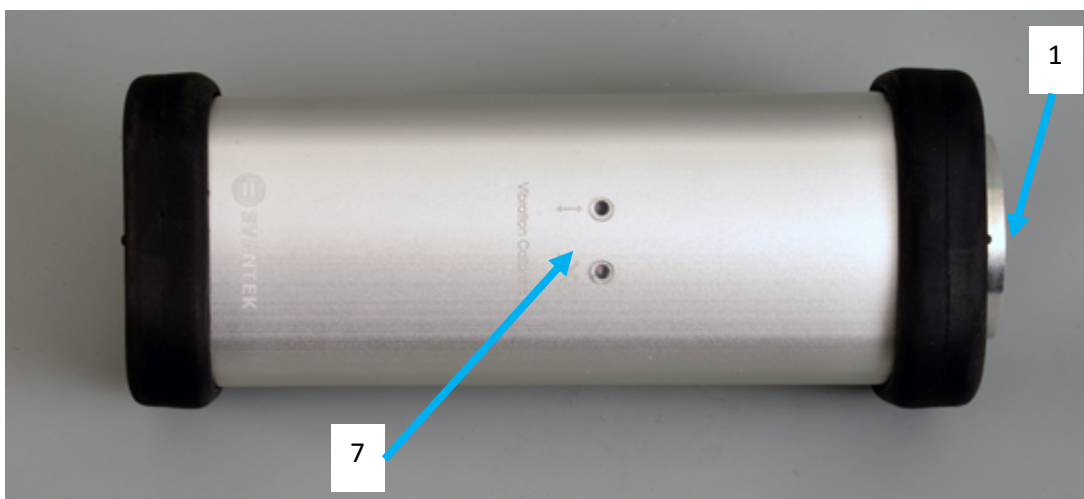
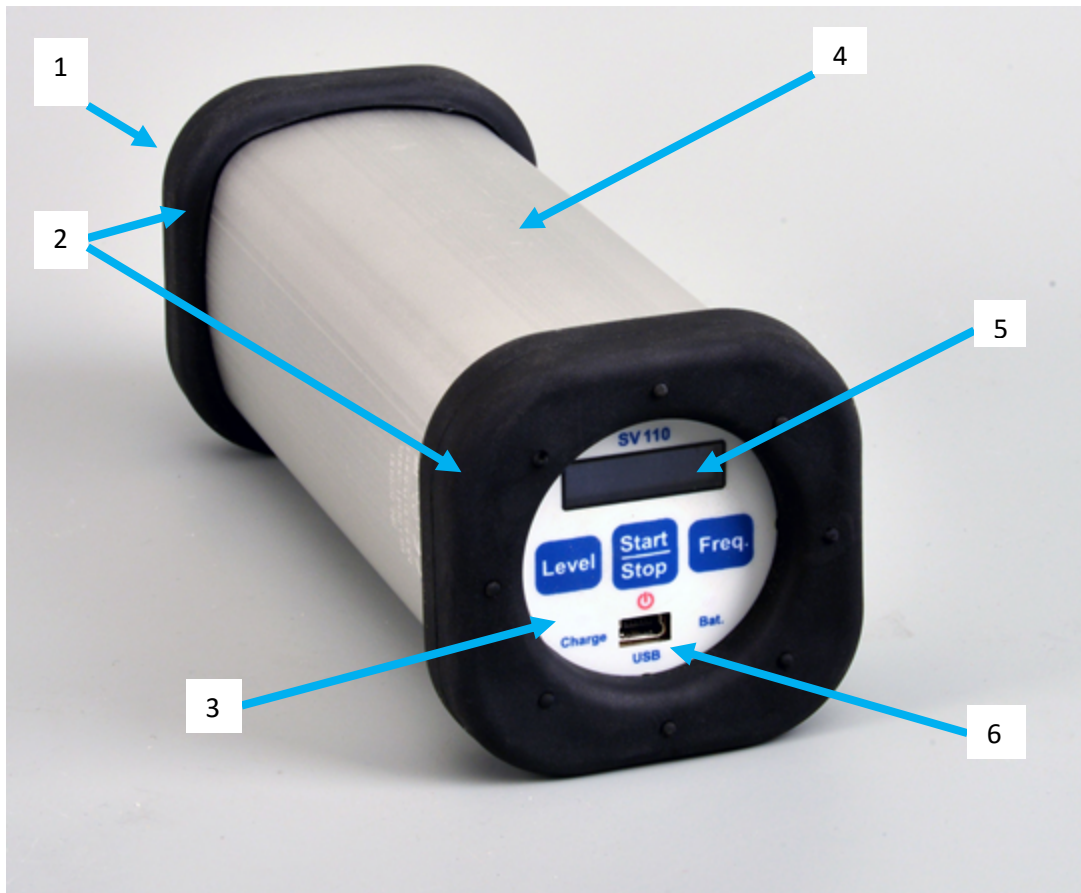
- **SV 110** – Portable Vibration Calibrator
- **SA 54** – Charger/power supply for SV 110
- **SC 56** - mini USB 2.0 cable
- **SA 81** – leather cover
- **CD with user manual**
- **Built-in rechargeable batteries**

Optional adapters:

- **SA 105A** - adapter for SV 105A (option)
- **SA 155** - adapter for SV150 and SV151 (option)
- **SA 40** - adapter for SV 207A, Dytran 3233A, SV 39A, Dytran 3143M1 (option)
- **SA 44** - adapter for SV 50, Dytran 3023M2 (option)

## 6. Getting started

The following figures show the SV 110 controls and ports:



### SV110 vibration calibrator

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

Following the requirements of ISO 8041, the calibrator's built-in reference accelerometer measures the cross-axis (transverse) vibrations to detect any interference to the calibration signal. Faults caused by transverse vibrations are indicated by two LEDs on the calibrator's housing. This unique solution ensures stability of both the calibration level & frequency, independent from the mass of the test object.

## 7. Manual control of the calibrator

The Instrument's keypad is designed to be minimal, but still highly ergonomic and easy to use providing effective operational capabilities. Thanks to that, the number of the control push-buttons of the instrument is reduced to only three.



**SV110 keyboard**

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

General keys functions:

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

### 7.1. Turning on/off

**TURNING ON:** To switch the power on the operator should hold the **<Start/Stop>** key for a couple of seconds. The instrument switches on and goes the self-test routine



(during this time the manufacturer's logo, the name of the instrument and firmware version is displayed).

In the ready to operate mode the SV 110 displays the amplitude and frequency of the shaker:



**TURNING OFF:** To shut down the unit the operator should hold the **<Start/Stop>** key for a couple of seconds during which a countdown (“Shutting down” 3... 2... 1... ) is displayed. Thus, the **SV 110** gives you time to decide if you really want to turn off the instrument. If you release the key too early, the **SV 110** returns to the last presented **VIEW** mode.



**Notice:** If the battery capacity is low **SV 110** will show a warning screen and signal it with red or yellow diode lights.

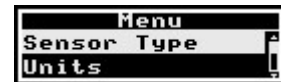
“Low Battery!” or “Warning! Low Battery!” messages appear when the shaker is stopped or is working accordingly.



## 7.2. Menu content

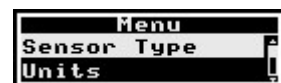
The menu is simply operated by three push-buttons and small OLED display. The **Menu** list consists of six positions: **Sensor Type**, **Units**, **Frequency Units**, **Calibration**, **Battery**, **USB charging** and **Unit Label**.

To enter the **Menu** mode the user should press **<Level>** and **<Freq.>** keys simultaneously. The **<Level>** and **<Freq.>** keys enable the user To scroll the **Menu** list down and up. To open the sub-menu the user should press **<Start/Stop>** key at the selected position.



### Sensor type selection

The **Sensor Type** position enables the user to select the type of used sensor: **Accelerometer** or **Velocity** and **Displacement** transducer.



**<Start/Stop>**



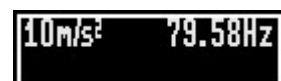
**<Level>**



For each sensor type and frequency there is dedicated set of charger amplitudes (see chapter “Technical data”):

For **79.58Hz**:

- 1; 2; 3; 4; 5; 6; 7; 8; 9; 10 m/s<sup>2</sup>;
- 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<sup>2</sup>;
- 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** position enables the user to select the measurement unit: **Linear Metric** or **Not Metric**.

**Frequency units selection**

The **Frequency Units** position enables the user to select the frequency units: **Hz** or **CPM** (Cycles per minute).

The screen on the right presents the ready to operate mode with **Non Metric** units and **CPM** frequency.

**Calibration factor setting**

The **Calibration** position enables the user to set the calibration factor for different calibration frequencies: **79.58Hz** and **159.2Hz**.

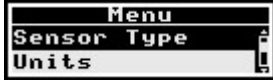
If the user decided to change the calibration factor he must press the **<Freq.>** key. After this to set the calibration **Factor** with the **<Level>** ("-") or **<Freq.>** ("+") keys.

**Battery control**

The **Battery** position enables the user to check the battery condition.

**USB charging**

The **USB charging** position enables the user to switch on



<Start/Stop>



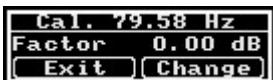
<Start/Stop>



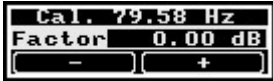
<Freq.>



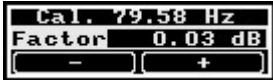
<Start/Stop>



<Freq.>



<Freq.>



<Start/Stop>



<Start/Stop>

or off the charging via USB port. If **USB charging** is switched off the unit will not charge the internal batteries via USB also when connected to USB source.

### Unit specific information

The **Unit Label** position enables the user to read the unit specific information:

- Copyrighted manufacturer name: SVANTEK (C)
- Instrument name: SV 110
- Unit serial number: SN 3500
- Firmware version: 1.02.1
- CRC(OK): 8BD4
- Standards that instrument conforms: ISO 8041:2005



<Start/Stop>



<Level>



<Level>



<Level>



## 8. Calibration

- Install the calibrated sensor on the shaker.

The SV 105 Hand-Arm sensor is calibrated with the use of dedicated adapter.



The Adapter should be installed on the shaker with the special stud.



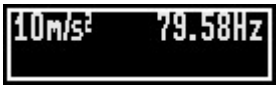


**Notice:** The SV 105 Hand-Arm sensor should be calibrated at 79,58 Hz only!

The general purpose accelerometer is connected to the shaker with the use of magnet adapter or with the special stud.



- Switch on calibrator by pressing **<Start/Stop>** key for a while. In ready to operate mode the **SV 110** displays the amplitude and frequency of the shaker
- By pressing the **<Freq.>** key select the shaker frequency: **79.58Hz** or **159.2Hz**.
- By pressing the **<Level>** key select the shaker amplitude, as example for an acceleration sensor: **1m/s<sup>2</sup>, 2m/s<sup>2</sup>, 3m/s<sup>2</sup>, 4m/s<sup>2</sup>, 5m/s<sup>2</sup>, 6m/s<sup>2</sup>, 7m/s<sup>2</sup>, 8m/s<sup>2</sup>, 9 m/s<sup>2</sup> or 10m/s<sup>2</sup>**.
- When the frequency and amplitude are set, run the shaker by pressing **<Start/Stop>** key.



- Hold the calibrator in a hand. Wait until both diodes emit a green light. This means that the calibration process is not disturbed by an external vibration.
- Placing calibrator on a surface may cause appearance of transverse vibrations which is signaled by the right-hand side LED diode emitting a red light.



- X and Y LEDs flashing yellow when the device is stabilising in Z axis direction. When the required level is achieved the LEDs stop flashing.

- If X and Y LEDs light red steadily it means that external vibrations' level in X or Y directions are higher than 10% (-20dB) of vibration level generated by shaker in Z direction. After external vibration is stabilized the LEDs are changed to green. Stable condition is indicated also by message "Level OK".



- If the calibration level is achieved by the unit, the X, Y vibration level is indicated as a % of vibration level generated by shaker in Z direction, but only if this level exceeds 10% value.

```
10m/s² 79.58Hz
Level OK
X Y Vibr.: 22 %
```

### THD compensation

**THD** (Total harmonic distortion) – means that the harmonics on Z axis exceed threshold 3% (-30,5 dB) of reference vibration level. In this case Z-diode starts to flash with red light.

For example: When the vibrations are set with  $\approx 80$  Hz,  $1 \text{ m/s}^2$  (120 dB), then the total vibrations amount with frequencies  $n \cdot 16$  Hz (160, 240, 320, 400,...) cannot be higher than  $0,03 \text{ m/s}^2$  (89,5 dB).

- If the unit detects the high THD level at 79.58Hz it will try to compensate it. If compensation is possible the “THD Compensation” message appears.

```
10m/s² 79.58Hz
Level OK
THD Compensation
```

- If compensation fails or in case the high THD level is detected at **159.2Hz**, but the unit can achieve the calibration level, the “Level OK, High THD!” message appears.

```
10m/s² 159.2Hz
Level OK
High THD
```

- If the unit cannot achieve the calibration level at the required frequency, the “Level unreachable” message appears and calibration is stopped. The user will be proposed to exit this screen.

```
Level
unreachable
Exit
```

- The inner temperature of the calibrator is constantly controlled and if it exceeds the certain dangerous level, the device is automatically stopped the shaker. Such situation may be caused by too heavy accelerometer. If this happened the “High temperature” message appears and the user should wait until the device temperature is normalised and continue the calibration.

```
High temperature
Exit
```

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

## 9. 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

### 10. Charging

**SV 110** instrument is equipped with an internal charger, so that the fixed internal batteries can be charged directly from USB port or charger (**SA 54**).



***Notice:** It is recommended to charge the unit with charger **SA 54**! Charging via USB port is optional and by default is switched off. To charge via USB it is necessary to have USB port with 500mA.*

Ensure the **SV 110** is fully charged prior to use by connecting it to a USB port or to USB charger. The **SV 110** will automatically switch on during charging and display how much the internal instrument battery is loaded. The **SV 110** will display 'Fully charged' once charging is complete. Full charging from **SA 54** should take approximately 5 hours from a fully discharged state. Charging from PC via USB port is much slower and takes approximately 10 hours for fully discharged battery. A fully charged instrument holds enough charge to run maximum 12 hours of work with attached accelerometer.





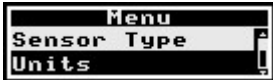




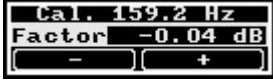

***Notice:** Use only high quality USB cables. Many poor quality cables do not ensure low resistance of the cable, thus disabling proper charging of the internal cells.*

### 11. Recalibration of SV110

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

Frequency	Vibrations level
79.58 Hz	10m/s <sup>2</sup>
159.2 Hz	10m/s <sup>2</sup>

Recalibration for frequency 159.2Hz:

- Install the reference sensor and start the shaker with **159.2Hz** and **10m/s<sup>2</sup>** vibrations parameters. 
- Wait until the vibrations are steady (diodes are lighting with green continuous light and information “**Level OK**” is displayed). 
- 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 shaker by pressing **<Start/Stop>** button
- When the device is idle press buttons **<Level>** and **<Freq.>** at the same time to enter the menu. 
- Select the sensor type in the **Sensor Type** position: **Accelerometer**, **Velocity** or **Displacement**. 
- With the **<Level>** button select the **Calibration** position. 
- With the **<Level>** button select the required frequency of the shaker. 
- With the **<Start/Stop>** button enter the **Calibration** menu. 
- Press the **<Freq.>** button (“**Change**”) and select the new calibration **Factor** with the **<Level>** (“-”) or **<Freq.>** (“+”) buttons. 
- Press the **<Start/Stop>** button to confirm new calibration Factor and exit the **Calibration** menu. 



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

### Definition of the calibration factor

Use one of formulas below:

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

$$C = A_r - A_c$$

Where:

A – standard sensor vibration level

$A_0$  –set vibration level of calibrated device

Where:

Ac- set vibrations level of calibrated device [dB]

Ar – standard sensor vibration level [dB].

## 12. Technical data

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



**Document history**

Version	Issue Date	Remarks	Software Version