



USER MANUAL



SV 110

PORTABLE VIBRATION CALIBRATOR



Note: *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.*



Note: *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. This user's manual presents the firmware revision named **1.02.x**. 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:

- 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 a calibration laboratory. If there is no possibility to recalibrate the device by a calibration laboratory the device should be send to the manufacturer.
- All maintenance work and repairs can only be done by a 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 you 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 ISO 8041-1:2017.

4 SV 110 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 8041-1:2017.
- 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/s² to 10 m/s².
- 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 ISO 8041:2017.
- Accelerometers are conveniently attached using either a mounting stud, a mounting disc or 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 the room temperature before connecting it 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 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 the charger/power supply plug to the SV 110 USB socket and then connect it to the electrical mains.

The complete set includes the following items:

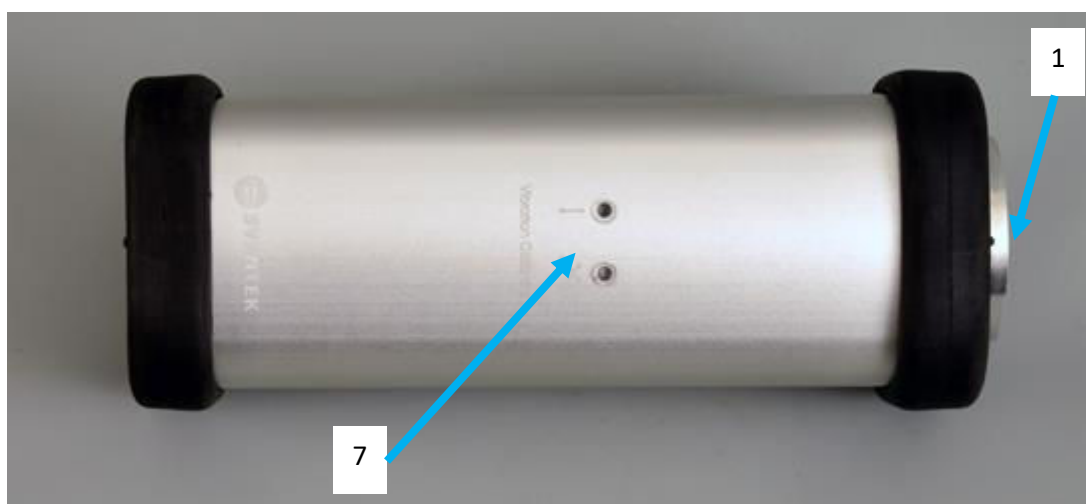
- **SV 110** Portable Vibration Calibrator including charger/power supply
- **SC 56** mini USB 2.0 cable
- **SA 81** leather cover

Optional adapters:

- **SA 105** adapter for SV 105 (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 figure shows the SV 110 controls and ports:



SV 110 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 8041-1:2017, 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 the stability of both the calibration level and the frequency, regardless of the mass of the tested object.

7 Manual control of the calibrator

The calibrator 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 keys of the instrument is reduced to only three.



SV 110 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 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, SV 110 gives you time to decide if you really want to turn off the instrument. If you release the key too early, SV 110 returns to the last presented **VIEW** mode.



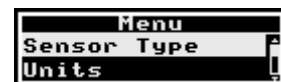
Note: If the battery capacity is low SV 110 will show a warning screen and signals it with red or yellow diode lights. "Low Battery!" or "Warning! Low Battery!" messages appear when the shaker is stopped or is working accordingly.



7.2 Menu content

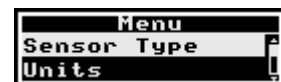
The menu is simply operated by three keys and small OLED display. The **Menu** list consists of six positions: **Sensor Type**, **Units**, **Frequency Units**, **Calibration**, **Battery**, **USB charging** and **Unit Label**.

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 the **<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>



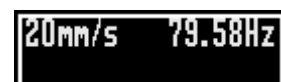
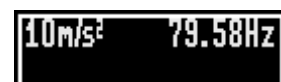
<Level>



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

For **79.58Hz**:

- 1; 2; 3; 4; 5; 6; 7; 8; 9; 10 m/s²;
- 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/s²;
- 1; 2; 3; 4; 5; 6; 7; 8; 9; 10 mm/s;
- 1; 2; 3; 4; 5; 6; 7; 8; 9; 10 μ m.

Measurement units selection

The **Units** position enables the user to select the measurement units: **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 and set the calibration **Factor** with the **<Level>** ("-") or **<Freq.>** ("+") keys.

Battery control

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

40 μ m 79.58Hz

10m/s² 159.2Hz

10mm/s 159.2Hz

10 μ m 159.2Hz

Menu
Sensor Type
Units

<Start/Stop>

Units
Linear Metric
Not Metric

Menu
Units
Frequency Units

<Start/Stop>

Frequency Units
Hz
CPM

<Freq.>

Frequency Units
Hz
CPM

1.02 g 4775cpm

Menu
Frequency Units
Calibration

<Start/Stop>

Calibration
Cal. 79.58 Hz
Cal. 159.2 Hz

Cal. 79.58 Hz
Factor 0.00 dB
Exit Change

<Freq.>

Cal. 79.58 Hz
Factor 0.00 dB
- +

<Freq.>

Cal. 79.58 Hz
Factor 0.03 dB
- +

Menu
Calibration
Battery

<Start/Stop>

Battery
Slow charging
Charge 100 %

USB charging

The **USB charging** position enables the user to switch on or off the charging from the “weak USB power sources”. With the switched off **USB charging** the calibrator can be charged only from the charger/power supply unit and cannot be charged from other USB sources, like PC.

```

Menu
Battery
USB charging
<Start/Stop>
  
```

```

USB charging
Off
On
  
```

```

Menu
USB charging
Unit Label
<Start/Stop>
  
```

```

Unit Label
SVANTEK (C)
SU 110
<Level>
  
```

```

Unit Label
SN 52500
Version 1.02.1
<Level>
  
```

```

Unit Label
CRC(OK) 8BD4
  
```

Unit specific information

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

- 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 8041-1:2017

8 Performing calibration

- Prepare and install the calibrated sensor according to Chapters 8.1 – 8.3.
- Switch on calibrator by pressing the **<Start/Stop>** key for a while. In the ready to operate mode 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/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, run the shaker by pressing the **<Start/Stop>** key.
- Put the calibrator on the rigid surface or keep it in the hand. Wait until the diodes will stop blinking yellow. This means that the calibration process is not disturbed by an external vibration.

```

10m/s2 79.58Hz
  
```



- 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% (-20 dB) of vibration level generated by the 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 the shaker in Z direction, but only if this level exceeds 10% value.

```
10m/s² 79.58Hz
Level OK
```

```
10m/s² 159.2Hz
Level OK
```

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

THD compensation

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

For example: When the vibrations are set with ≈ 80 Hz, 1 m/s^2 (120 dB), then the total vibration level 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 79.58 Hz it will try to compensate it. If compensation is possible the "THD Compensation" message appears.
- If compensation fails or in case the high THD level is detected at 159.2 Hz, but the unit can achieve the calibration level, the "Level OK, High THD!" message appears.
- 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.
- The inner temperature of the calibrator is constantly controlled and if it exceeds the certain dangerous level, the device automatically stops 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.
- To stop the shaker, press the **<Start/Stop>** key.
- Switch of the calibrator by pressing the **<Start/Stop>** key for a couple of seconds during which a countdown ("Shutting down" 3... 2... 1...) is displayed.

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

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

```
Level
unreachable
Exit
```

```
High temperature
Exit
```

8.1 Calibration of the SV 105 Hand-Arm sensor



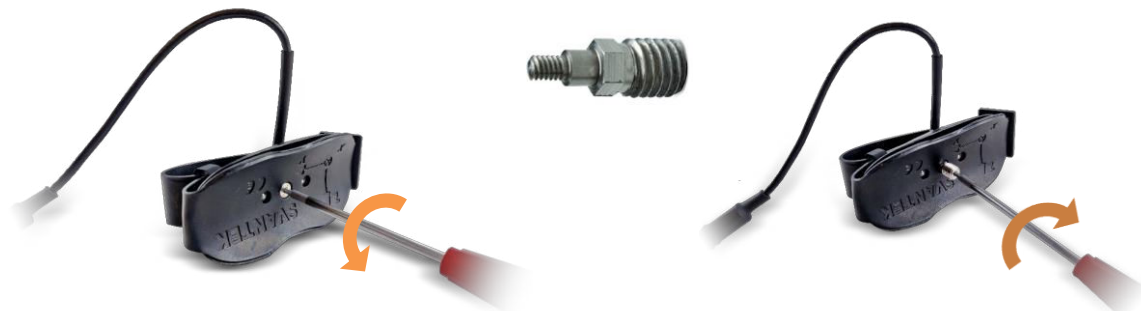
Note: The SV 105 Hand-Arm sensors should be calibrated at 79,58 Hz only.



Note: The description of calibration of SV 105 Hand-Arm sensors is given based on its **SV 105D** modification with the use of 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 with the use of their dedicated adapters and the calibration description presented in the previous SV 110 User manuals.

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

- Screw the SA 150C belt to the SV 105D sensor with the special screw from the SV 105D kit using for that 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 again with the screw from the SV 105D kit.



- Apply the twisted sensor and belt to the SA 105D adapter (SV 105D must be positioned so that the cable is facing the adapter side without thread hole). The adapter has a nut that will tighten the SV 105D sensor to the SA 105D adapter when twisted. In order for the belt not to dangle, it should be positioned as shown in the photo below.



- Install the calibration adapter with the vibration sensor to the calibrator's shaker using special stud (included in the SA 105 set):



Positioning of the adapter with the sensor for calibration of the X-axis, Y-axis and Z-axis should be as per photos below. For this use the appropriate hole in the adapter for the stud.



8.2 Calibration 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.

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



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

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



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

Connect SV 110 to a USB port or USB charger. SV 110 will turn on automatically while charging and display the charge level of the instrument's internal battery. SV 110 will display 'Fully charged' once charging is complete. Full charging 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 for fully discharged battery. A fully charged instrument has enough energy to run for up to 12 hours.



Note: Use only high-quality USB cables. Many poor-quality cables do not ensure low resistance of the cable, thus preventing the internal batteries from being charged properly.

11 Recalibration of SV 110

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 ²
159.2 Hz	10m/s ²

Recalibration for frequency 159.2Hz:

- Install the reference sensor and start the shaker with **159.2Hz** and **10m/s²** vibration parameters.
- Wait until the vibration is 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 shift to the next frequency. When it is different it is necessary to enter/modify the calibration factor.
- Stop the shaker by pressing <Start/Stop> button.
- When the device is idle press the <Level> and <Freq.> buttons 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.> (“+”) button.
- Press the <Start/Stop> button to confirm new calibration factor and exit the **Calibration** menu.

```

Menu
Frequency Units
Calibration

```

```

Calibration
Cal. 79.58 Hz
Cal. 159.2 Hz

```

```

Cal. 159.2 Hz
Factor 0.00 dB
Exit Change

```

```

Cal. 159.2 Hz
Factor -0.04 dB
- +

```

```

Menu
Units
Calibration

```



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 formulas bellow:

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

where:

A – standard sensor vibration level

A₀ – set vibration level of the calibrated device

$$C = A_r - A_c$$

where:

A_c – set vibrations level of calibrated device [dB]

A_r – 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	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	$\frac{mm}{s}$
Vibration displacement (rms)	4; 8; 12; 16; 20; 24; 28; 32; 36; 40	1; 2; 3; 4; 5; 6; 7; 8; 9; 10	μm
Amplitude error	Less than $\pm 3\%$		
Frequency error	Less than $\pm 0,5\%$		
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



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:

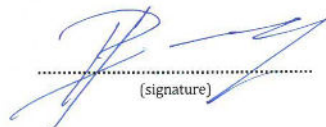
ISO 8041-1:2017 Human response to vibration -- Measuring instrumentation -- Part 1: General purpose vibration meters

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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