



SV 36

ACOUSTIC CALIBRATOR

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1. INTRODUCTION

1.1. Calibration

Calibration determines the ratio between the input signal value and the indication on the display of the measuring device (or measured result).

In principle, there are more or less large systematic deviations between the displayed measured value and the true value of the measured signal for every measuring device. The task of calibration is to determine these systematic deviations.

The simplest way to consider such systematic deviations is a correction of measurements by calibration factor obtained with the use of an acoustic calibrator.

However, in many cases it is sufficient to determine that the systematic deviations are within certain limits.

"Correct" value of the measured signal is set before calibration, and this value is compared with a value measured by the measuring device.

Thus, calibration means establishing a relationship between the reference and measured value of the variable for the corresponding standard to be able to take this ratio into account in subsequent measurements as a correction factor (calibration factor).

1.2. Accuracy of calibration

Measuring equipment and measurement methods have deviations. The measured variable is affected by environmental conditions (temperature and humidity), as well as the operator's actions. The displayed value of the measured variable will therefore usually deviate from the true value of the measured variable.

It is recommended to check the SV 36 every 2 years with periodic testing of the test equipment to ensure that the level values do not change, and the test results are reliable.

It is important to carefully check who should perform such monitoring:

- internally by the monitoring body,
- SVANTEK's own calibration laboratory according to ILAC
- externally from PTB = Physikalisch-Technische Bundesanstalt
- another local accredited laboratory

Accuracy

There is a deviation between the true value and the average value of the series of measurements under repetitive conditions, which is the result of repeated measurement of the reference level.

Overview of the classification of sound level meters and calibrators

Classification of sound level meters and acoustic calibrators

The acoustic calibrators (see IEC 60942. 2003) and the sound level meters (see IEC 61672: 2002) are classified into their respective classes and types for accuracy.

Type LS is subject to the strictest requirements of the device. Devices of this class are classified as the most precise.

Each of the following types (LS, 1 and 2) allow a wider tolerance range (see Table 1).

Table 1. Tolerances for these types of acoustic devices, except for the maximum extended measurement uncertainty ($f = 1\text{kHz}$)

Class / Type	LS	1	2
Sound level meters (dB)	-	0.7	1.0
Acoustic calibrators (dB)	0.10	0.25	0.40

As shown in Table 1, the acoustic calibrator has unambiguously lower tolerances than the sound level meter of the same class. Thus, the calibrator, as a reference of acoustic pressure, should be more precise than a sound level meter.

With respect to acoustic measurements conducted in accordance with the standard, the requirements for calibrating the measuring channel before each measurement and very often also after measurement are mandatory.

2. ACOUSTIC CALIBRATOR SV 36

2.1. General description

The SV 36 acoustic calibrator is a small, portable dual-range (94dB and 114dB) Class 1 device (sound source), see Picture 1. Powered by two LR03/AAA batteries, it contains a loudspeaker producing acoustic pressure, reference piezoresistive sensor for monitoring generated level, pressure and temperature sensors for measurements of atmospheric conditions and a microprocessor system controlling the operation of the calibrator. Sinusoidal waveform of 1 kHz frequency is digitally generated and feeds the loudspeaker. Sampled signal from the reference piezoresistive sensor indicates the level of currently generated signal in a feedback loop. On the basis of information about the level of the signal, actual values of pressure and temperature, microprocessor adjusts amplification of the loudspeaker signal in order to produce appropriate sound pressure level in the calibrator's chamber.



Note: Due to the feedback regulation loop the SV 36 calibrator does not require adjusting and operates in a wide range of temperatures and humidity (see SV 36 Datasheet).



Picture 1. Acoustic calibrator SV 36

The SV 36 is designed for calibration of sound level meters with $\frac{1}{2}$ " and $\frac{1}{4}$ " microphones. Picture 2 shows the calibration of Class 1 sound level meter SVAN 971 with a $\frac{1}{2}$ " microphone.



Picture 2. Calibration of the SVAN 971 sound level meter with a 1/2" measurement microphone



Note: For calibration of a meter with a 1/4" microphone the SA 30 reduction adapter must be applied.

2.2. Using the calibrator

2.2.1. Automatic calibration

The SV 36 calibrator is equipped with an optical system which detects the presence of a microphone in the calibrator's chamber. That allows the calibrator to be switched on automatically, when it is placed on the microphone and to be switched off when it is dismantled. For this reason, usage of the SV 36 calibrator is as simple as putting it on the microphone, performing the calibration and taking it off the microphone.



Note: The SV 36 calibrator will always switch on in the range set at the moment of switching it off.



Note: The automatic switching on will not work when the SA30 calibration adapter is inserted into the calibrators chamber.



Note: Default range after replacing the battery is 114 dB.

2.2.2. Button functions

The SV 36 calibrator is equipped with a multifunctional button for controlling operation of the device. The functions of the button depend on the state of the calibrator (ON/OFF) and on the time of its pressing (see Table 2).

When the calibrator is OFF, pressing the button turns it on immediately. Range is automatically set to that one in which the calibrator was switched off. If the calibrator is not put on the microphone within 3-5 seconds from turning on, it will switch off automatically.

When the calibrator is ON, short pressing of the button (less than 3-5 sec.) will cause switching the range from 94 dB to 114 dB or the other way round.

Either when the SV 36 is ON or OFF pressing the button over 10 seconds and releasing it will cause full reset of the system. Normally this function is not necessary. It has been implemented in the case of inappropriate operation of the calibrator caused by external (EM radiation, subnormal atmospheric conditions, etc.) or internal (inappropriate system reset as a result of battery replacement) factors.

The operation time of the calibrator with a microphone put inside its chamber is limited to 3 minutes. This functionality was added in order to save the battery, e.g. when the calibrator is accidentally left with the microphone inside.



Note: Leaving the SA 30 reduction adapter in the chamber of the calibrator is equivalent with the state of the microphone being left inside. Hence, the calibrator will switch off automatically after 3 minutes from the moment the adapter is put inside the calibrator.

Table 2. Functional description of the calibrator's button.

Calibrator turned OFF	
Button press	Function description
Short, less than 3 sec.	Turn on the device
Over 10 sec.	Full reset of the system

Calibrator turned ON	
Button press	Function description
Short, less than 3 sec.	Change the range of the device
Over 10 sec.	Full reset of the system

2.2.3. Range diodes

In normal mode of operation, the calibrator's diodes act as range indicators. In this mode diode of the chosen range is lighting with continuous light, indicating that the device is ready for to start the calibration procedure (see Picture 4).

After the calibrator is put on the microphone, switched on or the range is changed, acoustic pressure inside the calibrator's chamber is adjusted to the desired level. During that process, appropriate range diode blinks with a frequency of 2 Hz.



Note: Calibration should not be performed until the range diode is lighting with continuous light.



Picture 4. The top view of the SV 36 calibrator with one diode on

The diodes blinking alternately indicate the low voltage of the battery. It is recommended to not use the SV 36 calibrator in this state as the generated level may differ from the declared values.



Note: Replace the batteries, when diodes blink alternately.

2.3. Replacing the battery

The battery should be replaced as follows:



a) remove the rubber cover on the button and diodes' side



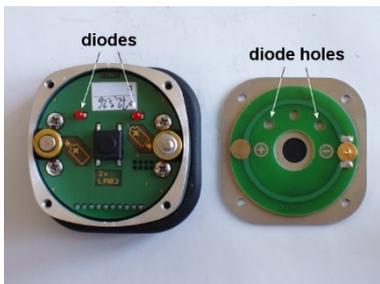
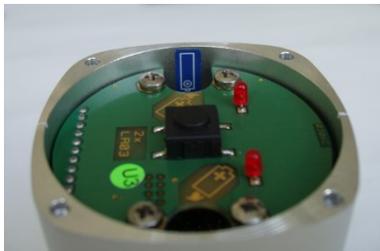
b) holding the cover unscrew four fixing screws with your fingers



c) take off the cover and remove discharged batteries



d) put new batteries in place of the discharged ones with polarization as indicated on the printed board and calibrator's case



e) put on the cover so that the diodes fit the corresponding holes in it



f) holding the cover with one hand fasten the fixing screws



g) put on the rubber cover

3. SV 36 TECHNICAL SPECIFICATIONS

Output signal

Sound Pressure Level (SPL):	94 dB and 114 dB, with respect to 20 μ Pa in reference conditions
Output frequency	1000 Hz
Accuracy:	IEC 60942: 2003 standard, Class 1
SPL Accuracy:	± 0.3 dB
Frequency accuracy:	± 0.2 %
Total Distortion	< 0.25 % for 94 dB range and < 0.75 % for 114 dB range

Reference conditions

Temperature:	23 °C
Atmospheric pressure:	101.3 kPa
Humidity:	30-80 % RH
Effective microphone load volume:	250 mm ³ , microphone type: Brüel&Kjaer 4134, SN: 1591010

General data

Effective load volume sensitivity:	0.00027 dB / mm ³
Level stabilization time:	typical 10 sec., max. 25 sec.
Microphone dimensions:	½" and ¼" with reduction adapter SA 30
Storage temperature range:	-25 °C do + 70 °C
CE classification:	EN 61010-1: 2010 EN 61326-1:2013 EN 60942:2003

Working conditions

Temperature range:	from -10°C to +50°C
Atmospheric pressure range:	from 65 kPa to 108 kPa
Humidity range:	from 25% to 90% RH

Environmental conditions influence (typical)

Temperature coefficient:	$\pm 5 \cdot 10^{-3}$ dB/°C
Pressure coefficient:	$\pm 1 \cdot 10^{-4}$ dB/hPa
Humidity coefficient:	$\pm 1.25 \cdot 10^{-3}$ dB/%

Power supply

Battery type:	two LR03 (IEC)/AAA (ANSI) alkaline batteries
Continuous operation time:	40 hours in 94 dB range and 30 hours in 114 dB range
Standby mode: approx.	2 years
Minimal operating voltage:	2.1 V DC
Maximum operating voltage:	4 V DC - absolute maximum supply voltage at the battery terminals.

Dimensions and weight

Weight:	305 g with batteries
Dimensions:	65 x 65 x 70 mm

EMC properties

- The configuration with the highest RF emission in the direction parallel to the axis of the calibrated microphone in the acoustic chamber
- The lowest level of noise immunity is parallel to the axis of the calibrated microphone in the acoustic chamber.

Other connections with the calibrator are not available.