INSTRUCTION MANUAL

A small, battery operated sound calibrator complying with IEC60942 class 2 for calibration of microphones and sound measuring equipment.

Output level is 114 dB SPL @ 1000 Hz.

nor**1252**

Class 2 **sound calibrator**

CE

Norsonic

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nor1252

Class 2 **Sound Calibrator**

What is a Calibrator for?

When you are going to make a measurement of any kind, you need to ascertain that what you measure is indicated correctly by your measuring device. The procedure of making a measuring device measure correctly, is called calibration.

For sound level meters and analysers, hereinafter referred to as ***sound measuring instruments***, calibration is no less than paramount - since sometimes legal action will be taken based on the sound and noise levels measured!

Internal Reference Calibration

Some sound measuring instruments offer the ability to calibrate by means of an internal reference oscillator. Although it may sound convenient, this method is not at all recommended, neither is it regarded as sufficient when measuring according to applicable standards.

The most vulnerable part of a sound measuring instrument is always its microphone. If dropped on the floor, for instance, damage is likely. This will, however, not be detected by calibration using an internal oscillator. The oscillator signal will pass through virtually every part of the measuring chain, except the microphone cartridge. Hence, the most vulnerable part will not be exposed to the calibration, which in turn is why the method should be avoided.

The use of calibrators dates back to those days when it was easier to design a stable calibrator than a stable sound level meter.

Today, sound measuring instruments generally are as stable as calibrators. However, measuring microphones are delicate devices designed to fulfil all specifications requested. Hence they are vulnerable and easily subject to damage unless great care is taken.

One may therefore say that a calibrator is just as much a verification of proper operation as it is a device for re-adjustment of the sensitivity of sound measuring instruments.

Whenever you are going to make measurements in accordance with applicable standards, calibration is always required before you start measuring. In some standards, calibration is required after the measurement as well! The former is to ensure that correct values are acquired, while the latter serves to confirm that nothing has changed during the measurement session.

The Calibration Process

To calibrate a sound measuring instrument we use a sound calibrator. A sound calibrator is designed to produce a known sound pressure level when used correctly together with the measuring microphone of the sound measuring instrument.

All sound measuring instruments of the quality levels considered here, feature some way of sensitivity adjustment. Some have a small potentiometer that can be adjusted by a screwdriver, while others do it in software.

If the level indicated by your sound measuring instrument deviates from the output level of the calibrator, the sound measuring instrument sensitivity is adjusted until the reading coincides with the calibrator's output level. The sound measuring instrument is then said to be ***calibrated***.

In case the level deviates significantly from earlier or nominal values, a thourough check of the instrumentation will be needed.

Accuracy and Tolerances

Above, we talked about the need to measure correctly. As we shall see this is strictly speaking not absolutely true, since a measuring device can only estimate the real value.

An uncertainty will always be present. The aim of the calibration is then to bring this uncertainty to within given limits or tolerances. For a sound measuring instrument, the width of the interval of acceptable estimates will depend on which ***class*** it belongs to.

Instrument Classes

According to the international standard for sound level meters IEC 61672-1, sound measuring instruments satisfying the requirements in the standard are classified as class 1 or 2. Class 1 is the best, i.e. with the most narrow tolerances, and type 2 as the least good.

You may experience that national and/or international standards may impose restrictions on which instrument types are considered usable for a given measurement task.

Our “problems” do not end with the uncertainties of the sound measuring instruments. Even sound calibrators are “infected” with level uncertainties! Hence, these have also been divided into classes depending on their level accuracy and level stability. This is to ensure that measurements made with your high-quality sound measuring instrument are not ruined by inaccurate calibration.

Table showing the permissive tolerances as defined by IEC 61672-1 (Sound Level Meters) and IEC 60942 (Sound Calibrators)

Sound Measuring Instruments

Type	**1**	**2**
Tolerances	±1,4 dB	±1,9 dB

Sound Calibrators

Class	**LS**	**1**	**2**
Tolerances	±0.2 dB	±0.4 dB	±0.6 dB

Tip: As a general rule, use a calibrator of the same class or higher (i.e. same or lower class number) than your sound measurement instrument. Otherwise, the accuracy of your acquired measurement data will be affected.

Using the Sound Calibrator

Introduction

The Sound Calibrator type 1252 is a small, battery operated sound source for calibration of microphones and sound measuring equipment.

The Sound Calibrator type 1252.

The microphone is placed in an acoustic coupler where the calibrator produces a regulated sinusoidal sound pressure signal of 1000 Hz. The level is 114 dB re. 20 µPa or 10 pascal RMS, corresponding to 0,1 mbar.

Due to the principle of operation[1], the calibration level is virtually independent of ambient conditions as temperature, atmospheric pressure and humidity within the specified range of operation. The calibrator complies with IEC 60942 Class 2. The calibrator is intended for 1/2" measurement microphones and sound level meters equipped with such microphones. Smaller microphones may be calibrated by application of suitable adapters.

To activate the calibrator:

1. Press the on-button to turn on the calibrator. The calibrator shuts off by itself after about five minutes. However, if a microphone has not been inserted or is removed, the unit will switch off after a few seconds.

As 1000 Hz is used as the reference frequency for most acoustic weighting network, no correction according to the network selected, has to be made.

1 Patented

Operation

When you are going to make calibrations with the Sound Calibrator type Nor1252, do as follows:

1. Place the microphone to be calibrated in the coupler of the sound calibrator.

2. If the background noise level is high, watch the noise level and press the power-on button to switch on the calibration signal. Verify that the calibration signal is at least 20 dB above the background noise floor.

3. Adjust the sensitivity of the microphone or measurement equipment to display the excitation sound pressure level of 114,0 dB. (About 113,8dB for free-field microphones.)

If you Have a Free-field Microphone

Most ½" free-field microphones (as defined by IEC61672-1), have a free-field response which is 0,2dB higher than their pressure sensitivity at 1000Hz. For a ½" free-field microphone, the level should therefore be adjusted to 113,8dB. Half-inch microphones designed for flat random incidence response normally require no correction and should be adjusted to 114,0dB.

Effective Microphone Front Volume

Various types and makes of microphones may have different effective front volume. Due to the patented working principle of the Sound Calibrator Nor1252, the coupler has a large effective volume. The variations in sound pressure due to variations in the effective front volume for different microphones is therefore for most application of less importance.

When the power on switch is pressed, the calibrator will stay on for approximately five minutes. However, if a microphone has not been inserted or is removed, the unit will switch off after a few seconds.

If the battery-voltage is too low for operation within the specifications, the calibrator will switch off as soon as the button is released.

The high sound pressure level generated in the coupler makes the calibrator virtually insensitive to external noise.

However, care should always be taken when a calibration is made in places with high extraneous noise levels.

It is always good practice to verify that the background noise level measured with the microphone mounted in the calibrator, but prior to switching it on, is sufficiently below the calibration level.

Battery Replacement

Remove the battery as soon as it is discharged or if the Sound Calibrator is stored for prolonged periods of time. Leakage from the battery may otherwise destroy the electronic components.

To change the battery, do as follows:

1. Remove the rear cover by pulling it straight backwards.

2. Pull out the battery from the compartment and un-clip the battery-connector.

3. Replace the battery with a fully charged battery type IEC type 6LR61 (9 volt alkaline). Alternatively, a 9 V lithium battery of identiical physical dimensions or a 6F22G battery may be used.

4. Install the battery and the rear cover.

See the figure on the following page for details.

External Supply of Power

For some applications it may be required to power the calibrator from an external DC voltage source. This may easily be achieved by connecting a DC voltage source in the range 8 - 15 volt to the battery connector.

Due to the power-cords, it will not be possible to mount the rear cover if the calibrator is connected to an external power source. Without the rear cover, the sound from the rear side of the loudspeaker will be less attenuated and the calibration will also be more sensitive to extraneous noise. This will, however, normally not otherwise influence the operation of the calibrator.

Sensitivity for Temperature, Humidity and Atmospheric Pressure

Due to the applied principle of operation and the careful selection of critical components, the level generated by the calibrator 1252 has low sensitivity to variations in the ambient conditions. The sensitivity for variations in temperature, pressure and relative humidity are all within the requirements for Class 2 sound calibrators according to the international standard IEC 60942.

If the application require excitation signal for longer periods of time, the on-button may be locked by a bit of tape around the calibrator. In this case, no indication of proper power supply voltage will be given as the battery voltage comparator will not be able to switch the calibrator off.

Note: The calibrator aluminium casing is connected to the negative battery terminal.

Recalibration

At regular time intervals, at least once a year, proper operation of the calibrator should be verified, preferably by an accredited acoustic calibration laboratory or the factory.

The verification should be carried out close to reference conditions and should cover at least:

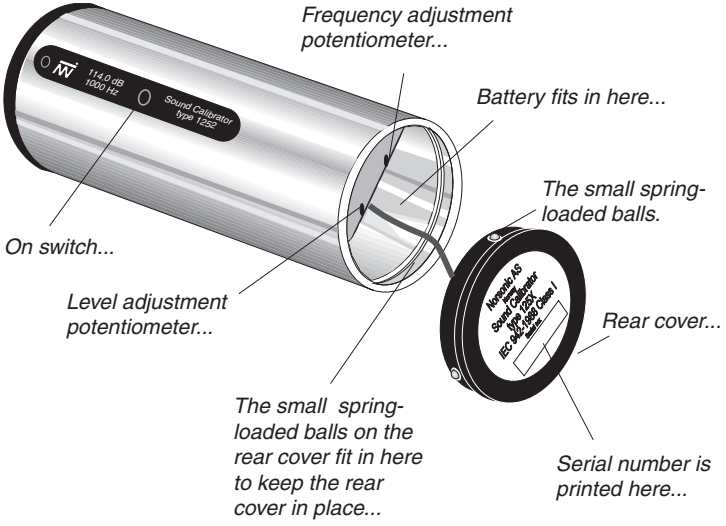
- Frequency accuracy
- Level accuracy
- Harmonic distortion

If the level or frequency needs to be re-adjusted, this is done by adjusting one of the two potentiometers placed on the rear edge of the circuit board. Gain access to the potentiometer by removing the rear cover, as shown in the Figure below. The access to the adjustment potentiometer may be blocked by a sealing mark.

The level should be measured with a working standard microphone type WS2 where the pressure sensitivity at 1000 Hz is known with a sufficiently high accuracy.

If larger deviations from level- or frequency-specifications are detected, or the distortion is above the specified limit, the calibrator should be repaired. Contact your local Norsonic representative or the factory for further instructions.

Once the rear cover has been removed you will have access to the battery and the level and frequency potentiometers



Caution: Never alter settings without being sure that your references are accurately calibrated.

Specifications

OUTPUT SIGNAL
Sound pressure level: Specified on the calibrator (re. 20µPa) @ reference conditions
SPL accuracy: ±0,3 dB
Frequency accuracy: ±0,5%.
Accuracy: Complies with ANSI S 1.40 and IEC60942 (2003) Class 2. Typical change in SPL per year: <0.02dB/year

REFERENCE CONDITIONS
Temperature: 23°C
Ambient pressure: 101.325 kPa
Humidity: 50% RH
Effective load volume: 250mm^3

GENERAL
Sensitivity to change in load volume: 0.0003dB/mm^3 (typical)
Time for level to stabilise: Max 2 sec.
Microphone size: ½" and ¼" (Adaptor Nor1444 – available separately) according to IEC61094-4
Harmonic distortion: Max. 1%
Controls: Power-on push button. Automatic shut-off
CE classification: EMC: EN 50081-1, EN 50082-1. Safety: EN 61010-1, 1993 for portable equipment, pollution category 2

AMBIENT REQUIREMENTS FOR SPECIFIED OPERATION
Temperature range: –10 to +50°C
Ambient pressure range: 65 - 108 kPa
Humidity range: 10 - 90% RH

POWERING
Battery type: 9V 6LR61
Battery lifetime: Approx. 20 hours. Use of a 6F22G battery will yield a shorter battery lifetime, while a 9V lithium battery will yield an extended operating time
External supply voltage: 7.5 - 15V. Automatic shut-off when V_{Batt} < 7.5V.

OVERALL WEIGHT AND DIMENSIONS
Weight: 185g with battery, L: 109.5mm; D: 40mm

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Norsonic AS supplies a complete range of instrumentation for acoustics – from sound calibrators, microphones & preamplifers; via small handheld sound level meters to advanced, yet portable, real time analysers, but also building acoustics analysers and complete community, industry and airport noise monitoring systems. Contact your local representative or the factory for information on our complete range of instrumentation.