

# Sound Calibrators

Nor1251

Nor1252

Nor1253



# Sound calibrators. No sound measurement is correct without them.

The use of sound calibrators dates back to the days when it was easier to design a stable sound calibrator than a stable sound level meter. Today, sound measuring instruments, in general, are as stable as the sound calibrators.

However, measuring microphones are very delicate devices designed to fulfill very rigid specifications. This makes them vulnerable and subject to damage unless 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 sensitivity of sound measuring instruments.

The Norsonic selection of sound calibrators comprises three types, viz. the Nor1251, the Nor1252 and the Nor1253. The difference between them lies in their accuracy; while the Nor1251 is a class 1 calibrator and the Nor1252 is a class 2 calibrator, the Nor1253 is a calibrator designed to class 0 requirements of the previous version of IEC 60942 and satisfies the Class 1 and Class LS in current standard.

## The “Electronic Pistonphone”

Being a class 0 calibrator the Nor-1253 is often referred to as the “electronic pistonphone” since it maintains an accuracy normally associated with a pistonphone without the need for a barometer to make corrections for variations in the ambient pressure.

The Nor1253 comes in two versions, producing 124 dB SPL re. 20 $\mu$ Pa at 250Hz or at 1000Hz. However, special versions are available.

## Effective Volume Corrections

Different microphone cartridges tend to have different effective front volumes. The working principle of our calibrators produces a large effective coupler volume. The variations in the sound pressure level inside the coupler due to variations in the effective front volume will therefore be insignificant for most applications.

The Nor1253 is adjusted with the 1/2-inch adaptor for an equivalent microphone volume of 250mm<sup>3</sup>, which corresponds to most 1/2-inch working standard microphones with protection grid mounted like the Nor1220, Nor1225 and Nor1227. If the cartridge under test has a different volume, the accuracy may be improved by applying a volume correction.

If no adaptor is used, the nominal effective front volume for no correction is 1333mm<sup>3</sup>. This corresponds to most full-inch cartridges with protection grid mounted.



## The Class 1 and 2 Calibrators

The Nor1251 is a class 1 calibrator with an output level of 114 dB @ 1 kHz. The calibrator accepts full-inch cartridges right away and 1/2-inch cartridges by means of the included adaptor. An optional adaptor (the Nor1444) – available separately, permits the use of the calibrator with 1/4-inch cartridges.

The Nor1252 is our class 2 alternative aimed at less critical applications. The Nor1252 cannot accept full-inch cartridges, but an optional Nor1445 adaptor is available, so that the 1/4-inch calibration possibility is maintained.

## The sound calibrator operating principles

Our selection of sound calibrators share a common working principle. The difference between them lies solely in their accuracy.

The microphone to be calibrated is placed in the coupler of the sound calibrator where the sound pressure level is generated by a miniature loudspeaker. The electrical signal – driving the loudspeaker – is generated by an electronic oscillator.

The sound pressure generated is measured with a pressure sensitive silicon sensor\*. This signal is used to adjust the level of the oscillator signal.

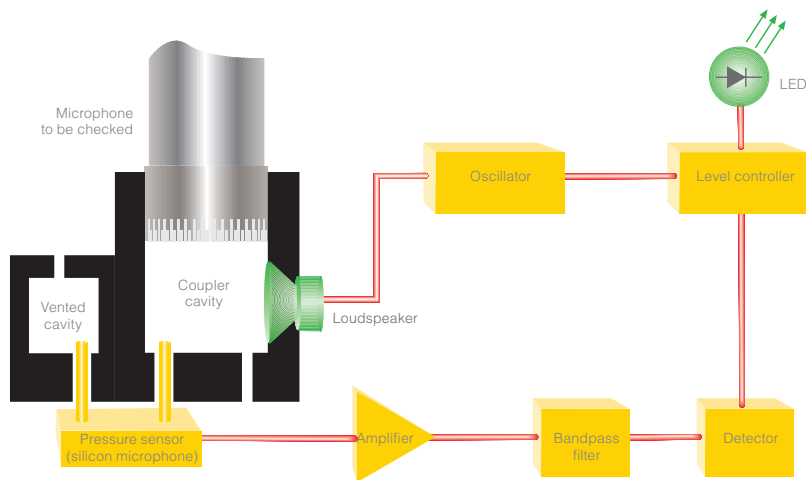
The rear side of the silicon sensor is located in a separate, vented cavity to prevent pick-up of extraneous noise signals. Noise pick-up is further reduced by the use of a bandpass filter in the feedback path.

Because of the high stability of the silicon sensor and the electronic controller, the acoustic signal generated becomes virtually independent of the battery voltage and ambient conditions such as temperature, humidity and the atmospheric pressure.

\*German patent Nr. 4294875

The feedback principle automatically compensates for variation in the equivalent volume of the microphones. Hence, it creates an effective coupler volume many times the volume given by the mechanical dimensions of the coupler. The system even compensates for drift in the loudspeaker.

The acoustic coupler is vented to the inside of the sound calibrator, which in turn is vented to the outside for equalisation to the atmospheric pressure. A separate channel vents the rear side of the reference transducer to the outside of the sound calibrator.

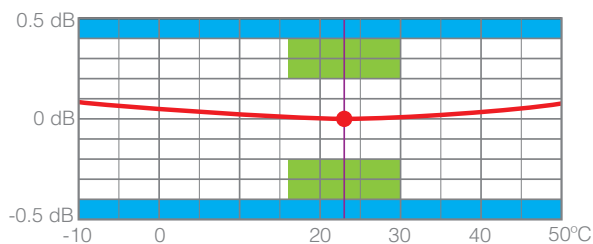


A light emitting diode (LED) illuminates whenever the level control is in balance. When there is no microphone placed in the coupler, the loudspeaker will in general fail to generate and maintain the correct sound pressure in the coupler. This situation is indicated by a non-illuminated LED and the calibrator will thereafter switch off.

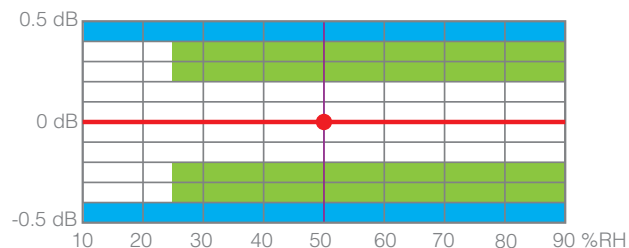
An electronic circuit inside the calibrator will switch off the power at approximately five minutes after the ON button was pressed. If a longer time period is required then the power button has to be fixed in the ON position.

## Nor1253 – the influence of ambient conditions

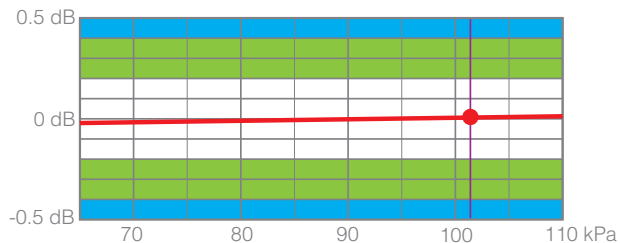
All the sound calibrators have a very low sensitivity to the ambient pressure, humidity, temperature and the load volume. The Nor1253 and the Nor1251 are calibrated at three temperatures (-10 °C, +23 °C and 45 °C) to ensure that the output sound pressure level is well within the requirements set by the IEC61942 and ANSI S 1.40-1997 over the specified temperature range.



Typical calibrator sound pressure level [dB] as a function of temperature [°C] referred to reference environmental conditions.



Typical calibrator sound pressure level [dB] as a function of air relative humidity [% RH] referred to reference environmental conditions.



Typical calibrator sound pressure level [dB] as a function of air pressure [kPa] referred to reference environmental conditions.

- Tolerance limits for Class 1 requirements
- Tolerance limits for Class LS requirements

The reference environmental conditions are:

- air temperature: 23 °C
- static pressure: 101,325 kPa
- relative humidity: 50 %

# Specifications



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|   |  |                                      |                                      |
|---|--|--------------------------------------|--------------------------------------|
| <b>IEC60942 (2003-01) Classification</b>                  | Class 1 <sup>1)</sup>  | Class 1                              | Class 2                              |
| <b>Complies with ANSI S1.40 (1997)</b>                    | Yes  | Yes                                  | Yes                                  |
| <b>Sound pressure level (re: 20µPa)</b>                   | 124.0 ± 0.2 dB   | 114.0 ± 0.2 dB                       | 114.0 ± 0.4 dB                       |
| <b>Frequency</b>  | 250 Hz ± 0.2% <sup>2)</sup>  | 1000 Hz ± 0.2%                       | 1000 Hz ± 0.2%                       |
| <b>Distortion</b>   | <1%  | <1%                                  | <1%                                  |
| <b>Sensitivity to change in the load volume</b>           | -0.00002 dB/mm <sup>3</sup> (250Hz)<br>+0.00003 dB/mm <sup>3</sup> (1000Hz)  | +0.00003 dB/mm <sup>3</sup> (1000Hz) | +0.00003 dB/mm <sup>3</sup> (1000Hz) |
| <b>Typical change in SPL per year</b>                     | < 0.01 dB  | < 0.01 dB                            | < 0.01 dB                            |
| <b>Time for level to stabilise</b>                        | < 2 sec  | < 2 sec                              | < 2 sec                              |
| <b>Microphone cartridge size</b>                          | 1", 1/2", 1/4" <sup>3)</sup>   | 1", 1/2", 1/4" <sup>3)</sup>         | 1/2", 1/4" <sup>4)</sup>             |
| <b>Controls</b>   | Power-on push button with green LED indication.<br>Automatic shut-off when the microphone is removed (except for 1/4") |                                      |                                      |
| <b>Temperature range</b>                                  | -10°C à +50°C  | -10°C à +50°C                        | -10°C à +50°C                        |
| <b>Ambient pressure range</b>                             | 65-108 kPa   | 65-108 kPa                           | 65-108 kPa                           |
| <b>Humidity range</b>                                     | 10-90 %RH  | 10-90 %RH                            | 10-90 %RH                            |
| <b>Battery type</b>                                       | 9V 6LR61   | 9V 6LR61                             | 9V 6LR61                             |
| <b>Battery life-time</b>                                  | > 20 hours   | > 30 hours                           | > 30 hours                           |
| <b>External supply voltage</b><br>(via battery connector) | 7.5–15 Vdc. Automatic shut-off when V <sub>BATT</sub> < 7.5 Vdc  |                                      |                                      |
| <b>CE classification, EMC</b>                             | EN561000-6-1, EN61000-6-3 following the provisions for the LVD- and EMC-directive                                      |                                      |                                      |
| <b>Size</b>   | L : 109.5 mm ; Ø : 40 mm   |                                      |                                      |
| <b>Weight</b>   | 185 g with battery   |                                      |                                      |

<sup>1)</sup> Designed to meet class 0 requirement in the previous version of IEC60942 (1997)

<sup>2)</sup> Other frequency on request. Note that this may alter the load volume

<sup>3)</sup> By the use of optimal adapter Nor1444

<sup>4)</sup> By the use of optional adapter Nor1445



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