

OPERATING MANUAL

HD2024

Acoustic calibrator



EN
V2.0



Contents

1	Introduction	3
2	Technical specifications.....	4
3	Description	5
4	Calibration procedure	6
	4.1 Correction depending on the type of microphone.....	6
5	Battery	7
	5.1 Low battery indication	7
	5.2 Battery replacement.....	7
	5.3 Cautions on using the battery	7
	5.4 Battery disposal.....	7
6	Construction and operation	8
7	Maintenance	9
8	Safety instructions	9
9	Ordering codes	10

1 Introduction

The **HD2024** sound level calibrator is a portable, battery operated sound source, suitable for sound level meters (portable and laboratory) and acoustic stations.

It allows calibrating 1/2" (1/4" with **HD2020AD4** adapter) microphones with mechanical dimensions compliant with IEC 61094-1 ("Measurement microphones. Part 1: Specifications for laboratory standard microphones") and IEC 61094-4 ("Measurement microphones. Part 4: Specifications for working standard microphones").

The generated sound pressure level is equal to 94 dB at 1000 Hz frequency.

A LED signals the low battery condition.

Advantages of the calibrator:

- The 1000 Hz frequency allows calibrating sound level meters with any frequency weighting (LIN, A, B, ...), without applying any correction factor.
- The generated sound pressure level is independent of atmospheric pressure: you don't need to adjust the value according to static pressure over a wide range of values.
- Its simplicity of use allows even unskilled staff to use it.

2 Technical specifications

The calibrator complies with **IEC 60942-2003 Class 1** and **ANSI S1.40-1984**.

Coupling cavity	For standard ½" (12.7 ± 0.03 mm) microphones according to IEC 61094-1 and IEC 61094-4
Optional adapter	HD2020AD4 for ¼" microphones
Frequency	1000 Hz
Frequency tolerance	1% in the range -10...+50 °C and 10...90%RH
Sound pressure level	94.0 dB ± 0.3 dB @ 1 kHz (referred to 101.3 kPa, 23 °C ± 3 °C and 65%RH)
Reference conditions	23 °C, 50%RH, 101.3 kPa, microphone capsule with 10 mm ³ equivalent volume
Stabilization time	10 s
Total distortion	< 1%
Ambient condition influence Temperature and humidity influence Static pressure influence	< 0.3 dB in the range -10...+50 °C and 10...90%RH < 0.1 dB in the range 65...108 kPa
Stability levels Short-term stability Stability after 1 year with normal use	±0.05 dB ±0.15 dB
Operating conditions	-10...+50 °C / ≤ 90%RH
Storage temperature	-25...+70 °C
Microphone equivalent volume	From 5 to 250 mm ³
Power supply	9 V alkaline battery IEC type 6LR61 9 V rechargeable batteries can also be used
Battery autonomy	48 hours of continuous use with good quality alkaline batteries
Case material	ABS
Dimensions	53 x 43 x 83 mm
Weight	160 g
Protection degree	IP 64
Effects of electromagnetic fields	< 0.3 dB

3 Description



1. **ON-OFF** key: turns on and off the calibrator.
2. LED indicating the calibrator status.
3. Calibrator cavity for 1/2" microphones.
4. **LOW BATT** LED: indicates that the battery is low and needs to be replaced.
5. Battery lid.

4 Calibration procedure

Standard 1/2" (and 1/4" with HD2020AD4 adapter) microphones compliant with IEC 61094-1 and IEC61094-2 can be calibrated.

To calibrate the microphone, insert it deep into the cavity; the O-ring will offer some resistance.

The calibrator can be held in vertical position or placed on a flat surface.

Do not move the microphone or the calibrator during the measurement; make sure that the worktable doesn't transmit vibrations.

A small misalignment of the microphone and calibrator axes is allowed.

- Switch on the calibrator by pressing the ON/OFF key.
- Calibrate the sound level meter as per the procedure shown in the instrument manual.
- Apply the correction to the pressure level depending on the type of microphone (see the following paragraph).
- Once calibration is complete, switch off the sound level meter and the calibrator and remove the microphone from the cavity.

The calibrator allows calibrating any sound level meter provided that it is equipped with a laboratory or working standard 1/2" microphone compliant with IEC 61094-1 and IEC 61094-4 standards.

4.1 Correction depending on the type of microphone

The calibrator generates a 94 dB sound pressure level referred to 20 μ Pa. Working standard 1/2" microphones for sound level meters are manufactured to achieve flat frequency response in free or diffuse field, i.e. in a field of progressive plane waves propagating in the same direction as the microphone axis and in a field of sound waves coming from every direction, respectively. These propagation conditions are different from those in the calibrator cavity.

In free field, reflections due to the microphone alter the sound level by increasing the actual high-frequency capsule sensitivity. Microphones optimized for free field measurements exploit this phenomenon to achieve flat frequency response even at very high frequencies. In these microphones, the sound level increase at 1 kHz corresponds to approximately 0.05...0.20 dB. Therefore, when you calibrate a free field microphone, you must take into account for this difference by setting in the sound level meter a sound level 0.1 dB or 0.2 dB lower than the calibrator nominal one.

Microphones optimized for diffuse field measurements, instead, do not require corrections when calibrated in a closed cavity at 1 kHz.

5 Battery

The calibrator is provided with a 9 V alkaline battery that can be replaced by the user. The battery charge is constantly monitored.

5.1 Low battery indication

If the battery is charged, the LOW BATT LED is off.

If the battery charge is insufficient to ensure the normal operation of the instrument, the LOW BATT LED lights up.

5.2 Battery replacement

To replace the 9 V battery:

- Switch off the instrument.
- Open the lid at the bottom of the instrument.
- Replace the battery.
- Close the lid.

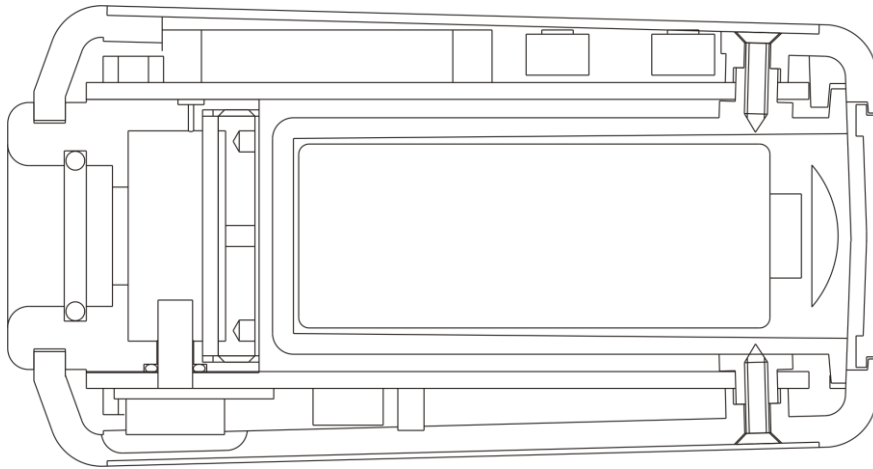
5.3 Cautions on using the battery

- Remove the battery if the instrument is not to be used for an extended period.
- If the battery is low, replace it as soon as possible.
- If the battery leaks, replace it immediately.
- Use good quality sealed batteries (alkaline if possible).

5.4 Battery disposal

- Dispose of the dead battery in the dedicated bins or deliver it to authorized collection centers. Follow the relevant regulation.
- Do not dispose as household waste.
- Do not throw the battery into fire.

6 Construction and operation



Calibrator mechanical construction (section)

The figure schematizes the calibrator structure (in section). The battery compartment is on the right side of the case. The printed circuits with the electronics are over and under the battery compartment. The electro-acoustic transduction system is on the left and it consists of a wide cavity with a piezoceramic generator and a feedback sensor. The system emits the signal through the 1/2" microphone cavity. An outer capillary hole balances the chamber static pressure protecting microphones from overpressure due to their insertion.

The electronics consist mainly of an oscillator combining high stability and low distortion, as well as an RMS converter, the automatic gain control (AGC), the driver for the ceramic resonator and the electronics for conditioning the signal from the feedback sensor.

The RMS level of the signal provided by the sensor is compared with the factory set reference level; the difference adjusts the width, through the automatic gain control, of the signal generated by the oscillator and thus the acoustic signal generated by the piezoelectric transducer.

The signal provided by the sensor has minimal changes with the ambient temperature and the static pressure; the frequency of the signal provided by the oscillator is also stable in relation to ambient parameters.

7 Maintenance

Do not use aggressive cleaning agents or incompatible with the materials indicated in the technical specifications. For cleaning, use a soft dry cloth or slightly dampened with clean water.

8 Safety instructions

The instrument proper operation and operating safety can be ensured only in the climatic conditions specified in this manual and if all standard safety measures as well as the specific measures described in this manual are followed.

Do not use the instruments in places where there are:

- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

User obligations

The instrument operator shall follow the directives and regulations below that refer to the treatment of dangerous materials:

- EU directives on workplace safety.
- National law regulations on workplace safety.
- Accident prevention regulations.

9 Ordering codes

The calibrator is supplied with a 9 V alkaline battery and ISO 17025 calibration certificate according to IEC 60942.

The 1/4" microphone adapter must be ordered separately.

Accessories

HD2020AD4 Microphone adapter for 1/4" capsules.

WARRANTY

The manufacturer is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.

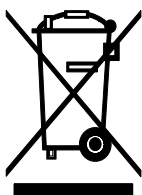
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased.

We reserve the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.



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