

Operating manual

Acoustic calibrator

HD2024



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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 HD2024 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 DESCRIPTION



1. **ON-OFF** key: turns on and off the instrument.
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.

3 CALIBRATION PROCEDURE

The HD2024 can calibrate standard 1/2" (and 1/4" with HD2020AD4 adapter) microphones compliant with IEC 61094-1 and IEC61094-2.

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.

While measuring, you should move neither the microphone nor the calibrator; 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 HD2024 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.

3.1 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 dB \div 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 don't require corrections when calibrated in a closed cavity at 1 kHz instead.

4 BATTERY

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

4.1 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.

4.2 BATTERY REPLACEMENT

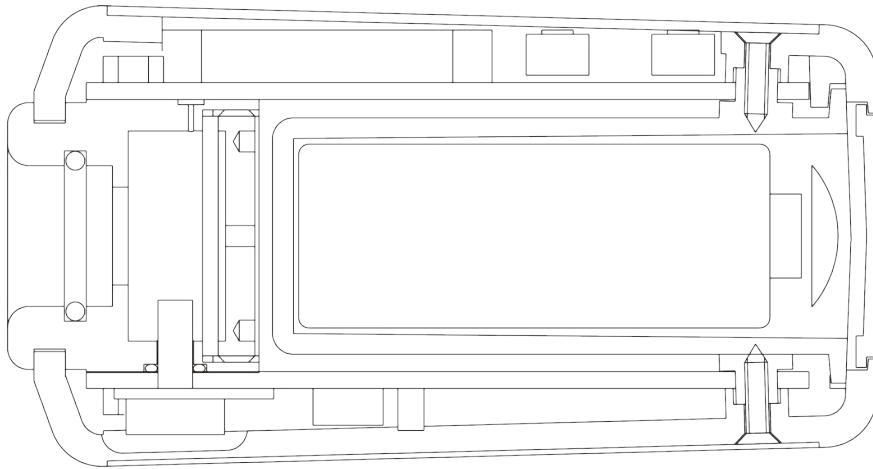
To replace the 9 V battery:

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

4.3 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.
- Make sure that there is no liquid leakage from the battery.
- Use good quality sealed batteries (alkaline if possible).

5 CONSTRUCTION AND FUNCTIONING



Calibrator mechanical construction (section)

The figure schematizes the HD2024 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.

6 TECHNICAL SPECIFICATIONS

The HD2024 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 at 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

7 INSTRUMENT STORAGE

Instrument storage conditions:

- Temperature: -25...+55 °C.
- Humidity: less than 90 %RH no condensation.
- In storage, avoid places where:
 - humidity is high;
 - the instrument is exposed to direct sun radiation;
 - the instrument is exposed to a high temperature source;
 - high vibration levels are present;
 - the instrument may be exposed to vapor, salt and/or corrosive gas.

The housing of the instrument is in ABS plastic material: do not use solvents not compatible for cleaning.

8 SAFETY INSTRUCTIONS

General safety instructions

The instrument has been manufactured and tested in accordance with the safety standard EN61010-1:2010 "Safety requirements for electrical equipment for measurement, control and laboratory use" and has left the factory in perfect safety technical conditions.

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

The instrument proper operation and operating safety can be ensured only in the climatic conditions specified in this manual.

Do not use the instruments in places where there are:

- Rapid ambient temperature variations that may cause condensation.
- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

If the instrument is moved from a cold environment to a hot one or vice versa, the formation of condensation might cause problems to its operation. In this case you need to wait for the instrument temperature to reach ambient temperature before operation.

User obligations

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

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

9 ORDERING CODES

HD2024 Acoustic calibrator. Supplied with: 9 V alkaline battery and instruction manual.

HD2020AD4 Microphone adapter for 1/4" capsules.

DELTA OHM metrology laboratories LAT N° 124 are ISO/IEC 17025 accredited by ACCREDIA for Temperature, Humidity, Pressure, Photometry / Radiometry, Acoustics and Air Velocity. They can supply calibration certificates for the accredited quantities.

**DICHIARAZIONE DI CONFORMITÀ UE**
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Document-No. / Month.Year :

Si dichiara con la presente, in qualità di produttore e sotto la propria responsabilità esclusiva, che i seguenti prodotti sono conformi ai requisiti di protezione definiti nelle direttive del Consiglio Europeo:

*We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:*Codice prodotto: **HD2024**
Product identifier :Descrizione prodotto: **Calibratore acustico**
Product description : **Acoustic calibrator**I prodotti sono conformi alle seguenti Direttive Europee:
The products conform to following European Directives:

Direttive / Directives	
2014/30/EU	Direttiva EMC / EMC Directive
2014/35/EU	Direttiva bassa tensione / Low Voltage Directive
2011/65/EU	RoHS / RoHS

Norme armonizzate applicate o riferimento a specifiche tecniche:
Applied harmonized standards or mentioned technical specifications:

Norme armonizzate / Harmonized standards	
EN 61010-1:2010	Requisiti di sicurezza elettrica / Electrical safety requirements
EN 61326-1:2013	Requisiti EMC / EMC requirements
EN 50581:2012	RoHS / RoHS

Il produttore è responsabile per la dichiarazione rilasciata da:
The manufacturer is responsible for the declaration released by:

Johannes Overhues

Amministratore delegato
Chief Executive Officer

Caselle di Selvazzano, 04/06/2018



Questa dichiarazione certifica l'accordo con la legislazione armonizzata menzionata, non costituisce tuttavia garanzia delle caratteristiche.

This declaration certifies the agreement with the harmonization legislation mentioned, contained however no warranty of characteristics.

GUARANTEE



Member of GHM GROUP

TERMS OF GUARANTEE

All DELTA OHM instruments are subject to accurate testing, and are guaranteed for 24 months from the date of purchase. DELTA OHM will repair or replace free of charge the parts that, within the warranty period, shall be deemed non efficient according to its own judgement. Complete replacement is excluded and no damage claims are accepted. The DELTA OHM guarantee only covers instrument repair. The guarantee is void in case of incidental breakage during transport, negligence, misuse, connection to a different voltage than that required for the appliance by the operator. Finally, a product repaired or tampered by unauthorized third parties is excluded from the guarantee. The instrument shall be returned **FREE OF SHIPMENT CHARGES** to your dealer. The jurisdiction of Padua applies in any dispute.



The electrical and electronic equipment marked with this symbol cannot be disposed of in public landfills. According to the Directive 2011/65/EU, the european users of electrical and electronic equipment can return it to the dealer or manufacturer upon purchase of a new one. The illegal disposal of electrical and electronic equipment is punished with an administrative fine.

This guarantee must be sent together with the instrument to our service centre.

IMPORTANT: Guarantee is valid only if coupon has been correctly filled in all details.

Instrument Code: HD2024

Serial Number _____

RENEWALS

Date _____

Date _____

Inspector _____

Inspector _____

Date _____

Date _____

Inspector _____

Inspector _____

Date _____

Date _____

Inspector _____

Inspector _____



The quality level of our instruments is the result of the constant development of the product. This may produce some differences between the information written in this manual and the instrument you have purchased. We cannot completely exclude the possibility of errors in the manual, for which we apologize.

The data, images and descriptions included in this manual cannot be legally asserted. We reserve the right to make changes and corrections with no prior notice.

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