HD 2020

English

HD 2020
Acoustic calibrator
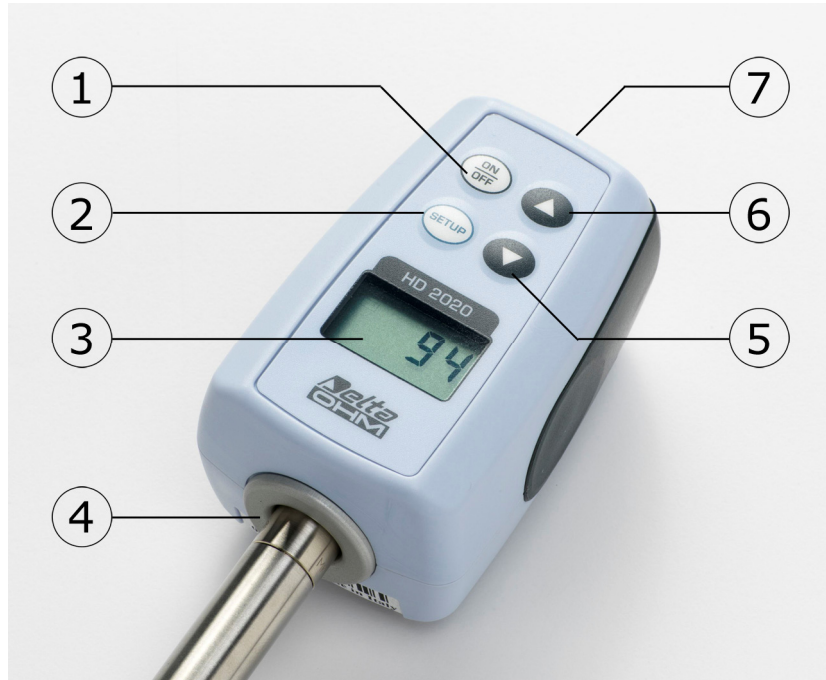
1. **ON-OFF** key: turns on and off the instrument. When you turn the instrument on, the display will switch on about two seconds later.

2. **SETUP** key: allows you to enter and scroll menu. To exit, press it repeatedly until you go back to the standard screen.

3. Display. When you turn the instrument on, it shows all segments on, then the sound pressure level (94 or 114dB) will appear in standard view.

4. Calibrator cavity for 1/2 inch microphones.

5. ▾ key: in standard mode, it selects 94dB and 114dB pressure levels alternately. In menu mode, it decreases the current value.

6. ▴ key : in standard mode, it selects 94dB and 114dB pressure levels alternately. In menu mode, it increases the current value.

7. Battery lid.

INTRODUCTION

The HD 2020 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" 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 calibration pressure levels of 94dB and 114dB can be selected by the keypad. The 1000 Hz frequency cannot be changed.

If the microphone is absent or not inserted correctly into the calibrator cavity, the sound level will blink on the display.

To conserve battery life, the instrument is provided with an automatic power off function: if you leave the instrument on with open cavity, it switches off automatically after 30 seconds. If the cavity is closed and the microphone is inserted, the instrument switches off 5 minutes after turning on, provided that you don't press any key.

The calibrator display shows calibration pressure level, battery life, current date and time.

Calibration

The HD2020 can be calibrated by a Delta Ohm authorized dealer or accredited laboratories. Calibrating the instrument means checking that frequency, sound level and signal distortion fall within the limits of tolerance set by IEC 60942:2003 standard. The current noise legislation estabilishes the maximum interval between calibration.

The HD2020 calibrator is a precision instrument, designed to maintain the sound level which is set in the factory. However, we suggest that you set up the calibrator at least every two years and whenever calibration values are close or above the tolerance values listed in technical specfications. You can set the HD2020 to warn you when the calibration expiration date is approaching. Its date indicator watch allows setting the calibration validity (months and years) starting from the setup: when the time interval expires a special symbol will blink on the display to remind you to set up the instrument. The setup will be performed by a Delta Ohm authorized dealer only.

The HD 2020 calibrator advantages are:

- The 1000Hz frequency allows calibrating sound level meters with any weighting (LIN, A, B, ...), without applying any correction factor.
- The calibration sound pressure level is indipendent of atmosferic pressure: you don't need to adjust the value according to static pressure over a wide range of values.
- The HD 2020 calibrator can be conveniently used both in laboratory and in the field. The 114 dB sound level allows performing calibrations even in high background noise environments.
- Its simplicity of use allows even unqualified staff to employ it.

DISPLAY AND KEYPAD DESCRIPTION

The instrument keypad is composed of 4 keys.
Listed below are their main functions.

ON-OFF key

Press the ON/OFF key to turn on and off the instrument.

When you turn the instrument on, all the display segments are shown, for a few seconds ...

... an automatic test including battery power is performed and the instrument switches to standard mode.

Note: the display turns on 3 seconds after you press the ON/OFF key: meanwhile, the initial automatic test is performed.

AutoPowerOff function

The instrument is provided with an automatic power off function which switches off the instrument after about 5 minutes if the microphone is inserted in the cavity and you don't press any key.

If the cavity is open, the sound level blinks on the display: in this case the instrument switches off automatically after 30 seconds.

You cannot disable the *AutoPowerOff* function.

SETUP Key

The SETUP key allows entering and viewing the menu. To exit, press the SETUP key until you go back to the standard screen.
The menu shows:
- Current date and time in the format year, month, day, hour, minute, second.
- The interval between the calibration date and the expiry date in years and months.

You can set all these items: press SETUP to select it and use the arrow keys ▲ ▼ to change it. Press the SETUP key to confirm.

From the standard screen, press the SETUP key to view the current year:

Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to the current month:

SETUP >>

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Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to the current day:

SETUP >>

HD 2020

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Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to the current time:

SETUP >>

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Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to the current minute:

SETUP >>

HD 2020

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Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to the current second:

SETUP >>

HD 2020

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Whenever you press the arrow keys, seconds will be reduced to zero. Press the SETUP key to confirm and go to menu to set up the calibration expiration date.
You can enter the number of years and months between the calibration date, which is entered by the calibration laboratory and cannot be modified by the user, and the expiry date. When the time interval expires, a triangle will blink in the lower left corner of the display to remind you that the calibrator needs adjusting.

Press the SETUP key to switch from current seconds to the calibration expiration date (years).

To distinguish it from the current year, a triangle will appear in the lower left corner.
Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to months.
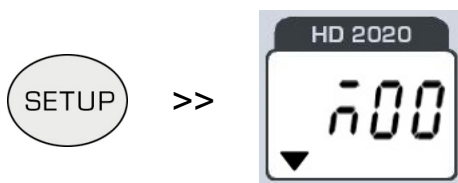
Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go back to standard mode.

 Arrow key

In standard mode, it selects 94dB and 114dB sound pressure levels alternately. In menu mode, it increases the current value.

 Arrow key

In standard mode, it selects 94dB and 114dB sound pressure levels alternately. In menu mode, it decreases the current value.

CALIBRATION PROCEDURE

The HD 2020 can calibrate standard 1/2" 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.

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.

- Before beginning to calibrate, you should make sure that the ambient noise level doesn't affect the calibration. After inserting the microphone into the cavity, with the sound level meter and the calibrator off, switch on the sound level meter and detect the unweighted ambient sound pressure level. If the measured level is below 78 dB, you can use both calibration sound levels (94 dB and 114 dB); if the level is between 78 dB and 98 dB you can use the 114 dB level only, while a sound level above 98 dB means that calibration is not possible.
- Press the ON/OFF key to switch on the instrument.
- Use the arrow keys to select the sound level: 94 dB or 114 dB.
- Make sure that the measurement value is not blinking on the display: this means that the microphone is not inserted correctly.
- Calibrate the sound level meter as per the procedure shown in the instrument manual.
- Apply the correction to the pressure level depending on the microphone (see the following chapter).
- Once calibration is complete, switch off the sound level meter and the calibrator and remove the microphone from the cavity.

The HD 2020 calibrator allows calibrating any sound level meter provided that it is equipped with a laboratory or working standard 1/2" microphone compliant with IEC 61094-01 and IEC 61094-4 standards.

Corrections depending on the microphone

The HD2020 calibrator generates a 94 dB (or 114 dB) sound pressure level referred to 20µPa. Working standard ½" 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 high-frequency cartridge effective 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 ÷ 0.20 dB. Therefore, when you calibrate a free field microphone, you must allow for this difference when you set 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.

LOW BATTERY INDICATION AND REPLACEMENT

The HD 2020 calibrator is provided with two batteries: a 9V alkaline battery that can be replaced by the user and a lithium buffer battery. The latter allows the date indicator and watch to work even without external battery: it must be replaced by a Delta Ohm authorized service centre.

The 9V battery power is constantly monitored:
- If the battery is fully charged, its symbol is off;
- If the battery is partially charged, its symbol blinks: please replace the battery as soon as possible;
- If the battery is uncharged and the instrument cannot work properly, its symbol is constantly on. When the battery is uncharged, the calibrator switches off in about 10 seconds.

To replace 9V batteries, switch off the instrument and open the lid at the bottom of the instrument. Replace the battery. Close the lid.

Date, time and calibration interval are stored if the buffer battery is charged.
The average life of the buffer battery depends on the external battery: if you use it, the average life of the internal battery is about 5 years.

Battery tips

- 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 loss of liquid.
- Use good quality sealed batteries (alkaline if possible).
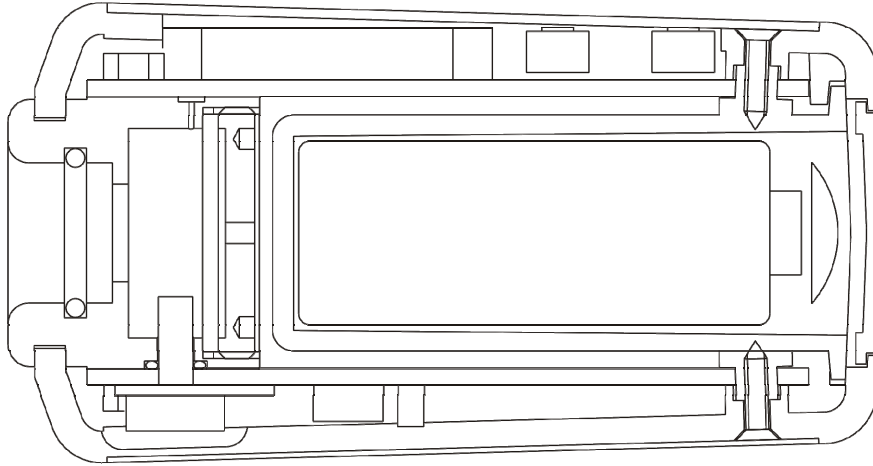
Mechanical construction

Fig. 3 Calibrator mechanical construction (section).

Fig. 3 schematizes the HD 2020 calibrator structure (section). The battery compartment is on the right side of the case. The printed circuits and the electronics are over and under the battery compartment. The display and the keypad take up the higher part. The electro-acoustic transduction device is on the left and it consists of a wide cavity with a piezoceramic generator and a feedback sensor. The device emits the signal through the ½" microphone. An outer capillary hole balances the chamber static pressure protecting microphones from overpressure due to their insertion.

Control electronics

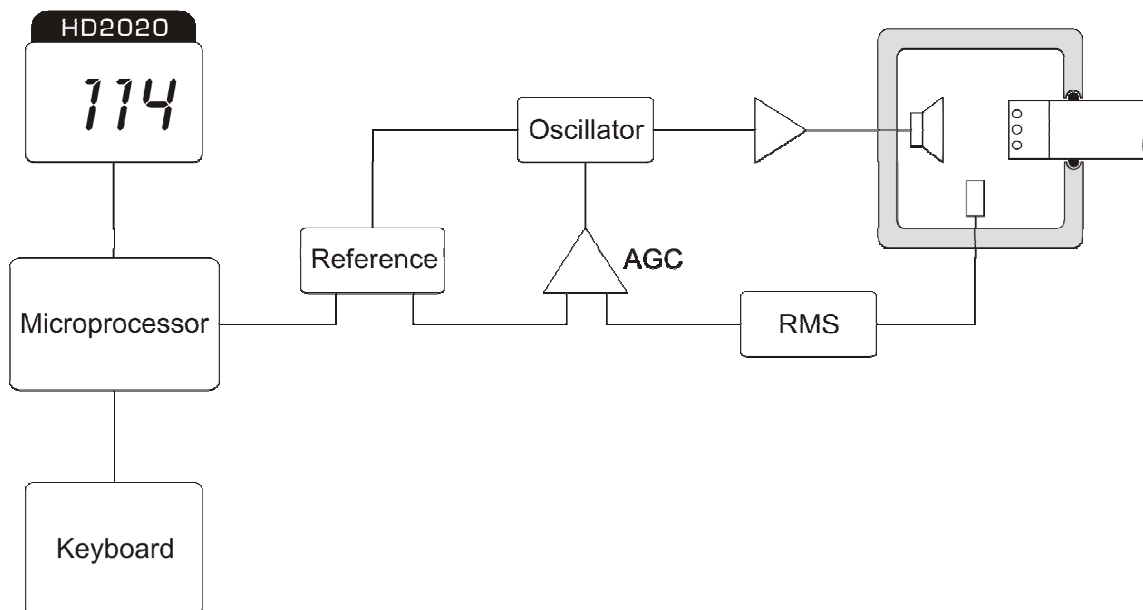Fig. 4 shows the calibrator block diagram.

Fig. 4 Electronics block diagram.

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 feedback signal conditioning.

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

The signal provided by the sensor slightly varies 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.

INSTRUMENT STORAGE

Instrument storage conditions:
- Temperature: -25...+55°C.
- Humidity: below 90% RH without condensation.
- When storing the instrument, avoid:
  High humidity.
  Direct exposure to sunlight.
  Exposure to high-temperature source.
  Strong vibration.
  Steam, salt and/or corrosive gas.

The instrument case is made of ABS: please use only compatible solvents to clean it.

FUNCTIONING AND OPERATING SAFETY

Authorized use

Please read carefully the specifications listed in the following chapter. You are allowed to use the instrument only in compliance with these instructions. Any other use is not authorized.

General safety instructions

This instrument is manufactured and tested in compliance with EN 61010-1 safety standard on electronic measuring instruments and it leaves the factory in perfect safety conditions.
Normal functioning and operating safety are guaranteed only if all usual and specific safety standards described in this manual are observed.
Normal functioning and operating safety are guaranteed only if climatic conditions are the same as described in the "specifications" chapter.

Use and store the instrument avoiding:
- Sudden change of the ambient temperature that may cause condensation.
- Inflammable or corrosive gases.
- Direct vibration or blows.
- Intense electromagnetic fields, static electricity.

If you carry the instrument from a cold to a hot environment, condensation may affect its functioning. In this case you should wait for the instrument temperature to reach the ambient temperature before using it again.

User obligations

The user must comply with the following standards and directives on the use of dangerous materials:
- EEC directives on safety in the workplace
- National legislation on safety in the workplace
- Safe working practices

SPECIFICATIONS

The HD 2020 calibrator complies with **IEC 60942-2003 Class 1 and ANSI S1.40-1984**.

Coupling cavity:	for standard 1/2" microphones (12.7 ±0.03 mm) according to IEC 61094-1 and IEC 61094-4
Frequency:	1000 Hz
Frequency tolerance:	1% in the range -10...+50°C and 10%...90%RH
Sound pressure level:	94.0 dB and 114.0 dB ±0.2 dB at 1kHz
	(referred to 101.3 kPa, 23°C ±3°C and 65% R.H.)
Reference conditions:	20°C, 50% RH, 101.3kPa, 10 mm^3 cartridge volume
Stabilization time:	10s
Total distortion:	<1%
Ambient condition influence	
Temperature and humidity influence:	< 0.3 dB in the range -10°C...50°C and 10%...90%RH
Static pressure influence:	< 0.1 dB in the range 65 kPa ... 108 kPa
Stability levels	
Short-term stability:	±0.01 dB
Stability after 1 year, normal use:	±0.1 dB
Operating conditions	
Working temperature:	-10 … +50°C
Relative humidity:	≤90% R.H.
Storage temperature:	-25 … +70°C
Microphone equivalent volume:	5 to 250 mm^3
Power supply:	9V alkaline battery IEC type 6LR61. 9V rechargeable batteries are also allowed.
9V battery autonomy:	48-hour continuous functioning with good quality alkaline batteries.
Automatic power off:	5 minutes – it cannot be disabled
Watch/date-indicator:	internal with 3V lithium buffer battery
Case material:	ABS
Dimensions:	53x43x83mm
Weight:	160g.
IP Protection degree	IP64
Effects of electromagnetic fields:	< 0.3 dB

ORDERING CODE

HD2020   The kit includes: HD2020 calibrator, one 9V alkaline battery and instruction manual.

CONTENTS

GUARANTEE

GUARANTEE CONDITIONS

All DELTA OHM instruments have been subjected to strict tests and are guaranteed for 24 months from date of purchase. DELTA OHM will repair or replace free of charge any parts which it considers to be inefficient within the guarantee period. Complete replacement is excluded and no request of damages are recognized. The guarantee does not include accidental breakages due to transport, neglect, incorrect use, incorrect connection to voltage different from the contemplated for the instrument. Furthermore the guarantee is not valid if the instrument has been repaired or tampered by unauthorized third parties. The instrument has to be sent to the retailer without transport charge. For all disputes the competent court is the Court of Padua.

The electric and electronic devices with the following symbol cannot be disposed in the public dumps. According to the Directive UE 2002/96/EC, the European users of electric and electronic devices are allowed to give back to the Distributor or Manufacturer the used device at the time of purchasing a new one. The illegal disposing of electric and electronic devices is punished by a pecuniary administrative penalty.

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

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

Instrument type ❑ **HD2020**

Serial number _____

RENEWALS

Date _____   Date _____

Inspector _____   Inspector _____

Date _____   Date _____

Inspector _____   Inspector _____

Date _____   Date _____

Inspector _____   Inspector _____

CE CONFORMITY	
Safety	EN61000-4-2, EN61010-1 LEVEL 3
Electrostatic discharge	EN61000-4-2 LEVEL 3
Electric fast transients	EN61000-4-4 LEVEL 3
Voltage variations	EN61000-4-11
Electromagnetic interference susceptibility	IEC1000-4-3
Electromagnetic interference emission	EN55020 class B