



## HD2020

▶ [ GB ]  
Acoustic  
calibrator



## ▶ [ GB ] 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 displayed value doesn't stop blinking within a few seconds, this means that the microphone is not inserted correctly.

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.



### Acoustic calibrator

1. **ON-OFF** key: turns on and off the instrument. When you turn the instrument on, the display will switch on about three 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 conventional 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**.

### 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 independent of atmospheric 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, or keep it pressed for more than 2 seconds.

The menu shows:

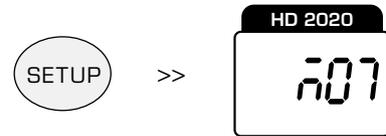
- Current date and time in the format year, month, day, hour, minute, second.
- Current date and time in the format year, month, day of the last calibration.
- The interval between the calibration date and the expiry date in years and months.

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.

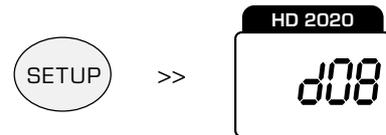
From the standard screen, press the SETUP key to view the current year:



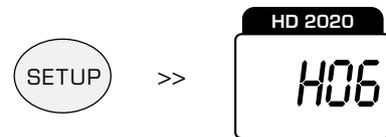
Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to the current month:



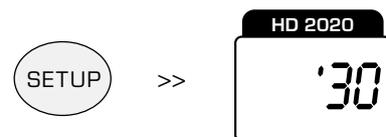
Use the arrow keys to increase/decrease the value. Press the SETUP key to confirm and go to the current day:



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



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



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



Whenever you press the arrow keys, seconds will be reduced to zero. Press the SETUP key to confirm and go to the calibration menu, the triangle in the lower left corner appears and the

calibration year is displayed. (This parameter can't be modified by the user).



(calibration year – first triangle)

Press the SETUP key to go to the calibration month (this parameter can't be modified by the user).



(calibration month – first triangle)

Press the SETUP key to go to the calibration day (this parameter can't be modified by the user).



(calibration day – first triangle)

Press the SETUP key to confirm and to go to menu to set up the calibration expiration date. The second triangle will appear and the number of years between the calibration date which is entered by the calibration laboratory and the expiry date can be entered. When the time interval expires, the triangle will blink to remind you that the calibrator needs adjusting.



(validity years – second triangle)

Use the arrow keys to increase or decrease the value. Press the SETUP key to confirm and go to the number of validity months.



(validity months – second triangle)

Use the arrow keys to increase or 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.

The calibration can be effected by holding the HD2020 upright as well as by leaning the instruments on a worktable.

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 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 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

- 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).

## CONSTRUCTION AND FUNCTIONING

### Mechanical construction

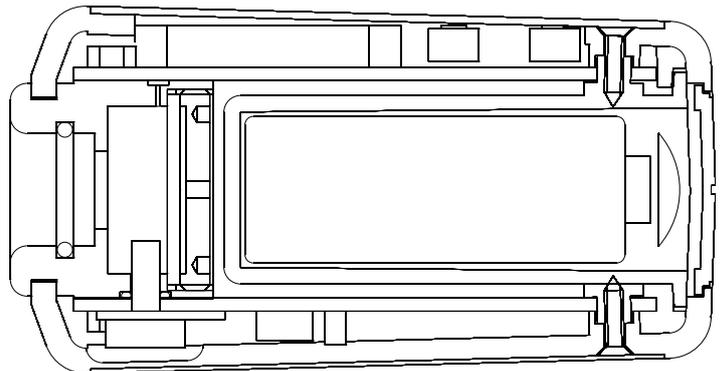


Fig. 3 Calibrator mechanical construction (section).

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 1/2" 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.

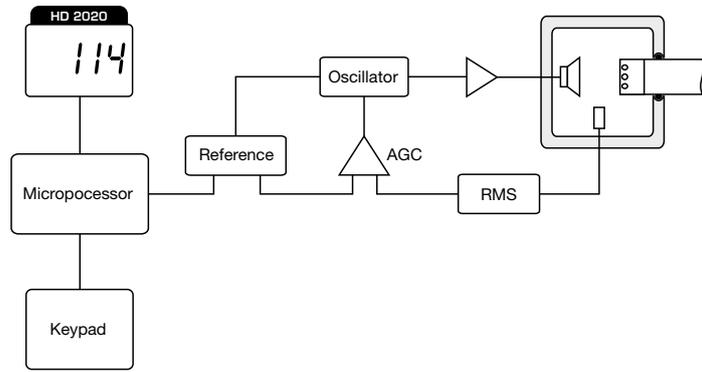


Fig. 4 Electronics block diagram.

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 <sup>3</sup> 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:	±0.03 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 <sup>3</sup>
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, instruction manual and calibration report.

Manufacture of portable and bench top instruments

Current and voltage loop transmitters

Temperature - Humidity - Pressure

Air speed - Light - Acoustics

pH - Conductivity - Dissolved Oxygen - Turbidity

Elements for weather stations - Thermal Microclimate



SIT CENTRE N°124

Temperature - Humidity - Pressure - Air speed

Photometry/Radiometry - Acoustics

#### CE CONFORMITY

- **Safety:** EN61000-4-2, EN61010-1 Level 3
- **Electrostatic discharge:** EN61000-4-2 Level 3
- **Electric fast transients:** EN61000-4-4 livello 3, EN61000-4-5 Level 3
- **Voltage variations:** EN61000-4-11
- **Electromagnetic interference susceptibility:** IEC1000-4-3
- **Electromagnetic interference emission:** EN55020 class B

