

## HD2010UC



### HD2010UC INTEGRATING SOUND LEVEL METER

HD2010UC is an integrating portable sound level meter performing statistical analysis. The instrument has been designed combining maximum low cost and simplicity of use. Attention has been paid to the possibility of adjusting the instrument and adding options at any time to the HD2010UC so to extend its applications. The user can upgrade the firmware directly by means of the Noise Studio programme supplied with the instrument. HD2010UC is equipped with a backlit graphic display.

#### Technical regulations

- Sound Level Meter Class 1 or 2 according to IEC 61672-1:2002 (I.N.R.I.M. Approval Certificate No. 07-0124-02), IEC 61672-1:2013, IEC 60651 and IEC 60804.

#### Applications

- Assessment of the environmental noise level,
- Optional "advanced data logging",
- Optional capture and analysis of sound events,
- Statistical analysis with the calculation of 3 percentile level and optional full statistical analysis,
- Noise monitoring ("Advanced data logger" option required)
- Identification of impulsive noises,
- Measurements in workplaces,
- Selection of personal protective equipment (SNR and HML methods),
- Production quality control,
- Measurement of machine noise, sound power measurements.

With HD2010UC sound level meter it is possible to measure the sound pressure level by programming 3 parameters with the possibility of freely selecting the frequency weightings and the time constants. It is possible to measure parameters such as  $L_{eq}$ , SEL, maximum and minimum sound levels with integration times from 1 second to 99 hours. If an undesired sound event

produces an over-load indication, or simply alters the result of integration, it is always possible to exclude it by using the versatile Back-Erase function. The measured sound levels can be recorded in the large non-volatile memory in order to be transferred to a PC using the supplied Noise Studio software package.

As a **statistical analyzer** (option HD2010.O2 "Advanced Data Logger" required) the HD2010UC samples the sound signal 8 times per second with A-frequency weighting and FAST time constant, and analyzes it statistically in 0.5 dB classes. It is possible to display up to 3 percentile levels between  $L_1$  and  $L_{99}$ . By using "Advanced Data Logger" it is possible to choose whether sampling  $L_F$ ,  $L_{eq}$  or  $L_{pk}$  with A, C or Z weightings (only C and Z for  $L_{pk}$ ).

For further analysis, the LINE un-weighted output allows recording the sound sample either on tape or directly on a PC equipped with a data acquisition card.

The high speed of the USB interface combined with the flexibility of the RS232 interface allows fast data transfers from the sound level meter to the PC mass storage, but can also control a modem or printer. For example, in case of long term measurements, it's possible to activate the "Monitor" function. This function allows to send the displayed data to a PC via the RS232 serial interface, to be directly stored on the PC mass storage. The sound level meter can be completely controlled by a PC through the multi-standard serial interface (RS232 and USB) by using a special communication protocol. Through the RS232 interface, the sound level meter can also be connected to a PC via modem.

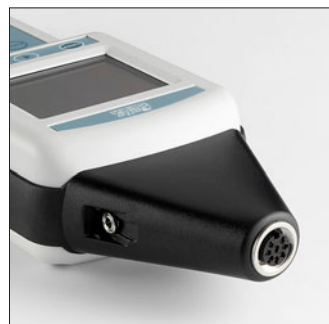
The calibration can be performed either by using the acoustic calibrator (class 1 or class 2 according to the sound level meter version) or the built-in reference generator. The electric calibration uses a special preamplifier and checks the sensitivity of the measuring channel, microphone included. A protected area in the non-volatile memory, reserved to factory calibrations, is used as a reference for the user's calibrations, so to allow keeping instrument drifts under control and to prevent the instrument from losing of calibrations. The control of the complete sound level meter functionality can be made directly by the user, on site, thanks to a diagnostic programme.

The HD2010UC sound level meter can perform measurements according to the law with respect to workers' protection from exposure to noise (D.Lgs.n.81/2008, UNI 9432/2011, ISO 9612/2011). The selection of the personal protective equipment (PPE) can be carried out through comparison of the A and C weighted equivalent sound pressure levels that can be measured simultaneously (SNR method).

The class 1 HD2010UC sound level meter with the "Advanced Data Logger" option is suitable for performing noise monitoring and acoustic mapping and, also assessments of the acoustic climate with capture and analysis of sound events function. When measuring traffic noise in the proximity of airports, railways and roads, the sound level meter can be used as a multi-parameter sound recorder, combining statistical analyzer features. Remote electrical calibrations and diagnostic tests can be executed by using its remote control capabilities.

#### Inputs and outputs

- DC output:** A-weighted sound level with FAST time constant, updated 8 times per second (Ø2.5 mm jack).
- Un-weighted LINE output (Ø3.5 mm jack).
- RS232C standard serial port according to EIA/TIA574. Baud Rate from 300 to 115200 bauds.
- USB 1.1 serial port.
- 5÷24 Vdc/500 mA external power supply (Ø5.5 mm jack).



## Options and accessories

### HD2010MC card reader ("Advanced Data Logger" option required)

It allows interfacing SD memory cards to the sound level meter. This device is connected to the sound level meter by means of a serial interface which supplies the necessary power supply as well. Further to the remarkable recording capacity, the interface allows to quickly download data stored in the internal memory of the sound level meter. It is possible to connect cards with up to 2 GB capacity. 2 GB memory card is supplied.

### Option HD2010.O2 "Advanced Data Logger"

Display and storage of A-weighted sound level profile with FAST time constant, sampled 8 times per second. Storage of the profiles of 3 programmable parameters, sampled 2 times per second. It is also possible to store, in the REPORTS mode, a further 5 global parameters programmable at intervals from 1 second to 1 hour.

The "Advanced Data Logger" option turns the HD2010UC Sound Level Meter into a sound level recorder capable for example of storing for over 40 hours, 1 PROFILE parameter @ 1/8 s + 3 SLM parameters @ 1/2 s.

The identification of impulsive events is possible, thanks to the simultaneous storage of sound level profiles with FAST, SLOW and IMPULSE constants.

During noise assessment in airport, railways or roads environments, the sound level meter can be used as **multi parameters sound events recorder**, or the possibility for recording simultaneously the profile with FAST time constant level and sound exposure level SEL.

This option integrates the sound level analyser functions, with the following additional features:

- **Statistical analysis** available in graphic form both as probability distribution and as cumulative distribution.
- **Capture of sound events** with trigger activated using a threshold level and filter length.
- **REPORTS** function which allows to log 5 additional overall parameters with logging interval from 1 s to 1 hour and complete statistical analysis.
- Record of the event parameters with the possibility of setting the maximum time resolution for the record of events and a lower resolution for the ground recording.
- Possibility to store **markers**.
- **Timer for delayed start** of acquisition.

## Post-processing software

### Noise Studio

The Noise Studio software allows interfacing HD2010UC to the PC in a simple and intuitive way. Main functions are:

- Transfer of stored data from the sound level meter to the PC memory.
- Visualization of the acquired data in a graphic and tabular form.
- Export to Excel and PDF format.
- Printing of graphs and data tables.
- Control of acquisition from a PC.
- Sound level meter configuration via PC. User configurations management and storage.
- Sound level meter firmware update.

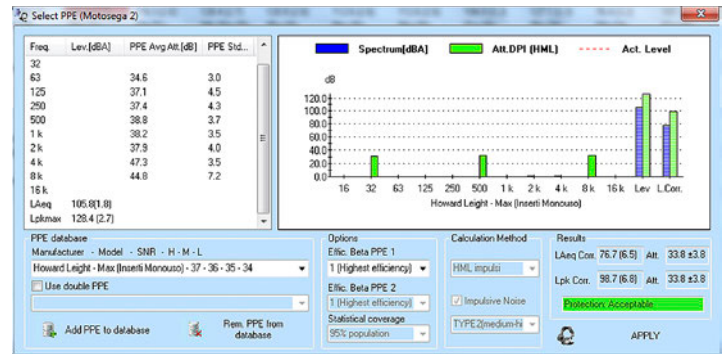
It results easier to create reports starting from the sound level meter's measurements due to the handy function which allows to copy and paste graphs or tables to other applications and to create PDF files.

Moreover Noise Studio is a post processing software able to perform different types of processings, studied for specific applications assembled in software modules to be enabled with licence on CH20 hardware key. Demo versions of the software modules are provided.

### Noise Studio NS1: 'Workers protection' module (to be activated by license)

This application module analyses noise and vibrations in the workplace according to the European directives 2003/10/EC, 2002/44/EC, UNI 9432/2011 and ISO 9612/2011. Sound level measurements and vibration measurements in workplaces are organized in a project where they can be handled and analysed according to standards requirements. The company information, the list of workers and the noise or vibration sources are organized in a database. In addition to calculating the noise exposure of workers the program allows to evaluate the effectiveness of personal

protective equipment (PPE) using the SNR, HML and OBM methods (the method applied depends on the presence or not of octave band spectrum on the sound level meter performances). According to UNI 9432/2011, the program also calculates the impulsiveness index of a noise source. The software creates complete reports both for individual worker and synthetic including the company exposition summary. Reports can be exported or printed directly.



Noise Studio: NS1 "Workers Protection" module; PPE effectiveness analysis.

### Noise Studio NS2A: 'Acoustic Pollution' module (to be activated by license)

This application module analyzes sound level profiles for the assessment of the noise climate, airports noise, road traffic noise and railway noise according to 2002/49/CE Directive.

The noise climate analysis is made on a daily, weekly and annual basis with resolutions up to 1 minute.

Noise profiles detected outdoor, are analyzed in order to search for annoying sources characterized by a sequence of events such as railways and airports. The analysis is performed on a daily basis with a resolution equal to 1/8 of a second and with automated detection and analysis of sound events. This module works on time histories acquired with option "Advanced Data Logger" installed on the sound level meter.

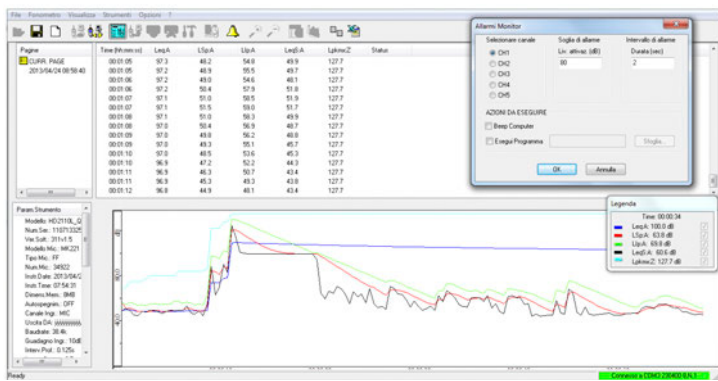


Noise Studio: NS2A "Acoustic Pollution" module; railway traffic noise, 24h analysis with automatic identification of train transits.

### Noise Studio NS4: 'Monitor' module (to be activated by license)

This software module allows to control the sound level meter with PC in remote location. The main features are:

- Real time display of acquired data, in graphical and tabular form.
- Possibility to remotely connect to the sound level meter via modem.
- Acquisition of sound level data directly into the mass memory of the PC (monitor function).
- Management of diagnostic and calibration functions.
- Automatic acquisition and monitoring programme.
- Possibility to log synchronized audio along with the sound level meter measurements, by using the easy trigger function.



Noise Studio: NS4 "Monitor" module; PC based noise acquisition with synchronized audio recording (for later playback).

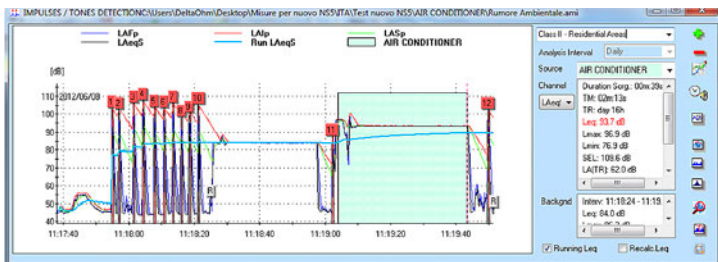
Noise Studio: NS5 "Environmental noise" module (to be activated by license)

Detailed analysis of acoustic pollution and environmental noise sources. The software performs statistical and spectral analyses\*, manually and automatically identifies, by means of the trigger function, single and combined sources. Partial sources levels can be calculated and compared to background noise.

Masking function to exclude one or more sectors of the time history from calculation. A powerful algorithm allows to detect and report impulsive events and to identify tonality\* of noise sources by scanning the multispectral\* 1/3 oct. acquisition and comparing results to ISO226 isophonic curves. Analysis of tones persistence\* over time is made as well. Automatic report and comparison with the limits, both absolute and differential.

Some of the functions require option HD2010.O2 "Advanced Data Logger".

\*Functions not available for HD2010UC. These functions require the spectral analysis options to be installed in the sound level meter - see Models HD2010UC/A and HD2110L.



Noise Studio: NS5 "Environmental Noise" module; sound sources analysis and impulsiveness evaluation.

ORDERING CODES

**HD2010UC.kit1:** it includes class 1 sound level meter HD2010UC, UC52/1 free field prepolarized microphone, HDSAV windscreen, HD2010PNE2 preamplifier (or HD2010PNE2W with opt. HD2010.OE), HD2110USB cable (alternatively, on request, HD2110RS serial cable for RS232 connection), rechargeable batteries, SWD10 stabilized mains power supply, Noise Studio basic software downloadable from Delta OHM website, IEC 61672 manufacturer conformity declaration, carrying case and instruction manual.

**HD2010UC.kit2:** it includes class 2 sound level meter HD2010UC, UC52 free field prepolarized microphone, HDSAV windscreen, HD2010PNE2 preamplifier (or HD2010PNE2W with opt. HD2010.OE), HD2110USB cable (alternatively, on request, HD2110RS serial cable for RS232 connection), rechargeable batteries, SWD10 stabilized mains power supply, Noise Studio basic software downloadable from Delta OHM website, IEC 61672 manufacturer conformity declaration, carrying case and instruction manual.

Options

**HD2010.O2:** "Advanced Data Logger": sound level profiles automatic recording, full statistical analysis with calculation of percentile levels from L<sub>1</sub> to L<sub>99</sub>, capture and analysis of sound events with trigger function, simultaneous data logging of profiles, reports and events. "Navigator" program for reviewing stored data.

**HD2010.SF1:** Option IEC 61672 ISO 17025 accredited calibration.

**HD2010.O1/4:** "Microphone set for measurements up to 160 dB" (only for HD2010UC.Kit1).

**HD2010.O1/4H:** "Microphone set for measurements up to 180dB" (only for HD2010UC.Kit1).

**HD2011.OMN:** "Monitor": extension of datalogger functions for combined use with HD2011NMT station.

**HD2010.OE:** Microphone protection for outdoor measurements. It includes: HDWME outdoor microphone protection with windscreen, rain protection and bird spikes; compatible with 1/2" preamplifiers with min length 85 mm including microphone; HD2010PNE2W heated preamplifier (substitutes HD2010PNE2 standard preamplifier); includes CTC device for electric calibration and 5 m (10 m on request) integrated extension cable.

**HD2010UC.U1:** Upgrade of HD2010UC with "Data Logger" option into HD2010UC/A. It includes:

- DSP with octave bands spectral analysis
- ISO 17025 calibration certificate of sound level meter according to IEC 61672 and octave filter bank according to IEC 61260

Calibrators

**HD2020:** Sound level calibrator, class 1 (type approved) according to IEC 60942:2003, with LCD display, suitable for 1/2" and 1/4" standard microphones. Does not require any correction for static pressure, humidity and temperature. Calibration frequency 1000 Hz, levels 94 dB and 114 dB. ACCREDIA (ISO 17025) calibration certificate according to IEC 60942 included.

**HD2022:** Sound level calibrator, class 2 according to IEC 60942:2003, suitable for 1/2" and 1/4" (1) standard microphones. Does not require any correction for static pressure, humidity and temperature. Calibration frequency 1000 Hz, level 114dB. ACCREDIA (ISO 17025) calibration certificate according to IEC 60942 included.

**HD2020AD4:** Adapter for 1/4" microphones. Can be used with HD2020 and HD2022 sound calibrators

Accessories

**HD2010PNE2:** Preamplifier for UC52/1 and UC52 microphones, equipped with CTC device for electrical calibration and driver for cable up to 10 m

**HD2010PNE2W:** Heated preamplifier for UC52/1 and UC52 microphones, with 5 m integrated extension cable (10 m on request). The preamplifier can be combined with the microphone outdoor protection HDWME and is equipped with CTC device for electrical calibration

**HD2110RS:** serial RS232 cable for connection to a PC or to HD40.1 printer.

**HD2110USB:** serial USB cable for connection to a PC

**SWD10:** Stabilized mains power supply 100-240 Vac/12 Vdc 1 A.

**CPA/5:** 5 m microphone extension cable.

**CPA/10:** 10 m microphone extension cable.

**VTRAP:** tripod, 1310 mm maximum height.

**BAT4V8NIMH:** spare battery pack for the sound level meter.

**HD2110/SA:** support to fix preamplifier to tripod.

**HD40.1:** portable serial thermal printer equipped with SWD10 stabilizer mains.



**HD2010MC:** Module for data logging and data download to MMC or SD type memory cards, 2 GB SD card included (HD2010.O2 "advanced data logger" required)

**BAGSL:** Carrying case

### Software for Windows\* operating systems

**Noise Studio:** software for Windows\* (32-64bit) supplied with the sound level meter kit. It allows sound level meter configuration, download, export and graphic display of stored data. This software supports acoustic and vibration post processing application modules, which can be enabled by licence with protection hardware key. Noise Studio includes demo versions of the application modules.

**CH20:** Hardware key for PC working with Windows\* operating system. When plugged into the USB port, according to licence purchased, it enables the Noise Studio software modules.

**NS1:** Noise Studio "Workers' Protection" module activation. Noise and vibration analysis in the workplaces according to UNI 9432/2011, ISO 9612/2011 and 2003/10/CE and 2002/44/CE European directives.

**NS2A:** Noise Studio "Acoustic Pollution" module activation. Acoustic climate analysis and evaluation of road, railway and airport traffic noise (according to 2002/49/CE Directive). Some of the functions require HD2010.O2 "Advanced Data Logger" option.

**NS4:** Noise Studio "Monitor" module activation. Real time PC data acquisition. Synchronized audio recording. Monitor and remote control programming. Connection by modem.

**NS5:** Noise Studio "Environmental Noise" module. Analysis of acoustic pollution and environmental noise sources. The software performs statistical analyses; automatically identifies noisy events and the pulse components of the noise sources. The analyses are performed in compliance with national (D.M. 16/03/1998) and EU legislation regarding noise pollution.

### Noise Studio combined packages:

**NSA:** "Environment" modules package including:

- NS2A: "Acoustic Pollution"
- NS5: "Environmental Noise"

**NSLA:** "Work & Environment" modules package including:

- NS1: "Workers Protection"
- NS2A: "Acoustic Pollution"
- NS5: "Environmental Noise"

### Ordering codes for spare parts and other accessories

**HDSAV:** Windscreen for 1/2" microphones.

**UC52/1:** Class 1 free field pre-polarized 1/2" microphone.

**UC52:** Class 2 free field pre-polarized 1/2" microphone.

TECHNICAL SPECIFICATIONS	
<b>Standards</b>	Class 1 or 2 Group X according to IEC 61672-1:2013 Approval according to IEC 61672-1:2002 (I.N.R.I.M. Approval Certificate No. 07-0124-02) Class 1 or 2 according to IEC 60651:2001 and IEC 60804:2000
<b>1/2" microphone</b>	UC52 (or UC52/1) condenser type, pre-polarized, for free field
<b>Dynamic range</b>	30 dBA ÷ 143 dB Peak
<b>Linearity range</b>	80 dB
<b>Acoustic parameters</b>	Spl, $L_{eq}$ , $L_{SEL}$ , $L_{EP,d}$ , $L_{max}$ , $L_{min}$ , $L_{pk}$ , Dose, $L_n$
<b>Frequency weightings</b>	Simultaneous A, C, Z (only C and Z for $L_{pk}$ )
<b>Time weighting</b>	Simultaneous FAST, SLOW, IMPULSE
<b>Integration</b>	From 1s to 99 hours with Back-Erase function
<b>Statistical analysis</b>	It displays up to 3 percentile levels, between $L_1$ and $L_{99}$ Probability distribution and percentile level calculation from $L_1$ to $L_{99}$ (HD2010.O2 "Advanced data logger" option) <ul style="list-style-type: none"> <li>• Parameter: <math>L_{F_{pk}}</math>, <math>L_{eq}</math>, <math>L_{pk}</math>, A, C or Z - weighted (only C or Z for <math>L_{pk}</math>)</li> <li>• Sampling frequency: 8 samples/second</li> </ul> Classification: Classes of 0.5 dB
<b>Analysis of events</b> (Option HD2010.O2)	<ul style="list-style-type: none"> <li>• Calculation of 5 freely-programmable event parameters</li> <li>• Calculation of statistical levels from <math>L_1</math> to <math>L_{99}</math></li> <li>• Event identification trigger with programmable threshold and duration filter</li> <li>• Manual trigger</li> </ul>
<b>Profile data logging</b> (Option HD2010.O2)	Parallel acquisition of profiles, reports and events 1 profile with sampling 1/8 s and 3 profiles with 2 samples/second, 5 parameters profiles in <b>Report</b> mode with minimum sampling interval 1s.
<b>Display</b>	Graphic backlit LCD display 128 x 64 <ul style="list-style-type: none"> <li>• 3 parameters in numeric format</li> <li>• Profile <math>L_{A_{Fp}}</math> with 8 samples/second (option HD2010.O2 "Advanced Data Logger")</li> <li>• Graph of sound level probability distribution (option HD2010.O2 "Advanced Data Logger")</li> <li>• Graph of percentile levels from <math>L_1</math> to <math>L_{99}</math> (option HD2010.O2 "Advanced Data Logger")</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>• Internal, equal to 8 MB for more than 500 records. If the HD2010.O2 option "Advanced Data Logger" is installed, with 8 MB it is possible to record 1 parameter PROFILE @ 1/8 s + 3 parameter SLM @ 1/2 s for more than 40 hours.</li> <li>• External, via the HD2010MC memory card interface, using SD cards up to 2 GB</li> </ul>
<b>Input/Output</b>	<ul style="list-style-type: none"> <li>• RS232 serial and USB interfaces</li> <li>• AC output (LINE)</li> <li>• DC output</li> </ul>
<b>PC programs</b>	Noise Studio (provided with the instrument): PC interface for data download, set up and instrument management Licensed software modules to be enabled by hardware key: <ul style="list-style-type: none"> <li>• <b>NS1</b> - "Workers protection" module. Analysis of noise and vibrations in the workplace according to UNI 9432 and ISO 9612 and 2003/10/CE and 2002/44/CE directives.</li> <li>• <b>NS2A</b> - "Acoustic pollution" module. Analysis of environmental noise. Analysis of the noise climate and assessment of noise from road, rail and airport according to the law. (requires option HD2010.O2).</li> <li>• <b>NS4</b> - "Monitor" module. PC based real time acquisition. Remote monitoring and data capture. Remote connection also via Modem. The program allows programming of measurements and calibrations with timer and performs events audio recording with programmable triggers levels.</li> <li>• <b>NS5</b> - "Environmental Noise" module: environmental noise analysis. Noise sources identification with threshold conditions and impulsiveness evaluation. Some of the functions require HD2010.O2 option.</li> </ul>
<b>Operating conditions</b>	Working temperature -10...50 °C, 25...90% RH (not condensing), 65...108 kPa. Protection degree: IP64
<b>Power supply</b>	4.8 V / 2.1 A NiMH rechargeable battery or external 5÷24 Vdc / 500 mA
<b>Dimensions and weight</b>	445 x 100 x 50 mm equipped with preamplifier, 740 g (with batteries)