



## HD 2010UC/A INTEGRATING SOUND LEVEL METER - FREQUENCY ANALYZER

*HD2010UC/A is a portable integrating sound level meter, with multiparametric data logging capability. It is suitable for statistical and spectral analyses, the instrument has been designed by combining maximum flexibility, cost effectiveness and usability. Attention has been paid to the possibility to update the instrument in order to comply with the standards evolution concerning acoustics. In order to adapt to the current and future users needs, it is possible to add options to the HD2010UC/A so to extend its applications; the user can update the firmware directly by means of the noise studio software supplied with the instrument.*

### Technical regulations:

- Class 1 or 2 sound level meter according to IEC 61672-1-2002 (Type Approval Certificate I.N.R.I.M. No. 07-0124-02), IEC 60651 and IEC 60804.
- Class 1 octave and third octave filters according to IEC 61260.

### Applications:

- Assessment of the environmental noise level,
- Noise monitoring, capture and analysis of sound events,
- Octave and optional third octave bands spectrum analysis from 25 Hz to 12.5 kHz,
- Statistical analysis with the calculation of 3 percentile levels and full statistical analysis,
- Identification of impulsive noise,
- Measurements in workplaces,
- Selection of personal protective equipment (SNR, HML and OBM methods),
- Sound insulation and reclamation,
- Production quality control,
- Measurement of machine noise,
- Optional architectural and building acoustics measurements.

By using the HD2010UC/A, you can log the time profile of 4 simultaneous parameters freely selecting time or frequency weightings. The possibility to display, store and even print the multi-parameter analysis of the sound level allows the sound level meter to work as a sound level logger capable of storing for more than 23 hours. For sound level monitoring, you can store 3 programmable parameters and the average spectrum at intervals of 1 second to 1 hour. In this recording mode, you can store the sound level (3 parameters + spectra) at intervals of 1 minute for over 23 days using the supplied memory (4 MB expandable to 8 MB). An advanced acquisition mode allows storing report sequences with dedicated parameters, average spectra and full statistical analysis, as well as sound level profiles. Moreover, a versatile trigger function can identify the sound events and record their analysis with 5 dedicated parameters, average spectrum and statistical analysis.

The spectrum analysis is carried out simultaneously with the profile logging in real time by octave bands and optionally by third octave bands. The sound level meter calculates the sound signal spectrum twice a second and can integrate it linearly for up to 99 hours. The average spectrum is displayed together with an A, C or Z -weighted wideband level.

As a statistical analyzer, the HD2010UC/A samples the sound signal 8 times per second with A-weighting and FAST time constant and analyzes it statistically in 0.5 dB classes. Up to 4 percentile levels, selectable between L<sub>1</sub> and L<sub>99</sub>, can be programmed. It can be decided to sample the following: L<sub>Fp</sub>, Leq and L<sub>pk</sub> with A, C and Z -weightings (only C and Z for L<sub>pk</sub>).

Additional functions as advanced sound analyser are available in the basic version:

- **Statistical analysis** in graphic form both as probability distribution and as cumulative distribution
- **Trigger functions for sound events capture** with threshold level and event duration filter
- **Record of measuring REPORTS** with programmable intervals from 1 s to 1 hour with a customizable set of 5 parameters, complete statistical analysis and frequency multi-spectra
- Acquisition of **noise events** with the possibility to set the maximum temporal resolution for event recording and a lower resolution for background recording.



HD WME

- Possibility to record up to **9 different markers**
- **Timer for programming delayed start** of acquisition

For further analyses, the LINE unweighted output allows recording the sound sample either on tape or directly on a PC equipped with a data acquisition card.

Recordings can be located in memory and visualized on the graphic display using the "Replay" function, which reproduces the time trend of the sound track. The high-speed USB interface, combined with the flexible RS232 interface, allows quick data transfers from the sound level meter to the PC mass storage, as well as controlling a modem or a printer. For example, should the supplied memory not be enough, this can be the case of long term monitoring campaign, you can activate the "Monitor" function. This function allows sending the displayed data to a PC via the 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 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.

HD2010UC/A sound level meter can perform all the measurements required to evaluate **workers' noise exposure**. The selection of the personal protective equipment can be carried out through octave band spectrum analysis (OBM method) or comparison of the A and C-weighted equivalent levels that can be measured simultaneously (SNR method). If an undesired sound event produces an overload indication, or simply alters the result of integration, its contribution can be excluded using the versatile Back-Erase function.

HD2010UC/A sound level meter is suitable for **environmental noise, noise monitoring** and acoustic mapping. Using the "Advanced datalogger", it can also perform analysis of the **acoustic climate** with capture and analysis of sound events. When measuring traffic noise near airports, railways and roads, the sound level meter can be used as a multi-parameter sound recorder, combining the statistical and spectrum analyzer features. Remote electrical calibrations and diagnostic tests can be executed using its remote control capabilities.

HD2010UC/A sound level meter with the "Third Octave" and "Reverberation Time" options can perform all measurements prescribed by the regulations on **building acoustics evaluation**. The sound level meter powerful DSP calculates 32 spectra/second, and it can measure reverberation times both using the sound source interruption and impulse response integration. The analysis is carried out simultaneously by both octave and third octave bands.

### Inputs and outputs

DC output corresponding to the A-weighted sound level with FAST time constant, updated 8 times/s (Ø 2.5 mm jack).

LINE unweighted output (Ø 3.5 mm jack).

Standard RS232C serial port complying with EIA/TIA574. Baud Rate 300 to 115200 baud.

USB 1.1 serial port.

External power supply 9÷12Vdc (Ø 5.5 mm jack).

### Options and accessories:

#### HD2010MC reader

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 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 having up to 2GB capacity. 2GB card is supplied.

#### Option "Third Octave" cod. HD2010.01

Third octave band spectrum analyzer class 1 according to IEC 61260.

Using the "Third Octave" option you can analyze the spectrum of a sound source in real time from 25 Hz to 12.5 kHz. The audibility of the different spectrum components can be evaluated thanks to the equal loudness curves calculation of Noise Studio, the program supplied with the instrument. The third octave analysis can be also in "multi-spectrum" mode with 1s minimum logging time period, thanks to the REPORT data-logging mode.

#### Option "Reverberation Time" cod. HD2010.04

Reverberation time measurement using the sound source interruption technique and the impulsive source method.

The reverberation time measurement is made simultaneously by octave bands from 125 Hz to 8 kHz and, optionally, third octave bands from 100 Hz to 10 kHz. Sampling interval  $1/32$  s.

Automatic calculation of reverberation times EDT, T10, T20 and T30 for all bands. Additional post processing of RT decays can be performed via NS3 Noise Studio software module available as an option.

#### Option "Heated preamplifier" cod. HD 2010.0R

Replacement of the standard preamplifier HD2010PNE2 with the heated version HD2010PNE2W. The heated preamplifier can be combined with the outdoor microphone protection HDWME and is equipped with CTC device for electrical calibration and 5m integrated extension cable (10m on request).

### Software:

#### Noise Studio

The Noise Studio software allows interfacing HD2010UC/A 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 captured data under graphic and tabular form.
- Export to Excel and PDF format.
- Printing of graphs and data tables.
- Isophonic curves superposition over third octave charts
- Control of acquisition from a PC.
- Sound level meter setup management.
- Sound level meter firmware update.

It results easy to create documents regarding the sound level meter's measurements due to the handy function which allows to copy graphs or visualized tables to other applications and to create PDF files.

Moreover Noise Studio is a post processing software able to perform different kind of noise and vibration analyses. Different software modules are available for specific applications; they can be enabled by purchasing the proper licence. Demo versions of the software modules are provided.

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

This application module analyzes noise and vibrations in the workplace according to the European Directive **2003/10/EC**, and technical standards **ISO9612/2011** and **UNI 9432/2011**. Data sound level measurement in work environment is organized in a project where they can be handled according to regulatory requirements. In addition to calculating the noise exposure of workers the software allows to evaluate the effectiveness of protective equipment by the methods SNR, HML and OBM. According to UNI 9432/2011 and ISO 9612/2011, the software also calculates the index of impulsiveness of a machine.



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



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

This application module analyzes noise level profiles for the assessment of noise produced by industrial plants, construction sites, airports, roads, railways and transport infrastructures.

The analysis is made on a daily, weekly and annual basis with resolutions up to 1 minute according to 2002/49/CE Directive.

The noises profiles are analyzed in order to search for disturbing sources characterized by a sequence of events such as railways and airports (SEL calculations). The analysis is performed on a daily basis with a resolution of 1/8 s and with automated search and analysis of sound events.

Some of the functions require option HD2010.01 "Third octaves".

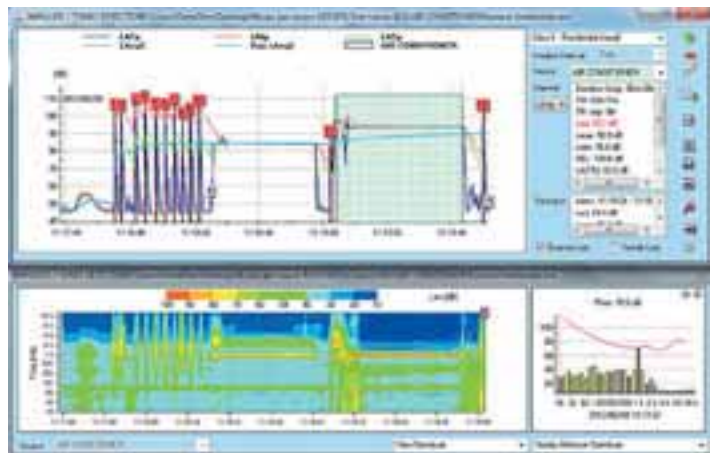


Noise Studio: NS2A "Acoustic Pollution" module; railway traffic noise, 24h analysis with automatic identification of train transits.

### 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



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

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 HD2010.01 "Third octaves".

### Noise Studio: NS3 'Acoustic Insulation' module (to be activated by license)

This module performs building acoustics calculations for the assessment of acoustic performances of buildings, according to ISO standard.

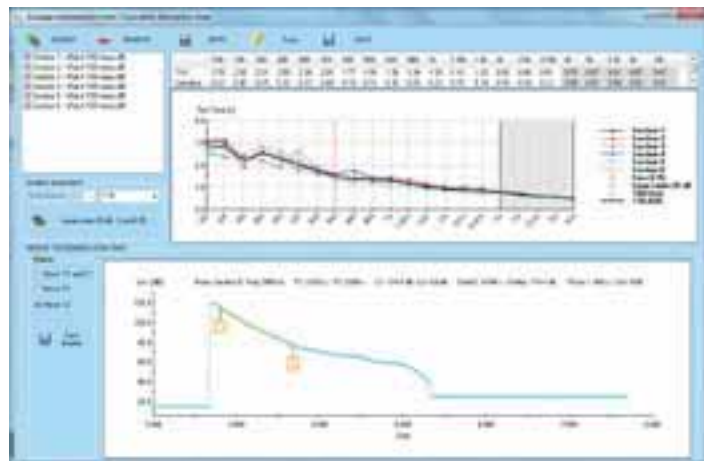
The measurements necessary for the analysis of a building are grouped in a project to simplify their storage and search. Also, technical reports, comments, graphics, photos, etc. which remain part of the work can be added to the same measures and, if necessary, may be found easily.

An upgradable database, divided by walls and floors, contains the main characteristics of sound-insulating structures. The data contained in the database can be graphically and numerically compared with on-site measures.

It's also possible to calculate:

- Average reverberation time (ISO 3382)
- Reverberation time decays editing
- Acoustic classification according to UNI 11367/2010
- Service equipments noise: continuous and discontinuous systems
- Area of equivalent absorption, coefficient of sound absorption (ISO 354)
- Airborne sound insulation: indices  $R$ ,  $R'$  and  $D_{nT}$  (ISO 140/III and IV)
- Insulation of facades and facade elements: indices  $D_{2m,nT}$  and  $R_{\theta}$  (ISO 140 / V)
- Impact noise insulation: indices  $L_n$ ,  $DL$ ,  $L'_n$  and  $L'_{nT}$  (ISO 140/VI, VII and VIII)

Most of the calculation require "third octave" and "reverberation time" options installed on the sound level meter.

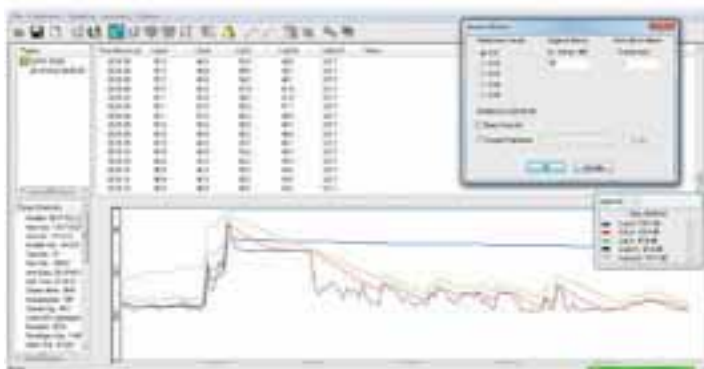


Noise Studio: NS3 "Acoustic Insulation" module; T60 re-calculation and decays editing.

### 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 functions are:

- Real time display of acquired data, in graphical and tabular form.
- Possibility of connection via modem with the sound level meter.
- 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).

## ORDERING CODES

**HD2010UC/A kit1 and kit2:** it includes HD2010UC/A class 1 sound level meter (class 2 for HD2010UC/A kit2), HD2010PNE2 preamplifier, UC52/1 free field microphone (UC52 for HD2010UC kit2), windscreen and serial RS232 or USB connection cable. Noise Studio PC programme. Supplied with individual ACCREDIA calibration Certification, according to IEC 61672. ACCREDIA Certification of CPB filters according to IEC 61260.

## Options and accessories

**Option HD2010.00 "Memory module":** 4MB expansion memory.

**Option HD2010.01 "Third Octave":** spectral analysis in third octave bands from 25Hz to 12.5KHz, class 1 according to IEC 61260. **ACCREDIA calibration Certification according to IEC 61260 included.**

**Option HD2010.04 "Reverberation Time":** reverberation time measurement by source interruption and integration of impulse response method.

**Option HD 2010.OR "Heated preamplifier":**

replacement of the standard preamplifier HD2010PNE2 with the heated version HD2010PNE2W. The heated preamplifier can be combined with the outdoor microphone protection HDWME and is equipped with CTC device for electrical calibration and 5m integrated extension cable (10m on request).

**HD2020:** Class 1 sound calibrator according to IEC60942:2003 (I.N.R.I.M. n.90-003-01 Certificate of Conformity). Features:

- Static pressure compensation from 65kPa to 108kPa,
- Cavity for ½" microphones according to IEC61094,
- 1000Hz frequency,
- 94dB/114dB noise levels.

The calibrator is provided with ACCREDIA individual calibration Certification.

**HD9101:** Class 1 sound calibrator according to IEC60942:1988. Features:

- Cavity for ½" microphones according to IEC61094,
- 1000Hz frequency,
- 94dB/114dB sound levels.

The calibrator is provided with ACCREDIA individual calibration Certification.

**HD9102:** Class 2 sound calibrator according to IEC 942:1988. Features:

- Cavity for ½" microphones according to IEC 61094,
- 1000Hz frequency,
- 94dB/114dB sound levels.

The calibrator is provided with ACCREDIA individual calibration Certification.

**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 5m integrated extension cable (10m 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 with Vin=100÷230Vac Vout=12Vdc/1000mA voltage.

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

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

**VTRAP:** tripod, 1550mm maximum height.

**VTRAP.H4:** Tripod with 4 m maximum height. Max. load 10 kg

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

**HD40.1:** portable serial thermal printer with 57mm paper tape equipped with SWD10 stabilizer mains.

**BAT40:** spare battery pack for HD40.1 printer

**RCT:** 4 rolls of thermal paper, 57width and 32mm diameter.

**HD2010MC:** module for data logging and data download to MMC or SD type memory cards, 2GB SD card included.

**HDWME:** Outdoor microphone protection with windscreen, rain shield and birds spike. Can be combined with the HD2010PNE2W preamplifier. Includes: windscreen HDSAV3, birds spike HDWME1, rain shield HDWME2, stainless steel support HDWME3

## 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 following 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 HD2010.01 "Third Octaves" option**

**NS3:** Noise Studio "Acoustic Insulation" module activation. Architectural and building acoustic according to ISO354, ISO140 and ISO717 series standards and UNI11367/10. **For some calculations sound level meter options HD2010.01 "Third Octaves" and HD2010.04 "Reverberation Time" are required.**

**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 and spectral analyses; automatically identifies noisy events and the pulse and tonal 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"

**NSAE:** "Environment & Building" modules package including:

NS2A: "Acoustic Pollution"

NS3: "Acoustic Insulation"

NS5: "Environmental Noise"

**NSS:** Noise Studio software complete package including:

NS1: "Workers Protection"

NS2A: "Acoustic Pollution"

NS3: "Acoustic Insulation"

NS4: "Monitor"

NS5: "Environmental Noise"

## Ordering codes for spare parts and other accessories

**HD SAV:** Windscreen for ½" microphones.

**HDSAV3:** Windscreen for HDWME weather protections.

**HDWME1:** Bird spike for HDWME weather protection.

**HDWME2:** Rain shield for HDWME microphone unit.

**HDWME3:** Stainless steel housing for the preamplifier of HDWME weather protection, with holder for rain shield HDWME2.

**UC52/1:** Class 1 free field pre-polarized ½" microphone .

**UC52:** Class 2 free field pre-polarized ½" microphone.



## TECHNICAL SPECIFICATIONS

Standards	Class 1 or 2 group X according to IEC 61672:2002, and class 1 or 2 according to IEC 60651:2001 and IEC 60804:2000 Class 1 according to IEC 61260:1995 Type 1 or 2 according to ANSI S1.4-1983 and S1.43-1997 Class 1-D, order 3, Extended range according to ANSI S1.11-1986
½ inch Microphone	UC52 condenser type, pre-polarized, for free field
Dynamic Range	30 dBA ÷ 143 dB Peak
Linearity range	80 dB
Acoustic Parameters	Spl, L <sub>eq</sub> , L <sub>eq</sub> I, SEL, L <sub>EP,d</sub> , L <sub>max</sub> , L <sub>min</sub> , L <sub>pk</sub> , Dose, L <sub>n</sub>
Frequency Weightings	Simultaneous A, C, Z (only C and Z for L <sub>pk</sub> )
Time Weighting	Simultaneous FAST, SLOW, IMPULSE
Integration	From 1s to 99 hours with Back-Erase function
Spectrum Analysis	Parallel CPB filters in real time complying with class 1 specifications according to IEC61260 ✓ Octave bands from 32 Hz to 8 kHz ✓ Third octave bands from 25 Hz to 12.5 kHz ("Third Octave" option) Average spectrum (AVR) mode – Multi-spectrum in "REPORT" mode
Statistical Analysis	It displays up to 3 percentile levels, between L <sub>1</sub> and L <sub>99</sub> Probability distribution and percentile level calculation from L <sub>1</sub> to L <sub>99</sub> ✓ Parameter: L <sub>Fp</sub> , L <sub>eq</sub> , L <sub>pk</sub> A, C or Z -weighted (only C or Z for L <sub>pk</sub> ) ✓ Sampling frequency: 8 samples/second Classification: Classes of 0.5 dB
Combined data logging	Parallel profiles, reports, events acquisition ✓ Record of measuring reports with programmable intervals from 1 s to 1 hour with a customizable set of 5 parameters, complete statistical analysis and frequency spectra.
Analysis of Events	✓ Calculation of 5 freely-programmable event parameters ✓ Average spectrum calculation by octave and third octave bands ✓ Calculation of statistical levels from L <sub>1</sub> to L <sub>99</sub> ✓ Event identification trigger with programmable threshold and duration filter ✓ External and manual trigger
Reverberation Time (option HD2010.04)	Reverberation time measurement using sound source interruption or impulse response integration Reverberation time calculation in 1/3 octave requires option HD2010.01 "Third Octave"
Profile Data Logging	1 profile with sampling 1/8 s and 3 profiles with 2 samples/second, 5 parameters profiles in "Report" mode with minimum sampling interval 1s.
Spectrum Data Logging	Programmable sampling from 1 second to 1 hour (AVR mode). Multi-spectrum data logging in "Report" mode with minimum sampling interval 1s.
Display	Graphic backlit LCD display 128x64 ✓ 3 parameters in numeric format ✓ Profile L <sub>AFp</sub> with 8 samples/second ✓ Octave band spectrum from 32 Hz to 8 kHz ✓ Third octave band spectrum from 25 Hz to 12.5 kHz (option "Third Octave" ) ✓ Graph of sound level probability distribution ✓ Graph of percentile levels from L <sub>1</sub> to L <sub>99</sub>
Memory	Internal, equal to 4 MB (4 profiles for 23 hours or over 23 recording days of 3 parameters + spectra per minute) expandable to 8 MB External, via the HD2010MC memory card interface, using MMC or SD cards up to 2 GB
Input/Output	✓ RS232 serial and USB interfaces ✓ AC output (LINE) ✓ DC output
PC Programs	Noise Studio (supplied with the instrument): PC interface for data download, set up and instrument management. Licensed software modules to be enabled by hardware key. ✓ NS1 "Workers protection" module. Analysis of noise in the workplace in accordance with ISO 9612/2011 and UNI 9432/2011. ✓ NS2A "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. <u>Some of the functions need option "Third octaves"</u> . ✓ NS3 "Acoustic Insulation" module. Evaluation of airborne sound insulation, impact noise and sound absorption; buildings insulation classification (UNI 11367). <u>Some of the calculation require option "Third octaves" and option "Reverberation time" installed in the sound level meter.</u> Calculation according to ISO140, ISO717 and ISO354. ✓ NS4 "Monitor" module. Acquisition in real time on PC. Synchronized audio recording. Remote monitoring and data capture. Connection via Modem. ✓ NS5 "Environmental Noise" module: environmental noise analysis. Noise sources identification with threshold conditions. Tonality and impulsiveness evaluation. <u>Some of the functions require "Third octave" option.</u>
Operating conditions	✓ Working temperature -10÷50°C, 25÷90%RH (not condensing), 65÷108kPa. Protection degree: IP64
Power	✓ 4 alkaline or rechargeable NiMH type AA batteries or external 9÷12Vdc 300mA
Dimension and weight	✓ 445x100x50 mm equipped with preamplifier, 740 g (with batteries)