Acoustics - Vibrations

it consists of HD2010UC class 1 sound level meter (class 2 for HD2010UC kit2), HD WME weatherproof microphone unit for outdoor use, HD2010PNE2W heated preamplifier, HD2010PNE2 preamplifier, UC52/1 microphone for free fields (UC52 for HD2010UC kit2), HD SAV windscreen, 5m extension cable and serial RS232 or USB connection cable. Noise Studio PC programme.

Accessories

Option 0 "Memory Expansion": 4MB memory expansion. **It needs Option 2 "Data Logger".**

Option 2 "Data logger": storage of sound level profiles, continuous and with intervals. It includes the memory expansion from 2MB to 4MB.

Option 5 "Advanced Analyser": Profiles+reports+events data logging, event capture and full statistical analysis. **Only for HD2010UC class 1 with Option 2 "Data Logger"**.

Option 7 "SIT Calibration": SIT calibration which replaces ISO9001 Reports. **For new instruments only**.

Option LCD: Backlit display. **For new instruments only**.

HD9101: class 1 calibrator according to IEC60942:1988. Features:
- Cavity for 1" and ½" standard microphones according to IEC 61094,
- Frequency: 1000Hz,
- Sound level: 94dB/114dB.

The calibrator is supplied with ISO 9001 report of calibration.

HD9102: class 2 calibrator according to IEC60942:1988. Features:
- Cavity for 1" and ½" standard microphones according to IEC 61094,
- Frequency: 1000Hz,
- Sound level: 94dB/114dB.

The calibrator is supplied with ISO 9001 report of calibration.

HD2020: class 1 calibrator according to IEC60942:2003 with I.N.RI.M. n.90-003-01 Certificate of Conformity. Features:
- LCD Display,
- Static pressure compensation from 65 kPa to 108 kPa,
- Cavity for ½" standard microphones according to IEC 61094,
- Frequency: 1000Hz,
- Sound level: 94dB/114dB.

The calibrator is supplied with ISO 9001 report of calibration.

HD2110/RS: serial RS232 cable for connection to a PC or to HD40.1 printer.

HD2110/USB: serial USB cable for connection to a PC

SWD10: stabilized mains power supply with Vin=100÷230Vac Vout=12Vdc/1000mA voltage.

CPA/10: 10m extension cable.

VTRAP: tripod, 1550mm maximum height.

HD 2010UC
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.

Technical regulations:
- **Class 1 or 2 sound level meter according to IEC 61672-1 dated 2002 (Certificate of Compliance I.N.RI.M. n. 07-0124-02)**, IEC 60651 and IEC 60804.

Applications:
- Assessment of the environmental noise level,
- Optional "data logging" function,
- Optional capture and analysis of sound events,
- Statistical analysis with the calculation of 3 percentile level and optional full statistical analysis,
- Identification of impulsive noises,
- Measurements in workplaces,
- Selection of personal protective equipments (SNR and HML methods),
- Production quality control,
- Measurement of machine noise.

Sound level meter class 1 or 2 Kit
- **HD2010UC kit1 and kit2**: consists of HD2010UC sound level meter class 1 (class 2 for HD2010UC kit2), HD2010PNE2 preamplifier, UC52/1 microphone for free field (UC52 for HD2010UC kit2), windscreen, 5m extension cable and serial RS232 or USB connection cable. Noise Studio PC programme.
- **HD2010UC kit1/E and kit2/E**: version for outdoor measurements, it consists of HD2010UC sound level meter class 1 (class 2 for HD2010UC kit2), HD WME weatherproof microphone unit for outdoor use, HD2010PNE2W heated preamplifier, UC52/1 microphone for free field (UC52 for HD2010UC kit2) and serial RS232 or USB connection cable. Noise Studio PC programme
- **HD2010UC kit1/IE e kit2/IE**: version for indoor and outdoor measurements,

HD WME

HD2110/SA: support to fix preamplifier to tripod.
HD40.1: portable serial thermal printer with 57mm paper tape equipped with SWD10 stabilizer mains.
HD2010MC: SD memory card interface equipped with SD 1GB card. **It needs Option 2 "Data Logger"**.

Software for Windows® 98/XP/Vista operating systems
Noise Studio: Programme for Windows® 98,XP and Vista supplied with the sound level meter kit. Instrument configuration, download and graphic display of the stored data. This programme supports some sound analysis application modules which can be enabled by licence with the hardware key. The programme includes demo versions of the modules.
CH20: Hardware key for PC working with Windows® operating system. It enables the software modules of Noise Studio when introduced into the USB port.
NS1: "Workers' Protection" module in Noise Studio programme. Noise analysis in working environment according to L.D. 81 dated 2008 and to standard UNI 9432 dated 2008.
NS2: "Acoustic pollution" module in Noise Studio programme. Acoustic climate analysis and road, railway and airport noise evaluation. **It needs Option 2 "Data Logger".**
NS4: "Monitor" module in Noise Studio programme. Real time PC data acquisition. Synchronized audio recording. Monitor and remote control programming. Connection by modem.

With HD2010UC sound level meter it is possible to measure the sound 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 Leq, SEL and 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 programme.

As a statistical analyzer the HD2010UC samples the sound signal 8 times per second with A-frequency weighting and FAST constant, and it 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 Analyser" it is possible to choose whether sampling L_{Fp}, 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 quick 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 lengthy recordings, you can 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 provided acoustic calibrator (type 1 according to IEC 60942) 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 all the measurements according to the law with respect to workers' protection from of exposure to noise (Legislative Decree n.81/2008). The selection of the personal protective equipment can be carried out through comparison of the A and C weighted equivalent levels that can be measured simultaneously (SNR method).

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

Italian Legislation
- Noise in working environment: D.L. 81/2008, UNI 9432/2008 standard and 2003/10/CE European regulation.
- Noise assessment in airports environment: Decree dated 31/10/97.
- Noise in entertainment dancing spaces: D.P.C.M. 215 dated 16/4/99.
- Noise emitted by machineries Lgs.D. 262 dated 4/9/2002 and 2005/88/CE European regulation.

Inputs and outputs
DC outputs corresponds to the A-weighed sound level with FAST time constant, updated 8 times per second (Ø 2.5mm jack).
Un-weighted LINE output (Ø 3.5mm jack).
RS232C standard serial port according to EIA/TIA574. Baud Rate from 300 to 115200 bauds.
USB 1.1 serial port.
9÷12Vdc External power supply (Ø 5.5mm jack).

Options and accessories:
HD2110/MC reader (it needs "Data Logger" Option 2)
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 having up to 2GB capacity. 1GB card is supplied.

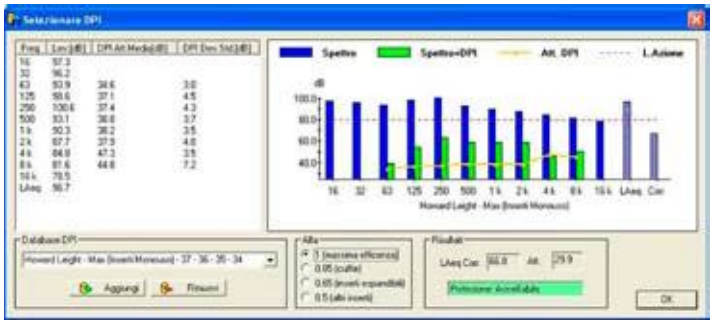
Option 2 "Data Logger"
It includes the internal memory expansion from 2 MB to 4 MB.
It displays and records the A-weighted sound level profile with FAST time constant, sampled 8 times per second. It storages the profiles of 3 programmable parameters, sampled twice per second. It is possible to storage 3 programmable parameters at intervals from 1 second up to 1 hour for sound level monitoring. By this recording mode it is possible to storage 3 parameters by intervals of 1 minute for over 80 days by using the supplied memory (4MB expandable to 8MB). "Data Logger" option transforms the HD 2010UC sound level meter into a sound level recorder suitable for recording the profile of 4 parameters for over 23 hours. Impulsive events can be easily identified thanks to the possibility of analysing simultaneously sound level profiles with FAST, SLOW and IMPULSE constant.
During noise assessment in airport, railways or roads environments, the sound level meter can be used as multi parameters sound events recorder, making the most of the static analyser characteristics or the possibility for recording simultaneously the profile with FAST constant level and sound exposure level.

Option 5 "Advanced Analyser"
(it can be installed on the HD2010UC Class 1 with "Data logger" option")
This Option integrates the complete functions of sound level analyser with the following functions:
- Statistical analysis is available in graphic form both as probability distribution and as cumulative distribution.
- Trigger for the capture of sound events with threshold level and filter length.
- Record of the measuring reports with intervals from 1 s to 1 hour with a dedicated set of parameters which includes the complete statistic analysis.
- Record of the event parameters with the possibility of setting the maximum temporal resolution for the record of events and a lower resolution for the ground recording.
- Possibility of storing markers.
- Timer for programming delayed start of capture.

Software:
Noise Studio
The Noise Studio programme 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 captured data under 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 setup management.
Sound level meter firmware update.
It results easier drafting documents regarding the sound level meter's relief due to the handy function which allows to copy graphs or visualized tables from other applications and to create PDF files.
Moreover Noise Studio is a post processing programme able to perform different kind of analyses, studied for specific applications assembled in software modules to be enabled with licence. Demo versions of the software modules are provided.

Noise Studio: 'Worker protection' module (to be activated by license)
This application module analyzes noise in the workplace according to the DL 81/2008, the European directive 2003/10/EC and the UNI 9432:2008. 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 program allows to evaluate the effectiveness of protective equipment by the methods SNR and OBM. According to UNI 9432 of 2008, the program also calculates the index of impulsiveness of a machine.

Noise Studio: 'Acoustic Pollution' module (to be activated by license)
This application module analyzes sound level profiles detected both in indoor and outdoor environments for assessment of the noise climate, of noise in airports and transport infrastructures.
The analysis of the noise climate is made on a daily, weekly and annual basis with resolutions up to 1 minute.



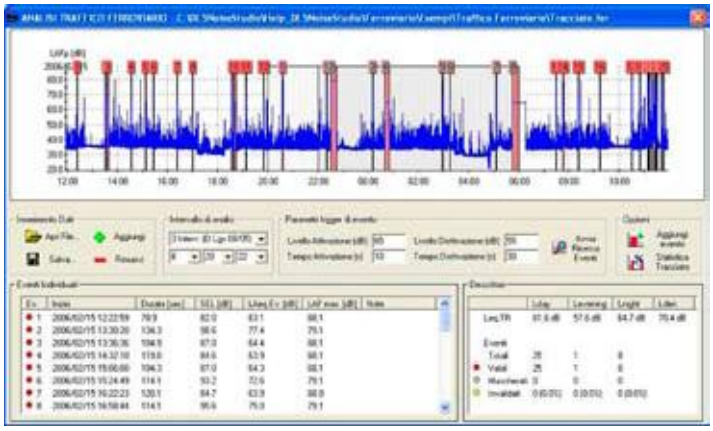
Noise studio: "workers' protection" module: analysis of the effectiveness of IPD

The profiles of noises detected in the external environment are analyzed in order to search for disturbing 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 search and analysis of sound events. **This module needs Option 2 "Data Logger"**.

Noise Studio: '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 data 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 of logging synchronized audio along with the sound level meter measures, by using the easy trigger function.



Noise studio: "railway traffic" module: analysis of 24 hours with automatic search of transit

Codes for ordering the new kits and accessories

HD2010UC kit 1 and kit 2: it includes class 1 sound level meter HD2010UC (class 2 for HD2010UC kit2), HD2010PNE2 preamplifier, UC52/1 microphone for free field (UC52 microphone for HD2010UC kit2), windscreen, 5m extension cable and RS232 serial (HD2110/RS) or USB (HD2110/USB) connection cable. Noise Studio PC program).

HD2010UC kit 1/E and kit 2/E: version for outdoor measurements, it includes HD2010UC class 1 sound level meter (class 2 for HD2010UC kit2), weatherproof microphone unit for outdoor use HD WME equipped with bird spike, wind screen and rain screen, HD2010PNE2W heated preamplifier with 5m connection cable (other lengths upon request), UC52/1 microphone for free field (UC52 for HD2010UC kit2) and serial RS232 or USB connection cable. The kit also includes: Noise Studio software and RS232 (HD2110/RS) or USB (HD2110/USB) cable for connection to PC.

HD2010UC kit 1/IE and kit 2/IE: version for indoor and outdoor measurements, it includes HD2010UC class 1 sound level meter (class 2 for HD2010UC kit2), weatherproof microphone unit for outdoor use HD WME equipped with bird spike, wind screen and rain screen, HD2010PNE2W heated preamplifier with 5m connection cable (other lengths upon request), HD2010PNE2 preamplifier, HD SAV wind screen, CPA/5 5m extension cable and UC52/1 microphone for free field (UC52 for HD2010UC kit2). The kit also includes: Noise Studio software and RS232 (HD2110/RS) or USB (HD2110/USB) cable for connection to PC.

Option 0 "Memory Expansion": 4 MB memory expansion. **It can be installed on the HD2010UC with option 2 "Data Logger".**

Option 2 "Data logger": recording of 4 profiles continuously and at programmable intervals from 1s to 1 hour. It includes memory expansion from 2 MB to 4 MB.

Option 5 "Advanced Analyzer": Profile+report+event data logging, capture and analysis of events, full statistical analysis. **It can be installed on the class 1 HD2010UC with option 2 "Data Logger".**

Option 7 "SIT Calibration": SIT calibration replaces ISO9001 reports. **For new instruments only**.

Option "LCD": Backlit LCD. **For new instruments only**.

HD9101: Class 1 calibrator according to IEC90942:1988. Features:
- Cavity for 1" and ½" microphones according to IEC61094,
- 1000Hz frequency,
- 94dB/114dB sound level.

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined with option 7 "SIT Calibration").

HD2020: Class 1 calibrator according to IEC60942:2003 equipped with I.N.RI.M. n.90-003-01 Certificate of Conformity. Features:
- Backlit LCD,
- Static pressure compensation from 65kPa to 108kPa,
- Cavity for 1" and ½" microphones according to IEC61094,
- 1000Hz frequency,
- 94dB/114dB sound level.

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined with option 7 "SIT Calibration").

HD9102: Class 2 calibrator according to IEC90942:1988. Features:
- Cavity for 1" and ½" microphones according to IEC 61094,
- 1000Hz frequency,
- 94dB/114dB sound level.

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined with option 7 "SIT Calibration").

HD2110/RS: RS232 serial cable for PC connection or connection to HD40.1 printer.

HD2110/USB: serial USB cable for PC connection.

SWD10: Stabilized mains power supply Vin=100÷230Vac / Vout=12Vdc/1000mA.

CPA/10: 10m extension cable for HD2010PNE2 preamplifier.

VTRAP: Tripod, 1550 mm maximum height.

HD2110/SA: Support to fix the preamplifier to the tripod.

HD40.1: Portable thermal serial printer with 57mm paper rolls equipped with SWD10 power supply.

BAT40: Replacement battery pack for HD40.1.

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

HD2010MC: SD memory card interface. This device includes a 1GB SD card and **it needs Option 2 "Data Logger"**.

Codes for ordering spare parts and other accessories

Upgrade 1: Conversion of HD2010UC (**equipped with Option "Data Logger"**) into HD2010UC/A. It includes:
- Octave band spectrum analysis
- Sound level meter and filters ISO 9001 calibration report.

HD WME/UC1: outdoor microphone unit **for class 1 sound level meters** equipped with:
- HD WME Weather protection with HD WME3 preamplifier housing, HD WME1 bird spike and HD SAV3 wind screen as well as HD WME2 rain screen,
- HD2010PNE2W Heated preamplifier with 5m connection cable (other lengths upon request),
- UC52/1 Pre-polarized microphone.

HD WME/UC2: outdoor microphone unit **for class 2 sound level meters** equipped with:
- HD WME Weather protection with HD WME3 preamplifier housing, HD WME1 bird spike and HD SAV3 wind screen as well as HD WME2 rain screen,
- HD2010PNE2W Heated preamplifier with 5m connection cable (other lengths upon request),
- UC52 Pre-polarized microphone.

HD WME/PNE: Weather protection **for class 1 and class 2 sound level meters** equipped with:
- HD WME Weather protection with HD WME3 preamplifier housing, HD WME1 bird spike and HD SAV3 wind screen as well as HD WME2 rain screen,
- Heated preamplifier HD2110PNE2W with 5m connection cable (other length upon request).

HD WME: Weather protection, complete with:
- Stainless steel housing for preamplifier HD WME3 with holder for rain shield HD WME2,
- Bird spike HD WME1,
- Wind screen HD SAV3,
- Rain shield HD WME2.

HD SAV: Windscreen for ½" microphones.

HD SAV2: Windscreen with bird spike for weather protection HD WME950.
HD SAVP: Rain shield for HD WME950 weather protection.
HD SAV3: Windscreen for HD WME and HD WME950 weather protection.
HD WME1: Bird spike for HD WME weather protection.
HD WME2: Rain shield for HD WME microphone unit.
HD WME3: Stainless steel housing for the preamplifier of HD WME weather protection, with holder for rain shield HD WME2.
HD2010PNE2: Microphone preamplifier for pre-polarized UC52 microphones. Equipped with CTC device for electrical calibration.
HD2010PNE2W: Microphone preamplifier to be housed in outdoor protection WME950 HD and HD WME. The preamplifier is heated, provided with standard connection for pre-polarized UC52 microphones and provided with CTC device for electrical calibration. Ending with a connection 5m cable (other lengths upon request).
UC52/1: Class 1 pre-polarized microphone for free field.
UC52: Class 2 pre-polarized microphone for free field.
CPA/5: Microphone 5m extension cable.

TECHNICAL SPECIFICATIONS

Standards	Class 1 or 2 X group according to IEC 61672:2002 and class 1 or 2 according to IEC 60651:2001 and IEC 60804:2000 type 1 or 2 according to ANSI S1.4-1983 and S1.43-1997
½" Microphone	UC52 condenser type, pre-polarized, for free field.
Dynamic range	30 dBA ÷ 143 dB Peak
Linear Field	80 dB
Acoustic Parameters	Spl, L_{eq}, SEL, $L_{EP,d}$, L_{max}, L_{min}, L_{pk}, Dose, L_n
Frequency Weights	simultaneous A, C, Z (only C and Z for L_{pk})
Temporal Weights	simultaneous FAST, SLOW, IMPULSE
Integration	from 1s to 99 hours with erasing function (Back-Erase)
Statistical Analysis	It displays up to 3 percentile levels, from L_1 to L_{99} Probability distribution and percentile level calculation from L_1 to L_{99} (Option 2 "Data Logger" and option 5 "Advanced Analyzer") ✓Parameter: L_{Fp}, L_{eq}, L_{pk} weighted A, C o Z (solo C o Z per L_{pk}) ✓Sampling frequency: 8 samples/second ✓Classification: Classes of 0.5 dB
Analysis of Events (Option 2 Data Logger" and option 5 "Advanced Analyzer")	✓Calculation of 5 freely-programmable event parameters ✓Calculation of statistical levels from L_1 to L_{99} ✓Event identification trigger with programmable threshold and duration filter ✓Manual trigger
Profile Data Logging (Option: "Data Logger")	1 profile with programmable sampling from 1/8 s to 1 hour and 3 profiles with 2 samples/second
Display	Graphic display 128x64 ✓3 parameters in numeric format ✓Backlit LCD ("LCD" option): ✓Profile L_{AFp} with 8 samples/second (Option 2 "Data Logger") ✓Graph of sound level probability distribution (Option 2 "data Logger" and option 5 "Advanced Analyzer") ✓Graph of percentile levels from L_1 to L_{99} (Option 2 "data Logger" and option 5 "Advanced Analyzer")
Memory	✓Internal, equal to 2 MB, enough to store over 500 recordings. With option 2 "Data Logger", internal memory equal to 4 MB (1 profile for 23 hours or over 80 recording days of 3 parameters per minute). Expandable to 8 MB with option 0 "Memory expansion". ✓External, via the HD2110MC memory card interface, using MMC or SD cards up to 2 GB. The interface requires option 2 "Data Logger".
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. ✓**"Worker protection" module.** Analysis of noise in the workplace in accordance with Decree 81 of 2008 and the UNI 9432-2008. ✓**"Acoustic pollution" module**. Analysis of environmental noise according to the Law 447/1995 and Decree of 16/03/1998. Analysis of the noise climate and assessment of noise from road, rail and airport according to the law. **Requires option 2 "Data Logger".** ✓**"Monitor" module**. Acquisition in real time on PC. Synchronized audio recording. Remote monitoring and data capture. Connection via Modem. The program allows programming of measurements and calibrations with timer and audio recording with programmable event triggers.
Operating conditions	✓Working temperature -10÷50°C, 25÷90%RH (without condensation), 65÷108kPa. Protection degree: IP64
Power Supply	✓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).

HD 2010UC/A
INTEGRATING SOUND LEVEL METER - PORTABLE ANALYZER

HD2010UC/A is a portable integrating sound level meter, with data logging function, suitable for performing statistical and spectral analyses The instrument has been designed by combining maximum flexibility and simplicity. Attention has been paid to the possibility of adjusting the instrument so to comply with the changes in the rules about noise and to the necessity of comply with the current and future requests of the users. 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 programme supplied with the instrument.

Technical regulations:
- Class 1 or 2 sound level meter according to IEC 61672-1, 2002 (Certificate of Compliance I.N.RI.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 and optional capture and analysis of sound events,
- Octave and optional third octave band spectrum analysis from 25 Hz to 12.5 kHz,
- Statistical analysis with the calculation of 3 percentile levels and optional 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 acoustics and building measurements.

Sound level meter class 1 or 2 Kit

HD2010UC/A kit1 and kit2: consists of HD2010UC/A class 1 sound level meter (class 2 for HD2010UC/A kit2), HD2010PNE2 preamplifier, UC52/1 microphone for free field (UC52 for HD2010UC kit2), windscreen, 5m extension cable and serial RS232 or USB connection cable. Noise Studio PC programme.

HD2010UC/A kit1/E and kit2/E: version for outdoor measurements, it consists of HD2010UC/A class 1 sound level meter (class 2 for l'HD2010UC/A kit2), HD WME weatherproof microphone unit for outdoor use, HD2010PNE2W heated preamplifier, UC52/1 microphone for free field (UC52 for HD2010UC kit2) and serial RS232 or USB connection cable. Noise Studio PC programme.

HD2010UC/A kit1/IE e kit2/IE: version for indoor and outdoor measurements, it consists of HD2010UC/A class 1 sound level meter (class 2 for l'HD2010UC/A kit2), HD WME weatherproof microphone unit for outdoor use, HD2010PNE2W heated preamplifier, HD2010PNE2 preamplifier, UC52/1 microphone for free field (UC52 for HD2010UC kit2) and serial RS232 or USB connection cable. Noise Studio PC programme.

Accessories

Option 0 "Memory Expansion": 4MB memory expansion. **It needs Option 2 "Data Logger".**

Option 1 "Third Octave": Third octave band spectrum analysis in real time from 25 Hz to 12.5 kHz.

Option 4 "Reverberation Time": Measurement using sound source interruption or impulse response integration. **Only for class 1 HD2010UC/A.**

Option 5 "Advanced Analyzer": Profile+report+event data logging, capture and analysis of events, full statistical analysis. **Only for class 1 HD2010UC/A.**

Option 7 "SIT Calibration": SIT calibration which replaces ISO9001 Reports. **For new instruments only.**

Option LCD: Backlit display. **For new instruments only.**

HD9101: class 1 calibrator according to IEC60942:1988. Features:
- Cavity for 1" and ½" standard microphones according to IEC 61094,
- Frequency: 1000Hz,
- Sound level: 94dB/114dB.

The calibrator is supplied with ISO 9001 report of calibration.

HD9102: class 2 calibrator according to IEC60942:1988. Features:
- Cavity for 1" and ½" standard microphones according to IEC 61094,
- Frequency: 1000Hz,
- Sound level: 94dB/114dB.

The calibrator is supplied with ISO 9001 report of calibration.

HD2020: class 1 calibrator according to IEC60942:2003 with I.N.RI.M. n.90-003-01 Certificate of Conformity. Features:
- LCD Display,
- Static pressure compensation from 65 kPa to 108 kPa,
- Cavity for ½" standard microphones according to IEC 61094,
- Frequency: 1000Hz,
- Sound level: 94dB/114dB.

The calibrator is supplied with ISO 9001 report of calibration.

HD WME

HD2110/RS: serial RS232 cable for connection to a PC or to HD40.1 printer.
HD2110/USB: serial USB cable for connection to a PC
SWD10: stabilized mains power supply with Vin=100÷230Vac Vout=12Vdc/1000mA voltage.
CPA/10: 10m extension cable.
VTRAP: tripod, 1550mm maximum height.
HD2110/SA: support to fix preamplifier to tripod.
HD40.1: portable serial thermal printer with 57mm paper tape equipped with SWD10 stabilizer mains.
HD2010MC: SD memory card interface equipped with SD 1GB card. **It needs Option 2 "Data Logger".**

Software for Windows® 98/XP/Vista operating systems
Noise Studio: Programme for Windows® 98, XP and Vista supplied with the sound level meter kit. Instrument configuration, download and graphic display of the stored data. This programme supports some sound analysis application modules which can be enabled by licence with the hardware key. The programme includes demo versions of the modules.
CH20: Hardware key for PC working with Windows® operating system. It enables the software modules of Noise Studio when introduced into the USB port.
NS1: "Workers' Protection" module of Noise Studio programme. Noise analysis in working environment according to L.D. 81 dated 2008 and to standard UNI 9432 dated 2008.
NS2: "Acoustic pollution" module of Noise Studio programme. Acoustic climate analysis and road, railway and airport noise evaluation. **Some of the functions need Option 1 "Third octaves".**
NS3: "Acoustic Insulation" module of Noise Studio programme. Calculations of acoustic and architectural evaluation of passive acoustic requirements of buildings according to D.P.C.M. dated 5/12/1997. **It needs Option 1 "Third octaves" and Option 4 "Reverberation Time"**.
NS4: "Monitor" module in Noise Studio programme. Real time PC data acquisition. Synchronized audio recording. Monitor and remote control programming. Connection by modem.
Noise Studio Suite: Noise Studio programme equipped with the following application modules:
- "Workers' Protection"
- "Acoustic pollution"
- "Acoustic Insulation"
- "Monitor"

By using the HD2010UC/A, you can log the time profile of 4 simultaneous parameters freely selecting temporal or frequency weightings. The possibility of displaying, storing and even printing 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 ("Advanced Analyzer" option) 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 it integrates 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 constant and it analyzes it statistically in 0.5 dB classes. Up to 4 percentile levels, selectable between L_1 and L_{99}, can be programmed. The "Advanced Analyzer" option can be used to choose the sampling of the following: L_{Fp}, Leq and L_{pk} with A, C and Z -weightings (only C and Z for L_{pk}).

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 printer. For example, should the supplied memory not be enough, this is the case of lengthy recordings, 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 provided acoustic calibrator (type 1 according to IEC 60942) 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 (Legislative Decree no.81 of 2008). 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 sound level monitoring and acoustic mapping. Using the "Advanced Analyzer" option, 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 room acoustics evaluation (D.P.C.M. of 5/12/1997). The sound level meter powerful DSP calculates 32 spectra/second, and it can measure reverberation times both using the sound source interruption and impulsive 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 constant time, updated 8 times/s (∅ 2.5 mm jack). This output is not available for all models.
LINE unweighted output (∅ 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 (∅ 5.5 mm jack).

Italian Legislation
- Noise in working environment: D.L. 81/2008, UNI 9432/2008 standard and 2003/10/CE European regulation.
- Noise assessment in airports environment: Decree dated 31/10/97.
- Noise in entertainment dancing spaces: D.P.C.M. 215 dated 16/4/99.
- Noise emitted by machineries Lgs.D. 262 dated 4/9/2002 and 2005/88/CE European regulation.
- Room acoustics evaluation: D.P.C.M. of 05.12.97

Options and accessories:
HD2110/MC 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 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 having up to 2GB capacity. 1GB card is supplied.

Option 1 "Third Octave"
Octave and 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.

Option 4 "Reverberation Time"
(it can be installed on the class 1 HD2010UC/A with "Third Octave" option)
Reverberation time measurement using the sound source interruption technique and the impulsive source method.
The reverberation time measurement is made simultaneously by wideband, octave band from 125 Hz to 8 kHz and, optionally, third octave band from 100 Hz to 10 kHz.
Sampling interval 1/32 s.
Automatic calculation of reverberation times EDT, T10, T20 and T30 for all bands

Option 5 "Advanced Analyser"
(it can be installed on the HD2010UC Class 1 with "Data logger" option")

This Option integrates the complete functions of sound level analyser with the following functions:

- Statistical analysis is available in graphic form both as probability distribution and as cumulative distribution.
- Trigger for the capture of sound events with threshold level and filter length.
- Record of the measuring reports with intervals from 1 s to 1 hour with a dedicated set of parameters which includes the complete statistic analysis.
- Record of the event parameters with the possibility of setting the maximum temporal resolution for the record of events and a lower resolution for the ground recording.
- Possibility of storing markers.
- Timer for programming delayed start of capture.

Software:
Noise Studio

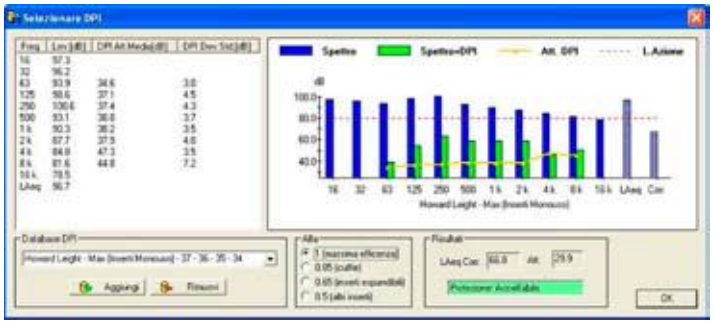
The Noise Studio programme allows interfacing HD2010UC to the PC in a simple and intuitive way. Main functions are:

Transfer of stored data from the sound level meter to the PC memory.
Visualization of the captured data under 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 setup management.
Sound level meter firmware update.

It results easier drafting documents regarding the sound level meter's relief due to the handy function which allows to copy graphs or visualized tables from other applications and to create PDF files.
Moreover Noise Studio is a post processing programme able to perform different kind of analyses, studied for specific applications assembled in software modules to be enabled with licence. Demo versions of the software modules are provided.

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

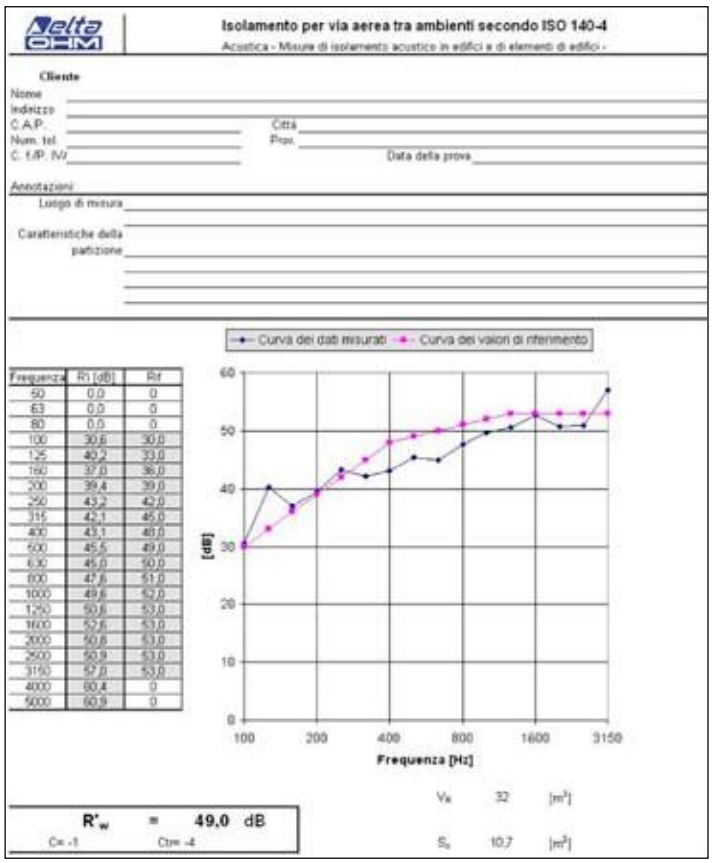
This application module analyzes noise in the workplace according to the DL 81/2008, the European directive 2003/10/EC and the UNI 9432:2008. Data sound level measurement in work environment is organized in a project where they can be handled according to regulatory requirements. In addition to calculating the noise exposure of workers the program allows to evaluate the effectiveness of protective equipment by the methods SNR and OBM. According to UNI 9432 of 2008, the program also calculates the index of impulsiveness of a machine.



Noise studio: "workers' protection" module: analysis of the effectiveness of IPD

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

This application module analyzes sound level profiles detected both in indoor and outdoor environments for assessment of the noise climate, of noise in airports and transport infrastructures.
The analysis of the noise climate is made on a daily, weekly and annual basis with resolutions up to 1 minute.
The profiles of noises detected in the external environment are analyzed in order to search for disturbing 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 search and analysis of sound events.
Some of the functions need Option 1 "Third octaves".



Noise studio "acoustic insulation" module: filling iso report.

Noise Studio: 'Acoustic Insulation' module

This module performs calculations of building acoustics for the assessment of passive acoustic requirements of buildings, according to ISO standard, and according to the DPCM of 5/12/1997.
The measures necessary for the analysis of a building are grouped in a project to simplify their storage and research. 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 updateable database, divided by walls and floors, contains the principal characteristics of sound-insulating structures. The data contained in the database can be compared graphically with measures in place.
With the program you can calculate:

- Average reverberation time (ISO 3382)
- Area of equivalent absorption coefficient of sound absorption (ISO 354)
- Isolation by air: indices R, R 'and D_{nT} (ISO 140/III and IV)
- Insulation of facades and facade elements: indices $D_{2m,nT}$ and R_{θ} (ISO 140 / V)
- Isolation of noise impact: indices L_n, DL, The N and L'_{nT} (ISO 140/VI, VII and VIII)

The form requires the Option 1 "Third Octave" also for the calculation of indices; you must have the Option 4: "Reverberation Time".

Noise Studio: '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 data 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 of logging synchronized audio along with the sound level meter measures, by using the easy trigger function.

Codes for ordering the new kits and accessories

HD2010UC/A kit1 and kit2: Includes HD2010UC/A class 1 Sound Level Meter (class 2 for kit HD2010UC/A kit 2), carrying case, HD2010PNE2 preamplifier, UC52/1 microphone for free field (UC52 for kit HD2010UC/A kit2), windscreen HD SAV, 5m extension cable CPA/5, Noise Studio software and serial cable for connection to a PC (HD2110/RS) or USB (HD2101/USB interface).

HD2010UC/A kit1/E and kit2/E: Version for outdoor measurements, includes class 1 Sound Level Meter HD2010UC/A (class 2 for HD2010UC/A kit2), carrying case, HD WME weather protection complete with bird spike, windscreen and rain shield, heated preamplifier HD2010PNE2W with 5m connection cable (other lengths on request), UC52/1 microphone for free field (UC52 microphone for HD2010UC/A kit2), RS232 serial (HD2110/RS) or USB (HD2110/USB) connection cable. Noise Studio PC programme.

HD2010UC/A kit1/IE and kit2/IE: Version for indoor and outdoor measurements, includes class 1 Sound Level Meter HD2010UC/A (class 2 for HD2010UC/A kit2), carrying case, HD WME weather protection with bird spike, wind screen and rain shield, heated preamplifier HD2010PNE2W with 5m extension cable (other lengths on request), wind screen HD SAV, preamplifier HD2010PNE2, UC52/1 microphone for free field (UC52 microphone for HD2010UC kit2), 5m extension cable CPA/5, and RS232 serial (HD2110/RS) or USB (HD2110/USB) connection cable. Noise Studio PC programme.

Option 0 "Memory Expansion": Additional 4 MB memory expansion.

Option 1 "Third Octave": Spectrum analysis in real time by third octave bands from 25 Hz to 12.5 kHz. Includes calibration report according to ISO9001.

Option 4 "Reverberation Time": Reverberation time measurement using the sound source interruption technique and the impulsive source method. **It can be installed on the class 1 HD2010UC/A with "Third Octave" option.**

Option 5 "Advanced Analyzer": Profile+report+event data logging, capture and analysis of events, full statistical analysis. **It can be installed on the class 1 HD2010UC/A.**

Option 7 "SIT Calibration": SIT calibration replaces ISO9001 reports**. For new instruments only.**

Option "LCD": Backlit LCD. **For new instruments only.**

HD9101: Class 1 calibrator according to IEC90942:1988. Features:
- Cavity for 1" and ½" microphones according to IEC61094,
- 1000Hz frequency,
- 94dB/114dB sound level.

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined with option 7 "SIT Calibration").

HD2020: Class 2 calibrator according to IEC60942:2003 equipped with I.N.RI.M. n.90-003-01 Certificate of Conformity. Features:
- Backlit LCD,
- Static pressure compensation from 65kPa to 108kPa,
- Cavity for 1" and ½" microphones according to IEC61094,
- 1000Hz frequency,
- 94dB/114dB sound level.

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined with option 7 "SIT Calibration").

HD9102: Class 2 calibrator according to IEC90942:1988. Features:
- Cavity for 1" and ½" microphones according to IEC 61094,
- 1000Hz frequency,
- 94dB/114dB sound level.

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined with option 7 "SIT Calibration").

HD2110/RS: RS232 serial cable for PC connection or connection to HD40.1 printer.

HD2110/USB: serial USB cable for PC connection.

SWD10: Stabilized mains power supply Vin=100÷230Vac / Vout=12Vdc/1000mA.

CPA/10: 10m extension cable for HD2010PNE2 preamplifier.

VTRAP: Tripod, 1550 mm maximum height.

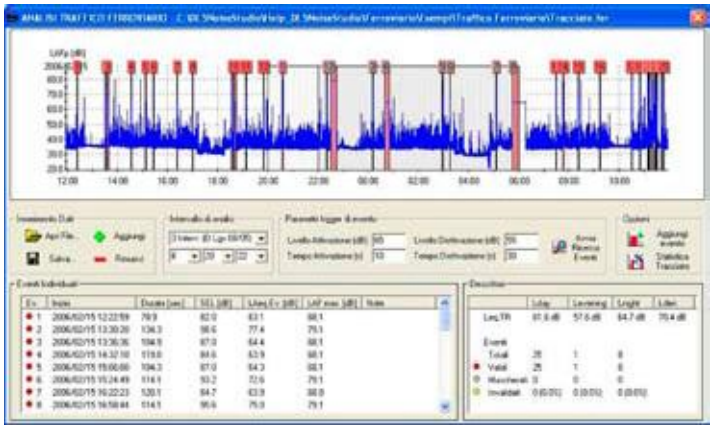
HD2110/SA: Support to fix the preamplifier to the tripod.

HD40.1: Portable thermal serial printer with 57mm paper rolls equipped with SWD10 power supply.

BAT40: Replacement battery pack for HD40.1.

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

HD2010MC: SD memory card interface. This device includes a 1GB SD card.



Noise studio: "railway traffic" module: analysis of 24 hours with automatic search of transit

Codes for ordering spare parts and other accessories

HD WME/UC1: outdoor microphone unit **for class 1 sound level meters** equipped with:
- HD WME Weather protection with HD WME3 preamplifier housing, HD WME1 bird spike and HD SAV3 wind screen as well as HD WME2 rain screen,
- HD2010PNE2W Heated preamplifier with 5m connection cable (other lengths upon request),
- UC52/1 Pre-polarized microphone.

HD WME/UC2: outdoor microphone unit **for class 2 sound level meters** equipped with:
- HD WME Weather protection with HD WME3 preamplifier housing, HD WME1 bird spike and HD SAV3 wind screen as well as HD WME2 rain screen,
- HD2010PNE2W Heated preamplifier with 5m connection cable (other lengths upon request),
- UC52 Pre-polarized microphone.

HD WME/PNE: Weather protection **for class 1 and class 2 sound level meters** equipped with:
- HD WME Weather protection with HD WME3 preamplifier housing, HD WME1 bird spike and HD SAV3 wind screen as well as HD WME2 rain screen,
- Heated preamplifier HD2110PNE2W with 5m connection cable (other length upon request).

HD WME: Weather protection, complete with:
- Stainless steel housing for preamplifier HD WME3 with holder for rain shield HD WME2,
- Bird spike HD WME1,
- Wind screen HD SAV3,
- Rain shield HD WME2.

HD SAV: Windscreen for ½" microphones.

HD SAV2: Windscreen with bird spike for HD WME950 weather protection.

HD SAV3: Windscreen for HD WME and HD WME950 weather protections.

HD SAVP: Rain shield for HD WME950 weather protection.

HD WME1: Bird spike for HD WME weather protection.

HD WME2: Rain shield for HD WME microphone unit.

HD WME3: Stainless steel housing for the preamplifier of HD WME weather protection, with holder for rain shield HD WME2.

HD2010PNE2: Microphone preamplifier for pre-polarized UC52 microphones. Equipped with CTC device for electrical calibration.

HD2010PNE2W: Microphone preamplifier to be housed in outdoor protection WME950 HD and HD WME. The preamplifier is heated, provided with standard connection for pre-polarized UC52 microphones and provided with CTC device for electrical calibration. Ending with a connection 5m cable (other lengths upon request).

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

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

CPA/5: 5m extension cable for preamplifier HD2010PNE2.

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
Linear Field	80 dB
Acoustic Parameters	Spl, L_{eq}, SEL, $L_{EP,d}$, L_{max}, L_{min}, L_{pk}, Dose, L_n
Frequency Weighting	Simultaneous A, C, Z (only C and Z for L_{pk})
Temporal Weighting	Simultaneous FAST, SLOW, IMPULSE
Integration	From 1s to 99 hours with Back-Erase function
Spectrum Analysis	Parallel 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
Statistical Analysis	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} (“Advanced Analyzer” option) ✓ Parameter: L_{Fp}, L_{eq}, L_{pk} A, C or Z -weighted (only C or Z for L_{pk}) ✓ Sampling frequency: 8 samples/second Classification: Classes of 0.5 dB
Analysis of Events Option 5 “Advanced Analyzer”	This option is only available for class 1 instruments. Calculation of 5 freely-programmable event parameters Average spectrum calculation by octave and third octave bands Calculation of statistical levels from L_1 to L_{99} Event identification trigger with programmable threshold and duration filter External and manual trigger
Reverberation Time (option 4 “Reverberation Time”)	The reverberation time measurement option requires the option 1 “Third Octave” and is available for class 1 instruments only. Reverberation time measurement using sound source interruption or impulse response integration
Profile Data Logging	1 profile with programmable sampling from ⅛ s to 1 hour and 3 profiles with 2 samples/second
Spectrum Data Logging	Programmable sampling from 1 second to 1 hour (AVR mode)
Display	Graphic display 128x64 ✓ 3 parameters in numeric format ✓ Profile L_{AFp} with 8 samples/second ✓ Octave band spectrum from 32 Hz to 8 kHz ✓ Backlit LCD (“LCD” option) ✓ Third octave band spectrum from 25 Hz to 12.5 kHz (option 1 “Third Octave”) ✓ Graph of sound level probability distribution (option 5 “Advanced Analyzer”) ✓ Graph of percentile levels from L_1 to L_{99} (option 5 “Advanced Analyzer”)
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 HD2110MC 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.** ✓ **“Worker protection” module. Analysis of noise in the workplace in accordance with Decree 81 of 2008 and the UNI 9432-2008.** ✓ **“Acoustic pollution” module. Analysis of environmental noise according to the Law 447/1995 and Decree of 16/03/1998. Analysis of the noise climate and assessment of noise from road, rail and airport according to the law. Some of the functions need option 1 “Third octaves”.** ✓ **“Acoustic Insulation” module. Calculations of acoustic and architectural evaluation of passive acoustic requirements of buildings according to DPCM of 5/12/1997. It needs option 1 “Third octaves” and option 4 “Reverberation time”.** ✓ “Monitor” module. Acquisition in real time on PC. Synchronized audio recording. Remote monitoring and data capture. Connection via Modem.
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)

HD2010 kit 1/E: Version for outdoor measurements. It consists of HD2010 Sound Level Meter, HD WME weather protection, free field microphone unit MK223, windscreen, heated preamplifier HD2010PNW, RS232 serial or USB connection cable. Noise Studio PC Program.

HD2010 kit 1/IE: Version for indoor and outdoor measurements. It includes HD2010 Sound Level Meter, HD WME weather protection, free field microphone unit MK223, windscreen HDSAV, heated preamplifier HD2010PNW, preamplifier HD2010PN, 5m extension cable CPA/5 and RS232 serial or USB connection cable. Noise Studio PC Program.

Accessories

Option 0 "Memory Expansion": Additional 4 MB memory expansion.

Option 1 "Third Octave": Third octave band spectrum analysis in real time from 16 Hz to 20 kHz. Includes calibration report according to ISO 9001.

Option 4 "Reverberation Time": Measurement using sound source interruption or impulse response integration. **It requires option 1 "Third octaves".**

Option 5 "Advanced Analyzer": Profile+report+event data logging, capture and analysis of events, full statistical analysis.

Option 7 "SIT Calibration": SIT calibration replaces ISO 9001 reports. **For new instruments only.**

MK231: Class 1 microphone for diffuse field type WS2D according to IEC 61094-4:1995.

MK223: Class 1 Microphone for free field, type WS2F, according to IEC 61094-4:1995. Coated membrane for outdoor use.

HD9101: Class 1 calibrator according to IEC90942:1988. Specifications:
- Cavity for 1" and ½" microphones according to IEC61094
- Sound level 94dB/114dB.

The calibrator is supplied complete with calibration report according to ISO 9001.

HD2020: class 1 calibrator according to IEC60942:2003 with I.N.RI.M. certificate of conformity n.90-003-01. Specifications:
- LCD display,
- Static pressure compensation from 65kPa to 108kPa,
- Cavity for 1" and ½" microphones according to IEC61094,
- 1000Hz frequency,
- Sound level 94dB/114dB.

The calibrator is supplied complete with calibration report according to ISO 9001.

HD2110/RS: RS232 serial cable for PC connection or connection to HD40.1 printer.

HD2110/USB: serial USB cable for PC connection.

SWD10: Stabilized mains power supply Vin=100÷230Vac / Vout=12Vdc/1000mA.

CPA/10: 10m extension cable.

HD 2010
INTEGRATING SOUND LEVEL METER - PORTABLE ANALYZER

The HD2010 is a precision integrating portable sound level meter, with data logging functions, performing both spectrum and statistical analysis. The instrument has been designed combining maximum flexibility and simplicity. Attention has been paid to the possibility of adjusting the instrument to regulatory modifications and to the necessity of meeting its users' needs of today and tomorrow. The HD2010 can be integrated with other options to extend its application scope at any time; the firmware can be directly updated by the user by means of the Noise Studio program (supplied with the instrument).

Technical regulations:
- **Class 1 sound level meter according to IEC 61672-1, 2002 (Certificate of Compliance I.E.N. No. 37035-01C)**, IEC 60651 and IEC 60804.
- Class 1 octave and third octave filters according to IEC 61260
- Microphone complying with IEC 61094-4.

Applications:
- Assessment of the environmental noise level,
- Noise monitoring and optional capture and analysis of sound events,
- Octave and optional third octave band spectrum analysis from 16 Hz to 20 kHz,
- Statistical analysis with calculation of 3 percentile levels and optional 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 acoustics and building measurements.

Sound level meter Kits

HD2010 kit 1: consists of HD2010 Sound Level Meter, HD2010PN preamplifier, MK221 microphone for free field, windscreen, 5m extension cable and RS232 serial or USB connection cable. Noise Studio PC Program.

HD WME

VTRAP: Tripod, 1550 mm maximum height.
HD2110/SA: Support to fix the preamplifier to the tripod.
HD40.1: Portable serial printer with 57mm paper rolls and SWD10 power supply.
HD2010/MC: SD memory card interface complete with 1GB SD card

Software for Windows®/98/ME/2000/XP/Vista operating systems
Noise Studio: Software for Windows® ME/2000/XP and Vista operating systems supplied in the sound level meter kit. Configuration of the instrument, downloading and graphical display of stored data. This programme supports some sound analysis application modules which can be enabled by licence with the hardware key. The program contains demo versions of the modules.
CH20: Hardware key for PC with Windows ® operating systems. Inserted into a USB port enables PCs to use software modules of the program Noise Studio.
NS1: Activation of module "Worker protection" of the Noise Studio program. Analysis of noise in the workplace in accordance with Decree 81 of 2008 and the UNI 9432-2008**.**
NS2: Activation of module "Noise pollution" of the Noise Studio Program. Analysis of environmental noise according to the Law 447/1995 and Decree of 16/03/1998. Analysis of the noise climate and assessment of noise from road, rail and airport according to the law. **Some program functions require option 1 "Third octaves".**
NS3: Activation of the module "Acoustic Insulation" of the Noise Studio program. Calculations of acoustic and architectural evaluation of passive acoustic requirements of buildings according to DPCM of 5/12/1997. **Requires option 4 "Reverberation time".**
NS4: Activation of the module "Monitor" of the Noise Studio program. Acquisition in real time on PC. Synchronized audio recording. Remote monitoring and data capture. Connection via Modem.
Noise Studio Suite: Noise Studio Program complete with following application modules:

- "Worker Protection "
- "Noise Pollution"
- "Acoustic Insulation"
- "Monitor"

Using the HD2010 you can log the time profile of 4 simultaneous parameters freely selecting temporal or frequency weightings. The possibility of displaying, storing and even printing 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 logging mode ("Advanced Analyzer" option) 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 in real time, simultaneous with profile acquisition, by octave bands and optionally by third octave bands. The sound level meter calculates the sound signal spectrum twice a second and it integrates 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 HD2010 samples the sound signal 8 times per second with A- weighting and FAST constant, and it analyzes it statistically in 0.5 dB classes. Up to 4 percentile levels, selectable between L_1 and L_{99}, can be programmed. The "Advanced Analyzer" option can be used to choose if you want to sample L_{Fp}, Leq and L_{pk} with A, C and Z weightings (only C and Z for L_{pk}).

For further analysis, 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 viewed 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 printer. For example, should the supplied memory not be enough, this is the case of lengthy recordings, 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 memory.

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 made either using an acoustic calibrator (class 1 according to IEC 60942) or the built-in reference generator. The electrical calibration employs a special preamplifier and it checks the sensitivity of the measuring channel, microphone included. A protected area in the non-volatile memory, reserved for factory calibration, is used as a reference in the user's calibrations, and it allows keeping instrument drifts under control and preventing the instrument from "going out of calibration".

The control of the complete sound level meter functionality can be made directly by the user, on site, thanks to a diagnostic programme.

The HD2010 sound level meter can perform the measurements required to evaluate workers' noise exposure (Legislative Decree 10.04.06 No. 195). 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 levels that can be measured simultaneously (SNR method). If an undesired sound event produces an overload indication or simply alters the result of the integration, its contribution can be excluded using the versatile Back-Erase function.

The HD2010 sound level meter is suitable for sound level monitoring and acoustic mapping. Using the "Advanced Analyzer" option, 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.

The HD2010 sound level meter with the "Third Octave" option meets the technical requirements of art. 2 of the Decree of 16 March 1998.
Impulsive events can be easily identified thanks to the possibility of analyzing the profile of the A-weighted level with FAST, SLOW, and IMPULSE constants. All measuring parameters can be stored for subsequent analysis. The identification of tonal components using the HD2010 has its limitations: the source can be identified only if dominant in the acoustic climate being examined. Moreover, the sound level meter cannot identify the tonal components at the standard third octave band crossing point. The audibility of the tonal component, to be compared with that of the remaining spectrum areas, can also be evaluated using the Noise Studio program supplied with the instrument, thanks to the calculation of the equal loudness curves.

The HD2010 sound level meter, with the "Third Octave" and "Reverberation Time" options, can perform all measurements prescribed by the regulations on room acoustics evaluation (D.P.C.M. of 5/12/1997). The sound level meter powerful DSP calculates 32 spectra/second, and it can measure reverberation times both using the sound source interruption and the impulsive source integration technique. The analysis is carried out simultaneously both by octave and third octave bands.

Inputs and outputs
DC output corresponding to the A-weighted sound level with FAST constant time, updated 8 times/s (∅ 2.5 mm jack).
LINE unweighted output (∅ 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 (∅ 5.5 mm jack).

Italian Laws

- Workplace noise: D.L.81/2008, Eurpoean Standard UNI 9432/2008 and European Directive 2003/10/CE.
- Noise pollution: Law 447 of 26/10/95, D.P.C.M. of 1/3/91, Decree of 16/03/98, D.L. 194 dated 19/08/2005 and European Directive 2002/49/CE.
- Airport noise: Decree of 31.10.97.
- Entertainment noise: D.P.C.M. 215 of 16.04.99.
- Machine noise emissions: D. Lgs. 262 of 4/9/2002 and European Directive 2005/88/CE.
- Room acoustics evaluation: D.P.C.M. of 05.12.97.

Options and accessories:
HD2110/MC reader
It allows interfacing SD memory cards with the sound level meter.
This device is connected to the sound level meter through the serial interface that also gives the required power supply.
In addition to the remarkable recording capacity, the interface allows quickly downloading the data stored in the sound level meter internal memory. Cards up to 2 GB can be connected. Includes a 1GB SD card.

Option 1 "Third Octave"
Class 1 octave and third octave band spectrum analyzer according to IEC 61260.
Using the "Third Octave" option you can analyze the spectrum of a sound source from 16 Hz to 20 kHz in real time. The audibility of the different spectrum components can be evaluated thanks to the calculation of equal loudness curves using the Noise Studio program supplied with the instrument.

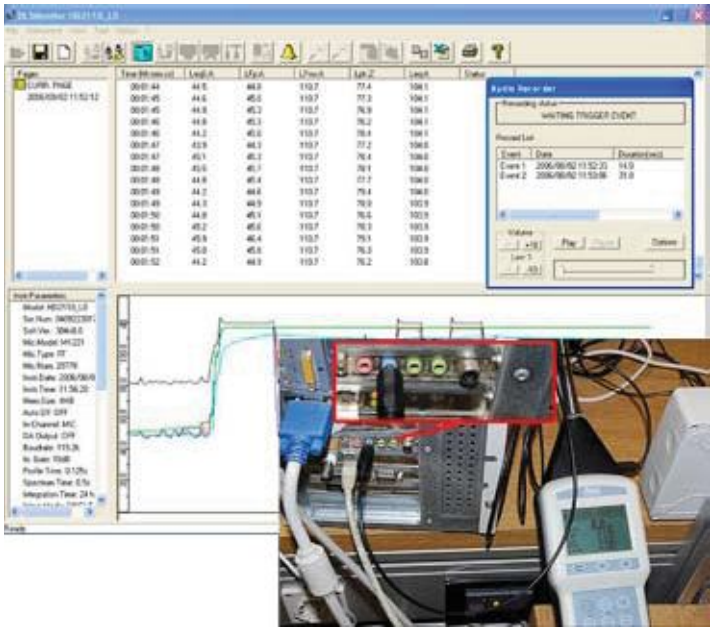
Option 4 "Reverberation Time" (it requires the "Third Octave" option)
Reverberation time measurement using the sound source interruption technique and the impulsive source method.
The reverberation time measurement is made simultaneously by wideband, octave band from 125 Hz to 8 kHz and, optionally, by third octave band from 100 Hz to 10 kHz. Sampling interval $^1/_{32}$ s.
Automatic calculation of reverberation times EDT, T10, T20 and analysis of the decay profile with the possibility to calculate the reverberation time in an interval of your choice.

Option 5 "Advanced Analyzer"
This option completes the sound level analyzer functions with the following:
- Statistical analysis available graphically, both as probability distribution and cumulative distribution.
- Trigger function to capture sound events with programmable threshold and duration filter.
- Recording of reports at intervals of 1s to 1 hour, with a dedicated set of parameters that includes average spectra and full statistical analysis.
- Recording of event parameters with the possibility of setting the maximum time resolution for event recording and a lower resolution for background noise recording.
- Possibility of storing markers.
- Timer for a delayed start of the acquisition.

Software:
Noise Studio
The Noise Studio program allows easily interfacing the sound level meter with the PC. Its main functions are:
- Data transfer from the sound level meter to the PC's memory.
- Display of the logged data as a table or a graph.
- Export to Excel
- Comparison of third octave band spectra with equal loudness curves.
- Logging control through PC (with the "Data Logger" option).
- Sound level meter setup.
- Sound level meter firmware upgrade

Writing reports is easier, thanks to a convenient function that allows copying the graphs or tables to other applications and the ability to create PDF files. Noise Studio is a program of post-processing that can perform different types of analysis designed for specific applications and grouped into modules with licensed software. Demo versions of the software modules are included.

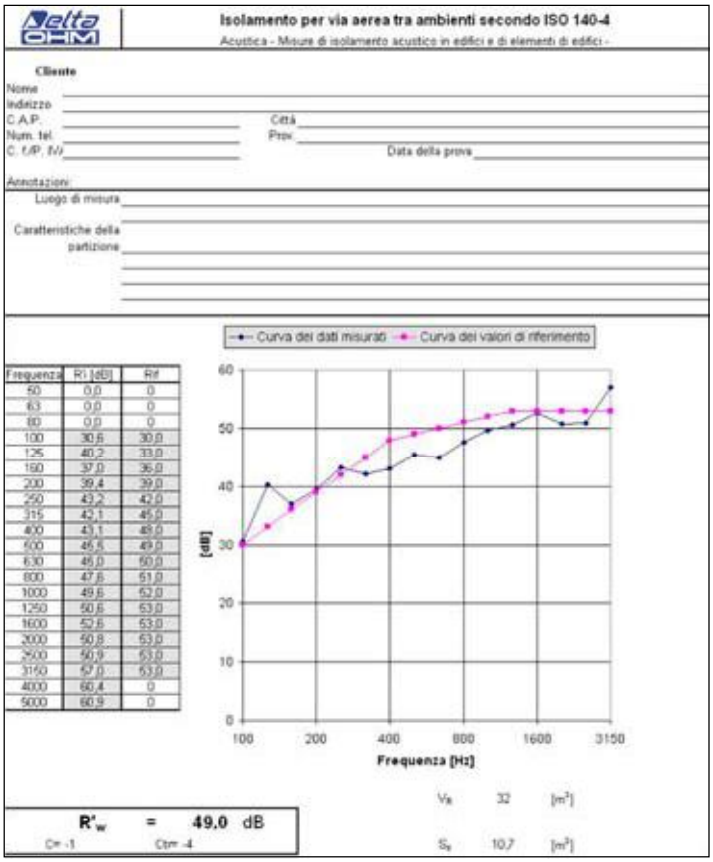
Noise Studio: 'Worker protection' module
This application module analyzes noise in the workplace according to the DL 81/2008, the European directive 2003/10/EC and the UNI 9432:2008. Data sound level measurements in work environment are organized in a project where they can be handled according to regulatory requirements. In addition to calculating the noise exposure of workers the program allows to evaluate the effectiveness of protective equipment by the methods SNR and OBM. According to UNI 9432 of 2008, the program also calculates the index of impulsiveness of a machine.



Noise studio: "monitor" module: acquisition om pc with synchronized audio recording

Noise Studio: 'Acoustic Pollution' module
This application module analyzes sound level profiles detected in indoor and outdoor environment for the assessment of the noise climate, the noise of industrial sites, ports, airports and transport infrastructure, and noise generally understood as a disturbance of human activity. The analysis of the noise climate is made on a daily, weekly and annual basis with resolutions up to 1 minute, according to DL 194, 19/08/2005.
The profiles of noise detected in the external environment are analyzed to search for disturbing 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 automatic search and analysis of sound events, according to the Ministerial Decree D.L. 194, 19/08/2005 of 16/03/1998. For the evaluation of the disturbance caused to the population from any source of noise even domestic, according to DM of 16/03/1998, the measured noise profiles are analyzed in search of impulsive or tonal components.
For some functions you need option 1: "Third octaves".

Noise Studio: 'Acoustic Insulation' module
This module performs calculations of building acoustics for the assessment of passive acoustic requirements of buildings, according to ISO standard, and according to the DPCM of 5/12/1997. The measures necessary for the analysis of a building are grouped in a project to simplify their storage and research. You can also add to the measures themselves, a technical report, comments, graphics, photos, etc. that remain part of the work and, if necessary, may be found easily. An updateable database, divided by walls and floors, contains the principal characteristics of sound-insulating structures. The data contained in the database can be compared



Noise studio "acoustic insulation" module: filling iso report.

graphically with measures in place.
With the program you can calculate:
- Average reverberation time (ISO 3382)
- Area of equivalent absorption coefficient of sound absorption (ISO 354)
- Isolation by air: indices R, R 'and DNT (ISO 140/III and IV)
- Insulation of facades and facade elements: indices $D_{2M,NT}$ and R_θ (ISO 140 / V)
- Isolation of noise impact: indices L_n, D_L, The N and L'_{nT} (ISO 140/VI, VII and VIII)
- Global Indices (ISO 717-1 and 717-2)
- **The program requires option 1 "Third octave" and for the calculation of some indices also the option 'Reverberation time'**

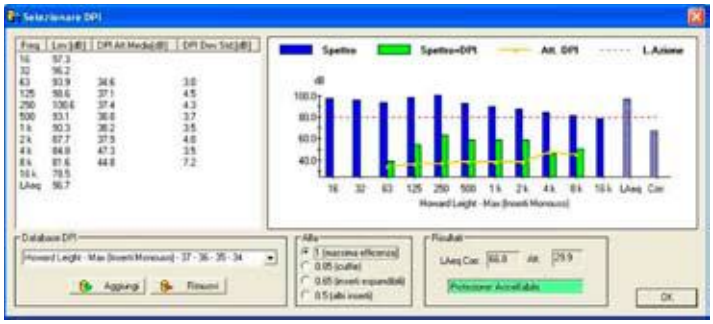
Noise Studio: 'Monitor' module

- 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 data sound level data directly into the mass memory of the PC (monitor function).
- Management of calibration and diagnostic functions.
- Automatic acquisition and monitoring program.
- Possibility of synchronized audio recording with the sound level measures, using a versatile trigger function

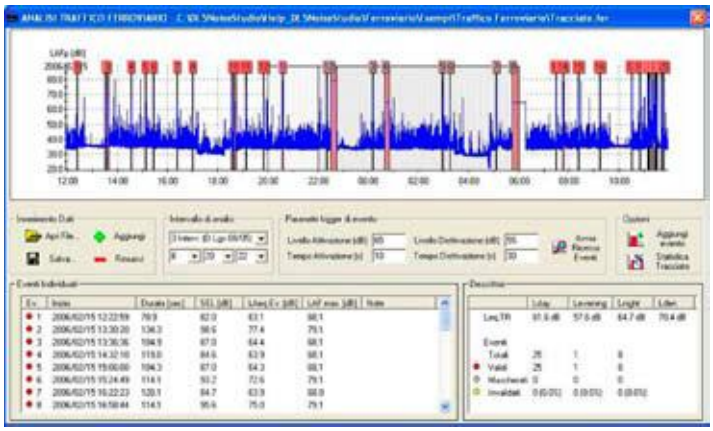
Purchasing codes for kit and accessories

HD2010 kit 1: consists of HD2010 Sound Level Meter, carrying case, HD2010PN preamplifier, MK221 microphone, CPA/5 5m extension cable, HD SAV windscreen, Noise Studio software and serial cable for connection to a PC (HD2110/RS) or USB (HD2101/USB interface).

HD2010 kit1/E: Version for outdoor measurements. It consists of: HD2010 Sound Level Meter, carrying case, HD WME weather protection with bird spike, wind screen and rain shield. HD SAV windscreen, heated preamplifier HD2010PNW with 5m extension cable(other lengths available on request), MK223 microphone, Noise Studio software and serial cable for connection to a PC (HD2110/RS) or USB (HD2101/USB interface).



Noise studio: "workers' protection" module: analysis of the effectiveness of ipd



Noise studio: "railway traffic" module: analysis of 24 hours with automatic search of transit

HD2010 kit1/IE: Version for indoor and outdoor measurements. It consists of HD2010 Sound Level Meter, carrying case, HD WME weather protection with bird spike, wind screen and rain shield, heated preamplifier HD2010PNW with 5m extension cable CPA/5, preamplifier HD2010PN, HD SAV windscreen, free field microphone unit MK223, Noise Studio software and serial cable for connection to a PC (HD2110/RS) or USB (HD2101/USB interface).

Option 0 "Memory Expansion": Additional 4 MB memory expansion.

Option 1 "Third Octave": Real-time third octave band spectrum analysis from 16 Hz and 20 kHz.

Option 4 "Reverberation Time": Reverberation time measurement using the sound source interruption technique and the impulsive source method. **It requires the "Third Octave" option and, for instruments manufactured before 2007, also the "Data logger" option.**

Option 5 "Advanced Analyzer": Profile+report+event data logging, capture and analysis of events, full statistical analysis. **It requires the "Data Logger" option for instruments manufactured before 2007.**

Option 7 "SIT Calibration": SIT calibration replaces ISO 9001 reports. **Only for new instruments**.

HD9101: Class 1 calibrator according to IEC90942:1988. Characteristics:

- Cavity for 1" and ½" microphones according to IEC61094
- 1000Hz Frequency
- Sound level 94dB/114dB

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined to Option 7 "SIT Calibration").

HD2020: class 1 calibrator according to IEC60942:2003 with I.N.RI.M. certificate of conformity n.90-003-01. Characteristics:

- LCD display
- Static pressure compensation from 65kPa to 108kPa
- Cavity for 1" and ½" microphones according to IEC61094
- Frequency 1000Hz
- Sound level 94dB/114dB

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate if combined to Option 7 "SIT Calibration").

MK231: Class 1 Microphone for diffuse field, type WS2D, according to IEC 61094-4:1995.

MK223: Class 1 Microphone for free field, type WS2F, according to IEC 61094-4:1995. Coated membrane for outdoor use.

HD2110/RS: RS232 serial cable for PC connection or connection to HD40.1 printer.

HD2110/USB: serial USB cable for PC connection.

SWD10: Stabilized mains power supply with Vin=100÷230Vac / Vout=12Vdc/1000mA.

CPA/10: 10m extension cable for HD2010PN preamplifier.

VTRAP: Tripod, 1550 mm maximum height.

HD2110/SA: Support to fix the preamplifier to the tripod.

HD40.1: Portable serial printer with 57mm paper rolls and SWD10 power supply.

BAT40: Spare battery pack for HD40.1

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

HD2010/MC: SD memory card interface complete with 1GB SD card

Codes for spare parts and other accessories

Option 2 "Data logger": Storage of 4 sound level profiles, continuously and at intervals. It includes memory expansion from of 2 MB. **This option is included in the new instruments.**

HD WME/PNMK: HD WME weather protection equipped with:

- HD WME consisting of preamplifier housing WME3 HD, bird spikes WME1, HD SAV wind screen SAV3 and rain shield HD WME2.
- Heated preamplifier HD2010PNW with 5m connection cable (other lengths upon request),
- MK223 microphone for free field type WS2F according to IEC 61094-4:1995 with coated membrane for outdoors use.

HD WME/PN

: HD WME weather protection equipped with:

- HD WME consisting of preamplifier housing WME3 HD, bird spikes WME1, HD SAV wind screen SAV3 and rain shield HD WME2.
- Heated preamplifier HD2010PNW with 5m connection cable (other lengths upon request),

HD WME: Weather protection equipped with:

- Stainless steel housing for HD WME3 preamplifier with rain shield HD WME2 support,
- HD WME1 bird spike,
- HD SAV3 wind-screen,
- HD WME2 rain shield.

HD SAV: Windscreen for ½" microphone.

HD SAV2: Windscreen with bird spike for HD WME950 microphone unit.

HD SAVP: Rain shield for HD WME950 microphone unit.

HD SAV3: Windscreen for HD WME and HD WME950 weather protections.

HD WME1: Bird spike for HD WME microphone unit.

HD WME2: Rain shield for HD WME microphone unit.

HD WME3: Stainless steel housing for the preamplifier of the outdoor microphone unit HD WME with holder for rain protection HD WME2.

HD2010PN: Microphone preamplifier for ½" microphones. Provided with CTC device for electrical calibration.

HD2010PNW: Microphone preamplifier for HDWME950N and HDWME weather protections. Heated and provided with CTC device for electrical calibration. Ending with 5m connection cable (other lengths upon request).

MK221: Class 1 microphone for free field, type WS2F, according to IEC 61094-4:1995

CPA/5: 5m extension cable for HD2010PN preamplifier.

HD2101/USB: USB serial cable for PC connection. **For sound level meters with serial Mini-Din connector**.

HD2110CSNM: RS232 serial cable for PC connection. **For sound level meters with serial Mini-Din connector**.

TECHNICAL SPECIFICATIONS

Standards	Class 1 group X according to IEC 61672:2002 and class 1 according to IEC 60651:2001 and IEC 60804:2000 Class 0 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 Microphones	MK221 condenser microphone pre-polarized (200V), for free field, high stability, type WS2F according to IEC 61094-4. MK223 condenser microphone with coated membrane, polarized (200V), for free field, high stability, type WS2F according to IEC 61094-4 (combined with the HDWME950 weatherproof unit). MK231 condenser microphone, polarized (200V), for diffuse field, high stability, type WS2D according to IEC 61094-4.
Dynamic range	21 dBA ÷ 143 dB Peak
Linear Field	80 dB (110 dB for the HD2010RE version)
Acoustic Parameters	Spl, L_{eq}, SEL, $L_{EP,d}$, L_{max}, L_{min}, $L_{pk,}$ Dose, L_n
Frequency Weighting	Simultaneous A, C, Z (only C and Z for L_{pk})
Temporal Weighting	Simultaneous FAST, SLOW, IMPULSE
Integration	From 1s to 99 hours with Back-Erase function
Spectrum Analysis	Parallel filters in real time complying with class 1 specifications according to IEC61260 ✓ Octave bands from 16 Hz to 16 kHz ✓ Third octave bands from 16 Hz to 20 kHz (option 1 “Third Octave”) Average spectrum (AVR) mode
Statistical Analysis	It displays up to 3 percentile levels for, L_1 to L_{99} Probability distribution and percentile level calculation from L_1 to L_{99} (option 5 “Advanced Analyzer”) ✓ Parameter: A, C or Z weighted, L_{Fp}, L_{eq}, L_{pk} (only C or Z for L_{pk}) ✓ Sampling frequency: 8 samples/second ✓ Classification: Classes of 0.5 dB
Analysis of Events	Option 5 “Advanced Analyzer” ✓ Calculation of 5 freely programmable event parameters ✓ Average spectrum calculation by octave and third octave bands ✓ Calculation of statistical levels from L_1 to L_{99} ✓ Event identification trigger with programmable threshold and duration filter ✓ External and manual trigger.
Reverberation Time (optional)	The reverberation time measurement option requires the “Third Octave” option Reverberation time measurement using sound source interruption or impulse response integration
Profile Data Logging	1 profile with programmable sampling from 1/8 s to 1 hour and 3 profiles with 2 samples/second
Spectrum Data Loggin	Programmable sampling from 1 second to 1 hour (AVR mode)
Display	Backlit graphic display 128x64 ✓ 3 parameters in numeric format ✓ Profile L_{AFp} with 8 samples/second Octave band spectrum from 16 Hz to 16 kHz ✓ “Third Octave” option ✓ Third octave band spectrum from 16 Hz to 20 kHz “Advanced Analyzer” option ✓ Graph probability distribution of sound level ✓ Graph of percentile levels from L_1 to L_{99}
Memory	Internal, equal to 4 MB (4 profiles for 23 hours or over 23 days recording 3 parameters + spectra per minute). Expandable to 8 MB External, via the HD2110MC 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. ✓ “Worker protection” module. Analysis of noise in the workplace in accordance with Decree 81 of 2008 and the UNI 9432-2008. ✓ “Acoustic pollution” module. Analysis of environmental noise according to the Law 447/1995 and Decree of 16/03/1998. Analysis of the noise climate and assessment of noise from road, rail and airport according to the law. Some program functions require option 1 “Third octaves”. ✓ “Acoustic Insulation” module. Calculations of acoustic and architectural evaluation of passive acoustic requirements of buildings according to DPCM of 5/12/1997. Requires option 4 “Reverberation time”. ✓ “Monitor” module. Acquisition in real time on PC. Synchronized audio recording. Remote monitoring and data capture. Connection via Modem. The program allows programming of measurements and calibrations with timer and audio recording with programmable event triggers.
Operating conditions	Working temperature -10÷50°C, 25÷90%RH (without condensation), 65÷108kPa. Protection degree: IP6
Power	4 alkaline or rechargeable NiMH type AA batteries or external 9÷12Vdc 300mA
Dimensions and weight	445x100x50 mm equipped with preamplifier, 740 g (with batteries)

HD 2110
INTEGRATING SOUND LEVEL METER - PORTABLE ANALYZER

The HD2110 is a precision integrating portable sound level meter, with data logging functions, performing both spectrum and statistical analysis. The instrument has been designed in order to offer high-performance analysis of acoustic phenomena, with particular regard to Italian legislation on environmental noise. Attention has been paid to the possibility of adjusting the instrument to regulatory modifications and to the necessity of meeting its users' needs of today and tomorrow. The HD2110 can be integrated with other options to extend its application scope at any time; the firmware can be updated directly by the user by means of the Noise Studio program supplied with the instrument.

Technical regulations:
- **Class 1 sound level meter according to IEC 61672-1, 2002 (Certificate of Compliance I.E.N. No. 37035-01C)**, IEC 60651 and IEC 60804.
- Class 0 octave and third octave filters according to IEC 61260
- Microphone in compliance with IEC 61094-4

Applications:
- Noise monitoring with sound event capture and analysis function,
- Real-time octave and third octave band spectrum analysis from 16 Hz to 20 kHz,
- Statistical analysis with calculation of all percentile levels from L_1 to L_{99},
- **Environmental noise measurement according to the decree of 16/03/1998,**
- **Identification of tonal components even at the standard third octave band crossing point,**
- **Estimate of the audibility of spectral components through comparison with equal loudness curves in real time**
- Measurement 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 acoustics and building measurements.

Sound level meter kit

HD2110 kit 1: consists of HD2110 Sound Level Meter, HD2110P preamplifier, MK221 microphone for free field, windscreen, 5m extension cable and RS232 serial or USB connection cable. Noise Studio PC program.

HD2110 kit 1/E: Version for outdoor measurements. It consists of HD2110 Sound Level Meter, HD WME weatherproof microphone unit, heated preamplifier HD2110PW, MK223 microphone cartridge for free field, 5m extension cable and RS232 serial or USB connection cable. Noise Studio PC program.

HD2110 kit 1/IE: Version for indoor and outdoor measurements. It consists of HD2110 Sound Level Meter, HD WME weatherproof microphone unit, HD2110PW heated preamplifier, preamplifier HD2110P, MK223 microphone cartridge for free field, windscreen HD SAV, 5m extension cable CPA/5 and RS232 serial or USB connection cable. Noise Studio PC program.

Accessories

Option 4 "Reverberation Time": Measurement by sound source interruption or impulse response integration.

Option 6 "FFT": 1/32 s Short Leq profile, narrow band spectrum analysis (FFT).

Option 7 "SIT Calibration": SIT calibration replaces ISO 9001 reports. **For new instruments only.**

MK231: Class 1 microphone for diffuse field, type WS2D according to IEC 61094-4:1995.

MK223: Class 1 microphone for free field, type WS2F according to IEC 61094-4:1995. Protected membrane for outdoor use.

HD9101: Class 1 calibrator according to IEC90942:1988. Characteristics:
- Cavity for 1" and ½" microphones according to IEC61094,
- Frequency 1000Hz,
- Sound level 94dB/114dB.

The calibrator is supplied complete with calibration report according to ISO 9001.

HD2020: class 1 calibrator according to IEC60942:2003 with I.N.RI.M. certificate of conformity n.90-003-01. Characteristics:
- LCD display,
- Static pressure compensation from 65kPa to 108kPa,
- Cavity for 1" and ½" microphones according to IEC61094,
- 1000Hz frequency,

Sound level 94dB/114dB.

The calibrator is supplied complete with calibration report according to ISO 9001.

HD2110/RS: RS232 serial cable for PC connection or connection to HD40.1 printer.

HD2110/USB: serial USB cable for PC connection.

HD SAV2

SWD10: Stabilized mains power supply Vin=100÷230Vac / Vout=12Vdc/1000mA.
CPA/10: 10m extension cable.
VTRAP: Tripod, 1550 mm maximum height.
HD2110/SA: Support to fix the preamplifier to the tripod.
HD40.1: Portable serial printer with 57mm paper rolls and SWD10 power supply.
HD2010/MC: SD memory card interface complete with 1GB SD card

For Windows® /98/ME/2000/XP/Vista operating systems

Noise Studio: Software for Windows® 95/ME/2000/XP and Vista operating systems supplied in the sound level meter kit. Configuration of the instrument, downloading and graphical display of stored data. This programme supports some sound analysis application modules which can be enabled by licence with the hardware key. The program contains demo versions of the modules.

CH20: Hardware key for PC with Windows® operating systems. Inserted into a USB port enables PCs to use software modules of the program Noise Studio.

NS1: Activation of module "Worker protection" of the Noise Studio program. Analysis of noise in the workplace in accordance with Decree 81 of 2008 and the UNI 9432-2008.

NS2: Activation of module "Noise pollution" of the Noise Studio Program. Analysis of environmental noise according to the Law 447/1995 and Decree of 16/03/1998. Analysis of the noise climate and assessment of noise from road, rail and airport according to the law.

NS3: Activation of the module "Acoustic Insulation" of the Noise Studio program. Calculations of acoustic and architectural evaluation of passive acoustic requirements of buildings according to DPCM of 5/12/1997. **Requires option 4 "Reverberation time".**

NS4: Activation of the module "Monitor" of the Noise Studio program. Acquisition in real time on PC. Synchronized audio recording. Remote monitoring and data capture. Connection via Modem.

Noise Studio Suite: Noise Studio Program equipped with the following application modules:
- "Worker Protection"
- "Noise Pollution"
- "Acoustic Insulation"
- "Monitor".

Using the HD2110 sound level meter you can log the time profile of 6 simultaneous parameters choosing freely temporal or frequency weightings. The possibility of displaying, storing and even printing the multi-parameter sound level analysis allows the sound level meter to log sound level and store for more than 46 hours. For sound level monitoring, you can store 5 programmable parameters and the average spectrum at intervals of 1 second to 1 hour, both by octave and third octave bands. Thanks to its high dynamic range, long integrations can be carried out with a minimum possibility of under- or over-range indications. The measurement dynamic range exceeds 110 dB and it is limited downwards only by the instrument intrinsic noise. For example, if you set the measuring upper limit at 140 dB, you can carry out measurements at the typical sound levels of a quiet office, with high accuracy and without overload indications, peak levels up to 143 dB.
The sound level meter can also log report sequences with dedicated parameters, at programmable intervals of 1 second to 1 hour, average spectra and full statistical analysis, in addition to sound level profiles. Moreover, a versatile trigger function can identify sound events and record their analysis with 5 dedicated parameters, average spectrum and statistical analysis.

The spectrum analysis is carried out simultaneous with the logging of the 6 profiles in real time, both by octave and third octave bands. The spectrum of sound signal is calculated twice a second and integrated linearly for up to 99 hours. Alternatively, the instrument can perform multi-spectrum analyses, even maximum or minimum, both with linear and exponential weighting. Spectra are displayed together with an A, C or Z -weighted wideband level. The third octave band spectrum analysis can be carried out, in addition to standard bands from 16 Hz to 20 kHz, also with bands shifted downwards by $^1/_{6^{th}}$ octave, from 14 Hz to 18 kHz. This feature is useful for finding tonal components hidden at the standard band crossing point. While the third octave band spectrum is displayed, you can enable the calculation of equal loudness curves in real time, for quickly estimating the audibility of spectral components.

As a statistical analyzer, the HD2110 samples the sound signal 8 times per second with A-frequency weighting and FAST constant, and it analyses it in 0.5 dB classes. You can program 4 percentile levels from L_1 to L_{99} and choose to sample L_{Fp}, L_{eq} or L_{pk} with A, C and Z-weightings (only C and Z for L_{pk}).

The Digital Audio interface allows recording the sound sample on tape, for further analysis. Recording in digital format guarantees the best accuracy. Audio tracks recorded with other instruments can also be analyzed using the Line input. For further analysis, 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 viewed 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 memory, as well as controlling a modem or printer. For example, should the supplied memory not be enough, this is the case for lengthy recordings, you can activate the "Monitor" function. This function allows sending the displayed data to a PC via the serial interface and storing them directly on the PC mass memory.
The HD2110 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 provided acoustic calibrator (type 1 according to IEC 60942) 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.
Most of the damages occurred to the instrument, microphone included, can be promptly identified thanks to a complete analysis program that includes the frequency response measurement of the whole measuring chain: microphone, preamplifier and sound level meter. The regular execution of diagnostic programs allows making reliable sound measurements, avoiding any repetition due to a malfunction later discovered.

The HD2110 sound level meter can perform the measurements required to evaluate workers' noise exposure (Legislative Decree 81/2008). The personal protective equipment can be selected through octave band spectrum analysis (OBM method) and a 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.

The HD2110 sound level meter is suitable for sound level monitoring, acoustic mapping and the assessment 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 statistical and spectrum analyzer features. Remote electrical calibrations and diagnostic tests can be executed using its remote control capabilities.

The HD2110 can also perform the measurements required to evaluate environmental noise (Decree of 16 March 1998, GU No.76 of 1 April 1998). Impulsive events can be easily identified thanks to the possibility of analysing the profile of the A-weighted level with FAST, SLOW, and IMPULSE constants. All measuring parameters can be stored for subsequent analysis. The identification of tonal components is also easy and certain as it allows displaying and recording the minimum spectrum with any wideband weightings (Z, C or A) both by third octave bands with standard nominal frequencies 16 Hz to 20 kHz, and with central frequencies shifted on the former crossing point 14Hz to 18 kHz. The audibility of the tonal component can be evaluated in the field thanks to the real-time calculation of equal loudness curves. The audibility of the tonal component, to be compared with that of the remaining spectrum, can also be evaluated using the Noise Studio program supplied with the instrument, thanks to the calculation of the equal loudness curves.

The HD2110 sound level meter with the "Reverberation Time" option can perform any measurement prescribed by the regulations on the room acoustics evaluation (D.P.C.M. of 5/12/1997). The sound level meter powerful DSP calculates 32 spectra/second, and it can measure reverberation times both using the sound source interruption method and the integration of impulse response technique. The analysis is carried out simultaneously by both octave and third octave bands.

Inputs and outputs

Digital audio input/output (IEC 60958:1999 type II) with RCA connector (S/PDIF).
LINE unweighted input/output (∅ 3.5 mm jack).
TRIGGER input/output (∅ 3.5 mm jack).
Standard RS232C serial port in compliance with EIA/TIA574. Baud Rate 300 to 115200 baud.
USB 1.1 serial port.
External power supply 9÷12Vdc (∅ 5.5 mm jack).

Italian Laws

- Noise in workplaces: D. Lgs 81/2008, UNI 9432/2008 and European Directive 2003/10/CE.
- Noise pollution: Law 447 of 26/10/95, D.P.C.M. of 1/3/91, Decree of 16/03/98, Decree No. 194 of 19/08/2005 and European Directive 2002/49/CE.
- Airport noise: Decree of 31.10.97.
- Noise in dancing entertainment locals: D.P.C.M. 215 dated 16/4/99.
- Noise emission from machines D. Lgs 262 of 4/9/2002 and European Directive 2005/88/CE.
- Evaluation of passive requirements of buildings: D.P.C.M. of 05.12.97.

Options and accessories:
HD2110MC reader

It allows interfacing SD and MMC memory cards with the sound level meter.
This device is connected to the sound level meter through the serial interface that also gives the required power supply. In addition to its remarkable storing capacity, the interface allows quickly downloading the data stored in the sound level meter internal memory. Cards with a maximum capacity of 2 GB can be connected. Includes a 1GB SD card.

Option 4 "Reverberation Time"

The measure of reverberation time is performed by using the sound source interruption and the impulsive source method.
The measure of reverberation time is performed simultaneously by wideband, octave band from 125 Hz to 8 kHz, and third octave band from 100 Hz to 10 kHz. Sampling interval 1/32 s.
Automatic calculation of reverberation times EDT, T10, T20 and T30 by all bands, and decay profile analysis with the possibility of calculating the reverberation time over a chosen interval.

Option 5 "Advanced Analyzer"
(included in new sound level meters only)

This option combines the sound level analyzer functions with the following:

- Statistical analysis available graphically, both as probability distribution and cumulative distribution.
- Trigger for noise event capture with level threshold and duration filter.
- Recording of measurement reports at intervals of 1s to 1 hour, with a dedicated set of parameters that includes average spectra and full statistical analysis.
- Recording of event parameters with the possibility of setting the maximum time resolution for event recording and a lower resolution for background noise recording.
- Possibility of storing markers.
- Timer for a delayed start of the capture.

Option 6 "FFT"
(only for HD2110 sound level meters with "Advanced Analyzer" option)

This option adds:

- Leq profile at 1/32 s intervals.
- Narrow band spectrum analysis (FFT) over the whole audio range with variable resolutions according to the frequency from 1.5Hz to 100Hz.

Software:
Noise Studio

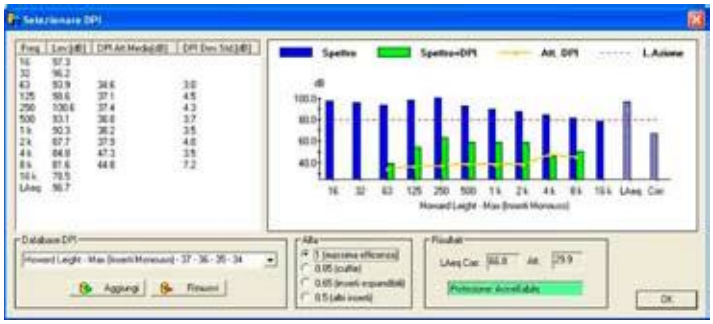
The Noise Studio programme allows interfacing HD2110 to the PC in a simple and intuitive way. Main functions are:

Transfer of stored data from the sound level meter to the PC memory.
Display of captured data under graphic and tabular form.
Export to Excel and PDF format.
Printing of graphs and data tables.
Comparison of spectra for third octave bands with noise contours.
Logging control by a PC.
Sound level meter setup management.
Sound level meter firmware update.

It results easier drafting documents regarding the sound level meter's relief due to the handy function which allows to copy graphs or visualized tables from other applications and to create PDF files.
Moreover Noise Studio is a post processing programme able to perform different kind of analyses, studied for specific applications assembled in software modules to be enabled with licence. Demo versions of the software modules are provided.

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

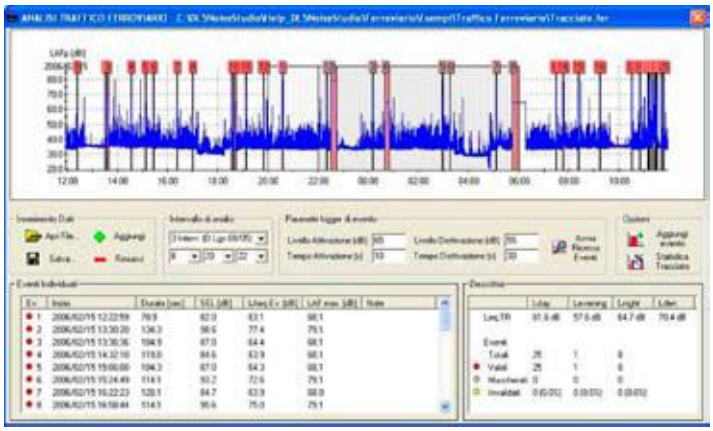
This application module analyzes noise in the workplace according to the DL 81/2008, the European directive 2003/10/EC and the UNI 9432:2008. Data sound level measurement in work environment is organized in a project where they can be handled according to regulatory requirements. In addition to calculating the noise exposure of workers the program allows to evaluate the effectiveness of protective equipment by the methods SNR and OBM. According to UNI 9432 of 2008, the program also calculates the index of impulsiveness of a machine.



Noise studio: "workers' protection" module: analysis of the effectiveness of ipd

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

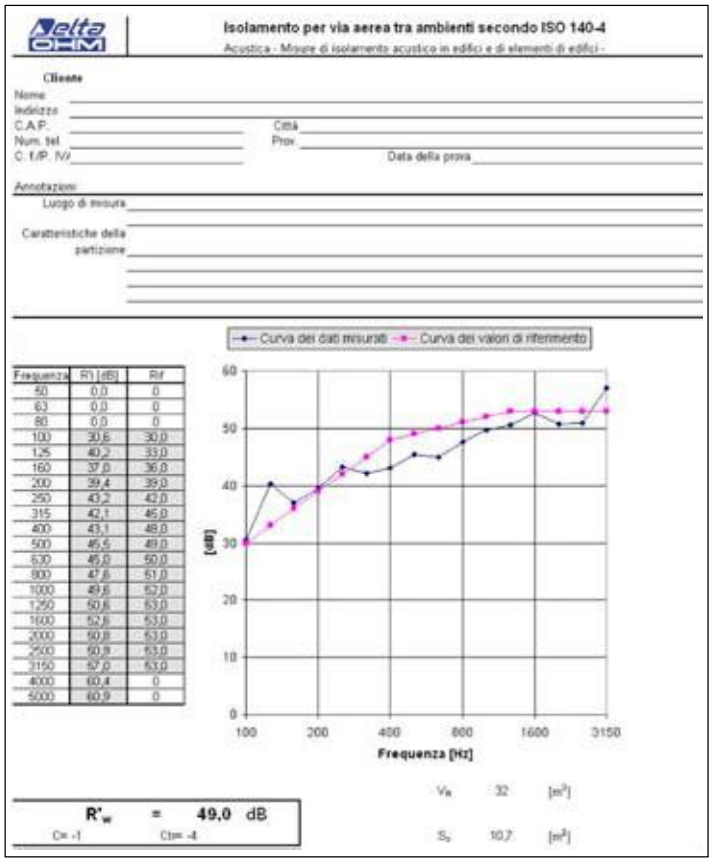
This application module analyzes sound level profiles detected in indoor and outdoor environment for the assessment of the noise climate, the noise of industrial sites, ports, airports and transport infrastructure, and noise generally understood as a disturbance of human activity. The analysis of the noise climate is made on a daily, weekly and annual basis with resolutions up to 1 minute, according to DL 194, 19/08/2005. The profiles of noise detected in the external environment are analyzed to search for disturbing 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 automatic search and analysis of sound events, according to the Ministerial Decree D.L. 194, 19/08/2005 of 16/03/1998. For the evaluation of the disturbance caused to the population from any source of noise even domestic, according to DM of 16/03/1998, the measured noise profiles are analyzed in search of impulsive or tonal components.



Noise studio: "railway traffic" module: analysis of 24 hours with automatic search of transit

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

according to the DPCM of 5/12/1997.
The measures necessary for the analysis of a building are grouped in a project to simplify their storage and research. You can also add to the measures themselves, a technical report, comments, graphics, photos, etc... which remain part of the work and, if necessary, can be found easily.
An updateable database, divided by walls and floors, contains the principal characteristics of sound-insulating structures. The data contained in the database can be compared graphically with measures in place.
With this program you can calculate:
Average reverberation time (ISO 3382)
Area of equivalent absorption coefficient of sound absorption (ISO 354)
Isolation by air: indices R, R 'and D_{nT} (ISO 140/III and IV)
Insulation of facades and facade elements: indices $D_{2m,nT}$ and Rθ (ISO 140 / V)
Isolation of noise impact: indices L_n, DL, The N and L'_{nT} (ISO 140/VI, VII and VIII)
Global Indices (ISO 717-1 and 717-2)
For the calculation of some indices, option 4 'Reverberation time' is required.



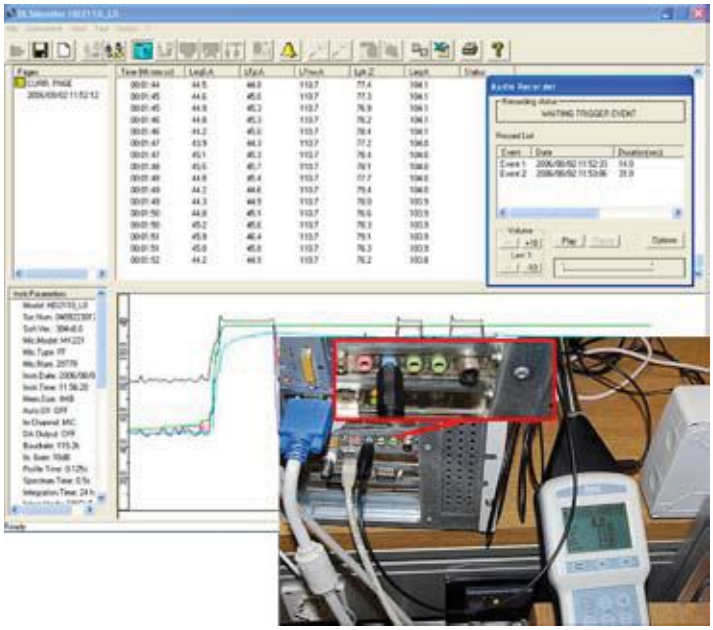
Noise studio "acoustic insulation" module: filling iso report.

Noise Studio: '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 data sound level data directly into the mass memory of the PC (monitor function).
Management of calibration and diagnostic functions.
Automatic acquisition and monitoring program.

Possibility of synchronized audio recording with the sound level measures, using a versatile trigger function.



Noise studio: "monitor" module: acquisition om pc with synchronized audio recording

Kit and accessories purchasing codes

HD2110 kit 1: consists of HD2110 Sound Level Meter, carrying case, HD2110P preamplifier, MK221 microphone, 5m extension cable CPA/5, HD SAV windscreen, Noise Studio software and RS232 serial (HD2110RS) or USB connection (HD2110/USB) cable.

HD2110 kit1/E: Version for outdoor measurements. It consists of HD2110 Sound Level Meter, carrying case, HD WME weather equipped with bird spike protection, wind screen and rain shield, HD2110PW heated preamplifier with 5m extension cable (other lengths available upon request) and MK223 microphone. The kit includes also Noise Studio software and serial cable for connection to a PC (HD2110/RS) or USB (HD2101/USB interface).

HD2110 kit1/IE: Version for indoor and outdoor measurements. It consists of HD2110 Sound Level Meter, carrying case, HD WME weather equipped with bird spike protection, wind screen and rain shield, HD2110PW heated preamplifier with 5m extension cable (other lengths available upon request), HD2110P preamplifier, 5m extension cable CPA/5, HD SAV wind screen and MK223 microphone. The kit includes also Noise Studio software and serial cable for connection to a PC (HD2110/RS) or USB (HD2101/USB interface).

Option 4 "Reverberation Time": Reverberation time measurement by source interruption and the impulsive source method.

Option 6 "FFT": Short Leq profiles at 1/32 s, narrow band spectrum analysis (FFT). **It requires the "Advanced Analyzer" option**.

Option 7 "SIT Calibration": SIT calibration replaces ISO 9001 reports. **For new instruments only.**

HD9101: Class 1 calibrator according to IEC90942:1988. Characteristics:
- Cavity for 1" and ½" microphones according to IEC61094,
- Frequency 1000Hz,
- Sound level 94dB/114dB.

The calibrator is supplied complete with calibration report according to ISO 9001.

HD2020: class 1 calibrator according to IEC60942:2003 with I.N.RI.M. certificate of conformity n.90-003-01. Characteristics:
- LCD display,
- Static pressure compensation from 65kPa to 108kPa,
- Cavity for 1" and ½" microphones according to IEC61094,
- 1000Hz frequency,

Sound level 94dB/114dB.

The calibrator is supplied complete with calibration report according to ISO 9001 (replaced by a SIT certificate when combined to Option 7 "SIT Calibration").

MK231: Class 1 microphone for diffuse field, type WS2D according to IEC 61094-4:1995.

MK223: Class 1 microphone for free field, type WS2F according to IEC 61094-4:1995. Protected membrane for outdoor use.

HD2110/RS: RS232 serial cable for PC connection or connection to HD40.1 printer.

HD2110/USB: serial USB cable for PC connection.

SWD10: Stabilized mains power supply Vin=100÷230Vac / Vout=12Vdc/1000mA.

CPA/10: 10m extension cable for HD2110P preamplifier.

CPA/20: 20m extension cable for HD2110P preamplifier.

CPA/50: 50m extension cable for HD2110P preamplifier.

VTRAP: Tripod, 1550 mm maximum height.

HD2110/SA: Support to fix the preamplifier to the tripod.

HD40.1: Portable serial printer with 57mm paper rolls and SWD10 power supply.

BAT40: Spare battery pack for HD40.1

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

HD2010/MC: SD memory card interface including 1GB SD card

Codes of spare parts and other accessories

Option 5 "Advanced Analyzer": Profile+report+event data logging, capture and analysis of events, full statistical analysis. **This option is included in new instruments.**

HD WME/PMK: HD WME weather protection complete with bird spike, windscreen and rain shield, HD2010PW heated preamplifier with CPA/5 5m extension cable, HDSAV windscreen, MK223free field microphone unit.

HD WME/P: HD WME weather protection complete with bird spike, windscreen and rain shield, HD2010PW heated preamplifier with CPA/5 5m extension cable (other lengths upon request).

HD WME: Weather protection, equipped with:
- Stainless steel housing for the preamplifier WME3 HD with holder for rain protection HD WME2,
- WME1 HD bird spike,
- HD SAV3 wind-screen,
- HD WME2 rain-shield.

HD SAV: Windscreen for 1/2" microphone.

HD SAV2: Windscreen with bird spike for HD WME950 microphone unit.

HD SAVP: Rain shield for HD WME950 microphone unit.

HD SAV3: Windscreen for HD WME microphone unit.

HD WME1: Bird spike for HD WME microphone unit.

HD WME2: Rain shield for HD WME microphone unit.

HD WME3: Stainless steel housing for the preamplifier of the outdoor microphone unit HD WME with holder for rain protection HD WME2.

HD2010P: Microphone preamplifier for ½" microphones. Provided with CTC device for electrical calibration. The HD2010P is also equipped with a driver for extension cable up to 100m length.

HD2010PW: Heated microphone preamplifier for HDWME950 and HD WME. It is heated and provided with CTC device for electrical calibration. Ending with 5m connection cable (other lengths upon request). The HD2010PW is also equipped

with a driver for extension cable up to 100m length.

HD2110PW: Heated microphone preamplifier to be housed in outdoor protection WME950 HD and HD WME. The preamplifier for ½"microphones is heated and provide with CTC device for electrical calibration; it ends with a 5m connection cable (other lengths on request). The HD2110PW is also equipped with a driver for extension cable up to 100m length.

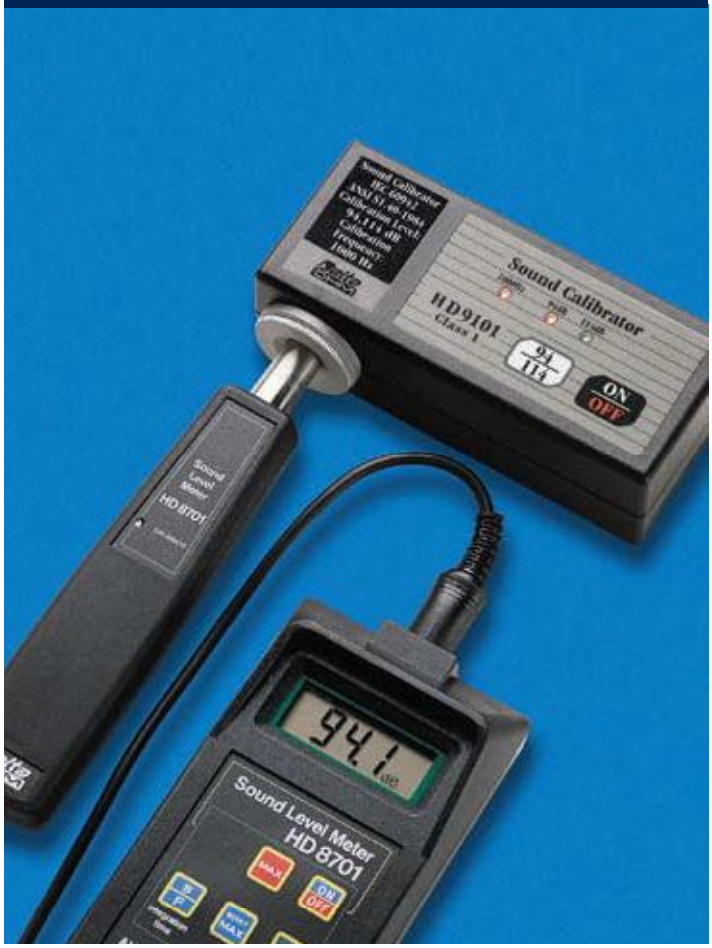
CPA/5: 5m extension cable for HD2010PN and HD2110P preamplifiers.

HD2101/USB: USB serial cable for PC connection. **For sound level meters with serial Mini-Din connector**.

HD2110CSNM: RS232 serial cable for PC connection. **For sound level meters with serial Mini-Din connector**.

TECHNICAL SPECIFICATIONS

Standards	Class 1 group X according to IEC 61672:2002 and class 1 according to IEC 60651:2001 and IEC 60804:2000 Class 0 according to IEC 61260:1995 Type 1 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 Microphones	✓MK221 condenser microphone, polarized (200V), for free field, high stability, type WS2F according to IEC 61094-4 ✓MK223 condenser microphone with coated membrane, polarized (200V), for free field, high stability, type WS2F according to IEC 61094-4 (combined with the HDWME950 weatherproof microphone unit) ✓MK231 condenser microphone, polarized (200V), for diffuse field, high stability, type WS2D according to IEC 61094-4
Dynamic range	23 dBA ÷ 143 dB Peak
Linear range	110 dB
Acoustic Parameters	Spl, L_{eq}, SEL, $L_{EP,d}$, L_{max}, L_{min}, L_{pk}, Dose, L_n
Frequency Weighting	Simultaneous A, C, Z (only C and Z for L_{pk})
Temporal Weighting	Simultaneous FAST, SLOW, IMPULSE
Integration	From 1s to 99 hours with Back-Erase function
Spectrum Analysis	Parallel filters in real time complying with IEC61260 class 0 specifications. ✓Octave bands from 16 Hz to 16 kHz ✓Third octave bands from 16 Hz to 20 kHz ✓Third octave bands from 14 Hz to 18 kHz ✓Optional FFT from 7 Hz to 22 kHz with variable resolutions from 1.5 Hz to 100 Hz Average spectrum (AVR) mode, multi-spectrum analysis (MLT), maximum spectrum (MAX), and minimum spectrum (MIN)
Audibility	Real-time comparison of third octave band spectrum with equal loudness curves according to ISO 266:2003
Statistical Analysis	Probability distribution and percentile level calculation from L_1 to L_{99} ✓Parameter: L_{Fp}, L_{eq}, L_{pk}, A, C or Z weighted (only C or Z for L_{pk}) ✓Sampling frequency: 8 samples/second ✓Classification: 0.5 dB classes
Event Analysis	✓Calculation of 5 freely programmable event parameters ✓Calculation of octave and third octave band average spectra ✓Calculation of statistical levels from L_1 to L_{99} ✓Event identification trigger with programmable threshold and duration filter ✓External and manual trigger
Reverberation Time (opt.)	Reverberation time measurement by sound source interruption and impulse response integrated
Profile Data Logging	1 profile with programmable sampling from 1/8 s to 1 hour and 5 profiles with 2 samples/second
Spectrum Data Logging	Programmable sampling from 0.5s to 1 hour (MLT, MAX, or MIN modes)
Display	Backlit graphic display 128x64 ✓5 numerical parameters ✓Profile of a selectable parameter with sampling time from 1/8 s to 1 hour ✓Octave band spectrum from 16 Hz to 16 kHz ✓Third octave band spectrum from 16 Hz to 20 kHz or 14 Hz to 18 kHz ✓Graph of sound level probability distribution ✓Graph of percentile levels from L_1 to L_{99} ✓Optional narrow band spectrum analysis (FFT) from 7Hz to 22 kHz
Memory	Internal, equal to 8 MB (1 profile for 72 hours or over 46 recording days of 5 parameters + spectra per minute) External, via the HD2110MC memory card interface, using MMC or SD cards up to 2 GB
Input/Output	✓ RS232 serial and USB interfaces ✓ AC input and output (LINE) ✓ S/PDIF digital audio input and output ✓ External event identification trigger
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. ✓ "**Worker protection**" module. Analysis of noise in the workplace in accordance with Decree 81 of 2008 and the UNI 9432-2008. ✓ "**Acoustic pollution**" module. Analysis of environmental noise according to the Law 447/1995 and Decree of 16/03/1998. Analysis of the noise climate and assessment of noise from road, rail and airport according to the law. Some program functions require option 1 "Third octaves". ✓ "**Acoustic Insulation**" module. Calculations of acoustic and architectural evaluation of passive acoustic requirements of buildings according to DPCM of 5/12/1997. Requires option 4 "Reverberation time". ✓ "**Monitor**" module. Acquisition in real time on PC. Synchronized audio recording. Remote monitoring and data capture. Connection via Modem. The program allows programming of measurements and calibrations with timer and audio recording with programmable event triggers.
Operating conditions	Working temperature -10÷50°C, 25÷90%RH (without condensation), 65÷108kPa. Protection degree: IP64
Power supply	4 alkaline or rechargeable NiMH type AA batteries or external 9÷12Vdc 300mA
Dimensions and weight	445x100x50 mm equipped with preamplifier, 740 g (with batteries)



HD 8701
SOUND LEVEL METER

The sound level meter **HD 8701** is a portable instrument, easy and quick to use, suitable for measuring industrial and civil noise levels.
The noise levels can be read easily in dB (A) on the large liquid crystal display which also shows all the information concerning the mode of operation of the instrument. One second after switching on and with a resolution of 0.1 dB, the digital reading gives the continuously updated value of the RMS sound pressure level, with a type A frequency weighting. The single range from 30 to 130 dB further simplifies the use of the instrument, as the user does not have to change scale. With the keyboard the following operations are possible:
- selecting the response time constant S/F
- displaying the maximum value recorded "MAX" and zeroing it "RESET MAX"
- freezing the indication on the display "HOLD".

DIRECTIONS OF USE
When pressing ON/OFF key the instrument switches on; by pressing it again, the instrument switches off.
S/F key allows to select selecting the time constant: Slow (1 second) - Fast (125 milliseconds) are displayed with "S" or "F". HOLD key allows holding the indication on display. By pressing HOLD again, you go back to the normal operation (continuous updating of reading). The frozen state is indicated on the display with "HOLD".
By hold the MAX key, you display the maximum value considered (for periods not exceeding one minute) automatically by the instrument, by the switching on or since pressing the RESET MAX. The display also indicates if the battery is low.
The instrument switches off automatically if it is in the measure, after about 3 minutes from ignition. In MAX and HOLD disables automatic shutdown of the instrument.

Automatic shutdown of the instrument in measuring can be disabled by moving the jumper in the battery compartment. In order to ensure the accuracy of the instrument over time, it is advised by the calibration trimmer multi-turn "CAL" in the probe, after connecting the microphone to the calibrator HD 9102.

TECHNICAL SPECIFICATIONS
- Measuring range: 30 dB (A)...130 dB (A)
- Frequency response: weighted A
- Time constants: S = slow (1 s) and F = Fast (125 ms)
- Resolution: 0.1 dB - Precision: class 2
- Display: 12 mm LCD with indication of operating mode and low battery
- Power supply: 9 V batteries
- Autonomy: (continuous duty) 15 hours with zinc-carbon battery, 30 hours with alkaline battery
- Working temperature: -5...+50°C
- Storage temperature: -20...+70°C
- Dimensions instrument: 80 x 160 x 40 mm
- Weight: 350 gr.

HD 2020
ACOUSTIC CALIBRATOR

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 ½" 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.

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, and then the sound pressure level (94 or 114dB) will appear in standard view.
4. Calibrator cavity for conventional ½ 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.

Advantages of the HD 2020 calibrator 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 the use even by unskilled personnel.
- The presence of the LCD helps you through the steps of setting the calibrator, signal the end of the span and allows you to check the status of the battery.

DESCRIPTION KEYBOARD AND DISPLAY

The keyboard instrument consists of 4 buttons.
The following describes in detail the functions performed by each.

ON-OFF key

Press the ON/OFF key to turn the instrument on and off.
When instrument is on, all display segments are shown for a few seconds,

...an auto-test including the level of battery charge starts and brings the instrument to the standard working condition.

Nota: between the instant when you press the ON / OFF button and switching the display pass about three seconds: this time it is necessary to perform the initial self-test.

Auto-off feature (*Auto-Power Off*)

The instrument has the auto-off feature (Auto-Power Off) that turns the meter off after 5 minutes if, in this interval, the microphone is inserted into the cavity of the calibrator and press any button.
If the cavity is open, indicating the noise level in the display: in these conditions the instrument will turn off automatically after 30 seconds
***Auto-off feature* cannot be excluded.**

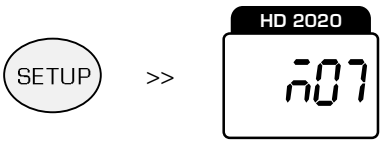
SETUP key

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.

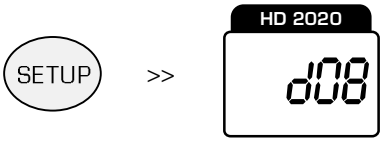
The user can set each of these items by selecting the SETUP button and modifying it with the arrow keys ▲▼. To confirm the setting, press the SETUP.

From the standard display, press SETUP to see the current year:

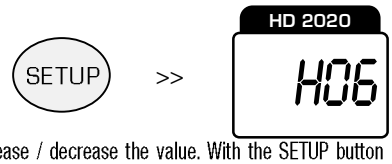
Use the arrows to increase / decrease the value. With the SETUP button is confirmed and changes to current month:



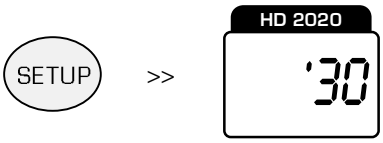
Use the arrows to increase / decrease the value. With the SETUP button is confirmed and passed to the current day:



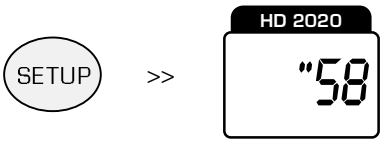
Use the arrows to increase / decrease the value. With the SETUP button is confirmed and the current time passes.



Use the arrows to increase / decrease the value. With the SETUP button is confirmed and passed to the current minutes.



Use the arrows to increase / decrease the value. With the SETUP button is confirmed and passed to the second current.



Each time you press the arrow keys, the seconds value to zero. With the SETUP button you confirm and move to the menu section on the calibration with the lighting of the first triangle to the left and display of calibration (the parameter is not user editable).

(calibration year - first triangle)

With the SETUP button switches per month span (the parameter is not user editable).

(calibration month - first triangle)

With the SETUP button switches per day span (the parameter is not user editable).

(calibration day - first triangle)

With the SETUP button switch setting the date of calibration with the lighting of the second triangle to the left and display the number of years of calibration. You can type the number of years and months between the date of calibration, entered by the laboratory conducting the formal point and the expiry date.
After the interval set, the triangle is flashing to indicate that it is necessary to re-start point of the calibrator.

(validity years - second triangle)

Use the arrows to increase / decrease the value. With the SETUP button you confirm and pass the number of months of validity.

(validity months - second triangle)

Use the arrows to increase / decrease the value. With the SETUP button you confirm and back to the default mode of operation.

s arrow key

Under standard conditions, select either the sound pressure levels of 94dB and 114dB. In the menu increases the current value.

t arrow key

Under standard conditions, select either the sound pressure levels of 94dB and 114dB. In the menu decrements the current value.

CALIBRATION PROCEDURE

The HD 2020 can calibrate standard ½" 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 the instrument on.
- Use the arrow keys to select the sound level: 94 dB or 114 dB.
- If the value displayed on the display stops flashing within a few seconds, this indicates improper placement of the microphone.
- Proceed with the calibration of sound level meter, following the procedure indicated on the instrument manual.
- Apply the correction to the pressure level generated in the type of microphone (see the following chapter).
- At the end, turn the sound level meter and calibrator off and remove the microphone from the cavity.

With the HD 2020 calibrator can calibrate any type of SLM is provided with a microphone or laboratory sample of work from ½" in conformity with the standards described in IEC 61094-01 and IEC 61094-4.

Corrections for the type of microphone

The HD2020 calibrator generates a sound pressure level equal to 94 dB (or 114 dB) reported in 20µPa. The normal working microphones ½", used on sound level meters are engineered to have a flat frequency response in terms of free field or diffuse field is respectively in a field of progressive plane waves with propagation direction coincides with the axis of microphone and in a field of sound waves from all directions. These propagation conditions are different from those experienced in the cavity of the sound calibrator. Free field reflections caused by the presence of the microphone alter the sound level by increasing the effective sensitivity of the capsule at high frequencies. The microphones are optimized for free-field measurements exploit this phenomenon to obtain a flat frequency response up to very high frequencies. In these microphones increase in noise level at 1 kHz is approximately 0.05 dB ÷ 0:20 dB. When you calibrate a microphone for free field should therefore reflect this difference in sound level meter by setting a noise level less than 0.1 dB and 0.2 dB compared to the nominal calibrator. The microphones are optimized for diffuse field measurements do not need instead of corrections when calibrated cavity closed at 1 kHz.

REPORTING FOR LOW BATTERY AND BATTERY REPLACEMENT

The calibrator HD 2020 is equipped with two batteries: a user-replaceable 9V alkaline battery and lithium. This serves to keep the clock and calendar function even if the external battery: its replacement should be done at an authorized by Delta Ohm.
The charge level of the 9V battery is continuously 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 charge is insufficient to ensure normal operation of the instrument, the symbol remains constantly lit. When the battery is discharged, the calibrator is turned off within approximately 10 seconds.

To replace the 9V battery, turn off the power and open the door at the bottom of the instrument. Replace the battery. Close the door. The date, time interval expires calibration will be saved if the battery is fully charged. The average duration of the battery depends on the presence or absence of the external, if the external battery is present; the average life of battery is approximately 5 years.

Warning on use of batteries
- 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 OPERATION
Mechanical construction

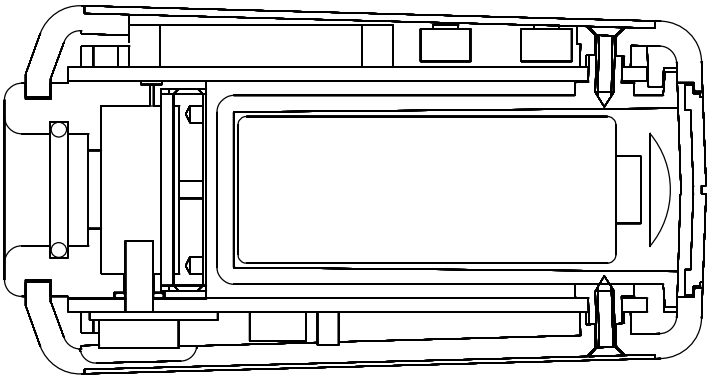


Fig. 3 Mechanical construction of the calibrator (section).

In Fig 3 is the schematic structure of the calibrator HD 2020 (in section). On the right side of the container is the battery compartment. Above and below the battery compartment are printed circuit boards and electronics. The upper one is reserved for the display and keyboard. At left is the electro-acoustic transduction system consists of a large volume cavity with piezoceramic generator and sensor feedback. The system emits a signal through the microphone located ½ “. A capillary hole outward balances the static pressure chamber protects the microphones from excessive pressure caused by the advertiser.

Electronic control
In Fig 4 shows the block diagram of the calibrator.

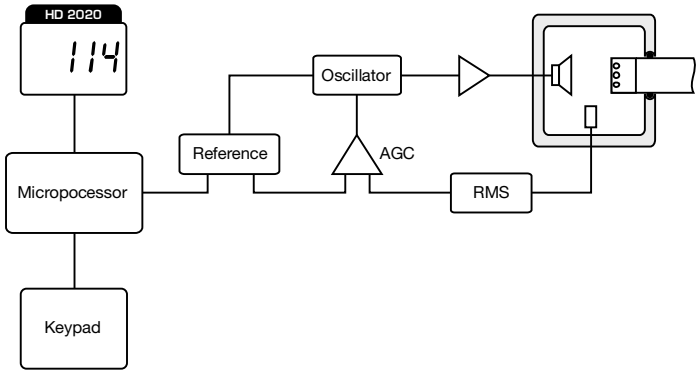


Fig 4 Block diagram of electronics.

The main part of electronics is an oscillator with high stability and low distortion plus an RMS converter, the automatic gain control (AGC), the driver for the ceramic resonator and electronics packaging of the signal provided by sensor feedback . The RMS level of the signal provided by the sensor is compared with the reference level set at the factory, the difference corrected by the automatic gain control, the amplitude of the signal generated by the oscillator and then the acoustic signal generated by the piezoelectric transducer. The signal from the sensor has minimal variation with temperature and static pressure, the frequency of the signal provided by the oscillator is stable in relation to environmental parameters.

INSTRUMENT STORAGE
Storage conditions of the instrument:
- Temperature: -25 ... +55 ° C.
- Humidity: less than 90% RH non-condensing.
- Do not store where:
  The humidity is high.
  The instrument is exposed to direct sun radiation.
  The instrument is exposed to a source of high temperature.
  There are strong vibrations.
  There is pressure, salt and / or corrosive gas.

The instrument body is ABS plastic: do not use incompatible solvents for clearing.

NOTES ON THE OPERATION AND OPERATIONAL SAFETY
Authorized use
Observe the specifications given in chapter “SPECIFICATIONS”. It only authorizes the use and operation in accordance with the instructions in this operating manual. Any other use is considered unauthorized.

General Safety Instructions
This instrument was manufactured and tested according to EN 61010-1 safety standards relating to electronic measuring instruments and left the factory in perfect condition safety techniques. The smooth functioning and operational safety of the instrument can only be guaranteed if you look all normal security measures as well as those specifications described in this manual. The smooth functioning and operational safety of the instrument can be guaranteed only under conditions specified in “Technical Specifications”.

Do not use or store the instrument in the manner and / or where are present:
- Rapid changes in temperature that may cause condensation.
- Corrosive or flammable.
- Direct vibration or shock to the instrument.
- High intensity electromagnetic fields, static electricity.

If the instrument is transported from a cold to a warm place, condensation may cause it to function. In this case we expect that the temperature of the instrument to reach room temperature before putting it back on.

User requirements
The user of the instrument must ensure that compliance with the following rules and guidelines concerning the treatment of hazardous materials:
- EC directives on occupational safety
- National laws and safety at work
- Accident prevention regulations

TECHNICAL SPECIFICATIONS
The calibrator HD 2020 falls in the characteristics of **class 1 according to IEC 60942-2003 and meets the requirements of the 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 1 kHz (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:	±0.03 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 mm3
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

PURCHASING CODES
HD2020: The kit consists of: HD2020 calibrator, 1 9V alkaline battery, instruction manual and report of calibration.

HD 9101
HD 9102

HD 9101 AND HD 9102
SOUND LEVEL METERS CALIBRATORS

APPLICATION FIELD

The generator noise level 9101/HD HD 9102 is a portable, battery-powered sound source, suitable for calibration of sound level meters (portable and laboratory) and acoustic measuring stations. And 'possible to calibrate directly microphones 1 / 2 "of mechanical dimensions conform to the requirements of 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)

ADVANTAGES OF CALIBRATORS HD 9101 / HD 9102 ARE:

- With the frequency of the sound signal at 1000Hz can perform calibration of sound level meters with any frequency weighting (LIN, A, B, ...), without introducing correction factors.
- The sound pressure level generated is independent of atmospheric pressure is therefore not necessary to correct the value function of atmospheric pressure.
- The calibrator 9101/HD HD 9102 can be conveniently used in both laboratory and field.
- Ease of use allows the use even by unskilled personnel.

TECHNICAL SPECIFICATIONS

The calibrator **HD9101** satisfies **Class 1 specifications according to the standard IEC 60942-1988 and complies with the requirements of the standard ANSI S1.40-1984.**
The calibrator **HD9102** satisfies **Class 2 specifications according to the standard IEC 60942-1988 and complies with the requirements of the standard ANSI S1.40-1984.**

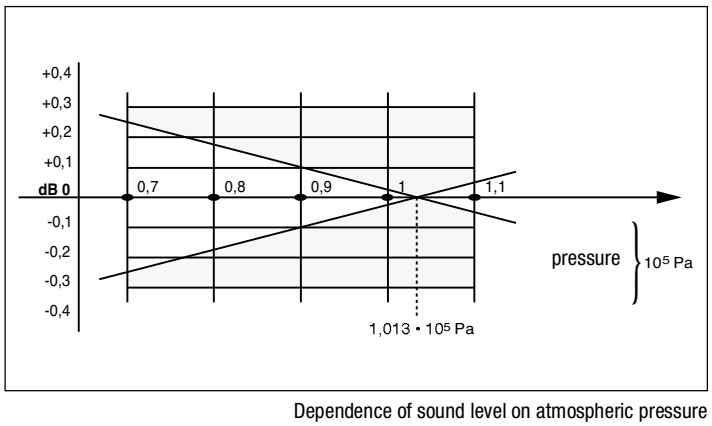
- Diameter of microphones that may be calibrated:
  23.77 ±0.05 mm 1"
  12.7 ± 0.03 mm 1/2" (with 1/2" adapter mod. 9101040) standard according to IEC 61094-1 and IEC 61094-4
- Stabilization time: 60 sec
- Frequency HD 9101: 1000Hz ± 2%
- Frequency HD 9102: 1000Hz ± 4%
- Sound pressure level HD 9101: 94db/114dB ± 0.3dB
- Sound pressure level HD 9102: 94db/114dB ± 0.5dB (ref.101.3kPa, 23°C ±3°C and 65% RH)
- Total distortion: <0.5%
- Static pressure influence (Ref. to 101.3kPa): ±0.1 dB between 90 kPa and 108kP ±0.3 dB between 65 kPa and 108kP
- Temperature influence: ±0.05 dB between 5°C and 35°C ±0.2 dB between -10°C and 50°C
- Relative humidity influence (ref. to 50%R.H.) ±0.1dB between 10% RH and 90% RH Free from condensation
- Stability (one year, standard use): ± 0.1 dB
- Working temperature: -10°C ÷ +50°C
- Storage temperature: -25°C ÷ +55°C
- Relative humidity: _90% RH
- Equivalent volume of the calibration room (+23°C): 10 cm3
- Power supply: 9V alkaline battery IEC type 6F22
- Battery life: about 15 hours with an alkaline battery
- Housing made of: NORYL NE110 resin
- Dimensions: 60x140 mm, H=46 mm
- Weight: 400 gr.

PURCHASING CODES

HD9101: class 1 calibrator according to IEC609442:1988. Frequency 1000 Hz, sound level 94dB/114dB.
HD9102: class 2 calibrator according to IEC609442:1988. Frequency 1000 Hz, sound level 94dB/114dB.

ACCESSORIES:

- Adapter for 1/2" model 9101040
- 9V alkaline battery IEC 6LF22
- Instructions manual



Dependence of sound level on atmospheric pressure

HD 2030
FOUR CHANNEL VIBRATION ANALYZER

HD2030 is a portable vibration analyzer performing spectral and statistical analysis on four channels simultaneously. The instrument measures all parameters required by current regulations concerning workers protection from vibration related risks and is able to measure vibrations transmitted to both hand-arm and whole body.

Main features

HD2030 has been designed combining maximum flexibility and easy of use with the possibility to update the instrument according to the evolution of regulations concerning vibrations. The user can directly update the instrument firmware by means of the program Noise & Vibration Studio supplied with the instrument.
The HD2030 satisfies the specifications of standards **ISO 8041:2005, ISO 5349-1:2001** (hand-arm vibrations) and **ISO 2631-1, 2 and 4 1997** (whole-body vibrations). Octave and third octave filters satisfy class 1 specifications of IEC 61260 standard.

The HD2030 vibration analyzer detects accelerations on four axes through two accelerometers with integrated amplifying electronics (IEPE or equivalent type). Three axes are grouped in the right input, where it is possible to connect three accelerometers or a tri-axial one; the fourth axis is associated to left input. Accelerometers with integrated electronics allow using standard cables to achieve low impedance and low noise connections between the accelerometer and the instrument, simplifying its use and decreasing the probability to get wrong or altered measurements, because of interferences or electromagnetic disturbances.
The HD2030 analyzes accelerometer signals and makes calculations simultaneously on four axes. The instrument calculates, in parallel for all the measurement channels, weighted acceleration values and octave or third octave spectra; acceleration, velocity or displacement values can be shown for each frequency band. Frequency weightings can be freely chosen according to the specific application. Together with values of instantaneous and mean acceleration, the analyzer calculates in addition peak levels, vibration dose (VDV), crest factors and performs statistical analysis.
As statistical analyzer HD2030 calculates the probability distribution of a measurement parameter in 1dB classes. Both the probability distribution graph and the percentile levels from L1 up to L99 are available. The measurement of acceleration on four axes allows, as an example, to measure vibration transmitted to the driver body through the vehicle seat isolating driver movements or to evaluate, during design and production verification, the damping effectiveness of seat suspension and absorbing material in general. In building analysis it is possible to correlate the signal of the hammer used to excite the structure with the signal received by a high sensitivity tri-axial accelerometer.

A flexible data logger function stores multiple profiles and spectra either into the internal 8MB memory or into a memory card (SD up to 2GB). When needed, it's possible to add to profiles the logging of accelerometer signals, directly recording the digital samples. Analysing stored data, it's useful to examine accelerometer signals in order to verify the absence of artefacts like, for example, those generated by DC-shift. Each recording can be documented including a vocal comment. Besides HD2030 can be used like an audio recorder, another possibility to document the measurements.
The "Navigator" program available in the analyzer, allows to examine logged measurements and to hear vocal comments.

For a quick instrument setting the HD2030 can store up to nine setups, customized by the user according to specific applications. The desired setup can be easily identified through the associated title.

Calibration can be performed using either accelerometer calibration data or using a vibration generator. The last 120 performed calibrations are written in a register file and logged in a reserved and protected area of the instrument permanent memory. The interface program Noise & Vibration Studio, included with the instrument, adds automatically the calibration file to the measurements when downloading data into the PC memory.
HD2030 can be completely controlled by a PC, through the RS232 and USB serial interfaces, using a special communication protocol.

Software

The interface program Noise & Vibration Studio is provided with the instrument and allows to download and visualize data logged in the instrument and to manage setups, sensor configurations and calibration register file.
Instrument settings can be customized by the user and stored with a title in a setup file for later use. In order to easily perform different kind of measurements it is possible to upload up to nine instrument settings, selected from the setup file.
Sensor configurations can be set either manually, filling in the accelerometer data table, or automatically, using the CD provided with the accelerometers supplied by Delta Ohm.
The HD2030 stores calibration information in a reserved area of internal memory. The calibration register file is downloaded to PC memory together with logged data and stored in the same folder.
Several optional analysis modules can be activated by means of license. The program can be automatically updated through the web and includes demonstrative versions of all modules.
- NS1 Application module "Workers' Protection":
- Analysis of workers' exposure to noise and vibration, both hand-arm and whole-body, in accordance with Decree Law n.81/2008 9432/2008 and UNI.
- Evaluation of hearing protectors with the methods and OBM SNR according to UNI EN 458.
- Evaluation of measurement uncertainties in accordance with UNI 9432/2008.
- Calculation of the impulsiveness of noise sources according to the requirements of UNI 9432/2008.

Applications

The HD2030 analyzer executes all measurements required by the European regulations concerning workers protection from mechanical vibration exposition at the workplace (2002/44/EC). The choice to perform hand-arm (HA) or whole body (WB or BV) measurements modifies

Input details

Output details

the frequency range of spectral analysis. For hand-arm measurements the range goes from 3.15Hz up to 3.15kHz (from 4Hz to 2kHz for octave band spectrum), while for whole body measurements the range of central frequencies is shifted downward from 0.32Hz up to 315Hz (from 0.5Hz to 250Hz for octave band spectrum).

The HD2030 is suitable for the evaluation of workers exposure to vibrations and to assess the risk of injury in the following cases:
• vibrations transmitted to hand-arm system through vibrating tools or items subject to vibrations or impacts, vibrations transmitted to whole body system through the seat of transport vehicles, vibrations transmitted to whole body system by vibrating floors or seats at the workplace,
• vibrations transmitted to whole body system by buildings with vibrations or impacts.

The HD2030 is a vibration analyzer suitable for the following applications:
• Vibration spectral analysis by octave o third octave bands,
• Statistic analysis with percentile calculation from L1 to L99,
• Evaluation of vibration attenuation of anti-vibration gloves, seats and materials, Structural verification of buildings.

Technical standards
HD2030 vibration analyzer conforms to the following standards:
ISO 8041:2005 "Human response to vibration – Measuring instrumentation"
ISO 5349-1:2001 "Mechanical vibration – Measurement and evaluation of human exposure to hand-transmitted vibration – General requirements"
ISO 5349-2:2001 "Mechanical vibration – Measurement and evaluation of human exposure to hand-transmitted vibration – Practical guidance for measurement at the workplace"
ISO 2631-1:1997 "Mechanical vibration and shock – Evaluation of human exposure to whole body vibration – General requirements"
ISO 2631-2:1989 "Evaluation of human exposure to whole body vibration – Continuous and shock-induced vibrations in buildings (1 to 80 Hz)"
IEC 61260:1995 "Electroacustics – Octave band and fractional-octave band filters"

Accelerometer models
HD356A02: **tri-axial** accelerometer for the measurement of vibrations transmitted to the hand-arm system; sensitivity of 10mV/g and maximum acceleration equal to 500g. This sensor is mainly used for hand-arm measurements.
HD356B21: miniature **tri-axial** accelerometer for the measurement of vibrations transmitted to the hand-arm system; sensitivity of 10mV/g and maximum acceleration equal to 500g. This sensor is mainly used for hand-arm measurements.
HD356B41: tri-axial accelerometer inserted in a rubber pad for the measurement of the vibrations trasnmitted to the whole body. 1,5m connection cable to the HD2030 analyser included. Sensitivity 100mV/g and maximum acceleration 10g.
HD356A22: tri-axial accelerometer for general application with sensitivity of 100mV/g and maximum acceleration equal to 50g.
HD352C34: mono-axial accelerometer for general application with nominal sensitivity of 100mV/g and maximum acceleration equal to 50g.
HD356B20: miniature tri-axial accelerometer for the measurement of vibrations transmitted to the hand-arm system at high shock level. Sensitivity of 1mV/g and maximum acceleration equal to 5000g.

Accessories
In order to measure vibrations transmitted to the hand-arm system, it's necessary to use adapters coupling the accelerometer to the tool handle. The available accessories are:
HD2030AC1: cubic shaped mounting block to be fastened to the handle with a cable tie or a metal clamp as near as possible to the hand position. This adapter is suitable for measurements on light tools, where the weight of the measurement chain has to be minimized. Material: light alloy.
HD2030AC2: adapter to be held between the hand and the handle. The accelerometer is placed in lateral position, at the left or the right of the hand. This adapter is suitable for large cylindrical handles. The measurement must be repeated positioning the accelerometer on both hand sides. Material: light alloy.
HD2030AC3: adapter to be held between the hand and the handle. The accelerometer is placed in lateral position, at the left or the right of the hand. This adapter is suitable for large cylindrical handles and for accelerometers with integrated screw. The measurement must be repeated positioning the accelerometer on both hand sides. Material: stainless steel
HD2030AC4: adapter to be held between the hand and the handle. The accelerometer is placed in central position, between the middle and the ring fingers or between the index and the middle fingers. This adapter is suitable for anatomical handles, not necessarily cylindrical and of small dimensions. Material: light alloy.
HD2030AC5: Support for measurement on floors and vibrating surfaces in general. An air bubble level is included and the height of two out of the three feet can be adjusted as needed. The support has a cavity on the lower face, where a high sensitivity tri-axial accelerometer, suitable for measurements in buildings, can be fastened. On the upper face there is a tapped hole (10-32 UNF) for accelerometer mounting. In order to use three mono-axial accelerometers instead of a tri-axial one, a cubic adapter is included to be mounted on the upper face. Material: stainless steel, weight 1.9kg.

The following accessories, needed to keep the accelerometers in contact with various surfaces, are available on request:
- Adhesive metal plate for accelerometer mounting with magnet • Permanent magnet for accelerometer mounting on metal surfaces
- Adhesive mounting base (glue or wax)
- Insulated mounting base
- Screws with various threading

The following accessories are included with the HD2030 analyzer:
- Wax
- Silicon grease
- USB cable for PC connection
- 1GB SD memory card
- CD with the interface program for PC with Windows operating system "Nose & Vibration Studio" and the HD2030 user manual

Each accelerometer comes with the following accessories:
- Mounting screw
- 2m connecting cable to the HD2030 analyzer (other lengths on request)
- CD with calibration and configuration data and accelerometer manual

Technical specifications of HD2030
- ***Technical standards:***
  ISO 8041:2005
  ISO 5349-1:2001 (hand transmitted vibration)
  ISO 2631-1,2,4 1997 (whole body vibration)
  IEC 61260:1995 class 1 (octave and third octave filters)
- ***Measurement modes:***
  Hand-transmitted vibrations
  Whole-body vibrations
  Building vibrations
- ***Measurement parameters:***
  RMS, VDV, MTVV, Peak, Max, Min
- ***Frequency weightings:***
  Fz, Fc, Wh for hand-transmitted vibrations
  Fz, Fa, Wb, Wc, Wd, We, Wj, Wk for whole body vibrations
  Fz, Fm, Wm for building vibrations
- ***Octave or third octave band spectral analysis:***
  The range of central frequencies depends on the chosen application according to the following table

Application	Central frequency range	
	Octave Band	Third Octave Band
	[Hz]	[Hz]
Hand-Arm	4 ÷ 2000	3.15 ÷ 3150
Whole-Body	0.5 ÷ 250	0.315 ÷ 315
Building-Vibration	0.5 ÷ 250	0.315 ÷ 315

- ***Statistic Analysis*** The selected measurement parameter is analyzed in 1dB classes. Both the probability and the percentile graphs can be shown.
- ***Measurement range*** 0.1m/s2 ÷ 7000 m/s2 with accelerometer HD356A02 for hand-arm measurements
- ***Linearity range*** three ranges of 80dB overlapped by 70dB
- ***Digital converter*** Four analog to digital converters with a resolution of 25 bits at 8k samples per second
- ***Inherent noise level*** Less than 30mm/s2 with accelerometer HD356A02 for hand-arm measurements and Wh filter
- ***Display*** Graphic backlit display 128x64 pixels Screens:
  VLM1: Three parameters for each measurement axis
  VLM2: Three parameters of acceleration vector calculated from the three right channel input axes
  VLM3: Three global parameters for each measurement axis
  VLM4: Three global parameters of acceleration vector calculated from the three right channel input axes
  PROFILE: Graphic profile of one parameter for each measurement axis with integration time programmable from 1s to 1 hour
  SPECTRUM: Octave or third octave spectrum for each measurement axis with calculation of one wideband filter. The graph can show the spectrum of acceleration, velocity or displacement.
  STATISTICS: the statistical distribution of the parameter chosen in PROFILE
  PERCENTILES: Percentile level graph of the parameter chosen in PROFILE.
- ***Memory*** 8MB Internal FLASH type memory and connector for memory card SD type up to 2GB.
- ***Interface*** Serial RS232 and USB type
- ***nput/Output*** LINE output for the four measurement channels: 2Vpp F.S.
  TRGIN electrically isolated input: instrument trigger used by external devices
  TRGOUT 3V logic output: trigger output used by external devices
- ***Power supply*** Four alkaline batteries AA 1.5V type with 10 hour lifetime-
  The instrument can use rechargeable batteries Ni-MH type. The HD2030 does not perform the function of charger.

- ***Ambient parameters*** Storage: -25°C ÷ 70°C relative humidity less than 90% without condensation
  Operating: -10°C ÷ 50°C relative humidity less than 90% without condensation
- ***Weight and Dimensions*** 95mm X 240mm X 50mm, weight 680gr.

Technical specifications of accelerometers:

Model HD356A02

- ***Type:*** Tri-axial accelerometer with integrated electronics (LIVM™). This sensor is used for hand-arm measures.
- ***Sensitivity:*** 10mV/g
- ***Measuring range:*** 500g pk
- ***Frequency Range*** (±5%)**:** 1Hz ÷ 5000Hz
- ***Resonant frequency:*** >25kHz
- ***Linearity:*** 1% F.S.
- ***Transverse sensitivity:*** 5% max
- ***Overload Limit (Shock):*** 7000g pk
- ***Working temperature:*** -50°C ÷ 120°C
- ***Temperature drift:*** 0.1%/°C
- ***Bias voltage:*** 8V÷12V
- ***Mechanical specifications:*** Weight: 10,5gr
  Dimensions: (Height x Length x Width) 14.0mm x 20.3mm 14.0mm
  Mounting Thread: 10-32 female (10-32 UNF to 10-32 UNF, 10-32 UNF to M6 screws included)
  Connector: ¼-28 4-Pin side type
  Housing Material: Titanium alloy
  Isolation: case grounded

Model HD356B21

- ***Type:*** Miniature tri-axial accelerometer with integrated electronics (LIVM™). This sensor is used for hand-arm measurements.
- ***Sensitivity:*** 10mV/g
- ***Measuring range:*** 500g pk
- ***Frequency Range*** (±5%)**:** 2Hz ÷ 10000Hz (y or z axis)
- ***Frequency Range*** (±5%)**:** 2Hz ÷ 7000Hz (x axis)
- ***Resonant frequency:*** >55kHz
- ***Linearity:*** 1% F.S.
- ***Transverse sensitivity:*** 5% max
- ***Overload Limit (Shock):*** 10000g pk
- ***Working temperature:*** -50°C ÷ 120°C
- ***Temperature drift:*** <0.17%/°C
- ***Bias voltage:*** 7V ÷ 11V
- ***Mechanical specifications:*** Weight: 4gr
  Dimensions: (Height x Length x Width) 10.2mm x 15.5mm 10.2mm
  Mounting Thread: 5-40 female (5-40 UNF to 5-40 UNF, 10-32 UNF to 5-40 UNF and 5-40 UNF to M3 screws included)
  Connector: 8-36 4-Pin side type
  Housing Material: Titanium alloy
  Insulation: case grounded

Model HD356B41

- ***Type:*** Low profile tri-axial accelerometer with integrated electronics (LIVM™) put in a rubber pad. This sensor is used for measures of whole body vibration through the seat.
- ***Sensitivity:*** 100mV/g
- ***Measuring range:*** 10g pk
- ***Frequency response*** (±5%)**:** 0.5Hz ÷ 1000Hz
- ***Resonant frequency:*** >27kHz
- ***Linearity:*** 1% F.S.
- ***Transverse sensitivity:*** 5% max
- ***Overload Limit (Shock):*** 2000g pk
- ***Working temperature:*** -10°C ÷ 50°C
- ***Temperature drift:*** <0.17%/°C
- ***Bias voltage:*** 2.8V ÷ 4.5V
- ***Mechanical specifications:*** Weight: 272gr
  Dimensions: (diameter x thickness) 200mm x 12mm
  Cable: 3m integrated cable with 4 pin LEMO connector (supplied)
  Material: hard rubber with accelerometer and integrated cable replaceable
  Connector: ¼-28 4-Pin side type
  Mounting Thread: threaded screw hole 10-32 UNF
  Insulation: accelerometer case grounded

Model HD356A22

- ***Type:*** mono-axial accelerometer with integrated electronics (LIVM™). This sensor is used for general applications.
- ***Sensitivity:*** 100mV/g
- ***Measuring range:*** 50g pk
- ***Frequency Range*** (±5%)**:** 0.5Hz ÷ 4000Hz
- ***Resonant frequency:*** >25kHz
- ***Linearity:*** 1% F.S.
- ***Transverse sensitivity:*** 5% max
- ***Overload Limit (Shock):*** 5000g pk
- ***Working temperature:*** -54°C ÷ 77°C
- ***Temperature drift:*** 0.1%/°C
- ***Bias voltage:*** 8V ÷ 12V
- ***Mechanical specifications*** Weight: 5.4gr
  Dimensions: (Height x Length x Width) 11.4mm x 16.7mm X 11.4mm
  Mounting Thread: 5-40 female (5-40 UNF to 5-40 UNF, 10-32 UNF to 5-40 UNF and 5-40 UNF to M3 screws included)
  Connector: 8-36 4-Pin side type
  Material: Titanum
  Isolation: case grounded

Model HD352C34

- ***Type:*** mono-axial accelerometer with integrated electronics (LIVM™). This sensor is used for general applications.
- ***Sensitivity:*** 100mV/g
- ***Measuring range:*** 50g pk
- ***Frequency Range*** (±5%)**:** 0.5Hz ÷ 100000Hz
- ***Resonant frequency:*** >50kHz
- ***Linearity:*** 1% F.S.
- ***Transverse sensitivity:*** 5% max
- ***Overload Limit (Shock):*** 5000g pk
- ***Working temperature:*** -54°C ÷ 93°C
- ***Temperature drift:*** 0.1%/°C
- ***Bias voltage:*** 7V ÷ 12V
- ***Mechanical specifications*** Weight: 6gr
  Dimensions: (Hex x Height) 11.2mm x 22.4mm
  Mounting Thread: 10-32 female (10-32 UNF to 10-32 UNF, 10-32 UNF to M6 screws included)
  Connector: top mounted 10-32 coaxial jack
  Material: Titanum
  Isolation: case grounded

Model HD356B20

- ***Type:*** miniature tri-axial accelerometer with integrated electronics (LIVM™). It is mainly used for hand-arm and shock measurements.
- ***Sensitivity:*** 1.0mV/g
- ***Measuring range:*** 5000g pk
- ***Frequency Range*** (±5%)**:** 2Hz ÷ 10000Hz (y or z axis)
- ***Frequency Range*** (±5%)**:** 2Hz ÷ 7000Hz (x axis)
- ***Resonant frequency:*** >55kHz
- ***Linearity:*** 1% F.S.
- ***Transverse sensitivity:*** 5% max
- ***Overload Limit (Shock):*** 7000g
- ***Working temperature:*** -50°C ÷ 120°C
- ***Temperature drift:*** <0.1%/°C
- ***Bias voltage:*** 7V ÷ 11V
- ***Mechanical specifications*** Weight: 4gr
  Dimensions: (Height x Length x Width) 10.2mm x 15.5mm X 10.2mm
  Mounting Thread: 5-40 female (5-40 UNF to 5-40 UNF, 10-32 UNF to 5-40 UNF and 5-40 UNF to M3 screws included)
  Connector: 8-36 4-Pin side type
  Material: titanium alloy
  Isolation: case grounded

Purchasing codes for kits and accessories

HD2030 kit 1: it consists of: four channel analyzer HD2030, carrying case, program "Noise & Vibration Studio", USB serial cable (CP22) and 1GB SD memory card (HD2030MC). **Accelerometers, connection cables and accessories have to be specified at the time of placing the order**.

HD2030 kit "HA & WB": it includes,
- HD2030 kit 1 consisting of:
- HD2030: 4 channels vibration analyser with ISO 9001 reports of calibration,
- HD2030MC: 1GB SD memory card,
- CP22: USB serial cable,
- silicone grease (HD6188) and wax bonding (HD6273)
- user manual and case;
- HD356B41: tri-axial accelerometer in a rubber pad with connection cable to HD2030 analyser;
- HD356A02: Miniature tri-axial accelerometer with 081B02 and M081B05 screws and connection cable to HD2030 analyser (HD2030CAB3-3M);
- Reports of calibrations for accelerometers HD356B41 and HD356A02;
- "Noise Studio" interfacing programme for PC.

HD2030 kit "Acoustic & Vibrations": Including
- HD2010UC/A kit 1 consisting of:
- HD2010UC/A: type 1 analyzer sound level meter IEC 61672 with spectral analysis octave bands from 32Hz to 8kHz, data logging with 4MB memory, backlit display;
- UC52/1C: pre-polarized and removable ½" condenser microphone,
- HD2010PNE2: removable microphone preamplifier and 5m extension cable (CPA/5),
- HD SAV: Windscreen for ½" microphones,
- HD2110USB: serial USB cable for PC connection (as an alternative COM-type serial

RS232 cable is supplied),
- HD2020: type 1 acoustic calibrator IEC 60942,
- user manual and case;
- HD2030 kit "HA & WB" consisting of:
- HD2030: 4 channels vibration analyser with ISO 9001 reports of calibration,
- HD356B41: tri-axial accelerometer in a rubber pad with connection cable to HD2030 analyser;
- HD356A02: Miniature tri-axial accelerometer with 081B02 and M081B05 screws and connection cable to HD2030 analyser (HD2030CAB3-3M);
- HD2030MC: 1GB SD memory card,
- CP22: USB serial cable,
- "Noise Studio" interfacing programme for PC with user licence (CH20) for application modul NS1 "Workers protection",
- silicone grease (HD6188), wax bonding (HD6273) and glue (080A90)
- user manual and case;
- ISO 9001 Reports of calibration for:
- HD2010UC/A sound level meter,
- HD2020 acoustic calibrator,
- accelerometers HD356B41 and HD356A02,
- HD2030 4 channels vibration analyser.

HD2030AC1: cubic shaped mounting block to be fastened to the handle, by means of a cable tie or a metal clamp, as near as possible to the hand position. This adapter is suitable for measurements on light tools, where the weight of the measurement chain has to be minimized. Material: light alloy. It includes:
- Hexagon socket head cap screw 10-32 UNF
- 4mm hex key
- 10 cable ties (length x width) 200mm x 4.5mm
- 1 metal clamp with 9mm width

HD2030AC2: adapter to be held between the hand and the handle. The accelerometer is placed in lateral position, at the left or the right of the hand. This adapter is suitable for large cylindrical handles. The measurement must be repeated positioning the accelerometer on both hand sides. Material: light alloy. Includes:
- Hexagon socket head cap screw 10-32 UNF
- 4mm hex key
- 10 cable ties (length x width) 200mm x 4.5mm
- 2 flat velcro straps, 24.5mm size

HD2030AC3: adapter to be held between the hand and the handle. The accelerometer is placed in lateral position, at the left or the right of the hand. This adapter is suitable for large cylindrical handles and for accelerometers with integrated screw with 10-32 UNF-2A threading. The measurement must be repeated positioning the accelerometer on both hand sides. Material: stainless steel. Includes:
- 10 cable ties (length x width) 200mm x 4.5mm
- 2 flat velcro straps, 24.5mm size

HD2030AC4: adapter to be held between the hand and the handle. The accelerometer is placed in central position, between the middle and the ring fingers or between the index and the middle fingers. This adapter is suitable for anatomical handles, not necessarily cylindrical and of small dimensions. Material: light alloy. Includes:
- Hexagon socket head cap screw 10-32 UNF
- 4mm hex key
- 10 cable ties (length x width) 200mm x 4.5mm
- 2 flat velcro straps, 24.5mm size

HD2030AC5: Support for measurement on floors and vibrating surfaces in general. An air bubble level is included and the height of two out of the three feets can be adjusted as needed. The support has a cavity on the lower face, where a high sensitivity tri-axial accelerometer, suitable for measurements in buildings, can be fastened. On the upper face there is a tapped hole (10-32 UNF) for accelerometer mounting. In order to use three mono-axial accelerometers instead of a tri-axial one, a cubic adapter is included to be mounted on the upper face. Material: stainless steel, weight 1.9kg. Includes:
- Stainless steel base with air bubble level and three feets. There are a tapped hole on the upper face (10-32 UNF) and a cavity with tapped hole (M4) on the lower face.
- Cubic adapter to be mounted on the upper face using two M4 screws (included). The cube has threaded holes (10-32 UNF) on three orthogonal faces.
- 3mm hex key

HD356B21: miniature tri-axial accelerometer for the measurement of hand transmitted vibrations. Sensitivity 10mV/g, range ±500g. Mounting screws included.

HD356B41: tri-axial accelerometer contained within a rubber pad for the measurement of whole body transmitted vibrations. Analyzer 1.5m connecting cable included. Sensitivity 100mV/g, range ±50g.

HD356B20: tri-axial accelerometer for the measurement of hand transmitted vibrations at high shock levels. Sensitivity 1mV/g, range ±5000g. Mounting screws included.

HD352C34: mono-axial accelerometer for general purpose. Sensitivity 100mV/g, range ±50g. Mounting screws included.

HD356A22: high sensitività tri-axial accelerometer. Sensitivity 100V/g, range ±50g. Mounting screws included.

HD2110/CSNM: serial cable connection to PC COM interface.

CP22: serial cable for connection to a PC with USB interface.

HD2030CAB1-3M: low noise coaxial cable for connection of mono-axial accelerometers (mini-coax SMA 10-32 connector) to the HD2030 analyzer (4 pin push-pull circular connector). 3m Long (other lengths upon request). Equipped with connectors.

HD2030CAB3-3M: coaxial cable for connection of tri-axial accelerometers (4 pin SMA connector) to the HD2030 analyzer (4 pin push-pull circular connector). 3m Long (other lengths upon request). Equipped with connectors.

HD2030CAB13: coaxial cable for connection of three mono-axial accelerometers to the HD2030 analyzer. 400mm Long, BNC connectors.

HD2030CAB1B-5M: coaxial cable for connection of mono-axial accelerometers to the HD-2030CAB13 cable. 5m Long (other lengths upon request). Equipped with connectors.

HD2030CAB1B-10M: coaxial cable for connection of mono-axial accelerometers to the HD-2030CAB13 cable. 10m Long (other lengths upon request). Equipped with connectors.

HD2030CAB1B-3M: coaxial cable for connection of mono-axial accelerometers HD2030CAB13 analyzer. 3m Long. Equipped with connectors.

HD2030CAB.BNC-xxM: coaxial cable, extension for HD2030CAB1B-3M cable. 30m maximum length.

HD2030MC: 1GB SD memory card.

HD2030AM: headset with microphone.

SWD10: Stabilized mains power supply Vin=100÷230Vac / Vout=12Vdc/1000mA.

CH20: hardware key for PC with Windows® operating systems. When inserted into a PC USB port enables execution of software modules.

NS1: "Workers Protection" Module. Analysis of noise and vibration in the workplace in accordance with Decree 81/2008

HD40.1: Portable serial printer with 57mm paper rolls and SWD10 power supply.

BAT-40: Replacement battery pack for HD40.1

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

VTRAP: tripod.

Available accessories for the accelerometers are:

HD6188: Silicone grease repellent to water and electrically insulating.

HD6273: Pan with wax bonding

080A90: Glue for quick fixing.

081B05: screw with double thread 10-32 UNF, included in accelerometers HD356A02 and HD356C34.

081A90: screw with double thread 5-40 UNC and 10-32 UNF, included in accelerometers HD356B21, HD356A22 and HD356B20.

M081B05: screw with double thread 10-32 UNF and M6x0,75, included in accelerometers HD336A02 and HD352C34.

M081A27: screw with double thread 5-40 UNC and M3x0,5", included in accelerometers HD356B21, HD356A22 and HD356B20.

081A27: screw with double thread 5-40 UNC, included in accelerometers HD356B21, HD356A22 and HD356B20.

HD6239: tip for accelerometer.

HD6286: metal disk to be applied by adhesive; for magnetic bases HD6284 and HD6196.

HD6284: magnetic base with 10-32 UNF threaded hole; for any accelerometer.

HD6194: magnetic base with 10-32 UNF screw integrated; for accelerometers HD356A02, HD356C34 and HD356B41 (by removing the rubber pad).

HD6226: base with 10-32 UNF threaded hole for mounting by adhesive; for any accelerometer.

HD6245: isoltaed base with integrated 10-32 UNF screw for mounting by adhesive, for accelerometers HD356A02, HD356C34 and HD356B41 (by removing the rubber pad).

HD6220: isolated base with integrated 10-32 UNF screw and threaded 10-32 UNF hole for mounting the accelerometer; for any accelerometer.

Acoustic measures SIT N° 124 Laboratory

Italian calibration service

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Permanent Laboratory **SIT ACCREDITATION TABLE**

Quantity	Instruments to be calibrated	Measuring range	Measuring conditions	Uncertainty (*)	Notes
Acoustics pressure level	Pistonphones	124 dB	250 Hz	0,10 dB	
	½" Calibrators	94 dB… 114 dB	250, 1000 Hz	0,11 dB	
	Multifrequency calibrators	94 dB … 124 dB	31,5 Hz… 125 Hz 250 Hz… 500 Hz 2000 Hz… 4000 Hz 8000 Hz 2500 Hz… 16000 Hz	0,30 dB 0,25 dB 0,30 dB 0,27 dB 0,63 dB	
	Sound level meter	25 dB… 140 dB	31,5 Hz… 16000 Hz	0,3 dB… 1,9 dB	⊘
	Octave band and octave fractional band filters		20 Hz < f_c < 20000 Hz	0,1 dB… 0,5 dB	⊠
Sensitivity to the acoustic pressure	1" Reference microphones	124 dB	250 Hz	0,10 dB	
	½" Reference microphones	124 dB	250 Hz	0,12 dB	
	½" Microphones	94 dB	31,5 Hz… 12500 Hz	0,3 dB… 0,9 dB	⊘
	¼" Microphones	124 dB	250 Hz	0,16 dB	

(*) The measuring uncertainties are expressed as twice the standard deviation, corresponding in the case of normal distribution to the confidence level of about 95%.
⊘ The uncertainty depends on the frequency.
⊠ f_c is the midband frequency of filter operating band.