HD 2030

HD 2030
FOUR CHANNELS VIBRATION METER-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 ease 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 Studio supplied with the instrument.
The HD2030 satisfies the specifications of standards **ISO 8041:2005, ISO 5349-1 and 2:2001** (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 L_1 up to L_{99} 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 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 Studio** is provided with the instrument and allows to download and display 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.
CH20: Hardware key for PC working with Windows® operating system. When plugged into the USB port, according to licence purchased, it enables the Noise Studio software modules.
NS1 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 and UNI9432/2011, European Directive 2003/10/CE and 2002/44/CE.
- Evaluation of hearing protectors with the methods OBM and SNR according to UNI EN 458.
- Evaluation of measurement uncertainties in accordance with UNI 9612.
- Calculation of the impulsiveness of noise sources according to the requirements of UNI 9432/2008.

Input details

Output details

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 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 0.315Hz 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 or 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)"
ISO 2631-4:2001 "Evaluation of human exposure to whole body vibration – Guidelines for the evaluation of the effects of vibration and rotational motion on passenger and crew comfort in fixed-guideway transport systems"
ISO 2631-5:2004 "Evaluation of human exposure to whole body vibration – Method for evaluation of vibration containing multiple shocks"
IEC 61260:1995 "Electroacoustics – Octave band and fractional-octave band filters"

Accelerometer models
It's possible to connect integrated electronics type (IEPE or equivalent) accelerometers both mono-axial and tri-axial. Accelerometers are directly power supplied with a 25V tension and a 2mA current.
The following models are available:

Model	Axes	Application	Sensitivity [mV/g]	Range [±gpk]	Weight [gr]
HDP-352C34	1	General purpose	100	50	5.8
HDP-356B20	3	Ha - Shock	1	5000	4
HDD-3023A2	3	Ha	10	500	4
HDP-356A02	3	Ha	10	500	10.5
HDP-356B21	3	Ha	10	500	4
HDP-356A22	3	WB - General purp.	100	50	5.4
HDP-356B41	3	WB - Seat	100	10	272
HDD-3143D1	3	General purpose	100	50	14
HDP-356B18	3	Building vibration	1000	5	25

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 provided with the HD2030 analyzer:
- Wax for quick fastening
- Silicon grease
- USB cable for PC connection
- 2GB SD memory card
- CD containing "Noise Studio" PC software (Windows compatible), user manual and carrying case

Each accelerometer comes with the following accessories:
- Mounting screw (if provided accelerometer requires it)
- 2m length connection cable for HD2030 analyzer input (other lengths on request)
- Manufacturer calibration chart of the sensor and ISO9001 calibration report
- CD with user manual and configuration data of accelerometer

Technical specifications
- ***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	
	1/1 Octave Band [Hz]	1/3 Octave Band [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/s^2 ÷ 7000 m/s^2 with accelerometer HDP356A02 (Ha measurement), 0.0007 m/s^2 ÷ 7m/s^{2}with HDP356B18 (BV measurement).
- ***Linearity range*** three ranges of 80dB overlapped by 70dB
- ***Digital converter*** Four A/D converters with a resolution of 25 bits at 8k samples per second
- ***Inherent noise level*** Less than 30mm/s^2 with accelerometer HDP356A02 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 vector acceleration calculated from the channels of tri-axial input
  VLM3: Three global parameters for each measurement axis
  VLM4: Three global parameters of vector acceleration calculated from the channels of tri-axial input
  PROFILE: Graphic profile of one parameter for each measurement axis with integration time programmable from 1s to 1 hour
  SPECTRUM: 1/1 or 1/3 octave spectrum for each measurement (contemporaneously) 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 screen
  PERCENTILES: Percentile level graph of the parameter chosen in PROFILE

Datalogging
Time history: Multi Profile recording with **single integration** allows to log with sampling periods from 1s to 1h:
- 3 instantaneous or integrated parameters of the VLM_1 screen calculated on Ch1, Ch2, Ch3 and Ch4 channels (a total of 12 parameters)
- 3 vector parameters of the VLM_2 screen (vector values from Ch1, Ch2, Ch3)
- Multi-spectra (from 1s) on Ch1, Ch2, Ch3 and Ch4 (4 multi-spectra), in 1/1 or 1/3 octave bands.
- Raw acceleration signals on Ch1, Ch2, Ch3 and Ch4 (4 signals at 8KHz each)
- Statistical analysis in 1dB classes with 1 second sampling frequency (only in multiple integration mode). Graph of levels probability distribution; graph of percentile levels from L_1 to L_{99}
- Voice comments recording

Global values: in parallel to time histories data logging, are logged:

- 3 overall integrated VLM_1 parameters for Ch1, Ch2, Ch3 and Ch4
- 3 overall vector parameters of the VLM_2 screen (vector values from Ch1, Ch2, Ch3)
- Integrated spectra on Ch1, Ch2, Ch3 and Ch4 (4 spectra), in 1/1 or 1/3 octave bands
- Graph of levels probability distribution; graph of the percentile levels from L_1 to L_{99}
- ***Memory*** 8MB Internal FLASH memory and memory card SD type up to 2GB (SD card supplied).
- ***Interface*** Serial RS232 and USB type
- ***Input/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 battery charger**.
- ***Environmental 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
- ***Dimensions and weight:*** 95mm X 240mm X 50mm, weight 680gr.

Technical specifications of accelerometers:

	HDP-352C34	HDP-356B20	HDP-356A02	HDP-356B21
Axes	1	3	3	3
Sensitivity [mV/g]	100	1	10	10
Range [±gpk]	50	5000	500	500
Frequency response [±5%]	0.5Hz ÷ 10KHz	(Z-Y) 2Hz ÷ 10KHz (X) 2Hz ÷ 7KHz	1Hz ÷ 5KHz	(Z-Y) 2Hz ÷ 10KHz (X) 2Hz ÷ 7KHz
Resonance frequency [KHz]	50	55	25	55
Linearity [%F.S.]	±1	±2.5	±2	±1
Transverse sensitivity [%max]	5	5	5	5
Max shock [gpk]	5000	7000	7000	10000
Operating temperature [°C]	-54 ÷ +93	-54 ÷ +121	-54 ÷ +121	-54 ÷ +121
Weight [g]	5.8	4	10.5	4
Dimensions	7/16" x 22.4 mm	10.2 x 10.2 x 10.2 mm	14 x 14 x 20.3 mm	10.2 x 10.2 x 10.2 mm
Mounting	threaded screw hole 10-32	threaded screw hole 5-40	threaded screw hole 10-32	threaded screw hole 5-40
Insulation	-	-	-	-
Connector	top mounted 10-32	Side 8-36 4 pin	Side 1/4 -28 4 pin	Side 8-36 4 pin
Material	Titanium	Titanium	Titanium	Titanium

Technical specifications of accelerometers:

	HDP-356A22	HDP-356B41	HDD-3143D1	HDP-356B18
Axes	3	3	3	3
Sensitivity [mV/g]	100	100	100	1000
Range [±gpk]	50	10	50	5
Frequency response [±5%]	0.5Hz ÷ 4KHz	0.5Hz ÷ 1KHz	0.5Hz ÷ 3KHz	0.5Hz ÷ 3KHz
Resonance frequency [KHz]	25	27	25	20
Linearity [%F.S.]	±1	±1	±1	±1
Transverse sensitivity [%max]	5	5	5	5
Max shock [gpk]	5000	2000	1500	5000
Operating temperature [°C]	-54 ÷ +77	-10 ÷ +50	-50 ÷ +85	-29 ÷ +77
Weight [g]	5.4	272 (with seat pad)	14	25
Dimensions	11.4 x 11.4 x 11.4 mm	Ø 200mm x 12 mm	20.8 x 20.8 x 8.6 mm	20.3 x 20.3 x 26.1 mm
Mounting	threaded screw hole 5-40	Accelerometer with threaded screw hole 10-32 mounted in a rubber seat pad	Through hole for 6-32 UNC screw or M3	threaded screw hole 10-32
Insulation	-	-		-
Connector	Side 8-36 4 pin	Side 1/4 -28 4 pin	Side 1/4 -28 4 pin	Side 1/4 -28 4 pin
Material	Titanium	Titanium	Titanium	Anodized aluminium

ORDERING CODES FOR KITS AND ACCESSORIES

Vibration analyzer kits

HD2030 kit 1 including: HD2030 4-axis vibration analyser, 1/1 and 1/3 octave filters, statistical analysis, digital recording of the accelerometer signals, silicon grease, wax tray for gluing, glue for quick mounting, 2 GB SD memory card, CP22 USB serial connection cable, "Noise Studio" software, user manual and carrying case, calibration reports for analyser and filters according to ISO8041 and IEC 61260. **Accelerometers, connection cables and accessories must be specified at the time of order**.

HD2030 kit "HA & WB": it includes,

- HD2030 kit 1 consisting of:
- HD2030: 4 channels vibration analyser with ISO 9001 calibration report
- HD2030MC: 2GB SD memory card,
- CP22: USB serial cable,
- silicon grease (HD6188), wax (HD6273) and glue (080A90)
- user manual and carrying case;
- HDP356B41: tri-axial accelerometer in a rubber pad with connection cable to HD2030 analyser;
- HDP356A02: miniature tri-axial accelerometer with 10-32 UNF and M6 screws and connection cable to HD2030 analyser (HD2030.CAB3-3M);
- Calibration reports for accelerometers;
- HD2030.124 accelerometer mounting adapters composed of HD2030.AC1, HD2030. AC2 and HD2030.AC4
- "Noise Studio" software for PC.

Accelerometer mounting adapters

HD2030AC1: cube-shaped adapter for accelerometers mounting. The adapter has to be fastened with plastic cable-tie or metallic clamp close to the handle holding hand. Suitable for anatomical handles and small size tools, where the weight and dimensions of the measurement chain must be minimized. Material: **light alloy**. *Includes:*

- 10-32 UNF cylindrical head with hex socket screw with 4 mm hex key
- 5-40 UNC cylindrical head with hex socket screw with 4 mm hex key
- 10 cable-ties, width 4.5 mm, length 200 mm
- 1 metallic clamp, width 9 mm

HD2030AC2: adapter for accelerometers mounting between the hand and the handle, is pushed against the handle by the hand itself. Because the accelerometer is placed in a lateral position, the measurement must be repeated placing the accelerometer both on the right and left side of the hand. Suitable for large cylindrical handles. Material: **light alloy.** *Includes:*

- 10-32 UNF cylindrical head with hex socket screw with 4 mm hex key
- 5-40 UNC cylindrical head with hex socket screw with 4 mm hex key
- 10 cable-ties, width 4.5 mm, length 200 mm
- 2 velcro straps, width 25 mm, length 300 mm (HD2030FV)

HD2030AC3: adapter for accelerometers mounting. The adapter, inserted between the hand and the handle, is pushed against the handle by the hand itself. Because the accelerometer is placed in a lateral position, the measurement must be repeated placing the accelerometer both on the right and left side of the hand. Suitable for large cylindrical handles. Provided with 10-32 UNF fixing hole for the mounting of the accelerometer. Material: **inox**. *Includes:*

- 10 cable-ties, width 4.5 mm, length 200 mm
- 2 velcro straps, width 25 mm, length 300 mm (HD2030FV)

HD2030AC4: The adapter, inserted between the hand and the handle, is pushed against the handle by the hand itself. The accelerometer is placed in central position between the middle-finger and the ring-finger or between the forefinger and the middle-finger. Suitable for anatomical handles even if not cylindrical or with small dimensions. Material: **light alloy**. *Includes*:

- 10-32 UNF cylindrical head with hex socket screw with 4 mm hex key
- 5-40 UNC cylindrical head with hex socket screw with 4 mm hex key
- 10 cable-ties, width 4.5 mm, length 200 mm
- 2 velcro straps, width 25 mm, length 300 mm

HD2030AC5: Support for mono and tri-axial accelerometers for the measurement of vibrations on floors or vibrating surfaces in general. Provided with levelling device and three feets, two of them with adjustable height. The support has a cavity on the bottom side with a M4 threaded hole; on the top side a 10-32 UNF threaded hole for accelerometer mounting. A cubic adapter is provided to fix on the top side three mono-axial accelerometers. Material: **nickel-plated steel**, weight 1.9 kg. *Includes:*

- Steel support with three feet and spirit level. Has a 10-32 UNF threaded hole on the top side and a cavity on the bottom side with a M4 threaded hole.
- Cubic adapter to be mounted on the support top side with two M4 screws (included). The cube is provided with 10-32 UNF threaded holes on three orthogonal faces.
- 3 mm hex key.

HD2030.124: adapters kit for the measurement of the vibrations transmitted to the hand-arm system.Includes:

- HD2030AC1: cube-shaped adapter for anatomical handles and small size tools. Has to be fastened to the handle with plastic cable-tie or metallic clamp (included).
- HD2030AC2: adapter for cylindrical handles. It is placed laterally with respect to the hand.
- HD2030AC4: general purpose adapter. The accelerometer is placed between the forefinger and the middle-finger or between the middle-finger and the ring-finger.

HD2030.1234: adapters kit for the measurement of the vibrations transmitted to the hand-arm system. *Includes:*

- HD2030AC1: cube-shaped adapter for anatomical handles and small size tools. Has to

be fastened to the handle with plastic cable-tie or metallic clamp (included).
• HD2030AC2: adapter for cylindrical handles. It is placed laterally with respect to the hand.
• HD2030AC3: adapter for cylindrical handles provided with threaded hole for accelerometers with 10-32 UNF screw. It is placed laterally with respect to the hand.
• HD2030AC4: general purpose adapter. The accelerometer is placed between the forefinger and the middle-finger or between the middle-finger and the ring-finger.

Accelerometers

HDP352C34: General purpose ICP mono-axial accelerometer. Sensitivity 100 mV/g. Range ±50 g pk. Weight 5.8 g. Includes:10-32 UNF copper-beryllium alloy mounting screw (081B05), M6 copper-beryllium alloy mounting screw, (M081B05), Calibration certificate (ACS-1)

HDP356B20: Miniature ICP tri-axial accelerometer for hand-arm vibrations at high shock levels. Sensitivity 1 mV/g. Range ±5000 g pk Weight 4 g, Includes:5-40 UNC copper-beryllium alloy mounting screw (081A27), 10-32 UNF copper-beryllium alloy mounting screw (081A90), M3 copper-beryllium alloy mounting screw (M081A27). Calibration certificate (ACS-1T)

HDP356A02: ICP tri-axial accelerometer for the measurement of the vibrations transmitted to the hand-arm system. Sensitivity 10 mV/g. Range ±500 g pk. Weight 10.5 g. Includes: 10-32 UNF copper-beryllium alloy mounting screw (081B05), M6 copper-beryllium alloy mounting screw (M081B05), Calibration certificate (ACS-1T)

HDP356B21: Miniature ICP tri-axial accelerometer for hand-arm vibrations. Sensitivity 10 mV/g. Range ±500 g pk
Weight 4 g. Includes: 5-40 UNC copper-beryllium alloy mounting screw (081A27), 10-32 UNF copper-beryllium alloy mounting screw (081A90), M3 copper-beryllium alloy mounting screw (M081A27), calibration certificate (ACS-1T).

HDP356A22: General purpose miniature ICP tri-axial accelerometer. Sensitivity 100 mV/g. Range ±50 g pk Weight 5.4 g. Includes: 5-40 UNC copper-beryllium alloy mounting screw (081A27), 10-32 UNF copper-beryllium alloy mounting screw (081A90), M3 copper-beryllium alloy mounting screw (M081A27), Calibration certificate (ACS-1T).

HDD3143D1: General purpose tri-axial accelerometer. Sensitivity 100 mV/g. Range ±50 g pk. Weight 14 g. Includes: 6-32 UNC mounting screw, Mounting adapter with M3 screw for fixing to the floor support HD2030AC5

HDP356B41: General purpose ICP tri-axial accelerometer inserted in a rubber pad for whole body vibrations transmitted through seats and backs. Sensitivity 100 mV/g. Range ±10 g pk. Weight 272 g. Includes: HD2030.CAB3-3M, 3 m connection cable. Calibration certificate (ACS-1T).

HDP356B18: High sensitivity ICP tri-axial accelerometer for buildings vibrations. Sensitivity 1 V/g. Range ±5 g pk Weight 25 g. Includes:10-32 UNF copper-beryllium alloy mounting screw (081B05), M6 copper-beryllium alloy mounting screw (M081B05), calibration certificate (ACS-1T)

Vibration calibrator

HD2060: Portable vibration calibrator with frequency 15.915 Hz and levels 1 m/s^2 and 0.1 g, and frequency 159.155 Hz and levels 10 m/s^2 and 1 g. LCD display. Includes: HD2060.20 support with UNF 10-32 screw for mounting tri-axial accelerometers,
HD6245.1 insulated base with integrated UNF 10-32 screw for adhesive mounting, BAT-40: 1.2 V x 4 NiMH rechargeable battery pack, SWD10 stabilized mains power supply 100-240 Vac / 12 Vdc - 1A, carrying case, calibration report

HD6245.1: adhesive base with integrated 10-32 UNF screw. It can be used with accelerometers without mounting screw.

HD2060.20: support for the lateral mounting of tri-axial accelerometers with 10-32 UNF mounting screw

Cables for mono-axial accelerometers

HD2030.CAB1-3M: low noise coaxial cable for connection of mono-axial accelerometers. L=3m (other lengths upon request). Can be used with HDP352C34

HD2030.CAB1-5M: low noise coaxial cable for connection of mono-axial accelerometers. L=5m (other lengths upon request). Can be used with HDP352C34

HD2030.CAB1-10M: low noise coaxial cable for connection of mono-axial accelerometers. L=10m (other lengths upon request). Can be used with HDP352C34

HD2030.CAB13: coaxial cable for connection of three mono-axial accelerometers to the HD2030 analyzer. L=40cm, BNC connectors. The accelerometers are connected to the HD2030.CAB13 cable through HD2030.CAB1B-3M cables

HD2030.CAB1B-3M: coaxial cable for connection of mono-axial accelerometers to the HD2030.CAB13 cable. L=3m (other lengths upon request). Equipped with connectors. Can be used with HDP352C34

HD2030.CAB.BNC-xxM: Coaxial extension cable for the connection of mono-axial accelerometers to the HD2030.CAB13 cable. **Maximum length 200 m**, both ends terminated with BNC female connectors.

Cables for tri-axial accelerometers

HD2030.CAB3-3M: Cable for tri-axial accelerometers connection to the right input of the analyzer. **L=3 m** and connectors. It can be used with HDP356A02, HDD3143D1 and HDP356B18 accelerometers.

HD2030.CAB3-5M: Cable for tri-axial accelerometers connection to the right input of the analyzer. **L=5 m** and connectors. It can be used with HDP356A02, HDD3143D1 and HDP356B18 accelerometers.

HD2030.CAB3-10M: Cable for tri-axial accelerometers connection to the right input of the analyzer. **L=10 m** and connectors. It can be used with HDP356A02, HDD3143D1 and HDP356B18 accelerometers.

Cables for miniature tri-axial accelerometers

HD2030.CAB3S-3M: Cable for miniature tri-axial accelerometers connection to the right input of the analyzer. **L=3 m** and connectors. It can be used with HDP356B20, HDP356B21 and HDP356A22 accelerometers.

HD2030.CAB3S-5M: Cable for miniature tri-axial accelerometers connection to the right input of the analyzer. **L=5 m** and connectors. It can be used with HDP356B20, HDP356B21 and HDP356A22 accelerometers.

HD2030.CAB3S-10M: Cable for miniature tri-axial accelerometers connection to the right input of the analyzer. **L=10 m** and connectors. It can be used with HDP356B20, HDP356B21 and HDP356A22 accelerometers.

Software

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 2003-10-CE and 2002-44-CE

Accessories

HD2110CSNM: serial cable connection to PC COM interface.
CP22: serial cable for connection to a PC with USB interface.
HD2030MC: 2GB SD memory card.
HD2030AM: headset with microphone.
SWD10: Stabilized mains power supply Vin=100÷240Vac / Vout=12Vdc/1000mA.
HD40.1: Portable serial printer with 57mm paper rolls and SWD10 power supply. Required interface cable HD2110CSNM (not supplied).
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
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.
HD6196: Magnetic base with integrated 10-32 UNF screw. It can be used with the HDP356A02, HDP356C34 and HDP356B41 (removing the rubber pad) accelerometers.
HD6226: base with 10-32 UNF threaded hole for mounting by adhesive; for any accelerometer.
HD6220: isolated base with integrated 10-32 UNF screw and threaded 10-32 UNF hole for accelerometer mounting; for any accelerometer.
080A90: glue for quick fixing.
081B05: screw with double thread 10-32 UNF.
081A90: screw with double thread 5-40 UNC and 10-32 UNF.
M081B05: screw with double thread 10-32 UNF and M6x0,75.
M081A27: screw with double thread 5-40 UNC and M3x0,5".
081A27: screw with double thread 5-40 UNC.
HD2060.20: support for the lateral mounting of tri-axial accelerometers with 10-32 UNF mounting screw
HD6245: Insulated base with integrated 10-32 UNF screw and threaded hole 10-32 UNF. It can be used with the HDP356A02, HDP356C34 and HDP356B41 (removing the rubber pad) accelerometers.
HD6245.1: adhesive base with integrated 10-32 UNF screw. It can be used with accelerometers without mounting screw.