



## HD2070 THREE CHANNELS VIBRATION METER-ANALYZER

HD2070 is a portable vibration analyzer performing optional spectral and statistical analysis on three 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

- HD2070 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 HD2070 vibration analyzer detects accelerations on three axes through accelerometers with integrated amplifying electronics (IEPE or equivalent). On the input it is possible to connect three accelerometers or a tri-axial one. IEPE accelerometers 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 HD2070 analyses accelerometer signals and makes calculations simultaneously on three axes. The instrument calculates, in parallel for all the measurement channels, weighted acceleration values and **1/1 or 1/3 octave spectra** (option HD2070.01 "spectral analysis"); 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** (option HD2070.02 "statistical analysis").
- As statistical analyzer HD2070 calculates the probability distribution of a measurement parameter in 1dB classes. Both the probability distribution graph and the percentile levels from L<sub>1</sub> up to L<sub>99</sub> are available.
- A flexible data logger function stores multiple profiles and spectra (option HD2070.01) 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 **raw digital samples** (option HD2070.03 "Digital Recorder"). Analysing

stored data, it's useful to examine raw 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 HD2070 can be used like an audio recorder, another possibility to add comments to the measurements.

- The "Navigator" program available in the analyzer, allows to examine logged measurements and listen to vocal comments.
- For a quick instrument setting the HD2070 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 calibrator as HD2060. 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, provided with the instrument, adds automatically the calibration file to the measurements when downloading data into the PC memory.
- HD2070 can be completely controlled by a PC, through the RS232 and USB serial interfaces, using a special communication protocol.

### Applications

The HD2070 analyzer executes all measurements required by the European regulations concerning workers protection from mechanical **vibration exposition at the workplace** (2002/44/EC).

- 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
- Vibration **spectral analysis by octave or third octave bands** (option HD2070.01 "Spectral Analysis") on all channels
- **Statistical analysis** with percentile calculation from L<sub>1</sub> to L<sub>99</sub> (option HD2070.02 "Statistical Analysis") on all channels
- General signal analysis of exported **raw digital samples** (option HD2070.03 "Digital Recorder") on all channels (to export data in wav format NS1 module is required)

### Specifications

#### technical standard

- 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"

#### Measurement modes:

- **Ha:** Hand-transmitted vibrations
- **Wb:** Whole-body vibrations
- **BV:** Building vibrations

#### Measurement parameters:

- RMS, VDV, MTV, 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

#### Spectral analysis 1/1 and 1/3 octave bands (option HD2070.01):

Real time, parallel on all input channels. 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).

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

**Statistical Analysis** (option HD2070.02): The selected measurement parameter is analyzed in 1dB classes. Both the probability and the percentile graphs can be shown.

**Measurement range** 0.1m/s<sup>2</sup> ÷ 7000 m/s<sup>2</sup> with accelerometer HDP356A02 (Ha measurement), 0.0007 m/s<sup>2</sup> ÷ 7m/s<sup>2</sup> with HDP356B18 (BV measurement).

**Linearity range** three ranges of 80dB overlapped by 70dB

**Digital converter** Three A/D converters with a resolution of 25 bits at 8k samples per second

**Inherent noise level** Less than 30mm/s<sup>2</sup> 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** (option HD2070.01): 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** (option HD2070.02): the statistical distribution of the parameter chosen in PROFILE screen
- **PERCENTILES** (option HD2070.02): 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 and Ch3 channels (a total of 9 parameters)
- 3 vector parameters of the VLM\_2 screen (vector values from Ch1, Ch2, Ch3)
- Multi-spectra (from 1s) on Ch1, Ch2 and Ch3 (3 multi-spectra), in 1/1 or 1/3 octave bands (option HD2070.01).
- Raw acceleration signals (option HD2070.03) on Ch1, Ch2 and Ch3 (3 signals at 8KHz each)
- Statistical analysis (option HD2070.02) in 1dB classes with 1 second sampling frequency (only in multiple integration mode). Graph of levels probability distribution; graph of percentile levels from L<sub>1</sub> to L<sub>99</sub>
- Voice comments recording

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

- 3 overall integrated VLM\_1 parameters for Ch1, Ch2 and Ch3
- 3 overall vector parameters of the VLM\_2 screen (vector values from Ch1, Ch2, Ch3)
- Integrated spectra (option HD2070.01) on Ch1, Ch2 and Ch3 (3 spectra), in 1/1 or 1/3 octave bands
- Graph of levels probability distribution (option HD2070.02); graph of the percentile levels from L<sub>1</sub> to L<sub>99</sub>

#### Memory

8MB Internal FLASH memory and connector for memory card SD type up to 2GB (SD card supplied).

#### Interface

Serial RS232 and USB type

#### Input/Output

LINE output for the three 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 HD2070 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.

#### Available 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

#### Technical specifications of accelerometers:

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

#### Technical specifications of accelerometers:

	HDP-356A22	HDP-356B41	HDD-3143D1	HDP-356B18
<b>Axes</b>	3	3	3	3
<b>Sensitivity [mV/g]</b>	100	100	100	1000
<b>Range [±gpk]</b>	50	10	50	5
<b>Frequency response [±5%]</b>	0.5Hz ÷ 4KHz	0.5Hz ÷ 1KHz	0.5Hz ÷ 3KHz	0.5Hz ÷ 3KHz
<b>Resonance frequency [KHz]</b>	25	27	25	20
<b>Linearity [%F.S.]</b>	±1	±1	±1	±1
<b>Transverse sensitivity [%max]</b>	5	5	5	5
<b>Max shock [gpk]</b>	5000	2000	1500	5000
<b>Operating temperature [°C]</b>	-54 ÷ +77	-10 ÷ +50	-50 ÷ +85	-29 ÷ +77
<b>Weight [g]</b>	5.4	272 (with seat pad)	14	25
<b>Dimensions</b>	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
<b>Mounting</b>	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
<b>Insulation</b>	-	-	-	-
<b>Connector</b>	Side 8-36 4 pin	Side 1/4 -28 4 pin	Side 1/4 -28 4 pin	Side 1/4 -28 4 pin
<b>Material</b>	Titanium	Titanium	Titanium	Anodized aluminium

## 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:

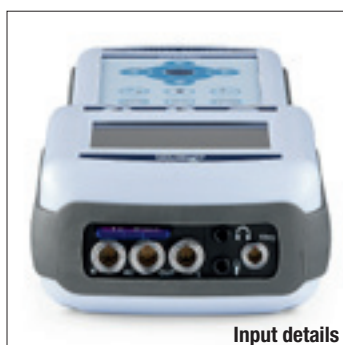
- Adhesive metal plate for accelerometer mounting with magnet
- Permanent magnet for accelerometer mounting on metal surfaces
- Adhesive mounting base (glue or wax)
- Insulated mounting base
- Screws with various threading

The following accessories are provided with the HD2070 analyser:

- 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)
- Manufacturer calibration chart of the sensor and ISO9001 calibration report
- CD with user manual and configuration data of accelerometer



Input details



Output details



## 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.

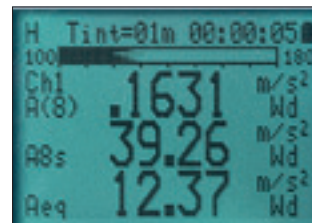
Sensor configurations can be set either manually, filling in the accelerometer data table, or automatically, using the CD provided with the accelerometers supplied by Delta Ohm. The HD2070 stores calibration information in a reserved area of internal memory. The calibration register file is downloaded 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.

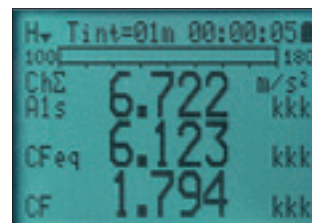
**CH20:** Hardware key for PC working with Windows® operating system. When plugged into the USB port, according to licence purchased, it enables the Noise Studio software modules.

**NS1** Application module "Workers' Protection":

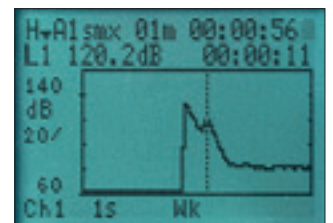
- Analysis of workers' exposure to noise and vibration, both hand-arm and whole-body, in accordance with Decree Law n.81/2008 and UNI9432/2011, European Directive 2003/10/CE and 2002/44/CE.
- Evaluation of hearing protectors with the methods OBM and SNR according to UNI EN 458.
- Evaluation of measurement uncertainties in accordance with UNI 9612.
- Calculation of the impulsiveness of noise sources according to the requirements of UNI 9432/2008.



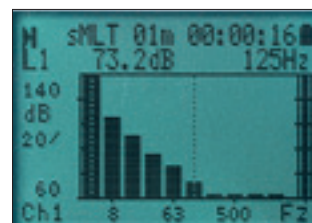
Base screen:  
single axis measurements



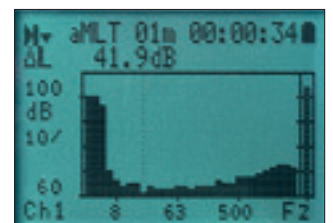
Base screen:  
vector measurements



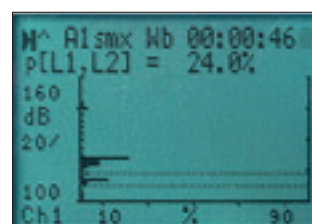
Time profile



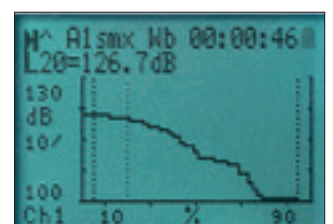
Octave band spectrum  
(option HD2070.01)



Third octave spectrum  
(option HD2070.01)



Statistic analysis:  
probability distribution  
(option HD2070.02)



Statistic analysis:  
graph of percentile levels  
(option HD2070.02)

## ORDERING CODES FOR KITS AND ACCESSORIES

**HD2070.K1** including:

- **HD2070** 3 channels vibration analyser, **HD6188** silicon grease, **HD6273** wax tray for gluing, **080A90** glue for quick mounting, **HD2030MC** 2 GB SD memory card, **CP22** USB serial connection cable, “**Noise Studio**” software, user manual and carrying case, **calibration report** for analyser according to ISO8041. **Accelerometers, connection cables and accessories must be specified at the time of order.**

**HD2070.HA-WB** kit including:

- **HD2070**: 3 channels vibration analyser, **HD6188** silicon grease, **HD6273** wax tray for gluing, **080A90** glue for quick mounting, **HD2030MC** 2 GB SD memory card, **CP22** USB serial connection cable, “**Noise Studio**” software, user manual and carrying case
- **HDP356A02**: 10mV/g Hand-Arm **tri-axial accelerometer** and connection cable to HD2070 analyser (HD2030.CAB3-3M), manufacturer calibration chart and **ISO8041 calibration report** for analyser-accelerometers chain with Wh filters, mounting screws, ;
- **HDP356B41**: 100mV/g whole-body **tri-axial accelerometer** in a rubber pad including HD2030.CAB3-3M connection cable to HD2070 analyser, manufacturer calibration chart and **ISO8041 calibration report** for analyser-accelerometers chain with Wd, Wk filters;
- **ISO 8041 Calibration report** as vibration analyzer;
- **HD2030.124** set of three accelerometer mounting adapters composed of HD2030AC1, HD2030AC2 and HD2030AC4
- “**Noise Studio**” software for PC.

### Firmware Options for HD2070 analyzer

**HD2070.01 “Spectral analysis”**: measurement of the acceleration spectrum in 1/1 octave bands from 0.5 Hz to 2 kHz and 1/3 octave bands from 0.5 Hz to 3.15 kHz class 1 according to IEC 61260. Calibration report according to IEC 61260.

**HD2070.02 “Statistical analysis”**: probability distribution graph and percentile levels graph from  $L_1$  to  $L_{99}$  in 1 dB classes

**HD2070.03 “Digital recorder”**: digital storage of accelerometer raw signals (on all channels) in the memory card.

### Software

**CH20**: Hardware key for PC with Windows® operating systems. When connected to a USB port, it enables the use of software modules.

**NS1** Application module “**Workers’ Protection**”: Analysis of noise and vibrations exposure in the workplace according to UNI9432, ISO9612, 2003-10-CE, 2002-44-CE

### Accelerometers

**HDP352C34**: General purpose ICP mono-axial accelerometer. Sensitivity 100 mV/g. Range  $\pm 50$  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  $\pm 5000$  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  $\pm 500$  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  $\pm 500$  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  $\pm 50$  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  $\pm 50$  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  $\pm 10$  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  $\pm 5$  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)



Optional tripod



Optional headset

## Vibration calibrator

**HD2060:** Portable vibration calibrator with frequency 15.915 Hz and levels 1 m/s<sup>2</sup> and 0.1 g, and frequency 159.155 Hz and levels 10 m/s<sup>2</sup> 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

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

## Mounting adapters for accelerometers

**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

**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

**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 feet, 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:

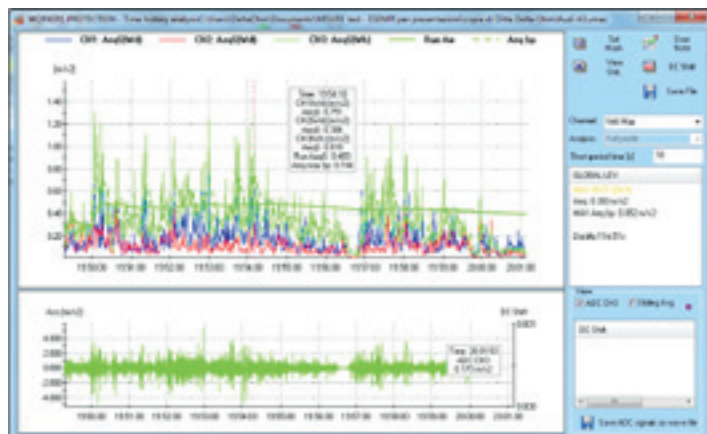
- Steel support with three feet and spirit level. Has a 10-32 UNF threaded hole on the top side and a cavity on the bottom side with a M4 threaded hole.
- Cubic adapter to be mounted on the support top side with two M4 screws (included). The cube is provided with 10-32 UNF threaded holes on three orthogonal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



NS1 "Workers Protection" vibration module: vibration exposition evaluation, X, Y, Z axes time histories analysis. **Vibration signal DC shift analysis.**



#### 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 HD2070 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.

#### Accessories for accelerometers mounting:

**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.

#### 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.

