

Operating manual

Seat accelerometer **HD2030MSP**



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1 INTRODUCTION

HD2030MSP is an accelerometer suitable for the measurement of vibrations transmitted by seats to the occupants of passenger and work vehicles.

The mechanical design is compliant with the requirements of ISO 10326-1.

The seat pad consists of a thin circular rubber pad housing a low profile tri-axial accelerometer.

The accelerometer is suitable for the measurement of human exposure to whole-body vibrations, according to ISO 2631, ISO 10326-1, ISO 7096 and ISO 8041.

The transducer is based on MEMS technology and the electrical interface is IEPE/ICP compatible for reliable signal transmission.

The device measures the acceleration imparted to the body in three orthogonal axes with a sensitivity of 100 mV/(m/s²) nominally.

The tri-axial accelerometer HDWBV-100, mounted at the center of the rubber pad HD2030PAD, is housed in an anodized aluminum case provided with a threaded hole, suitable for sensor calibration, and a 4-pin M5 connector compatible with HD2030.CAB3M cables.

Reference markets are:

- **Control of vibration risk for drivers of passenger and work vehicles**
- **Measurement of vibrations in the automotive industry**
- **Laboratory measurements**

2 TECHNICAL CHARACTERISTICS

SENSOR	
Sensing element	MEMS inertial sensor
Number of axis	3
PERFORMANCES	
Sensitivity @ 15.915 Hz	100 mV/(m/s ²)
Range F.S. (@24V supply voltage)	± 50 (m/s ²)
Frequency response (f3dB)	0.2 Hz ÷ 700 Hz
Frequency response (f10%)	0.4 Hz ÷ 350 Hz
Frequency response (f5%)	0.6 Hz ÷ 230 Hz
Resonant frequency (MEMS transducer)	> 5 kHz
Linearity error (FSO)	± 0.5 %
Transverse sensitivity	< 5%
Residual noise (0.4 Hz ÷ 100 Hz)	< 0.005 m/s ²
ELECTRICAL CHARACTERISTICS	
Output	IEPE
Compliance (supply) voltage range	+18 ÷ +28 V
Constant current supply	2 mA ÷ 4 mA
Output bias voltage	13.0 V ÷ 15.0 V
Output impedance	<100 ohm
Ground isolation	Case grounded
ENVIRONMENTAL CHARACTERISTICS	
Shock limit	1000 G
Operating temperature range	-20°C ÷ 60°C
Temperature coefficient	0.01 %/°C
Protection rating	IP65
PHYSICAL CHARACTERISTICS	
Weight	410 g
Size	250 mm diameter, 12 mm height
Connector	4-pin M5
Material	Anodized aluminum accelerometer inserted in a rubber pad

3 DESCRIPTION

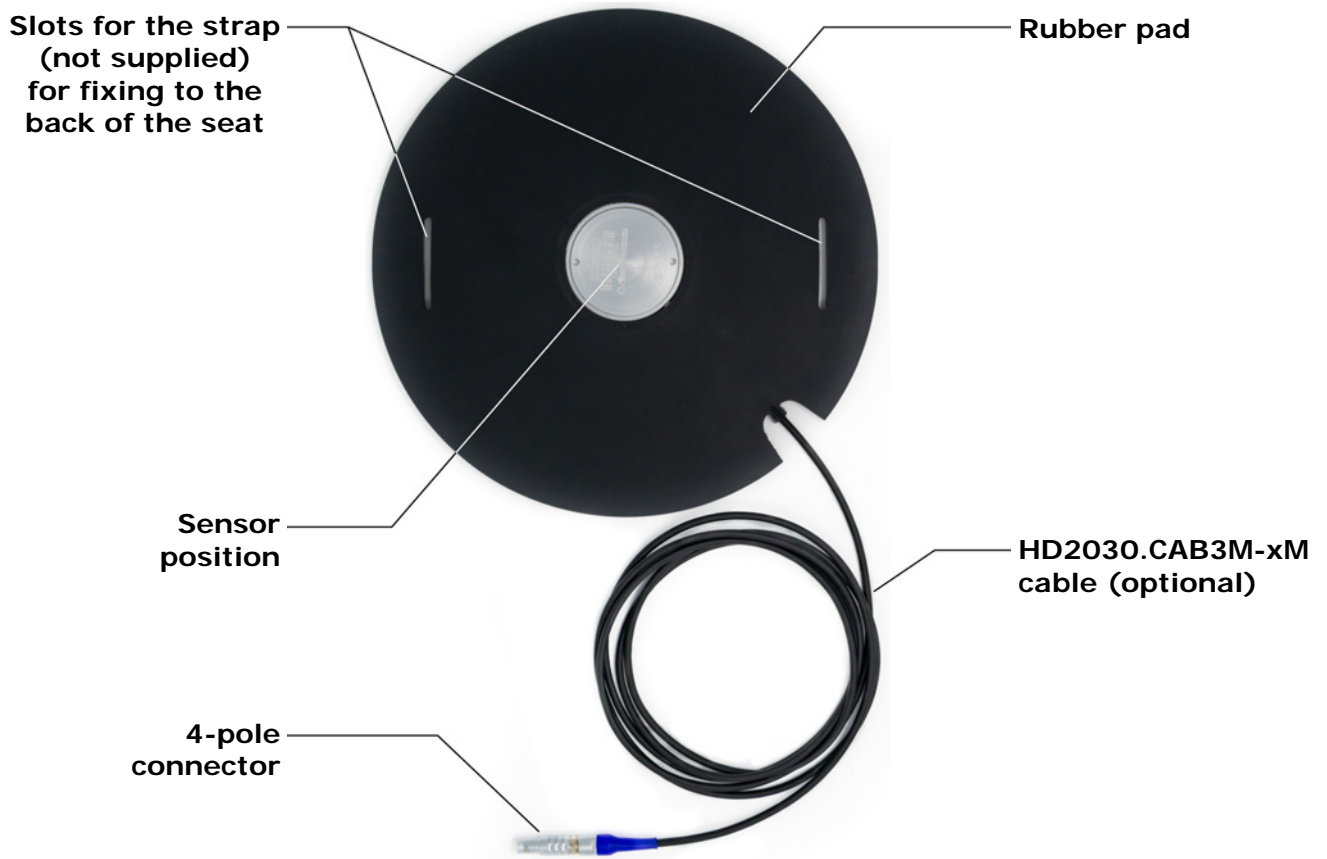


Fig. 3.1: Top side

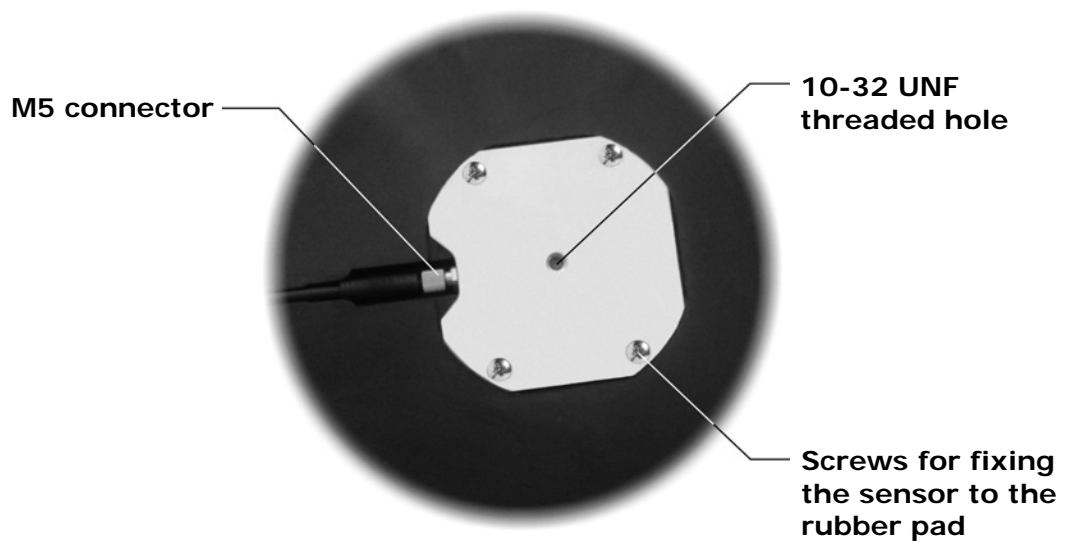


Fig. 3.2: Detail of bottom side

4 USE

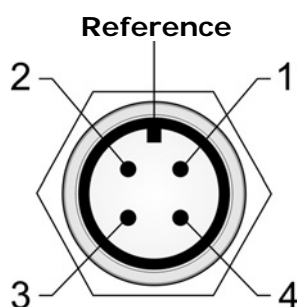
The rubber pad must be fixed to the seat or the backrest so that it is interposed between the seat itself and the body part subject to vibrations. For the fixing it is possible to use tape or a strap (not supplied), by passing it through the appropriate slots provided in the pad.

The sensor detects the acceleration imparted to the body on three orthogonal axes. It is necessary to accurately orient the axes of the accelerometer according to the reference system established by ISO 2631-1. The orientations of the axes along which the sensor detects the acceleration are printed on the top of the accelerometer. The analog output signal corresponding to the X and Y axes increases when the sensor is subjected to an acceleration in the direction of the arrows printed on the housing. The analog output signal corresponding to the Z axis increases when the sensor is subjected to an acceleration upwards.



Fig. 4.1: Reference axes of the accelerometer

The accelerometer is equipped with a male 4-pole M5 connector having the following pinout:



Pin Number	Description
1	Z
2	Y
3	X
4	GND

Fig. 4.2: M5 connector pinout

For the connection to the HD2030 and HD2070 vibration analyzers, the **optional HD2030.CAB3M-xM** cables can be used.

Route the connecting cable so that the connection point with the sensor is not subjected to stress. Minimize the possibility of cable movements, by securing it with cable ties or tape. Do not route the cable near power lines, to avoid interferences on the sensor output signal.

The accelerometer must be powered with constant current. Use only power sources equipped with the current regulating function or use a current regulating diode as shown below:

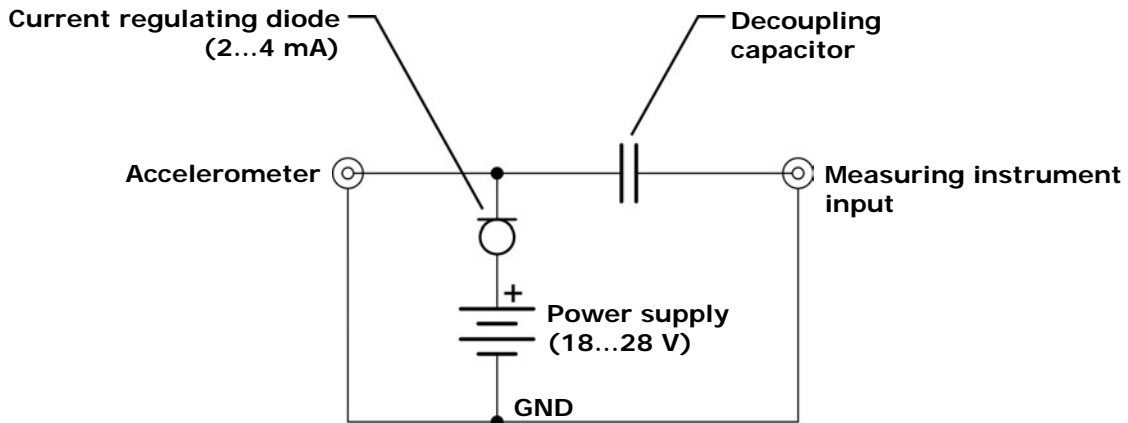


Fig. 4.3: Sensor connection

If the accelerometer is connected to the HD2030 or HD2070 analyzer, the power supply and current regulation functions are performed by the analyzer.

In order to remove the bias voltage from the sensor output signal and obtain only the AC component, connect the sensor output to the measuring instrument using a decoupling capacitor.

DO not power the accelerometer with voltage and corrente outside the limits specified in the technical characteristics table, in order not to damage the internal electronic circuit.

5 FIXING FOR CALIBRATION

The accelerometer is supplied with a double threaded screw for fixing the sensor to the vibrating base of a calibration system.

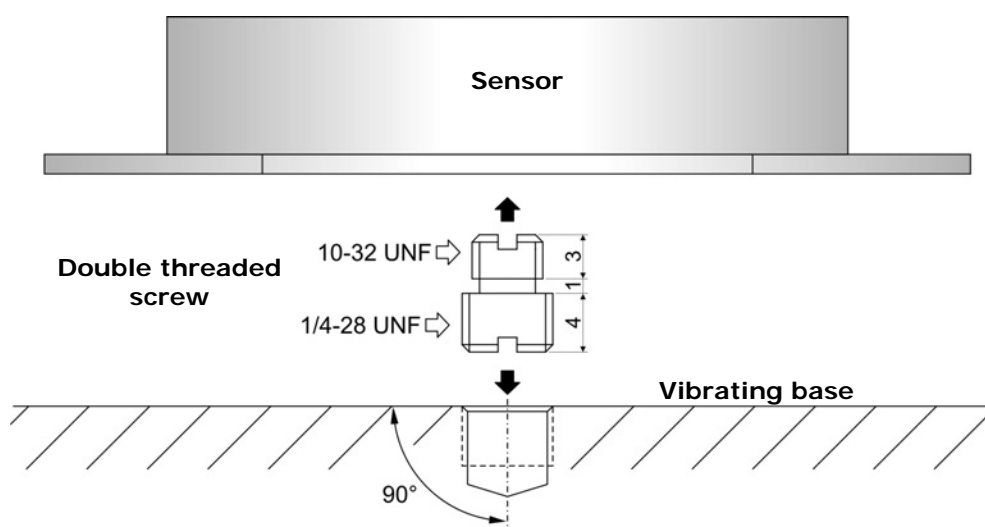


Fig. 5.1: Double threaded screw

The contact surface (vibrating base) of the sensor must be smooth and flat. Before fixing the sensor it is advisable to clean the surface and apply a light film of grease/oil (or equivalent fluid) to fill small gaps between the contact surface and the sensor and improve the vibration transmissibility.

To fix the accelerometer using a screw it is sufficient a 1-2 Nm tightening force, compatible with a manual operation. For maximum measurements repeatability, the use of a torque wrench is recommended.

As an alternative to screw mounting, in case the contact surface is not provided with a threaded hole, it is possible to fix the sensor using:

- adhesive material (double-sided tape, wax or quick glue);
- a magnet.

Mounting with adhesive material or a magnet can reduce the sensor response to higher frequencies, especially in the mounting with magnet.

Mounting with adhesive material:

The sensor can be fixed with adhesive material to the contact surface:

- directly;
- through an adapter, fixing the sensor to the adapter (preferably using the screw) and gluing the adapter to the contact surface.

If the sensor is fixed directly to the contact surface with glue or wax, be careful not to obstruct the threaded hole at the bottom of the sensor; moreover, do not use too much glue that could make the removal of the sensor difficult. In order to remove a glued sensor, use a debonder product suitable for the type of glue used, avoiding to force the sensor.

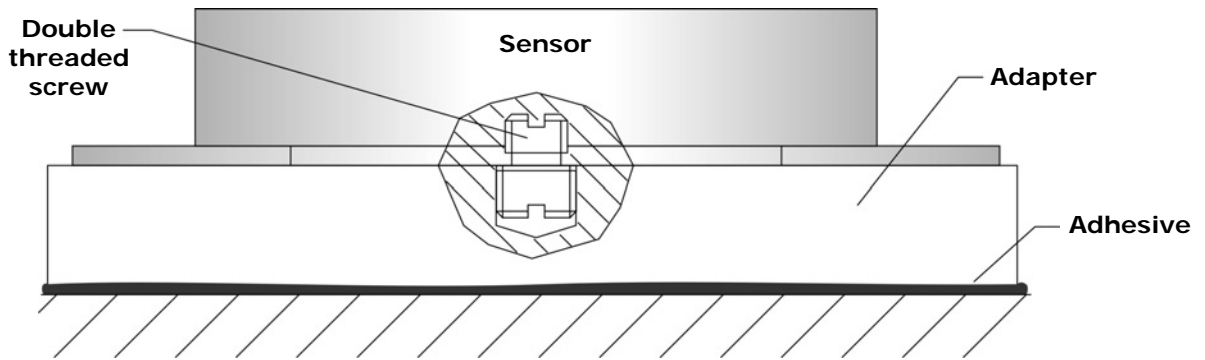


Fig. 5.2: Fixing with adhesive

Mounting with magnet:

Fix the sensor to the magnet (preferably using the screw) and place the magnet on the contact surface.

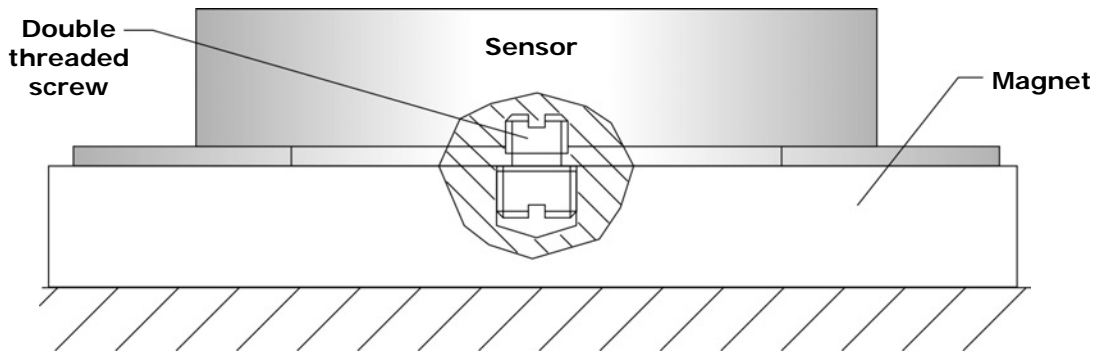


Fig. 5.3: Fixing with magnet on a flat surface

For non-flat surfaces, dual-rail magnets can be used.

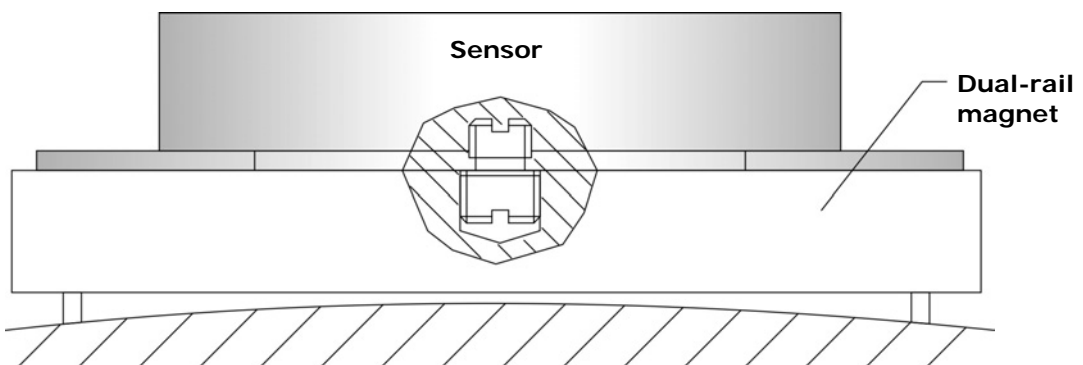


Fig. 5.4: Fixing with dual-rail magnet

For uneven surfaces, glue a flat metal base onto the surface, then place the sensor with the magnet on the metal base.

Place the sensor with the magnet on the contact surface gently, to avoid damaging the sensor due to the high accelerations caused by the magnet attraction.

6 STORAGE

Storage conditions:

- Temperature: -20...+60 °C.
- Humidity: less than 90 %RH no condensation.
- For storage, avoid places where:
 - There is a high level of humidity;
 - Instruments are exposed to direct sun radiation;
 - Instruments are exposed to a high temperature source;
 - There is vapor, salt and/or corrosive gases.

7 SAFETY INSTRUCTIONS

General instructions for safety

The transducer has been manufactured and tested in compliance with the safety standard EN61010-1:2010 "Safety requirements for electrical equipment for measurement, control and laboratory use" and left the factory in a safe and secure technical condition.

The regular functioning and operational safety of the transducer can be ensured only if all normal safety measures, as well as the specific measures described in this manual, are followed.

The regular functioning and operational safety of the transducer can only be guaranteed under the climatic conditions specified in the manual.

Do not use the transducer in places where there are:

- Rapid ambient temperature variations that may cause condensation.
- Corrosive or flammable gases.
- High-intensity electromagnetic fields, static electricity.

If the transducer is transported from a cold environment to a warm one, or vice versa, the formation of condensation may cause disturbances to its functioning. In this case, wait until the temperature of the transducer reaches room temperature before putting into operation.

Obligations of the User

The user of the transducer must ensure compliance with the following standards and guidelines for the treatment of hazardous materials:

- EEC directives on workplace safety
- National low regulations on workplace safety
- Accident prevention regulations

8 ORDERING CODES

HD2030MSP IEPE tri-axial accelerometer with rubber pad for the measurement of the vibrations transmitted to the whole body by the seats to the occupants of vehicles. Sensitivity 100 mV/(m/s²). 4-pole M5 connector. 10-32 UNF mounting screw for the sensor calibration is included.
The HD2030.CAB3M-xM cable has to be ordered separately.

Accessories

HD2030.CAB3M-2M Cable for connecting the accelerometer to the HD2030 or HD2070 vibration analyzer. M5 4-pole connector on the accelerometer side, circular 4-pole push-pull connector on instrument side. Cable length 2 m.

HD2030.CAB3M-5M Cable for connecting the accelerometer to the HD2030 or HD2070 vibration analyzer. M5 4-pole connector on the accelerometer side, circular 4-pole push-pull connector on instrument side. Cable length 5 m.

Delta OHM LAT N° 124 metrology laboratories are ISO/IEC 17025 accredited by ACCREDIA in Temperature, Humidity, Pressure, Photometry/Radiometry, Acoustics and Air Speed. They can provide certificates for the accredited quantities.

WARRANTY

The manufacturer is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.

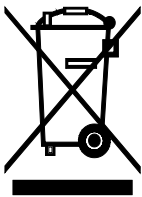
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased.

We reserves the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.

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