# WIRELESS SMART SENSOR – H1.3

## (ACCELEROMETER AND THERMOMETER)

### DATASHEET – V1.0x

## INTRODUCTION

**H1.3 Sensor** is a solution based on the Internet of Things, designed to enable the digitalization of processes and industrial machines. It is a wireless sensor that acquires temperature and vibration data, operating as a driver for the signal sent to the cloud in real time.

**H1.3** is powered by 2 ER14250 batteries. They provide an autonomy of up to 5 years. **H1.3** is attached to the motors using neodymium magnets and the plastic housing is designed to endure industrial environments. The sensor interface applications allow direct access to the operating settings of the MEMS accelerometer and its peripherals, such as data acquisition frequency, measurement resolution, resolution and sensitivity of the embedded algorithms, making it highly flexible in its applications.

## APPLICATIONS

- Sensing for predictive maintenance of electric motors.
- Vibration trend analysis.
- Hour meter for electric motors.
- Motor stall detection.
- Cavitation detection in pumps.
- Gearboxes monitoring.
- Surface temperature sensing.
- Engine location and identification, as well as maintenance history.
- Monitoring the opening and closing of doors and gates.
- Dam movements monitoring.
- 3-axis inclinometer.
- Pipeline vibration monitoring.
- Motion detection.
- Tilting valves and levers.
- Staff ergonomics monitoring.
- Cavitation in pumps.
- Storage levels.
- Transformer monitoring.

## BENEFITS

- Low-cost.
- Low battery consumption.
- Easy to install, wireless, and magnetically attached.
- Compact and resistant housing.
- Application flexibility with parameterizable analyses.
- Increased reliability and faster decision-making for predictive maintenance.
- Reduction of maintenance costs.
- Reduction of unscheduled downtime.
- Data centralization.

## DIMENSIONS

**H1.3 Sensor** has the following dimensions:

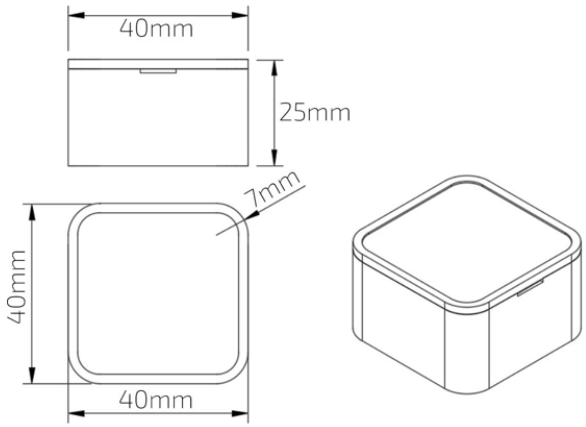


**Figure 1 –** Overview

## ON-BOARD SERVICES

All on-board services are based on acceleration and temperature data. Services can be configured remotely and changed at any time via the **Hedro** platform.

Services can be configured according to the parameters listed below.

### RMS SPEED (mm/s)

This service returns the effective value of the vibration speed. It is an algorithm used to statistically represent the average magnitude of the speed of the object the sensor is monitoring. The user can set the passband. The results of this service can be used to monitor the evolution of the vibration in a specific machine.

The available parameters are:

| | |
|---|---|
| **Axes** | X, Y, Z, or all. |
| **Sensitivity** | ± 2 g, ± 4 g, or ± 8 g. |
| **Resolution** | 8-bits or 16-bits. |
| **Sample Rate** | 3200 Hz. |
| **Lower Cutoff Frequencies** | 1 Hz, 2 Hz, 5 Hz, 10 Hz. |
| **Upper Cutoff Frequencies** | 500 Hz, 1000 Hz, 1600 Hz. |
| **Number of Samples** | 32, 64, 128, 256, 512, 1024, or 2048. |
| **Sampling Period** | 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 h, 2 h, 6 h, or 12 h. |
| **Number of Results per Submission** | From 1 to 10 samples. |

**Table 1 –** Rms speed

### RMS ACCELERATION (m/s²)

This service returns the effective value of the vibration acceleration. It is an algorithm used to statistically represent the average magnitude of the acceleration of the object the sensor is monitoring. It can be used to implement vibration-based hour meters, for example.

The available parameters are:

| | |
|---|---|
| **Axes** | X, Y, Z, or all. |
| **Sensitivity** | ± 2 g, ± 4 g, or ± 8 g. |
| **Resolution** | 8-bits or 16-bits. |
| **Frequencies** | 0,781 Hz, 1,563 Hz, 3,125 Hz, 6,25 Hz, 12,5 Hz, 25 Hz, 50 Hz, 100 Hz, 200 Hz, 400 Hz, 800 Hz, 1600 Hz, 3200 Hz, 6400 Hz, 12800 Hz, or 25600 Hz. |
| **Number of Samples** | 32, 64, 128, 256, 512, 1024, or 2048. |
| **Sampling Period** | 1 sec, 2 sec, 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 h, 2 h, 6 h, or 12 h. |
| **Number of Results per Submission** | From 1 to 10 samples. |

**Table 2 –** Rms acceleration

## STATIC INCLINOMETER (°)

This service returns the Euler angles, with reference to the gravitational acceleration. This is a static inclinometer, which estimates the orientation of the sensor based on the average of the acceleration samples collected.

The available parameters are:

| | |
|---|---|
| **Reference axis** | X, Y, or Z. |
| **Sensitivity** | ± 2 g, ± 4 g, or ± 8 g. |
| **Resolution** | 8-bits. |
| **Frequencies** | 0,781 Hz, 1,563 Hz, 3,125 Hz, 6,25 Hz, 12,5 Hz, 25 Hz, 50 Hz, 100 Hz, 200 Hz, 400 Hz, 800 Hz, 1600 Hz, 3200 Hz, 6400 Hz, 12800 Hz, or 25600 Hz. |
| **Number of Samples** | 32, 64, 128, 256, 512, 1024, or 2048. |
| **Sampling Period** | 1 sec, 2 sec, 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 h, 2 h, 6 h, or 12 h. |
| **Number of Results per Submission** | From 1 to 10 samples. |

**Table 3 –** Static inclinometer

## FAST FOURIER TRANSFORM (m/s²)

This service converts acceleration signals in the time domain to a representation in the frequency domain. This algorithm returns the module of the FFT result. The result can be used for several applications. Among the most important is the analysis of rotating machine failures.

The available parameters are:

| | |
|---|---|
| **Axes** | X, Y, Z, or all.[1] |
| **Sensitivity** | ± 2 g, ± 4 g, or ± 8 g. |
| **Resolution** | 8-bits or 16-bits. |
| **Frequencies** | 0,781 Hz, 1,563 Hz, 3,125 Hz, 6,25 Hz, 12,5 Hz, 25 Hz, 50 Hz, 100 Hz, 200 Hz, 400 Hz, 800 Hz, 1600 Hz, 3200 Hz, 6400 Hz, 12800 Hz, or 25600 Hz. |
| **Number of Samples** | 32, 64, 128, 256, 512, 1024, or 2048. |
| **Sampling Period** | 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 h, 2 h, 6 h, or 12 h. |

**Table 4 –** Fast Fourier transform

## PURE ACCELERATION (m/s²)

This service returns the acceleration measurements collected at the selected frequency. The buffer of this function is expressed in bytes. This means that, if the buffer size chosen is 2048 bytes, the service can return 1024 16-bit samples or 2048 8-bit samples.

The available parameters are:

| | |
|---|---|
| **Axes** | X, Y, Z, or all.[2] |
| **Sensitivity** | ± 2 g, ± 4 g, or ± 8 g. |
| **Resolution** | 8-bits or 16-bits. |
| **Frequencies** | 0,781 Hz, 1,563 Hz, 3,125 Hz, 6,25 Hz, 12,5 Hz, 25 Hz, 50 Hz, 100 Hz, 200 Hz, 400 Hz, 800 Hz, 1600 Hz, 3200 Hz, 6400 Hz, 12800 Hz, or 25600 Hz. |
| **Buffer size (Bytes)** | 32, 64, 128, 256, 512, 1024, or 2048. |
| **Sampling Period** | 1 sec, 2 sec, 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 h, 2 h, 6 h, or 12 h. |

**Table 5 –** Pure acceleration

[1] When configured for all axes, the sample limit is 1024.

[2] When configured for all axes, the sample limit is 1024.

### TEMPERATURE (°C)

This service returns the current temperature of the sensor over the selected period with the selected resolution.

The available parameters are:

| | |
|---|---|
| **Resolution** | 0.25 °C or 0.50 °C. |
| **Sampling Period** | 1 sec, 2 sec, 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 h, 2 h, 6 h, or 12 h. |
| **Number of Results per Submission** | From 1 to 20 samples. |

**Table 6 –** Temperature

## DATA VISUALIZATION AND STORAGE (HEDRO PLATFORM)

The data generated by the **H1.3 Sensors** is sent to the cloud via the **HG3 data collector**, which is a Gateway between the BLE/Wi-Fi protocols.

The data sent to the platform is decompressed and made available on dashboards for real-time visualization. They can be stored for up to 3 years. The user can view them by accessing the **Hedro** website. Through the platform, it is also possible to set monitoring alarms for the data collected by the sensors.

# TECHNICAL SPECIFICATION

| OPERATION AND STORAGE CONDITIONS | H1.3 SENSOR |
|---|---|
| **Operating temperature** | -20 °C ... 60 °C (up to 85 °C with a special battery). |
| **Storage temperature** | -5 °C ... 25 °C. |

**Table 7 –** Operation and storage conditions

| HARDWARE | H1.3 SENSOR |
|---|---|
| **External Dimensions** | 25 mm x 40 mm x 40 mm. |
| **Microcontroller** | 32-Bit microcontroller, 16 MHz (ARM® Cortex™-M0). |
| **Memory** | • Flash memory: 256 kB.<br>• RAM memory: 32 kB. |
| **Communication** | Bluetooth Low Energy 4.2 (2.4 GHz). |
| **Signal range** | From 50 to 70 meters without obstacles. |
| **Transmission Power** | +4 dBm. |
| **Reception Sensitivity** | -93 dBm. |
| **Battery** | 2 x ER14250 (duration 9 to 60 months, according to the application). |
| **Fixing** | 4 neodymium magnets \| 10 mm x 6 mm. |
| **Encapsulation** | ABS plastic encapsulation |
| **Embedded Temperature Sensor Operation** | -20 °C ... 85 °C. |
| **Resolution of the Embedded Temperature Sensor** | 0.25 °C. |
| **Temperature Accuracy** | ±4°C without calibration. |

**Table 8 –** Hardware

## CERTIFICATIONS

### ANATEL

This device is homologated by ANATEL, according to the regulated procedures for conformity assessment of telecommunications products, and meets the technical requirements applied.

This equipment is not subject to the protection from harmful interference and may not cause interference with duly authorized systems.

For more information, see the ANATEL website: www.anatel.gov.br.

### CE Mark

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

### FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are

designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

**RF Exposure: A distance of 20 cm shall be maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna.**

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

## WARRANTY

Warranty conditions are available on our website www.novusautomation.com/warranty.