



Datasheet version V1.2

Wireless Smart Sensor – H1.2

(Accelerometer, Thermometer, NTC Probes and 4~20mA Driver)

General description:

The H1.2 sensor is a solution based on the Internet of Things, developed to enable the digitization of industrial processes and machines. It is a wireless sensor that acquires temperature and vibration data and interfaces with any standard 4~20mA sensors, operating as a driver for the signal, which is sent to the cloud in real time.

The H1.2 is powered by a CR2477 battery that gives it an autonomy of up to 5 years. The attachment of the H1.2 to the motors is done by neodymium magnets and the plastic case was designed to withstand 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.
- Engine stop detection.
- Detection of cavitation in pumps.
- Monitoring of reduction boxes.
- Surface temperature sensing.
- Location and identification of engines, as well as maintenance history.
- Monitoring the opening and closing of doors and floodgates.

- Monitoring of dam movement.
- 3 axis inclinometer.
- Pipeline vibration monitoring.
- Motion detection.
- Inclination of valves and levers.
- Personnel ergonomics monitoring.
- pump cavitation
- reservoir level
- Transformer monitoring

Benefits:

- Low cost.
- Low battery consumption.
- Easy installation, wireless and with magnetic attachment.
- Compact and resistant case.
- Application flexibility with parameterizable analyses.
- Increased reliability and agility in decision making for predictive maintenance.
- Reduction of maintenance costs.
- Reduction of unscheduled stops.
- data centralization

Technical description:

- **Operating and storage conditions:**
 - Operating temperature: -20°C ... 60°C. (up to 85°C with special battery)
 - Storage temperature: -5°C ... 25°C.
- **Hardware:**
 - External dimensions (mm): 25 x 40 x 40.
 - 32-Bit, 16 MHz microcontroller (ARM® Cortex™-M0).
 - 256 kB flash memory.
 - 32 kB RAM memory.
 - Bluetooth Low Energy 4.2 (2.4GHz) communication.
 - Signal range: 50 to 70 meters without obstacles.
 - Transmission power +4dBm.
 - Receive sensitivity -93dBm.
 - CR2477 battery (duration 9 to 60 months depending on the application)
 - Fixation with 4 neodymium magnets 10x6mm.

- o Plastic encapsulation in ABS.
- o Onboard temperature sensor operation: -20°C ... 85°C .
- o On-board temperature sensor resolution: 0.25°C .
- o Temperature accuracy of $\pm 4^{\circ}\text{C}$ without calibration.
- o Predisposition for NTC probes and optional 4~20mA. (See order references)
- o Inputs for NTC probes: 2 x Inputs.
- o Inputs for 4~20mA signals: 2 x Inputs.
- o Accuracy of NTC probes of 0.5°C .
- o NTC probes operating range: -50°C ... 250°C .
- o 4~20mA driver resolution: 0.01mA.

Onboard services:

All embedded services are based on acceleration and temperature data. Services can be remotely configured and changed at any time through Hedro's platform. The services can be on the same sensor at the same time, as long as the settings of each service respect the limit of 1 algorithm per second. For more information about operation and battery consumption, refer to the H1.2 configuration and operation manual. Services can be configured according to the parameters listed below:

o **Velocity RMS** (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 velocity of the object the sensor is monitoring. User can set the passband. The results of this service can be used to monitor the evolution of vibration in a given machine:

The parameters available for this service are:

- Axes: X, Y, Z or all.
- Sensitivity: $\pm 2g$, $\pm 4g$ or $\pm 8g$.
- Resolution: 8bits or 16bits.
- Sampling frequency: 3200Hz.
- Lower Cut Frequencies: 1Hz, 2Hz, 5Hz, 10Hz
- Upper cut frequencies: 500Hz, 1000Hz, 1600Hz
- Number of samples: 32, 64, 128, 256, 512, 1024 or 2048.
- Sample periods: 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.
- Number of results per shipment: from 1 to 10 samples.

o **Acceleration RMS** (m/s^2):

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

The parameters available for this service are:

- Axes: X, Y, Z or all.
- Sensitivity: $\pm 2g$, $\pm 4g$ or $\pm 8g$.
- Resolution: 8bits or 16bits.

- Frequencies: 0.781Hz, 1.563Hz, 3.125Hz, 6.25Hz, 12.5Hz, 25Hz, 50Hz, 100Hz, 200Hz, 400Hz, 800Hz, 1600Hz, 3200Hz, 6400Hz, 12800Hz or 25600Hz.
- Number of samples: 32, 64, 128, 256, 512, 1024 or 2048.
- Sample periods: 1sec, 2sec, 5sec, 10sec, 20sec, 30sec, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.
- Number of results per shipment: from 1 to 10 samples.

o Static inclinometer (Roll & Pitch):

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

The parameters available for this service are:

- Axes: X, Y or Z.
- Sensitivity: $\pm 2g$, $\pm 4g$ or $\pm 8g$.
- Resolution: 8bits.
- Frequencies: 0.781Hz, 1.563Hz, 3.125Hz, 6.25Hz, 12.5Hz, 25Hz, 50Hz, 100Hz, 200Hz, 400Hz, 800Hz, 1600Hz, 3200Hz, 6400Hz, 12800Hz or 25600Hz.
- Number of samples: 32, 64, 128, 256, 512, 1024 or 2048.
- Sample periods: 1sec, 2sec, 5sec, 10sec, 20sec, 30sec, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.
- Number of results per shipment: from 1 to 10 samples.

o Fast Fourier Transform (FFT):

This service converts a signal from its original domain to a frequency domain representation. This algorithm returns the real part of the FFT result. Its result can be used for a huge variety of applications, among the most important is the failure analysis of rotating machines.

The parameters available for this service are:

- Axes: X, Y, Z or all*.
- Sensitivity: $\pm 2g$, $\pm 4g$ or $\pm 8g$.
- Resolution: 8bits or 16bits.
- Frequencies: 0.781Hz, 1.563Hz, 3.125Hz, 6.25Hz, 12.5Hz, 25Hz, 50Hz, 100Hz, 200Hz, 400Hz, 800Hz, 1600Hz, 3200Hz, 6400Hz, 12800Hz or 25600Hz.

- Number of samples: 32, 64, 128, 256, 512, 1024 or 2048.
- Sample periods: 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.

o **Raw Acceleration (G):**

This service simply returns the G-acceleration measurements collected at the chosen frequency. This function's buffer is expressed in bytes, which means that the service is capable of returning 1024 samples of 16bits or 2048 of 8bits samples, if the chosen buffer size is 2048 bytes.

The parameters available for this service are:

- Axes: X, Y, Z or all*.
- Sensitivity: $\pm 2g$, $\pm 4g$ or $\pm 8g$.
- Resolution: 8bits or 16bits.
- Frequencies: 0.781Hz, 1.563Hz, 3.125Hz, 6.25Hz, 12.5Hz, 25Hz, 50Hz, 100Hz, 200Hz, 400Hz, 800Hz, 1600Hz, 3200Hz, 6400Hz, 12800Hz or 25600Hz.
- Buffer size (bytes): 32, 64, 128, 256, 512, 1024 or 2048.
- Sample periods: 1sec, 2sec, 5sec, 10sec, 20sec, 30sec, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.

o **Temperature:**

Returns the current temperature of the sensor in the chosen period with the chosen resolution.

The parameters available for this service are:

- Resolution: 0.25°C or 0.50°C.
- Sample periods: 1sec, 2sec, 5sec, 10sec, 20sec, 30sec, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.
- Number of results per shipment: from 1 to 20 samples.

▪ **4~20mA driver:**

Returns the value of the 4~20mA current reading of up to two channels in the chosen period with the chosen resolution. In the dashboard offered by Hedro, it is possible to define the lower and upper limits and the variable of the linearized function of the sensor being read.

The parameters available for this service are:

- Channels: a, b or ab.

- Resolution: 8 or 16bits.
- Sample periods: 1sec, 2sec, 5sec, 10sec, 20sec, 30sec, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.
- Number of results per shipment: from 1 to 10 samples.

o **NTC probes:**

Returns the temperature value of NTC probes from -50°C to $+250^{\circ}\text{C}$.

The parameters available for this service are:

- Channels: a, b or ab.
- Resolution: 8 or 16bits.
- Sample periods: 1sec, 2sec, 5sec, 10sec, 20sec, 30sec, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 6h or 12h.
- Number of results per shipment: from 1 to 10 samples.

Data visualization and storage (Hedro Platform):

The data generated by the H1.2 sensors is sent to the cloud through the HG2 data collector, which is a gateway between the BLE/WiFi protocols.

The data that is sent to the platform is uncompressed and made available in dashboards for real-time visualization. They can be stored for up to 3 years and are available to the user through a login on the Hedro website. Through the platform, it is also possible to configure monitoring alarms for the data collected by the sensors.

Order references

The H1.2 sensors can be supplied in different models for the predisposition of the NTC probe inputs, 4~20mA signals or for the way of closing the sensor's encapsulation. The following table describes the ordering code for each sensor version:

request code	Models
H1.2	Sensor without inputs for external signals
H1.2 x	Sensor without inputs for external signals (sealed sensor / IP66)
H1.2 a	1x NTC probe
H1.2 b	2x NTC probe
H1.2 c	1 x 4~20mA Input
H1.2 d	2 x 4~20mA Inputs
H1.2 e	2 x NTC probes + 2 x 4~20mA Inputs

Mechanical drawing (mm):

