H EDRO
SENSOR HD25

Wireless Distance Sensor – HD25

General description:

The HD25 sensor is an Internet of Things based solution, developed to accurately collect short distance measurements in harsh industrial environments. As it is a sensor derived from the H1.2 Sensor, it retains some measurement characteristics such as temperature, vibration and tilt data, which are sent to the cloud in real time. The HD25 is powered by two AA batteries which give it an autonomy of up to 5 years. The HD25 is fixed to the equipment using a magnetic adapter that allows quick installation and removal. 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:

- Monitoring of small distances in real time
- Distance monitoring between lamination rolls
- cardan monitoring
- Press monitoring
- Injector monitoring

Benefits:

- Low battery consumption.
- Easy installation, wireless and with magnetic attachment.
- Resistant case.
- Increased production quality.
- Increased process stability
- Reduction of unscheduled stops.

Technical description:

- **Operating and storage conditions:**
  - Operating temperature: -20ºC ... 60ºC. (up to 85ºC with special battery)
  - Storage temperature: -5ºC ... 25ºC.
- **Hardware:**
  - 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.
  - 2 x AA battery (lasting from 9 to 60 months depending on the application)
  - Fixing with magnetic adapters.
  - Plastic encapsulation in carbon fiber.
  - Onboard temperature sensor operation: -20ºC ... 85ºC.
  - On-board temperature sensor resolution: 0.25ºC.
  - Distance measurement accuracy: 0.024mm.
  - Distance measuring range: 25mm.

Embedded services:

Embedded services are based on acceleration, temperature and distance 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. Services can be configured according to the parameters listed below:

- **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: ±2g, ±4g or ±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.

- **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: ±2g, ±4g or ±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: ±2g, ±4g or ±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: ±2g, ±4g or ±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.

- ### 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: ±2g, ±4g or ±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.

- ### 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.

- ### Distance (mm):

  Returns the value of the distance between two points with the chosen resolution. In the dashboard offered by Hedro it is possible to view the distances in real time.

  The parameters available for this service are:
  - Channels: a.
  - Resolution: 8 or 16bits.

- Sample periods: 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 HD25 sensors is sent to the cloud through the HG3 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.

Mechanical characteristics of the HD25