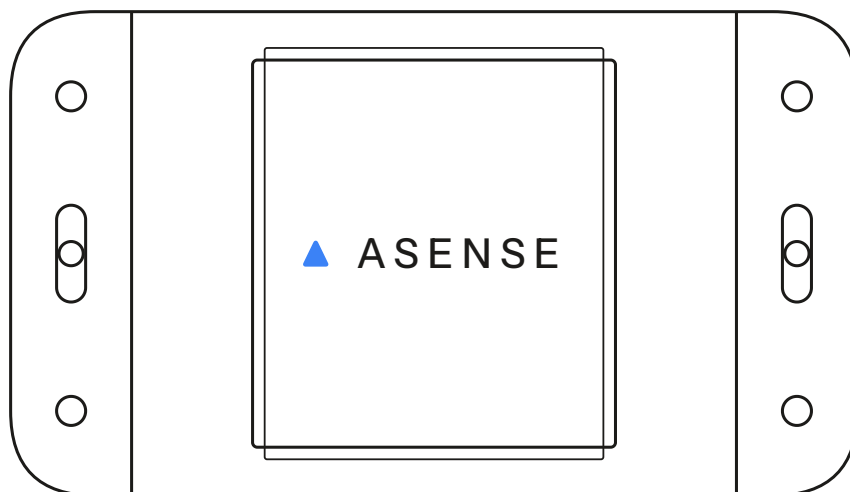




OWNER'S GUIDE

Asense IMU

Mounting · wiring · first connection · data · API

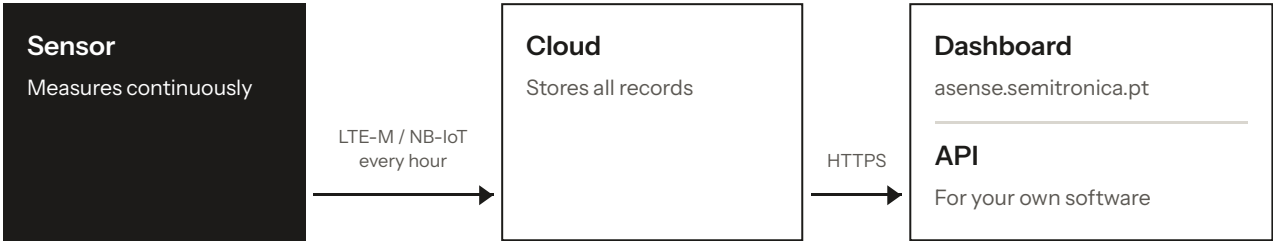
SERIAL NUMBER ASENSE _____

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About the sensor

Continuous **vibration** and **tilt** measurement on structures. Internal battery or 12 – 24 VDC supply, data over the mobile network.



What it measures

Acceleration	3 axes. Average, maximum and minimum every hour, plus the frequency spectrum.
Rotation	3-axis gyroscope.
Tilt	Inclination of the sensor, every hour.
Vibration events	40 s of continuous recording at 50 Hz, around the strongest vibration of each hour.
Optional inputs	Wind meter (RS-485) and two strain gauge inputs.
Also	Ambient temperature, GPS position.

1

Mounting

Fixed firmly to the structure or a pole · vertical · X axis up · cables down.

On a wall or structure

- 1 Choose a flat, rigid spot on the structure. The sensor must move with the structure, not on its own.
- 2 Hold the sensor **vertical**, with the **X axis pointing up** and the cable connectors on the **bottom face**.
- 3 Fix it through the four flange holes (Ø 5 mm). Tighten until the sensor cannot move.
- 4 Check the angle: the sensor must be less than **2°** off vertical.

WHY VERTICAL?

The tilt readings are measured from this position. A sensor fitted at an angle starts with an offset.

On a pole

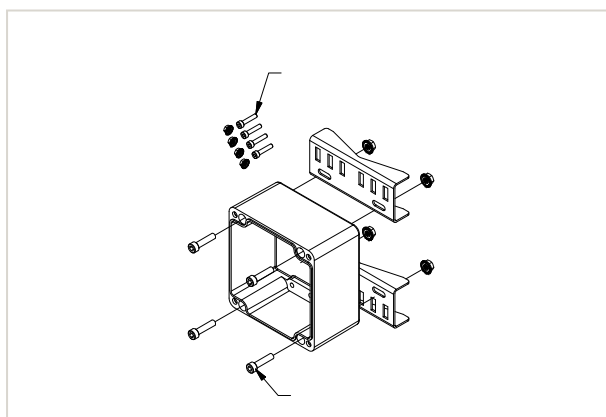
Round pole · 2 brackets · 2 clamps. Keep the X axis up and the connectors down.

YOU NEED

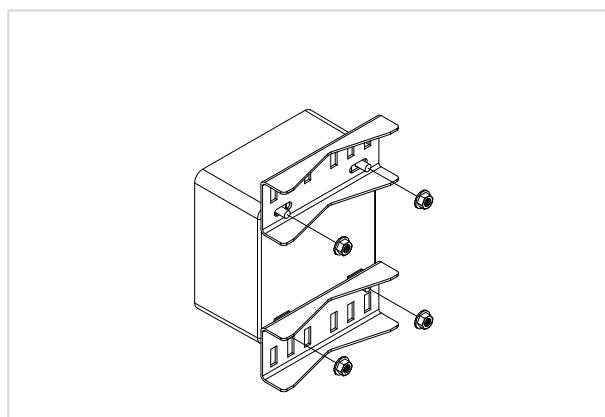
- 3 mm hex key, for the bracket screws
- 7 mm nut driver, for the flange nuts
- 8 mm nut driver or socket, for the clamps

POLE DIAMETER

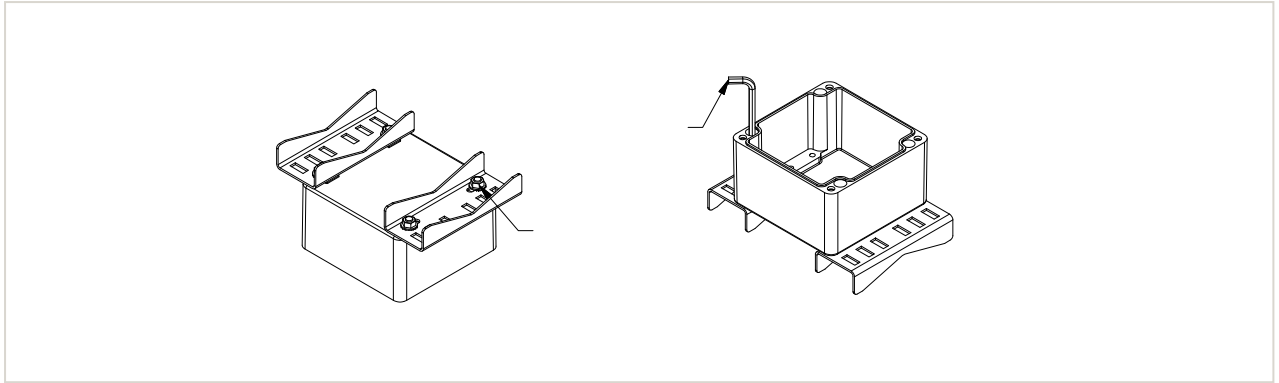
- 3.8 to 17.8 cm (1.5 to 7 in, supplied clamps)



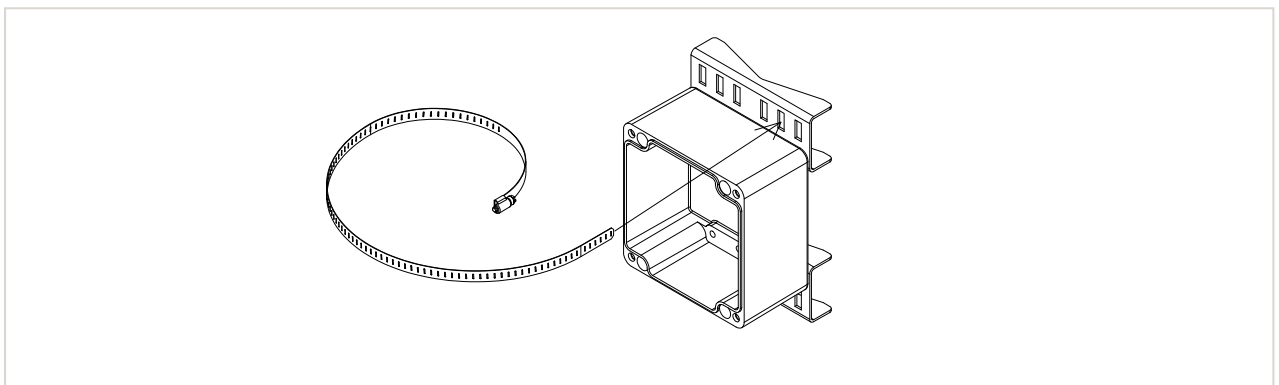
- 1 Check the kit: two brackets, four screws and four flange nuts. If the kit has two sizes of screw, use the ones that fit through the flange holes.



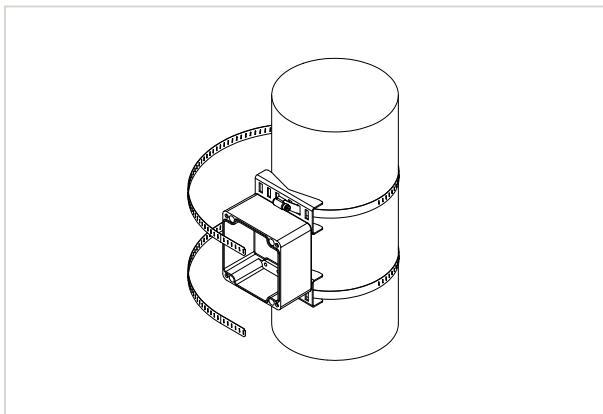
- 2 Fit a bracket at the top and one at the bottom, through the four flange holes. Put a flange nut on each screw.



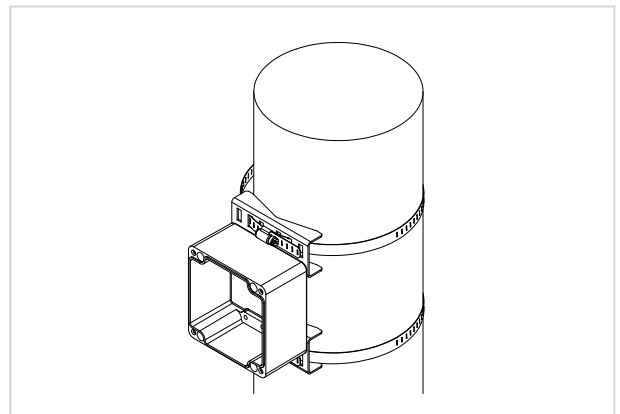
3 Hold each screw with the hex key and tighten its nut with the 7 mm nut driver, to 1.5 N·m. Do not overtighten.



4 Thread a clamp through a slot in each bracket. Pick the slot that lines up with the pole.



5 Wrap both clamps around the pole and thread each one back through its bracket.



6 Hold the sensor against the pole, X axis up, and tighten both clamps with the 8 mm nut driver. Check it is less than 2° off vertical.

2

Wiring

One connector for power and RS-485 · one connector for strain gauges (option).

POWER + RS485 connector

Supply 12 – 24 VDC. The wind meter and other RS-485 sensors share this connector.

Pin	Function · wind meter cable colour · power cable colour
1	RS485-B · black · –
2	0 V · blue · white
3	RS485-A · white · –
4	12 / 24 VDC · brown · brown

AIN connector (strain gauge option)

Two half-bridge inputs. The reference half-bridges are inside the sensor.

1	Common (0 V)
2	Input B (AIN2+)
3	Input A (AIN1+)
4	Reference voltage 2.5 V

3

First connection

Use **central.semitronica.pt** on site, next to the sensor, to check it works.

1.

Phone or laptop with Bluetooth and a supported browser (table below).
2.

Sensor powered (internal battery or 12 – 24 VDC supply). Bluetooth is on whenever it has power.
3.

Stand next to the sensor. Bluetooth reaches a few metres. Out of reach? Our **Asense Central** hub has a long-range link to the sensors and works as an extender. Ask us about it.

	Windows	macOS	Linux	Android	iOS
Chromium browsers (Chrome, Edge)	✓	✓	✓ flag	✓	✗
Firefox, Safari	✗	✗	✗	✗	✗
Browsers with Web Bluetooth	–	–	–	–	✓

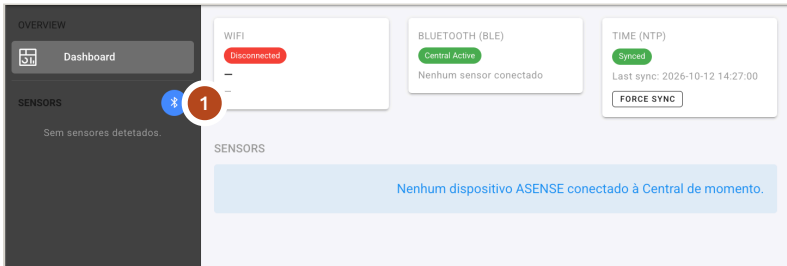
LINUX: TURN ON ONE FLAG

In Chrome, open `chrome://flags/#enable-experimental-web-platform-features`, set it to **Enabled** and restart Chrome. Without it, web pages cannot use Bluetooth on Linux.

PAIRING TIME

a few min

On some phones and computers pairing takes a few minutes. Wait before retrying.



- 1

Open **central.semitronica.pt**. Click the Bluetooth icon next to *SENSORS*.
- 2

Select **ASENS-...** in the list and click **Pair**.
- 3

Info tab: the sensor shows *Connected*. Check the serial number matches the label.

Tabs worth a look

Sense	The current hourly values: acceleration average, maximum and minimum, tilt, main frequencies, supply voltage, inputs A and B, temperature and wind.
ACC · Gyro	Live acceleration and rotation on 3 axes. Tap the structure and watch it respond.

FFT

The current frequency spectrum of each axis.

Central is for checking the sensor on site. Your measurements are in the cloud dashboard and the API.

4

Cloud dashboard

ADDRESS asense.semitronica.pt/dashboard Any current browser, any device.	YOUR API KEY Also used for the API (chapter 6).
---	--



Welcome back

Enter your credentials to access the secure dashboard.

ACCESS KEY

1



2

Access Dashboard →

- 1 Paste your API key in **ACCESS KEY**.
- 2 Click **Access Dashboard**.

Select a Monitoring Mode
Choose which family of Asense devices to monitor.

3

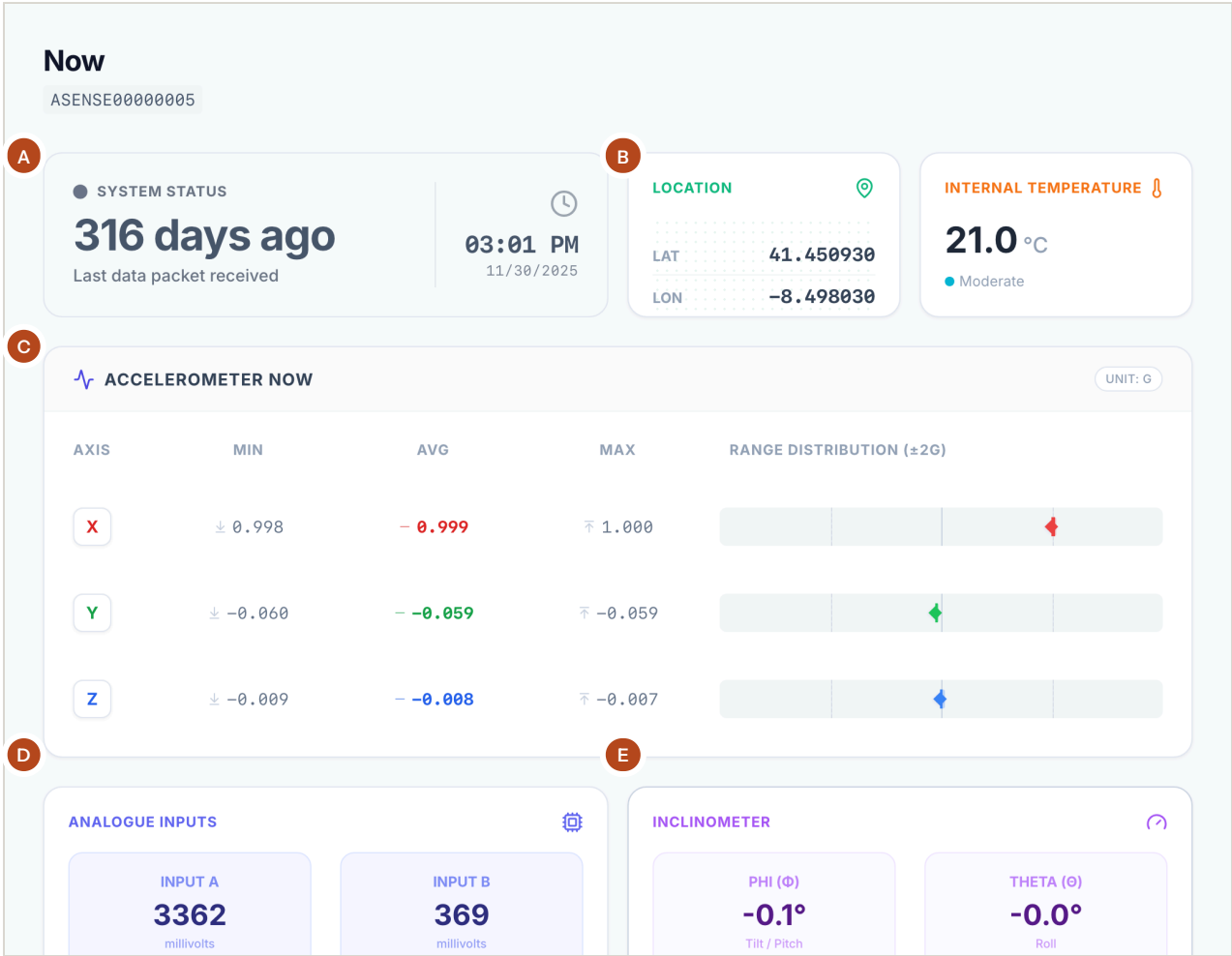
**Structural Monitoring**
Accelerometer, gyroscope, spectroscopy and analog inputs

**Environmental Monitoring**
Particulate matter and noise level

Cancel

- 3 Select **Structural Monitoring**.

Now: latest hourly summary



- A

System status

Time since the last data packet. Normally under 1 h.

B

Location · temperature

GPS position and temperature.

C

Accelerometer

Minimum, average and maximum of the hour, per axis (g).

D

Analogue inputs

Strain gauge inputs A and B.

E

Inclinometer

The two tilt angles.

Recent: hourly trends

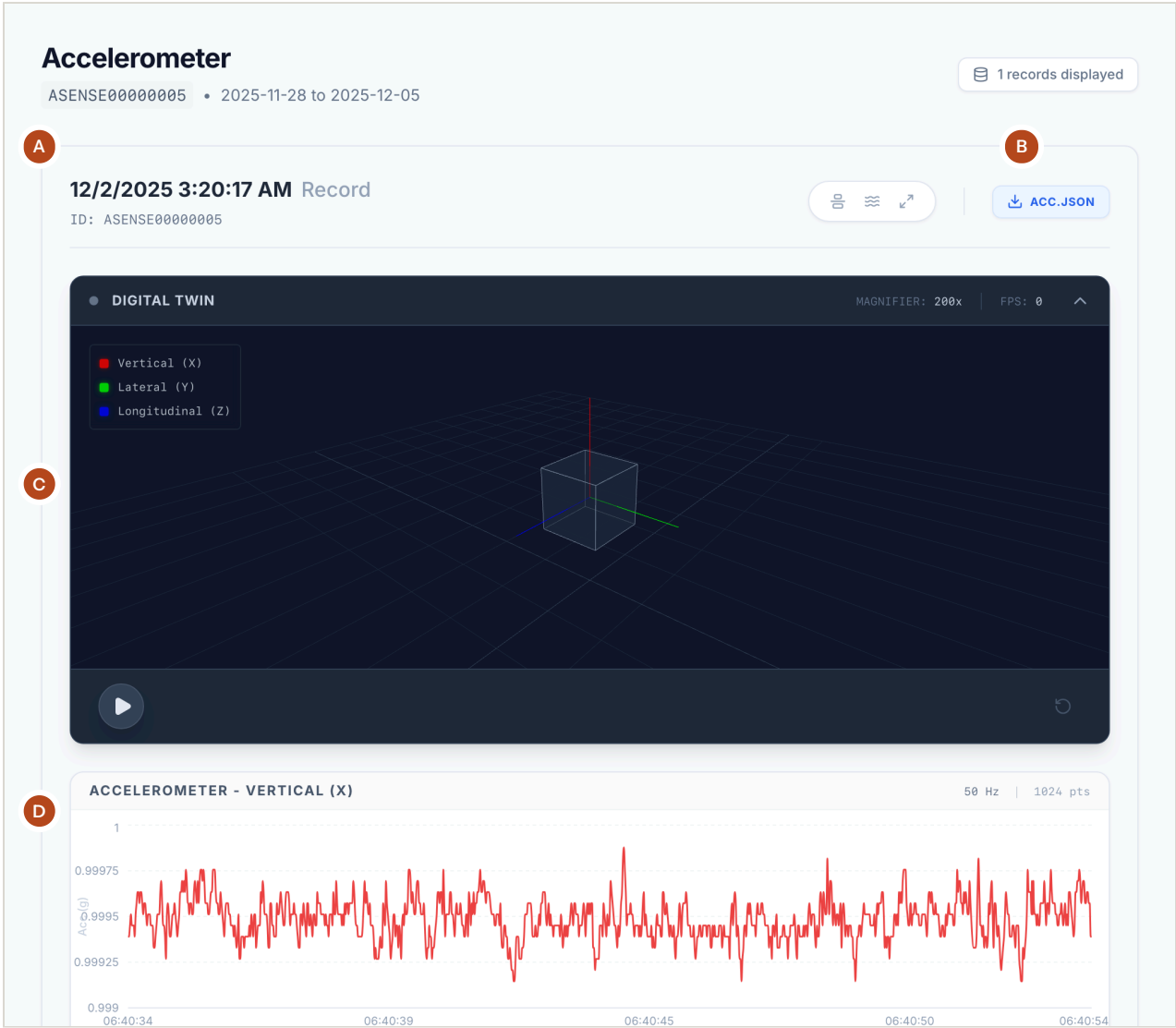


A Acceleration
Hourly average per axis, with the maximum and minimum as dotted lines.

B Incliner
How the two tilt angles move over time.

C Main frequencies
The strongest vibration frequencies of each axis, hour by hour.

Accelerometer · Gyroscope: vibration recordings

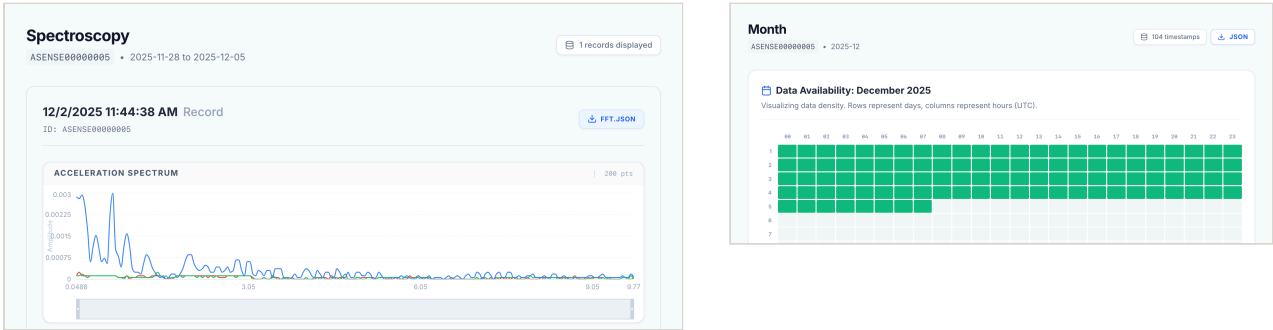


- A Recording**
Date and time of the 40 s recording.

C 3D view
Press play to replay the motion.
The Gyroscope page has the same layout, for rotation.
- B Export**
Download the recording as JSON.

D Traces
One chart per axis, 50 samples per second.

Spectroscopy · Month



Spectroscopy: the hourly spectrum of each axis. **Month:** which hours have data; rows are days, columns are hours. All dashboard times are UTC.

5

What it sends

Three publications every hour, over LTE-M or NB-IoT.

Hourly summary

Acceleration	Average, maximum and minimum on each axis (g)
Tilt	Two inclination angles
Main frequencies	The two strongest vibration frequencies on each axis, with their amplitude
Wind	Speed and direction (16 sectors), plus six 10-minute average speeds
Strain gauges	Inputs A and B
Other	Ambient temperature, GPS position

Hourly spectrum

The frequency spectrum of each axis, 0 – 25 Hz in steps of about 0.05 Hz. It is the spectrum at the moment it is sent, not the hour's peak.

Vibration recording

Every hour the sensor keeps the 40 s around its strongest vibration and uploads them in full: acceleration and rotation on 3 axes, 50 samples per second. Both share one 32 kHz clock, so they line up sample for sample.

6

Data API

ENDPOINT

https://api.semitronica.pt/asense/v2/
HTTPS GET, JSON response.

HEADER

x-api-key
Your API key (same as the dashboard).

What to ask for

table_name	data	Hourly summary
	fft	Hourly spectrum, one record per axis
	acc	Vibration recording: acceleration
	gyr	Vibration recording: rotation
id	ASENSE...	Serial number of the sensor
start_time	1791364200000	Start, Unix time in milliseconds (UTC)
end_time	1791450600000	End, Unix time in milliseconds (UTC)
timestamps_only	true	Optional, data table only: times without values

Request

```
curl -sG "https://api.semitronica.pt/asense/v2/" \
-d "table_name=data" \
-d "id=ASENSE..." \
-d "start_time=1791364200000" \
-d "end_time=1791450600000" \
-H "x-api-key: YOUR_API_KEY"
```

Response (hourly summary, shortened)

```
{
  "data": [
    { "id": "ASENSE...", "time": 1791367200000,
      "aavgx": 0.998, "amaxx": 1.004, "aminx": 0.991, ... y, z
      "theta": ..., "phi": ...,
      "nx1": 2.34, "mx1": ..., "nx2": ..., "mx2": ..., ... y, z
      "tamb": 18.5, "w_s": 4.2, "w_d": 225.0, "w_s_avg": [ ... ],
      "in_a": ..., "in_b": ..., "lat": ..., "long": ... }
    ],
  "next_timestamp": ...
}
```

MORE THAN ONE PAGE

When the response has `next_timestamp`, ask again with it as `start_time`. Full reference:
asense.readme.io

7 Troubleshooting

Find the symptom. Try the fixes in order, top to bottom.

Sensor not in the Bluetooth list

- 1  Check the supply: 12 – 24 VDC on pin 4, 0 V on pin 2 of the POWER + RS485 connector.
- 2  Wait. On some devices pairing takes a few minutes.
- 3  Turn Bluetooth off and on again.
- 4  Refresh the page and click the Bluetooth icon again.

Pairing fails or keeps disconnecting

- 1  Forget the sensor in your phone's or computer's Bluetooth settings. Then pair again.
- 2  Close the browser or app completely and open it again.
- 3  Reset the Bluetooth adapter: Bluetooth off, wait 10 s, on.

Central shows an error or stops responding

- 1  Refresh the page and go to *Dashboard*.
- 2  Close the browser or app and open it again.
- 3  Forget the sensor in Bluetooth settings, then connect again.

No Bluetooth icon, or nothing happens on click

- 1  Use a supported browser: Chrome or Edge on Windows, macOS, Android, or Linux with the flag on. iOS: a browser with Web Bluetooth (chapter 3).
- 2  Allow the browser to use Bluetooth when it asks.

Tilt readings start with an offset

- 1  Check the mounting: vertical, X axis up, connectors down, less than 2° off.
- 2  Check the sensor is fixed firmly and does not move on its own.

No wind readings

- 1  Check the wind meter cable: RS485-B black on pin 1, RS485-A white on pin 3.
- 2  Open the *Sense* tab in central and check the wind speed changes.

Dashboard shows no new data

- 1  Normal: the sensor sends once an hour. Wait for the next hour.
- 2  Check the sensor has power (see above).
- 3  Check the site has mobile coverage (LTE-M or NB-IoT).

8

Specifications

Measurements

Accelerometer	3 axes, 16-bit · full scale ± 2 , ± 4 , ± 8 or ± 16 g
Accelerometer noise	$70 \mu\text{g}/\sqrt{\text{Hz}}$ · 0.70 mg RMS (100 Hz bandwidth)
Accelerometer drift	Zero-g $\pm 0.15 \text{ mg}/^\circ\text{C}$ · sensitivity $\pm 0.005 \text{ \%}/^\circ\text{C}$
Gyroscope	3 axes, 16-bit · full scale ± 15.6 to ± 2000 $^\circ/\text{s}$ · noise 0.0038 $^\circ/\text{s}/\sqrt{\text{Hz}}$
Recording rate	50 Hz · acceleration and rotation synchronized to a 32 kHz clock
Spectrum	0 – 25 Hz, about 0.05 Hz resolution
Inputs	2 half-bridge strain gauge inputs, 2.5 V reference · RS-485 (wind meter)

Hardware

Power source	Internal lithium battery · or 12 – 24 VDC $\pm 25 \text{ \%}$ supply
Consumption	0.25 W typical · 2 W maximum
Enclosure	Polycarbonate UL94-V0 · IP65 · 130 × 90 × 38 mm · 4 flange holes $\varnothing 5$ mm
Communication	LTE-M / NB-IoT · Bluetooth 5.0 · RS-485