Vibration Sensor
and Temperature

PRODUCT MANUAL

SPECTRA 1.0

PN: PRD00504

VERSION 1.0 - 10/10/2024
|BRAZIL

Sumário

Chapter 1

Technical Information

1.1 Description

The Spectra 1.0 is a smart sensor for asset monitoring with guaranteed connectivity in any application, even in environments with high electromagnetic pollution and/or physical obstacles. This connectivity takes place without the need for wires or frequent device battery changes.

This sensor (IBBX Spectra 1.0) is capable of monitoring the values of vibration and temperature of equipment, through collecting data and sending it to the Gateway (IBBX Bolt) which sends it to the cloud. Once there, and altogether with our real-time data analysis and visualization platform (IBBX Retina Software), it can predict risks and failures, enabling the reduction of unscheduled stoppages and granting more efficiency towards overall maintenance schedule, thus contributing to the adoption of predictive and prescriptive maintenance along the lines of Industry 4.0.

Main applications:

- Rotating Machinery;
- Transformers;
- Turbines;
- Generators;
- Agricultural Machinery;
- Refrigeration systems;
- Escalators;
- Elevators

1.2 Sheet

Mechanics	Dimensions	85.0 x 60.0 mm
	Weight	0.245 Kg
	Working Temperature	-20°C to +60°C
	Degree of mechanical protection	IP65
Communication Interfaces	Wireless Communication	Proprietary LRLC protocol, ISM band, Operating distance 2,000 m (direct sight)
Temperature measurement	Measuring range	-20°C to +120°C
	Tolerance	+-10°C
Vibration measurement	Accelerometer	Triaxial
	Amplitude range	+-8g, +-16g, +-32g and +-64g
	Detection Type	RMS
	Global Measurements	**Global:** Acceleration, Velocity, Envelope, Temperature
	RMS Measurements	Acceleration, Speed
	FFT measurements	Acceleration, Envelope
	Spectra Measurements	Time Wave Form (g), FFT Acceleration, FFT Speed, FFT Envelope ***Once a day**
	Stitches	4096
Data collection and transmission times (Standard)	Data collection interval	10/10 minutes
	Data transmission interval	Global Transmission: 60/60 minutesDynamic Transmission: 1 time per day
Food and consumption	Built-in battery	LiPo 3.7V 4000mAh (rechargeable)
Fixation	Form 1	M8 screws per fixing hole
	Form 2	Chemical Adhesive
	Form 3	Magnetic (Neodymium Magnet)
Certifications	Anatel	Homologation: 100292314090

Operational Notes and Recommendations

The sensor is designed to measure temperatures of up to 120°C at the target. However, targets with high temperatures can transfer heat to the interior of the sensor, especially in hot outdoor environments.

As the internal temperature of the sensor is not directly accessible, it is essential to ensure that external conditions (of the target and the environment) remain within the specified working temperature limits -20°C to +60°C. Failure to comply with these specifications may cause damage to the sensor's internal components, negatively impacting data analysis and the useful life of the device.

1.3 Overview

1. Case
2. Label with QR Code
3. Fixing Base
4. Orientation Axis
5. Activation key
6. Power charging input

1.4 Packing

The Spectra 1.0 packaging consists of the following items:

- 1 PC – Spectra 1.0 Packaging Box
- 4 PC – Spectra 1.0 device.
- 1 PC – Inner Cradle Spectra 1.0 Packaging Box.
- 1 PC – Bubble Wrap 10 x 10 cm.
- 1 UN – Screw M3 Philips short
- 1 UN – M8 Allen Fastening Thread

Box IBBX Spectra 1.0

Protection Bubble wrap

Short Screw M3 philips

M8 Allen Fastening Thread

QR Code do site IBBX

Dispositivo Spectra 1.0

1.5 Accessories

5V Individual Charger

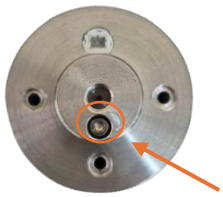
The individual charger for **Spectra 1.0** is a compact and efficient accessory designed to recharge the device's battery with ease. It uses a standard USB input, making it ideal for various environments, from field operations to industrial applications, ensuring reliable support for the continuous operation of the **Spectra 1.0**.

Chapter 2

Installation, Configuration and Operation

2.1 Powering on and connecting the Spectra 1.0

Step 1: Turn on the Spectra 1.0 by removing the golden Philps screw and adding the black Philips screw

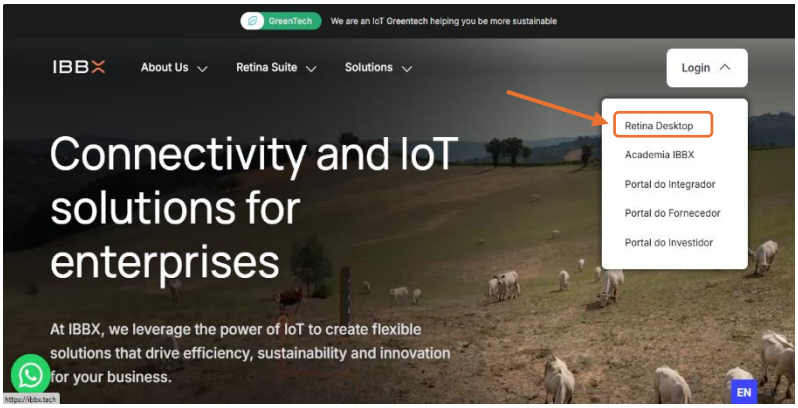


Black Philips screw (minor length)

Philips screw (longer length)

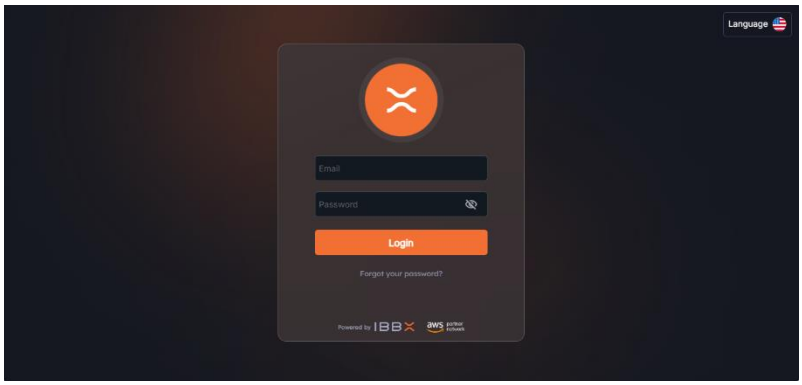
Step 2: Access the Software Platform

Access the IBBX website through the link https://ibbx.tech, on the website you will find the path to login to the Platform Retina.Se you already have a shortcut to access Retina this step is dispensable.



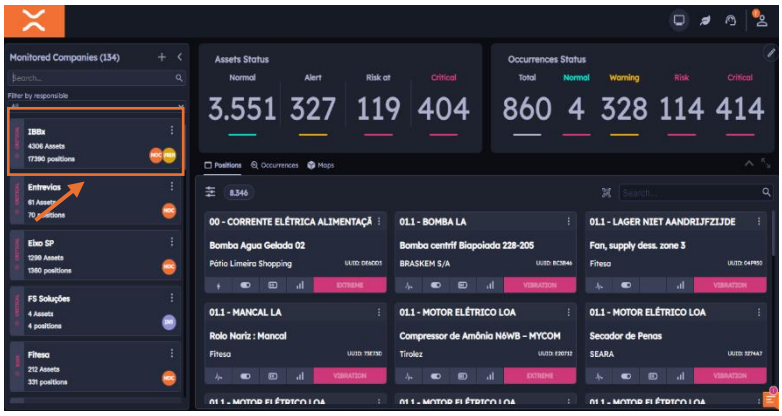
Step 3: Login to Retina

With your registration in hand, log in to the Retina platform *If you do not have an account to access the platform, look for your Commercial Manager to be registering.



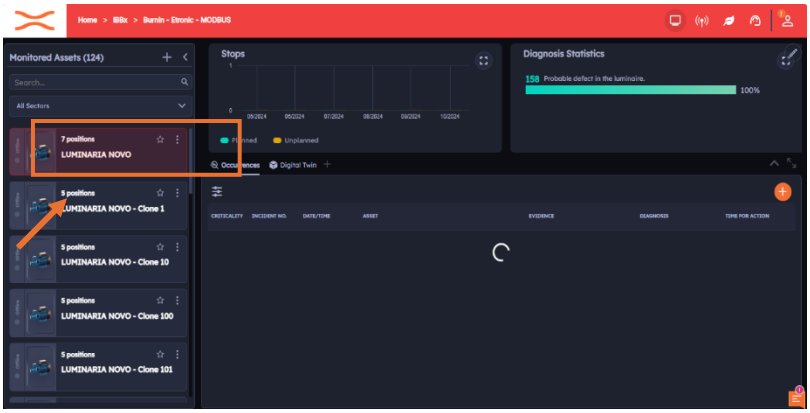
Step 4: Access your Unit/Area/Sector

Access the desired unit by selecting "Monitored Units" from the left side menu.



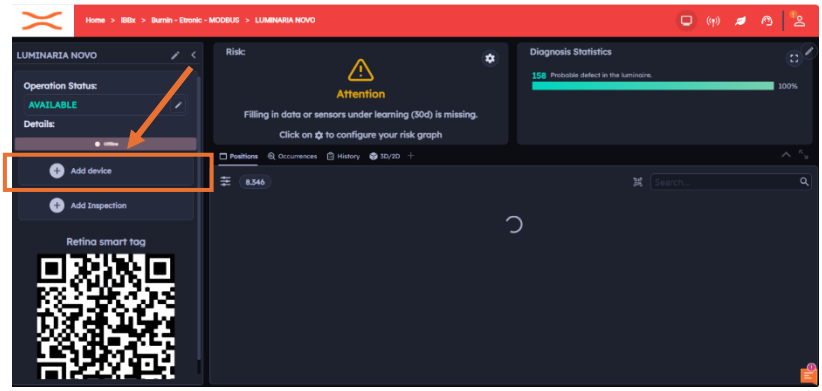
Step 5: Access the asset to be monitored

From the left side menu, select the equipment on which Spectra 1.0 will be installed



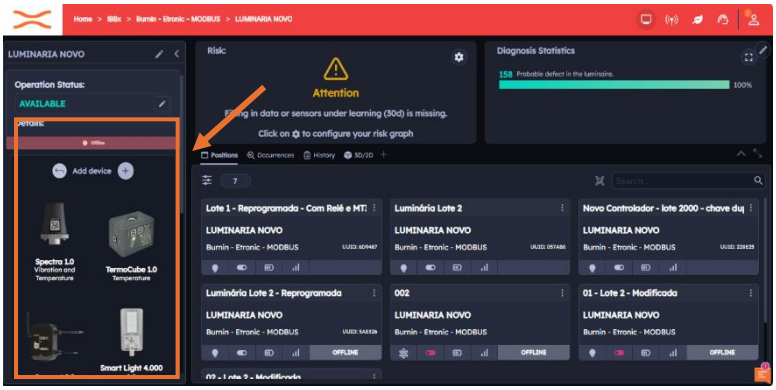
Step 6: Click on the Add Device button

Click on the "Add Device" button and follow the indicated step by step choosing the type of device



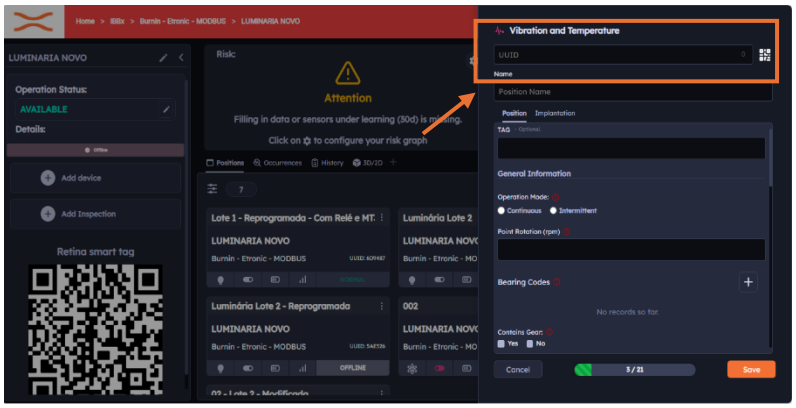
Step 7: Choose Spectra 1.0

Make the choice of Spectra 1.0.



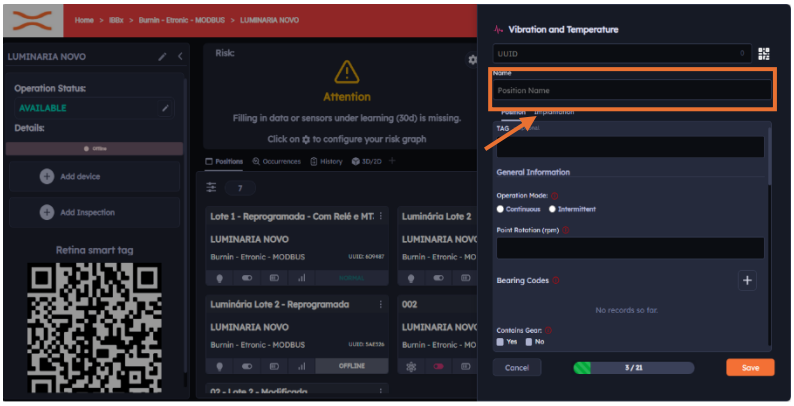
Step 8: Fill in the UUID

Fill in the UUID manually or scan the QR Code located on the device, clicking on the QR Code as indicated in the figure on the side



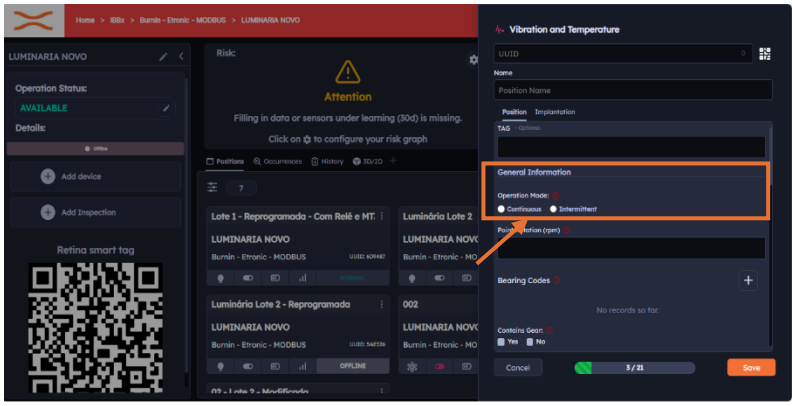
Step 9: Fill in the name of the point

Fill in the name of the point in order to facilitate its identification



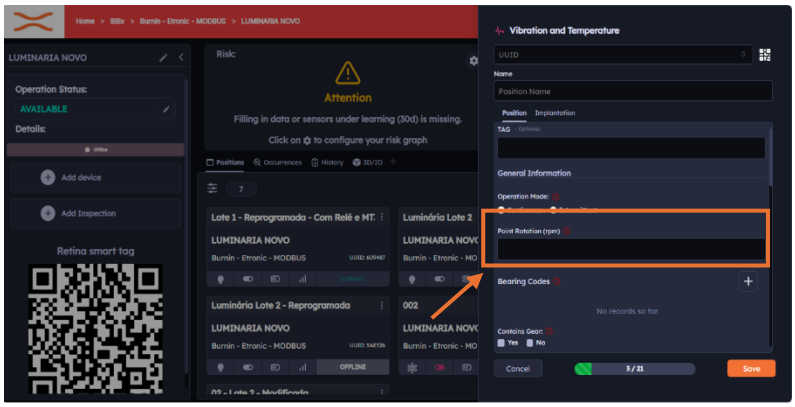
Step 10: Select the asset's operating mode

Select the asset's operating mode, choosing between continuous or intermittent.



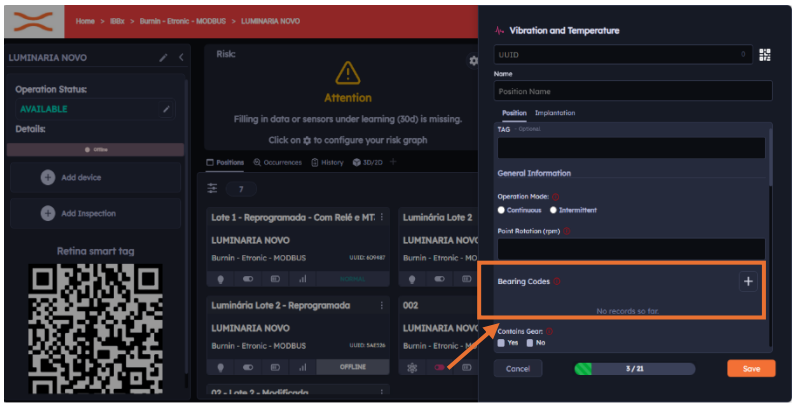
Step 11: Enter the point rotation (rpm)

Fill in the rotation per minute of the monitored point.



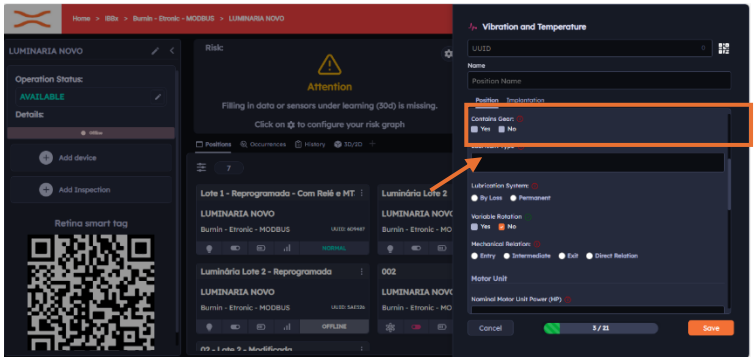
Step 12: Add the bearing codes

Clicking on the add bearing codes button will open a field for you to choose the bearing code



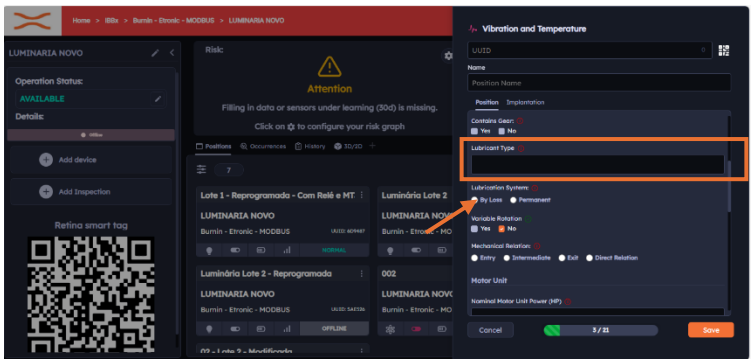
Step 13: Inform if they contain gear

If the monitored point has meshes, selecting "Yes" will open a field to fill in the Number of teeth.



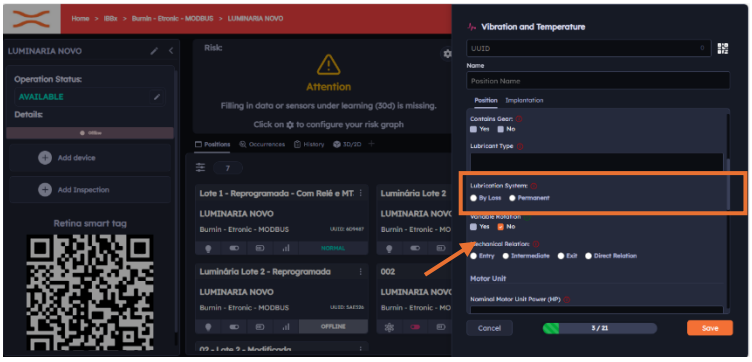
Step 14: Fill in the lubricant type

Fill in the lubricant type of the monitored point.



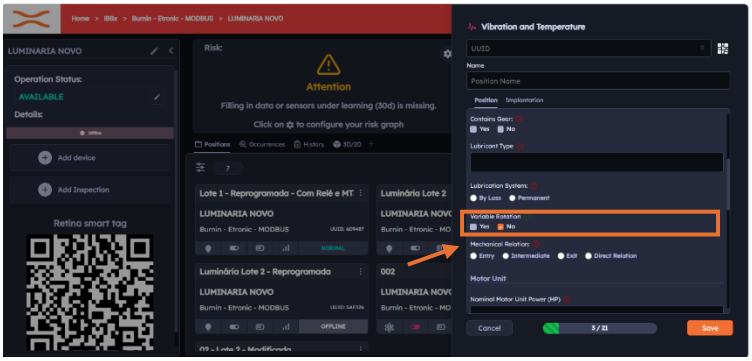
Step 15: Enter the Lubrication System

Inform the lubrication system used if it is for Loss or Permanent.



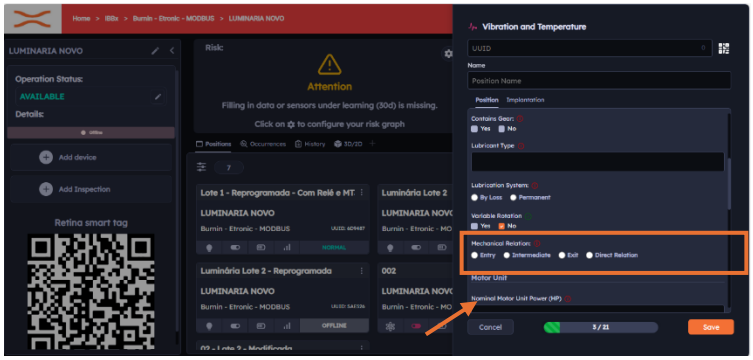
Step 16: Fill in the Variable Rotation field

Fill in the Variable rotation field according to the monitored equipment.



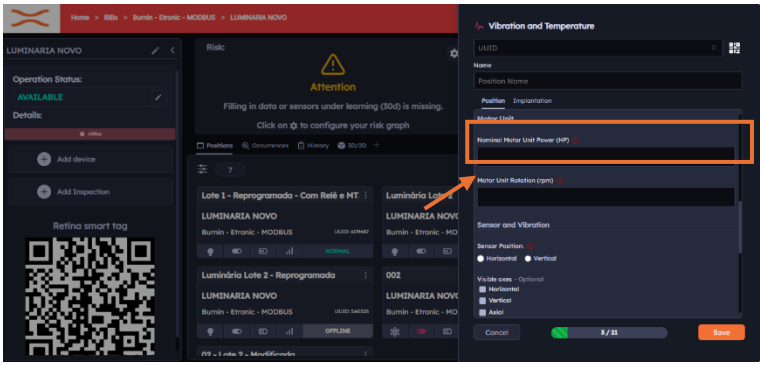
Step 17: Select the mechanical ratio

Perform the selection of the mechanical ratio of the monitored equipment



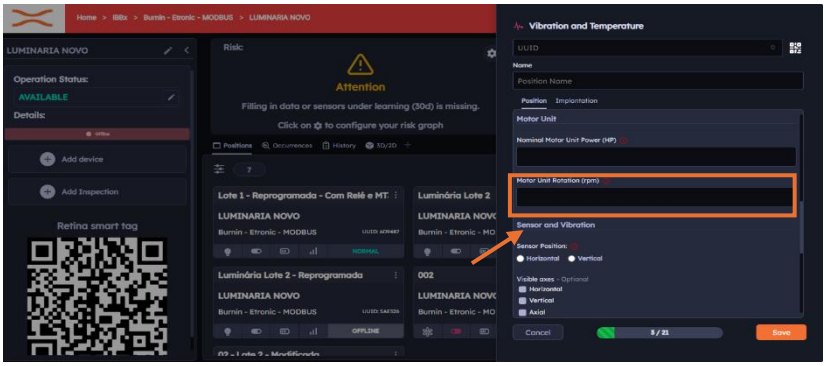
Step 18: Fill in the rated power of the motor unit

Fill in the rated power of the drive unit in CV



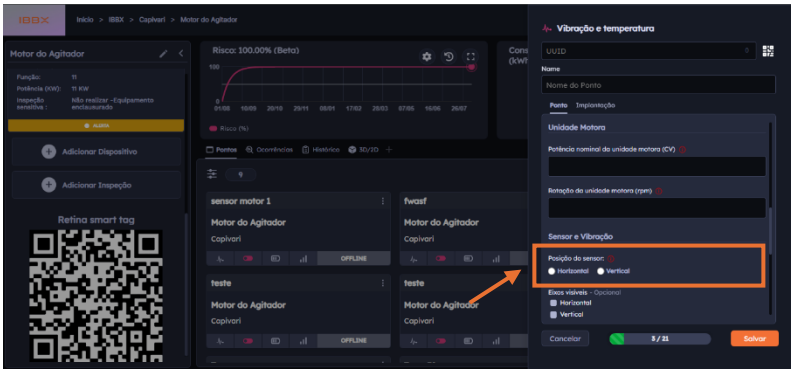
Step 19: Fill in the Drive Rotation

Fill the rotation of the motor unit in rpm



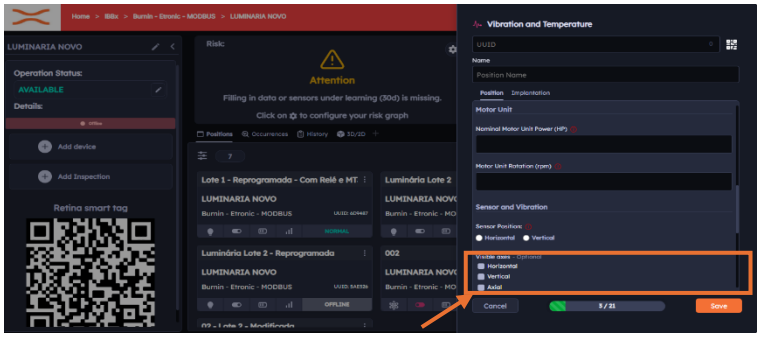
Step 20: Fill in the sensor position

Perform sensor position filling



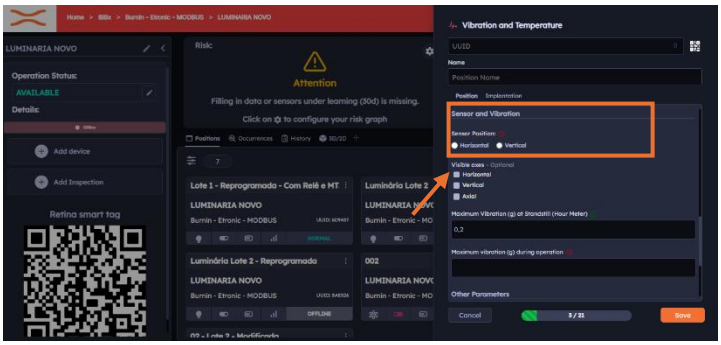
Step 21: Select the visible Axes

Perform the selection of visible axes.



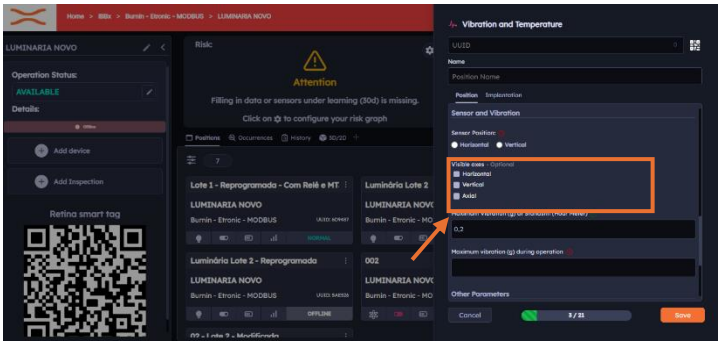
Step 22: Report the Maximum Vibration (g) Stopped

Fill the maximum vibration field (g) with the machine stopped



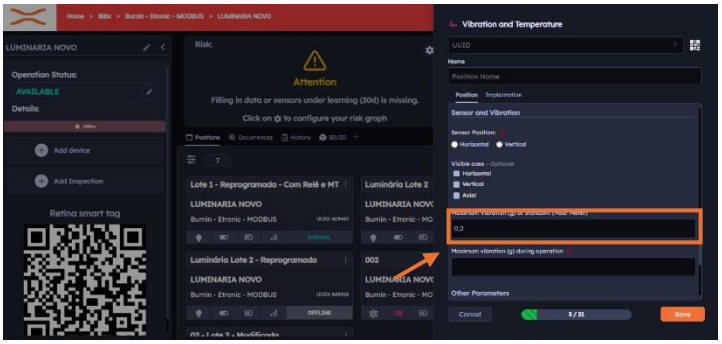
Step 23: Report the maximum vibration (g) in operation

Fill the maximum vibration field (g) with the machine running



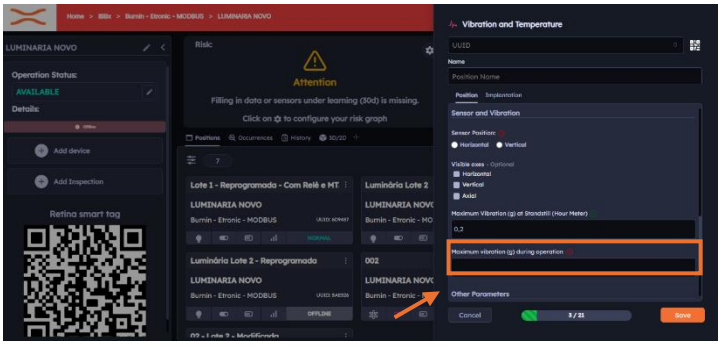
Step 24: Enter the type of coupling

Fill in the coupling type field.



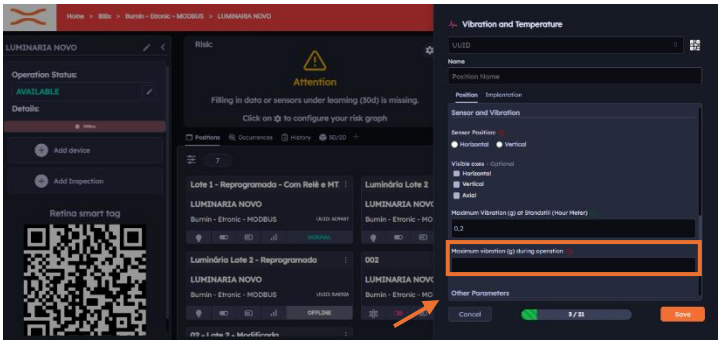
Step 25: Rigidity system

Select the type of stiffness system.



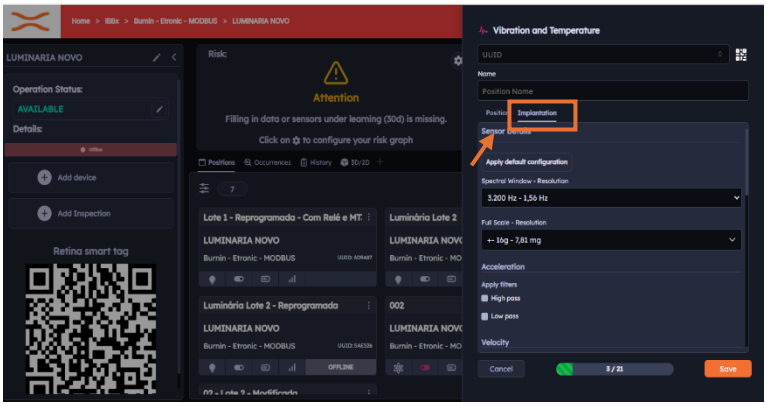
Step 26: Fill in comments (optional)

If necessary, fill in the comment field.



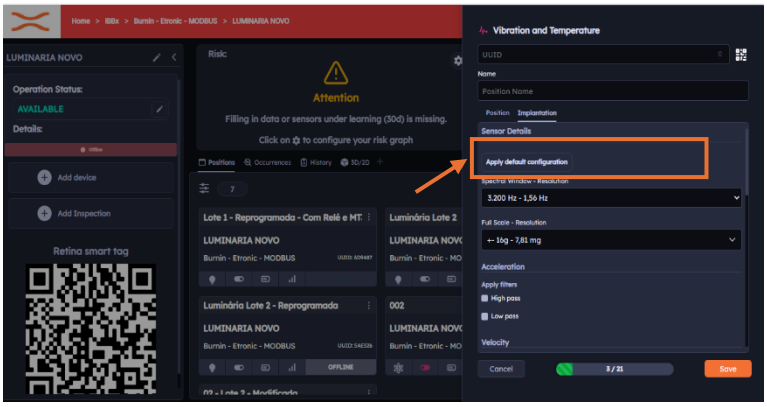
Step 27: Select the Deployment Tab

Select the deployment tab.



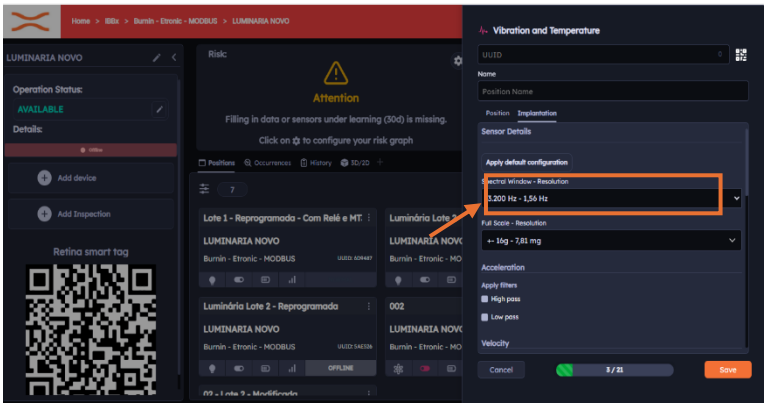
Step 28: Apply default configuration

Through the apply default configuration button, you set all the parameters of the deployment tab automatically according to the filling in the time tab.



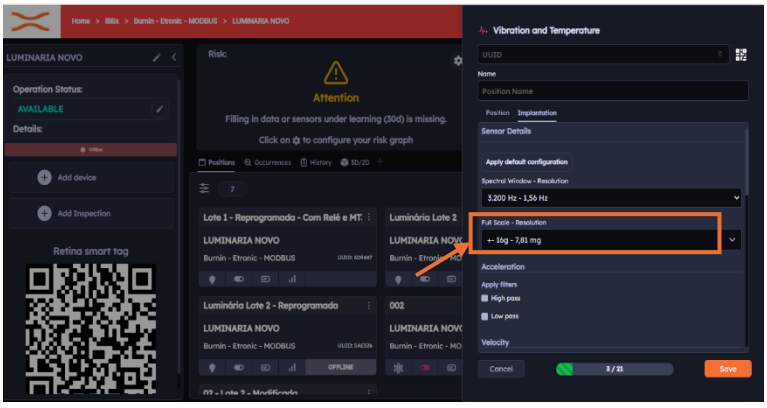
Step 29: Select the Spectral Window

Perform the selection of the expectral window (Frequency range to be monitored)



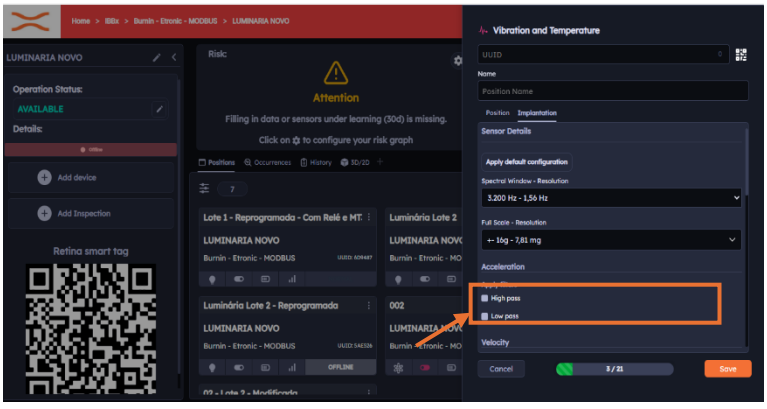
Step 30: Select the Scale Background – Resolution

Perform the selection of the scale background.



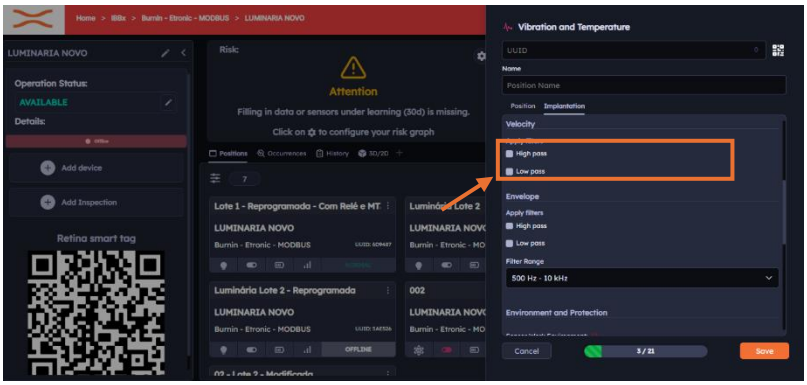
Step 31: Selecting filters for acceleration

Select filters for acceleration, being able to choose high pass and low pass, after that inform the cutoff frequency (Hz) in both cases



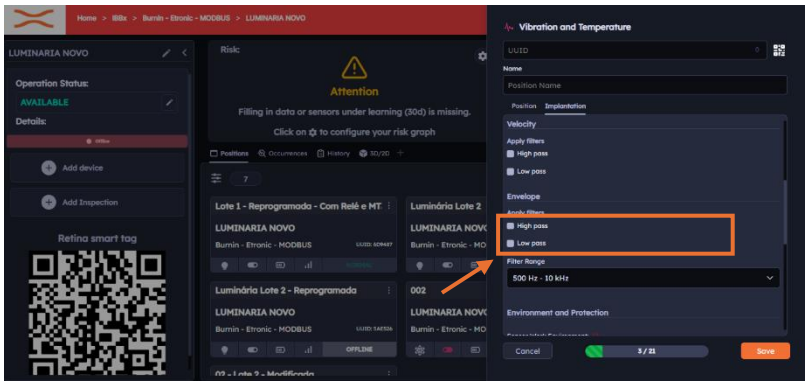
Step 32: Selecting filters for Speed

Select filters for speed, being able to choose high pass and low pass, after that inform the cutoff frequency (Hz) in both cases



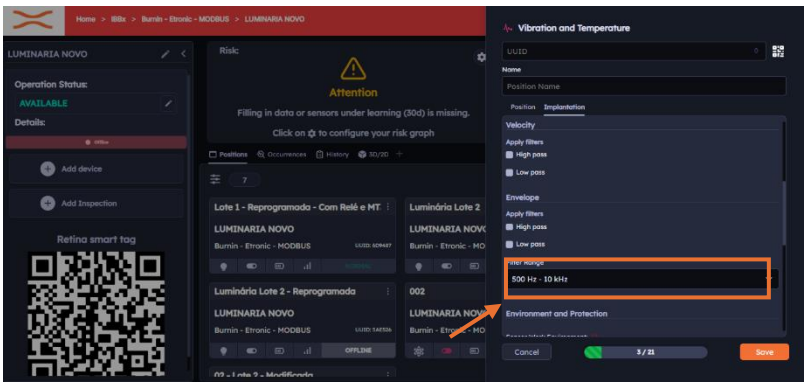
Step 33: Selecting filters for Envelope

Perform the selection of envelope filters, being able to choose high pass and low pass, after that inform the cutoff frequency (Hz) in both cases



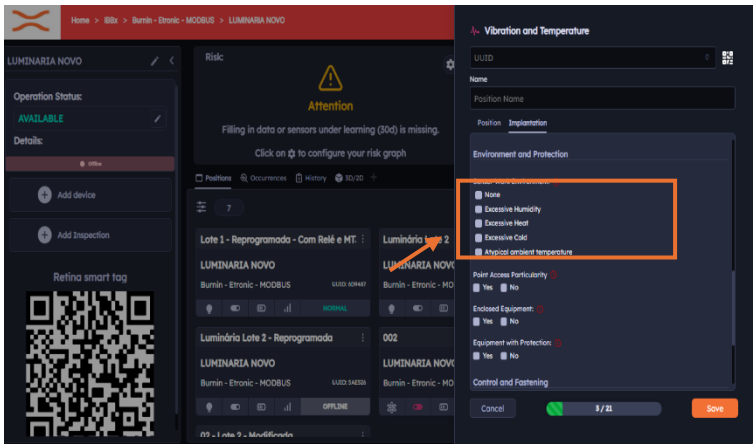
Step 34: Enter the filter strip

Perform the filter strip selection.



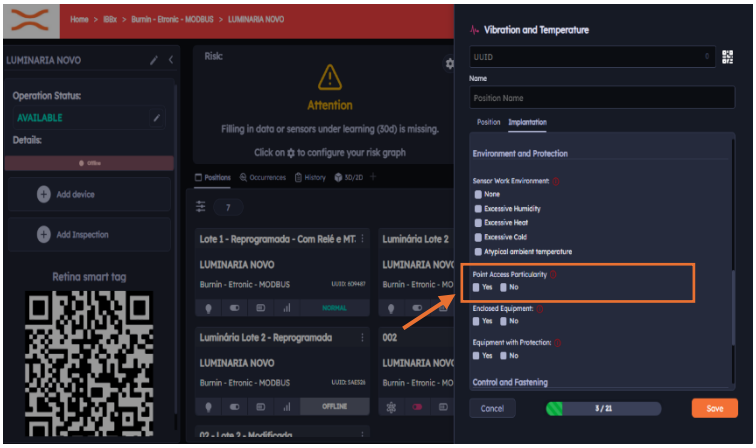
Step 35: Enter the sensor's working environment

Inform the sensor's working environment



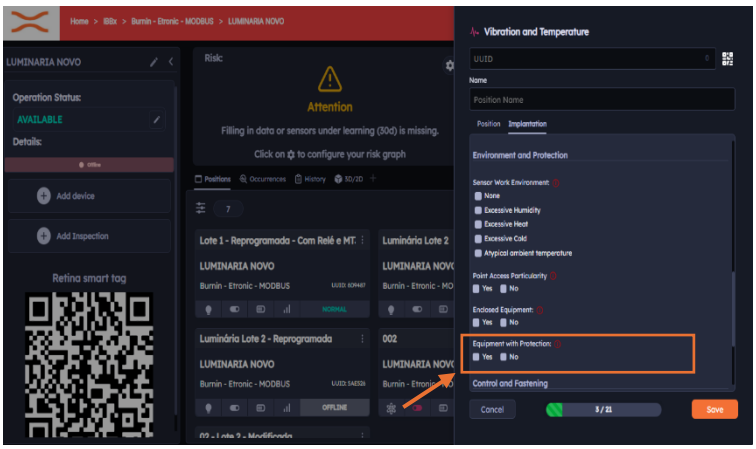
Step 36: Inform if there is any particularity in the access to the point

Inform if there is any particularity in the access to the point, if selected yes, a field will open to describe the particularity.



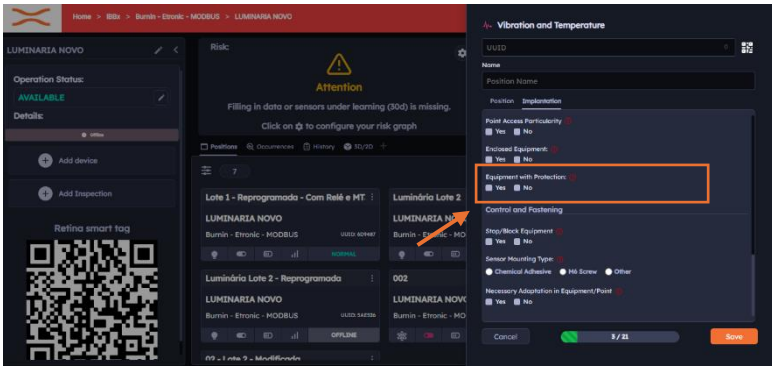
Step 37: Enter if the Asset is enclosed

Inform if the asset is enclosed.



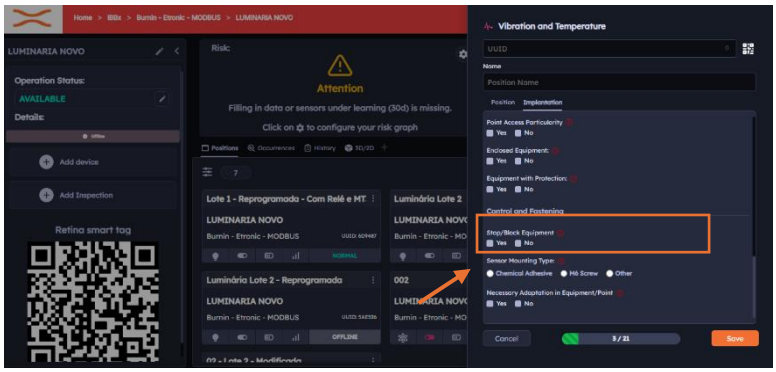
Step 38: Perform the Active Field with Protection selection

Select the active field with protection, if yes inform the height of the protection.



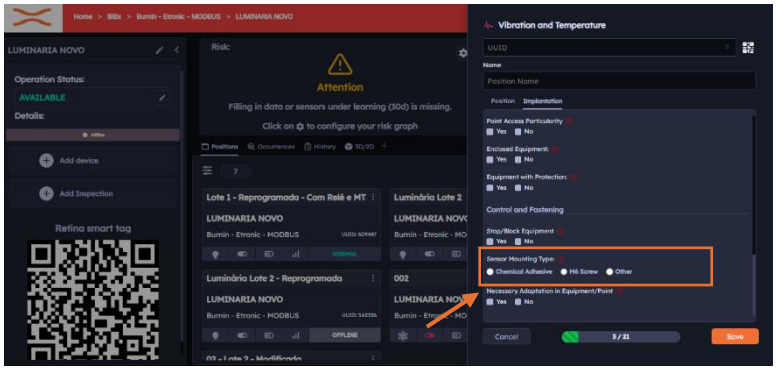
Step 39: Perform the Asset Stop/Lock Field selection

Select the stop/block field of the asset, if yes enter the block time (min)



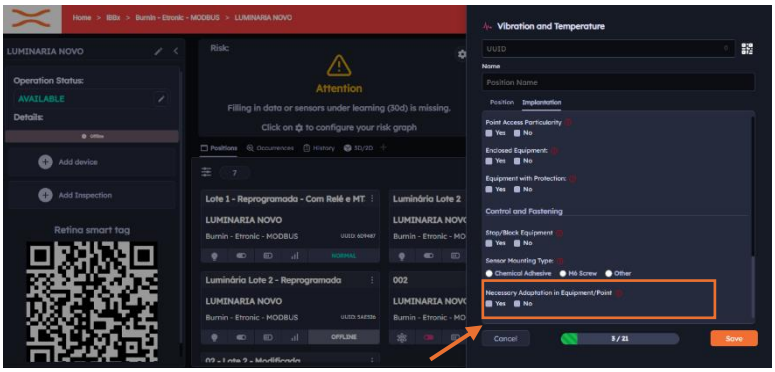
Step 40: Perform the selection of the Sensor Attachment Type Field

Enter the type of sensor attachment

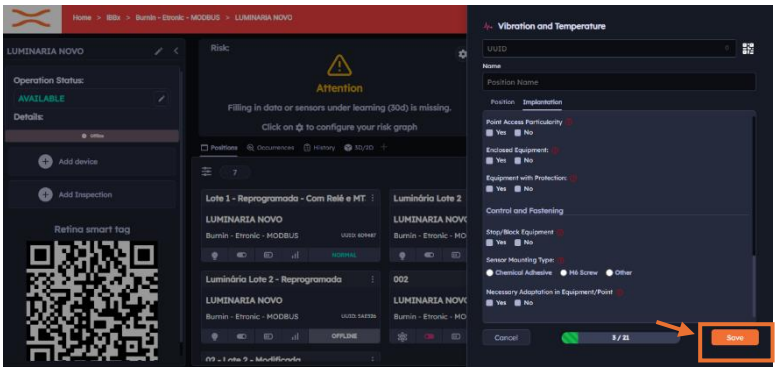


Step 41: Perform the selection of the required adequacy field in the asset/point

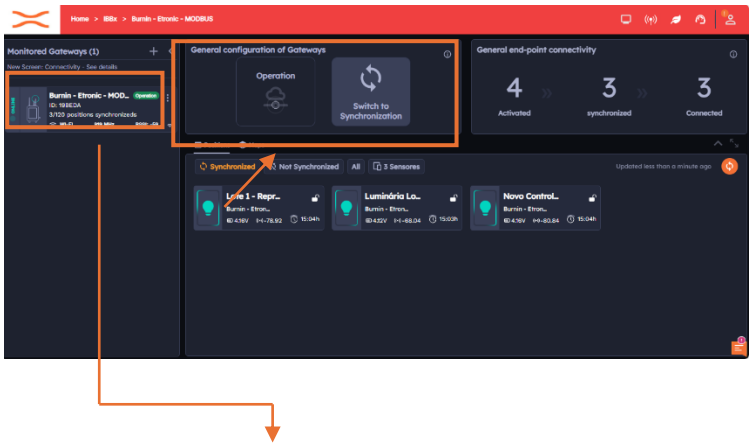
Inform if there is necessary adjustment in the asset/point, if yes it will open a field to fill in the type of necessary adjustment.



Step 42: Click Save
To finish the sensor setup step, click Save.



Step 43: Synchronize the Spectra 1.0 with the IBBX connectivity network of the desired unit



It is important to understand that for each application you must choose/configure the gateway network differently, depending on the desired transmission interval (10 min, 1h, 24h, etc.).

In the "Bolt Gateway Setup Mode on Unit" section, select the current mode for "Sync" as highlighted in the figure opposite.

After the activation of the point, synchronization should occur automatically. The synchronization time depends on the number of sensors that

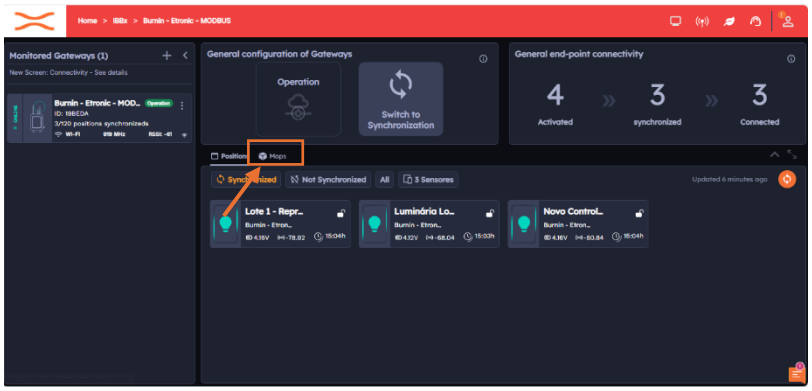
It is important to make sure that the Gateway is active in an operating state

Once the synchronization of the Spectra 1.0 to the Bolt is finished, it is necessary that the Bolt is in Operation Mode, as shown in the Figure. This step is necessary for the sensors to be able to send the data.

ATTENTION

You can only register one QR-Code per point, as the system does not allow you to register it at more than one point

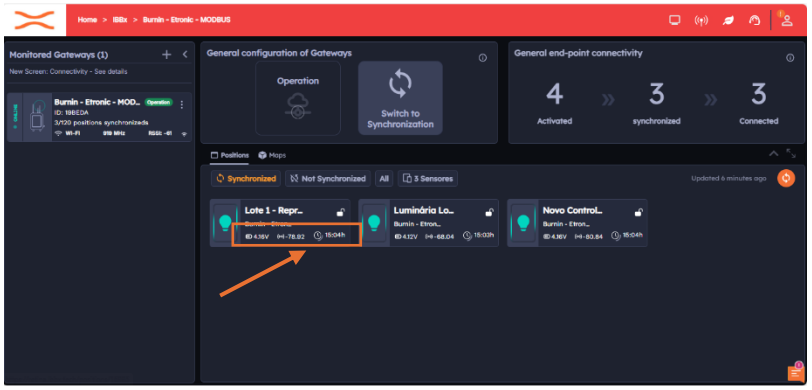
Step 44: Spectra 1.0 Operation Management



To manage the clock, follow the following instructions:

1- Access the monitored unit
2- Access the Connectivity tab
3- Access the points tab

Points tab:



In the points tab you will have access to information from all devices connected to the Bolt Gateway 1.0, as well as battery status information and device connectivity quality

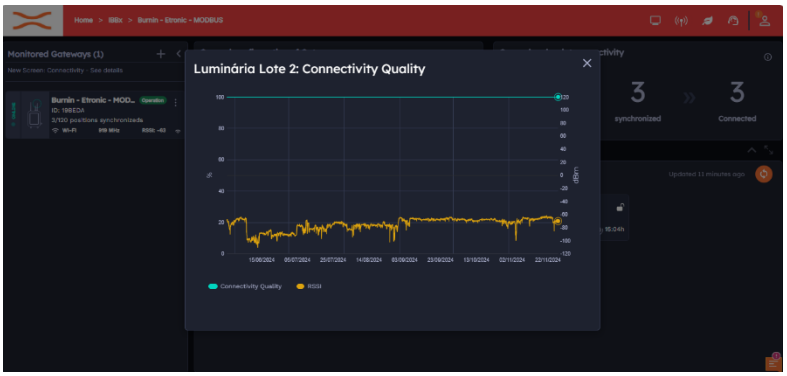
To access the battery conditions, click on the location informed in the figure on the side, as described below

4- Access to Battery conditions

Figure: Device Connectivity Quality

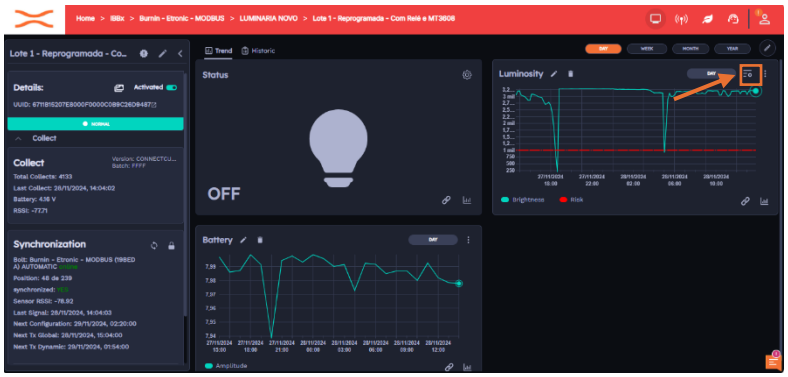
By clicking on the Battery you will have access to the Battery conditions of the Access Device (Green Measured Line/Expected Yellow Line)

5- Access to connectivity conditions and status: By clicking on item 5, as shown in the image, you will have access to the device's connectivity status (Green line is the connectivity quality and yellow is the strength of the received RSSI signal, which is measured in dBm)



Step 45: Alarm Set Configuration

To configure the alarm set, choose a chart you want to configure and click on the button as indicated in the image on the side.



Then a screen will open for alarm configuration:

Configure case submission.

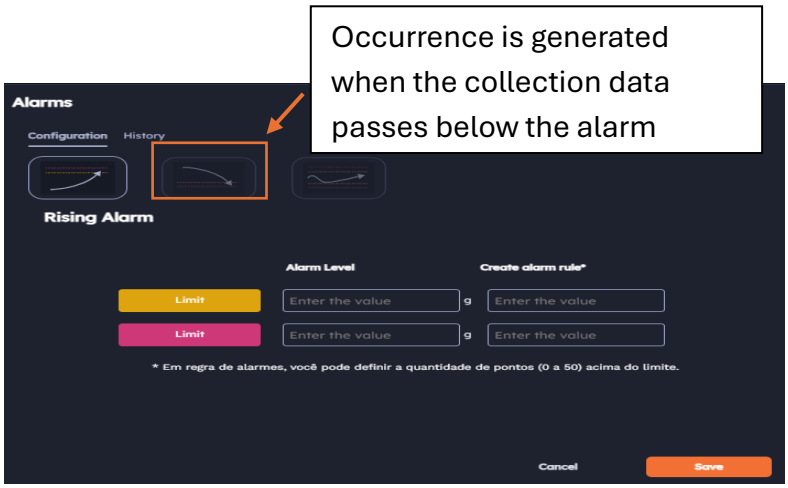
This step must be aligned according to the need to trigger the alarms, and there can be three conditions for sending.

1. **Occurrence generated, when the collection data passes above the alarm:**

   In this configuration, it is necessary to enter the limit point and the extreme of the alarm configuration.

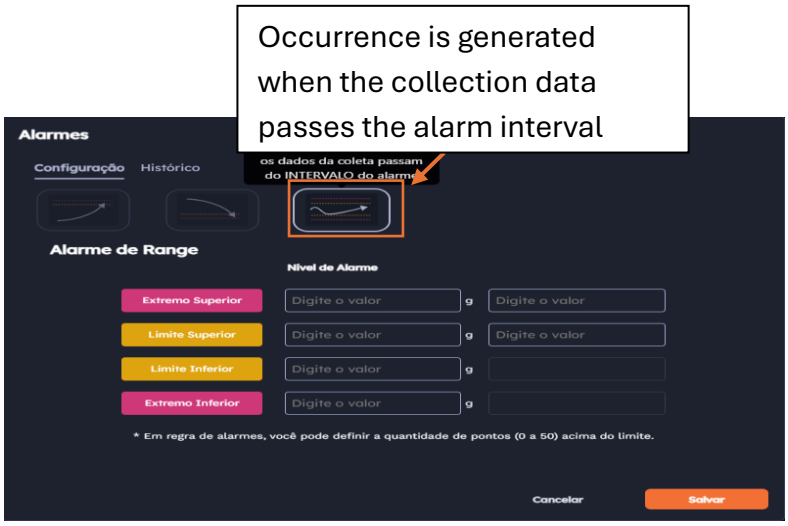
2. **Occurrence generated, when the collection data passes below the alarm:**

In this configuration, it is necessary to enter the limit point and the extreme of the alarm configuration.



3. **Occurrence generated, when the collection data passes below the alarm:**

In this configuration, it is necessary to enter the upper and lower limit point and the upper and lower end of the alarm configuration.



2.2 Mode of operation

Spectra 1.0 collects data at scheduled intervals, configured as needed by each application, ensuring that the information captured accurately reflects the operational state of the monitored assets. In standard mode, data collections are carried out in 10-minute cycles, ensuring a continuous visualization of the dynamic behavior of the machines.

In terms of transmission, Spectra 1.0 is programmed to send global data every 1 hour, allowing the integration and analysis of this data in centralized systems, such as the IBBX Retina platform. This frequent submission makes it easier to identify trends and detect anomalies early, allowing corrective action to be taken quickly and effectively.

In addition, dynamic data transmission occurs at 24-hour intervals, providing a more detailed view of operating conditions over extended periods, which aids in the detection of potential wear or intermittent failures. Adjustment of the RF setting is also performed every 24 hours, ensuring that communication between the devices and the monitoring system remains stable and efficient, even in environments with interference or changing operating conditions.

2.3 Power Supply and Power Consumption of the Spectra 1.0

Internal Battery Power (No External Power Sources)

The Spectra 1.0 comes equipped with an internal rechargeable **4,000 mAh lithium-ion battery**, which allows independent operation of external power sources. With this configuration, the useful life of the device can vary between **14 months** transmitting at intervals of **1 h**, and **18 months** transmitting at intervals of 2 hours

In addition, the **Spectra 1.0** is rechargeable, which provides a practical and efficient solution to ensure its continuous operation in industrial environments. Below is a step-by-step process regarding the Spectra 1.0 battery charging process

1. Spectra 1.0 Battery Charging

Spectra 1.0 Loading Process

1- Check the Sensor Status

An image containing metal parts, screw, dark, single Automatic description **Spectra 1.0** is turned off by inserting the golden M3 philips screw.

2- Connect the Charging Cable

Use a cable with two JST PHR-2 female connectors.
Plug one end of the charging cable into the connector located at the base of the Spectra 1.0 and the USB end into the power adapter, which will be connected to a 110/220V power source.

4- Disconnect

After full charging, disconnect the sensor cable carefully to avoid damage to the connector. Replace the sensor in its place of use and, if necessary, turn it back on using the short screw M3 philips black.

2.4 Connectivity to the IBBX gateway network (Distances and barriers and other factors)

The connection of Spectra 1.0 depends on the network of gateways available at the installation site, so make sure before installing it, how the local network is configured in terms of distance factors, barriers, transmission and performance times, among others, and confirm that it meets the project.

It is also important to understand the environment in which the project is located to know the distances between Spectra 1.0 and the nearest gateways. For this, we have prepared a guideline table below:

Environment	Characteristics	Examples	Maximum distance
A	Barrier-free open locations between Spectra 1.0 and the nearest gatewayBarrier-free open locations between Spectra 1.0 and the nearest gateway	Water and sewage treatment plants, agricultural crops, industrial yards, open fields, indoor industrial areas in general	2000m
B	Open sites with some barriers between Spectra 1.0 and the nearest gateway	Open, tall industrial sheds, mining conveyors, city streets, forests	1000m
C	Closed sites with many barriers between Spectra 1.0 and the nearest gateway	Closed industrial warehouses with many metal structures, reinforced concrete walls, basements, enclosed environments	300m
Special Cases	Outdoor use cases, distance over 5km among other factors	Connection between cities, underground equipment, mobile and armored equipment	On-demand IBBX project

Table of distances between Spectra 1.0 and gateway depending on the environment.

Note1: Remember that these distances are between the Spectra 1.0 and the gateway mais próximo, utilizando protocolo IBBX.

Note2: This table is indicative, in special projects or in lack of connection following the table below, look for the IBBX support team.

Note3: The distance in the "A" environment can reach 30km in special IBBX projects, for this, consult the Bolt 1.0 gateway manual or your commercial manager for more information.

Spectra 1.0 Attachment

Mounting

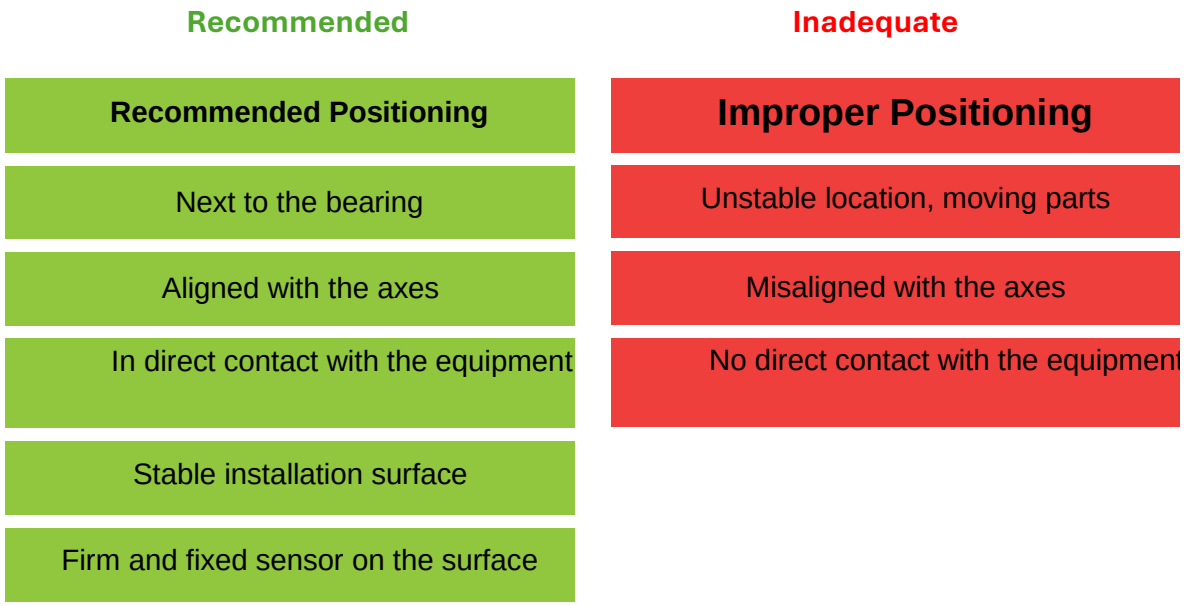
The applicable installation methods are briefly described in the following sections.

Spectra Installation on the Asset

The device must be fixed in such a way as to ensure the best mechanical coupling on the surface of the asset to be monitored. The point chosen for the fixation must be as close as possible to the bearing and in direct contact with the equipment.

The installation location on the asset must be prepared in advance: make sure that the attachment location is clean and dry and that there is no dust or oil residues, regardless of the installation method to be followed.

Installation Guidelines:



Note: The above positioning guidelines must be followed to ensure proper operation of Spectra 1.0.
Recommended positions are indicated as they provide accurate readings from more reliable data.
Improper positions can result in inaccurate readings, so they should be avoided.

Installation Methods

The Spectra 1.0 can be installed in three ways: fastening by screw, glue or magnet. These three methods will be presented below:

1) Screw Installation

To facilitate the installation of the Spectra 1.0 device, have the following items on hand:

- Hammer and punch;
- Drill/Screwdriver;
- 6.8 mm drill bit;
- T-T Stripper;
- Male of 8

Step 1: Identify the point for attachment

- Identify Points in the Asset
  stable and fixed (see figure on the side);

- Select from these points,
  which are workable for installation
  the Spectra 1.0 device;

- Pay attention to possible environmental risks, such as: machinery working, cutting surfaces,
  among others, which are particular to
  every place or company.

- With proper authorization, start the booking process

Step 2: Marking the point to be pierced

- After Once the best possible place for fixing the Spectra 1.0 device has been identified, pick up the tools necessary for marking the hole: hammer and punch. Attention: use gloves for your protection.

- Position the punch tool exactly at the point where the hole will be drilled and mark the place with the help of a hammer, leaving a mark on the surface. This procedure prevents the drill from sliding at the time of drilling.

Step 3: Drilling and Thread Preparation

- Position High Speed Steel Drill Bit
  6 mm over marking previously
  punched, and start drilling
  gradually applying force under the

drill. If necessary, use water
Cut to facilitate drilling.

Attention! The hole should have the depth
maximum of 4 mm, to avoid damage to the asset.
After drilling, clean the place for the
execution of the next step.

Step 4: Create Thread for Bolt Attachment

- In possession of a diswalker and a
  8mm tap, fit the tap
  correctly in the disbander.

- Start the thread creation process

  Rotating the tap inside the hole

  previously done.

- Clean the site after the thread is manufactured.

Step 5: Screw Fastening

- In possession of the Allen M8 screw, apply a medium torque thread lock to its threads;

With the help of the Allen key, start threading the screw at the base of the sensor to the limit, applying enough force to lock it;

- If it is necessary to use a spacer to fix the sensor (insufficient space to screw the sensor, or lack of direct contact with the asset), repeat the previous steps for fixing the screw to the spacer (apply a thread lock to the spacer).

Step 6: Attaching the sensor to the asset

- Deposit threadlocker in the hole of the
  active, and thread the sensor into the active
  manually until you reach the end of the
  thread stroke.

- Use a 19 mm wrench to
  Spectra 1.0 fixation, if possible.

The torque on the sensor should be only the necessary for its locking, thus ensuring a good transfer of energies from the asset to the sensor.

Step 7: Positioning according to axes

Sensor Adjustment

- Adjust the sensors according to the axes indicated at the top of Spectra 1.0. For a better adjustment, spacers can be used to ensure that the sensors are secured in position Desired.

The closer the fixture is to the axles, the more accurate the information will be.

Side Clamping (Optional)

- If you can't pin Spectra 1.0 to the superior of the asset, it can also be fixed sideways.

Make sure the axis is aligned with the asset, as demonstrated in the previous step.

2) Installation with Glue

To facilitate the installation of the Spectra 1.0 device, have the following items available:

- Iron G180 Sandpaper
- Adhesive anaerobic structural AA 319
- Spray adhesion activator SF 7649

Step 1: Preparing the Site for Glue Fixation

- The site should be cleaned and sanded, removing

All ink and impurities present in the asset

before fixing the sensor.

Step 2: Application of activator for the glue

- Apply the SF 7649 activator to the asset, exactly in the place that was previously prepared.

- Perform the same application (SF 7649 activator) at the base of the sensor that will be fixed to the asset.

Step 3: Applying the glue to the sensor

- After applying the activator, apply AA 319 glue to the base of the sensor (a thin layer surrounding the base that will be in contact with the active ingredient).

Step 4: Hold the sensor in the asset

- After the application of the activator and glue, Position the sensor in the final position of monitoring in the asset.

- The glue is fast-acting: after 20 to 40 seconds the Spectra 1.0 will be fixed in place on the vertical position, and from 1 to 2 minutes, in the horizontal position.

  Attention: Pay attention to the position of the axles. After Glued it is not possible to reposition the sensor.

Step 5: Final Inspection of the Facility

Perform a visual inspection of Spectra 1.0

in the asset, to ensure that all the fastening

It went according to plan.

3) Magnet installation

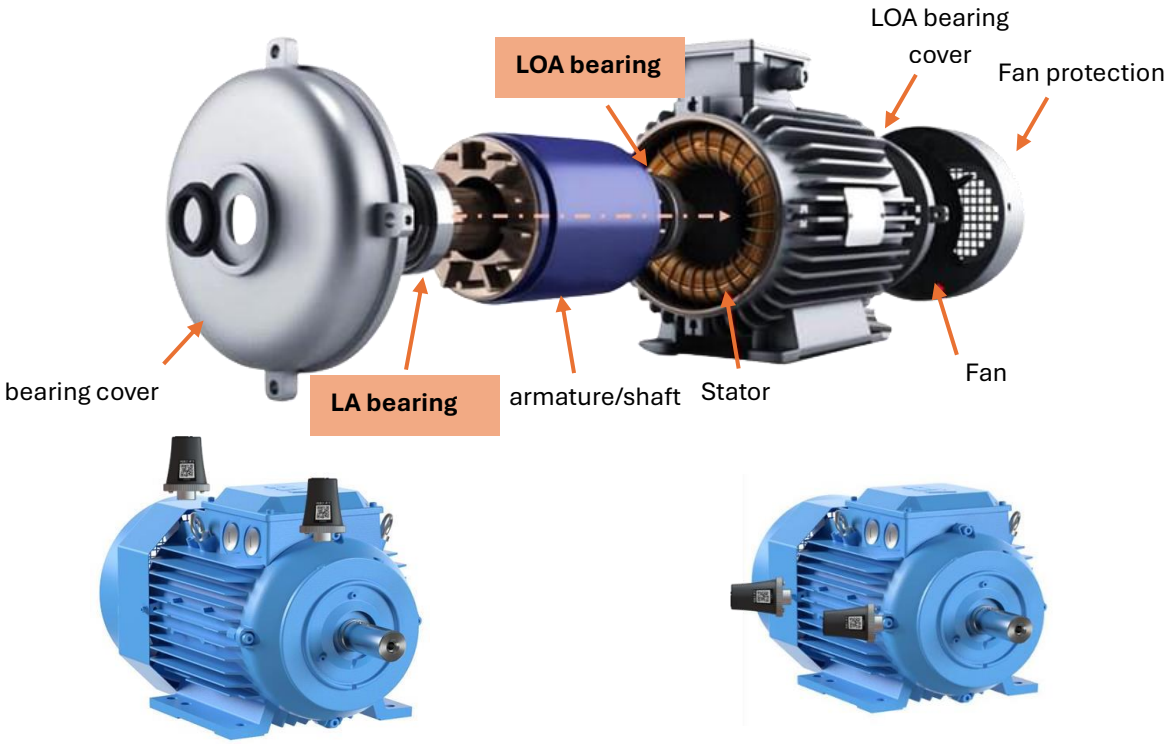
Step 1: Swap the Spectra 1.0 Base to the Magnetized Base.

Step 2: Attach the device to the chosen location as indicated.

Examples of installation on some equipment

Electric Motors

- 2 Spectra 1.0 per Electric Motor monitored is recommended. One sensor positioned on the LA Bearing and the other positioned on the LOA Bearing. Remember to prioritize installation by screw. Position the sensor vertically or horizontally. Keep the Z-Axis aligned with the motor shaft as referenced in Spectra 1.0



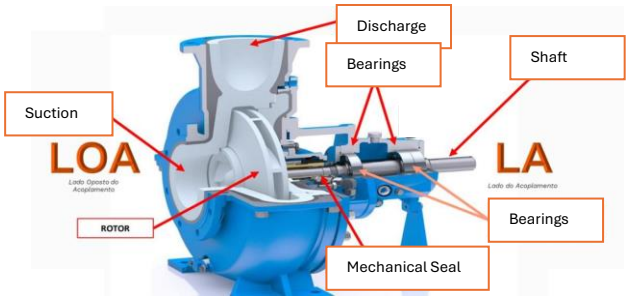
Bearings

- 1 Spectra 1.0 per bearing is recommended. Preferably position vertically on the bearing or on the bushing.

- If there is a shaft with other in-line housings, 1 Spectra 1.0 is recommended in each housing to detect both wear of the housing and its components, as well as wear or warping of the shaft.

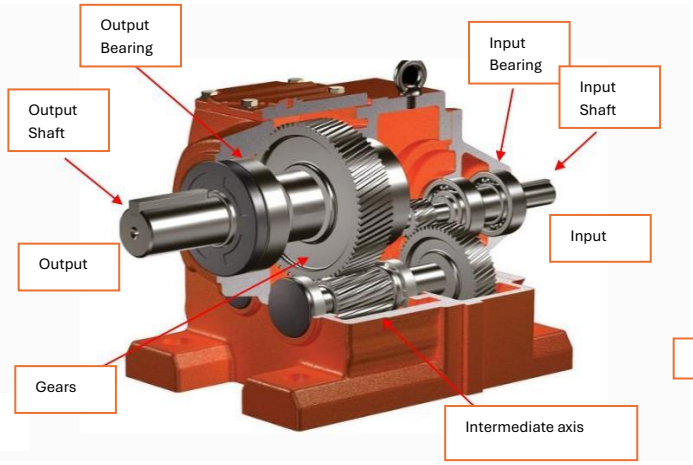
Pumps / Motorcycle Pumps

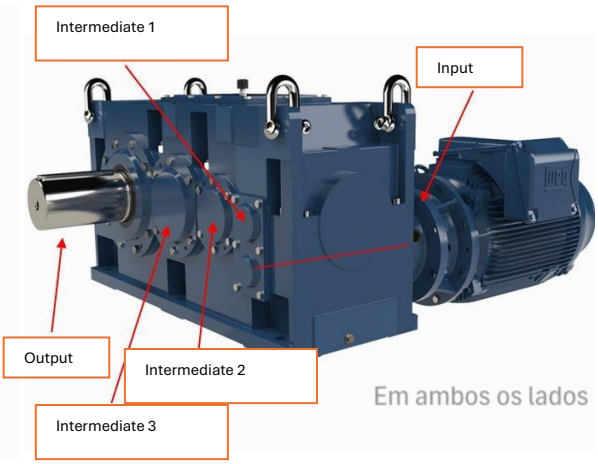
- In the Motor Pump set, it is generally recommended, when the shaft length is less than 250 mm, only 1 Spectra 1.0 in the center between the bearings. Preferably position it vertically on the bearing. 2 sensors are recommended in each pump bearing when the distance between the bearings is greater than 250 mm (shaft length), in addition to the 2 Spectras 1.0 in the electric motor.



Reducers

- In the case of Gearboxes, it is recommended to install a Spectra 1.0 sensor at each bearing point from the Input Shaft, through the Intermediate Shafts, to the Output Shaft, on both sides.





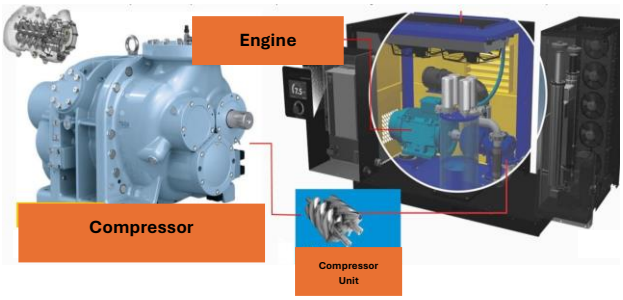
Compressors

- In the case of Compressors, it is recommended to install Spectra 1.0 sensors at the points where there are Bearings in the motor and in the compressor unit. It is a complex piece of equipment that needs to be technically analyzed before installation. Request the drawing to understand where the Bearings are.

Piston Reciprocating Compressor

Screw compressor

Centrifugal compressor



Application Examples

3 Exemplos de Aplicação

Chapter 3

3.1 Electric Motor Monitoring

IBBX was approached by a client who was facing difficulties in monitoring electric motors in real time, which resulted in unexpected failures and high maintenance costs. After analyzing the situation, IBBX's technical team verified that the installation of the *Spectra 1.0 device* would be the ideal solution, since it allows predictive monitoring of vibration and temperature of the motors, critical factors to avoid failures.

The *Spectra 1.0* was installed quickly and conveniently, directly on the engines, without the need to stop the system. Its ability to communicate with the IBBX Retina platform made it possible to transmit data in real time to the cloud, where the customer began to continuously monitor the following parameters:

- RMS acceleration
- FFT Peak Acceleration
- RMS Speed
- Envelope Pico from FFT
- Temperature
- Global Acceleration
- Global Speed
- Envelope Global

Figure: Spectra 1.0 in electric motor

With the solution implemented, the customer was able to anticipate preventive maintenance, avoiding serious failures, reducing downtime and optimizing energy consumption, ensuring system efficiency and eliminating unnecessary costs.

Figure: Data being collected on the Retina Platform

Figure: Data Projection Analysis in Retina

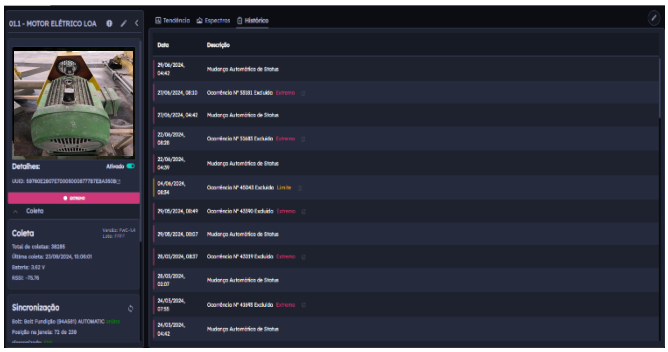


Figure: Occurrence History recorded

Figure: Gallery of registered images of the monitored asset

3.2 Agitator Motor Monitoring

IBBX was approached by a client who was struggling to monitor an agitator's motor in real time, which resulted in operational inefficiencies and increased maintenance costs. After a detailed analysis, IBBX's technical team identified that the installation of the *Spectra 1.0* device would be the ideal solution, as it allows predictive monitoring of vibration and temperature, essential indicators to avoid agitator failures.

The *Spectra 1.0* was installed quickly and efficiently on the agitator motor, with no interruption of operations required. Its integration with the IBBX Retina platform made it possible to transmit data in real time to the cloud, where the customer started to monitor the following parameters continuously:

- RMS Acceleration
- FFT Peak Acceleration
- RMS Speed
- Pico Envelope from FFT
- Temperature
- Global Acceleration
- Global Speed
- Envelope Global

With the implementation of this solution, the customer was able to anticipate preventive maintenance, avoiding agitator failures, optimizing operation and significantly reducing maintenance and energy costs.

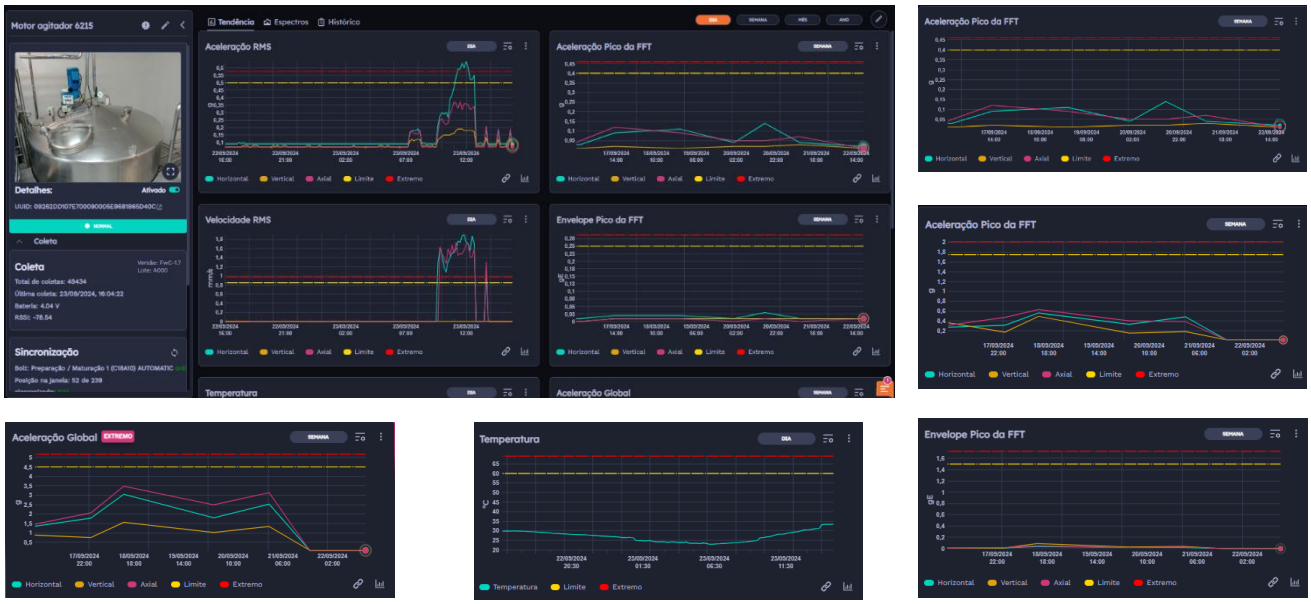


Figure: Data being collected on the Retina Platform

Figure: Data Projection Analysis in Retina

Figure: Spectra 1.0 Analysis

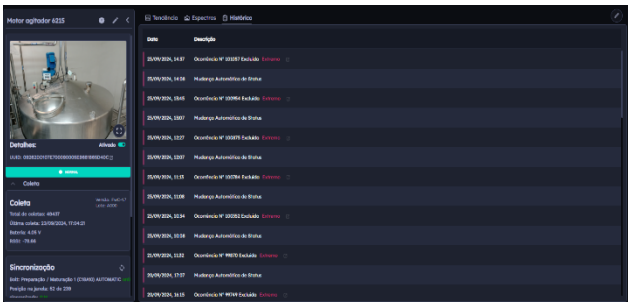


Figure: Occurrence History recorded

Figure: Resource Gallery

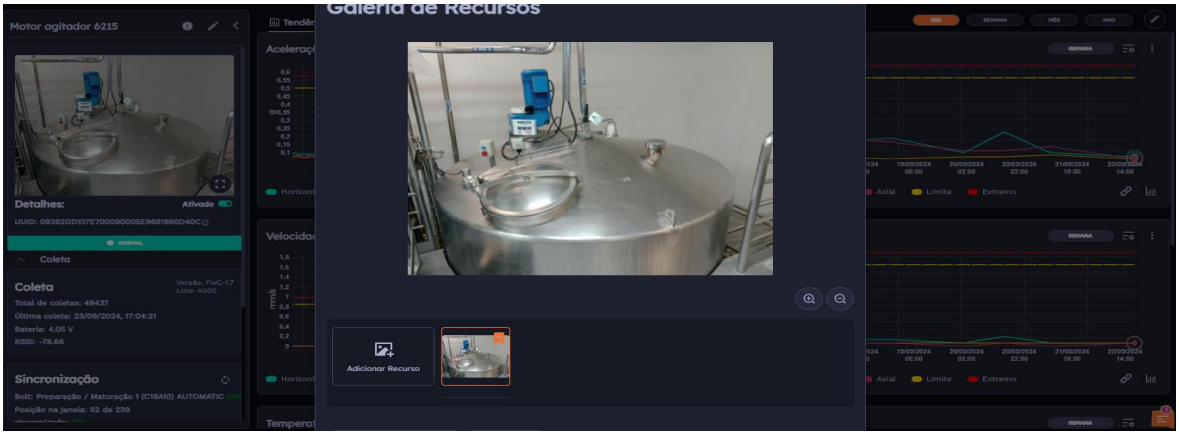


Figure: Resource Gallery

3.3 Bearing Monitoring

IBBX was approached by a client who was facing difficulties in real-time monitoring of bearings, which led to unexpected failures and high maintenance costs. After a technical analysis, the IBBX team recommended the installation of the *Spectra 1.0* device, which offers predictive monitoring of vibration and temperature, critical factors to prevent bearing failures.

The *Spectra 1.0* was quickly and efficiently installed directly on the bearings, without the need to interrupt the operation of the system. The device's communication with the IBBX Retina platform allowed the transmission of data in real time to the cloud, where the customer began to continuously monitor the following parameters:

- RMS Acceleration
- FFT Peak Acceleration
- RMS Speed
- Pico Envelope from FFT
- Temperature
- Global Acceleration
- Global Speed
- Envelope Global

With the solution implemented, the customer was able to predict necessary maintenance, avoiding serious bearing failures, optimizing system performance and reducing costs related to maintenance and unexpected downtime.

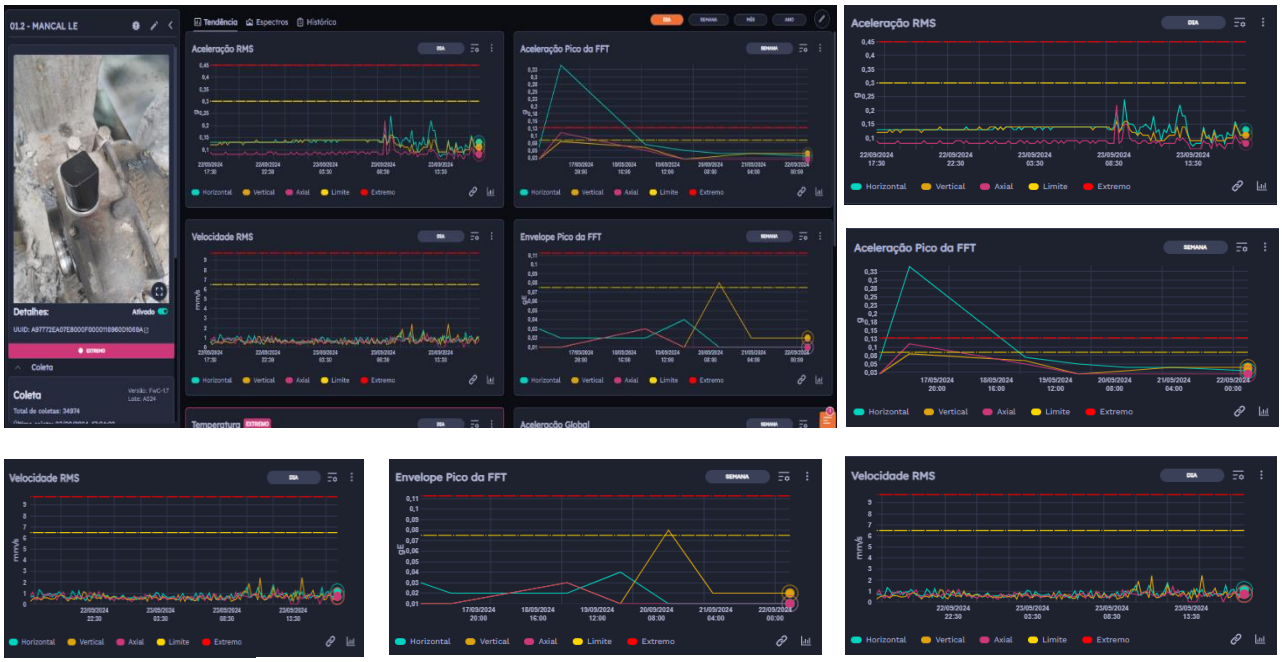


Figure: Data being collected on the Retina Platform

Figure: Data Projection Analysis in Retina

Figure: Spectra 1.0 Analysis

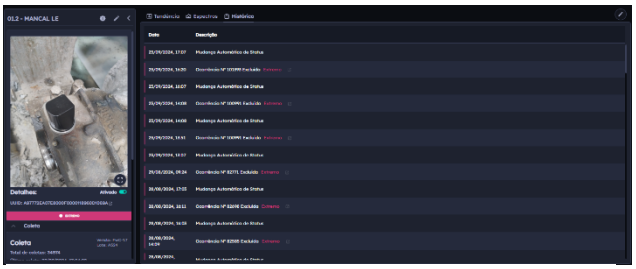


Figure: Occurrence History recorded

Figure: ESG Panel

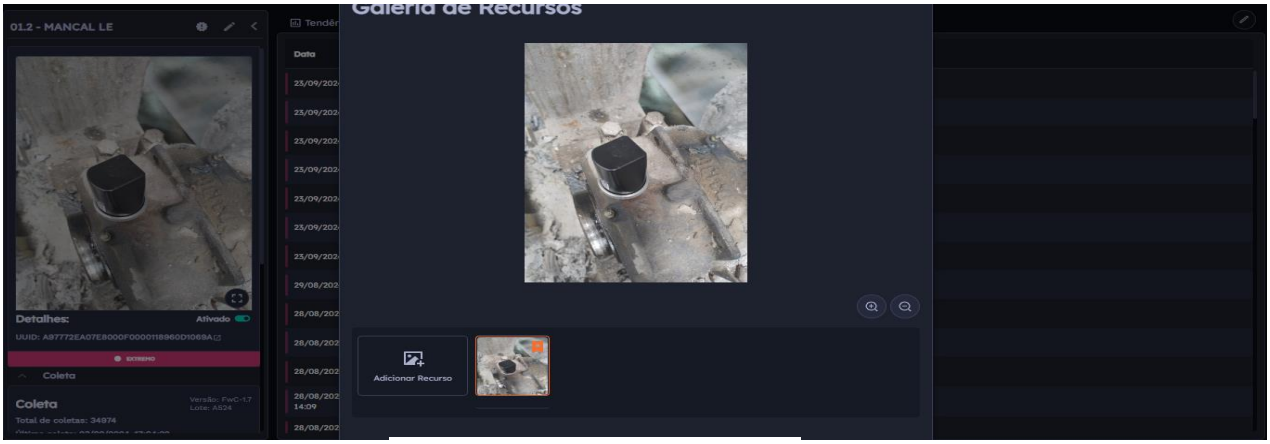


Figure: Resource Gallery

3.4 Compressor Monitoring

IBBX was approached by a customer who was facing difficulties in real-time monitoring of compressors, which resulted in unexpected failures and high maintenance costs. After a detailed technical analysis, the IBBX team recommended the installation of the *Spectra 1.0* device, which offers predictive monitoring of vibration and temperature, essential factors to prevent compressor failures.

The *Spectra 1.0* was installed quickly and efficiently in the compressors, without the need to interrupt operations. Integrated with the IBBX Retina platform, the device allowed the continuous transmission of data in real time to the cloud, where the customer started to monitor the following parameters:

- RMS Acceleration
- FFT Peak Acceleration
- RMS Speed
- Pico Envelope from FFT
- Temperature
- Global Acceleration
- Global Speed
- Envelope Global

With the solution implemented, the customer was able to predict necessary maintenance, avoiding serious failures in the compressors, optimizing the performance of the system and significantly reducing maintenance costs and unexpected stoppages, in addition to ensuring greater reliability in the production process.

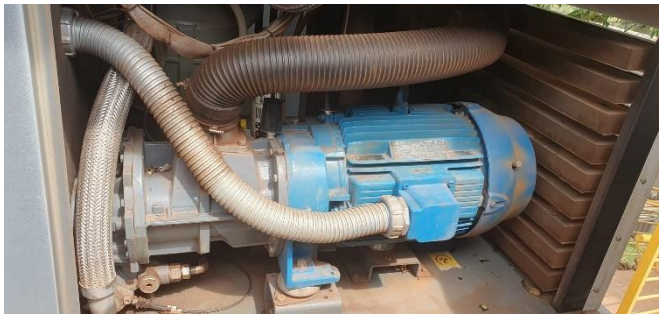


Figure: Data being collected on the Retina Platform

Figure: Spectra 1.0 Analysis

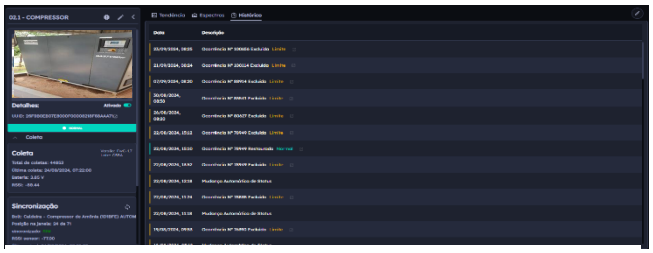


Figure: Occurrence History recorded

Figure: Frequency Analysis between two points

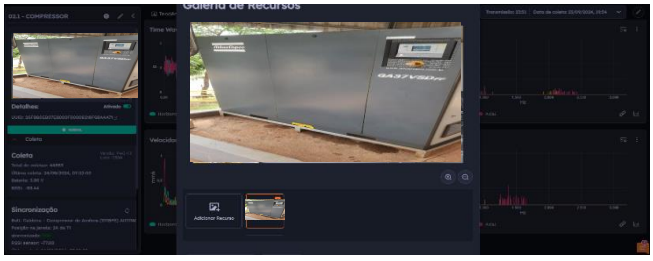


Figure: Resource Gallery

Figure: ESG Panel

3.5 Water Pump Monitoring

IBBX was approached by a client who was experiencing difficulties in real-time monitoring of water pumps, which resulted in unexpected failures and increased operating costs due to outages and repairs. After a technical analysis, the IBBX team recommended the installation of the *Spectra 1.0* device, which provides predictive monitoring of vibration and temperature, essential to avoid failures in water pumps.

The *Spectra 1.0* was conveniently and quickly installed directly on the pumps, without the need to interrupt the operation of the system. Integration with the IBBX Retina platform enabled real-time data transmission to the cloud, allowing the customer to continuously monitor the following parameters:

- RMS Acceleration
- FFT Peak Acceleration
- RMS Speed
- Pico Envelope from FFT
- Temperature
- Global Acceleration
- Global Speed
- Envelope Global

With the solution implemented, the customer started to anticipate preventive maintenance, avoiding failures in the water pumps, optimizing the efficiency of the system and reducing costs related to maintenance and unexpected stops, ensuring a continuous and reliable supply of water.

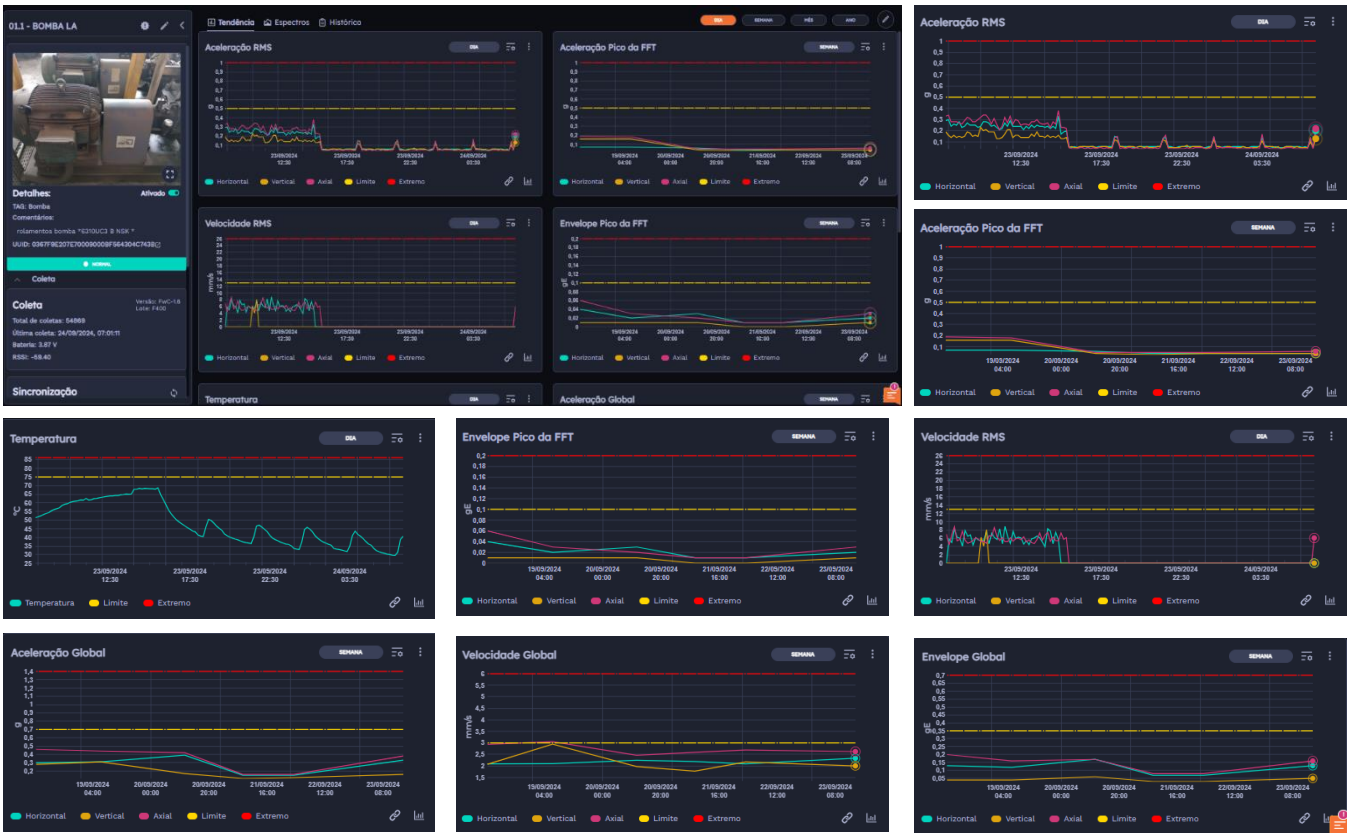


Figure: Data being collected on the Retina Platform

Figure: Spectra 1.0 Analysis

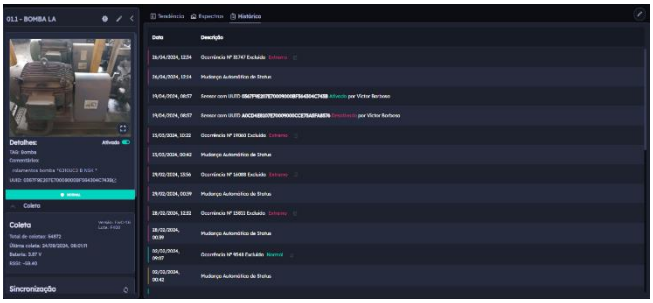


Figure: Occurrence History recorded

Figure: Frequency Analysis between two points

Figure: ESG Panel

ILLUSTRATIONS AND PRODUCT SPECIFICATIONS

The illustrations contained in this document are for demonstration purposes only. Images may vary by hardware and software version and market region. To report any errors or omissions in this document, please send an email to: comercial@ibbx.tech

Disposal and Recycling Information

Batteries should not be disposed of in household waste. When you decide to dispose of this product and/or its battery, do so in accordance with local environmental laws and guidelines. For information on IBBX's recycling program, collection points and information phone, please visit https://ibbx.tech/.

LEARN MORE

To learn more about this strategy and all the measures we are taking to protect the environment, visit https://ibbx.tech/.

Every care has been taken to ensure the proper accuracy of the information contained