

Service and installation instructions

AiSIGHT Aion

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Introduction

Aion measures vibration, geomagnetic, and temperature data of your machine. The sensor picks up the vibration data of your machine which is then sent to our cloud. As a result, we can detect anomalies and faults in your machine and prevent bigger failures. Once a significant fault is detected you will get notified and you will be able to repair the damage in time without needing to stop the full production.

In order for us to give you the best and most accurate results, it is very important that you carefully read and understand the instruction manual.

1. Definitions and Glossary

Package: The package received by the client is a recycled paper box that includes the sensor node, power supply, and mounting interfaces.

Sensor Node: across this document, the words “Sensor Node” will be used to refer to the AiSight Sensor Node (Aion).

Power Supply: The 90~240VAC to 24V power supply to power up the sensor with 24VDC.

Power Cable: The cable with M8 4 pins connector to power up the sensor directly from 24V from machine panels or other local DC power sources.

MAC Address: Unique identifier number for each sensor node, known as serial number.

Mounting Interface: the mounting interface is any mechanical and/or chemical combination to attach the sensor node to the machine.

Bluetooth Low Energy (BLE): is a low power consumption wireless technology standard used for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves.

WiFi Network: is a wireless technology standard used for exchanging data between fixed and mobile devices over medium-range distances with higher data rates, also providing access to the internet.

Provisioning Application (App): it is a smartphone application that connects with the sensor node via BLE to input the WiFi credentials.

Dashboard: web application used to access the machine status, features, and anomalies.

User: end client of the Aion.

Cloud: where the user's vibration, geomagnetic, and temperature data will be stored.

This manual contains the requirements for the correct installation, provisioning, and operation of Aion designed for the sole purpose of condition monitoring.

The Aion is designed for, and must only be handled and installed by trained personnel.

Not following this manual may cause malfunction of the sensor node, unprecise anomaly detection, damage to the machines and to the environment.

Any abnormal behavior or defect on Aion must be informed immediately to AiSIGHT, who will provide maintenance or replacement of the sensor node.

The user is not authorized to open or to perform any maintenance actions on the sensor node and power supply.

2. Proper Handling

Proper handling of AiSIGHT Aion Sensor Node is critical to prevent any damage.

The following hazard situations should be avoided:

- To drop the item
- Hit the item against sharp or hard surfaces
- Touch the pins of the connector of the Aion connector or its power supply with any metal tools or conductive devices
- Use excessive force when mounting the unit
- In case of the use of magnet accessory:
 - avoid impact (due to magnetic attraction) when mounting the sensor on the desired surface.
 - do not put any operator body parts between the magnet and metal surfaces
- In case of use of swivel mounting, force the mounting without the presence of a thread
- Expose the item to temperatures above 90°C
- Expose the item to any reactive chemicals
- In the case of using the power cable instead of the power supply, only trained electricians can handle the installation of the cable

The user's Environmental, Health, and Safety (EHS) manager has to be consulted to ensure a safe installation of the sensor. The technicians who are responsible for the installation must follow all EHS guidelines, use the required Personal Protective Equipment (PPE) and use the proper and indicated tools.

For adhesive mounting options, the cure time must be respected before the operation of the machine restarts.

The power supply cable or the power cable alone must be securely tied to fixed parts of the body of the machine, cable trays, or ducts. It's suggested to use cable ties, clips, and clamps.

1.1. Caution and Warnings

Caution indicates a hazard that could cause minor personal injury, or property damage if ignored.



A warning indicates a hazard that could cause severe personal injury, death, or substantial property damage if ignored.



1.2. Risk Assessment

The risk assessment of the sensor is based on the CENELEC GUIDE 32 and it can be shared. Please contact AiSight if you need any further information.

1.3. Compliance

1.3.1 FCC Compliance Statements

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
2. This device must accept any interference received, including interference that may cause undesired operation.

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

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

1.3.2 ISED Compliance Statements

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s).

Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

In accordance with the Canadian requirements (RSS-102, 2.6) a minimum distance of 20cm must be kept between the device and the user during service.

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage, et
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Conformément aux exigences canadiennes (RSS-102, 2.6), une distance minimale de 20cm doit être maintenue entre l'appareil et l'utilisateur pendant les opérations.

3. Service and installation instructions

In order to successfully install Aion and directly read the data on the AiSight dashboard three steps are needed:

1. **Mounting:** Mount Aion on the desired machinery
2. **Powering:** Connect Aion to power
3. **Connecting:** Provision the sensor to wifi
4. **Operating.** Read data from AiSight Dashboard

The steps that MUST be performed by qualified personnel are 1. **Mounting** and 2. **Powering**.



3.1. Mounting

The Aion is a three axial vibration and geomagnetic sensor. The axes for both measurements are configured as shown in Figure 4.1. The “x” axis is aligned with the logo, while the “y” is aligned with the M8 connector. The “z” axis covers the resulting dimension, perpendicular to the body of the sensor. The Aion can be installed on Motors, Pumps or Gearboxes through the magnet on its back.

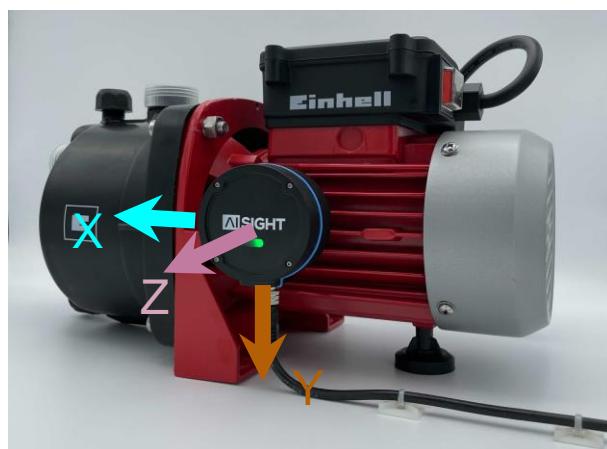


Figure 4.1 - Sensor orientation

The first step is to identify the ideal mounting position on the machine. As we are measuring the vibration of the machine and we rely on very good transmission of the data it is not recommended to attach the sensor anywhere on the machine. Ideally, if a probable failure location is known, it is recommended to place the sensor as close as possible to it.

Steps

1. Identify the best monitoring position on the machine
2. Start by cleaning the surface of your machine with the cleaner and the cloth. Be sure no dirt is remaining
3. Sand the surface to improve the mounting process and then clean the surface again from sanding residuals
4. Carefully slide out the protective metal ring from the magnet with the help of pliers
5. Apply the Aion on the previously prepared surface

For additional information regarding the mounting of Aion, please contact AiSight.

Safety Precautions

The magnet on the back of the Aion is very strong, and it is mandatory to take exceptional care with handling it in the vicinity of magnetic surfaces and the user's fingers.



3.2. Powering

Two options to power up the sensor can be used depending on how the customer prefers and how the contract between the two parts was agreed. The first option is to use the custom AC power supply compatible with the product, the TRE25R240 with 3m long cable and female M8 4 pin connector, as shown in Figure 4.3.



Figure 4.3 - AiSight custom power supply with M8 connector

In cases where AC connection is not possible close to the machine (either by physical or safety constraints) the customer can also use a 2-wire or 4-wire cable with M8 4-pin female connector to directly connect the sensor node from existing machine panels or switchboards that has DC connection from 8 to 48V (24V recommended). A cable with an overmolded connector can be used or a cable with a field installable connector, as shown in Figure 4.4. For either case, the cable must be designed for industrial use, have internal and external insulation jackets and have the UL94-V0 or higher.

The sensor node consumes a maximum of 3W and supports a power supply voltage from 8 to 48Vdc, with a preferred supply of 24Vdc.



Figure 4.4 - Example of a cable with M8 female plug connector

Only authorized and technically trained personnel should handle and install the power supplies and cables, specifically when access to panels and switchboards are necessary.



3.2.1. Powering with the AC Power Supply

The TRE25R240 power supply accepts voltage levels from 90 to 264 VAC, with a maximum input current of 0.7 A. Overcurrent protection and exclusive breakers can be set by the user if required.

The power supply will be provided either with a fixed or pluggable European plug (CEE 7). In the case of the pluggable end, the user must connect it to the power supply after unpacking.

The AC connection must be at a distance equal to or less than 3 linear meters from the installation of the sensor node. The power supply must be connected to the AC mains, in a vibration and stress-free environment, stable as possible. The preferred connection points are wall outlets or secure outlets on the floor. The outlets can also be connected via an extension cord, as long as the connection end is safe and secure.

The power supply doesn't share the same ingress protection level as the sensor node. The customer must observe the IP level in order to safely install the power supply.

3.2.2. Powering with DC cable

When using a cable (4x0.25mm² minimum) with an overmolded female M8 4-pin connector, Figure 4.9, the cable follows the industrial standard, including the pin numbers and colors. The sensor node accepts from 8 to 48Vdc and the recommended voltage is 24Vdc. The customer must observe that most cables are limited to 30V. The M8 connector must follow the IEC 61076-2-104 standard with A-coding. The cable construction must be IP65 or higher, built either with PVC or PUR materials with UL94 rating HB or superior.

3.2.3. Cable Management

The cable is present in both powering alternatives, and it must be securely installed independently. The customer can install the cable inside distribution trays and ducts. For external installation, if existing cables (for power or communication) or safe mechanical lines

or fixed machines parts are present, the cable can be attached to them by using cable ties. If there is no support or existing cables, cable tie holders can be installed in flat surfaces. Ensure the surface is clean and degreased before installing adhesive cable tie holders.

Once the cable is close to the sensor mounting point, some safety precautions must be taken to provide enough distance from any moving parts (i.e. shafts, belts). Since the connector must be screwed to the sensor, some slack must be ensured. The connector and cable cannot introduce any traction on the sensor, since this may compromise the sensor reading and functionality.

When installing the cable in moving parts, like injection molding tools, the equipment must be placed initially in the position in

The suggested external installation procedure with adhesive cable tie holders is described below.

- 1) Observe the complete path of the cable before starting the installation
- 2) Draw lines or use a level if necessary to mark the support points
- 3) Clean all the surfaces with industrial surface cleaners
- 4) Install the cable tie holders
- 5) Lay the cable and install all the cable ties partially
- 6) Ensure some cable slack close to the sensor mounting location
- 7) Finish all cable ties and cut the excess edges
- 8) Connect the first end to the 24Vdc supply

After the cable is securely installed, the M8 connector must be plugged into the sensor.

- 9) Verify the polarity of both parts and align them
- 10) Push (without turning) the connector until it reaches the limit
- 11) Turn the connector in clockwise direction until a secure connection is achieved

Once the power is on, the sensor should indicate visually on the display LED the status of the connection. The white light will indicate that the sensor is on. The light should shortly change to a blue color, which will indicate that the sensor ready is ready for the next step.

3.3. Connecting

This session describes the requirements and steps for provisioning the sensor node.

3.3.1. Required parts

- Aion Sensor Node
- AC Power Supply or 24V Power Cable
- Apple Iphone or Ipad with enabled bluetooth connectivity
- Provisioning Application (App) provided by AiSIGHT
- Wi-Fi router with internet connection or Wi-Fi cellular gateway

3.3.2. Sensor Node Overview

- Protocol: IEEE-802.11B/G/N (802.11N up to 150 Mbps).
- WPA, WPA2, WPA2-Enterprise (soon) and WPA3 (following months).
- Frequency range: 2412 to 2484 MHz (2.4 GHz).
- Integrated antenna: Able to connect to routers/gateways up to 30 meters away.

3.3.3. Wi-Fi Requirements

In order to a successful connection of Aion with the cloud, the following requirements must be met.

- Robust access points with high performance features (e.g. MU-MIMO - multi-user, multiple-input and multiple-output)
- DHCP and network configured for an appropriate topology (e.g. correct subnet size, VLANs, etc.)
- Network must able to handle communication over MQTT protocol (TLS1.2)

3.3.4. Provisioning

Connect the sensor node to the power supply (TRE25240) or to the 24V power cable. Make sure the plug is securely tightened to the sensor connector. Once Aion has a blue steady LED light, as shown in Figure 4.5, it is ready to be provisioned using the app.



Figure 4.5. Sensor node connected to power and ready to be provisioned

Open the app and make sure the Bluetooth connections are allowed and click on **Provision Device**, as shown in Figure 4.6(a). The app will scan for all available devices in range. The devices will be shown in a list as shown in Figure 4.6(b). Observe the node serial number on its lid and choose the matching number in the app.

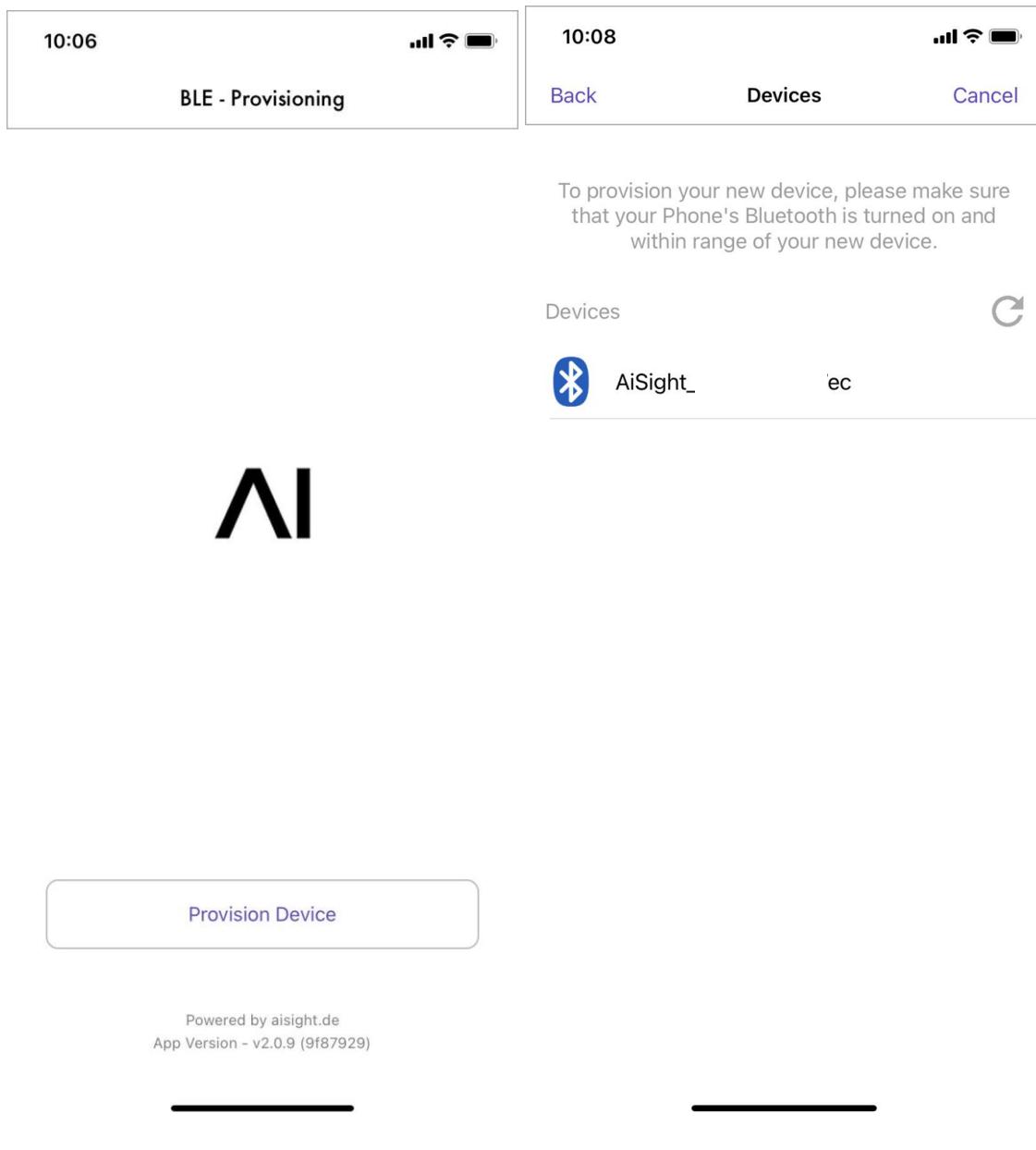


Figure 4.6. (a) Initial screen and (b) list of available sensors

After selecting the proper node, the app will communicate with it and scan available WiFi networks in range and display them as shown in Figure 4.7(a). Select the network that will be used for the nodes. Insert the network password, as shown in Figure 4.7(b).

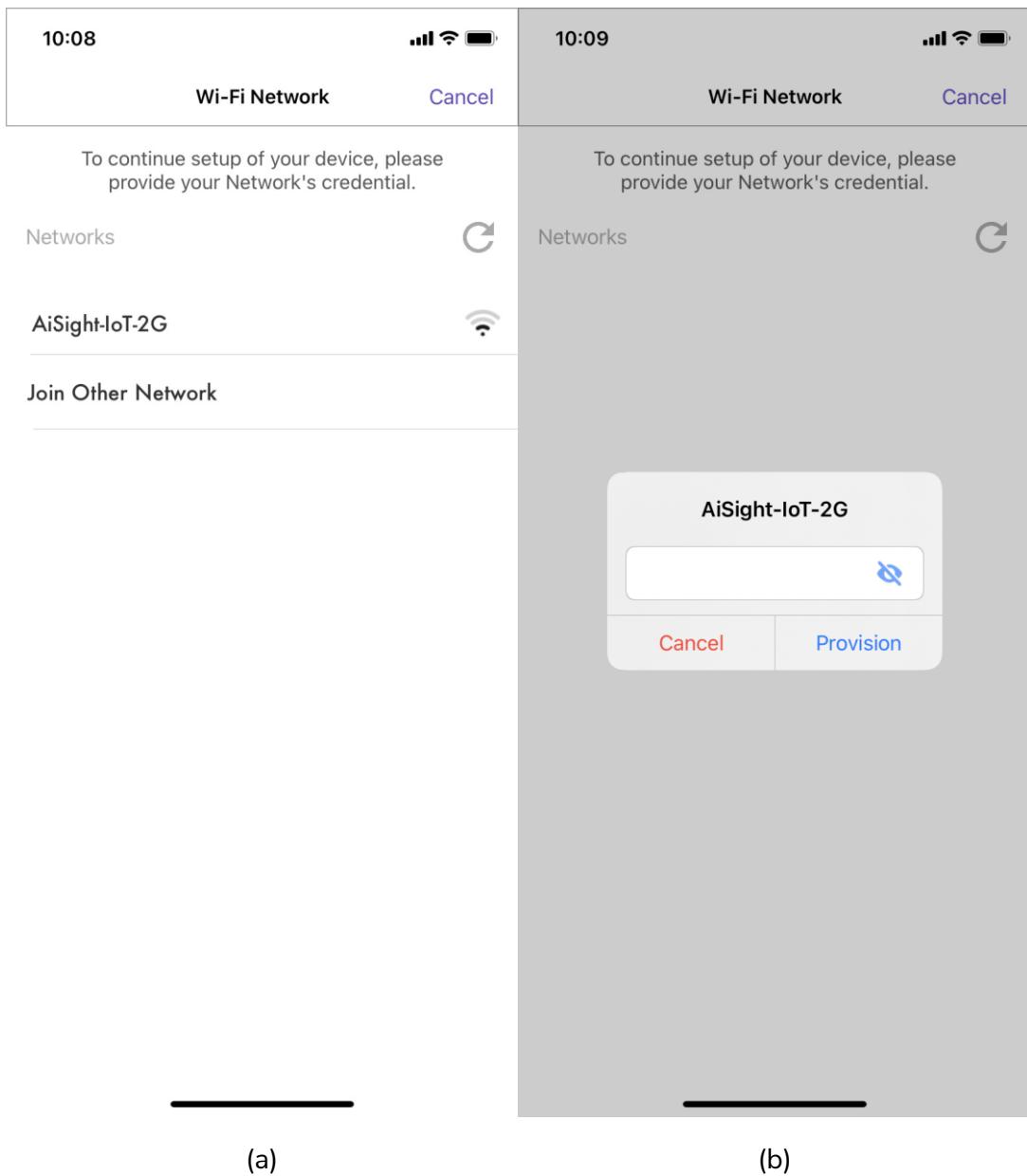


Figure 4.7. (a) Available Wi-Fi selection (b) Screen for password insertion

Once the password is inputted, the app will move to the next screen, Figure 4.8. Initially, the app will confirm that it sent the credentials to the sensor node and, if everything is correct, confirm the Wi-Fi connection.

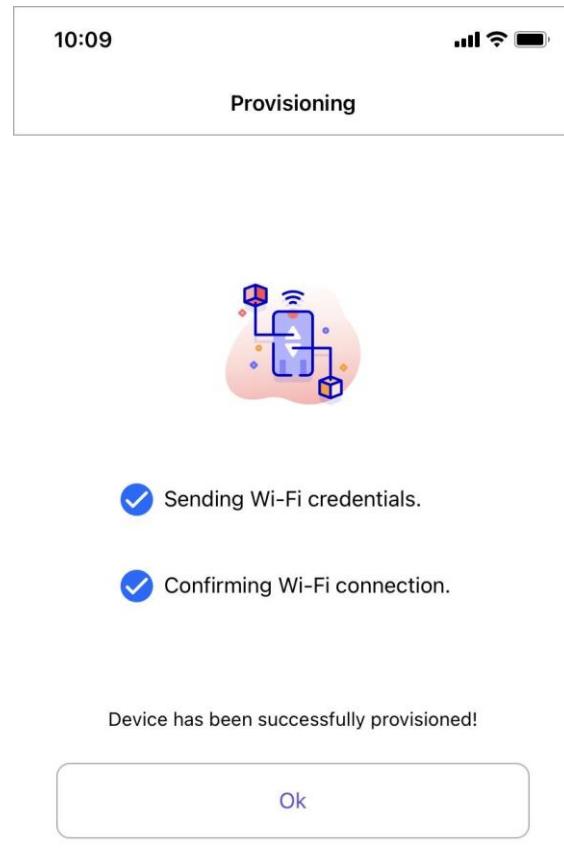


Figure 4.8. Screen confirming the connection of the sensor with the Wi-Fi.

By clicking on the OK button, the user can start the provisioning process for the next sensor node in range.

The sensor node should now change its colour to yellow as soon as connected to the Wi-Fi and shortly after turning green confirming the connectivity with our platform in the cloud, as shown in Figure 4.9. If the node stays with the yellow LED on, the network requirements presented at the beginning of this document must be reviewed.



Figure 4.9. Sensor node provisioned and connected to the Wi-Fi

4. Notes and Version Control

This is the latest version of the documentation. We are open to corrections and improvements.

All the suggestions on how to improve the service and installation must be sent to info@aisight.de

Version	Date	Approved by	Reason/Changes
1.1	22.06.2022	Alberto Rinaldi	Part "Compliance" reviewed
1.0	09.02.2021	Alberto Rinaldi	Initial version