Koherent Grid
User Guide

This guide walks you through the initial deployment of Koherent Grid™, the measurement system from Koherent. It includes tools and essential components in installing and maintaining Koherent Grid.

Before installing and operating the system, please read carefully attached safety instructions.

Accuracy	Down to 0.01 mm
Measurement rate	Up to 200Hz
Range	200 m
Transmission power	23 dBm EIRP
Operating frequencies	2.4 GHz and 5 GHz
Usage environments	Outdoors and indoors
IP rating	IP66

K·H·R·NT

support@koherent.io
www.koherent.io

Äyritie 8 C, 01510 Vantaa, Finland

Overview

Koherent Grid™ is a standalone wireless high-precision local positioning system. The technology is based on continuous radio-interferometric measurements between proprietary Koherent positioning devices, as well as processing of those measurements using patented algorithms.

Position data can be monitored either in real-time or fetched later over the Koherent Position API. Documentation for the API is available at docs.koherent.io.

Intended use cases

Typical use cases for accurate real-time local positioning include

- structural monitoring and vibration mode analysis
- construction monitoring against 3D Building Information Models (BIM)
- machine tracking on construction sites
- logistics automation

support@koherent.io
www.koherent.io
Äyritie 8 C, 01510 Vantaa, Finland

Radio Unit

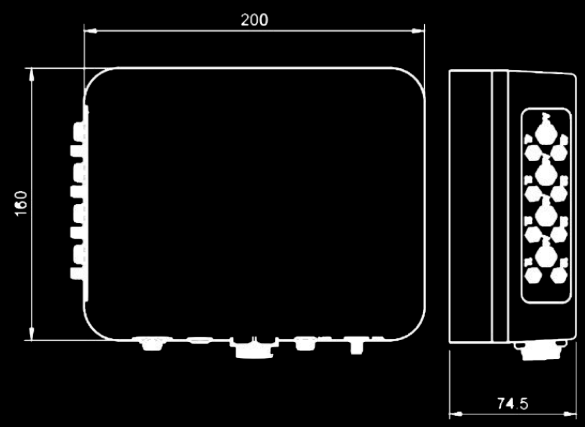
At the core of Koherent Grid™ are the Radio Units (RU) that control transmission and reception of radio frequency measurements from up to four Sensors. RU also pre-processes all received measurements, before forwarding them to a backend computation unit for precise position determination and tracking.

A Koherent Grid™ comprises of one or more RUs, enabling both small and large deployments that fit each customer use case.

Radio Unit

RF signal processing and control unit for Koherent Sensors.

Max number of Sensors	4 x Koherent Sensors
Operating voltage	9 - 32 VDC
Connectors	8 x SMA, 4 x M8, RJ45, 2 x SMA (WiFi), DC connector
Weight	2.2 kg



Sensor

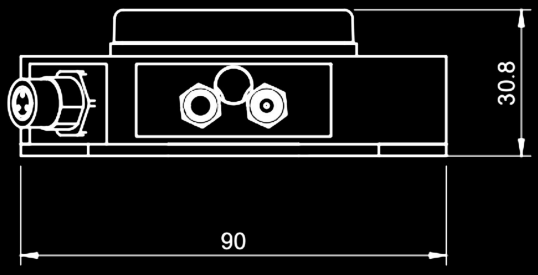
Sensor is the high-precision measurement device responsible for transmission and reception of RF signals on the unlicensed 5GHz band. The Sensor contains active antenna elements that are also the reference points for which accurate distance measurements are performed.

Koherent Grid™ supports measuring distances between individual Sensors as well as positioning individual Sensors in 3D space. Additionally, measurements from multiple Sensors placed in a rigid structure can be used to estimate the position and orientation of such structure.

Sensor

High precision measurement device responsible for transmission and reception of RF signals.

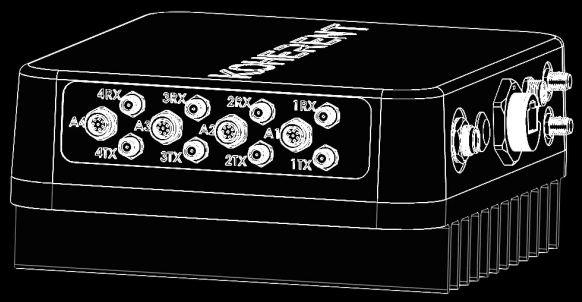
Transmission power	23 dBm EIRP
Optimal field of view	120 degrees
Connectors	2 x SMA, M8
Weight	0.2 kg
Materials	Coated aluminium (Surtec 650) HDPE plastic



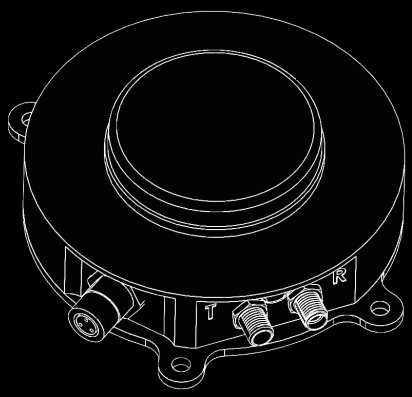
Installation

Required equipment and tools.

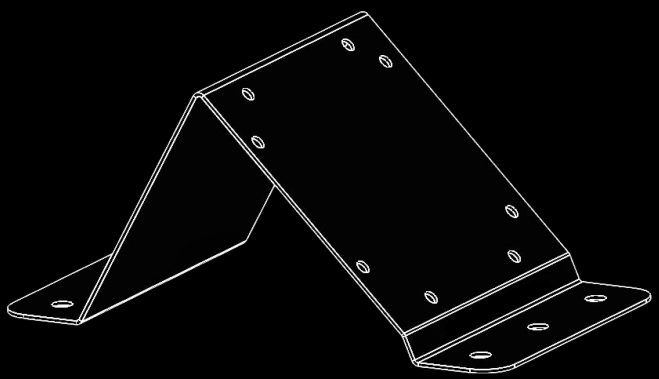
Radio unit(s)



Sensors



Sensor mounts



Sensor cables

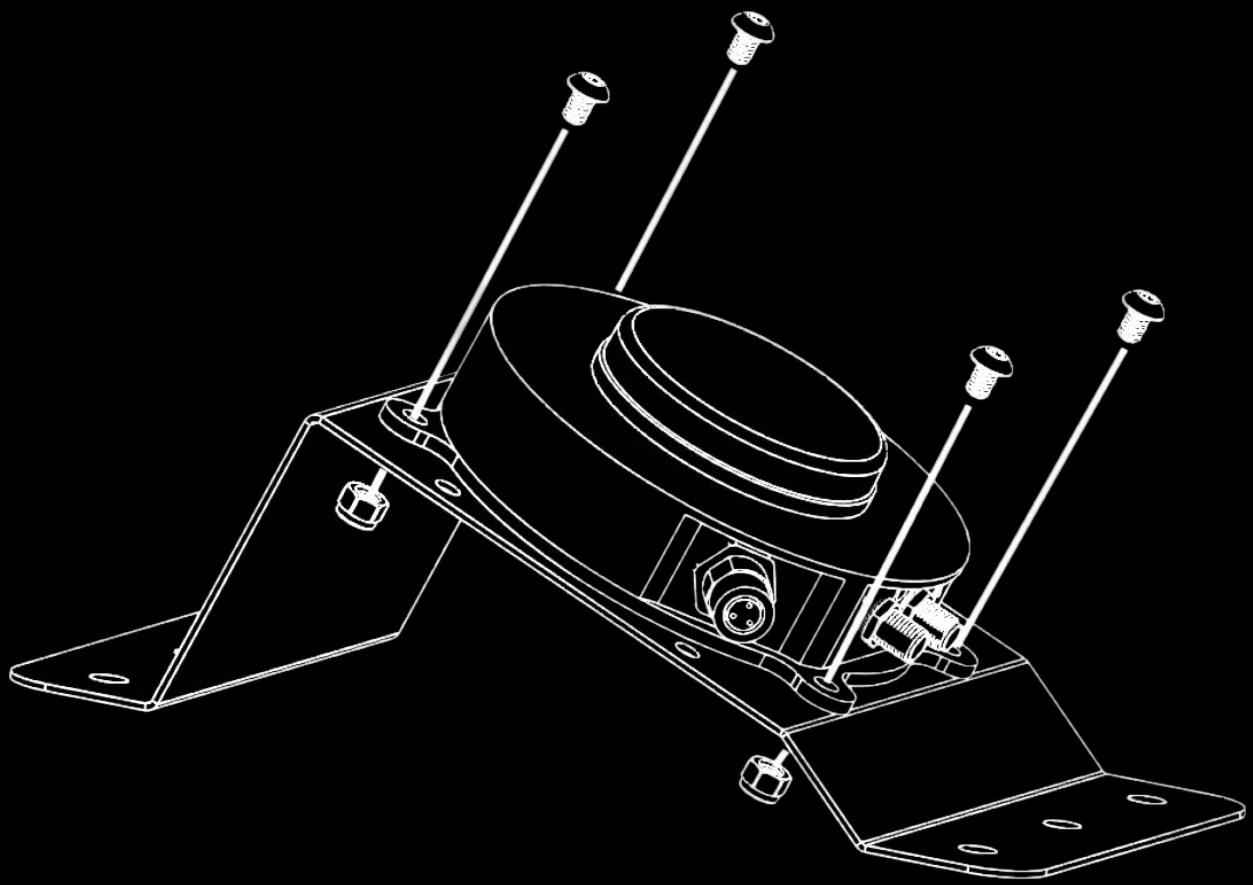
Installation

1

Install Sensor mounting plates and attach Sensors

Avoid any mechanical play in mounting plate and Sensor installation to ensure high quality measurements.

Pay attention to structural thermal expansion characteristics if mounting to a target structure with large temperature gradients.



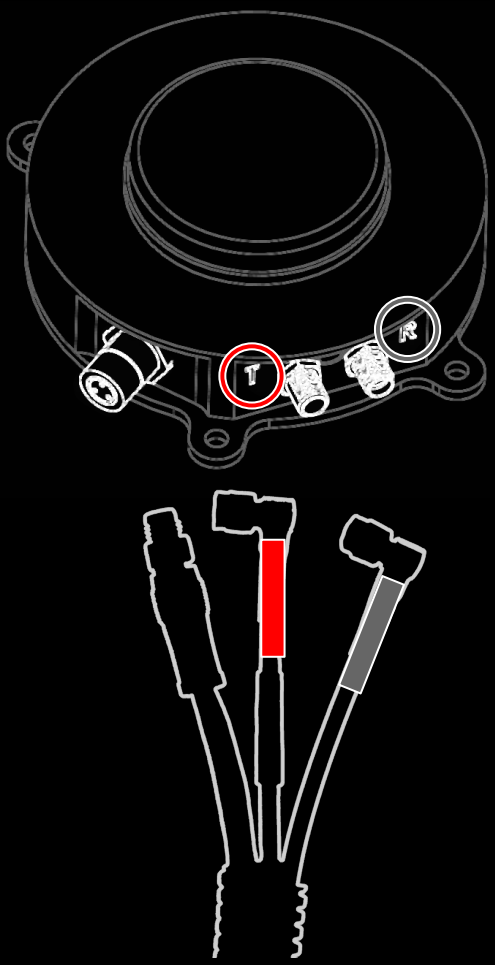
support@koherent.io
www.koherent.io
Äyritie 8 C, 01510 Vantaa, Finland

Installation

2

Connect cables to Sensors

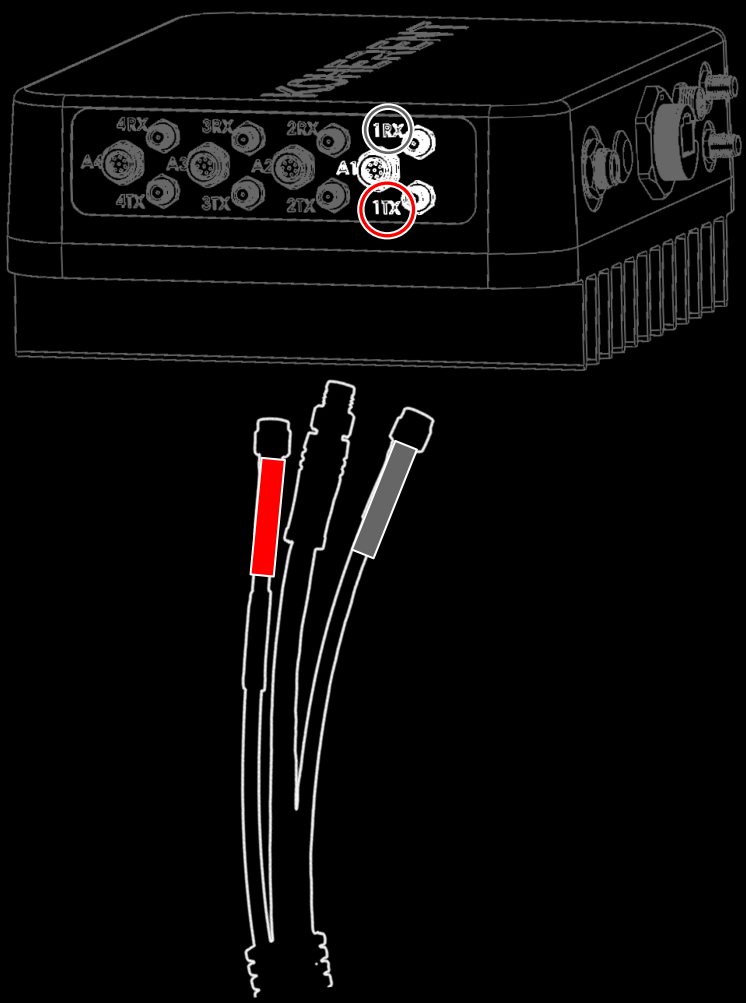
Pay attention to transmit and receive terminals. Cable colors: T = red, R = black.



3

Connect Sensors to Radio unit

The three cables of a specific Sensor must be connected to ports with the same number.



4

Tighten SMA connectors

Use provided SMA torque wrench to tighten Sensor and Radio unit connectors to 0.68 Nm (6 Lbf). Please use Loctite 222 (soft) or similar to prevent loosening.

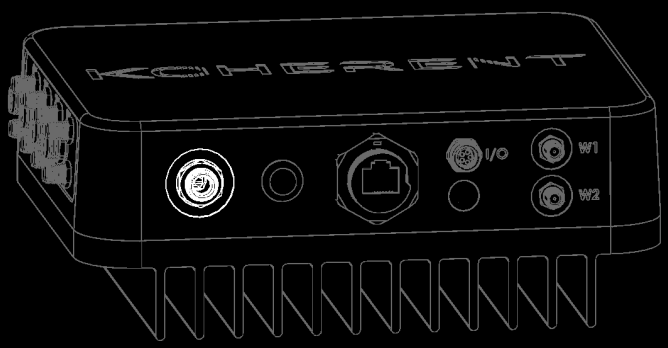
Installation

5

Connect power to Radio unit

DC power supply must be first connected to Radio unit, and thereafter to mains power!

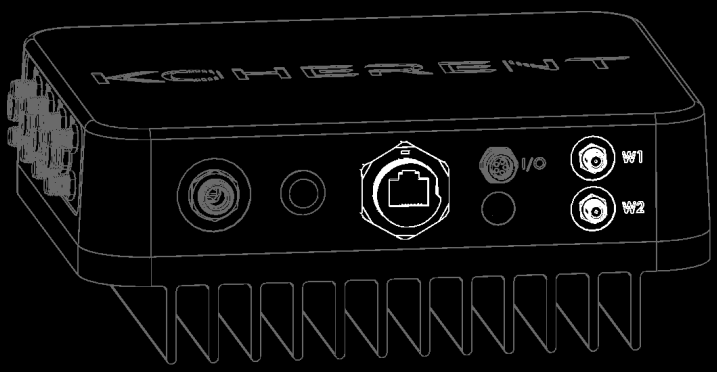
Power supply must be protected from direct contact with water.



6

Provide internet connection

Use ethernet cable or WLAN. If using WLAN, connect provided WLAN antennas and contact Koherent support at support@koherent.io for configuration.



7

Ensure system enters the operational state

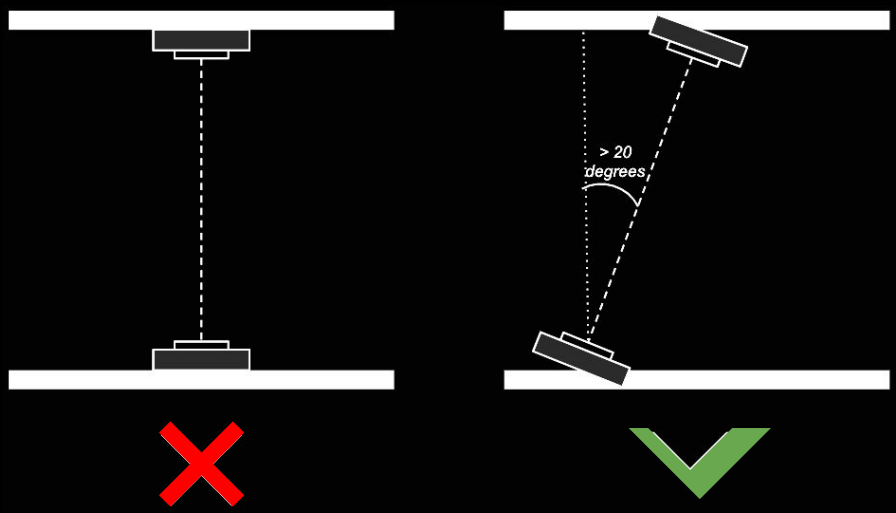
Check Radio Unit status LED. All LED patterns explained in table on page 11.

State	Color pattern
System operational	

Requirements for high quality measurements

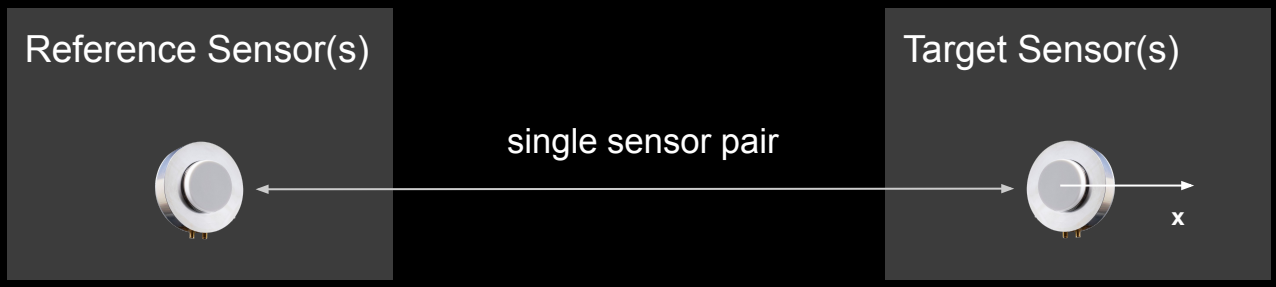
- Clear Line of Sight (LoS) between Sensors
- No objects attached to any surface of the Sensor except the back cover
- Avoid blocking of the first Fresnel Zone between measuring Sensors

Avoid performing measurements in vicinity of parallel surfaces that reflect RF signals like metal walls, or over large bodies of water.

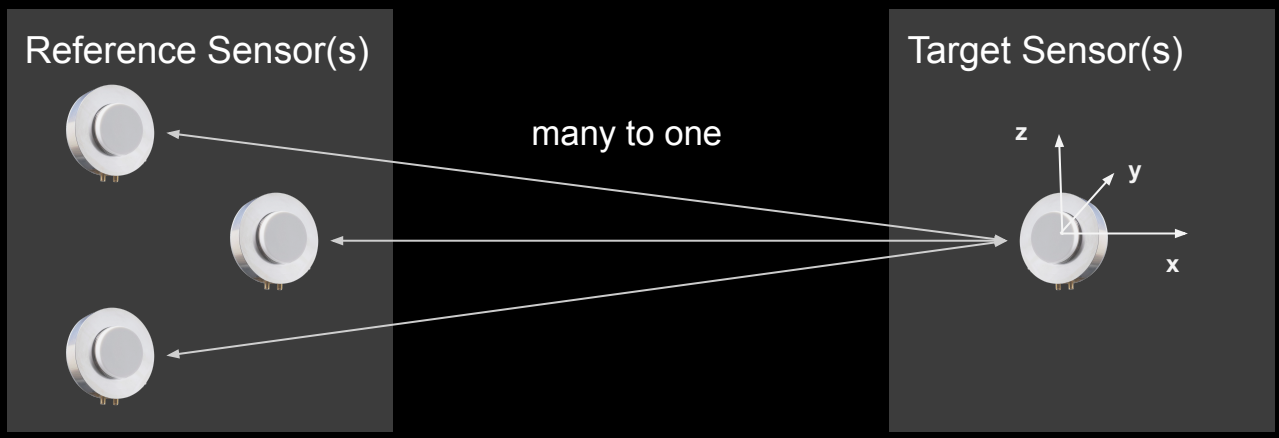


Deployment examples

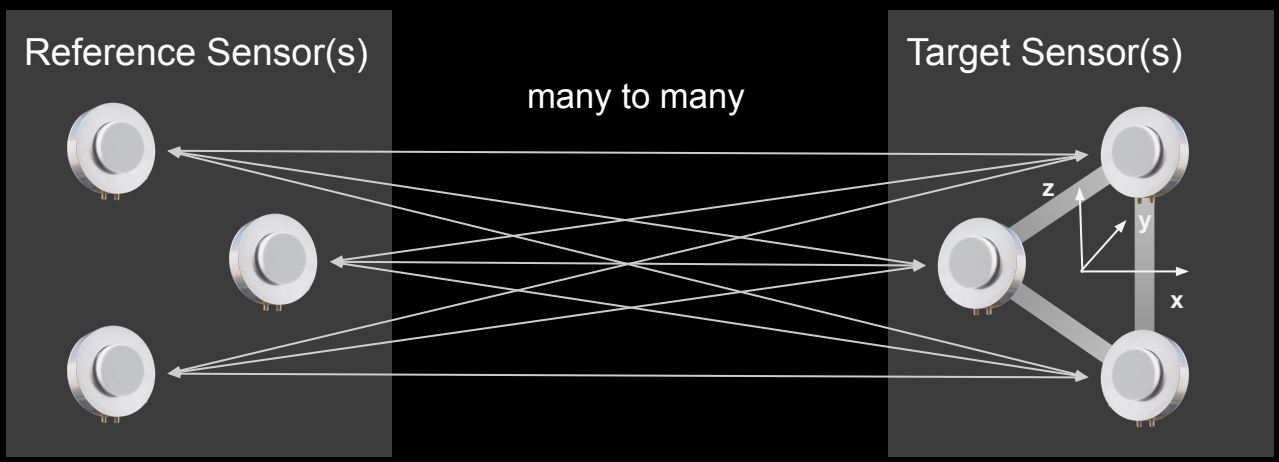
1D distance



3D position



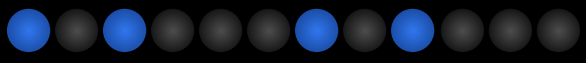
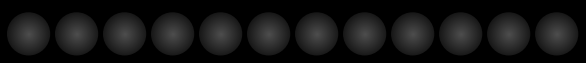
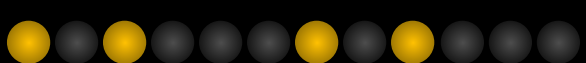
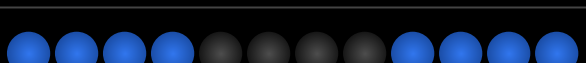
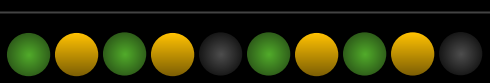
6D position & orientation



Troubleshooting

Observation	RU LED	Problem	Remedy
Radio Unit is not powering on	LEDs off	RU is not receiving necessary power	1. Ensure power cable is fully connected and tightened. 2. Ensure power source is functional 3. Ensure power source is properly rated
Measurements are not started	Yellow slow blink	RU is not able to acquire network connectivity	1. Ensure Ethernet cable is properly connected to RU 2. Ensure RU has proper internet connectivity
Measurements are not started	Blue slow blink	RU is not able to connect to backend positioning service	1. Ensure internet connectivity is stable with +2 MBps throughput
Measurements are not started	Toggle between State A and F	System self calibration fails	1. Ensure all Sensor cables are fully connected and tightened 2. Ensure Sensor TX and RX cables are connected to TX and RX ports on Radio Unit 3. Ensure Sensor cables are connected to correct ports according to installation plan
Measurements are stopping unexpectedly	Toggle between State A and F	Measurement between specific Sensors is not possible or reliable	1. Check for all previous issues 2. Ensure Sensors have an unobstructed Line of Sight, and first Fresnel Zone is free from objects and radio reflecting surfaces
Measurements are fluctuating unexpectedly	Blue heartbeat	Low signal or potential interference from moving objects between Sensors	1. Ensure Sensors are oriented towards each other with free Line of Sight 2. Ensure measurement environment is free from interference of large moving objects

Radio unit LED states

State ID	State name	Color pattern
A	Blue heartbeat (System operational)	
B	LEDs off (Power off)	
C	Yellow heartbeat (Booting up)	
D	Yellow blink 3 sec (Network initializing)	
E	Blue blink 4 sec (Connecting to backend)	
F	Measurements initializing (Green indicates port with Sensor. In this example ports 1 and 3 are active.)	

Ownership

All devices are property of Koherent Oy under the established Positioning Service Agreement. Koherent Oy does not sell or give ownership of Koherent Grid devices to any third party.

Recycling

Koherent Oy handles device recycling according to EU WEEE Directive (2012/19/EU).

All devices shall be returned to Koherent Oy for maintenance, replacement, or at the end of Positioning subscription period, or after unilateral termination of the Positioning subscription according to contract terms and conditions.

Do not dispose of any property of Koherent Oy without separate written permission from Koherent Oy or an authorized representative.

support@koherent.io
www.koherent.io
Äyritie 8 C, 01510 Vantaa, Finland

Additional information

Device identification

An identification label is attached to the bottom of every device. The label specifies device type, serial number, operating and recycling information, and manufacturer contact details.

Declaration of Conformity

Koherent Oy declares under its sole responsibility that the Koherent Grid based positioning devices comply with the essential requirements of the EU directives and standards applicable to the product.

Contact information

Address: Äyritie 8 C, 01510 Vantaa, Finland
Email: support@koherent.io