

SENSORFACT

Energy saving made easy



Installation manual

Current Sensors

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1 Introduction

The box(es) you find in front of you contain all the components of your Sensorfact energy management system: sensors, bridges and accessories. This manual will help you install the system, allowing you to quickly gain insight into the energy consumption of your machines and start collecting data for a custom savings advice.

Before starting the installation, we would like to give the following recommendations:

- Please read this manual in its entirety;
- Decide in advance where you want to place the sensors and bridges. Power supply (220V) must be present at the location where the bridge is placed;
- Prepare the network configuration if you want to connect the bridges via WiFi or Ethernet. This may be necessary to give the bridges the proper permissions to connect to the Internet within your local network. It is likely that your IT department can help you with this. Instructions for the network configuration can be found under the heading 'Contact & Support' on the help centre on our website: <http://www.sensorfact.eu/>.

You will need the following resources during installation:

- The inventory list - this can be found both as a hard copy in the box and digitally in the welcome email you received from us;
- Fixing materials such as screws, double-sided tape or tie wraps;
- A cleaning cloth;
- The sensors and bridges in the package;
- Familiarity with the names/functions of machines to be measured on the inventory list.

The following topics will be discussed in this manual. Chapter 2 describes how the system works and how to perform the installation. In chapter 3 an introduction is given to the Sensorfact Software, through which you can get access to your measurement data and check the quality of the installation. The annex contains answers to a number of Frequently Asked Questions that you may encounter during installation, as well as the technical specifications of the sensors. For additional questions, please refer to the help centre on our website.

2 Installation

The Sensorfact energy management system consists of two hardware components: the sensors and the bridges. A sensor is a module that measures the power consumption and transmits the measurement data to (a) bridge(s) that are designed to receive such signals. A bridge is a gateway connected to the internet and that will send the measurement data to our cloud platform.

2.1 Sensors

A sensor consists of a transmitter module with three (or one if you use a single-phase sensor) separate clamps (see figure 2.1). The sensor relies on 'energy harvesting' from the power cables of the machines and thus does not need an external power supply.

The transmitter module sends the measurement data to the bridge. To be able to interpret the data correctly in the dashboard, it is important that you connect the correct sensors to the designated machines on the inventory list.

You can identify the sensors using the 8-digit sensor ID.

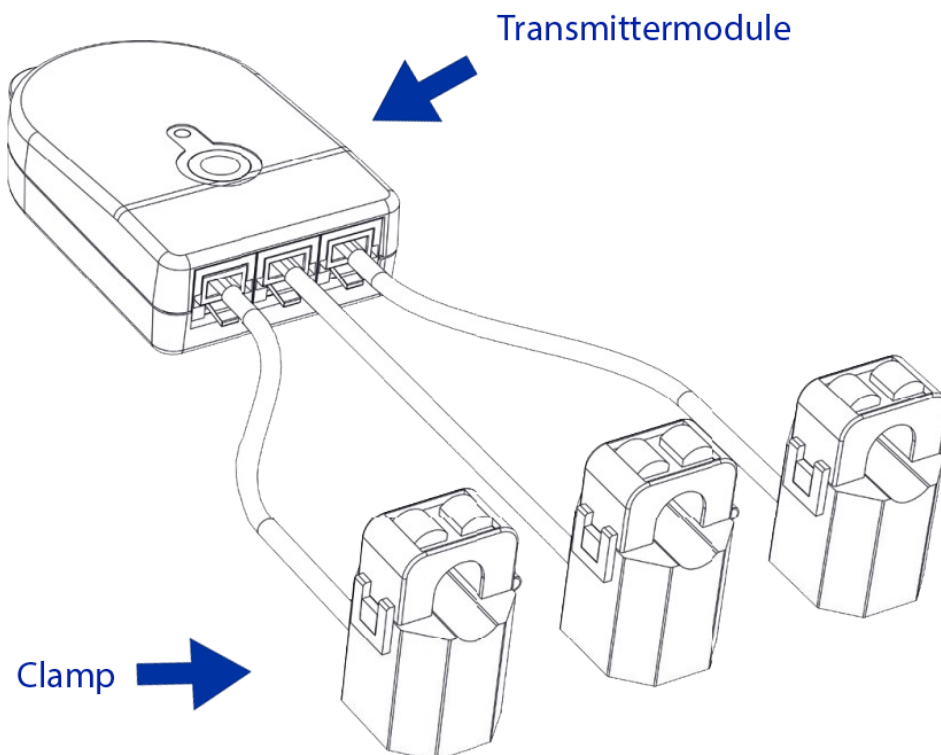


Figure 2.1 Schematic representation of a 3-phase sensor

2.2 Installation of sensors

1. Grab a sensor (transmitter module + 3 clamps) and read the sensor-ID. Find the sensor ID on the inventory list and go to the power cables of the corresponding machine.
2. Check that the metal parts of the clamp are free of dust and dirt. If this is not the case, wipe them clean with a cleaning cloth.
3. Click a clamp around every phase of the power cable and make sure that they are securely fastened by checking the snap closures; this prevents discharge vibrations. If the clamp does not fit around the cable properly, please contact our support.
4. Should a machine be powered through more phases than can be measured, it is sufficient to only attach the clamps where possible. In this case, it is **very important** to inform our support department of the number of power cables in total and the number of power cables with clamps, so that the data is processed in the appropriate way.
5. Click the RJ11 plugs (i.e. telephone sockets) of the clamps into the transmitter model (see figure 2.2). The order in which these are connected is not important.

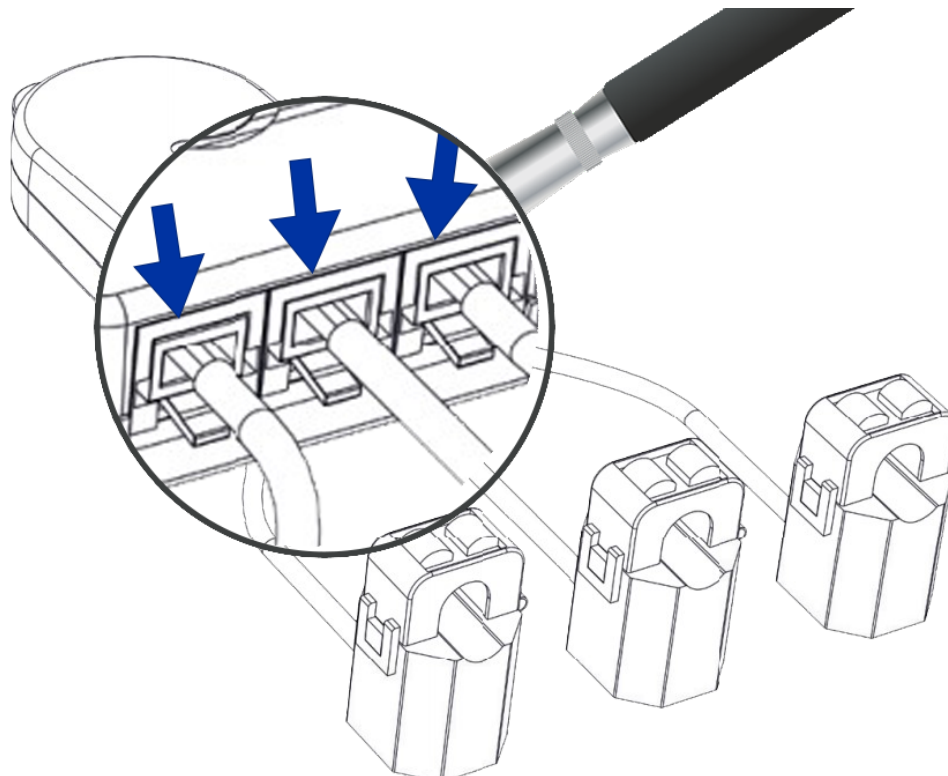
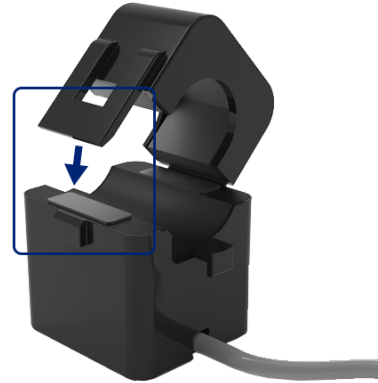


Figure 2.2 – View of connecting a clamp with RJ11 plug to a transmitter module

6. After installation, check that the sensor is working properly by checking the LED light. If the transmitter light flashes every 10 seconds, the sensor is working properly (see figure 2.3).

Note: if the machine is not switched on or disconnected from the power supply, the LED light will not flash. The intensity of the LED light is low, this can be difficult to see.

7. If possible, mount the transmitter outside the distribution cabinet. Metal and concrete obstacles can significantly reduce the range of the wireless transmitter. If this is not possible, make sure that a bridge is placed close to the cabinet. Mounting can be done with double sided tape, screws, bolts or tie wraps.

8. To ensure that a decent connection between the bridge and a sensor is established, use the installation overview. This functionality is described in chapter 3.3.
9. Congratulations! The sensor is now installed, repeat the above steps for all other sensors in the box.

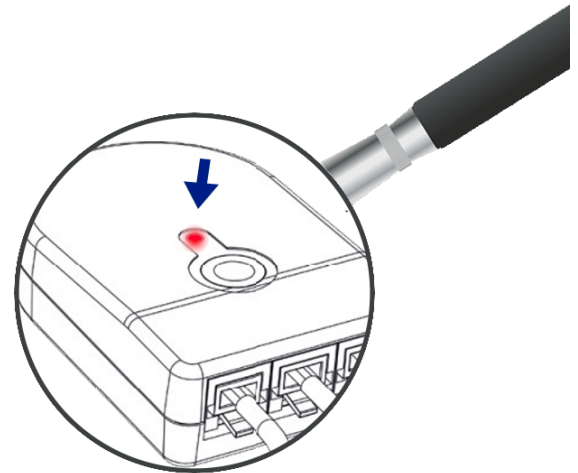


Figure 2.3 – Display of LED location on the sensor's transmitter

2.3 Bridges

A bridge has three antennas, a power cable and a 5V adapter. The bridge receives the data from the sensors through a wireless EnOcean connection. The bridge (temporarily) stores this data and uploads it to our cloud platform via a network connection. This network connection can be provided by means of an Ethernet cable, WiFi or an LTE (mobile network) connection. The bridge also has a LED light that indicates the connection status; this LED is located on the same side as the power cable.

The figure below shows the different parts:

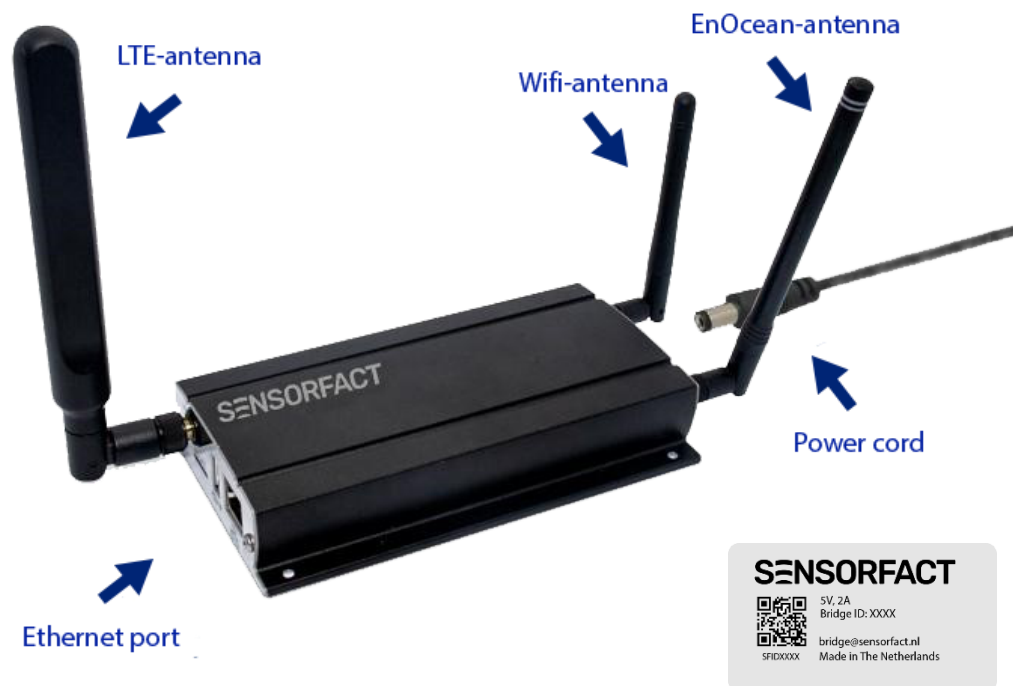


Figure 2.4 – View of the bridge with its accessories and the label on the top of the bridge

PLEASE NOTE!

To ensure correct functionality of the Sensorfact energy management system, please take the following guidelines into account:

- Place the bridge as close as possible to the sensors;
- Make sure that there are **no** large obstacles such as a large machine and/or wall between the bridge and the transmitter of the sensors. This can result in signals from the sensors not being received properly by the bridge;
- The bridge has a white sticker on top with the text: 'Bridge ID: XXXX'. This is essential information for the support department in case of questions about this bridge;
- Make sure you do not attach any mounting material over the stickers of the bridge;

- Do not place the bridge in a distribution cabinet. This is important or else the Internet connection via WiFi or LTE (4G) might not be established properly;
- Make sure a power socket is available for the bridge.

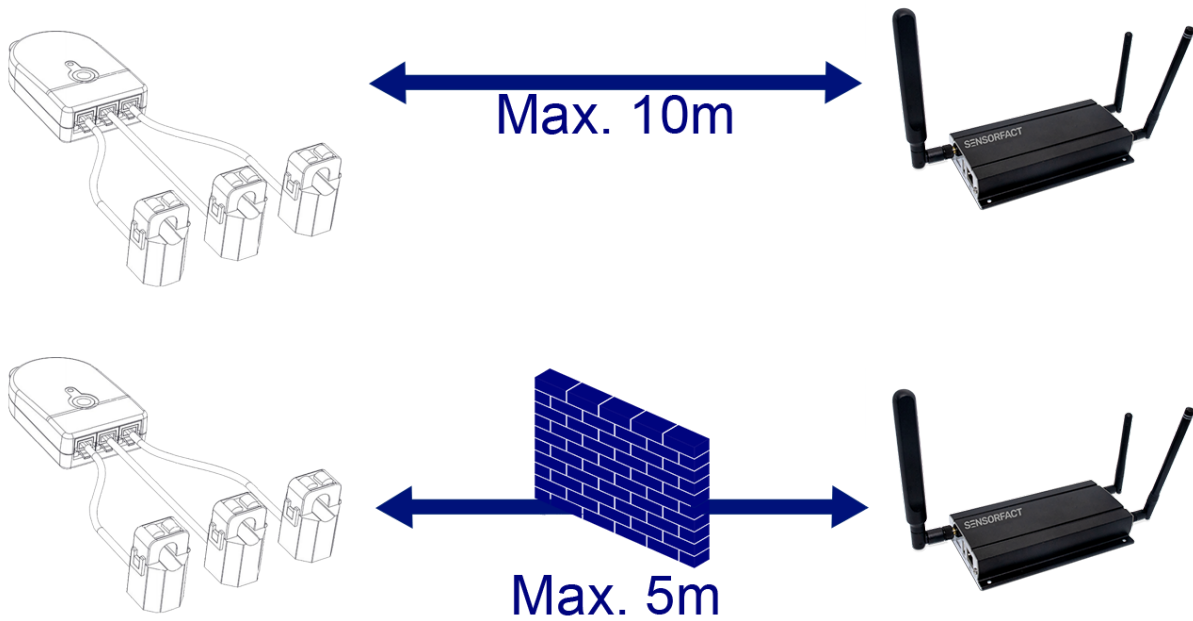


Figure 2.5 – Obstacles between a sensor and a bridge reduce the maximum distance



Figure 2.6 – Do not place the bridge in a distribution cabinet, this may disrupt the connection to the WiFi network or the mobile data network (4G).

2.4 Installation of bridges

1. Attach each antenna to the appropriate socket in the bridge. Three antennas are available for each bridge: an EnOcean antenna, LTE antenna and WiFi antenna. Please mount all 3 antennas to ensure optimal functionality of the system.

- a. Place the EnOcean antenna by screwing it to the bridge near the label 'EnOcean'. The EnOcean antenna is:

- a thin antenna with two gray stripes at the end



- or a long, tapered antenna



- b. Install the LTE antenna by screwing it to the bridge at the 'LTE' label. The LTE antenna is a thick, semi-flat antenna.



- c. Install the WiFi antenna by screwing it to the bridge near the label 'WiFi'. The WiFi antenna is the shortest antenna.



2. Plug the power cable into the 5V adapter at the USB input. Plug the other side of the power cable into the bridge.
3. Fixate the bridge with the mounting materials.
4. The power adapter can now be plugged into the socket.
5. Check the LED to see if the bridge is connected. The LED can transmit the current status in three different ways:
 - a. Continuously red: Installation is successful, the bridge has connected with the Sensorfact platform;
 - b. Flashing green: Disk activity is taking place, for example for writing measurement data;
 - c. Flashing red: The bridge is trying to connect to the network.

When a bridge is connected to the network, it can take about 20 minutes for the bridge to connect. In exceptional cases, it may take longer. You can continue to install the other bridges while the bridge is connecting.

6. Congratulations! The bridge is now installed, repeat the above steps for all other bridges in the box.

3 Sensorfact Software

The Sensorfact Software is a cloud-based platform that gives you and our energy consultants team access to your measurement data.

3.1 Logging in

Once you have completed the above steps, you can log in with your Sensorfact account at app.sensorfact.nl. We have sent you an e-mail with login instructions, with the subject "Your Sensorfact account has been created". If you did not receive this email, please also check your spam folder. If you can't find an e-mail from us there either, please contact our support department via support@sensorfact.nl or T: +31 30 781 00 15

3.2 Viewing data

As soon as you are logged in, you will be shown a short introduction. We advise you to follow it carefully to be introduced to all the Software's functionalities. On the left-hand side, you will see the machines and the groups from the inventory list you provided. If you have installed the bridges and sensors, and selected them in the left column, you will see your data coming in within minutes.

3.3 Installation overview

To ensure a solid installation of your Sensorfact energy management system, it is highly advised to use our installation overview. This overview can be found under the tab 'Installation' in the Sensorfact Software, where you can find more information about the functioning of the different components of your measuring system.

Here you will find:

- Information about the network connectivity strength of your bridge(s)
- The strength of the connection between the bridges and the sensors.
 - For optimal functionality, the connection between bridge and sensor preferably has a **blue or green** colour (3-4 dashes).
 - If this connection is indicated with a red or yellow colour (1-2 dashes), your measuring system may not function optimally.

If you click on the (i) in the upper right corner, the installation overview will be explained. If you have not been able to complete the installation successfully after using this overview, please contact our support department.

Annex

A.1 Troubleshooting & FAQ

For frequently asked questions, please refer to our help centre on our website www.sensorfact.eu. Do you have any questions regarding the installation, any additions to the manual or any additions to the FAQ? Please contact our support department: support@sensorfact.nl or +31 30 781 00 15.

Problem	Solution
Sensor will not come online	<p>Please go over the following questions:</p> <ol style="list-style-type: none">1. Has the sensor been installed?2. Is the machine switched on? (NB. the sensor is powered by the power cable of the machine being measured)3. Is the sensor properly clicked onto the power cable? Can you open and close the sensor again?4. Is the range between the sensor and the bridge sufficient?5. Are the correct antennas attached to the bridge? Are they firmly tightened?6. Are there any obstructions between the sensor and the bridge, such as metal doors, walls, etc? <p>If the sensor has not come online after completing the above steps, please place it where another working sensor is / was mounted. If the sensor does not come online in this setup, please contact our support department.</p>
Bridge will not come online	<p>This can have various causes, e.g. network strength or network configuration.</p> <p>In the case of WiFi or 4G, the network strength may be insufficient at the location of the bridge. In this case, try to move the bridge to a different location. Also, please check the configuration of the bridges and your local network.</p> <p>If this does not have the desired effect, please contact our support department to assess the situation and find a targeted solution.</p>

How do I know which sensor to use?	<p>First choice: check the fused power (per phase) of the power supply to be measured. Choose the sensors on this basis; our sensor types indicate the maximum current that can be measured with them: 60A, 200A or 600A per phase.</p> <p>Alternative: check the power of the machine being measured. You can recalculate the current by dividing the power of the machine by the voltage (in Volts) and by a standard power factor of 0.9. For example, a 50 kW machine connected to 230 Volt has a current of $50,000 / (230 * 0.9) = 242 \text{ A}$.</p>
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A.2 Sensor specifications

Technical Specifications	
Measurement Ranges 60A, 200A and 600A 3 Channel CT Clamps	60A range: 1A-60A, 200A range: 2A-200A and 600A range: 2A-600A
Measurement Frequency	50Hz or 60Hz
Accuracy - whichever is greater	60A = +/- 0.1A or 2%; 200A = +/- 0.1A or 2.5%; 600A = +/- 1A or 3%
Transmission Rate	30 Seconds
Reported Value	3 Separate channels in Amps
Repeater	No
Environment	IP 4X
Enclosure Material	Nylon 66
Sample time	Average of 5 measurements per 30 seconds (Per channel)
Telegram	VLD
Calibration	Not Required
Operating Temperature & Humidity Range	-5°C to +40°C; 0%-85% RH
Storage Temperature & Humidity Range	-20°C to +55°C; 0%-85% RH
Diameter of Measurable Conductor 60A 3 Channel CT Clamp	10mm or less
Diameter of Measurable Conductor 200A 3 Channel CT Clamp	24mm or less

Diameter of Measurable Conductor 600A 3 Channel CT Clamp	36mm or less
Dimensions of 60A 3 CH V3 CT Clamps	25mm x 22mm x 35mm approx.
Dimensions of 200A 3 CH V3 CT Clamps	35mm x 45mm x 65mm approx.
Dimensions of 600A 3 CH V3 CT Clamps	65mm x 41mm x 85mm approx.
Dimensions of Case	80mm x 55mm x 20mm approx.

Notes

[illegible]

