

# EcoPh

Renewables Engineering

## EcoPhi Basic Box



# Installation and setup manual

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## INTRODUCTION

Before your first installation, we recommend to test the Monitoring Box in your office and with good network connection.

## 1 SHORT MANUAL

- 1.) Connect with SIM
- 2.) Connect the devices and sensor to the EcoPhi Monitoring Box
- 3.) Do the online settings

## 2 CONNECTION SETTINGS

### 2.1 SIM/ MOBILE DATA CONNECTION

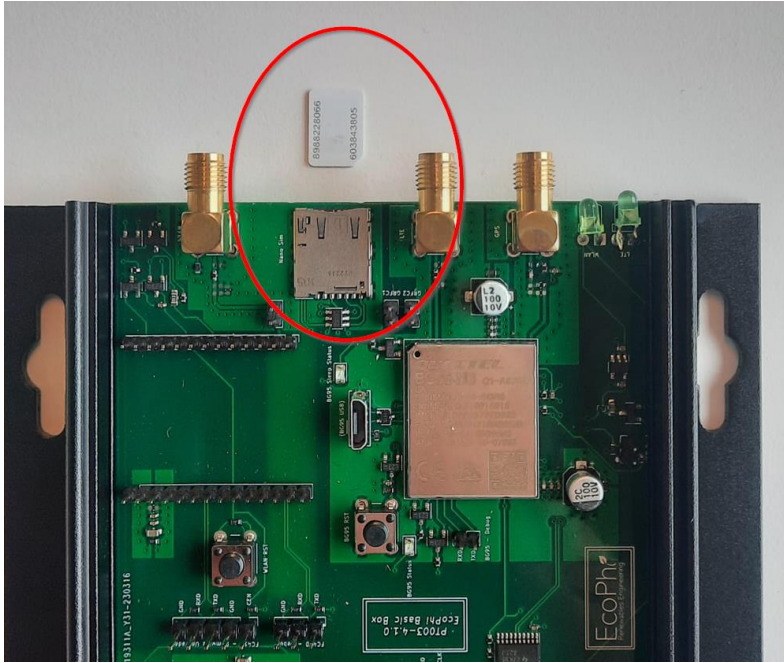
**Important! Make sure that the SIM card is topped up with mobile data and that no PIN is required!**

**Important! Make sure that the device is disconnected from the power supply when you insert the SIM.**

Note: You need a SIM card in Nano SIM format.

Remove the screws and remove the upper cover of the EcoPhi Box.

Insert the SIM card into the SIM card slot as shown in the picture until you hear a clicking sound.



Close the cover again and attach the antenna at “GSM”.

Power the device with 11-28 VDC either by using the separate power connector or directly via the inverter if possible.

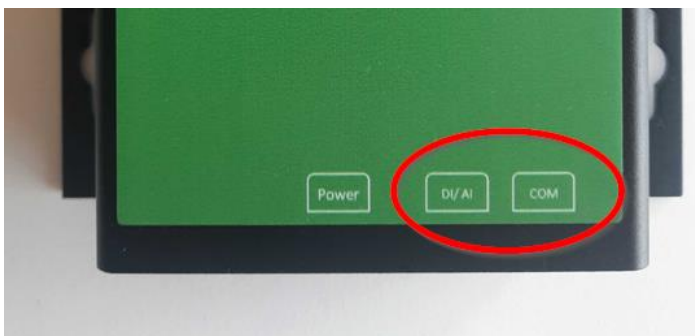
When the EcoPhi Box is connected, the right green LED (second from the antenna) will blink in the following pattern: 1800ms ON, 200ms OFF.

If no connection is being established, restart the device.

### 3 INVERTER AND SENSOR CONNECTION

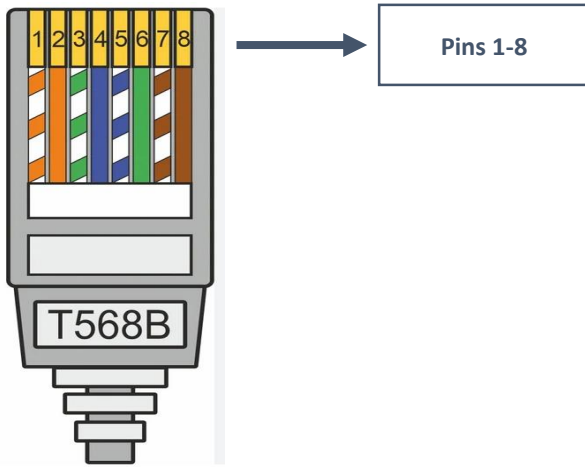
#### 3.1 INVERTER AND SENSOR CONNECTIONS

You need to prepare one RJ45 cable for serial communication (inverter and other devices) and one for the sensor connection.



**RJ45-1: DI/AI sensor connection**

The cable has to be prepared depending on the required sensor (see pin mapping below).



Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8
V Supply	Din	GND	Ain				GND

Connect the prepared cable to the DI/AI port.

**RJ45-2: COM Data connection**

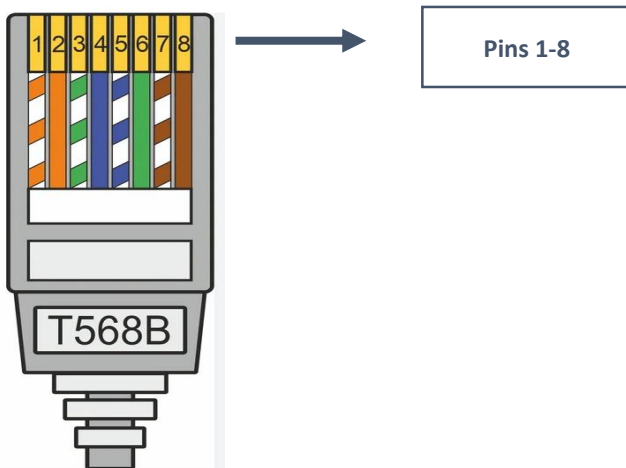
This connection is used for inverters and other serial communication devices.

There are two ways to connect an inverter:

- RS485
- RS232

Info: Sometimes, in addition to the cable connection, inverter specific settings and steps need to be taken. For this, please refer to the specific inverter manual or the manufacturer instructions.

The cable has to be prepared depending on the required device (see pin mapping below).



Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8

<b>RS232 Rx</b>	<b>RS232 Tx</b>	<b>RS485 B</b>	<b>V Supply</b>	<b>RS485 A</b>			<b>GND</b>
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Connect the prepared cable to the COM port.

### 3.2 POWER SUPPLY

Each RJ45 Plug has a “V Supply” and a “GND” Pin, which can be used to supply the box with power. They can also be used to forward the existing power supply of the box to potential sensors. (bidirectional)

Additionally, there is a standard 5.5mm barrel jack connector for the power supply next to the RJ45 connectors.

The Basic Box requires a DC supply of 11-28V DC with a peak current of 550mA.

## 4 INSTALLATION OF SELECTED SENSORS

### 4.1 AC CURRENT CLAMP

Info: Use only in combination with an energy meter.

Place the current clamp around the cable carrying the current to be measured. Always place the current clamp only around the single phase and not around the whole cable, otherwise the return line will also be measured and both currents will cancel each other out.

Place the arrow engraved in the current clamp in the direction of the expected current flow (currents in the other direction are counted negatively).

### 4.2 AC CURRENT SENSOR

Type: Analog Sensor

Clamp the AC current sensor around the cable carrying the current to be measured. Always place the AC current sensor only around the single phase and not around the whole cable, otherwise the return line will also be measured and both currents will cancel each other out.

Place the arrow engraved in the current clamp in the direction of the expected current flow (currents in the other direction are counted negatively).

### 4.3 DC VOLTAGE SENSOR

Type: Analog Sensor

Apply the voltage to be measured to input 8 (+) and input 5 (-).

Connect the sensor to the EcoPhi Box:

Box	Pin1 V Supply	Pin2 Din	Pin3 GND	Pin4	Pin5 Ain	Pin6	Pin7	Pin8 GND
Sensor	Input 1		Input 2		Input 3			

#### 4.4 DOOR SENSOR

Type: Digital sensor

Connect the sensor cable to the EcoPhi Box:

Box	Pin1 V Supply	Pin2 Din	Pin3 GND	Pin4	Pin5 Ain	Pin6	Pin7	Pin8 GND
Sensor	Blue	Brown						

Attach the fixed sensor end to the door frame and attach the loose sensor end to the door. To fix the sensor, loosen the adhesive strip.

Make sure that there are no magnetic interference fields in the immediate vicinity.

The sensor cable must always be at least 10cm away from the nearest power cable, otherwise interference may occur.

#### 4.5 ENERGYMETER SPM91 SINGLE PHASE

Type: Serial sensor

Attach phase and neutral input to terminal 1 (phase) and terminal 2 (neutral).

Attach phase and neutral output to terminal 3 (phase) and terminal 4 (neutral).

Connect the sensor to the EcoPhi Box:

Box	Pin1 RS232 Rx	Pin2 RS232 Tx	Pin3 RS485 B	Pin4 V Supply	Pin5 RS485 A	Pin6	Pin7	Pin8 GND
Sensor			Terminal 8	Not used, isolate	Terminal 7			Not used, isolate

Note the ID printed on the energy meter for doing the online settings properly (Chapter 5.1).

The sensor cable must always have a distance of at least 10cm to the next power cable, otherwise interference may occur.

#### 4.6 ENERGMETER SPM93 3-PHASE

Type: Serial sensor

Info: To be used in combination with current clamps.

Attach the neutral input to terminal N of the energy meter.

Attach phases 1, 2 and 3 to terminals 1, 3 and 5 of the energy meter.

Attach one current clamp (Phase 1): S1 to L1 input and connector S2 to L1 output.

Attach one current clamp (Phase 2): S1 to L2 input and connector S2 to L2 output.

Attach one current clamp (Phase 3): S1 to L3 input and connector S2 to L3 output.

Connect the sensor to the EcoPhi Box:

Box	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8
	RS232 Rx	RS232 Tx	RS485 B	V Supply	RS485 A			GND
Sensor			Terminal 15	Not used, isolate	Terminal 16			Not used, isolate

Note the ID printed on the energy meter for doing the online settings properly (Chapter 5.1).

The sensor cable must always have a distance of at least 10cm to the next power cable, otherwise interference may occur.

#### 4.7 IRRADIATION SENSOR/INDICATOR

Type: Analog sensor

Plug the sensor into the analog input of the EcoPhi Box. Extend the cable as needed.

Place sensor in sun. For the use in a solar system, install the sensor as close as possible and in parallel to the solar panels. Watch out for possible shadows.

#### 4.8 LEVEL SENSOR

Type: Analog sensor

Extend the cable as needed.

Connect the sensor cable to the EcoPhi Box:

Box	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8
	V Supply	Din	GND		Ain			GND



<b>Sensor</b>	<b>Red</b>				<b>Blue</b>			
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It is important to note that the level sensor has a special cable which supplies the sensor itself with a reference pressure from the atmosphere. This cable must be laid at least up to the ambient pressure (above the water line), otherwise the measurement results will be falsified.

Place the sensor in the water to be measured. The sensor will report how many feet of water is above it. If a water tank is to be measured, then it should be attached to the bottom of the tank. If a borehole is to be measured, then it should be mounted directly above the pump to show how much water is still above the pump.

Pay attention to the measuring range. If more water than the measuring range is above the sensor, the maximum value is indicated.

#### 4.9 PRESSURE SENSOR

Type Analog sensor

Extend the cable as needed.

Connect the sensor cable to the EcoPhi Box:

<b>Box</b>	<b>Pin1</b>	<b>Pin2</b>	<b>Pin3</b>	<b>Pin4</b>	<b>Pin5</b>	<b>Pin6</b>	<b>Pin7</b>	<b>Pin8</b>
	<b>V Supply</b>	<b>Din</b>	<b>GND</b>		<b>Ain</b>			<b>GND</b>
<b>Sensor</b>	<b>Red</b>				<b>Black</b>			

The pressure sensor must be installed in a ¼ inch thread. A T-fitting can be used for this purpose.

If the pressure sensor is used for water, make sure that no air bubbles can collect in front of it. Otherwise the measuring results can be falsified.

When installing, make sure that the thread is tight.

#### 4.10 STRING MONITORING UNIT

Type: Serial sensor

Plug the sensor into the Modbus input of the EcoPhi Box. Extend the cable as needed.

<b>Box</b>	<b>Pin1</b>	<b>Pin2</b>	<b>Pin3</b>	<b>Pin4</b>	<b>Pin5</b>	<b>Pin6</b>	<b>Pin7</b>	<b>Pin8</b>
	<b>RS232 Rx</b>	<b>RS232 Tx</b>	<b>RS485 B</b>	<b>V Supply</b>	<b>RS485 A</b>			<b>GND</b>
<b>Sensor</b>			<b>CN2.2</b>	<b>CN1.1</b>	<b>CN2.1</b>			<b>CN1.3</b>

Attach the PV voltage to be measured to CN3 (each at + and -).

Put the strings to be measured through terminals CH1...8. Pay attention to the direction of the current. This is marked by an arrow.

Note the ID printed on the energy meter for doing the online settings properly (Chapter 5.1).

The sensor cable must always have a distance of at least 10cm to the next power cable, otherwise interference may occur.

#### 4.11 TEMPERATURE AND HUMIDITY SENSOR OUTSIDE

Type: Serial sensor

Extend the cable as needed.

Connect the sensor cable to the EcoPhi Box.

Box	Pin1 RS232 Rx	Pin2 RS232 Tx	Pin3 RS485 B	Pin4 V Supply	Pin5 RS485 A	Pin6	Pin7	Pin8 GND
Sensor			Yellow	Red	Black			Green

Place the sensor in the location where temperature and humidity are to be measured.

The sensor is protected against rain, so it can be placed outdoors. Make sure that the sensor is never submerged in water.

Note the ID printed on the energy meter for doing the online settings properly (Chapter 5.1).

The sensor cable must always be at least 10cm away from the nearest power cable, otherwise interference may occur.

#### 4.12 TEMPERATURE AND HUMIDITY SENSOR INSIDE

Type: Serial sensor

Extend the cable as needed.

Connect the sensor cable to the EcoPhi Box.

Box	Pin1 RS232 Rx	Pin2 RS232 Tx	Pin3 RS485 B	Pin4 V Supply	Pin5 RS485 A	Pin6	Pin7	Pin8 GND
Sensor			Blue	Red	Yellow			Black

Place the sensor in the location where temperature and humidity are to be measured.

The sensor is designed for indoor use and must be protected from rain. Ensure that the sensor is never submerged in water.

Note the ID printed on the energy meter for doing the online settings properly (Chapter 5.1).

The sensor cable must always be at least 10cm away from the nearest power cable, otherwise interference may occur.

#### 4.13 TEMPERATURE SENSOR

Type: Analog sensor

Extend the cable as needed. Connect the sensor to the EcoPhi Box according to the sensor manual (as there are different temperature sensors).

Place the temperature sensor at the desired location. If the temperature sensor is threaded, screw in at appropriate location and seal it.

#### 4.14 WATER METER

Type: Digital Sensor

Connect the sensor to the EcoPhi Box

Box	Pin1 V Supply	Pin2 Din	Pin3 GND	Pin4	Pin5 Ain	Pin6	Pin7	Pin8 GND
Sensor	1 cable	1 cable						

Extend the cable as needed.

Install the water meter in water circuit and seal it.

Ensure that there are no magnetic interference fields in the immediate vicinity.

The sensor cable must always be at least 10cm away from the nearest power cable, otherwise interference may occur.

## 5 SETUP OF DEVICES AND SENSORS

### 5.1 SETUP INVERTERS AND OTHER DEVICES VIA SERIAL INTERFACES

Note that depending on the inverter and device, settings must be made directly on the connected device. Depending on the inverter, separate instructions are available for this.

Connect the inverter to the monitoring box according to the manufacturer's instructions or an existing EcoPhi manual.

Make sure that the EcoPhi box is connected to the Internet.

Log in to the EcoPhi platform and open the “**Device Settings**” dashboard.

Switch to the tab "**Inverters, generators, and other devices (serial communication)**".

Click on "**Request current values**" to request the current settings from the device. A request is sent to the EcoPhi Box, whereupon the EcoPhi Box sends the current settings. A timer of 10 seconds is set for this.

Depending on the EcoPhi Box and Platform subscription, up to 32 queries can be set.

New queries can be added under "**Add setting**":

- "**Mod ID**": Depending on the inverter or sensor, the ID is predefined. Please refer to the instructions of the inverters/devices. Duplicate IDs are not permitted. If an ID is specified that already exists, the existing query will be overwritten.
- "**Readout Time (seconds)**": An individual query interval can be defined for each query. The value is limited depending on the service level.
- "**Protocol**": Select the device from the list. If your device does not appear or if you are not sure which protocol to select, contact EcoPhi Support. There are four classes of devices:
  - 1000: Inverters and Pump Controllers
  - 2000: Generators
  - 3000: Meters and Sensors
  - 4000: Batteries
- "**IP (if needed)**": An IP must be entered for some devices. Please refer to the instructions of the inverters/devices. (The usage of devices with an IP, might impact the possibility to connect the device via Ethernet)

Confirm the entries with your PIN.

Delete queries:

Existing queries can be deleted individually. To do this, select the query to be deleted by clicking on the circle in the last column. The selected column is highlighted in red.

Confirm the deletion of the query with your PIN.

## 5.2 CONNECTING DIGITAL AND PULSE SENSORS

Place the sensor at the final location. Connect the cable to the matching connector at the EcoPhi Box.

Make sure that the EcoPhi box is connected to the Internet.

Log in to the EcoPhi platform and open the “**Device Settings**” dashboard.

Switch to the "**Analog, digital, and pulse sensor settings**" tab.

Click on "**Request current values**" to request the current settings from the device. A request is sent to the EcoPhi Box, whereupon the EcoPhi Box sends the current settings. A timer of 10 seconds is set for this.

Settings:

**"Units per Counter"**: Here you can enter for each pulse sensor how many units are counted per pulse. The information for this can be found directly on the sensor or in the EcoPhi sensor data sheets. If no pulse sensors are connected, nothing needs to be entered.

(Example: A water meter measures 10 liters per pulse/counter. In this case 10 is entered here).

Confirm the entries with your PIN.

Info: The sensor settings are applied directly. A restart of the system is not necessary.

Info: At the top of the page under the tab **"Data Checkup"**, you can check **"All values"** to see if the sensor values arrive correctly.

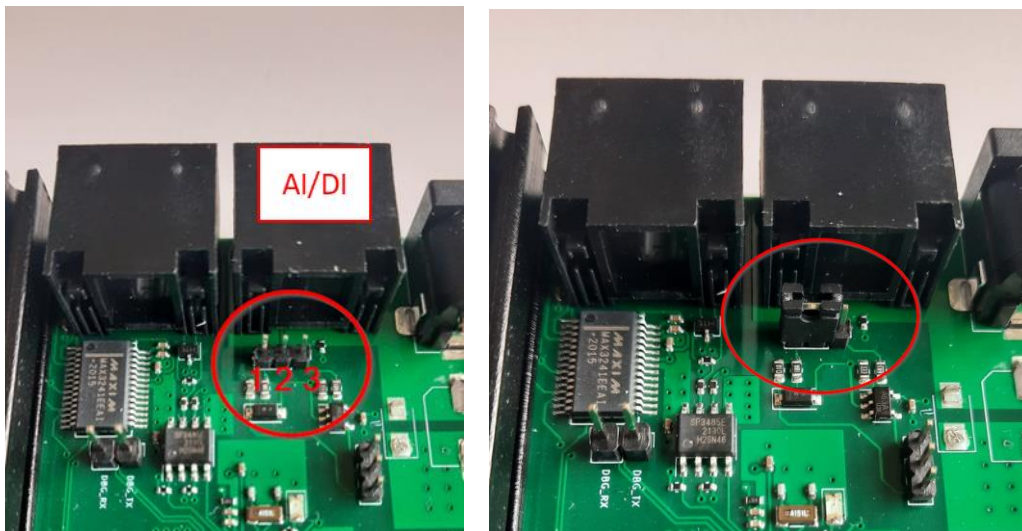
### 5.3 CONNECTING AND SETTING ANALOG SENSORS

The EcoPhi Basic Monitoring Box can read analog sensors with a 0-10 V or 4-20mA output. As a standard, the box is delivered to read 4-20mA analog sensors. If you want to connect a 0-10V sensor, you need to switch a jumper on the board.

0-20mA: Standard setting. The sensor can be connected directly.

0-10V: Open the upper cover of the box.

Behind the **"AI/DI"** port you will find three pins. Usually pins 1+2 are connected with a jumper(0-20mA). To switch to 0-10V, connect pins 2+3 with the jumper.



Close the box cover again.

Place the sensor at the desired location. Connect the cable to the box.

Make sure that the EcoPhi box is connected to the internet.

Log in to the EcoPhi platform and open the **"Device Settings"** dashboard.

Switch to the **"Analog, digital, and pulse sensor settings"** tab.

Click on "**Request current values**" to request the current settings from the device. A request is sent to the EcoPhi Box, whereupon the EcoPhi Box sends the current settings. A timer of 10 seconds is set for this.

Settings:

"**Analog ...**": Under "Type", one of three sensor types must be selected. The sensor type can be found in the EcoPhi Sensor Data Sheets or on the label of the sensor. Under "From" and "Till", the measuring range is entered. The info for this can be found directly on the sensor or in the EcoPhi Sensor Data Sheets.

Info: The sensor settings are applied directly. A restart of the system is not necessary.

Info: At the top of the page under the tab "**Data Checkup**", you can check "**All values**" to see if the sensor values arrive correctly.

## 5.4 CONNECTING AND SETTING MODBUS SENSORS

Place the sensor at the final location. Connect the cable to the matching connector on the EcoPhi Box (4-pin).

Make sure that the EcoPhi box is connected to the internet.

Log in to the EcoPhi platform and open the "**Device Settings**" dashboard.

Follow the instructions in chapter 5.1 - *Connecting inverters and other devices via serial interfaces*.

# 6 OPERATION

## 6.1 CHECK YOUR SYSTEM OPERATION

To check your system and see the data, log in to the EcoPhi platform. You will find a separate description on the features and option of the EcoPhi platform.

## 6.2 RESTART THE DEVICE

To restart the device, press the button on the bottom of the Basic Box next to the LED with a small needle or paperclip.



## 7 TROUBLESHOOTING

**I have inserted a SIM card but the device doesn't connect to the cloud:**

Does the SIM card have a PIN? It is important to remove the PIN.

Does the SIM card have mobile data available? Make sure that you have mobile data.

Restart the device.

## 8 ECOPHI SUPPORT

In case you have difficulties setting up your EcoPhi Monitoring Box, we are here to help you. Please contact the EcoPhi support under [support@ecophi.de](mailto:support@ecophi.de) or contact your support agent at EcoPhi.