



USER MANUAL

for Meteobot® Mini / Micro / Nano

Thank you for buying a Meteobot® weather station!

This user manual contains instructions for installation, correct operation and de-installation of Meteobot® weather stations.

Please read the instructions carefully before you begin – the product warranty depends on the correct installation and operation.

December 17th, 2020
Version 1.1

Prointegra Ltd.
Bulgaria, Varna 9009
2, Todor Penev str.
+359 884 833 780
tech@meteobot.com
www.meteobot.com

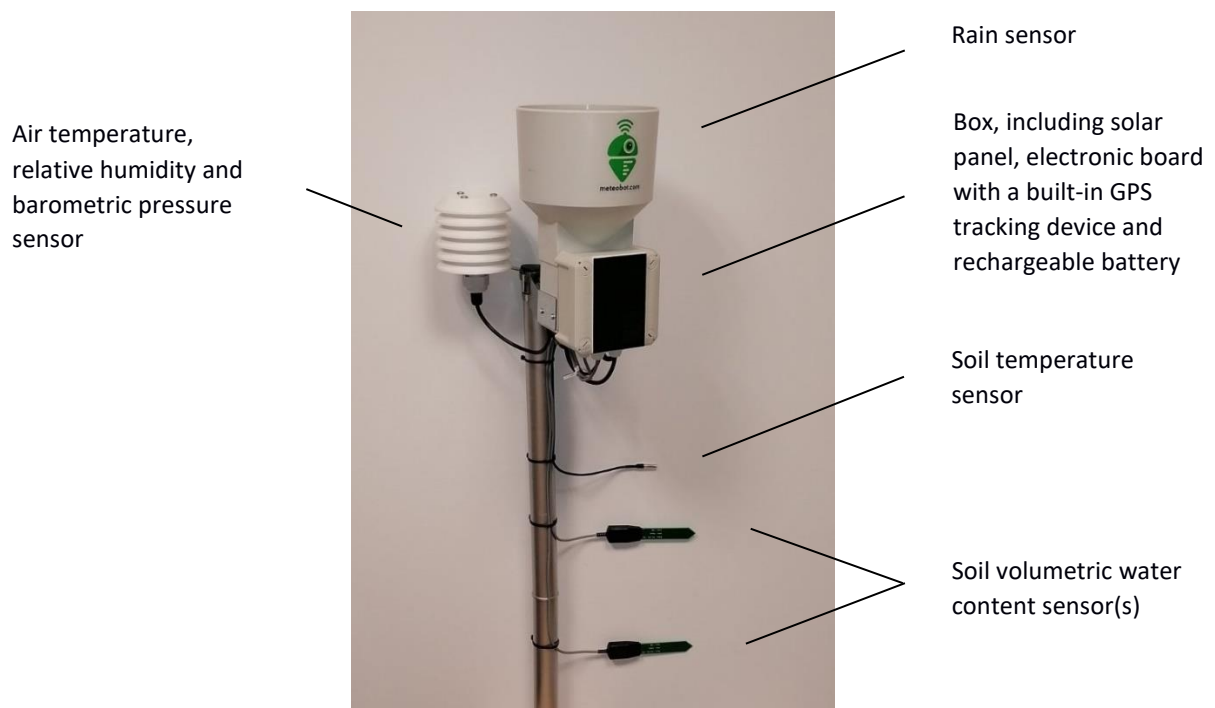
Table of Contents

1	Preparation.....	3
1.1	What's in the box?.....	3
1.2	General Overview	4
1.3	Before you start the installation.....	5
2	Where to place the weather station?	6
2.1	Sensor for temperature, relative humidity and air pressure.....	6
2.2	Rain sensor	6
2.3	Soil volumetric water content sensor.....	6
2.4	Solar panel.....	6
3	Installation.....	7
3.1	Pole.....	7
3.2	Box / rain sensor.....	7
3.3	Air temperature, relative humidity and barometric pressure sensor	7
3.4	Soil temperature sensor	7
3.5	Soil volumetric water content sensor.....	7
3.6	SIM card.....	8
3.7	Battery	9
3.8	Solar panel.....	9
4	Receiving data from the weather station.....	10
4.1	Install the mobile application	10
4.2	Registering the weather station	10
4.3	Data transfer frequency	12
5	GPS security and tracking.....	13
6	Diagnostics	14
6.1	Initial startup	14
6.2	Data transmission	14
6.3	GPS positioning.....	14
6.4	No GSM coverage	14
6.5	No connection to the server.....	15
7	Maintenance	16
7.1	Sensors maintenance	16
7.2	Battery maintenance	16
8	Uninstallation and replacement.....	17
8.1	Uninstalling the weather station	17
8.2	Replacing the battery	17
8.3	Replacing the solar panel	17
8.4	Uninstalling and replacing a sensor.....	17
8.5	Cable connection scheme.....	18
9	Troubleshooting	19
9.1	Battery not charging	19
9.2	The weather station does not send data.....	19
9.3	Missing or incorrect sensor data	20
10	Technical specification	21
11	Protecting the environment.....	22
11.1	Disposal	22
11.2	Battery information	22

1 Preparation

1.1 What's in the box?

No	Component	Meteobot® Mini	Meteobot® Micro	Meteobot® Nano
1	Box, including:	✓	✓	✓
1.1	Solar panel	✓	✓	✓
1.2	Electronic board with a built-in GPS tracking device	✓	✓	✓
1.3	Rechargeable battery	✓	✓	✓
2	Rain sensor	✓	✓	option
3	Air temperature, relative humidity and barometric pressure sensor	✓	option	option
4	Soil temperature sensor	✓	option	✓
5	Soil volumetric water content sensor (max 3 pcs)	option	option	✓
6	Mini USB cable for charging	✓	✓	✓
7	Hose clamps for installation	✓	✓	✓



1.2 General Overview



Meteobot® Mini



Meteobot® Micro



Meteobot® Nano

1.3 Before you start the installation

Please make sure you have:

- Pole (metal tube) with diameter: 4-5 cm, and length: 1,50 m;
- Hammer (for hammering the tube down in the soil);

- Tools;

- Wide screwdriver (5-6 mm);
- Narrow screwdriver (2 mm);
- Measuring tape;
- Level;
- Knife (2 cm wide);
- Shovel or auger (18-20 cm);



- Mobile phone with:
 - Android 4.0.3 (or newer) with Google Play Services;
 - iOS 8 (or newer);
- Data SIM card (if already not provided by your sales representative / distributor) with the following parameters:
 - Size: nano SIM;
 - Operating temperature: -40 °C ÷ +105 °C;
 - Option to send and receive SMS text messages;
 - Data: 10 MB / month;
 - Minimum size of one data transmission session: 1 kB.

2 Where to place the weather station?

The weather station should be placed at a location with GSM coverage by your mobile operator.

In order to get correct measurements, it is important to place the station:

- On an even field and at a location, which is representative for the region;
- If there is another object nearby (e.g. tree, building, etc.), the station should be installed at a **distance at least 4 times longer than the height of the object**. Example: if there is a 5-meter-tall tree nearby, the station should be at least 20 meters away from the tree.

2.1 Sensor for temperature, relative humidity and air pressure

- At a height **70 – 80 cm above ground**.
AWAY FROM:
- Heat emitting objects – e.g. rocks, concrete, asphalt, dark surfaces, roofs, chimneys, air conditioners, air vents;
- Water bodies and other objects, which can artificially change the air humidity (e.g. rivers, dams, lakes, etc.).

2.2 Rain sensor

- At a height **80 – 90 cm above ground**;
- The upper opening of the sensor should be absolutely horizontal;
- **IMPORTANT:** There should be no water in the sensor, other than natural precipitation.
AWAY FROM:
- Sprayers;
- Sprinkler irrigation systems;
- Roofs, tree leaves and other surfaces, from which water could get into the sensor.

2.3 Soil volumetric water content sensor

The sensor should be placed in the plant's roots. The location of the sensor should be **representative** of the field:

- Field edges are not suitable;
- The soil conditions (type, slope, etc.) should be similar to the prevailing soil conditions in the field;
- The plants, near which the sensor is placed, should be of average size. Too big or too weak plants are not suitable.

2.4 Solar panel

- Should be facing **South**;
- Should be lit by the sun during the whole day (should not be in a shadow).

3 Installation

3.1 Pole

- Use a pole (metal tube) with diameter: 4-5 cm, and length: 1,50 m;
- Hammer the pole 70 cm in the ground;
- **IMPORTANT:** Should be perfectly vertical!

3.2 Box / rain sensor

- Install the box / rain sensor by clamping the metal holder to the top of the pole with hose clamps;
- The box / rain sensor should be facing South;
- **IMPORTANT:** The upper opening of the rain sensor should be absolutely horizontal.

3.3 Air temperature, relative humidity and barometric pressure sensor

- Install the sensor using the lower hose clamp of the rain sensor;
- The sensor should be facing North (opposite the rain sensor).

3.4 Soil temperature sensor

- Dig a hole in the ground to a desired depth (e.g. 10 cm) and bury the sensor in it;
- **IMPORTANT:** Compact the soil, so that no air remains around the sensor;
- **IMPORTANT:** Do not thrust the sensor in the ground by force;
- **IMPORTANT:** If there is a risk of rodents, place the sensor cable in a tube or another kind of protective wrapping.

3.5 Soil volumetric water content sensor

The sensor should be placed in the plant's roots. The location of the sensor should be **representative** of the field:

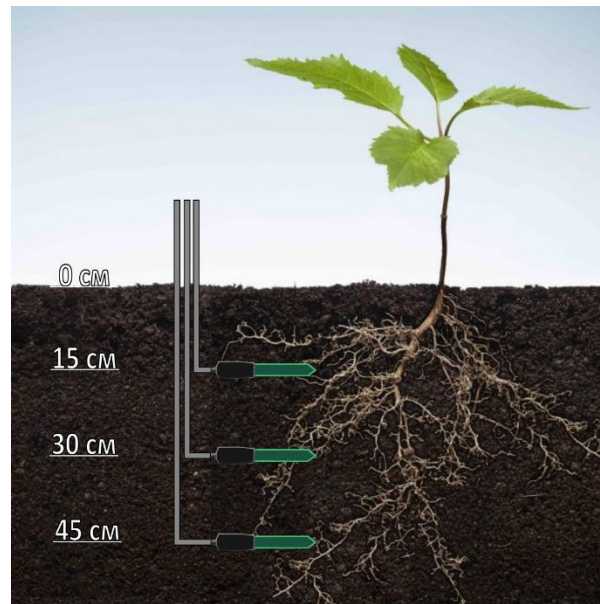
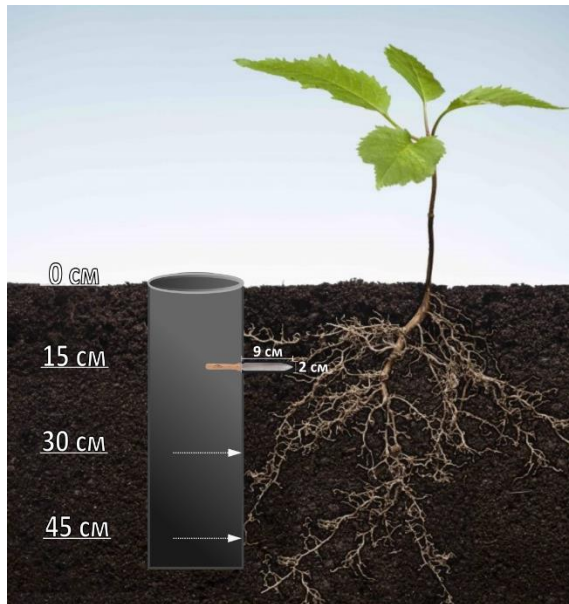
- Field edges are not suitable;
- The soil conditions (type, slope, etc.) should be similar to the prevailing soil conditions in the field;
- The plants, near which the sensor is placed, should be of average size. Too big or too weak plants are not suitable.

IMPORTANT: If there is a risk of rodents, place the sensor cable in a tube or another kind of protective wrapping.

How to install the sensor:

- Dig a hole in the ground with a shovel or an auger, as close as possible to the plant's roots;
 - The hole diameter should be 18-20 cm;
 - The depth depends on where you would like to place the sensor. For example, if you're going to place the sensors at 15, 30 and 45 cm, dig a hole that is 50 cm deep.
- With a thin knife make a slit sideways in the wall of the hole, holding the blade in a vertical plain. The slit should be:
 - 2 cm wide and 9 cm long (corresponding to the dimensions of the sensor);
 - At a depth, where you would like to measure the volumetric water content;

- As close as possible to the roots of your plants.
- Push the sensor in the slit gently;
- **IMPORTANT:** Do not thrust the sensor in the ground by force;



- If your Meteobot® comes with several volumetric water content sensors, repeat the procedure for each of them;
- **IMPORTANT:** The sensor should fit tightly in the soil. If there are air or stones around it, the measurements will be wrong;
- Mix the soil with water and fill the hole with the mud.
- **IMPORTANT:** If the soil above the sensor cracks as a result of drought, compact it.

3.6 SIM card

If your Meteobot® comes with an already installed SIM card, skip this step.

- Install the SIM card in your mobile phone and disable the SIM PIN code;
- Install the SIM card in the SIM card slot on the electronic circuit board;
- Push the “reset” button.



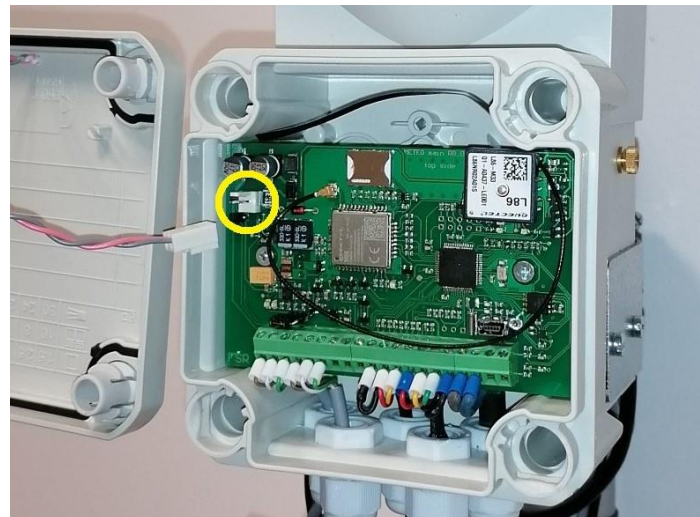
3.7 Battery

- Unscrew the bolts, which hold the electronic board to the box, and turn the board slightly downwards;
- **IMPORTANT:** Be careful not to snap the antenna cable;
- Plug the battery cable in the connector on the back of the electronic board;
- Fasten the electronic board to the box with the bolts.



3.8 Solar panel

- Connect the plug of the solar panel to the corresponding plug on the electronic board.



4 Receiving data from the weather station

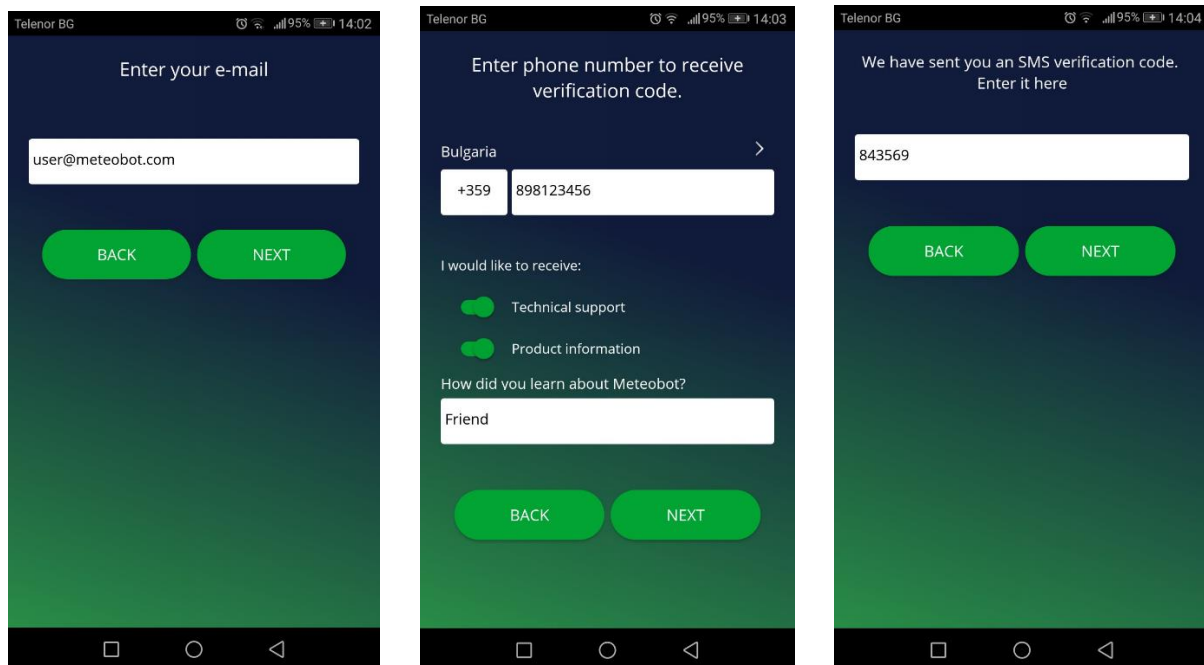
In order to start receiving data from your weather station, you need to install the Meteobot® app on your mobile device (smartphone or tablet).

If you already have installed the Meteobot® app, go on to the next section: “Registering the weather station”.

4.1 Install the mobile application

Download the Meteobot® app from Google Play or Apple AppStore and install it on your smartphone or tablet. If you start the app for the first time, you will go through the following steps:

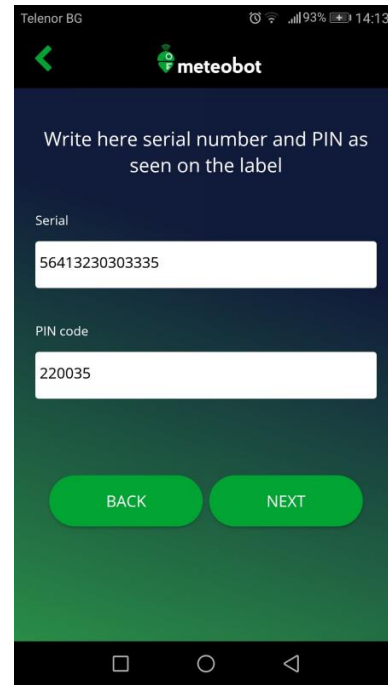
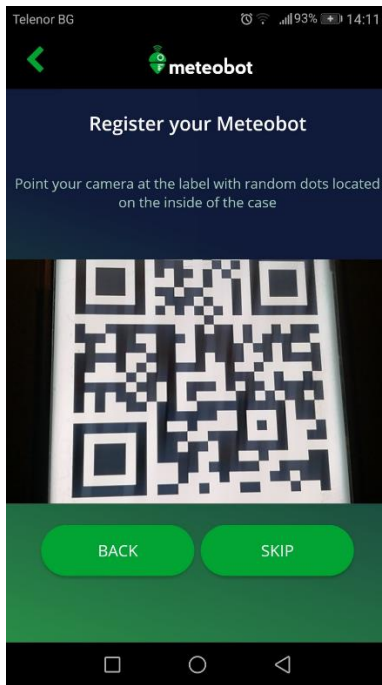
- Select the app’s language;
- Enter your e-mail address;
IMPORTANT: Please use an e-mail address, which you check frequently. In the future you will receive service information about your Meteobot® there;
- Enter your telephone number. You will receive an SMS text message with a confirmation code;
- Enter the code and press “Next”.



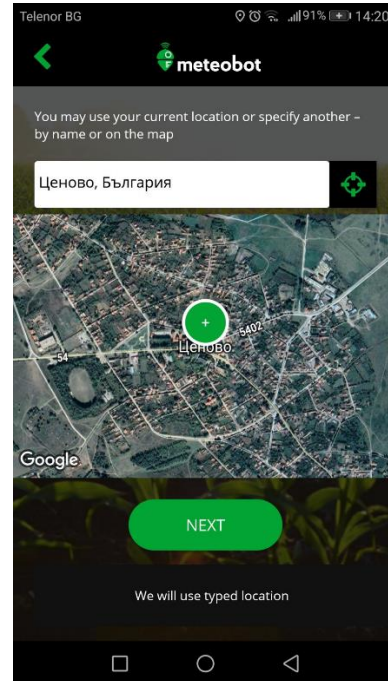
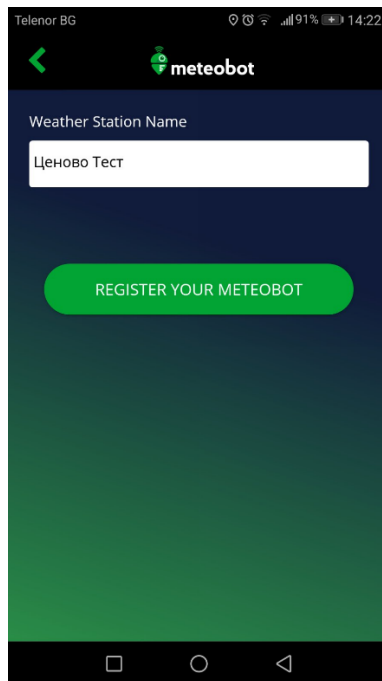
4.2 Registering the weather station

From the app menu (top left on the screen) select „New weather station“, and follow the steps on the screen:

- Scan the registration QR code from the weather station label. If your device cannot scan it, press the “Skip” button and type the serial number and the PIN-code from the label in the next screen;



- Give your weather station a name, according to your preference;
- Wait for your mobile device to determine your current location and then press “Next”;
- Give this location a name, according to your preference;



- Fill in the sensor configuration data (number, type, depth, etc.)
- This ends the weather station registration and you can see data from your Meteobot®. Depending on the configuration, you may need to wait for maximum one hour until you receive the first data.

4.3 Data transfer frequency

By default, the weather station records data from the sensors and sends them every 10 minutes.

The transmission interval can be from 10 minutes up to 8 hours. If you would like a different interval, send a request to the Meteobot® technical support team to tech@meteobot.com.

IMPORTANT: The more frequently the station sends data, the bigger the power consumption is. During winter the low temperature decreases the useful battery capacity, so too frequent data transmission can deplete the battery.

5 GPS security and tracking

There is a built-in GPS tracking device in the electronic board. With it you receive information about the exact location of the weather station.



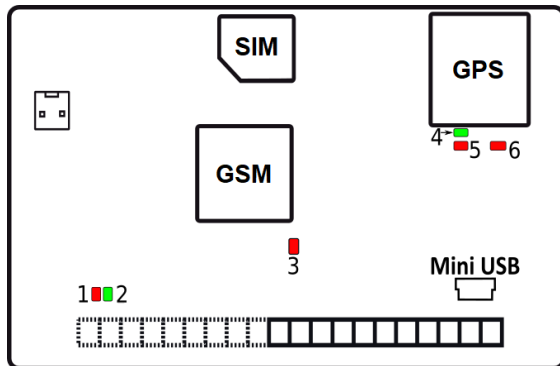
If the station is shaken, it sends an alarm signal to the Meteobot® mobile app. Right afterwards the GPS tracker starts showing the exact location of the weather station on the map. The location gets updated every minute.

If the shaking stops, the GPS tracker turns off automatically and stops showing the location.

IMPORTANT: Make sure to install the station on a stable tube (or pole), well fixed in the ground. If the tube is flexible or can easily be shaken by the wind, you will receive false alarms. Besides, if the GPS tracker turns on frequently, the battery may get quickly discharged.

6 Diagnostics

There are six light emitting diodes (LEDs) on the electronic circuit board. By observing how they glow or blink, you can diagnose what function the weather station is performing.



- 1 – red LED (for the battery)
- 2 – green LED (for the battery)
- 3 – red LED (for the GSM module)
- 4 – green LED (for the processor)
- 5 – red LED (for the processor)
- 6 – red LED (for the GPS module)

6.1 Initial startup

- When power is supplied (i.e. after connecting the battery) the green (4) and red (5) LEDs glow for 1 second. After that (4) goes out, and (5) starts blinking;
- After several seconds (4) glows for 2 seconds and goes out, (5) continues blinking, and (3) starts blinking quickly;
- When the weather station connects to the GSM network (3) starts blinking at longer intervals;
- After several seconds all LEDs go out.

6.2 Data transmission

- When the weather station starts transmitting data, the red LED (5) blinks, the green LED (4) glows continually, then the red LED (5) also glows continually;
- When the device stops transmitting data, first (4) goes out, (5) blinks several times. After that all LEDs go out.

6.3 GPS positioning

- When the weather station is shaken, it sends an alarm - the red LED (5) blinks, the red LED (4) glows continually, then the red LED (5) also glows continually. After that (4) goes out, and (5) continues blinking;
- When the GPS tracking device finds coverage, the red LED (6) starts blinking, and the weather station sends data again, this time with GPS location.

6.4 No GSM coverage

- When power is supplied (i.e. after connecting the battery) the green (4) and red (5) LEDs glow for 1 second. After that (4) goes out, and (5) starts blinking;
- After several seconds (4) glows for 2 seconds and goes out, (5) continues blinking, and (3) starts blinking quickly;
- If the weather station cannot connect to the GSM network, it restarts (LEDs (4) and (5) glow for several seconds, (3) goes out), after which the process repeats.

6.5 No connection to the server

- When power is supplied (i.e. after connecting the battery) the green (4) and red (5) LEDs glow for 1 second. After that (4) goes out, and (5) starts blinking;
- After several seconds (4) glows for 2 seconds and goes out, (5) continues blinking, and (3) starts blinking quickly;
- If the weather station cannot connect to the GSM network, it restarts (LEDs (4) and (5) glow for several seconds, (3) goes out), after which the process repeats;
- The weather station tries to connect to the server three times. If it does not succeed, it tries again after 10 minutes (or after another time interval – depending on the setting);
- If you encounter this situation, please contact the Meteobot® support team at tech@meteobot.com.

7 Maintenance

The weather station itself does not need any regular maintenance to work all year round without interruption, but for the normal operation it is necessary:

7.1 Sensors maintenance

- Rain sensor:
 - Clean the funnel, if full or dirty;
 - Pull up the funnel and clean the spoon underneath it, if dirty;
- Solar panel – if dirty, clean it with a soft wet cloth. Be careful not to scratch it;
- If the pole or the sensor for rain are tilted, set them up straight – they should be vertical;
- If the soil around the soil temperature or moisture sensors gets cracked (e.g. due to drought), compress it.
IMPORTANT: There should be no air left around those sensors.

7.2 Battery maintenance

If the battery level falls below 3.7 V, you will receive a low voltage alarm on your mobile phone. In case the solar panel cannot charge up the battery in the course of several days (e.g. in cloudy weather), you can charge yourself.

- Plug the mini USB cable (from the package) in the charging port. It is on the electronic board, above the sensor connectors;
- You can use a mobile phone charger or a power bank (min. 1 A);
- The battery should be charged for at least 12 hours;
- During charging the red LED (1) in the lower left angle of the electronic board will glow continually. When the battery is fully charged, the green LED (2) will glow.



If the battery level continues to fall down quickly, please contact the Meteobot® support team at tech@meteobot.com, so that we increase the data transmission interval. (The more often the weather station sends data, the more power it requires.) If this does not solve the problem, check the “Troubleshooting” section in this manual.

8 Uninstallation and replacement

When uninstalling the weather station or replacing any components, observe the instructions below.

8.1 Uninstalling the weather station

- Open the lid of the box with a wide straight screwdriver (-);
- Unplug the solar panel connector;
- Close the lid, making sure it fits tightly to the box;
- **IMPORTANT:** To take a sensor out of the ground, dig it out. Do NOT pull it by the cable;
- Unscrew the hose clamps of the rain sensor and the air temperature and humidity sensor and uninstall them from the pole.

8.2 Replacing the battery

- Open the lid of the box with a wide straight screwdriver (-);
- Unplug the solar panel connector;
- Unscrew the bolts, which hold the electronic board to the box, and turn the board slightly downwards;
- **IMPORTANT:** Be careful not to snap the antenna cable;
- Unplug the battery connector from the back of the electronic board;
- Plug in a new battery;
- Fasten the electronic board to the box with the bolts;
- Plug in the solar panel connector;
- Close the lid, making sure it fits tightly to the box.



8.3 Replacing the solar panel

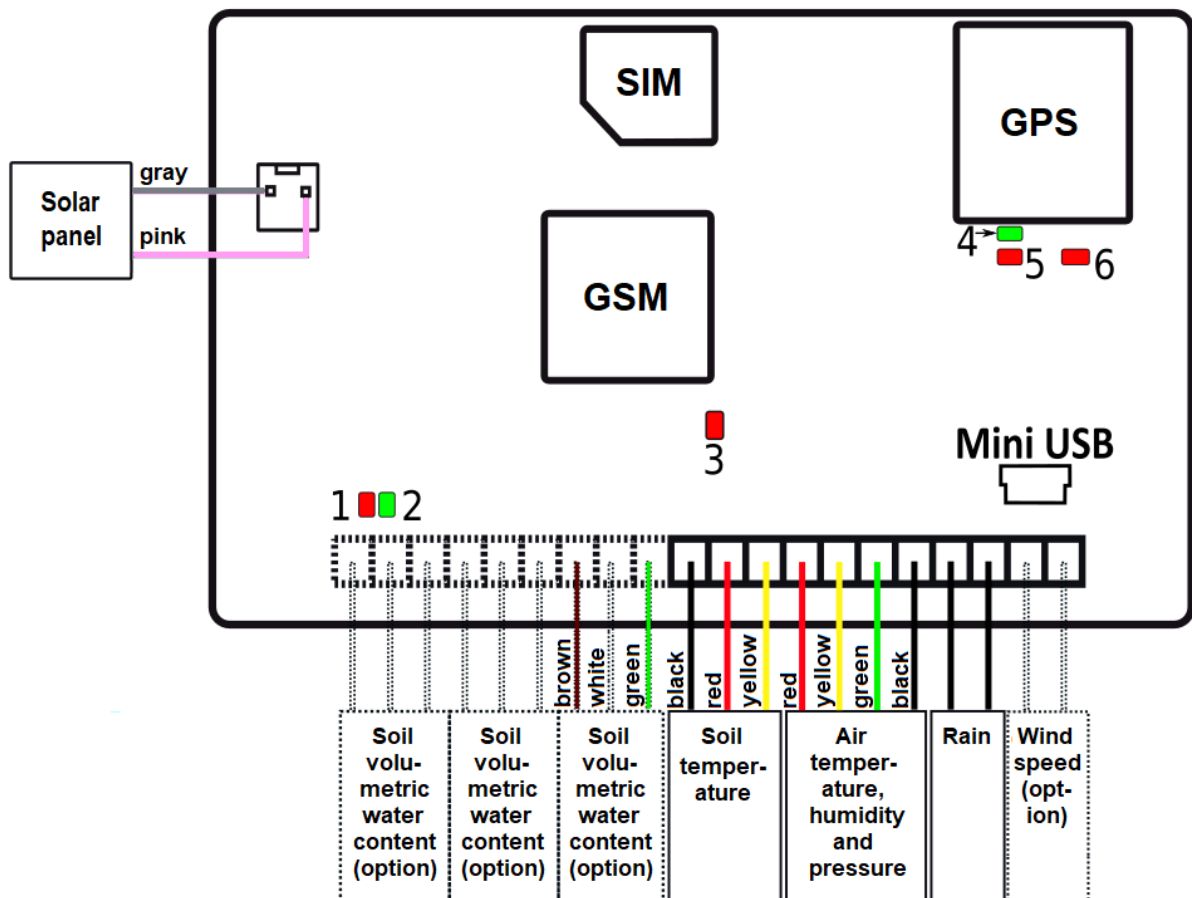
- Open the lid of the box with a wide straight screwdriver (-);
- Unplug the solar panel connector;
- Plug in the new solar panel connector. **IMPORTANT:** The solar panel should be plugged-in only if the battery has already been connected to the electronic board!
- Close the lid, making sure it fits tightly to the box.

8.4 Uninstalling and replacing a sensor

- Open the lid of the box with a wide straight screwdriver (-);
- Unplug the solar panel connector;
- Unscrew the cables, coming from the respective sensor;
- Unscrew the respective cable gland and withdraw the sensor cables from the box;
- **IMPORTANT:** To take a sensor out of the ground, dig it out. Do NOT pull it by the cable;
- Put the cable of the new sensor in the box through the cable gland and tighten the cable gland;

- **IMPORTANT:** Only one cable should pass through a cable gland;
- **IMPORTANT:** If you do not replace the sensor right away, fit a short piece of cable in the cable gland opening, so that it fits tightly, and screw it. Otherwise water may get into the box and may damage the electronic circuit board;
- Place the cable ends in the corresponding socket on the electronic circuit board, as described on the scheme above. Then screw the socket bolts with a small screwdriver.;
- **IMPORTANT:** Observe the cable colours of the following sensors:
 - Air temperature, relative humidity and air pressure sensor;
 - Soil temperature sensor;
 - Soil volumetric water content sensor;
- For the rain and wind speed sensors, it does not matter which cable is left and which is right;
- Plug in the solar panel connector;
- Close the lid, making sure it fits tightly to the box.
- Bind the slack cables to the pole with cable ties.

8.5 Cable connection scheme



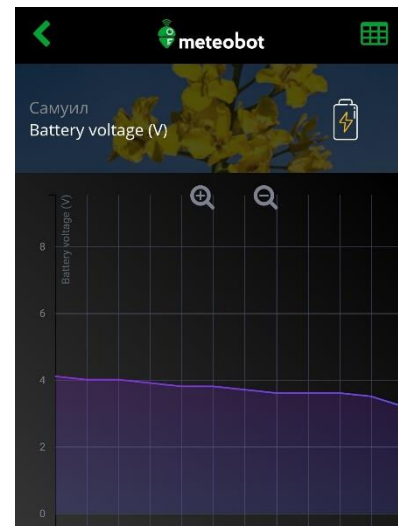
9 Troubleshooting

This section provides solutions in case any problems occur with the weather station.

IMPORTANT: Whenever it is necessary to replace a component, always observe the uninstallation instructions in the “Uninstallation and replacement” section.

9.1 Battery not charging

If the battery voltage chart shows progressive decrease (with no increase), this means that the battery does not get charged. If this happens on sunny days, there is a problem with charging.



No	Cause	Solution
1	The solar panel is very dirty	Clean the solar panel
2	The solar panel is broken or punctured	Replace the solar panel
3	The cable from the solar panel to the box is interrupted	Replace the solar panel
4	The solar panel does not face South	Loosen up the hose clamps and turn the weather station, so that the solar panel faces South
5	There are none of the problems, listed in p. 1 - 5, but the battery still does not get charged	With a multimeter, measure the voltage between the solar power cables in sunny weather. <ul style="list-style-type: none"> • If the voltage is above 4.5 V, replace the battery; • If the voltage is below 3 V, replace the solar panel
6	The solar panel and/or the battery were replaced, but the battery still does not get charged	Disassemble the weather station and send the box with the electronic circuit board for service

9.2 The weather station does not send data

No	Cause	Solution
1	No GSM coverage	Move the weather station to a location with GSM coverage OR install a SIM card from a mobile operator, who has GSM coverage in the area

2	Damaged SIM card	Replace the SIM card
3	SIM card bill not paid (in case of own SIM card)	Pay the bill
4	Battery voltage is under 3.5 V	See section „Battery not charging“

9.3 Missing or incorrect sensor data

No	Cause	Solution
1	A sensor cable is incorrectly connected or not connected at all	Disconnect the solar panel; Connect the sensor cable according to the cable connection scheme (see section “Uninstallation and replacement”); Connect the solar panel.
2	The sensor is dirty or stuck	Carefully clean the sensor
3	The sensor cable is interrupted or damaged	Replace the sensor
4	The sensor is damaged or broken	Replace the sensor
5	The sensor has been replaced, but the problem remains	Disassemble the weather station and send the box with the electronic circuit board for service


10 Technical specification

Sensor	Resolution	Range	Accuracy
Air temperature	0,1 °C	-40 °C ÷ +125 °C	± 0,5 °C
Relative air humidity	0,1 %	0 – 100 %	± 2 %
Barometric pressure	1 hPa	500 - 1100 hPa	± 1 hPa
Rain quantity	0,25 l/m ²	0,25 l/m ² - ∞ над 0 °C	0,25 l/m ²
Rain intensity	0,25 l/h	0,25 - 180 l/h	0,25 l/h
Soil temperature	0,1 °C	-40 °C ÷ +125 °C	± 0,5 °C
Soil volumetric water content	0,5 %	0 - 50 %	± 0,5 %
Solar panel	0,1 V	0 - 6 V	± 0,1 V
Rechargeable battery	Operating temperature: -20 ÷ +55 °C Operating voltage: 3.5 V – 4.2 V Capacity: 2900 mAh		

11 Protecting the environment

11.1 Disposal

This device is marked in accordance with the Waste Electric & Electronic Equipment Directive of the European Union. By ensuring the product is disposed of correctly at its end-of-life, you will help prevent potential negative consequences for the environment and human health.

This symbol  on the product, on its packaging or on the accompanying documents, indicates that this product shall not be treated as household waste. Instead, it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment. The recycling of materials will help to conserve natural resources. When disposing of it, observe the local waste disposal regulations. For more detailed information about treating, recovering and recycling of this product, please contact your local Civic Office, your household waste disposal service, or the vendor, from whom you purchased the product.

11.2 Battery information

This device contains a lithium-ion maintenance-free rechargeable battery. It has been tested for continuous operation in the temperature range -20°C to $+55^{\circ}\text{C}$. However long exposure to extreme temperatures (below -15°C or above $+45^{\circ}\text{C}$) decreases battery capacity and life. Never expose the battery to temperature above $+55^{\circ}\text{C}$.

In case the battery has to be replaced, treat the waste battery according to the guidelines in the Disposal section.