



iMETOS RadioNode

extended user manual

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Thank you for choosing an iMETOS for monitoring soil moisture data and agrometeorological variables. iMETOS RadioNode is a small, wireless, battery powered datalogger for in-field measurement of soil moisture, temperatures, rain, flow rate, leaf wetness, relative humidity and other parameters. iMETOS RadioNode sends all sensor readings in real time through an interactive star network back to our base station. From the iMETOS base station the data is uploaded to the web via cellular network (GPRS, Edge, UMTS, CDMA, WiFi). All data is available through FieldClimate platform.

Users have free access to data through web and mobile applications. Additional services (like plant disease models and hyper localized weather forecasts) are available upon license fee payment. Web API is available for interface with other custom applications.

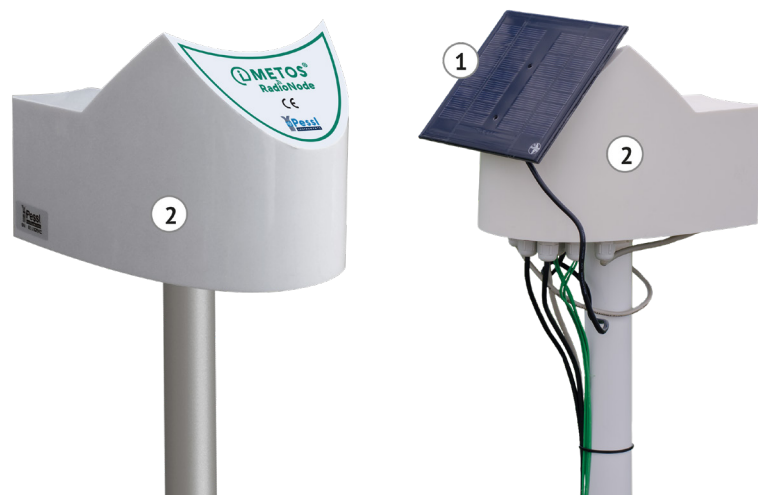
iMETOS RadioNode systems will be mainly used for:

- Meteorological monitoring
- Soil moisture and irrigation systems monitoring
- Weather forecast corrected with local measurements
- Plant disease models (depending on the configuration of the equipment)
- Hydrology and flood warning applications
- Environmental monitoring
- Frost warning via SMS

1. YOUR iMETOS RadioNode

To install iMETOS RadioNode, you will need an RF Internal Wireless Access Point PCB (AP) and an RF Sensor Device PCB (SD). The Radio wireless AP is connected to the iMETOS 3.3 through extension connector and is powered directly from the battery of iMETOS 3.3. This internal wireless AP controls the network that iMETOS RadioNodes are peered to.

The iMETOS RadioNode consists of a white plastic case containing the electronics, the battery and the RF Sensor Device PCB (SD). Each RadioNode SD is powered by 3.6V Lithium battery (19000 mAh) or by 6V battery (4.5 Ah), has a built-in PCB antenna and can support many sensors (see below). You can connect up to 16 radio nodes to the main station with a star topology. The expected operating range is 300 to 400 meters (1200 to 1400 ft.) at +14 dBm. By line of sight, when mounted on level ground at least 3 m (10 ft.) high and above crops, grass, bushes or foliage, it can reach more than 1000 meters.



Picture: 2 iMETOS RadioNode variations (with and without solar panel); 1. Solar panel; 2. Body containing a sensor device PCB and a battery.

REMOTE SENSOR NODES VARIATIONS

- **External Climate Radio Module with inputs for:** Rain gauge/Water meter, Hygroclip, Pressure switch/ Leaf wetness sensor, 2 Temperature sensors, 2 Watermarks/2 METER soil sensors + PI Bus
- **External Watermark/METER Group Radio Module** – with inputs for RRain gauge/Water meter, Soil temperature sensors, 4 Watermarks, 4 METER sensors, 4 Tensiometers + PI Bus
- **External PROFILE PROBE Radio Module with Solar panel** – with inputs for Rain gauge, 2 Sentek Drill&Drop sensors/2 Aquacheck sensors, 2 Watermarks, 2 METER sensors, 2 Tensiometers + PI Bus

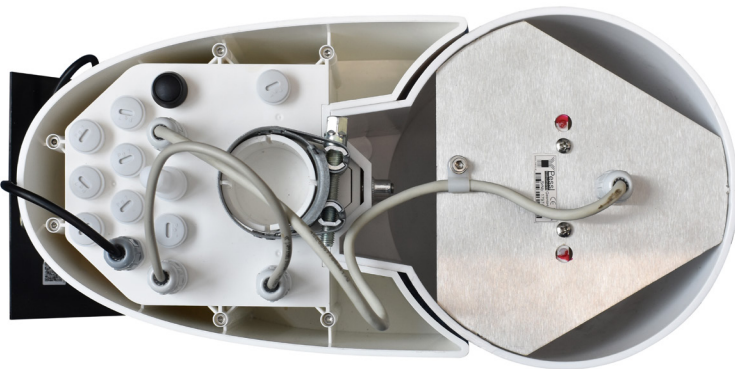
FEATURES

5 minutes measuring interval (default).

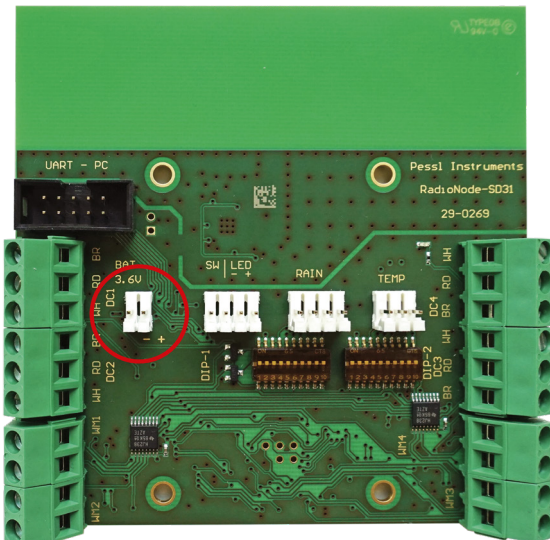
- Automatic rebuild of the synchronization in case of communication fails.
- Automatic switching between RF channels according to the noise.
- Lifetime of RF SD – over 5 years (with 3.6V Lithium Battery with capacity 19000 mAh)
- The range of communication is up to 1000 meters in the ideal conditions (line of sight) or more. Normally the guaranteed range is at least 400 meters.

2. START-UP THE iMETOS RadioNode

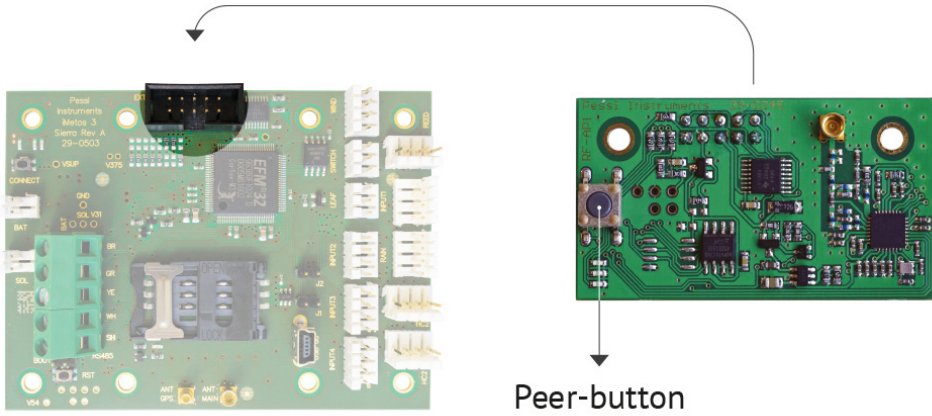
1. Open the housing by un-screwing the 6 screws downside.



2. RF Sensor Devices installation: Connect the sensors to the SD boards. Plug the battery into the SD board (LED indicator lights up for 2 seconds).



3. RF Access Point board installation: Connect the RF AP board through the extension connector of iMETOS RadioNode. Turn on the iMETOS RadioNode (all LED indicators will light up one by one for a while).



4. Device pairing (link establishment) between RF AP and all RF SDs.

4.2 Check if RF AP board is “ready to use” by clicking on the peer-button:

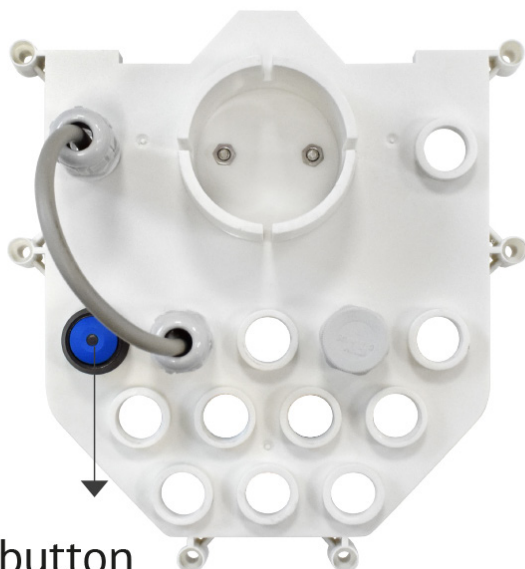
- **RF AP is ready to use (for pairing mode):** The red LED diode is not flashing. You may pair a new sensor device.
- **RF AP is not ready to use:** The red LED diode is flashing fast. RF AP has not been configured by the host device (iMETOS station). In this state, RF AP board does not acquire any data and it is not possible to pair a new sensor device. This happens right after starting up. You need to wait until the RF AP board is ready to use (iMETOS station should configure the AP board up to 5 minutes at latest).

4.2 Activate device pairing mode on RF AP by pressing the peer-button and holding it for at least 3 seconds. Device pairing of RF AP is activated for 3 minutes.

- All LED diodes of RF AP are lighting up for 1 second, after that only green LED diode is lighting up during active device pairing mode.
- All LED diodes of RF AP are lighting up for 1 second, after that only green LED diode is lighting up during active device pairing mode.

5. Activate device pairing mode on RF SDs by clicking on the external button. Device pairing takes 3 minutes.

- LED diode of RF SD is blinking during pairing mode.
- When wireless link is established successfully, the LED diode on RF SD board turns off (within 3 minutes).



External button

The report of RF SD node through communication terminal by successful pairing:

Start pairing

PAIRING TIME: 180	-> Length of pairing in seconds.
Joined.	-> RF SD node found and joined to RF AP.
Linked.	-> Communication link established OK.
Sync ok.	-> Synchronization and configuration data received OK.
Successful pairing.	-> RF SD node has been paired and configured by RF AP successfully.

Stop pairing

6. It is recommended to do the pairing of other iMETOS RadioNodes one by one, not all sensor devices at once. Repeat the steps above with all iMETOS RadioNodes.

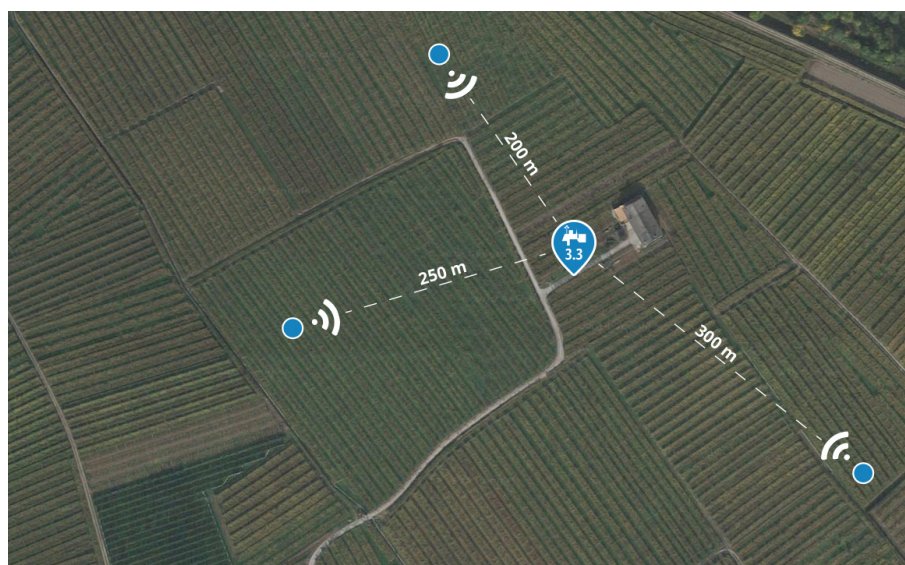
3. INSTALLING YOUR iMETOS

With iMETOS RadioNodes we can spatially extend our monitoring solution around the main iMETOS 3.3 station for a radius **from 50 m to 1000 m**, line of sight, when mounted on level ground at least 3 m high and above crops, grass, bushes or foliage:

- to monitor soil moisture in **heterogeneous soils** (soil characteristics can vary greatly over short distances);
- in relatively homogeneous soils it could be interesting to monitor the soil moisture in different **positions to have more spatially representative information**;
- in **different parcels** with different crops or varieties and/or different irrigation system sectors;
- **research applications with different small test plots**;
- **different microclimatic conditions**, in particular for example in green houses.

*For simple configurations where distances are below 50 m, the application of the PI bus using sensors chain makes sense.

NOTE: For complex configurations with more than 5 nodes we recommended contacting the PI Product Management for advice and revision of the draft project.



Picture above: iMETOS RadioNode star configuration.

The iMETOS has to be mounted on the pole: At the bottom of the unit there is a plastic ring with a metal clamp on it. Make sure that the pole is as vertical as possible. Check the bubble level on the rain gauge to ensure the right installation verticality of the pole.

If you have the solar panel, mount it on the main plastic case. In the northern hemisphere, it should face south while in the southern hemisphere it should point towards north.

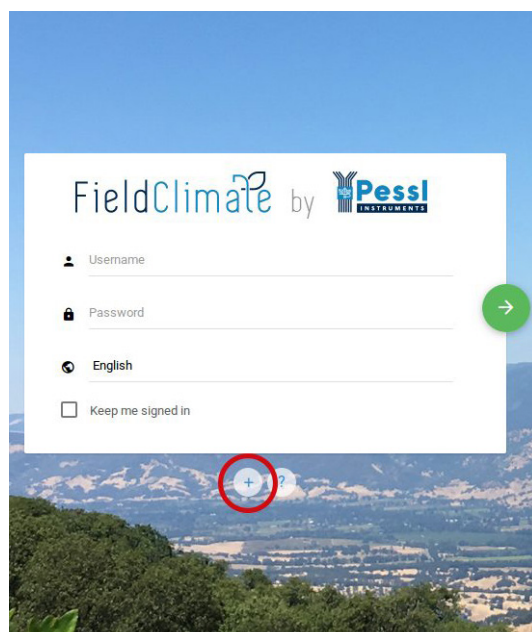
iMETOS RadioNode for soil moisture monitoring comes with a set of soil moisture sensors. Each RF sensor device can support a set of soil moisture sensors. The soil moisture and temperature sensors have to be properly installed in the ground. Depth of placement depends on the application and varies with the rooting depth of turf or plant material. To install fork-like sensors, excavate a trench to the depth required and insert the entire sensing portion of the sensor horizontally into the undisturbed soil face. Let the cable go down first and then take it up to the top. This prevents water from following the cable in the ground and wetting the sensor. Soak Watermark sensors in water before installation. To install soil moisture profile probes, drill a hole with an auger and insert the probe carefully in the tapered soil opening, until the top of the probe is levelled with the soil surface. To ensure high quality of measurements, all soil moisture sensors should have a good contact with the soil around them.

The leaf wetness sensor can be tied to a branch of the plant slightly inclined with the filter paper looking up. Mount it in a position that allows the sensor to pick up early rain and to stay wet in the shade.

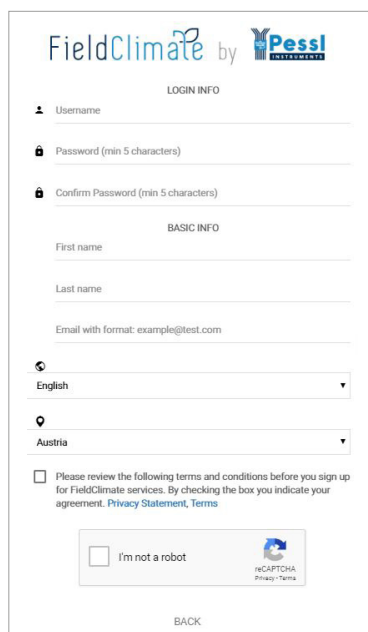
4. USE YOUR iMETOS

To start using services we provide, you need to register on the FieldClimate platform, which gives you the access to the data in graphs or tables. FieldClimate also provides a powerful decision support system for growing your crops (plant protection, irrigation, sowing, harvesting, fertilizing).

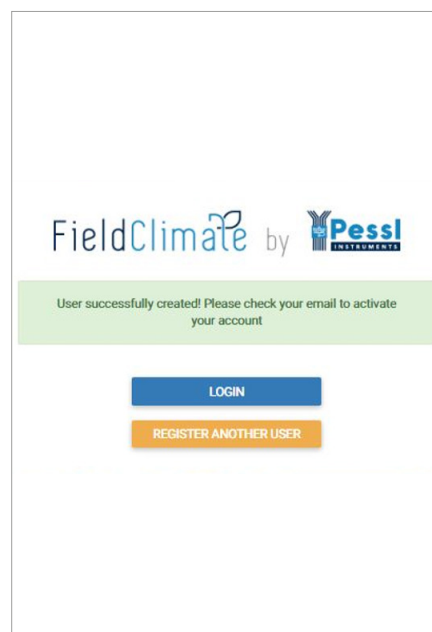
REGISTER AS A NEW USER ON ng.FieldClimate.com



1. Go to FieldClimate and click the button "+".



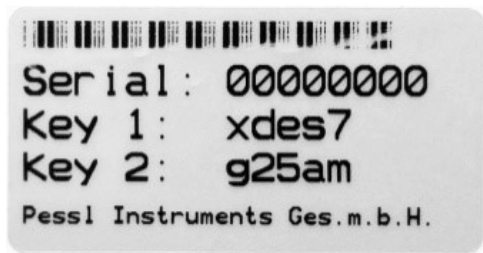
2. Insert your personal data & e-mail.



3. Check your e-mail and click on the link to activate the user account you created.

ADD YOUR iMETOS DEVICE TO YOUR ACCOUNT

Now you can login to ng.FieldClimate.com. To add your iMETOS device, click on the icon in the top right corner User Menu > Add/Remove station. It will ask you for the Station Serial number (SN) and the station key. Now the silver sticker (in the figure) which came with your iMETOS has to be used. Key 1 gives you full (admin) access and enables you to change all the settings and set up the iMETOS (e.g. data transfer interval, SMS warning, etc.). With Key 2 the user is not allowed to change the station parameters, but can access all the data.



Add Station

Use the Station ID and key that came with your iMetos station to add it to your list. Use key 1 if you want to be able to change station configuration settings or key 2 if you want read-only access.

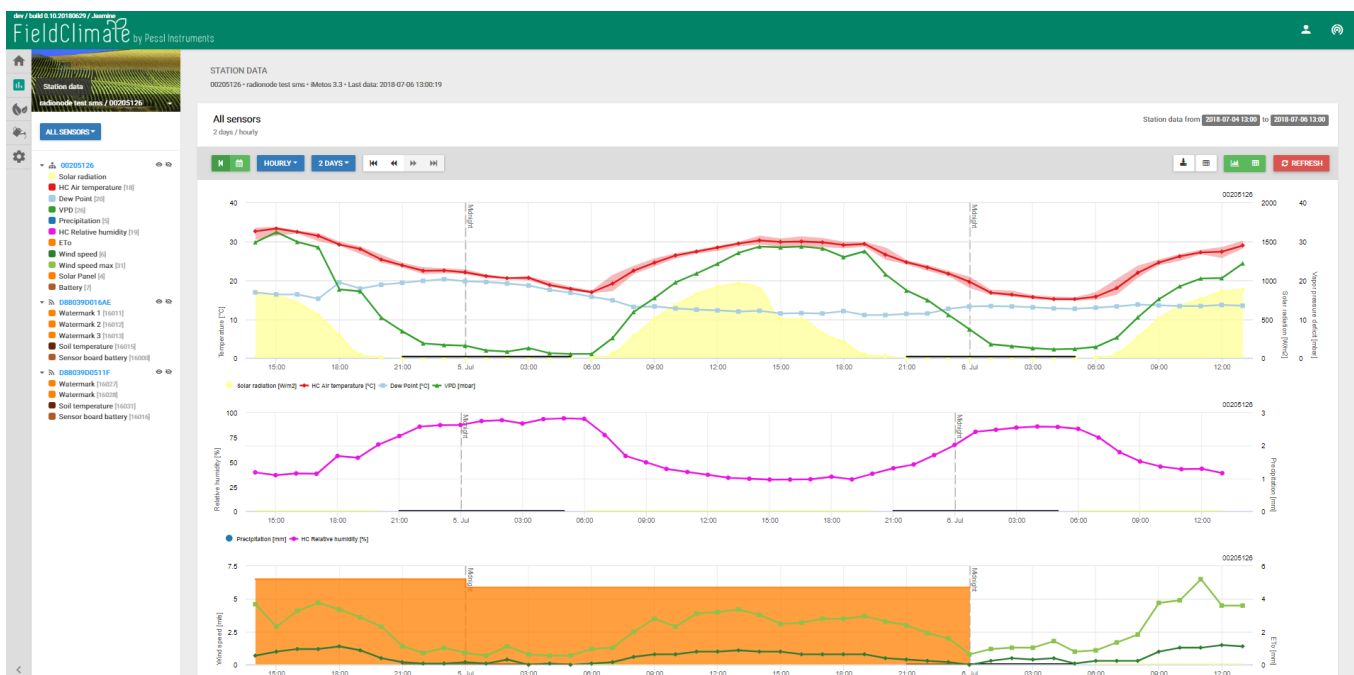
Station id:

Station key:

THE iMETOS DASHBOARD, STATION DATA AND SETTINGS

In the new **Dashboard** with a widgeted structure, the user can manage quick access to the services of the highest interest. On the top right corner, **Station List** allows you to choose among all the iMETOS devices and select a single one.

On the left side, **Station data** page displays the data measured by your iMETOS. Data can be viewed in detailed graphs and tables. You can access the structured menu, which allows you to define time series-resolution and export data in a chart/table. On the left side, you can see all sensors connected to your iMETOS RadioNode (see figure below).



With the activation of licenses for site specific localized weather forecast and plant disease models, it is possible to set these services for each of your iMETOS stations. To activate them please contact your local distributor or license@metos.at.

On **Station settings** page you can configure your iMETOS.

Station settings > Configuration: Under Time zone and location, you need to provide precise information, as weather forecast and other services depend on it. Under Logging and transfer settings, you can define how your iMETOS device logs and sends data. Please note that the iMETOS is delivered with the default factory settings (as in the figure on the previous page). More options are available by clicking the “Advanced options” button.

Station settings > Sensors and nodes: You can define a custom name for your station and nodes connected to it. For convenient viewing of data, you can also rename each sensor and customize its color in the graph.

Station settings > Warnings: You can add phone numbers and set thresholds for each sensor, at which the warning SMS should be sent.

For further inquiries visit FieldClimate.

5. MAINTAINING THE iMETOS

The weather station should be checked periodically to ensure that sensors are in optimal condition. Regular maintenance is necessary for flawless operation and durability.

At the beginning of the new season, check that the station is working correctly; data must be transmitted at the set interval to FieldClimate. Keep the solar panel and sensors clean and ensure correct rainfall measurements by making sure the rain gauge is leveled (check the bubble indicator), and not obstructed by leaves, insects or debris. Check if leaf wetness sensor has the appropriate filter paper intact and positioned correctly (it should be replaced once, preferably twice a year).

When the solar panel of the iMETOS is exposed to the sun and gets enough sunlight it should constantly recharge the battery of the system. The lifespan of the battery is expected to be 5 to 6 years with sufficient recharging from the solar panel. Deep discharge shortens its lifetime. The iMETOS will prevent this from happening and protect the battery by limiting the data transfer to the safe level of charge. In doing so, data is not lost and battery recovers faster.