European Funds
Eastern Poland

Republic of Poland

European Union
European Regional Development Fund

waterly

innovative water quality monitoring system

waterly.eu

WHAT IS IT?

Waterly is an innovative system for water quality monitoring and early warning system using state-of-the-art technology to continuously analyze the condition of surface water in real time. With the Waterly system, you will be sure that taking a dip in a lake or river is safe for you and your loved ones, and that the water parameters provide the right conditions for the development of the local flora and fauna.

The system consists of three components. The first of these is fully autonomous measuring buoys that float on the water surface and continuously and independently of weather conditions or season monitor the water environment. The second is a master system, the so-called cloud, which aggregates, stores and analyzes data obtained from measuring devices. The cloud uses artificial intelligence algorithms to predict changes and threats that may occur in a given water body, such as predicting the occurrence of blue-green algae in bathing areas or fish suffocation. The final component is a data visualization application that allows viewing current values of measured parameters, previewing events, analyzing historical data, remotely changing buoy settings or updating the software of measuring buoys.

When changes in the aquatic environment are detected, the system sends notifications to the reservoir administration about the situation that has occurred.

Complementing the entire system are information boards that can be placed in public areas near reservoirs monitored by Waterly. Each board has its own unique QR code, which, when scanned with a smartphone, automatically launches the Waterly app.And all this so that every person can check the water quality of a lake, pond or river in their immediate vicinity.

Due to its unique characteristics and unconventional design, the entire Waterly system finds use in a wide spectrum of monitoring applications:

- water quality and level of lakes and rivers,
- water quality of farm ponds,
- water quality of fishing ponds,
- water level (digital water level gauge),
- water quality of public bathing areas,
- quality of water used by industrial plants in technological processes,

waterly

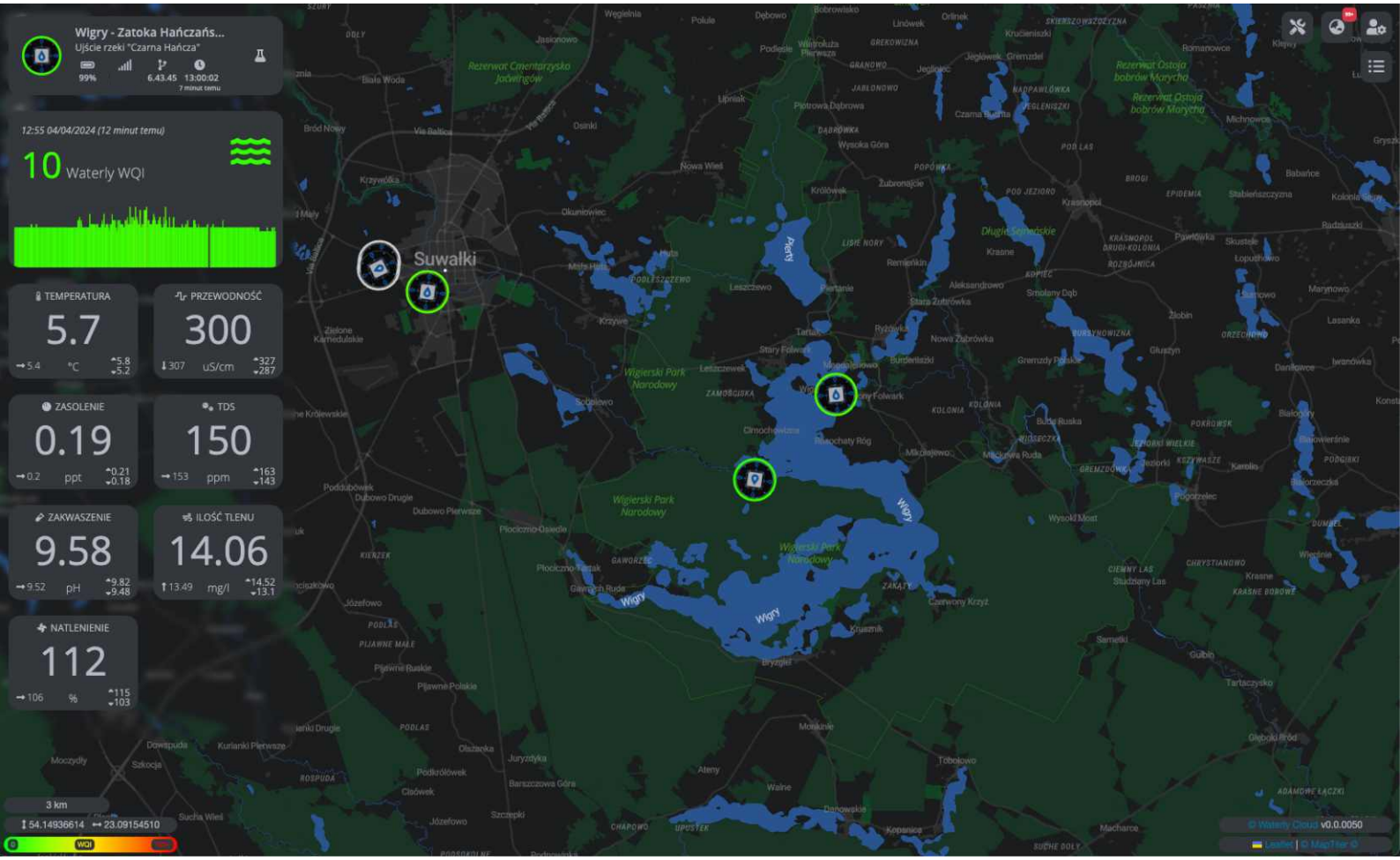
APP

The Waterly application is based on a clear map interface that clearly presents water resources, namely seas, lakes, rivers and ponds, in contrast to forested, rural and urban areas. The map depicts Waterly's survey buoys, whose position on the map reflects their actual location in the field. In addition to measuring points, the map also shows public bathing areas, which are monitored by the Waterly system. This allows you to easily and quickly locate the place you are most interested in.

The Waterly app is currently available in a browser-based version at https://waterly.cloud. A native version of the Waterly app for iOS and Android platforms will also be available in the near future.

After selecting a given measurement point, the current values of the measured parameters are presented along with a bar graph that visualizes the last 24h of the Water Quality Index (WQI). Each of the measured parameters can be visualized using a line graph with an adjustable range of presented data - 6h, 12h, 24h, 48h, 72h, week or month. The presentation of historical data also includes the current trend, current value, minimum, average and maximum value. The presented range of historical data can be exported to an external file using the .csv format, so it can be very easily and quickly imported into other programs for data visualization and analysis.

Presentation of data in the form of a dashboard.



Waterly application interface. The map shows the currently working survey buoys.

waterly

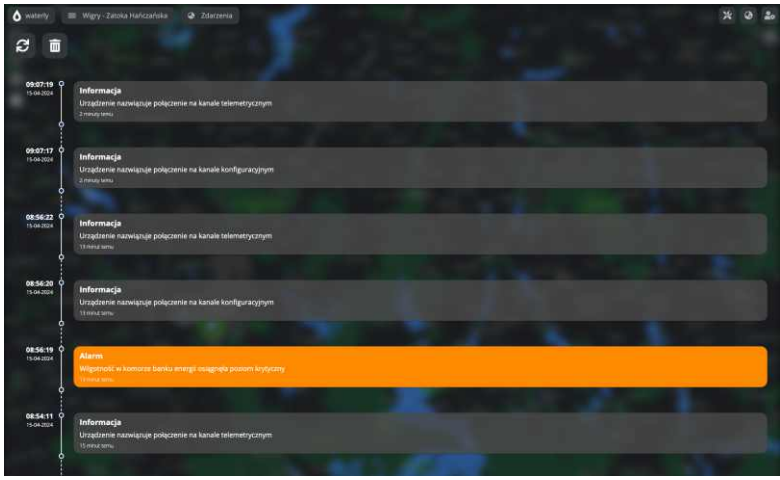
APP

The application also presents a preview of the history of events that the measuring buoy has recorded. These are mainly all kinds of exceeded parameter values, alarm situations related to acts of vandalism or diagnostic messages related to the device's operation status.

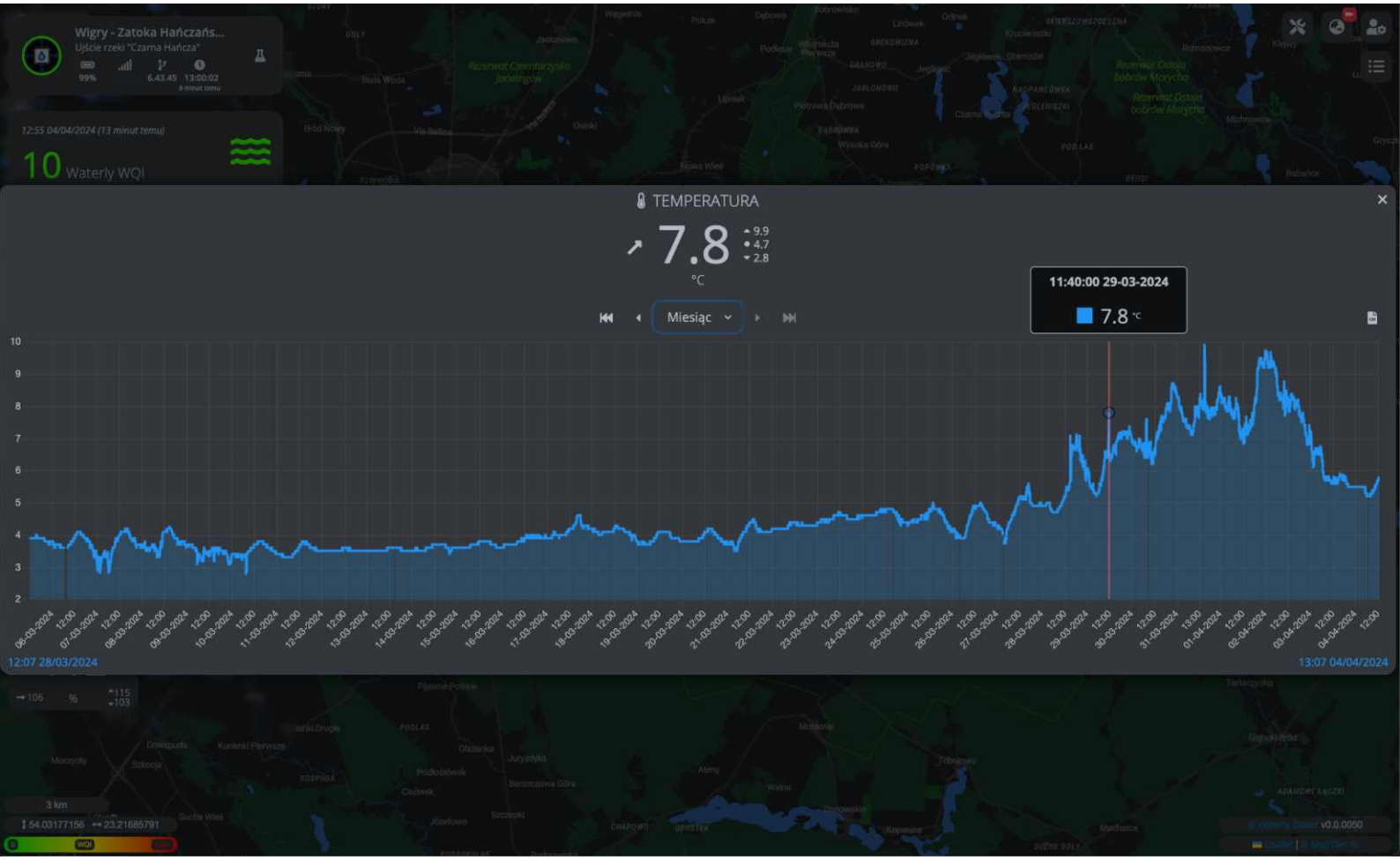
Using the configuration panel, it is possible to change settings related to the operation of the measuring buoy, including, among others, the frequency of measurements, alarm thresholds for individual parameters, the mode of operation of the beacon, its brightness and frequency of illumination.

The application also has a data presentation module by means of the so-called dashboard. This is a dashboard that allows analysis of current and historical data, all measured parameters at once. This makes it possible to correlate changes in individual indicators with changes that occur in the entire environment.

The application also enables OTA (Over The Air) firmware updates of the measurement buoy, and this involves continuous product improvement and expansion of its functionality. In addition, the application includes a number of tools for diagnostics and analysis of the device's internal parameters.



Presentation of the events that the survey buoy recorded.



Presentation of historical data in the Waterly application.

waterly

MEASURING BUOY

Our measuring buoys are fully autonomous devices that, regardless of the season, weather conditions, day or night, fully perform their tasks and are a kind of guardian of water.

The design ensures stable operation during strong waves, and thanks to the use of high-strength materials, the buoys can perfectly cope with winter conditions and are completely resistant to icing of the water surface.

The Waterly buoys are equipped with technologies that allow it to communicate with the Internet in places where a regular cell phone can't access the network!

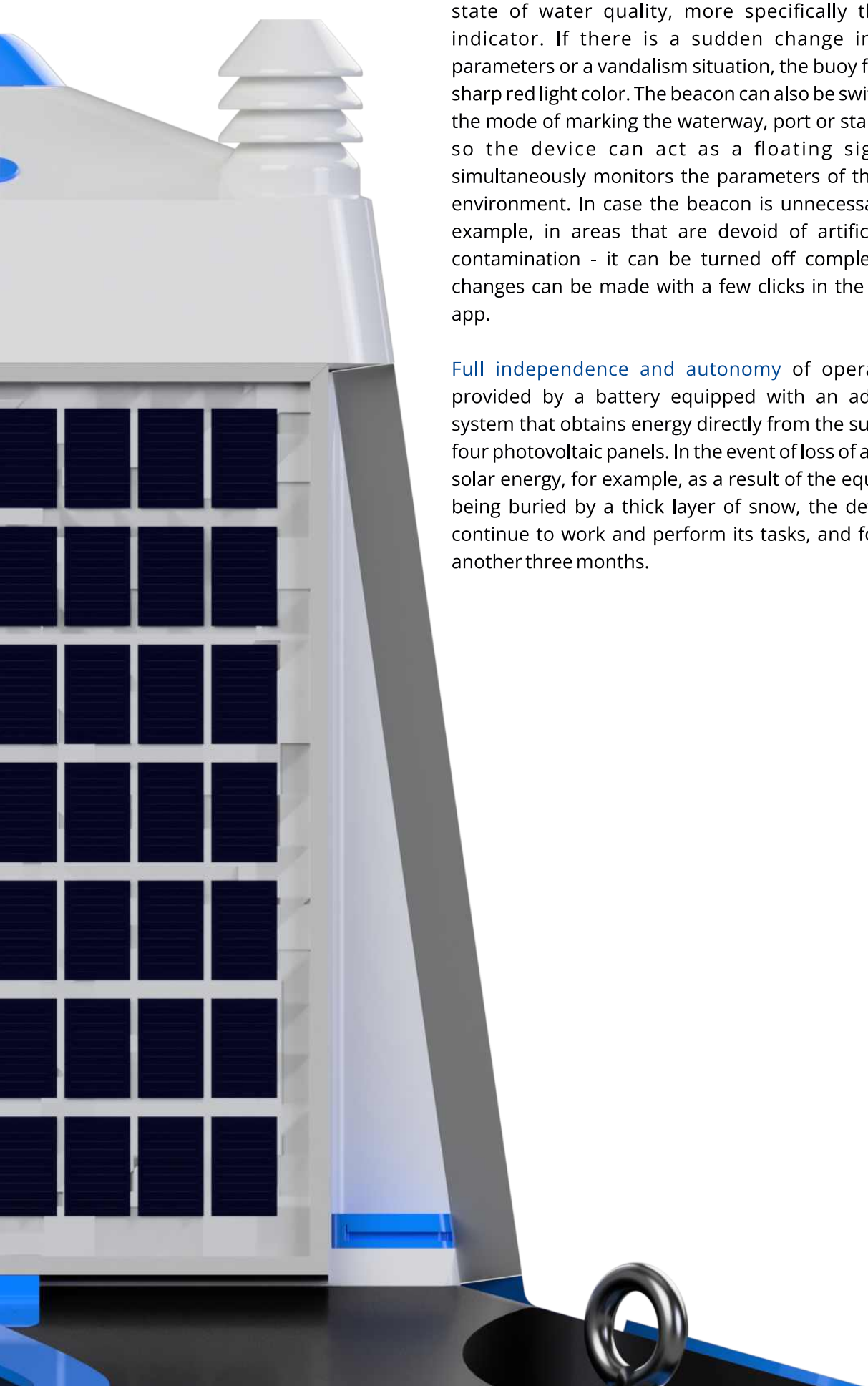
The devices have a number of advanced technologies that enable self-diagnosis of the device, and the status of the device is continuously reported in our app.

The equipment is installed in a body of water by means of a so-called loose mooring, which minimizes interference with the water environment, while ensuring stable working conditions even during strong ripples of the water surface.

TECHNICAL PARAMETERS	
FULL YEAR WORK	yes
FULL AUTONOMY	yes
BUILT-IN BATTERY	yes
CHARGING FROM THE SUN	yes
WORKING TIME WITHOUT SUN	up to three months
LIGHT INDICATOR	yes, multicolor
SABOTAGE DETECTION	yes
IMPACT DETECTION	yes
GPS LOCATION	yes
REMOTE CONTROL	yes
MEASUREMENT INTERVAL	5 minutes or less frequently
COMMUNICATION INTERVAL	5 minutes or less frequently
ALARM INTERVAL	immediately
HEIGHT	157 cm
DIAMETER	56 cm
WEIGHT	15 kg
ANCHORING	slack mooring
INSTALLATION	drop and go (plug and play)
MAX. INSTALLATION DEPTH	unbound
PURPOSE	still and flowing waters

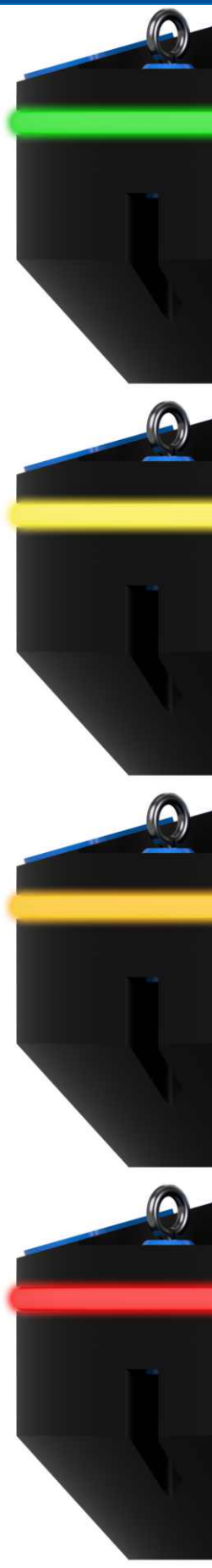
waterly

MEASURING BUOY



The buoy signals its presence on the water with a cyclic flashing light, the color of which depends on the current state of water quality, more specifically the WQI indicator. If there is a sudden change in water parameters or a vandalism situation, the buoy flashes a sharp red light color. The beacon can also be switched to the mode of marking the waterway, port or starboard - so the device can act as a floating sign that simultaneously monitors the parameters of the water environment. In case the beacon is unnecessary - for example, in areas that are devoid of artificial light contamination - it can be turned off completely. All changes can be made with a few clicks in the Waterly app.

Full independence and autonomy of operation is provided by a battery equipped with an additional system that obtains energy directly from the sun, using four photovoltaic panels. In the event of loss of access to solar energy, for example, as a result of the equipment being buried by a thick layer of snow, the device will continue to work and perform its tasks, and for up to another three months.



waterly

MONITORING

The main task of Waterly's measuring buoys is to monitor water parameters and provide early warning ofof changes in the aquatic environment. Each Waterly buoy is equipped with an advanced sensor system that monitors individual water and air parameters all the time, regardless of weather conditions or season. The frequency of the measurements is adjustableand can be changed via the Waterly app from 5 minutes to 4 hours.

Waterly buoys have a set of sensors on board that monitor such water parameters as temperature, conductivity, salinity, TDS, pH, ORP potential, the amount of oxygen expressed in mg/l and oxygenation expressed in %. The water environment is strongly dependent on atmospheric factors, so Waterly buoys also monitor temperature, humidity and, importantly, atmospheric pressure. The table opposite shows the baseline parameters that are monitored by Waterly buoys.

Despite appearances, water temperature is a very important parameter. For people resting by the water, its value should be as high as possible. For fish, the value of water temperature affects their development. The higher the temperature indication, the lower the solubility of oxygenin the water, and this can lead to fish suffocation.

The conductivity of water makes it possible to assess the level of water mineralization. The conductivity value increases with the amount of impurities present in the water. Using conductivity, TDS (Total Dissolved Solids) is determined, which is the total amount of dissolved substances in the water, which also increases with the amount of impurities.

The pH of water is one of the most important parameters regarding water quality. Based on it, we can assess whether conditions for plant and animal life are possible in the waterand animals. In addition, the correct pH range makes it possible to preserve the water's self-purification mechanisms.

The level of oxygenation and the amount of dissolved oxygen in water is fundamental to the functioning and life of aquatic organisms. It takes part in the natural processes of water purification, and too low a value of oxygen in the water can lead to the death of fish. Its content is strongly related to water temperature and atmospheric pressure.

WATER TEMPERATURE	
RANGE	0-60°C
RESOLUTION	0.1°C
ACCURACY	0.5°C
CONDUCTIVITY OF WATER	
RANGE	0-100000 uS/cm
RESOLUTION	1 uS/cm
ACCURACY	2.5%
TDS WATER	
RANGE	0-9999 ppm
RESOLUTION	1 ppm
ACCURACY	2.5%
WATER SALINITY	
RANGE	0-40.00 ppt
RESOLUTION	0.01 ppt
ACCURACY	2.5%
pH OF WATER	
RANGE	0.00-14.00
RESOLUTION	0.01
ACCURACY	0.02
WATER ORP	
RANGE	-1000.0-1000.0 mV
RESOLUTION	0.1 mV
ACCURACY	0.2 mV
AMOUNT OF OXYGEN DISSOLVED IN WATER	
RANGE	0-20.00 mg/l
RESOLUTION	0.01 mg/l
ACCURACY	0.3 mg/l
WATER OXYGENATION	
RANGE	0-200 %
RESOLUTION	1 %
ACCURACY	3 %
AIR TEMPERATURE	
RANGE	-40-80°C
RESOLUTION	0.1°C
ACCURACY	0.5°C
AIR HUMIDITY	
RANGE	0-100 %
RESOLUTION	1 %
ACCURACY	3 %
ATMOSPHERIC PRESSURE	
RANGE	300-1100 hPa
RESOLUTION	1 hPa
ACCURACY	1 hPa

waterly

ADDITIONAL PARAMETERS

Waterly buoys have been designed by our designers with the broadest possible spectrum of applications in mind, so the architecture of the devices makes it possible to expand the sensory system to monitor additional parameters such as the depth of the water body, turbidity, the amount of nitrates, chlorine or carbon dioxide in the water. And this makes the Waterly solution, a multi-instrument system for aquatic environments. Additional parameters are shown in the table opposite.

The buoy can be equipped with a depth monitoring system for each body of water. Whether lakes, ponds, reservoirs or rivers. This allows them to act as a digital water level gauge with an early warning and notification system for water level changes.

Water turbidity (the inverse of transparency) is a parameter that determines the ability to absorb and scatter light rays. The higher the turbidity, water, the higher the content of organic agents (clays, plankton, bacteria, insoluble organic compounds from industrial wastewater) or inorganic substances (sands, iron compounds, manganese, chemical compounds from wastewater). Water color depends mainly on the amount of ironand manganese, but can also come from industrial wastewater.

Nitrates are a key nutrient for plants, but excess levels (such as from agricultural runoff) can lead to eutrophication of waters. Excessively high levels of NO_3 are also dangerous to human health.

The ammonium ion NH_4^+ is formed by the decomposition of organic matter and is the main form of bioavailable nitrogen for aquatic plants. In high concentrations, it can be toxic to aquatic organisms.

Chlorine is toxic to microorganisms and its concentration should be controlled to protect health.

Potassium is a micronutrient present in water that plays an important role in the metabolism of aquatic organisms. Its concentration is usually low, but can increase as a result of agricultural pollution.

Calcium is an essential component of water hardness. It is essential for many organisms, especially those that build shells and skeletons, and affects the ionic balance in the aquatic ecosystem.

Carbon dioxide in water comes from respiration of aquatic organisms, decomposition of organic matter and chemical processes. Its concentration affects the pH balance of the water and the availability of calcium carbonate, important for organisms with shells.

TANK DEPTH / WATER LEVEL	
RANGE	0-70 m
RESOLUTION	1 cm
ACCURACY	1 cm
WATER TURBIDITY	
RANGE	0.01-4000.00 NTU
RESOLUTION	0.01 NTU
ACCURACY	0.1 NTU
AMOUNT OF CHLOROPHYLL IN THE WATER	
RANGE	0-400 ug/l
RESOLUTION	0.01 ug/l
ACCURACY	5%
AMOUNT OF DISSOLVED DIOXIDE IN WATER	
RANGE	0-2000 ppm
RESOLUTION	1 ppm
ACCURACY	5%
AMOUNT OF NITRATES (NO3) IN THE WATER	
RANGE	0.1-1000 mg/l
RESOLUTION	0.01 mg/l
ACCURACY	5%
AMOUNT OF AMMONIUM ION(NH4-N) IN WATER	
RANGE	0.1-1000 mg/l
RESOLUTION	0.01 mg/l
ACCURACY	5%
AMOUNT OF FLUORIDE IN THE WATER	
RANGE	0.02 - 1000 mg/l
RESOLUTION	0.01 mg/l
ACCURACY	5%
AMOUNT OF CHLORINE IN THE WATER	
RANGE	0.02 - 1000 mg/l
RESOLUTION	0.01 mg/l
ACCURACY	5%
AMOUNT OF CALCIUM IN THE WATER	
RANGE	0.02 - 1000 mg/l
RESOLUTION	0.01 mg/l
ACCURACY	5%
AMOUNT OF POTASSIUM IN THE WATER	
RANGE	0.02 - 1000 mg/l
RESOLUTION	0.01 mg/l
ACCURACY	5%

waterly

VANDAL-PROOF

Waterly measuring buoys are equipped with detectors that continuously analyze the status of the device and detect unexpected incidents such as mechanical impacts and shocks, as well as unauthorized removal of buoys from the water. These types of incidents, trigger an immediate alarm procedure, which automatically activates the optical signaling with a red warning light and an alarm siren, in addition to immediately notifying the situation by email, text message or through PUSH notifications in the Waterly app.

In the event of an alarm situation, the siren starts flashing with an intense red light, the glow of which will spread across the water surface of the entire tank. Safety is enhanced by an alarm siren (now available on the Waterly Mini buoy), whose sharp sound can be heard up to 1,000 meters away. These elements effectively deter potential vandals.

Each Waterly buoy is equipped with a GPS locator, so the actual position of the device is available on the app at all times, and to an accuracy of 70 centimeters. In case of theft, the buoy will continuously transmit its location to the app, even if it is severely damaged.

waterly

INFO SIGN

The Waterly system is complemented by waterfront information boards that allow you to easily and quickly launch the Waterly app, which will instantly present the parameters measured by the buoy for which the information board has been prepared.

Each array has its own unique QR code, which can be scanned with a smartphone. This code is assigned to the corresponding measurement buoy nearest the array.

The information board can be installed in a place that is both accessible to tourists and one where the measuring buoy can be observed within sight. This will allow you to see what color the measuring buoy is flashing after dark to verify the water level through the WQI indicator.

The boards, like the measuring buoys, are fully resistant to changing weather conditions and can be installed in any location.

TECHNICAL PARAMETERS	
OVERALL HEIGHT	120 cm
BOARD WIDTH	25 cm
BOARD LENGTH	35 cm

waterly