

Meteo-Marine Monitoring Buoy



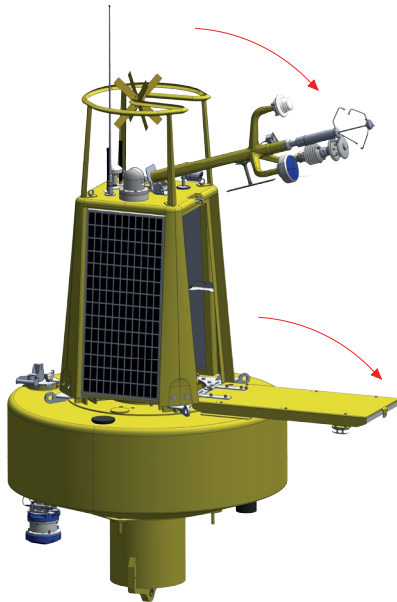
- High accuracy and availability of all wave parameters in raw data format.
- Innovative solutions designed to facilitate on-site maintenance.
- Wide variety of redundant communication systems.
- Extensive system customization for tailor-made solutions.

Description

Poseid1 is a highly specialized buoy for meteo-marine monitoring, designed to ensure continuous and reliable measurements even in the most challenging marine and coastal environments. It is the result of years of research, development, and application within wave monitoring networks, adhering to the strictest international standards. In this context of high specialization, Poseid1 underwent extensive study, validation, and characterization by several accredited research institutions in the field of meteo-marine monitoring (such as ISPRA, CNR-ISMAR, and various universities) before being released on the market. Indeed, Poseid1 is an innovative product developed in response to advanced needs expressed by research institutions—needs that standard market products were unable to meet. Years of investment and research have made it possible to industrialize Poseid1, offering a standard configuration capable of meeting the majority of requirements, along with numerous options for achieving a high level of customization. In its standard configuration, Poseid1 can measure wave height, direction, and period; wind speed and direction; barometric pressure; air temperature and humidity; solar radiation; and water temperature and conductivity. With various optional features, Poseid1 can be further equipped with a current meter, multiparametric probe, water temperature profiler, webcam, radar rain gauge, visibility sensor, additional communication systems, and strategic redundancies in measuring, acquisition, and/or communication devices. Thanks to its advanced design choices, including the use of cutting-edge sensors, selected materials, and eco-friendly protective coatings, Poseid1 represents the state of the art in meteo-marine monitoring. Even in its standard version, the buoy includes several features to ensure remote connectivity, enabling continuous acquisition of monitoring data and system status/alerts at the customer's control center. To enhance system resilience, the buoy is equipped with a dual power supply system comprising two pairs of 100W solar panels (for a total of 400W) and dual LiFePO4 battery packs, ensuring sufficient power even under the most demanding conditions.

In its standard configuration, the buoy includes:

- IALA-compliant flashing light (3 NM) and radar-reflective topmark for visual and radar signaling;
- Combined weather sensor (measuring air temperature and humidity, wind direction and speed, barometric pressure, and solar radiation);
- Water quality monitoring probe (measuring water temperature and conductivity as direct parameters, and derived salinity);
- Accelerometric wave sensor;
- IRIDIUM and GSM/UMTS/LTE communication systems;
- Embedded Linux-based onboard computer for data management, acquisition, and processing of alarms.



Hull

The lower section of the buoy incorporates a cylindrical core made of AISI 316L stainless steel, specifically optimized to enhance hydrodynamic stability. The upper section has been carefully designed to maintain a low weight above the buoy's center of gravity, in order to avoid interference with wave measurements. Special attention has been paid to facilitating at-sea maintenance. The onboard electronics are accessible through a fold-down, walkable panel, allowing for safe and easy maintenance operations. Another practical feature is the tiltable sensor mast, which enables sensor replacement without the risk of falling into the sea. The minimization of the buoy's above-water weight ensures highly accurate measurements, even in extreme wind and sea conditions, as the center of gravity remains low. More broadly, the mass distribution of the buoy has been carefully engineered to position the center of gravity just a few centimeters below the waterline, ensuring optimal hydrodynamic behavior for measurement purposes.

Designed for maximum efficiency in offshore operations

Every component of Poseid1 is designed to facilitate installation, maintenance, and retrieval, even under challenging conditions:

- Reinforced lifting and mooring eyes, galvanically isolated, to simplify deployment and recovery operations;
- Stainless steel battery housings with IP68-rated sealing, ensuring protection up to 10 meters depth;
- Onboard electronics housed in an IP68-rated, connectorized enclosure, allowing for easy replacement as a single unit.

Sensor Technical Specifications

Wave Sensor

The wave sensor (accelerometric) of Poseid1, developed by SIAP+MICROS, is designed to provide comprehensive information on all displacements along the buoy's three axes (X, Y, and Z). It represents the state of the art in terms of high sampling frequency and data processing capabilities. Thanks to the combined measurements from the accelerometer, gyroscope, and magnetometer, Poseid1 is able to accurately and precisely reconstruct the buoy's movements in space, with uninterrupted acquisition cycles of 30 minutes every 30 minutes. The Euler angles are sampled at a frequency of up to 8 Hz (default: 4 Hz). The main parameters measured in both the time and frequency domains are listed below:

Parameter	Description	Unit
Misure (Time Domain)	Significant wave height	m
	Maximum wave height	m
	Mean Wave Period	s
	Peak Wave Period	s
	Mean Wave Direction	deg (0÷360)
	Mean Wave Height	m
Misure (Frequency Domain)	Significant wave height	m
	Mean Wave Period	s
	Peak Wave Period	s
	Mean Wave Direction	deg (0÷360)
	Peak Wave Direction	deg (0÷360)
	Mean Direction of Arrival of Wind Waves (waves generated by local wind)	deg (0÷360)

Multiparametric Weather Sensor

- Positioned at the top of the buoy to minimize structural interference and enhance measurement accuracy;
- Wind direction data electronically compensated using an internal compass.

Parameter	Sensor	Range	Resolution	Accuracy
Wind Speed	Ultrasonic	0...60 m/s (0...50 m/s with rain gauge option)	0.001 m/s	± 0,2 m/s o ± 2%, the greatest (0...35 m/s); ± 3% (> 35 m/s)
Wind Direction	Ultrasonic	0...359,9°	0,1°	± 2° RMSE da 1,0 m/s
Air Temperature	Pt100	-40...+70 °C	0,1°C	± 0,15 °C ± 0,1% of the measurement
Relative Humidity	Capacitive	0...100%UR	0,1%UR	± 1,5 %UR (0...90 %UR), ± 2 %UR
Atmospheric Pressure	Piezo	300...1100 hPa	0,1 hPa	± 0,5 hPa @ 20 °C
Solar Radiation	Termopile	0...2000 W/m²	1 W/m²	Spectrally Flat Classe C

Multiparameter Water Quality Probe

The probe is able to read:

- Water temperature;
- Salinity;
- Conductivity.

Measurement Principle	Value
Conductivity	
Range	0-200,0 µS/cm
Resolution	0,01 ÷ 1 depending on the range
Accuracy	± 1 % full range
Salinity	
Range	5 ÷ 60 g/Kg
Range TDS-KCl	0 ÷ 133 000 ppm
Temperature	
Range	0.00 °C to +50.00 °C
Resolution	0.01 °C
Accuracy	± 0.5 °C

Connectivity

- IRIDIUM SBD module for global satellite communications (SBD annual subscription not included);
- Industrial dual-SIM GSM/UMTS/LTE router for high-speed coastal data transmission (SIM cards and data traffic not included);
- Integrated GPS system for real-time buoy position tracking, available in both the Iridium module and the LTE router.

Onboard Data Processing Uni

- Low-power embedded Linux-based computer, optimized for energy efficiency;
- Availability of all wave parameters, both in raw format and processed as per the specifications listed above;
- Standard data format for easy integration with existing databases, cloud platforms, or modeling software;
- Logging of all events, with logs transferrable via the LTE network (where available);
- Comprehensive onboard diagnostics, capable of detecting system states and alarms such as: Presence of water and humidity in the electronics housing, presence of water in the battery compartment, monitoring of battery charge status and power system efficiency, sensor diagnostics.

Power Supply System

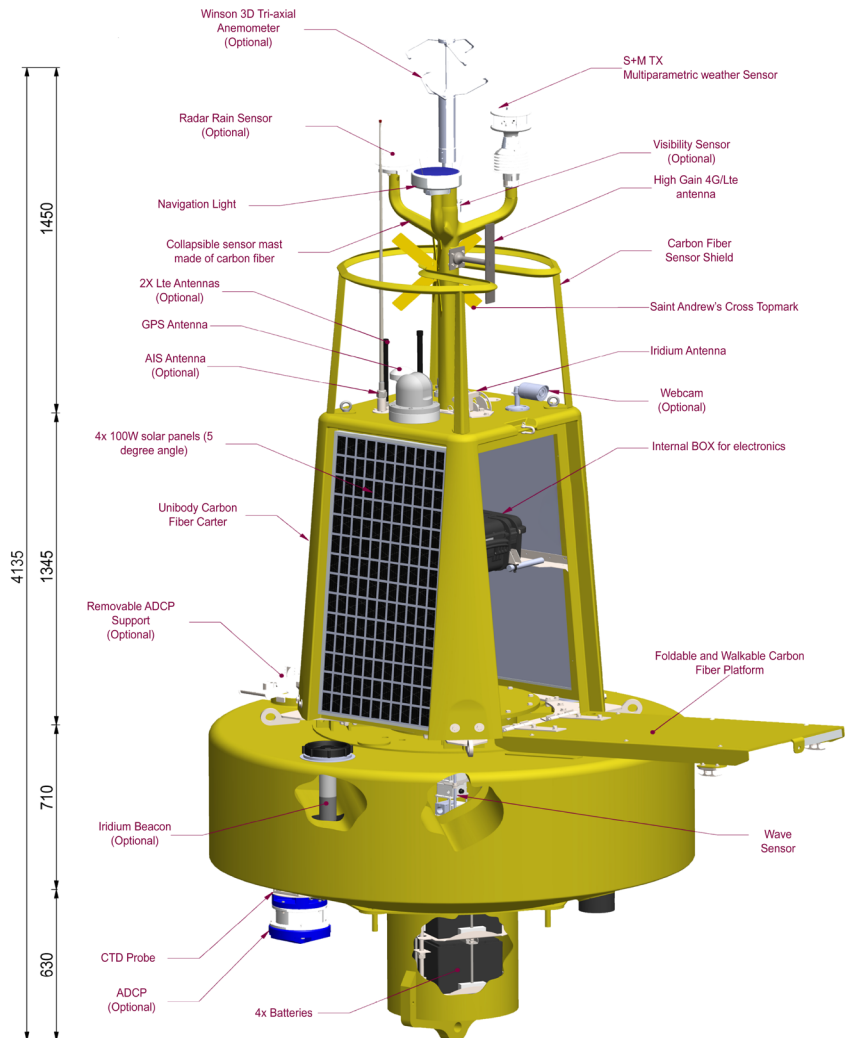
- Four 100W solar panels, for a total power output of 400W;
- Four 100Ah LiFePO₄ batteries, with a redundant charge management system to ensure continuous operation even under low solar irradiance conditions;
- Isolated and weather-protected power system, with remote monitoring of charge status.

Available Options

Poseid1 can be customized with the following additional modules (sold separately):

- ADCP Current Meter (available in different frequency configurations depending on seabed depth);
- AIS Communication System (subject to MMSI registration) for automatic transmission of position data to vessel AIS systems, along with processed wave measurements;
- Tri-axial Ultrasonic Anemometer for measuring wind speed and direction along the X, Y, and Z axes;
- Radar Rain Gauge;
- Visibility Sensor;
- Complete Mooring Line, including dead weight, custom-designed based on the depth at the mooring location;
- Webcam;
- Beacon: low-power, independent positioning system.

Note: Additional sensors or measurement systems may be integrated upon verification of electrical and mechanical compatibility.



Order Codes	
Poseid1	PSM-T911-POSEID1

*Technical changes to performance characteristics can be applied upon specific calibration requests.