

# ANNEX I - MARINE EYE

Detailed specifications of components purchased

## A. System Description

The Marine Eye system consists of communication base stations, sensor devices and operator equipment. All three components together and their models are described below.

### 1. Base stations

MarineEye base stations for mooring surveillance

#### 1.1 Network base station

Network base station for mounting on a vertical pole (e.g. light pole)

#### GENERAL INFORMATION

- Consumption: 7W
- LTE Internet
- Channel number 8
- GPS antenna: YES
- LoRA antenna: YES
- GSM antenna: YES

#### MODELS:

**BSM<sub>1</sub> – Network base station for mounting on an existing vertical pole with a diameter of up to 10cm,**

Junction box support (L): 1 pc.

Junction box with inlets (2): 1 set

GSM/LoRAWAN base station - (868 MHz Lora)

**BSM<sub>2</sub> – Network base station for mounting on an existing vertical pole with a diameter above 10 cm**

Junction box support (H): 1 set

Junction box with inlets (2): 1 set

GSM/LoRAWAN base station - (868 MHz Lora)

Stainless steel tensioning band with clips (2): 1 set

**BSM<sub>3</sub> – Network base station on a vertical pole with lighting**

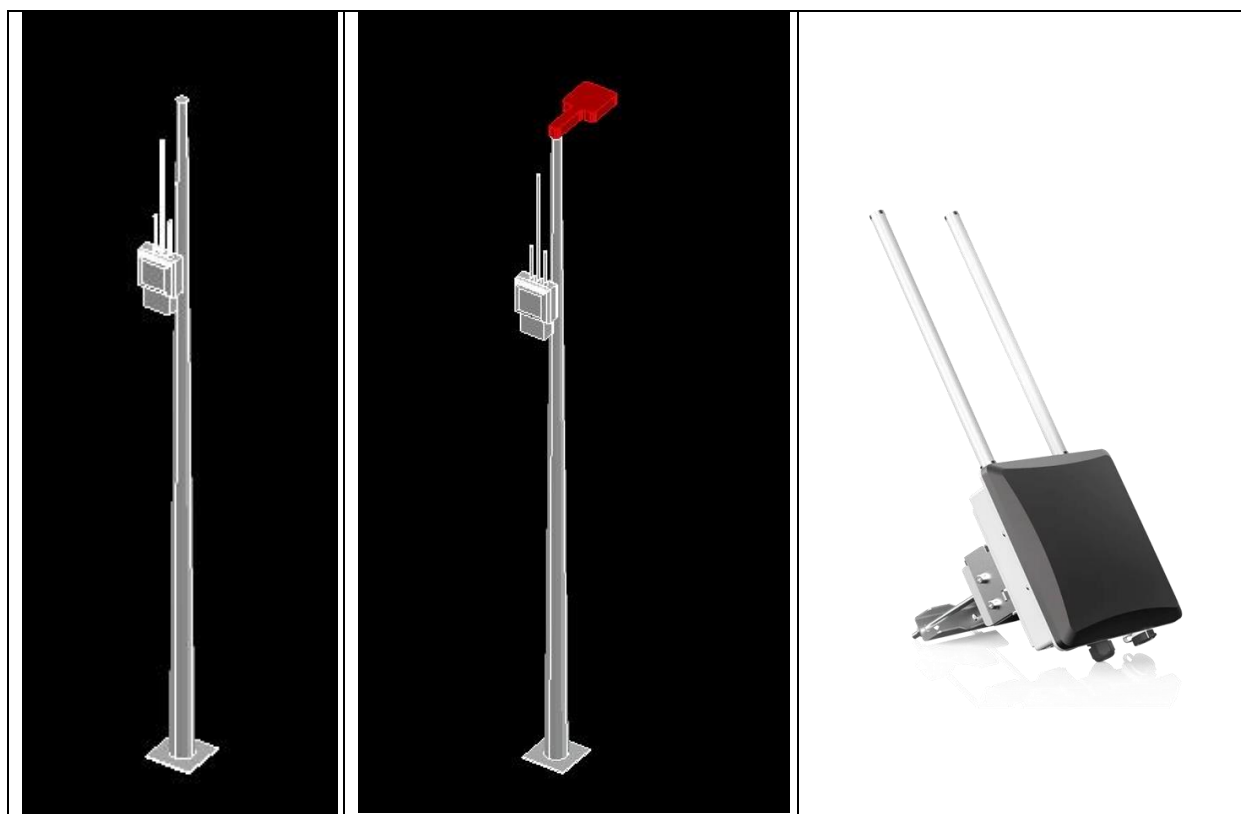
Light pole with LED light fixture: 1 set

Junction box support (L): 1 pc.

Junction box with inlets (2): 1 set

GSM/Lora WAN base station - (868 MHz Lora)

Figure 1 - Spatial(3D) models of BSM1 and BSM3 base stations and GSM/Lora WAN base stations



## 1.2 The island base station

The island base station for mounting on a vertical pole

### GENERAL DATA

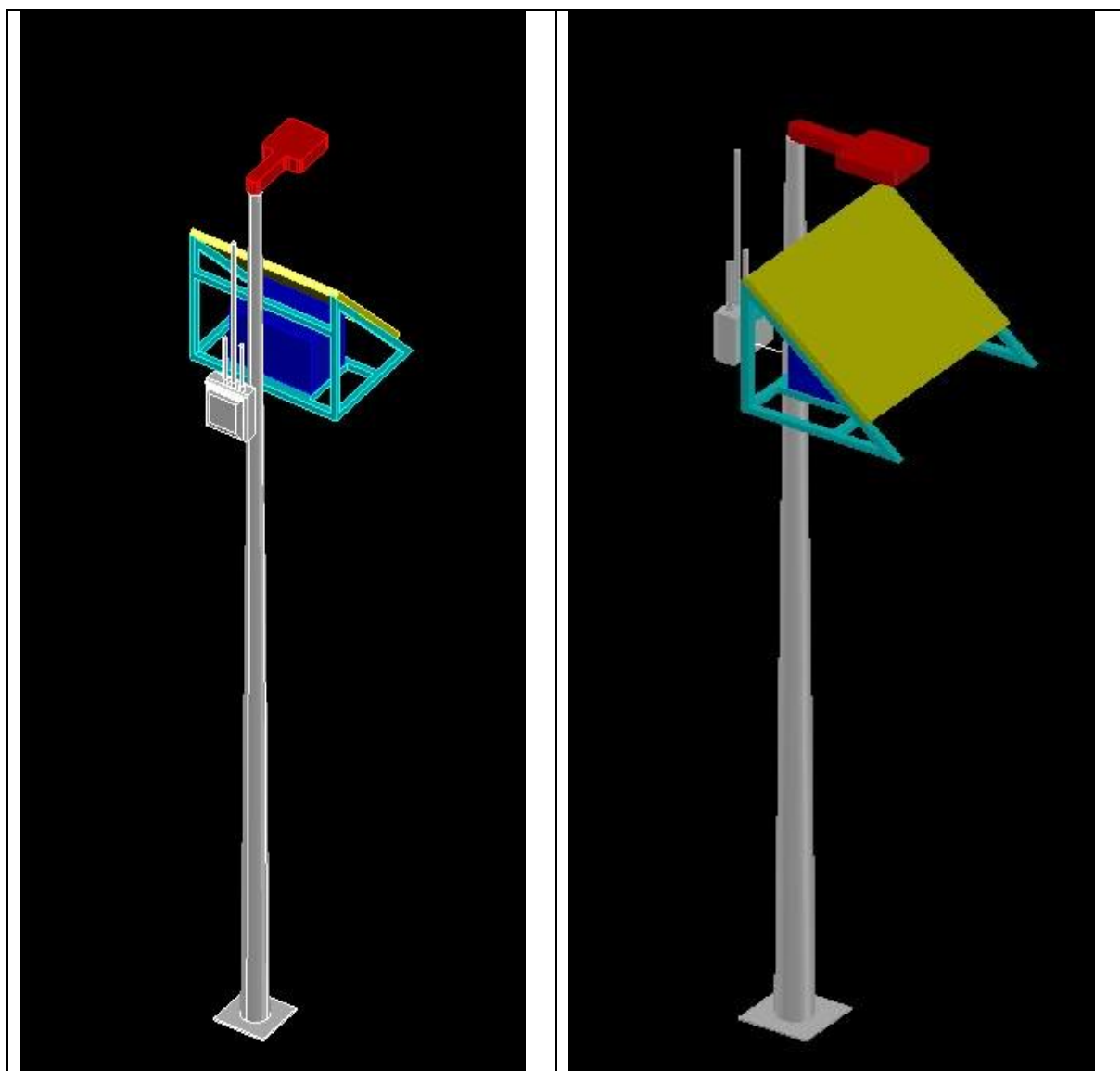
Consumption: 7W LTE Internet Channel number 8 GPS antenna: YES LoRA antenna: YES GSM antenna: YES	Solar charger (10A) Solar panel 90W (780x668 mm) Accumulator Lead 90Ah (600 days) Deep Cycle / (On/Off switch) Panel support for side pole mounting Battery box Advertising sub-structure
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### MODELS

BSO1 Island base station with side mounted SOLAR panel

- Vertical light pole (two types of materials)
- SOLAR panel holder with box for housing batteries, switch and solar charger
- SOLAR panel power 90W, Lead batteries with a total capacity of 90Ah
- Advertising sub-structure for the SOLAR panel support
- GSM/LoRAWAN base station - (868 MHz Lora)

Figure 2 –Spatial(3D) model of BSO1 island base station



#### ACCESSORIES for the basic base station

BSO1r – Lighting with motion sensor                      /                      BSO1p – Flag for mounting on a pole

#### 1. 3 Functional components of base stations

Components of the base station, regardless of the model, can be divided into mounting pole, power system, Lora WAN router and additional equipment.

Of the above components, the mounting pole, LORA WAN router and accessories can be ordered directly from the manufacturer's catalog and are listed as such in chapter B (List of components), while the power system includes the supply of materials and the delivery of a functional system of required characteristics.

#### 1.3.1 Network power supply system

The network power supply system consists of:

1. PoE power supply with a power of 10W or more, placed in a IP65 waterproof housing
2. Backup power supply compatible with the Lora WAN router, which has an integrated battery with a minimum capacity of 120Wh and a battery charger compatible with PoE power supply
3. Connecting cables and inlets (PoE and mains connection 230 VAC), cable length (min. 2m)

The backup power supply should be placed in the housing of the external Lora Wan router or in a separate IP65 housing.

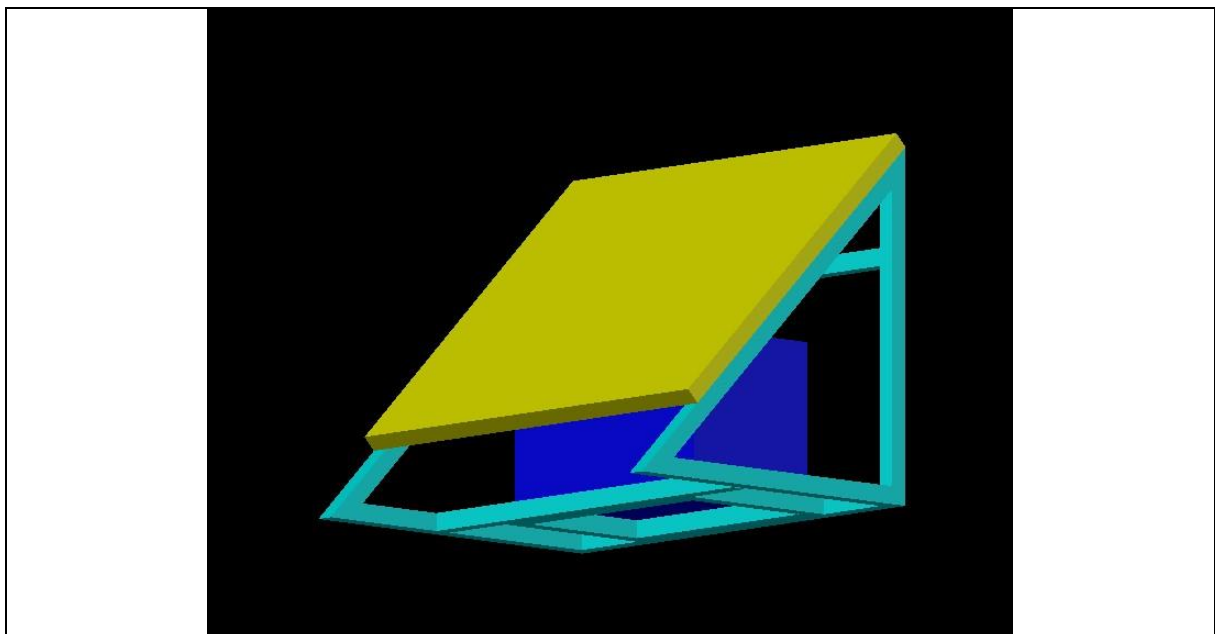
The entire power system should be a compact, pre-connected mains power system, ready for mounting on a pole up to 10 cm in diameter. Before delivery, the supplier is obliged to check the charging of the battery power supply during the presence of the electric network and the automatic backup operation of the battery in such a way as to ensure a non-interrupted transition from the mains to the backup battery power supply.

#### 1.3.1 Island power supply system

The island power supply system consists of:

1. FN solar panel with a power of 80W or higher
2. Accumulator 12VDC minimum capacity 90 Ah
3. FN MPPT charger, rated charging current 10A or more
4. Bracket for solar panel with the possibility of mounting on a pole with a diameter of 60 to 100 mm and a space for battery storage
5. Consumer cut-off switch for mounting on a power cable with waterproof protection level IP65 or higher
6. A box for housing batteries and electronic equipment that is within the solar panel mounting support

Below is a 3D model representation of the island power supply system.



The supplier is obliged to deliver an already connected island power supply system, ready for mounting on a pole with a diameter of up to 10 cm. Before delivery, the supplier is obliged to check the correct charging of the battery power supply from the photo-voltaic panel.

## 2. The sensor device

The sensor device presents the per-assembled device assembled according to the instructions from this chapter, which consists of several elements: housing, clip elements, electronic board that was developed as part of the MarineEye project, and a battery.

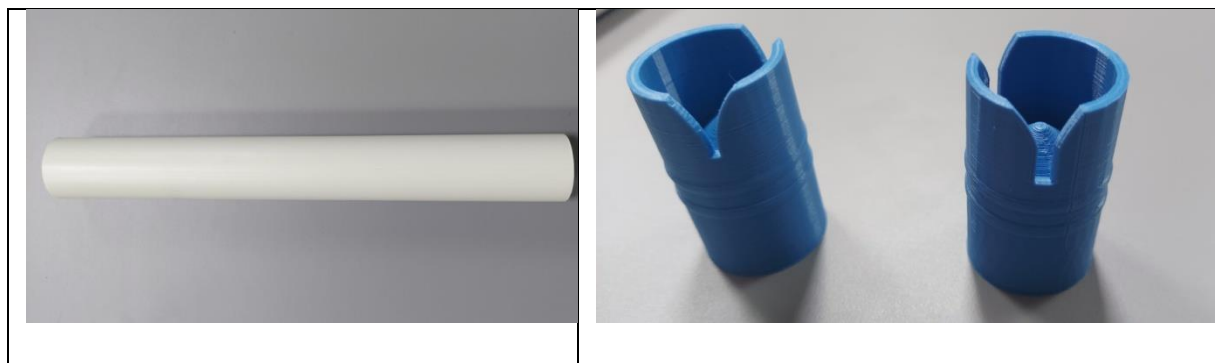
The sensor components are presented in the picture below.



### 2.1 Housing of the sensor device

The housing of the sensor device consists of: a) a PVC cylinder with an inner diameter  $\varnothing$  27 mm and a length of 280 mm, with a length deviation of  $\pm 2$  mm and a deviation of the inner diameter  $\pm 0.2$  mm and a minimum wall thickness of 2 mm and two profiled plugs according to the drawing below with the permitted deviation of  $\pm 0.1$  mm.

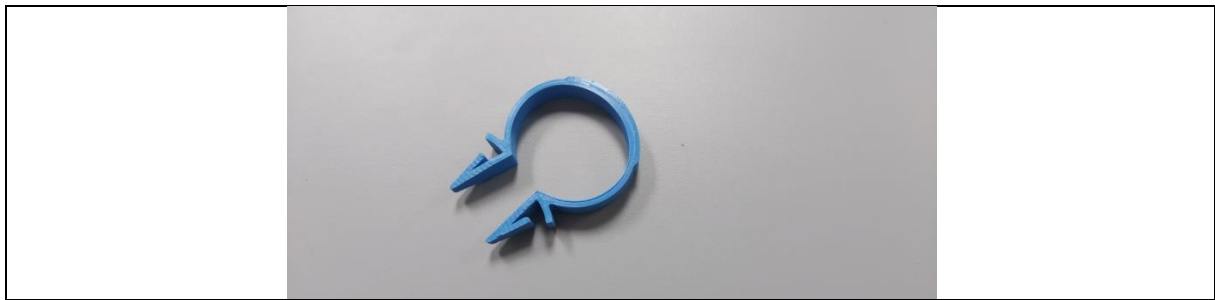
The material of the cylinder is PVC plastic; The material for making the profiled plugs is ABS plastic. Manufacturing method: Extrusion and/or 3D printing.



### 2.2 Fastening elements

The fastening elements are rope clamps. There are four clamp models in total.

The form of the fastening element is shown in the picture below.



Below is the table from which the difference is visible in material and dimension and in which the reference for marking is given.

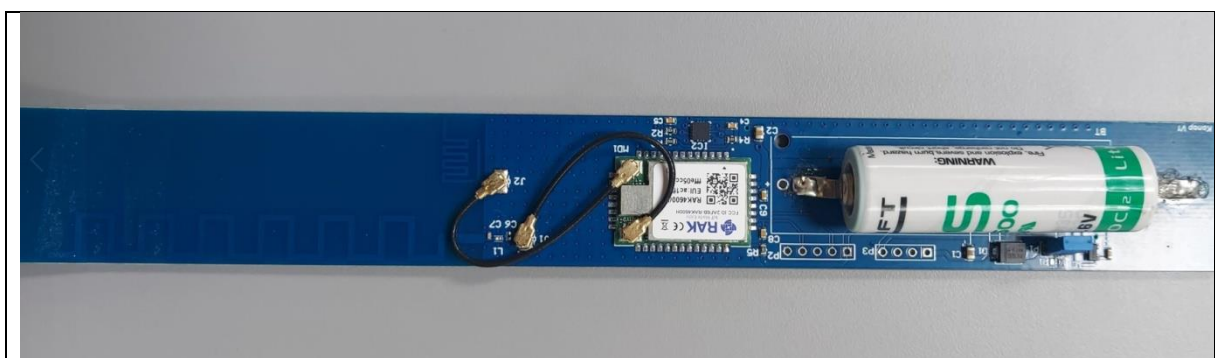
PE1	Inner diameter: 25 mm Material: ABS	
PE1N	Inner diameter: 25 mm Material: Nylon	
PE2	Inner diameter: 35 mm Material: ABS	
PE2N	Inner diameter: 35 mm Material: Nylon	

Manufacturing method: Extrusion and/or 3D printing.

### 2.3 Sensor electronics

The sensor electronics is basically the mother board of the sensor unit which is designed in the Altium Designer program and the Altium designer project will be shared with the supplier.

It is a four-layer PCB board whose design is shown in the picture below.



To estimate the costs below are the main components of the sensor motherboard: Microcomputer module RAK4630, Inclination sensor: LIS3DH, Magnetic switch LF11115.

The sensor electronic represent a finished PCB board assembled according to the Altium specification and any deviations from the project are not allowed except in exceptional cases when a mutually agreed change due to force majeure or due to the change that is acceptable to both the customer and the supplier.

## 2. 4 Battery power supply

The sensor device's battery power supply consists of a standard size AA battery, with a minimum capacity of 2000 mA and a chemical base of LiSoCl<sub>2</sub>.

## 2.5 Assembling and finishing the sensor device

Within the framework of the production of the sensor device, the supplier is obliged to supply all components in the above-mentioned required specification necessary for the production of the device and in accordance with the specification from this chapter.

- a) perform programming and testing of the device before assembly
- b) assemble the sensor device in accordance with the instructions
- c) perform final mechanical processing of the assembled sensor device and
- d) test the device before delivery.

### 2.5.1 Programming and testing the device before assembly

The purpose of programming and testing of the device before assembly is to check sensor device programming in office environment. The testing includes Bluetooth and LoraWAN connectivity test and functioning of the gravity sensor.

For testing purposes, the supplier should have: the **MarineEye Sailor** application installed on a mobile phone and established LoRA WAN network at the testing site.

Testing procedure:

1. A battery power supply is inserted into the PCB motherboard,
2. Marine-eye firmware is programmed into the device
3. The Marine Eye Sailor mobile application is set to sensor scanning mode
4. The device waken up with a magnet

TESTPOINT 1: Bluetooth communication established

(if communication is not established between the device and the mobile application, troubleshooting is required)

5. Tester sets the device parameters for testing the LoraWAN network with mobile application
6. Tester uses the application server to check establishment of communication channel

TEST POINT 2: Program parameters accepted and LoraWAN communication established

(checking LORAWan connectivity, sensor power rate (range), if test is not passed, the device is marked for troubleshooting)

6. Tester restarts the device by magnet and sets the standby mode ON

TEST POINT 3: Program parameters accepted and LoraWAN communication established (checking

(checking the command validity and sensor response)

### 2.5.2 Assembling the sensor device

The sensor device is assembled **exclusively** by hydraulic pressing. First, the floor plug is pressed, then the previously tested sensor device is placed in the receiving jaw of the floor plug in the



direction of the battery toward the floor and the antenna towards the top plug. System is hermetically closed with the top plug pressed on top side of the cylindrical casing.

#### 2.5.3 Final mechanical processing of the assembled sensor device

The final mechanical processing of the assembled sensor device includes drilling a slot to accept the clip and engraving the logo.

The slot for holding the clip is a square dimensions 10 x 10 mm. Logo engraving involves CNC engraving in depth of 0.25 mm on the outer shell of the cylindrical case.

The appearance of the sensor device after the final mechanical processing is shown in the picture below.



#### 2.5.4. Testing the device before delivery

Testing of the device before delivery includes re-implementation of test from chapter 2.5.1.

### 3. Operator equipment

#### 3.1 Office LoraWAN station

The office LoraWAN station is a station intended for the mooring operator and is used to establish a connection with the sensor system before placing it on the anchorage and to connect to the sensors when they are put into low-power or sleep mode.



Minimum specifications:

- Power supply: 230 VAC
- Number of LORA channels: 8
- Operating range: 863-870 MHz
- WiFi – 802.11 a/b/g/n 2.4 GHz

#### 3.2 Magnetic pendant

The magnetic pendant has the functionality of resetting the sensor by activating the magnetic switch. In nature, these are Neodymium magnets with a minimum diameter of 10 mm placed in a plastic or leather pendant so that it is easy to use.



Magnetic material: Neodymium

Magnet diameter: 10 mm

Maximum dimensions of the pendant: 50 x 70 x 10 mm.

## B. LIST OF COMPONENTS

### B1. BASE STATION

Component	Minimum required specifications	Specifications offered
B1.1. Conical light pole	Height: 4 m Construction material: hot-dip galvanized steel sheet Weight: 35 kg or less  <b>Quantity: 5</b>	
B1.2. Fastening equipment dimensioned for a conical light pole from B1.1	B1.2.1 Anchor bolts for concrete with nuts and washers Dimensions: M 20 Length: 550 mm <b>Quantity: 15</b>  B1.2.2. Top ending for the light pole Construction material: hot-dip galvanized steel sheet <b>Quantity: 5</b>	
B1.3. LED lighting element for mounting on a light pole from B1.1	Motion sensor: YES Power: 10W <b>Quantity: 3</b>	
B1.4. Outdoor LoraWAN router	LTE connectivity: YES Consumption: 8W or less Number of Lora Channels: 8 WEB controllable interface: YES GSM antenna: YES GSM antenna power: 3 dBI or higher LoraWAN antenna: YES	

	LoraWAN antenna power: 3 dBI or higher WiFi antenna: YES GPS antenna: YES Pole mounting kit up to 10 cm: YES Degree of protection: IP65 or higher <b>Quantity: 5</b>	
B1.5. Network power system	Power: 10W or higher Degree of protection: IP65 or higher Design: according to the description from ANNEX I – technical specification - chapter 1.3.1  <b>Quantity: 5</b>	
B1.6. Island power supply system	Power of installed FN panel: 90W or higher Minimum battery capacity: 90Ah Nominal battery voltage: 12 VDC Design: according to the description from ANNEX I – technical specification - chapter  <b>Quantity: 4</b>	
B1.7. Advertising sail	Height: from 240x66 cm Material: polyester <b>Quantity: 4</b>	

## B2 SENSOR DEVICE

Component	Minimum required specifications	Specifications offered
B2.1. Marine Eye sensor element	Tested sensor element consisting of: - housing of the sensor device according to the description from ANNEX I – technical specification - chapter 2.1,  - sensor electronics according to the description from ANNEX I - technical specification - chapter 2.3,	

Component	Minimum required specifications	Specifications offered
	<p>- battery power according to the description from ANNEX I - technical specification - chapter2.4,</p> <p>assembled and tested according to ANNEX I - technical specification - chapter2.5.</p> <p><b>Quantity: 160 pieces</b></p>	
B2.2. Fastening elements of sensor devices	<p>B2.2.1 Clamps model PE1, according to the provided 3D model- Inner diameter 25mm; Material: ABS <b>Quantity: 200 pcs.</b></p> <p>B2.2.2 Clamps model PE1N, according to the provided 3D model- Inner diameter 25mm; Material: Nylon <b>Quantity: 200 pcs.</b></p> <p>B2.2.3 Clamps model PE2, according to the provided 3D model- Inner diameter 35mm; Material: ABS <b>Quantity: 200 pcs.</b></p> <p>B2.2.4 Clamps model PE2N, according to the provided 3D model- Inner diameter 35mm; Material: Nylon <b>Quantity: 200 pcs.</b></p>	

### B3. OPERATOR'S EQUIPMENT

Component	Minimum required specifications	Specifications offered
B3.1. Office LORA WAN station	Power supply: 230VAC Number of LORA channels: 8 or more LORA Operating range: 864-870 MHz or higher WiFi connectivity: YES  <b>Quantity: 3 pieces</b>	
B3.2. Magnetic pendant	Maximum pendant length: 70 mm Maximum width of pendant: 50 mm Maximum depth of pendant: 10 mm Minimum diameter of the built-in magnet: 10 mm Magnet material: Neodymium or equivalent  <b>Quantity: 40 pieces</b>	
B3.3 Replaceable battery	Chemistry: LiSoCl <sub>2</sub> . Minimal capacity: 2000 mAh Size AA battery  <b>Quantity: 80 pieces</b>	