

# DataPole: Shallow Water Measuring Beacon

## General

emma technologies GmbH combines the expertises of its partners to offer a modular system of marine environmental measuring stations and networks. The basic element - the instruments platform - is an elastic beacon. This is a pipe construction of variable length with a sinker at the lower end, and floating pipe sections. The sinker fixes the pole to the bottom and the floats hold it vertical. The connection between the pole and the sinker is a joint. In case of a collision the pole can incline to each side but will return to the vertical quickly.

The elastic beacons do not rotate. This allows for optimal positioning of solar panels and directional antennas if those should be necessary.

Our beacons can be adapted to various water depths due to pipe segments of different lengths. Several measuring levels with well defined heights above the sea bottom are possible with integration of open space frames into the pipe construction.

The solid but lightweight beacons made from sea-water resistant materials are durable and easy to maintain. Deployment and recovery is possible from small vessels with some lifting equipment.

Single beacons as well as a whole net of them at many measuring sites can be connected to land stations or direct to the internet using different wireless techniques. This way they can be reached worldwide.

## Details of construction

The elastic beacons mainly consist of tube elements of approx. 300 mm diameter made of robust glass reinforced outer shells with thin inner stainless steel tubes, and flanges. The tubes are filled with closed-cell foam. Therefore, the elements stay floating even if the shell is punctured accidentally.

The whole construction is elastic not only due to the bottom joint but due to the composite tubes themselves.

The mentioned metallic components ensure electrical grounding of the whole beacon for protection against lightning and electric impulses.

On top of the beacon there is a frame where a top light, the meteorological instruments, radar reflectors, and a watertight enclosure for the control unit and the radio modem find place.

Optionally a solar panel can be installed. All electric components above the surface are protected to IP65 at least.

A St. Andrews Cross can be installed optionally if needed.

Under water open-frame structures build up the measuring sections at different levels. The multi-parameter probes S-2001 are installed inside these frames. They can be exchanged under water if necessary.

The bottom section contains the main battery and the joint to the anchor. For a lasting function sea water firm epoxy slide bearings are used. The construction of the anchor depends on the ground.

Control unit, measuring devices, and battery are connected by a single segmented bus cable with under water pluggable connectors. This cable is fed through the central stainless steel tubes for best mechanical protection.



## Measuring equipment

As means-of-choice we use our multi-parameter probes S-2001 to achieve one-probe solutions at each measuring level. This allows for minimal effort in case of a necessary in-field exchange which is therefore possible even under water.

All in-air devices are waterproof too - at least according to IP65 but IP67 where ever possible. If so, fully equipped beacons can be deployed without additional at-site installations.

Beneath is a list of selected parameters to be measured. Others are possible on request. Detailed technical data of the sensors and probes can be found in the respective data sheets.

Parameters to be measured:

1. Meteorological data
  - wind speed and direction
  - air pressure
  - air temperature
  - air humidity
2. Oceanographic data
  - conductivity
  - temperature
  - depth/ water level (from hydrostatic pressure and air pressure)
  - dissolved oxygen
  - current velocity and direction
  - wave height, period, and direction (instrument at one level)
3. Optional data
  - turbidity
  - chlorophyll
  - oil in water
  - H<sub>2</sub>S, etc.
4. House keeping parameters if necessary, e.g.
  - battery voltage
  - pole inclination
  - pole direction
  - etc.

## Safety elements

Following the requirements of each individual application the beacons can be completed with different signalling elements such as:

- top mark
- radar reflector
- marine lantern

## Data acquisition

At the beacons data acquisition and storage is done as follows:  
a) with the multi-parameter probes, where data are written to (volatile) RAM and - optionally - to additional CompactFlash Cards;  
b) sampling from all instruments and storage to CompactFlash Card inside the central control and communication unit.

The interval of data acquisition is adjustable depending on the measuring requirements and the potential of the power supply.

## Communication

The beacons are equipped with a central communication unit which accumulates data received from the measuring devices and sends it to land stations or to internet based services.

These are two-way data communications where authorised users can change settings as well.

Services available are (among others):

- direct radio link
- cellular phone
- satellite communication

## Power supply

Due to the modularity of the measuring station there are several solutions to supply power:

- primary batteries
- solar panels
- wind generators
- even wired supply for some applications

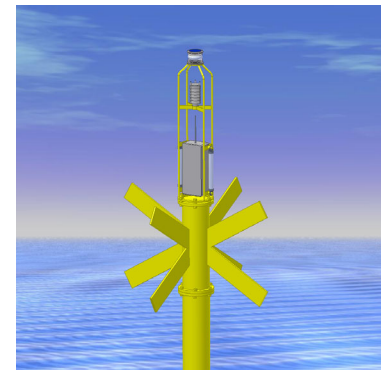
With our low-power measuring equipment primary batteries are often the most economic and reliable solution.

The system power is managed by the central control and communication unit of the beacon. Instruments connected to the bus cable are supplied for measurements only, the modem only if communication is required.

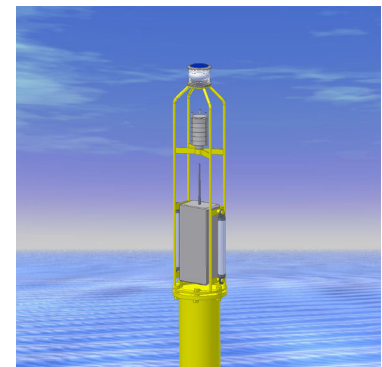
This way long lasting deployments with minimal effort are possible.

## Pictures of constructional details

Top section



Top instruments frame



Under water instruments section



Bottom section

