# MKI-4

## ENVIRTECH EASY TO DEPLOY TSUNAMI BUOY

# SYSTEM OVERVIEW

### TSUNAMI RELAY BUOY

The Envirtech MKI-4 buoy assures a stable platform for bidirectional communications to/ from the ocean bottom, and allows total remote control of deployed devices.
Together underwater modules, like Calypso or Poseidon Class devices, the MKI-4 is a reliable part of the marine segment of a tsunami warning system.
It has been designed taking in mind the big experience matured by Envirtech in Bengal Bay, the Andaman Sea and the South China Sea, to mitigate vandalism risk and to implement *easy to deploy* (ETD) procedures as requested by end-users. It can be deployed easily using relative small fishing boats or oceanographic and supply vessels and can be serviced on board avoiding the return in port for maintenance operations. The MKI-4 can be ordered in two configurations with solar panels or powered by lithium batteries. A special hook consents a safe management of all deployment operations.

### WHAT IS A TSUNAMI?

Tsunamis are large water waves created by seismic activity, landslides, volcanic activity, or by any vertical disturbance of water. Historically, tsunamis have killed hundreds of thousands of people and have caused significant damage to many coastal areas of the world.

### TSUNAMI WAVES

Tsunamis differ from normal wind-generated waves in that wind-generated waves have a shorter period and wavelength. A tsunami can have a wavelength in excess of 100 km over a period of hours. Tsunamis can travel at hundreds of kilometers per hour for great distances, with a very low attenuation.

### HOW TO MEASURE TSUNAMI WAVES

To give an early warning to coastal populations, tsunamis are measured in the open sea using underwater modules deployed on the sea bottom and communicating with a surface buoy moored above them.

### ENVIRTECH TSUNAMI BUOY TECHNICAL DESCRIPTION

The Envirtech buoy MKI-TSU is composed of three main parts:

- A subsurface pole hosting acoustic modems in a protective carter;
- A float composed of 3 parts in the middle;
- An instrument case hosting CPU, transceivers and batteries.

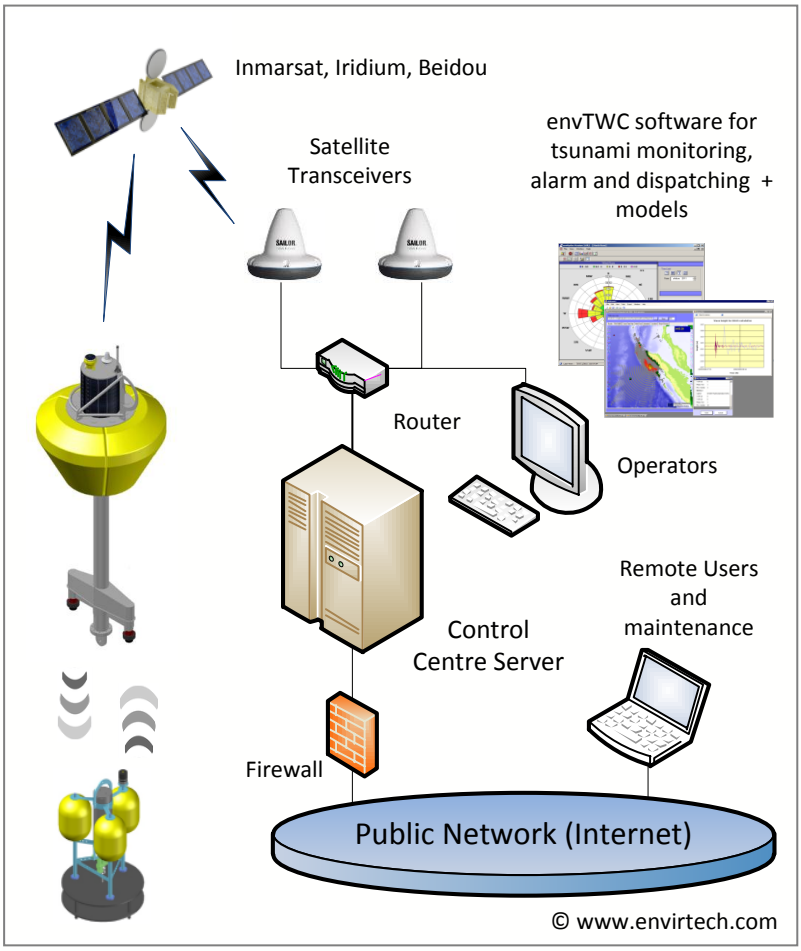
The main advantages of this configuration for specific data relay applications are the following:

- The lower pole provide a reliable mechanical support for the acoustic modems and related cables.
- The top, central part of the float can contain the battery and electronic unit with related connectors.
- The turret on the top allows the mounting of solar panels, the satellite modems and additional devices such as a Wi-Fi interface, meteorological station, etc.
- The hydrodynamics of the buoy are characterised to obtain a stable platform to optimise the performance of the acoustic link between the buoy and the underwater module that transfers the data related to the tide and tsunami detection.

The buoy can be optionally supplied with further payloads such as:

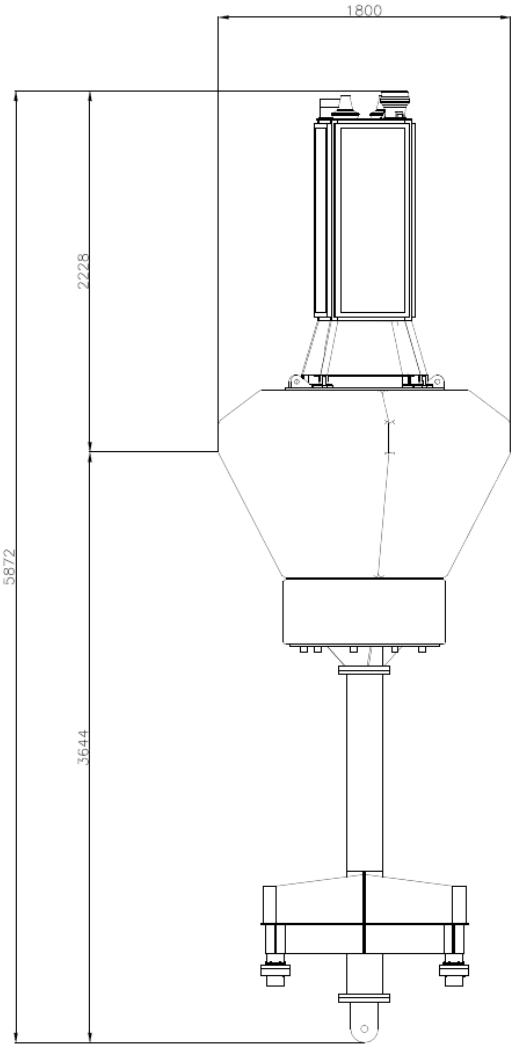
- A complete meteorological station (single or double)
- An ADCP for multi-cell current data collection
- Water quality multi-parameter probe

*Envirtech Sistemi Complessi* is a private Italian company that is completely owned by its management. It invests more than 30% of annual revenue in research. Envirtech manufactures according to strict standards of quality control and is ISO9001- 2000 certified.




Picture above shows a tsunami warning system solution, based on MKI-4 buoy and a sea bottom tsunameter (Ex: *Envirtech Calypso Class*). High accuracy pressure data are transmitted via acoustic modems to the buoy on surface and from it, via satellite, to an on-shore Control Centre.

| **GENERAL INFORMATION MKI-4** | |
|---|---|
| | |
| **Dimensions** | Diameter 1800mm<br>Overall Length 5872 mm |
| **Construction** | 4 pieces - Rotationally molded Polyethylene, UV stabilized, foam filled float<br>+ AISI 316L Stainless steel |
| **Instrument case** | Aluminum |
| **Weight in air** | 1,200 Kg (could change) |
| **Operational Temperature** | -4°C +60°C (standard) |
| **Extended Operational Temperature** | -20°C +70°C (optional) |
| **Operational** | Beaufort Extended Scale: 14 (Tropical Cyclones) |




| **MKI-4 STANDARD FEATURES** | |
|---|---|
| | |
| **CPU** | 32 bit Ram 1024 Kb<br>Very low power consumption |
| **Tsunami Detection** | Mofjeld algorithm – remotely operable |
| **Telemetry** | 2 x Spread Spectrum Acoustic Modems<br>• Acoustic link max 8,500 bps<br>• Operating Frequency: 12.75 to 21.25 KHz<br>1 x WIFI (to be used during commissioning and maintenance) |
| **Satellite** | 2 x Inmarsat- mini C or<br>1 Iridium + 1 Inmarsat mini-C<br>Option: Beidou or Insat<br>GPS 12 channels for buoy tracking |
| **Datalogger** | NVRAM - 32 GB |
| **Power** | Standard 4 solar panels<br>Or Lithium Battery Pack (max 2 years autonomy) |
| **Navigation Aids** | Obstruction light 3-5 NM<br>Radar Reflector 10 $m^2$ equiv. |
| ***Specifications can change without notice*** | |

envirtech

DOC:MKI-4-01