TSUNAMETERS
CALYPSO CLASS

SYSTEM OVERVIEW

DEEP OCEAN MONITORING AND TSUNAMI ALARMS

CALYPSO CLASS devices are the result of many years of experience in the manufacture of Tsunami gauges. CALYPSO devices are deep ocean real-time tsunami monitoring systems based on sea level measurements. The systems are deployed in free-fall assured to their compact buoyancy line, after a brief survey of the sea bottom to find a flat area.
Each CALYPSO unit integrates all the basic functions in one titanium case, which results in a more cost-effective system to meet the increasing market demand for highly accurate, reliable, and low cost bottom pressure recorders, operating in semi-real time. CALYPSO devices have an operating depth of 6,000 meters and can run on independent power for 2.5 years.

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 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.

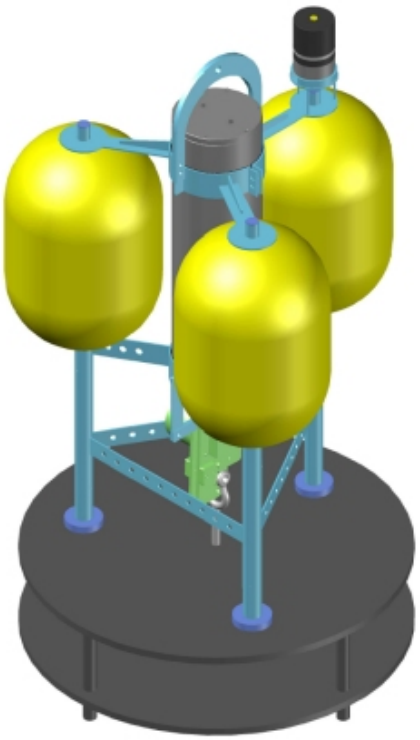
CALYPSO CLASS TECHNICAL DESCRIPTION

The *Calypso Class* tsunameter is an autonomous system suitable for the real-time detection of perturbations to the normal tide, caused, for example, by tsunamis and solitons. It can be installed at depths up to 6000 metres in open ocean together with a surface buoy which is needed to relay data via satellite to a shore control centre.
The system is composed of a robust mechanical frame in stainless steel AISI316 suitable for the marine environment and a Titanium grade-5 case containing the following main parts:

- One pressure sensor with a pressure measurement resolution better than 1mm of H2O in a water column of 7000m. The sensor is temperature-compensated and also provides high resolution temperature measurement (0.001°C).
- One spread spectrum modulation acoustic modem providing a 5000 bps bidirectional data link with a surface modem on a relay buoy.
- An autonomous power supply unit composed of a primary lithium battery pack. This guarantees an operating life of 30 months, with the system sending one acoustic message per hour.
- Data acquisition and control unit including a low power microelectronic system for real time data acquisition and pressure data processing. The electronic system includes a switchboard, voltage conditioning board, heading and tilt sensor (which can measure heading, pitch and roll with a resolution of 0.1 deg) and a diagnostic board monitoring battery voltage and current, internal pressure, temperature and water intrusion in the Titanium housings.
- A recovery system employing a buoyancy line. The system is composed of one deep-sea syntactic buoy and an acoustic release unlocking metal ballast weight of 130 kg for the recovery of the system on the surface. The acoustic release can be actuated by a dedicated deck unit with coded commands.
- The electronic unit has a mass memory (CF card) to store all the data acquired over 30 months

HIGH RELIABILITY

The CALYPSO Class ruggedized electronic and sensors are enclosed in a Titanium Grade-5 case. The use of a spread spectrum acoustic modem allows a very high percentage of semi-real time data to be obtained from the ocean bottom.

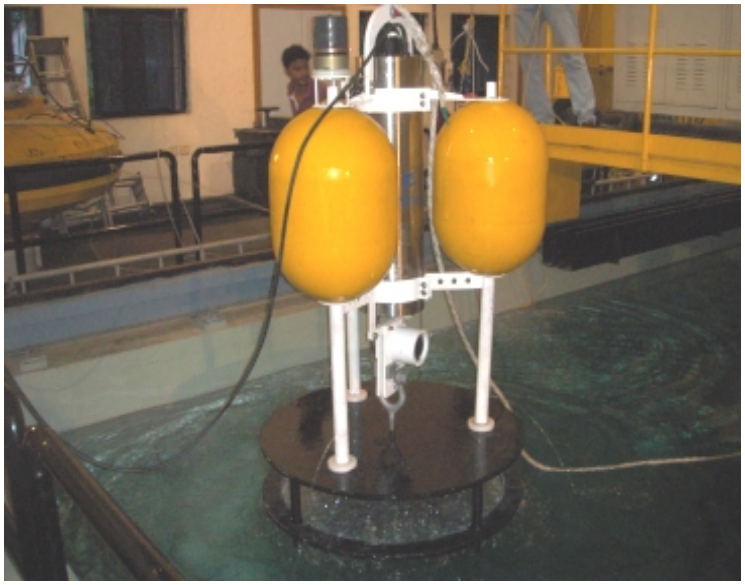


CALYPSO Class tsunameters can be supplied with a payload to be included in a surface buoy for acoustic data relay via satellite to a shore control centre. The best performance is obtained using an Envirtech MKIII Spar tsunami buoy.

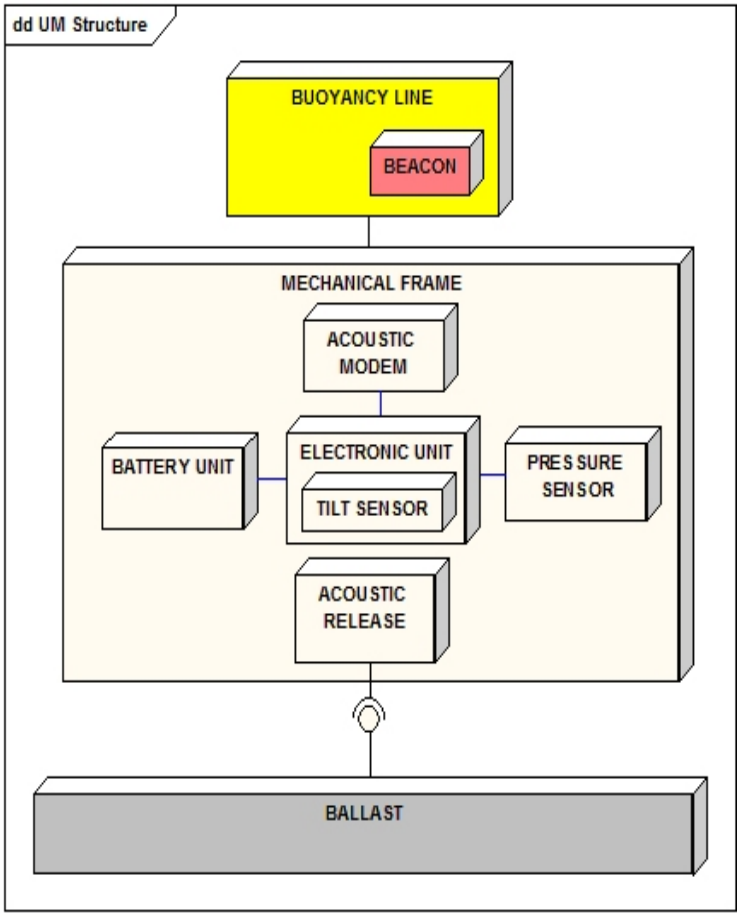
envirtech

Envirtech 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.

GENERAL INFORMATION	
Frame Shape	1800 mm x 1000 mm
Construction	AISI 316L Stainless steel
Instrument case	TITANIUM GRADE 5
Weight in air	196 Kg
Weight in water	ZERO
Ballast	130 Kg
Operational Temperature	-4°C +45°C (standard)
Extended Operational Temperature	-20°C +70°C (optional)
Operational maximum Depth	6,000 meters water depth



STANDARD FEATURES	
Pressure Gauge	Paroscientific Quartz Crystal resonator technology Range: 7,000m H_2O Pressure accuracy 0.01 % FS Pressure resolution 0.1 ppm Built-in Temperature sensor Resolution: 0.001°C
Tilt meter	+/- 45° x 3 axes
Compass	Micromachined Electro-Mechanical System (MEMS) Gyro-stabilized Azimuth accuracy: 0.5° RMS, 0.1° resolution Inclination accuracy: 0.2° RMS, 0.1° resolution
CPU	16 or 32 bit Ram 1024 Kb Very low power consumption
Telemetry	Spread Spectrum Acoustic Modem Acoustic link max 8,500 bps Operating Frequency: 12.75 to 21.25 KHz
Datalogger	NVRAM - 32 GB
Power Autonomy	Lithium Power Pack – 2.5 Years
Specifications can change without notice	



DOC:CALYPSO-003