

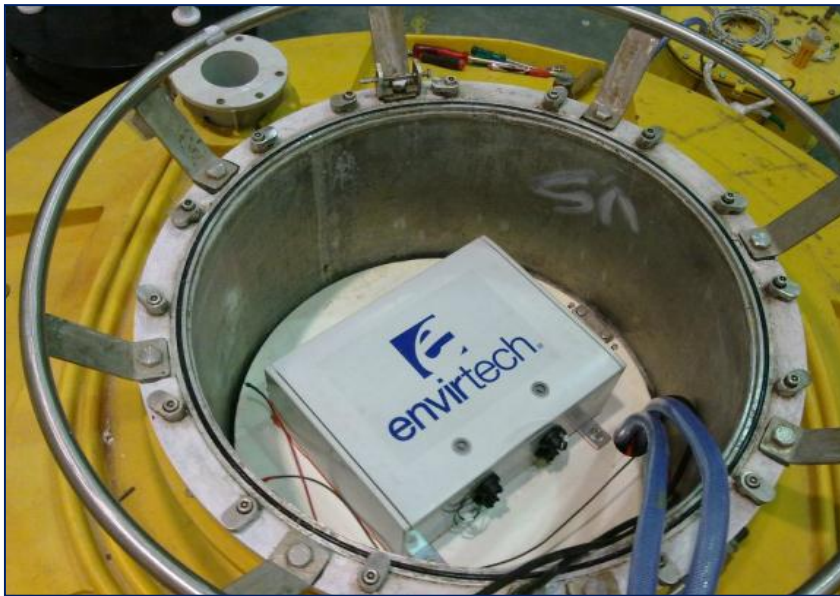
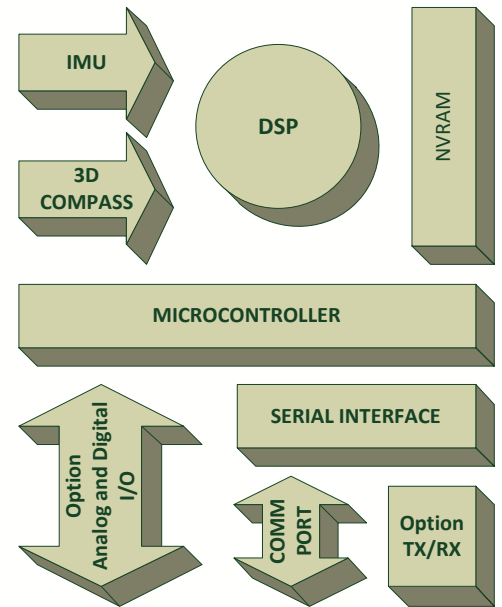
# DWSP DIRECTIONAL WAVE SENSOR AND PROCESSING PAYLOAD

## SYSTEM OVERVIEW

### “PARTICLE FOLLOWING” MEASURING PAYLOAD

The system core consists of a state of the art IMU (Inertial Measurement Unit) . It is a solid state, MEMS, electronic device that measures the buoy hull dynamic parameters using a combination of 3D accelerometers, gyroscopes, and magnetometers. A Digital Signal Processor (DSP) provides real-time 3D orientation, acceleration, rate of turn and earth-magnetic field data. Once calculated the attitude and heading data, a microprocessor unit processes them to obtain a geographically oriented displacement file (HNE file). In the HNE file each sample consists of Heave, Displacement North/South and Displacement East/West measured in millimetres. Once transmitted to a shore station, data can be further processed by a zero-crossing analysis and a Fast Fourier Transform to obtain the directional sea wave statistics as well as the directional energy spectra. The local Non-Volatile Ram can store all collected data for some years, depending on the data acquisition rate.

As option, a very high accurate GNSS receiver can measure the absolute position of the payload and the height respect the ellipsoid for instantaneous sea height measurement (tide).



## TECHNICAL DESCRIPTION

The unit is composed of following main parts:

- The sensor pack containing the IMU sensors and 3D magnetic compass
- The micro-controller. It consists of a low power consumption RISC processor, embedding a LINUX operating system able to manage serial lines I/O.
- Local data processing software to format an HNE file (Heave, Displ. N/S, Displ. E/W)
- DC Power supply
- As option, a multi Analog/Digital I/O interface to manage local sensors
- As option, a multi-channel multi-satellite GNSS receiver for iSSH measurement
- As option, a Radio Frequency modem. Its configuration depends on the user choice at order time. Available Radio Frequency Bands are : VHF, UHF, GPRS/EDGE, Inmarsat mini-C, Iridium, W-LAN
- Software for remote data decoding, post-processing and user presentation of wave statistical data (Hm0, Hmax, Tp, Tm, Dp, Dm etc.) and directional energy spectra.

### PARTICLE FOLLOWING BUOY

A particle-following directional wave buoy measures the wave direction by correlating the buoy's horizontal and vertical motion. In contrast to a surface-following buoy, no specific buoy shape is required. Free-floatingly, the buoy follows the motion of the water particle, both vertically and horizontally.

### WHAT IS MEMS

Micro-Electro-Mechanical Systems, or MEMS, is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements (i.e., devices and structures) that are made using the techniques of micro fabrication.



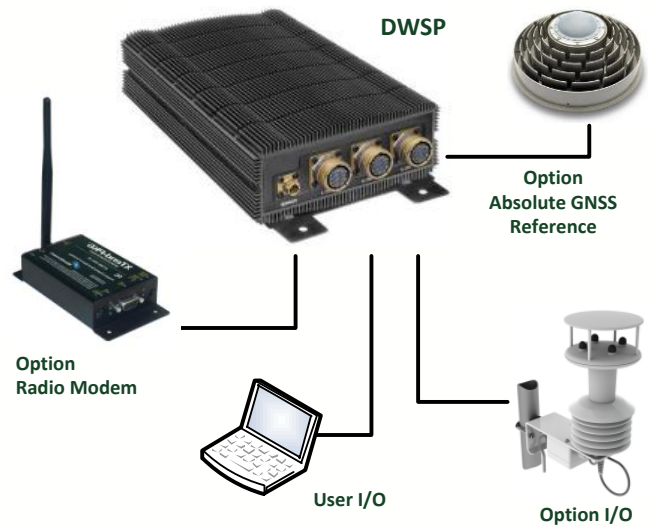
Envirtech is a private Italian company that is completely owned by its management. It invests more than 30% of annual revenue in research. Envirtech manufactures according to strict standards of quality control and is ISO9001- 2000 certified.

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GENERAL INFORMATION (AS BUOY PAYLOAD)	
Wave Height/Heave	Range -25 .. 25 m Resolution 1 mm Accuracy < 2 mm
Period	Range 1.0 .. 33 sec Resolution 0.1 s Accuracy 0.1 s
Direction	Range 0 .. 360 ° Resolution 0.2° Accuracy 1°
Box dimensions	250 X 200 X130 mm
Construction	Diamagnetic
IP GRADE	IP68 – 1 meter submerged
Operational Temperature	-15 .. +70°C (standard)
Operating Voltage	9 .. 18 VDC
Power consumption	100 mA (with NO Options)

MICRO CONTROLLER	
Microprocessor	32 Bit – RISC – <i>Embedded Linux</i>
NV-RAM	1 GB standard up to 8 GByte
User I/O	2 x RS-232
Analog Channels	Option IN: 8 Channels
Digital Channels	Option I/O: 20 Channels
<i>Specifications can change without notice</i>	

OPTION VHF – UHF RADIO MODEM	
Frequency Range	138 .. 174 MHz 218 .. 238 MHz
Channel Spacing	12.5 KHz / 25 KHz
Number of Channels	1760 MAX
TX MODE	HALF-DUPLEX
TX Carrier Power	From 100 mW to 5W / 50 ohm
RX Sensitivity	< -115 dbm (BER < 10 E-3)
Radio Data Speed	19200 @ 25 KHz / 9600 @ 12.5 KHz
Antenna Conn	TNC, 50 ohm female
The equipment complies with the EN 300 113-1, EN 301 489-1, -5, EN 60950- 1 and FCC CFR47 section 90 specifications	
FURTHER OPTIONS	
Inmarsat mini-C, Iridium, GPRS/EDGE, WI-FI, GNSS Absolute Reference with or without RTK correction	



The DSP calculates the orientation between the sensor-fixed co-ordinate system, S, and a earth-fixed reference co-ordinate system, G. By default the local earth-fixed reference co-ordinate system used is defined as a right handed Cartesian co-ordinate system with:

- X positive when pointing to the local magnetic North.
- Y according to right handed co-ordinates (West).
- Z positive when pointing up.

The 3D orientation output is defined as the orientation between the body-fixed co-ordinate system, S, and the earth-fixed co-ordinate system, G, using the earth-fixed co-ordinate system, G, as the reference co-ordinate system.

