![xylem - Let's Solve Water logo]

MOTUS Wave Sensor 5729

A directional wave sensor module for use on surface buoys. The MOTUS Wave Sensor is an integrated part of MOTUS Tideland SB 138P buoy but also suitable for other third party buoys. It is intended for commercial as well as research use. The sensor processes wave data and is configurable to present parameters and wave spectrum directly. The sensor can be connected to a SmartGuard using the CANbus based AiCaP protocol. It can also be connected to a PC or third party systems through the RS-232 interface.

Key features
- *User configurable transferfunction to compensate for buoy frequency response*
- *Configurable compensation algorithm for installation outside of buoy center.*
- *Built-in solid state 9-axis accelerometer/gyroscope/magnetometer.*
- *Options for external compass ensuring high directional accuracy even if the wave sensor is installed close to magnetic components.*
- *A compact field friendly low power multi-parameter wave sensor.*
- *Wide range of parameters are calculated inside the sensor, configurable output.*
- *Direct readout of engineering data*
- *Integration time from 5 to 60 minutes.*
- *RS-232 output for integration to most third party Dataloggers.*
- *Customer configurable separation frequency between wind and swell waves*
- *Extremely rugged and watertight. Handles 30 meter knockdown*
- *Low power consumption, <125mW @12V*

Applications
- Oceanographic research
- Marine Transport
- Offshore / Oil & Gas
- Aquaculture / fisheries
- Environmental management
- Infrastructure design / Survey companies
- Offshore wind

Internal or External Compass
The sensor is using an internal compass in order to reference directional data to geographical or magnetic north. If the magnetic field is disturbed by the buoy structure or payload an optional external compass may be used. This compass may either be connected via the AiCaP bus or using RS-232 input. At RS-232 input the sensor accepts heading given in NMEA 0183 format.

Sensor communication protocols
The AADI Real-time collector PC software can be used for communication with the sensor. It simplifies the sensor configuration process and saves sensor data to files on a PC. The AADI Real-Time communication protocol is a XML-based protocol which also includes numerous metadata provides the Smart Sensor Terminal protocol a simpler protocol that can be used in most third party systems.

The size of the output message can be reduced in both protocols by only enabling the necessary data parameters. Both protocols use ASCII output which makes it directly readable without any conversion (no binary data).

Sensor as a part of a system
The MOTUS sensor is designed to be use stand-alone with third party buoys or as a part of the Aanderaa hydrography/meteorology buoy (ODAS) solution with easy expansion with a large number of additional sensors e.g. single point currents, current profiler, various water quality and meteorological sensors.
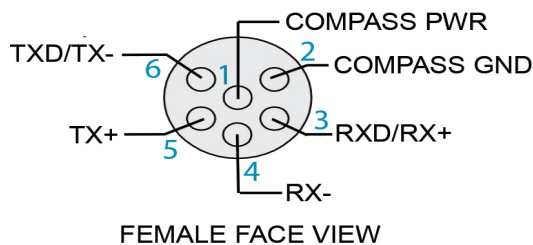
Mooring consideration
In order for the wave sensor to fully capture the required movements of the buoy a more flexible mooring is required. To obtain the required flexibility one section of the mooring should consist of a rubber cord. Guidelines for mooring design are available or the mooring may be ordered as a part of the buoy delivery.
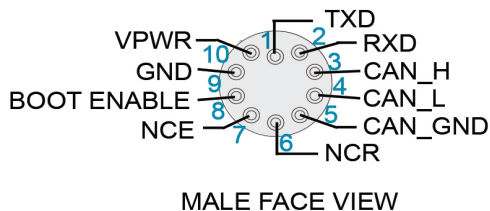
Specifications

M5x17 — 21

Ø129

124

4xØ6.5 — □116 / □130
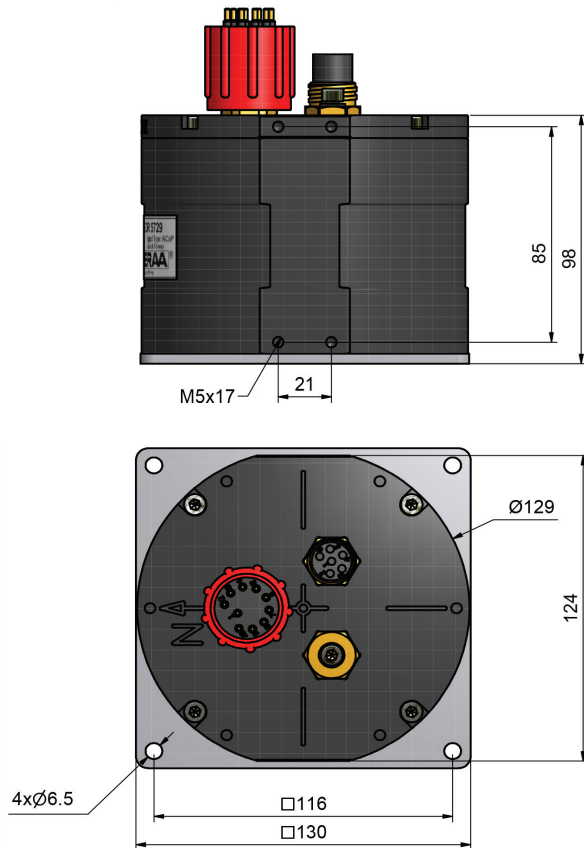
PIN CONFIGURATION WET-CON MCBH6F
EXTERNAL COMPASS INPUT

TXD/TX- 6 — 1
TX+ 5 — 4 — RX-
COMPASS PWR — 2
COMPASS GND
3 — RXD/RX+

FEMALE FACE VIEW

PIN CONFIGURATION WET-CON MCBH10M
AiCaP / RS-232

VPWR — 1 — 2 — TXD
GND — 10 — RXD
BOOT ENABLE — 9 — 3 — CAN_H
NCE — 8 — 4 — CAN_L
7 — 5 — CAN_GND
6 — NCR

MALE FACE VIEW

Wave Height:	
Range:	30m
Resolution:	< 0.001m
Accuracy:	< ±0.05m or 1% of reading[1]

Wave Period:	
Range:	1.42 - 33s
Resolution:	< 0.05s
Accuracy:	< 1% [1]

Wave Direction:	
Range:	0 to 360°
Resolution:	< 0.5° [2]
Accuracy:	< 2° [1][2]

Integration Time:	5 -60 minutes
Wave Calculation update rate:	2 minutes

Sampling Frequency:	
IMU output rate:	100Hz

Interfaces:	AiCaP, RS-232

Power:	
Supply voltage:	6-30 Vdc
Current drain:	125mW @ 12V

Environmental:	
Depth rating:	30m
Operating temperature:	-40 to +70°C
Dimensions:	130x130x110mm
Weight including bracket:	1.23kg

Materials:	POM, Stainless steel 316, Brass

[1] *Accuracy achieved under temperature from -5 to +40°C*
[2] *Rms 5-60 min.*

Frequency Based Parameters

Significant Wave Height:	H_{mo}
Wave Height Swell/Wind:	H_{mo}
Peak Wave Direction Height:	θ
Peak Wave Direction Swell/Wind:	θ
First Order Spread:	σ
Mean Spreading Angle:	θ_k
Peak Wave Period:	T_p
Mean Wave Period:	T_{m02}
Long Crestedness Parameter:	τ
Mean Wave Direction:	θ_{avg}
Wave Energy Spectrum:	$E(f)$
Directional Wave Spectrum:	$DWSm(f)$
Principal Wave Directional Spectrum:	$DWSp(f)$
Orbital Ratio Spectrum:	$K(f)$
Fourier Coefficients Spectra:	$A1(f), B1(f), A2(f), B2(f)$

Time Based Parameters

Significant Wave Height:	$H_{1/3}, H_{1/10}$
Mean Wave Period:	$T_z, T_{1/3}, T_{1/10}$
Maximum Wave Height:	H_{max}
Wave Period:	T_{max}
Wave Height Max Crest:	C_{max}
Wave Height Max Trough:	Tr_{max}
Heave Timeseries:	$H(t)$