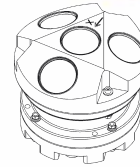


600 kHz & 1 MHz

# AWAC™

- Wave height and direction
- Full current profile
- ...All with a single instrument



With the Nortek AWAC, you get a current profiler and a wave directional system in one unit. You can measure the current speed and direction in 1-m thick layers from the bottom to the surface and you can measure long waves, storm waves, short wind waves, or transient waves generated by local ship traffic.

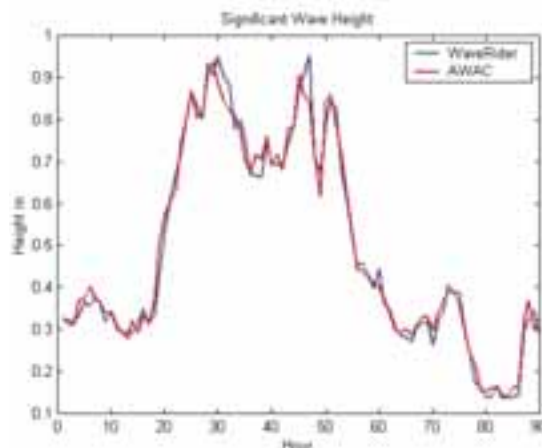
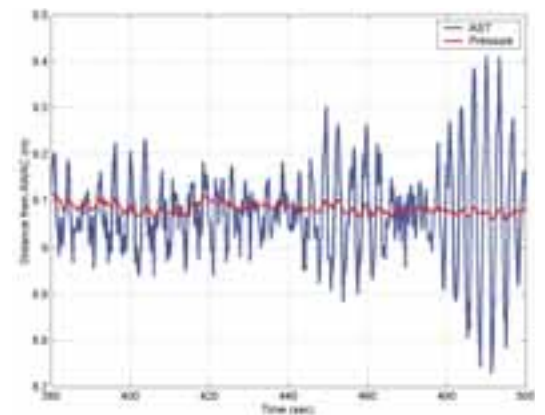
The AWAC is designed as a coastal monitoring system. It is small, rugged, and suitable for multi-year operation in tough environments. It can be operated online or in stand-alone mode with an internal recorder and batteries.

The sensor is usually mounted in a frame on the bottom, protected from the harsh weather and passing ship traffic.

The mechanical design is all plastic and titanium to avoid corrosion. Online systems can be delivered with protected cables, interface units on shore, and backup batteries and recorder. In stand-alone use, the raw data are stored to the internal data logger and power comes from an external battery pack. A variety of options are available with maximum deployment lengths of 4 months with hourly wave data (8 months with Lithium batteries).

## AST breakthrough

With the optional Acoustic Surface Tracking (AST) firmware you can measure the long waves (swell), storm waves and the short waves generated from local winds. Moreover, the AST also gives you the ability to derive wave parameters based on *times series analyses*, which is a major advantage relative to the classical bottom mounted systems that derive the wave parameters from spectral estimates of pressure or velocity. This means that AWAC can directly measure wave parameters such as  $H_{max}$ ,  $H_{1/10}$ ,  $T_{mean}$ , etc. which other bottom mounted systems simply cannot.



The AWAC with AST firmware option has been deployed for comparison with wave (directional) buoys all over the world. The short segment shows a test conducted by Nortek partner Thetis SA off the south coast of France.

## Software

The AWAC software is used to configure the instrument for deployment, retrieve the data and convert all data files to ASCII, and view all the measured current profiles and wave data. In order to calculate the wave parameters, the non-graphical WaveExtract software will generate ASCII files with all the interesting wave parameters.

For long term projects with multiple deployments and/or multiple stations, please contact Nortek to receive the latest information on the Nordis generation software. For system integrators, individual DLL and ActiveX® elements are available for integration into Windows® or Windows® CE applications.



## Specifications

### System

Acoustic frequency	1 MHz or 600kHz
Acoustic beams	4 beams, one vertical, three slanted at 25°
Operational modes	Stand-alone or long term monitoring

### Current profile

Maximum range	30m (1MHz), 50m (600kHz) (depends on local conditions)
Depth cell size	0.4 – 4.0m (1MHz) 0.5 – 8.0m (600kHz)
Number of cells	Typical 20–40, max. 128
Maximum output rate	1s

### Wave data

Maximum depth	40m (1MHz), 60m (600kHz)
Data types	Pressure, one velocity cell along each slanted beam, distance to surface
Cell size	0.4 – 4.0m (1MHz) 0.5 – 8.0m (600kHz)
Sampling rate (output)	1Hz/2Hz, 2Hz (4Hz AST)
No. of samples per burst	512, 1024, or 2048

### Velocity measurements

Velocity range	±10m/s horizontal, ±5m/s along beam (inquire for higher ranges)
Accuracy	1% of measured value ±0.5 cm/s
Doppler uncertainty	
- Waves	3.5 cm/s at 1Hz for 2m cells
- Current profile	1 cm/s (typical)

### Sensors

Temperature	Thermistor embedded in head - Range: -4°C to 40°C - Accuracy/ Resolution: 0.1°C/0.01°C - Time constant: <10 min
Compass	Flux-gate with liquid tilt - Maximum tilt: 30° - Accuracy/Resolution: 2°/0.1° for tilt <20°
Tilt	Liquid level - Accuracy/Resolution: 0.2°/0.1° - Up or down: Automatic detect
Pressure	Piezoresistive - Range: 0–50m (standard) - Accuracy/Resolution: 0.5% of full scale/ Better than 0.005% of full scale per sample

### Data Recording

Capacity (standard)	2 MB, expandable to 26/82/154MB
Profile record	#cells×9 + 120
Wave record	#samples×24 + 46

### Data Communication

I/O	RS-232 or RS-422
Baud rate	300–115200
User control	Handled via "AWAC" software or ActiveX® controls

### Power

DC input	10–16 ±10% VDC
Peak current	2A
Operating power consumption	1W (typical)



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### Online applications

The AWAC is designed with long term monitoring in mind. The optional 48-Volt interface unit can be used to drive cables that are 5 km long and contains options for a variety of communication interfaces. This includes direct links using cable or radio as well as

interfaces for GSM or analog telephone with automatic download from the internal recorder. Batteries and internal recorder can be used in conjunction with online systems for backup purposes.

### Wave measurements

The AWAC provides three independent methods for measuring waveheight and period. The three methods utilize the pressure, orbital velocity, and acoustic surface tracking (optional). These three independent measurements provide an internal check so that the processed estimates can be checked against each other.

Directional estimates are derived from the projected array of velocity measurement cells. The processing technique is known as the *Maximum Likelihood Method* (MLM). This advanced approach of estimating wave direction allows for wave events from independent directions to be resolved, unlike standard single point measurement methods.

Standard Output Parameters for systems with AST:  $H_{1/3}$ ,  $H_{1/10}$ ,  $H_{max}$ ,  $T_{1/3}$ ,  $T_{1/10}$ ,  $T_{max}$ ,  $T_{mean}$ ,  $T_{peak}$ ,  $L_{1/3}$ ,  $L_{1/10}$ ,  $L_{max}$ , Peak Direction, Mean Direction, Directional Spreading, Unidirectivity Index

### Specifications:

Height Resolution:	1 mm
Height Accuracy:	1 cm
Height Range:	0–20m
Period Resolution:	0.01 sec
Period Accuracy:	0.1 sec
Period Range:	0.5–100sec
Direction Accuracy:	2°
Direction Resolution:	1°

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