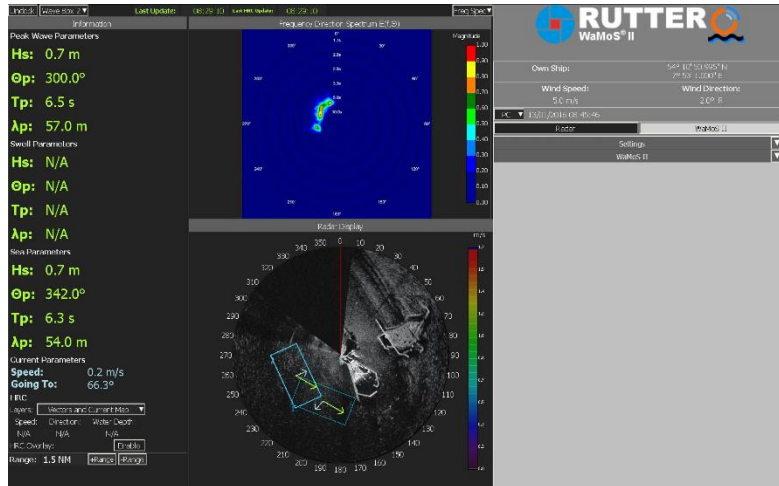


OceanWaveS GmbH's *sigma* S6 WaMoS® II is a proven radar-based wave and surface current monitoring system providing measurements up to 4 km from a radar site. Connecting to most commercial X-Band radars, *sigma* S6 WaMoS® II measures and reports on all essential wave field parameters: 2D-directional wave spectrum, significant wave height (H_s), peak wave period (T_p), peak wave length (L_p or λ_p), and peak wave direction (Θ_p), as well as surface current speed (U_s) and direction (U_d).

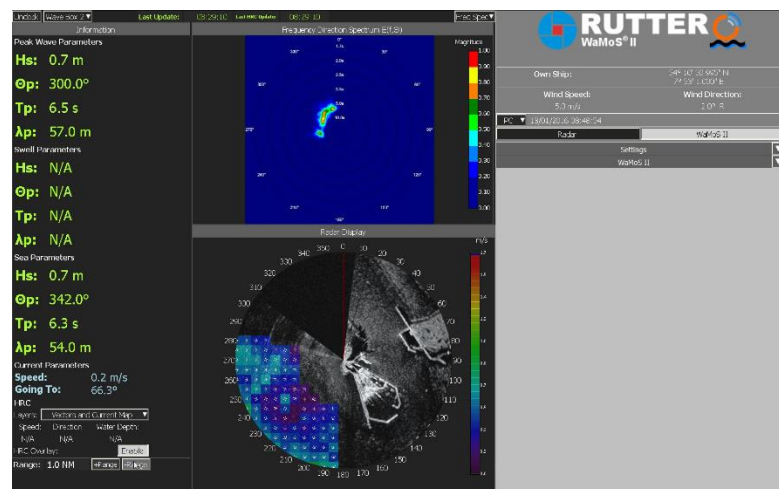
The system distinguishes between wind, sea, and swell and can automatically recognize up to three different wave systems. *sigma* S6 WaMoS® II provides higher fidelity information and comparable accuracy, at lower lifecycle costs than other wave and current measurement sensors. It is presently used in offshore construction, diver support, safe helideck operations, navigation support, and research facilities.



WaMoS® II – Sea State Analysis

sigma S6 WaMoS® II's optional High Resolution Current (HRC) delivers ocean surface current information with high spatial resolution to aid in drift prediction of oil slicks, the management of offshore activities, harbour entry and route planning, safer navigation, and coastal protection. HRC also displays bathymetry information in shallow water (up to approximately 30m water depth) to assist in the monitoring of sedimentation and erosion processes. Presently, HRC is available for fixed installations only.

sigma S6 WaMoS® II provides real-time measurements, providing accurate analysis as conditions change. High definition radar imaging, and intuitive graphical reporting keeps the operator informed when assessing environmental risks and identifying safe operating windows. Unlike conventional wave buoys and current profiling devices, the radar covers a larger area, simultaneously measuring and reporting on multiple locations within the radar's



WaMoS® II – High Resolution Currents

field of view.

sigma S6 WaMoS® II can be installed with a dedicated Rutter 100S6 X-Band radar, but also interfaces with most other commercially available marine radars. sigma S6 WaMoS® II is fully motion compensated and operates equally well from both fixed platforms and moving vessels.

Minimum environmental conditions are required to measure the sea state: a minimum wind speed of 3 m/s, and a significant wave height of 0.5 m. The system detects wave lengths from 15 m – 600 m and wave periods between 3 s – 18 s.

The standard sigma S6 WaMoS® II output parameters are listed in the table below:

| Wave Spectra | Resolution | Range | |
|---|----------------------|-------------------------------|------------|
| 2-dimensional frequency-direction spectrum [$S(f, \theta)$] | 0.005 Hz 4° | 0.02 Hz – 0.35 Hz 0 - 360° | |
| 1-dimensional spectrum [$S(f)$] | 0.005 Hz | 0.02 Hz – 0.35 Hz | |
| Wave and Current Parameters | Accuracy | Range | Resolution |
| Significant Wave Height [H_s] | +/- 10% or +/- 0.5 m | 0.5 – 20 m | 0.1 m |
| Peak Direction [θ_p] | +/- 2° | 0 - 360° | 1° |
| Peak Period [T_p] | +/- 0.5 s | 3 – 18 s | 0.1 s |
| Peak Wave Length [λ_p] | +/- 10 % | 15 – 600 m | 1 m |
| Current Speed [U] | +/- 0.2 m/s | 0 – 40 m/s | 0.01 m/s |
| Current Direction [U_θ] | +/- 2° | 0 - 360° | 1° |

sigma S6 WaMoS® II offers a variety of outputs allowing wave and current information to be stored locally or streamed over a network connection to remote computers. All data is available in ASCII format for further system integration or subsequent analysis and can be output to external systems via NMEA formatted messages. In addition, sigma S6 WaMoS® II comes standard with sigma S6 Connect, a web enabled interface, allowing 3rd party solutions to interface with the system to view radar imaging (GeoTIFF, PNG, JPEG formats) and receive wave, surface current and HRC parameters (GML, KML, DXF, ESRI formats). This feature allows easy integration into external systems such as Google Earth Pro, GIS, and decision support systems.

As sigma S6 WaMoS® II is not deployed in the ocean, high yearly costs associated with maintaining and operating many other wave and current measurement devices can be avoided, resulting in lower ongoing operational costs.

After commissioning of sigma S6 WaMoS® II and a short period of operation, it is recommended that the configuration be calibrated for proper wave height measurements. Rutter offers this service as part of the standard system install.

sigma S6 WaMoS® II

- Marine certified (IEC 60945)
 - Rack Mountable/Desktop Radar Data Processor
 - 24" marine certified Rack Mountable/Desktop monitor (alternate sizes available)
 - Keyboard/Trackball Unit (Desktop style or Console Mount)
- Windows 7 operating system
- Radar server & SeaView WaMoS display processing software (GUI)
- Operational for mobile & fixed stations
- 2- and 1-dimensional wave spectra (f-theta, kxky)
- All integrated parameters such as: significant wave height, peak periods, directions, wave lengths both for sea and swell.
- Surface current speed and direction (average value over measurement windows)
- NMEA output of derived parameters
- Automatic Screen Recording in selectable time intervals for evidence documentation
- Remote client capability
- Computer-Based Training package
- 4TB USB 3.0 External hard drive for WaMoS raw data recording
- Wave height calibration after receipt of suitable data with reference system
- *sigma* S6 Connect