TRIAXYS™ Sensors  The “Next Wave”

FEATURES & BENEFITS:

- Designed for low power applications
- No moving parts
- Continuous wave sampling
- Supports any telemetry
- Supports other sensor inputs
- >5 years data storage capacity

TRIAXYS™ Directional Wave Sensor
TRIAXYS™ Motion Sensor
TRIAXYS™ Heave Sensor
Physical Attributes
The sensor is packaged in a small stainless steel box that needs only a single connector for power and data. The output from the sensor is fully processed wave data. Data is stored in the sensor on a compact flash disk.

Sampling Regime
The sampling regime for the sensor is user-selectable, with sample lengths from 5 to 34 minutes (or continuous), and sample intervals from 5 to 1440 minutes.

Location
TRIAXYS wave sensors can be located anywhere on the floating body to measure motion at a specific point or - using embedded software - to calculate the motion at another point on the body (e.g. the centre of gravity).

Sensors
The TRIAXYS Directional Wave Sensor is comprised of three accelerometers and three rate sensors that ultimately measure the total displacement along the three orthogonal axes of the floating platform, x, y, z or HNE. In addition, this sensor is equipped with a gimballed fluxgate compass to measure true magnetic direction.

The TRIAXYS Heave Sensor uses the same technology as the Directional Wave Sensor, but without the compass. This provides the same six degrees of freedom analysis but without a magnetic direction reference.

The TRIAXYS Motion Sensor also contains three accelerometers and three angular rate sensors and outputs the raw motion of the platform.

These sensors use software developed by the National Research Council of Canada for data processing within the sensor. All sensors have the option of onboard data logging of both the raw collected data and the final processed data.

Software
The processor in the TRIAXYS Heave Sensor uses the measured sensor motions to perform wave analyses which include:

- a zero crossing analysis of the wave elevation record to produce time domain wave statistics.
- a spectral analysis that computes the non-directional wave energy spectrum, which defines the distribution of wave energy as a function of frequency.

In the TRIAXYS Directional Wave Sensor the analysis also includes:

- a directional spectral analysis, using the wave elevation and the north and east velocity components, that computes the directional wave spectrum. This defines the distribution of wave energy as a function of frequency and direction of propagation.
- calculation of the mean wave direction and the directional spreading width as functions of frequency.
- first 4 Fourier coefficients which can be used to reconstruct the directional spectra for analysis by your software and algorithms.
TRIAXYS™ Sensors were the result of a collaborative development and testing program between AXYS and the Canadian Hydraulics Centre (CHC) of the National Research Council of Canada. The wave analysis software in the sensors was adapted from CHC software that has been in use in their wave testing facilities for decades.

The TRIAXYS™ Sensors use the AXYS WatchMan500™ processor to provide desktop to sensor monitoring and control.

APPLICATIONS

For the TRIAXYS™ Directional and Heave Wave Sensors:

- weather forecasting
- oceanographic research
- environmental monitoring
- marine and coastal engineering
- marine traffic safety
- climate studies

For the TRIAXYS™ Motion Sensor:

- wave energy system control
- vessel response information
- naval architectural design
- platform loading and design
- structural and stress analyses

These sensors have been integrated numerous times into existing navigation and data buoys as upgrades to allow users to measure wave and motion.
<table>
<thead>
<tr>
<th>Specifications</th>
<th>TRIAXYS™ Directional Wave Sensor</th>
<th>TRIAXYS™ Motion Sensor</th>
<th>TRIAXYS™ Heave Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>±20m</td>
<td>±20m</td>
<td>±20m</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>0.01 m</td>
<td>0.01 m</td>
<td>0.01 m</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>Better than 2%</td>
<td>Better than 2%</td>
<td>Better than 2%</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>1.6 - 33 secs</td>
<td>1.6 - 33 secs</td>
<td>1.6 - 33 secs</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>0.1 sec</td>
<td>0.1 sec</td>
<td>0.1 sec</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>&gt;2%</td>
<td>&gt;2%</td>
<td>&gt;2%</td>
</tr>
<tr>
<td><strong>Direction</strong></td>
<td>0-360°</td>
<td>0-360°</td>
<td>0-360°</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>3°</td>
<td>3°</td>
<td>3°</td>
</tr>
<tr>
<td><strong>Sensor Size</strong></td>
<td>35cm x 35cm x 20cm (13” x 13” x 6”)</td>
<td>35cm x 35cm x 20cm (13” x 13” x 6”)</td>
<td>35cm x 35cm x 20cm (13” x 13” x 6”)</td>
</tr>
<tr>
<td><strong>Sensor Weight</strong></td>
<td>13 Kg (29lbs)</td>
<td>13 Kg (29lbs)</td>
<td>13 Kg (29lbs)</td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>10.5 to 19 VDC</td>
<td>10.5 to 19 VDC</td>
<td>10.5 to 19 VDC</td>
</tr>
<tr>
<td><strong>Input/Output</strong></td>
<td>Power and data through Bulgin connector</td>
<td>Power and data through Bulgin connector</td>
<td>Power and data through Bulgin connector</td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td>19,200 baud, 8 bits, 1 stop bit, no parity</td>
<td>9,600 baud, 8 bits, 1 stop bit, no parity</td>
<td>9,600 baud, 8 bits, 1 stop bit, no parity</td>
</tr>
<tr>
<td><strong>Operating Temperature Range</strong></td>
<td>-30°C to +65°C</td>
<td>-30°C to +65°C</td>
<td>-30°C to +65°C</td>
</tr>
<tr>
<td><strong>Storage Temperature Range</strong></td>
<td>-40°C to +70°C</td>
<td>-40°C to +70°C</td>
<td>-40°C to +70°C</td>
</tr>
<tr>
<td><strong>Sampling Frequency</strong></td>
<td>4 Hz (up to 50 Hz)</td>
<td>4 Hz (up to 50 Hz)</td>
<td>4 Hz (up to 50 Hz)</td>
</tr>
<tr>
<td><strong>Frequency Range</strong></td>
<td>0.64 Hz (1.56 seconds) to 0.030 Hz (33.33 seconds)</td>
<td>N/A</td>
<td>0.64 Hz (1.56 seconds) to 0.030 Hz (33.33 seconds)</td>
</tr>
<tr>
<td><strong>Frequency Interval</strong></td>
<td>0.005 Hz</td>
<td>N/A</td>
<td>0.005 Hz</td>
</tr>
<tr>
<td><strong>Sample Length</strong></td>
<td>Variable (1 to 34 minutes)</td>
<td>Variable (1 to 34 minutes) or continuous</td>
<td>Variable (1 to 34 minutes)</td>
</tr>
<tr>
<td><strong>Sample Interval</strong></td>
<td>Variable (5 to 1440 minutes)</td>
<td>Variable (5 to 1440 minutes) or continuous</td>
<td>Variable (5 to 1440 minutes)</td>
</tr>
<tr>
<td><strong>Frequency Bands</strong></td>
<td>Up to 123</td>
<td>N/A</td>
<td>Up to 123</td>
</tr>
<tr>
<td><strong>Location of Sensor</strong></td>
<td>Ability to calculate waves at any point of the body</td>
<td>Ability to calculate motion at any point of the body</td>
<td>Ability to calculate waves at any point of the body</td>
</tr>
<tr>
<td><strong>Data Storage</strong></td>
<td>Internal 8GB: &gt;5 years; (expandable to 32GB)</td>
<td>Internal 8GB: &gt;5 years*; (expandable to 32GB) *@ 4 Hz</td>
<td>Internal 8GB: &gt;5 years; (expandable to 32GB)</td>
</tr>
</tbody>
</table>

**Notes:**
- Range: ±20m
- Resolution: 0.01 m
- Accuracy: Better than 2%
- Frequency: 4 Hz (up to 50 Hz)
- Sampling Frequency: 0.64 Hz (1.56 seconds) to 0.030 Hz (33.33 seconds)
- Frequency Interval: 0.005 Hz
- Sample Length: Variable (1 to 34 minutes)
- Sample Interval: Variable (5 to 1440 minutes)
- Frequency Bands: Up to 123
- Location of Sensor: Ability to calculate waves at any point of the body
- Data Storage: Internal 8GB: >5 years; (expandable to 32GB)

**Contact Information:**
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