The Seapath OEM is developed specifically for embedded solutions where high precision heading, position, roll, pitch, heave and timing are critical measurements. The product combines state-of-the-art dual frequency GNSS receivers (GPS/GLO/GAL/BDS), inertial technology and processing algorithms in a small size package.

**Product components**
The main component is the Processing Unit with the motherboard and GNSS receivers. The Processing Unit is typically mounted in an enclosed compartment within an Unmanned Surface Vehicle (USV) together with the miniMRU inertial sensor unit. The two GNSS antennas are mounted on the USV deck with free selected distance between them. The Seapath operator software is installed on a connected PC for configuration and monitoring. The Seapath OEM has in addition to the miniMRU connection, three configurable serial lines, DGNSS (Differential GNSS) correction input, 1PPS output, network communication and power inlet.

**Product range**
The Seapath OEM-30 series is delivered in the following miniMRU models and accuracies:

<table>
<thead>
<tr>
<th>Model</th>
<th>Roll/Pitch [RMS]</th>
<th>Heading [RMS]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0m baseline</td>
<td>2.5m baseline</td>
</tr>
<tr>
<td>miniMRU 30</td>
<td>0.08°</td>
<td>0.15°</td>
</tr>
<tr>
<td>miniMRU 50</td>
<td>0.03°</td>
<td>0.08°</td>
</tr>
<tr>
<td>miniMRU 60</td>
<td>0.03°</td>
<td>0.08°</td>
</tr>
</tbody>
</table>

Note: The miniMRU models which are a part of Seapath OEM have to be mounted in a fixed direction relative to the vessel and that is with the connector horizontal. Else the performance of the Seapath OEM will be degraded.

**Interfaces**
The product has three configurable RS-232/422 serial lines and Ethernet for output of motion data and NMEA messages to the multibeam and survey computer. Input of DGNSS corrections of various quality and sources are input on a configurable RS-232/422 serial line or Ethernet.

**Function**
The advanced Seapath navigation algorithms integrate the RTK GNSS data with the inertial sensor data. This gives the Seapath OEM unique advantages compared to stand-alone RTK products. The Seapath product’s accurate roll, pitch and heading measurements allow the RTK antenna position to be referenced to any point on the vessel where accurate position and velocity are required. All the data from Seapath have the same time stamp and the output is in real-time. Subdecimetre position accuracy can be achieved through download of satellite orbit and clock data from internet and by post processing of satellite and IMU (Inertial Measurement Unit) data. The Seapath is robust against GNSS dropouts by using the inertial sensor for dead reckoning navigation in order to provide position, velocity and also heading measurements when GNSS is not available.
TECHNICAL SPECIFICATIONS

PERFORMANCE
Heave accuracy (real-time) 5 cm or 5 % whichever is highest
Heave accuracy (delayed signal) 2 cm or 2 % whichever is highest
Heave periods (real-time), miniMRU 50 & 60 1 to 25 seconds
Heave periods (real-time), miniMRU 30 0 to 18 seconds
Heave periods (delayed signal) 1 to 50 seconds
Position accuracy DGNSS 0.5 m RMS or 1 m 95% CEP
Position accuracy SBAS 0.5 m RMS or 1 m 95% CEP
Position accuracy Fugro XP2/G2/G4/G4+ 0.1 m RMS or 0.2 m 95% CEP
Position accuracy RTK (X and Y) 1 cm + 1 ppm RMS
Position accuracy RTK (Z) 2 cm + 1 ppm RMS
Velocity accuracy 0.03 m/s (RMS)

DATA OUTPUTS
Communication ports 3 serial RS-232/RS-422 lines and 8 Ethernet UPD/IP ports
Data output interval Programmable in 0.01-sec steps and 1PPS pulse
Data update rate Up to 100 Hz

POWER SPECIFICATIONS
Processing Unit 24 V DC, 10 W
IMU 24 V DC, 12 W
GNSS antenna 5 V DC from Processing Unit

WEIGHTS AND DIMENSIONS
Processing Unit 0.8 kg, 59(H) x 175(L) x 125(W) mm
IMU 2.2 kg, 140 x Ø105 mm
GNSS antenna 0.5 kg, 69 x 185 mm

ENVIRONMENTAL SPECIFICATIONS
Operational temperature range Processing Unit -5 to +55 °C
IMU -5 to +55 °C
GNSS antenna -40 to +85 °C
Storage temperature range Processing Unit -20 to +70 °C
IMU -25 to +70 °C
GNSS antenna -55 to +85 °C

Enclosure protection IMU IP52
GNSS antenna IP66

Specifications are valid without multipath, without shadowing of antennas and with vessel in motion.

FEATURES
• 0.03° to 0.08° roll and pitch accuracy depending on model
• 2 cm heave accuracy by use of the PFreeHeave® algorithms
• Meets IHO special order requirements
• Robust against GNSS dropouts due to the inertial sensor part of the product
• 555-channel dual frequency GPS/GLONASS/Galileo/Beidou receiver
• All available GPS/GLONASS/Galileo/Beidou/QZSS satellites are used in the positioning solution
• Includes ionospheric compensation methods to reduce Sunspot 24 cycle effects
• Fugro XP2/G2/G4/G4+ corrections and RTK supported
• RTK corrections format RTCM and CMR supported
• Includes SBAS corrections (WAAS, EGNOS, MSAS, QAGAN)
• All data have the same time stamp and to an accuracy of 0.001 s to the actual measurement time
• Logging of raw satellite and IMU data possible

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