FEWER ROUGH WATERS

Marine environments present some of the most challenging positioning conditions in the world—raging currents, rugged coastlines, narrow passageways and high winds. The good news is that for over two decades, NovAtel has delivered reliable, high precision positioning products that marine application developers can count on for their competitive advantage. And with engineering-based customer support provided to all of our customers, you can be confident NovAtel will deliver the performance you need for success.
NovAtel’s Global Navigation Satellite System (GNSS) receiver, antenna, Inertial Measurement Unit (IMU) and post-processing software products are used in marine positioning, hydrographic survey and navigation applications around the world. State-of-the art, our technology is easy to integrate and configure, and delivers future-proof features and capabilities.

Precise Products, Superior Solutions
NovAtel pushes the boundaries of what is possible in positioning and navigation. Our ongoing investment in research and development allows us to deliver a well-aligned product mix—one that provides the flexibility to configure ideal solutions for your performance requirements and overcome technical or competitive challenges.

GNSS Precise Positioning Receivers
NovAtel’s GNSS receivers set the standard when it comes to positioning performance, flexibility and ease of integration. Available card-level or enclosed, our multi-constellation, multi-frequency receivers offer low power consumption, field upgradeable software and comprehensive message suites. Our rugged enclosed receivers provide maximum protection and a variety of connectivity and configuration capabilities. Our ProPak6™ GNSS receiver, with delayed heave signal, provides an excellent rover option.

SPAN® GNSS Inertial Systems
SPAN technology tightly couples our precision GNSS receivers with IMUs to provide continuous 3D position, velocity and attitude (roll, pitch, yaw) determination—even when satellite signals are blocked or unavailable for short periods of time. Our SPAN systems include receivers, IMUs, single enclosure GNSS+INS systems and interface cards.

GNSS Antennas
An extensive antenna product line delivers many options that maximize your positioning performance. With the performance of much larger choke-ring antennas, NovAtel’s Pinwheel® GNSS antenna line delivers exceptional multi-path mitigation. We also supply a wide variety of compact antennas suitable for space constrained applications.

Smart Antennas
Our SMART antennas integrate a NovAtel high precision GNSS receiver and antenna into a single, rugged and durable enclosure. They are designed to ensure optimal GNSS system performance.

Firmware/Software
NovAtel offers a range of firmware and software options that are field upgradeable and designed to optimize your equipment’s performance. Marine integrators can leverage our ALIGN® heading and relative positioning firmware and Inertial Explorer® GNSS+INS post-processing software to optimize system performance.

For additional information on all our industry leading products, visit novatel.com
**SPOTLIGHT ON HYDROGRAPHIC SURVEY**

**Explore the Secrets of the Deep**
Advances in technology make exploring the oceans one of the greatest opportunities of the 21st century. Our leading GNSS innovations are already helping hydrographic surveyors discover the secrets of the deep—and they’re doing it more precisely than ever. Our positioning and orientation products have been tested, evaluated and accepted in sea trials by major sonar manufacturers around the world.

**Customized and Configured for You**
With a wide selection of positioning and orientation products available, we offer a number of options when it comes to system performance, size and cost. Dual antenna systems can be configured with the receiver, IMU and firmware options necessary to create solutions that meet your product’s market and competitive demands.

**Flexible Marine Solutions**

- **Satellite-delivered corrections with NovAtel CORRECT™**

- **DUAL ANTENNA SYSTEMS**
  - GPS-702-GG Pinwheel Antenna
  - Delivers GNSS Heading with ALIGN

- **BASE STATION OPTIONS**
  - FlexPak6™ (shown)
  - Provide local RTK corrections.

- **HIGH-PERFORMANCE GNSS RECEIVERS**
  - ProPak6™ (shown)
  - Available in card or enclosed level—single or dual antenna configurations.

- **RANGE OF IMUs**
  - MEMS IMU
    - For space or power constrained applications.
  - IMU-CPT
    - Commerically exportable IMU for continuous position, velocity and attitude solution
  - Tactical Grade IMUs
    - High-performance IMUs for exceptional performance.
SUPERIOR RESULTS

NovAtel’s suite of marine solutions provides exceptional 3D position and attitude data in any sea state, even through short GNSS outages.

Sample Technical Specifications

<table>
<thead>
<tr>
<th>MOTION SENSOR</th>
<th>IMU-IGM-S1 Entry Level Performance</th>
<th>IMU-CPT Mid Range Performance</th>
<th>IMU-ISA-100C High Range Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll/Pitch</td>
<td>Real Time 0.015°</td>
<td>Real Time 0.02°</td>
<td>Real Time 0.007°</td>
</tr>
<tr>
<td></td>
<td>Post Processed 0.015°</td>
<td>Post Processed 0.015°</td>
<td>Post Processed 0.005°</td>
</tr>
<tr>
<td>Heading</td>
<td>Real Time 0.08°</td>
<td>Real Time 0.08°</td>
<td>Real Time 0.007°</td>
</tr>
<tr>
<td></td>
<td>Post Processed 0.02°</td>
<td>Post Processed 0.01°</td>
<td>Post Processed 0.010°</td>
</tr>
<tr>
<td>Position Accuracy</td>
<td>Real Time 0.02 m²</td>
<td>Real Time 0.02 m²</td>
<td>Real Time 0.02 m²</td>
</tr>
<tr>
<td></td>
<td>Post Processed 0.01 m²</td>
<td>Post Processed 0.01 m²</td>
<td>Post Processed 0.01 m²</td>
</tr>
<tr>
<td>Heave</td>
<td>Real Time 5 cm or 5%</td>
<td>Real Time 5 cm or 5%</td>
<td>Real Time 5 cm or 5%</td>
</tr>
<tr>
<td></td>
<td>Post Processed 2.5 cm or 2.5%</td>
<td>Post Processed 2.5 cm or 2.5%</td>
<td>Post Processed 2.5 cm or 2.5%</td>
</tr>
<tr>
<td>Data Rate</td>
<td>Real Time 125 Hz</td>
<td>Real Time 100 Hz</td>
<td>Real Time 200 Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>&lt;4.6 W (typical), i/p +10 to +30 VDC</td>
<td>13 W Max, i/p +9 to +18 VDC</td>
<td>18 W (typical), i/p +10 to +34 VDC</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40° C to +65° C</td>
<td>-40° C to +65° C</td>
<td>-40° C to +55° C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-50° C to +80° C</td>
<td>-50° C to +80° C</td>
<td>-40° C to +85° C</td>
</tr>
<tr>
<td>MTBF</td>
<td>&gt; 75,000 hrs</td>
<td>&gt; 10,500 hrs</td>
<td>&gt; 46,100 hrs</td>
</tr>
<tr>
<td>ProPak6 Dimensions</td>
<td>190 x 185 x 75 mm</td>
<td>190 x 185 x 75 mm</td>
<td>190 x 185 x 75 mm</td>
</tr>
<tr>
<td>IMU Dimensions</td>
<td>152 x 137 x 51 mm</td>
<td>152 x 168 x 89 mm</td>
<td>180 x 150 x 137 mm</td>
</tr>
</tbody>
</table>

1. Typical values. Performance specifications subject to GPS system characteristics. US DOD operational degradation, ionospheric and tropospheric conditions, satellite geometry, baseline length, multipath effects and the presence of intentional or unintentional interference sources.
2. RTK horizontal position accuracy. 1 ppm should be added to all values to account for additional error due to baseline length.
3. Post-processing results using WayPoint Inertial Explorer software.
4. The MTBF for the SPAN-IGM-S1 design has been calculated, using the PRISM Reliability Prediction model for Electronic Equipment and the Parts Stress methodology at 25° C operating ambient temperature.
TAKE POSITIONING TO THE NEXT LEVEL

Our innovative firmware, software and correction services maximize your marine application’s positioning performance.

ALIGN Heading and Relative Positioning Firmware
ALIGN firmware combines two or more receivers to generate precise positioning and heading for dynamic applications. ALIGN uses GPS, GLONASS and SBAS to provide high solution accuracy and availability, with output rates up to 20 Hz on our OEM6® receiver platform.

WE OFFER TWO MODELS:
ALIGN Heading  Generates high precision heading and pitch angles between two receivers for real-time navigation.
ALIGN Relative Positioning  Generates high accuracy heading, pitch, relative separation and positioning between two or more receivers. It’s ideal for customers like marine towing operators who benefit from relative directional heading information.

Waypoint® Post-Processing for Greater Accuracy
Inertial Explorer, post-processing software from NovAtel’s Waypoint products group, is a powerful and highly configurable processing engine that ensures the best possible accuracy using all available GNSS data. It processes data in forward and reverse time and takes advantage of features like local base station differential processing, backward smoothing and the application of precise satellite clock and orbit information. The result is accuracy beyond what is possible in real-time.

NovAtel CORRECT
NovAtel CORRECT provides a single source of GNSS hardware, correction services and support. As a comprehensive NovAtel supplied solution, it makes it easy to achieve decimeter-level or better positioning. Manufacturers and system integrators receive flexible, scalable and highly competitive positioning technology with great opportunity for future innovation.

GPS, GLONASS, Galileo, BeiDou, L-Band or NTRIP—NovAtel CORRECT manages it all. It optimally handles multiple GNSS satellite constellations and corrections from a variety of sources in order to deliver the best positioning solution possible. And now, access to Veripos’ marine subscription services is available to NovAtel CORRECT customers.

Learn more at novatel.com/correct
NovAtel offers the marine navigation and hydrographic survey market the most accurate and reliable precise position and orientation solutions in the industry. From R&D to customer service, we’re constantly thinking about how we can help our customers do more, be better and maximize their investment. With an exceptional track record on GNSS innovation, NovAtel makes your success our number one priority.