Boreas combines ground-breaking Digital Fibre Optic Gyroscope (DFOG) and closed-loop accelerometer technologies, with a dual antenna RTK GNSS receiver. These are coupled in an AI based fusion algorithm to deliver accurate and reliable navigation data. The system features ultra-fast gyrocompassing, acquiring and maintaining an accurate heading under all conditions with no reliance on GNSS.

**PERFORMANCE**
- 0.005 ° Roll and Pitch
- 0.001 °/hr FOG Gyroscope
- 0.01 ° Gyrocompass Heading
- 2 min Gyrocompassing
- 3 Year Warranty

**KEY FEATURES**
- Ultra-Fast North Seeking
- AI-Based Algorithm
- Industry Leading SWAP-C
- Multiple Protocols & Interfaces

**APPLICATIONS**
- **AIR**
  - Aerial Surveying
  - Stabilisation & Pointing
- **LAND**
  - Land Surveying
  - Antenna Targeting
- **SEA**
  - AUV Navigation
  - ROV Navigation
  - Hydrography
Boreas takes Fibre Optic Gyroscope (FOG) technology into the next generation with new, patent pending Digital FOG (DFOG) technology, developed over 25 years with 2 research institutions. This revolutionary DFOG technology combines a specially designed closed loop optical coil with advanced spread spectrum digital modulation techniques that have never been used in a FOG before. The resulting DFOG offers dramatically improved accuracy, stability and reliability with significantly reduced size, weight, power and cost.

**REVOLUTIONARY DFOG TECHNOLOGY**

The superior accuracy of the DFOG technology enables Boreas D90 to rapidly determine its heading, without the need for GNSS or magnetometers. By sensing the Earth's rotation, Advanced Navigation's revolutionary north-seeking algorithm allows Boreas D90 to acquire an accurate heading within minutes of start up. This can be achieved in both static and dynamic conditions, as well as at high latitudes.

**ULTRA FAST NORTH SEEKING**

Boreas D90 has been designed from the ground up for reliability. Both the hardware and software are designed and tested to safety standards. The precision aluminium enclosure is waterproof and dustproof to the IP67 standard. The system is resilient to shock and vibration, allowing it to be used in the most extreme conditions. The hardware is designed and tested to MIL standards. The GNSS contains RAIM, which excludes malfunctioning or tampered satellite signals.

**RELIABILITY**

Based on ground-breaking DFOG technology, Boreas D90 offers a 40% reduction in size, weight, power and cost, when compared to competing systems of similar performance.

**INDUSTRY LEADING SWaP-C**

Boreas D90 features multiple interfaces including Ethernet, CAN, RS232, RS422 and GPIOs. Boreas D90 supports all the industry standard protocols including NMEA, CANopen, NTP, PTP, as well as a wide variety of proprietary protocols. A rich, responsive embedded web interface provides full access to all of the device’s internal functions and data. Internal storage allows for up to 1 year of data logging.

**EXTENSIVE PROTOCOLS AND INTERFACES**
### NAVIGATION

- **Roll and Pitch Accuracy**: 0.005°
- **Heading Accuracy (Dual GNSS 1 m separation)**: 0.006°
- **Heading Accuracy (without GNSS)**: 0.01° secant latitude
- **Gyrocompassing Alignment**: 2 minutes coarse, 10 minutes fine (typical)
- **Accuracy with Odometer (no GNSS)**: 0.01% distance travelled
- **Horizontal Position Accuracy (RTK or PPK)**: 0.01 m
- **Vertical Position Accuracy (RTK or PPK)**: 0.015 m
- **Horizontal Position Accuracy (SBAS)**: 0.5 m
- **Vertical Position Accuracy (SBAS)**: 0.8 m
- **Velocity Accuracy**: 0.05 m/s
- **Heave Accuracy**: 2% or 0.02 m (whichever is greater)
- **Output Data Rate**: 1000 Hz

### GNSS

- **Model**: Advanced Navigation Aries
- **Supported Navigation Systems**: GPS L1, L2, GLONASS L1, L2, GALILEO E1, E5a, Beidou B1, B2
- **Supported SBAS Systems**: WAAS, EGNOS, MSAS, GAGAN, QZSS
- **Update Rate**: Up to 20 Hz
- **Hot Start First Fix**: 2 s
- **Cold Start First Fix**: 30 s
- **Horizontal Position Accuracy**: 1.2 m
- **Horizontal Position Accuracy (SBAS)**: 0.5 m
- **Horizontal Position Accuracy (RTK)**: 0.01 m
- **Velocity Accuracy**: 0.05 m/s
- **Timing Accuracy**: 20 ns
- **Acceleration Limit**: 4 g

### HARDWARE

- **Operating Voltage**: 9 to 36 V
- **Power Consumption (Typical)**: 12 W
- **Hot Start Battery Capacity**: > 48 hrs
- **Hot Start Battery Charge Time**: 30 mins
- **Hot Start Battery Endurance**: > 10 years
- **Operating Temperature**: -40°C to 65°C (v1.0), -40°C to 75°C (v1.1 & later)
- **Environmental Protection**: IP67
- **MTBF**: > 70,000 hrs
- **Shock Limit**: 50 g, 11 ms
- **Vibration**: 8 g rms (20-2000 Hz random)
- **Dimensions**: 160x140x115.5 mm
- **Weight**: 2.8 kg

### COMMUNICATION

- **Interface**: Ethernet, RS232/RS422, CAN, 1PPS
- **Speed**: 100Mbit, 4800 to 4M baud serial
- **Protocol**: AN Packet Protocol, NMEA, CANopen
- **Peripheral Interface**: 2x GPIO, 1x Auxiliary RS232
- **GPIO Level**: 5 V (RS232), 3.3 V
- **GPIO Functions**: 1PPS input/output, Odometer input, DVL/USBL input, Air Data input, Zero Velocity input, MEA input/output, Novatel GNSS input, Trimble GNSS input, AN Packet Protocol, CAN/CANopen

### SENSORS

<table>
<thead>
<tr>
<th>SENSOR</th>
<th>ACCELEROMETERS</th>
<th>GYROSCOPES</th>
<th>PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>± 15 g</td>
<td>± 490 °/s</td>
<td>10 to 150 kPa</td>
</tr>
<tr>
<td>Bias Instability</td>
<td>7 µg</td>
<td>0.001 °/hr</td>
<td>8 Pa</td>
</tr>
<tr>
<td>Initial Bias</td>
<td>&lt; 100 µg</td>
<td>&lt; 0.01 °/hr</td>
<td>&lt; 50 Pa</td>
</tr>
<tr>
<td>Initial Scaling Error</td>
<td>340 ppm</td>
<td>80 ppm</td>
<td>-</td>
</tr>
<tr>
<td>Scale Factor Stability</td>
<td>100 ppm</td>
<td>10 ppm</td>
<td>-</td>
</tr>
<tr>
<td>Non-linearity</td>
<td>150 ppm</td>
<td>10 ppm</td>
<td>-</td>
</tr>
<tr>
<td>Cross-axis Alignment Error</td>
<td>&lt; 0.001 °</td>
<td>&lt; 0.001 °</td>
<td>-</td>
</tr>
<tr>
<td>Noise Density</td>
<td>30 ug/νHz</td>
<td>0.06 °/νHz/vHz</td>
<td>0.4 Pa/νHz</td>
</tr>
<tr>
<td>Random Walk</td>
<td>17 mm/s/νz/νhr VRW</td>
<td>0.001 °/νz ARW</td>
<td>-</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>300 Hz</td>
<td>400 Hz</td>
<td>50 Hz</td>
</tr>
</tbody>
</table>
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