

# Rugged FOG-based INS for Demanding Autonomous Applications

KVH Industries, USA, has introduced the GEO-FOG 3D [inertial navigation system \(INS\)](#) offering roll, pitch, and heading accuracies of .05° for demanding applications in unmanned, autonomous, and manned aerial, ground, marine, and subsurface platforms, such as subsea remotely operated vehicles (ROV) or mining systems.

The GEO-FOG 3D is based on the company's high-performance fibre optic gyro (FOG) technology combined with centimetre-level precision RTK GNSS receivers and advanced sensor fusion algorithms. The result is a solution that continuously provides fast, ultra-accurate position, velocity, and attitude measurements that keep applications operating no matter how challenging the conditions.

The core inertial sensor for the new system is KVH's 1750 IMU, a proven inertial measurement unit incorporating three axes of KVH's DSP-1750 FOG with three axes of accelerometer technology. The 1750 IMU is then fully integrated with a GNSS receiver and a 3-axis magnetometer, a barometric pressure sensor, and a triple frequency RTK GNSS receiver to deliver reliable, real-time, centimetre-level positioning and orientation measurements. The system's sensor fusion algorithms automatically switch from loosely- to tightly-coupled filtering for improved performance under poor GNSS signal conditions. The system also offers high-speed update rates and rapid north-seeking gyrocompass capabilities for high-accuracy heading in environments when magnetometers and GNSS-aided heading cannot be used.

## Dual Including INS and AHRS

KVH has also introduced a variant, the GEO-FOG 3D Dual, an INS and attitude and heading reference system (AHRS). This product features two GNSS antennas on a fixed RTK baseline that offers the same reliability and performance levels as the GEO-FOG 3D, with increased heading, pitch, and roll accuracy for static and dynamic applications where single antenna systems can be problematic. The GEO-FOG 3D Dual is a superior choice for applications that require heading at system startup or in low dynamic conditions.

Both the GEO-FOG 3D and GEO-FOG 3D Dual are designed to support current and future satellite navigation systems including GPS, GLONASS, GALILEO, and BeiDou. Both systems offer data rates up to 1,000Hz, and the ability to output data over a high-speed RS-422 interface or RS-232 interface, which ensures the systems can be easily and readily integrated in a wide range of platforms.