

# SPAN<sup>®</sup>



Tightly coupled GNSS+INS technology  
performance for exceptional 3D,  
continuous position, velocity & attitude





NOVATEL'S SPAN TECHNOLOGY PROVIDES CONTINUOUS 3D POSITIONING, VELOCITY AND ATTITUDE DETERMINATION EVEN WHEN SATELLITE RECEPTION MAY BE COMPROMISED FOR SHORT PERIODS OF TIME.

SPAN integrates our industry leading Global Navigation Satellite System (GNSS) technology with Inertial Measurement Units (IMUs) to create a tightly coupled GNSS+INS solution at data rates up to 200 Hz. A range of receiver, IMU and antenna options are available to meet accuracy and size requirements for nearly any application.

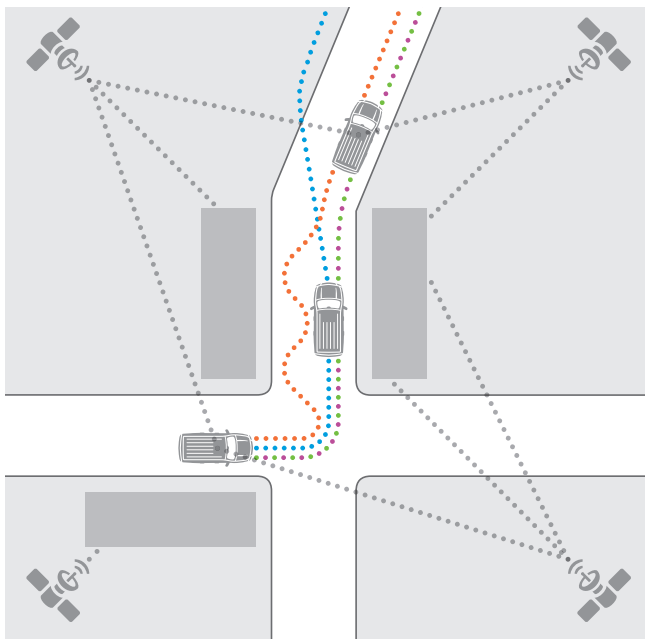
For comprehensive SPAN information, visit

[www.novatel.com/span](http://www.novatel.com/span)

The accuracy of SPAN products can be optimized with best-in-class post-processing software from our Waypoint® Products Group.

For more information, go to [www.novatel.com/waypoint](http://www.novatel.com/waypoint).

## How SPAN Works



### ••• GNSS Solution

With GNSS only positioning, navigating becomes unreliable or impossible when satellites are blocked by obstructions such as trees or buildings.

### ••• Drifting INS Solution

In the absence of an external reference, the Inertial Navigation System (INS) solution will drift over time due to accumulated errors in the IMU data.

### ••• True Path

### ••• SPAN solution

Continuously available and following the true path

### ••• SATELLITE Line-of-Sight

When combined, the two navigation techniques augment and enhance each other to create a powerful positioning system. The absolute position and velocity accuracy of the GNSS is used to compensate for the errors in the IMU measurements. The stable relative position of the INS can be used as a bridge to span times when the GNSS solution is degraded or unavailable. Data is available in real-time or can be post-processed for workflows requiring the most robust solution possible and additional quality control.

# SPAN Combined GNSS+INS Systems

## Single Enclosure Receiver and IMU



### SPAN-CPT™

» Features NovAtel's OEM628 GNSS receiver and an IMU featuring fiber optic gyros and Micro Electromechanical Systems (MEMS) accelerometers in one enclosure.

**Dimensions:** 152 x 168 x 89 mm

**Weight:** 2.28 kg

**Operating Temperature:** -40 °C to +65 °C

**GPS L1, L2, L2C + GLONASS L1, L2 + BeiDou<sup>1</sup> + SBAS + L-Band**



### SPAN-IGM-S1

» Features the OEM615 receiver and STIM300 IMU.  
» The STIM300 is a tactical grade IMU with MEMS gyros and accelerometers.  
» Stacks with a FlexPak6 receiver to create a compact ALIGN® heading system.

**Dimensions:** 152 x 142 x 51 mm

**Weight:** 540 g

**Operating Temperature:** -40 °C to +65 °C

**GPS L1, L2, L2C + GLONASS L1, L2 + SBAS**



### SPAN-IGM-A1

» Features the OEM615 receiver and ADIS-16488 IMU.  
» The ADIS-16488 is a cost effective IMU with MEMS gyros and accelerometers.  
» Stacks with a FlexPak6 receiver to create a compact ALIGN® heading system.

**Dimensions:** 152 x 142 x 51 mm

**Weight:** 515 g

**Operating Temperature:** -40 °C to +65 °C

**GPS L1, L2, L2C + GLONASS L1, L2 + SBAS**



### PwrPak7-E1<sup>2</sup>

» Next Generation OEM7™ receiver provides an all-constellation, multi-frequency positioning solution  
» Integrated Epson G320N MEMS IMU offers cost effective INS performance  
» Multiple communication interfaces for easy integration and installation  
» Built-in Wi-Fi and 16 GB of internal data logging storage

**Dimensions:** 147 x 145 x 53 mm

**Weight:** 510 g

**Operating Temperature:** -40 °C to +75 °C

**GPS L1 C/A, L1C, L2C, L2P, L5 + GLONASS L1 C/A, L2C, L2P, L3, L5 + BeiDou B1, B2, B3 + Galileo E1, E5 AltBOC, E5a, E5b, E6 + IRNSS L5 + SBAS L1, L5 + QZSS L1 C/A, L1C, L2C, L5, L6 + L-Band**

1. Requires OEM6.400 firmware or higher

2. The PwrPak7-E1 specifications are preliminary and subject to change

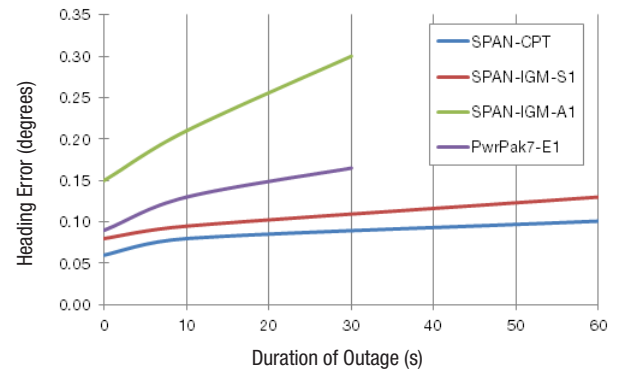
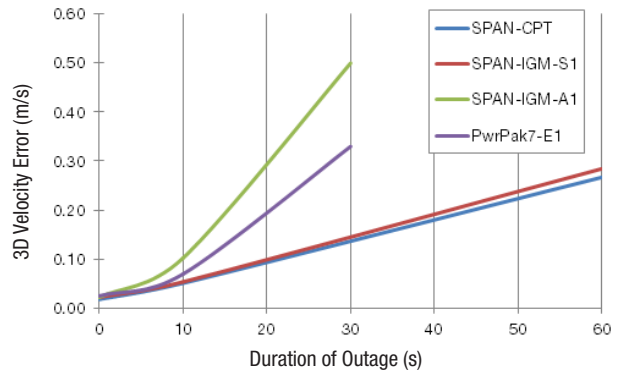
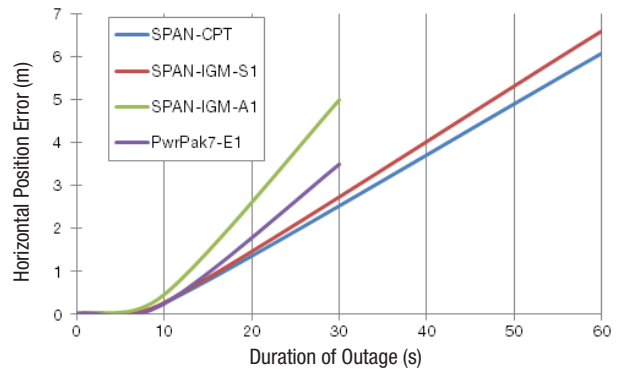
**IMU SPECS**

| Power Consumption | Export Control | Data Rate | Gyro Technology |
|-------------------|----------------|-----------|-----------------|
| 16 W (max)        | Commercial     | 100 Hz    | FOG             |
| 6 W <sup>4</sup>  | Commercial     | 125 Hz    | MEMS            |
| 4 W <sup>4</sup>  | Commercial     | 200 Hz    | MEMS            |
| 1.8 W (typical)   | Commercial     | 125 Hz    | MEMS            |

**SPAN SYSTEM ATTITUDE ACCURACY (DEGREES)<sup>1</sup> RMS**

| RTK <sup>2</sup> |       |         | Post Processed <sup>3</sup> |       |         |
|------------------|-------|---------|-----------------------------|-------|---------|
| Roll             | Pitch | Heading | Roll                        | Pitch | Heading |
| 0.020            | 0.020 | 0.060   | 0.008                       | 0.008 | 0.035   |
| 0.015            | 0.015 | 0.080   | 0.006                       | 0.006 | 0.019   |
| 0.035            | 0.035 | 0.150   | 0.012                       | 0.012 | 0.074   |
| 0.030            | 0.030 | 0.100   | 0.010                       | 0.010 | 0.040   |

**SPAN PERFORMANCE**



1. When SPAN is in RTK mode. Based on 0 seconds outage duration.  
 2. 0 seconds outage on land vehicle application.  
 3. RMS, incremental error growth from steady state accuracy. Computed with GPS, RTK trajectory using Waypoint Inertial Explorer.  
 4. Typical, GPS + GLONASS only, 12 V, 25 °C.



# SPAN Inertial Measurement Units (IMUs)

## High Performance IMUs



### ISA-100C

A near navigation grade IMU from Northrop-Grumman Litef GMBH. The low noise and stable biases of the accelerometer and gyro sensors mean the ISA-100C is well suited for ground or airborne survey applications. The ISA-100C is a commercially exportable IMU that offers the highest level of performance in our IMU portfolio.

**Dimensions:** 180 x 150 x 137 mm

**Weight:** 5.0 kg



### LN200/LN200C

The low noise, tactical grade LN200 is a proven sensor for airborne survey and mobile mapping applications. The LN200 features closed-loop fiber optic gyros and solid state accelerometers.

The LN200C has the same SPAN performance as the LN200, but is a commercial product that can be licensed under the U.S. Department of Commerce for customers outside the United States.

#### IMU Enclosure

**Dimensions:** 150 x 134 x 134 mm

**Weight:** 3.2 kg



### HG1700 AG58

The HG1700 AG58 is a tactical grade IMU from Honeywell containing ring-laser gyros and servo accelerometers. With a Gyro Bias of 1 degree per hour, the economical HG1700 AG58 offers excellent performance.

The HG1700 AG58 is available in the Universal IMU Enclosure (shown) or the SPAN HG Enclosure.

#### Universal IMU Enclosure

**Dimensions:** 168 x 195 x 146 mm

**Weight:** 4.5 kg

#### SPAN HG Enclosure

**Dimensions:** 167 x 193 x 100 mm

**Weight:** 3.4 kg

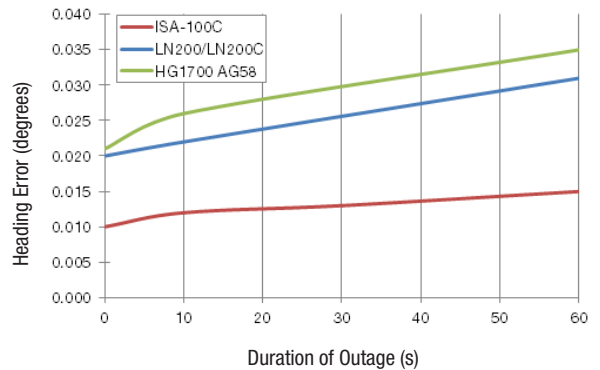
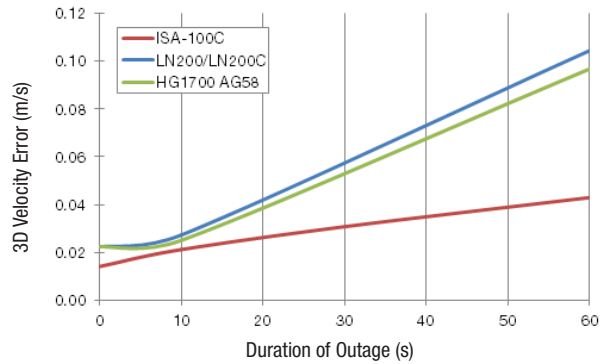
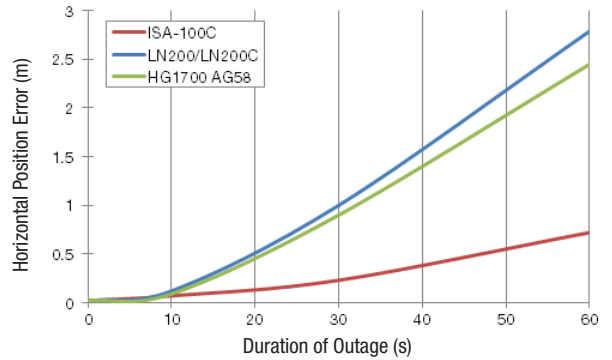
**IMU SPECS**

| Power Consumption | Export Control                      | Data Rate | Gyro Technology | Available as OEM |
|-------------------|-------------------------------------|-----------|-----------------|------------------|
| 18 W              | Commercial                          | 200 Hz    | FOG             | +                |
| 17 W (typical)    | ITAR (LN200)<br>Commercial (LN200C) | 200 Hz    | FOG             | +                |
| 8 W               | ITAR                                | 100 Hz    | RLG             | +                |

**SPAN SYSTEM ATTITUDE ACCURACY (DEGREES)<sup>1</sup> RMS**

| RTK <sup>2</sup> |       |         | Post Processed <sup>3</sup> |       |         |
|------------------|-------|---------|-----------------------------|-------|---------|
| Roll             | Pitch | Heading | Roll                        | Pitch | Heading |
| 0.007            | 0.007 | 0.010   | 0.003                       | 0.003 | 0.004   |
| 0.010            | 0.010 | 0.020   | 0.005                       | 0.005 | 0.007   |
| 0.010            | 0.010 | 0.021   | 0.005                       | 0.005 | 0.008   |

**SPAN PERFORMANCE**



1. When SPAN is in RTK mode.  
 2. 0 seconds outage on land vehicle application.  
 3. RMS, incremental error growth from steady state accuracy. Computed with GPS, RTK trajectory using Waypoint Inertial Explorer.

# SPAN Inertial Measurement Units (IMUs)

## Mid Performance IMUs



### HG1900

The IMU-HG1900 incorporates an HG1900, which is a MEMS gyro based IMU manufactured by Honeywell. Economical, robust and small in size, the low power HG1900 provides high end tactical grade performance for commercial and military guidance and navigation applications.

**Dimensions:** 130 x 130 x 125 mm

**Weight:** 2.5 kg



### OEM-HG1900

The HG1900 is a MEMS gyro based IMU manufactured by Honeywell. Economical, robust and small in size, the low power HG1900 provides high end tactical grade performance for commercial and military guidance and navigation applications.

The OEM-HG1900 requires a NovAtel Universal IMU Controller (UIC) to integrate with NovAtel GNSS receivers.

**Dimensions:** 92.7mm dia max x 79.1 mm h

**Weight:** <460 g



### KVH-1750

The IMU-KVH1750 offers tactical grade performance in a compact and rugged package with minimal power consumption. It contains Fiber Optic gyros (FOG) and MEMS accelerometers.

**Dimensions:** 88.9 mm dia max x 73.7 mm h

**Weight:** <700 g



### μIMU

The μIMU features Northrop Grumman Litef GMBH's proven inertial measurement technology offering exceptional performance when paired with a NovAtel SPAN receiver.

**Dimensions:** 130 x 130 x 115

**Weight:** 2.6 kg



### HG1700 AG62

The HG1700 AG62 is a tactical grade IMU from Honeywell containing ring-laser gyros and servo accelerometers. With a Gyro Bias of 5 degrees per hour, the economical HG1700 AG62 offers good performance. The HG1700 AG62 is available in the Universal IMU Enclosure (shown) or the SPAN HG Enclosure.

#### Universal IMU Enclosure

**Dimensions:** 168 x 195 x 146 mm

**Weight:** 4.5 kg

#### SPAN IMU Enclosure

**Dimensions:** 167 x 193 x 100 mm

**Weight:** 3.4 kg



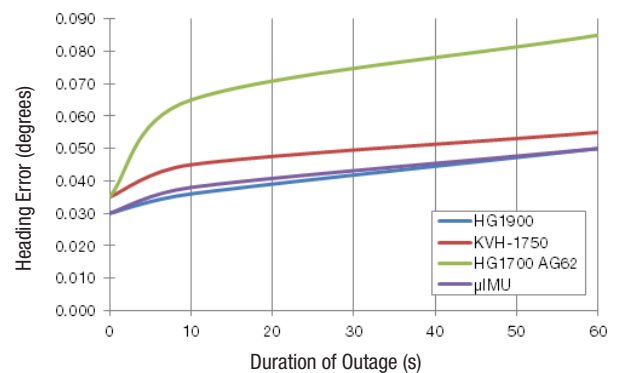
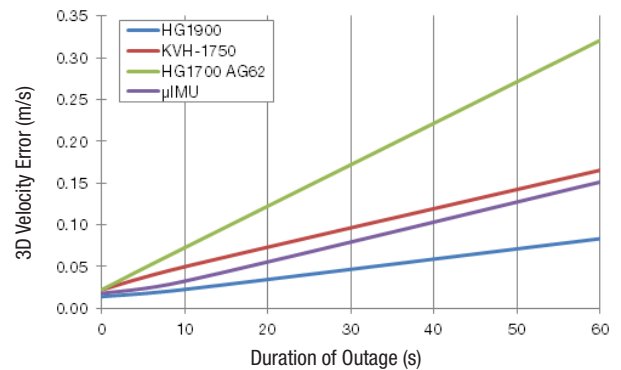
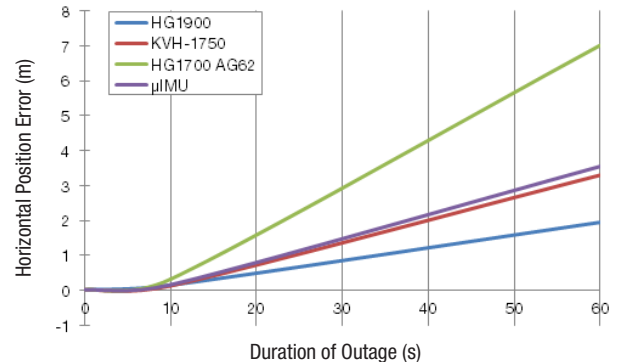
**IMU SPECS**

| Power Consumption | Export Control | Data Rate | Gyro Technology | Available as OEM |
|-------------------|----------------|-----------|-----------------|------------------|
| 8 W (typical)     | ITAR           | 100 Hz    | MEMS            | +                |
| <3 W              | ITAR           | 100 Hz    | MEMS            |                  |
| 8 W (max)         | Commercial     | 200 Hz    | FOG             |                  |
| 13 W (typical)    | Commercial     | 200 Hz    | MEMS            | +                |
| 8 W               | ITAR           | 100 Hz    | RLG             | +                |

**SPAN SYSTEM ATTITUDE ACCURACY (DEGREES)<sup>1</sup> RMS**

| RTK <sup>2</sup> |       |         | Post Processed <sup>3</sup> |       |         |
|------------------|-------|---------|-----------------------------|-------|---------|
| Roll             | Pitch | Heading | Roll                        | Pitch | Heading |
| 0.010            | 0.010 | 0.030   | 0.005                       | 0.005 | 0.011   |
| 0.010            | 0.010 | 0.030   | 0.005                       | 0.005 | 0.011   |
| 0.015            | 0.015 | 0.035   | 0.005                       | 0.005 | 0.017   |
| 0.010            | 0.010 | 0.030   | 0.005                       | 0.005 | 0.009   |
| 0.012            | 0.012 | 0.035   | 0.004                       | 0.004 | 0.009   |

**SPAN PERFORMANCE**



1. When SPAN is in RTK mode.  
 2. 0 seconds outage on land vehicle application.  
 3. RMS, incremental error growth from steady state accuracy. Computed with GPS, RTK trajectory using Waypoint Inertial Explorer.

# SPAN Inertial Measurement Units (IMUs)

## Entry Level Performance IMUs



### IMU-CPT

Stand alone IMU with the same form factor as our SPAN-CPT containing fiber optic gyros and MEMS accelerometers. Made entirely of commercially available components, the IMU-CPT reduces cross border difficulties when operating in multiple countries.

**Dimensions:** 152 x 168 x 89 mm **Weight:** 2.29 kg



### IMU-IGM

Incorporating a MEMS inertial sensor, the IMU-IGM delivers the smallest and lightest IMU enclosure in our SPAN product portfolio. There are two IMU-IGM models available:

**IMU-IGM-A1** contains an ADIS-16488 IMU to provide our most cost effective IMU enclosure.

**IMU-IGM-S1** contains a STIM300 IMU to deliver our smallest tactical grade IMU enclosure.

**Dimensions:** 152 x 137 x 51 mm **Weight:** 475 g (A1), 500 g (S1)

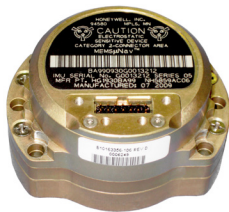


### OEM-STIM300

MEMS IMU from Sensoror. Features low noise gyros and accelerometers in a small, light weight, environmentally sealed enclosure. When integrated with NovAtel's SPAN technology, this IMU is ideal for airborne and ground applications that require accurate 3D position, velocity and attitude data.

The OEM-STIM300 can be connected to OEM7 receivers using an RS-422 serial connection. A TTL to RS-422 transceiver is required.

**Dimensions:** 39 x 45 x 22 mm **Weight:** 55 g



### OEM-HG1930

Small, economical MEMS IMU manufactured by Honeywell. Provides tactical grade performance for unmanned vehicles and other commercial and/or military guidance applications.

The OEM-HG1930 requires a MEMS Interface Card (MIC) to integrate with NovAtel GNSS receivers.

**Dimensions:** 64.8 mm dia max x 35.7 mm h max **Weight:** 200 g



### OEM-EG320N

MEMS IMU from Epson, the EG320N enables precision measurements for applications that require low cost, high performance and rugged durability in a very small form factor.

The OEM-EG320N can communicate directly to OEM7 receivers using a SPI port.

**Dimensions:** 24 x 24 x 10 mm **Weight:** 10 g



### OEM-ADIS-16488

MEMS IMU from Analog Devices. Features low noise gyros and accelerometers in a small, light weight and rugged, environmentally sealed enclosure. Enables precision measurements for applications that require low cost, high performance and rugged durability in a small form factor.

The OEM-ADIS-16488 can communicate directly to OEM7 receivers using a SPI port.

**Dimensions:** 47 x 44 x 14 mm **Weight:** 48 g

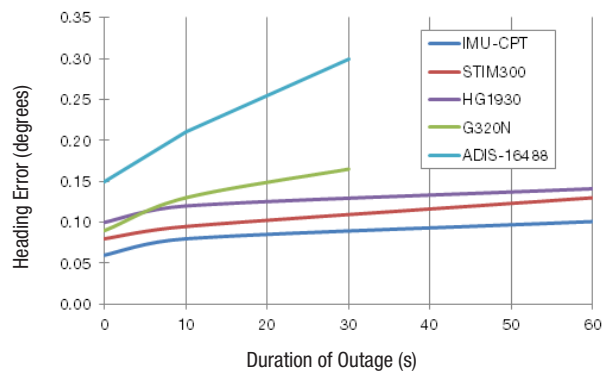
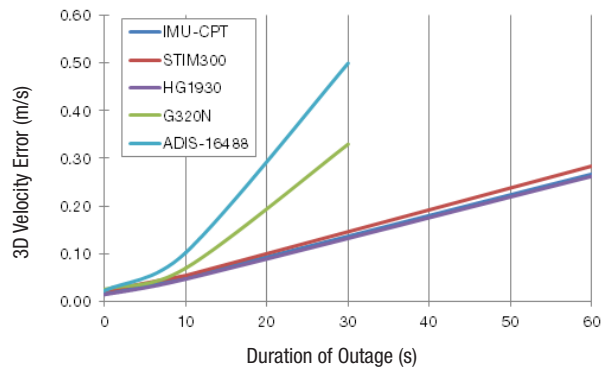
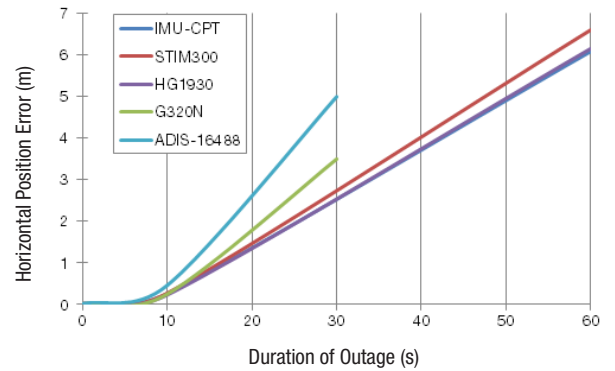
IMU SPECS

|    | Power Consumption | Export Control | Data Rate | Gyro Technology | Available as OEM |
|----|-------------------|----------------|-----------|-----------------|------------------|
|    | 13 W (max)        | Commercial     | 100 Hz    | FOG             |                  |
| A1 | 2.5 W             | Commercial     | 200 Hz    | MEMS            |                  |
| S1 | <4.6 W            | Commercial     | 125 Hz    | MEMS            |                  |
|    | 1.5 W             | Commercial     | 125 Hz    | MEMS            | +                |
|    | <3 W              | ITAR           | 100 Hz    | MEMS            | +                |
|    | 0.1 W             | Commercial     | 125 Hz    | MEMS            | +                |
|    | 0.9 W (typical)   | Commercial     | 200 Hz    | MEMS            | +                |

SPAN SYSTEM ATTITUDE ACCURACY (DEGREES)<sup>1</sup> RMS

| RTK <sup>2</sup> |       |         | Post Processed <sup>3</sup> |       |         |
|------------------|-------|---------|-----------------------------|-------|---------|
| Roll             | Pitch | Heading | Roll                        | Pitch | Heading |
| 0.020            | 0.020 | 0.060   | 0.008                       | 0.008 | 0.035   |
| 0.035            | 0.035 | 0.150   | 0.012                       | 0.012 | 0.074   |
| 0.015            | 0.015 | 0.080   | 0.006                       | 0.006 | 0.019   |
| 0.015            | 0.015 | 0.080   | 0.006                       | 0.006 | 0.019   |
| 0.060            | 0.060 | 0.100   | 0.007                       | 0.007 | 0.014   |
| 0.020            | 0.020 | 0.090   | 0.008                       | 0.008 | 0.038   |
| 0.035            | 0.035 | 0.150   | 0.012                       | 0.012 | 0.074   |

SPAN PERFORMANCE



1. When SPAN is in RTK mode. Based on 0 seconds outage duration.  
 2. 0 seconds outage on land vehicle application.  
 3. RMS, incremental error growth from steady state accuracy. Computed with GPS, RTK trajectory using Waypoint Inertial Explorer.



## The secret to positioning success.

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### **NovAtel is an Original Equipment Manufacturer (OEM) that designs, manufactures and sells high-precision Global Navigation Satellite System (GNSS) positioning technology.**

Developed for efficient and rapid integration, our GNSS products have set the standard in quality and performance for over 20 years. State-of-the-art, lean manufacturing facilities in our North American headquarters produce the industry's most extensive line of OEM receivers, antennas and subsystems. All of our products are backed by a team of highly skilled customer support and design engineers, ready to answer all your integration questions. For unsurpassed quality, product selection and precise engineering know-how, choose NovAtel.

To learn more, visit

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