

# SPAN<sup>®</sup>

Tightly Coupled GNSS+INS Technology for  
Continuous 3D Position, Velocity & Attitude

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# SPAN Technology

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

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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)

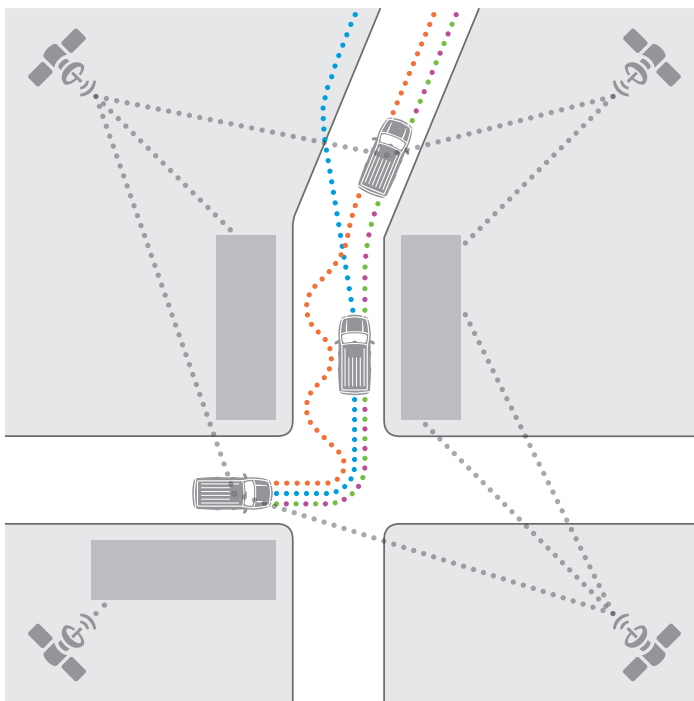
The accuracy of SPAN products can be optimized with best-in-class post-processing software from our Waypoint® Products Group.

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

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## How SPAN works

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••• **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 Enclosures

Power Consumption    Operating Temperature



### ProPak6™

- » Standalone metre-level to RTK centimetre-level positioning.
- » 4 GB onboard memory for data logging and easy storage and retrieval.

Dimensions: 190 x 185 x 75 mm

Weight: 1.79 kg

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

3.5 W<sup>2</sup>

-40°C to +75°C



### FlexPak6™

- » Houses NovAtel's OEM628 GNSS receiver board.
- » Provides multiple communication options including Ethernet, USB and CAN bus.

Dimensions: 113 x 147 x 45 mm

Weight: 337 g

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

1.8 W<sup>3</sup>

-40°C to +75°C

## OEM Receiver Boards



### OEM615™

- » Smaller than the size of a business card, the OEM615 features high performance GNSS positioning with low power consumption.

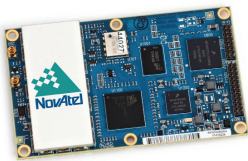
Dimensions: 46 x 71 x 11 mm

Weight: 24 g

GPS L1/L2/L2C + GLONASS L1/L2/L2C + SBAS

<1.0 W<sup>4</sup>

-40°C to +85°C



### OEM628™

- » High performance GNSS positioning with low power consumption.
- » Drop in replacement for NovAtel's OEMV-2 GNSS receiver.

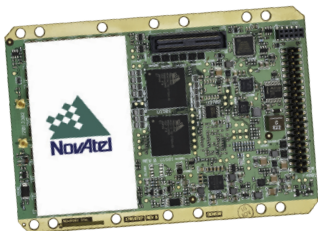
Dimensions: 60 x 100 x 9 mm

Weight: 37 g

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

1.3 W<sup>5</sup>

-40°C to +85°C



### OEM638™

- » The most advanced GNSS receiver within the OEM6 series of products.
- » 4 GB onboard memory for data logging and easy storage and retrieval.

Dimensions: 85 x 125 x 14.3 mm

Weight: 84 g

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

2.8 W<sup>5</sup>

-40°C to +85°C

1. Requires OEM6.400 firmware or higher  
 2. Model and/or configuration dependent.  
 3. Typical, GPS L1/L2 at 6 VDC with Ethernet disabled.

4. Typical, GPS L1/L2.  
 5. Typical, GPS L1/L2 with Ethernet disabled.

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# SPAN Combined GNSS+INS Systems

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## SPAN-CPT™

- » Features NovAtel's OEM628 GNSS receiver, fiber optic gyros and Micro Electromechanical Systems (MEMS) accelerometers in one enclosure.
- » This product is not ITAR controlled, reducing cross border difficulties when operating in multiple countries.

**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/L2C + 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.
- » This product is not ITAR controlled, reducing cross border difficulties when operating in multiple countries.
- » 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/L2C + 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.
- » This product is not ITAR controlled, reducing cross border difficulties when operating in multiple countries.
- » 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/L2C + SBAS**

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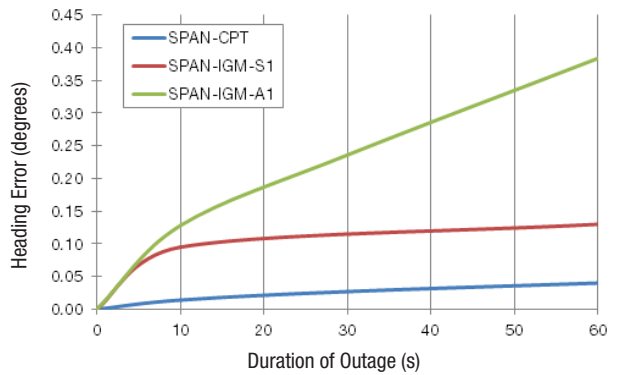
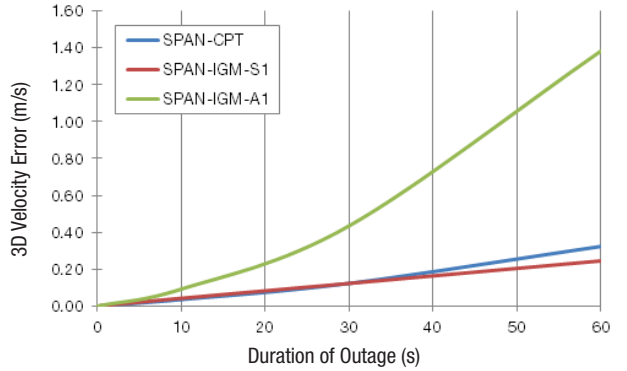
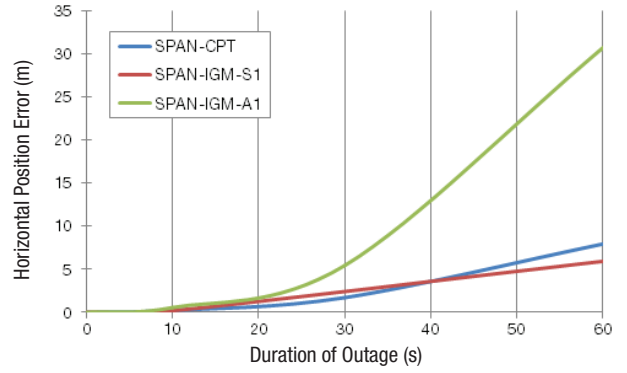
1. Requires OEM6.400 firmware or higher  
2. Typical, GPS + GLONASS only, 12 V, 25°C,

IMU SPECS				
Power Consumption	Export Control	Data Rate	Gyro Bias	Gyro Technology
16 W (max)	Commercial	100 Hz	20.0 deg/hr	FOG
6 W <sup>2</sup>	Commercial	125 Hz	0.5 deg/hr <sup>1</sup>	MEMS
4 W <sup>2</sup>	Commercial	200 Hz	6.0 deg/hr <sup>1</sup>	MEMS

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

RTK <sup>2</sup>			PP <sup>3</sup>		
Roll	Pitch	Heading	Roll	Pitch	Heading
0.020	0.020	0.060	0.015	0.015	0.030
0.015	0.015	0.080	0.015	0.015	0.080
0.035	0.035	0.150	0.035	0.035	0.150

### SPAN PERFORMANCE



1. Values are in-run bias stability figures.

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# SPAN Inertial Measurement Units (IMUs)

## High Performance IMUs

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### LN200

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 LN200 is available in the Universal IMU Enclosure (shown) or the SPAN IMU Enclosure.

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#### Universal IMU Enclosure

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

**Weight:** 4.5 kg

#### SPAN IMU Enclosure

**Dimensions:** 135 x 153 x 130 mm

**Weight:** 3.0 kg



### LCI

A tactical grade IMU from Northrop-Grumman Litef GmbH. The low noise and stable biases of the accelerometer and gyro sensors mean the LCI is well suited for ground or airborne survey applications. Manufactured in Germany, the LCI offers LN200 performance.

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

**Weight:** 4.25 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.

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#### 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-FSAS

Small, tactical grade IMU consisting of three closed-loop fiber optic gyros and three servo accelerometers. Manufactured in Germany, the IMU-FSAS is a good option for customers looking for a product without International Traffic in Arms Regulations (ITAR) restrictions.

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**Dimensions:** 128 x 128 x 104 mm

**Weight:** 2.1 kg

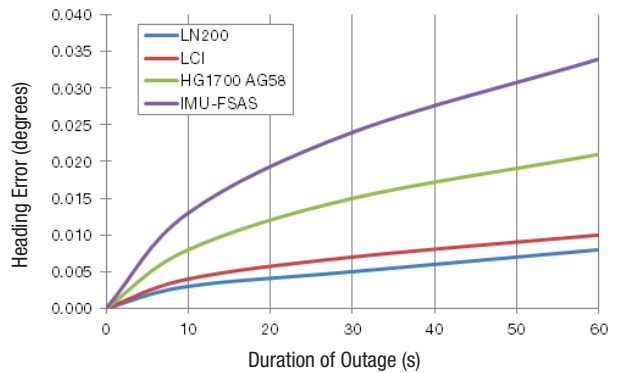
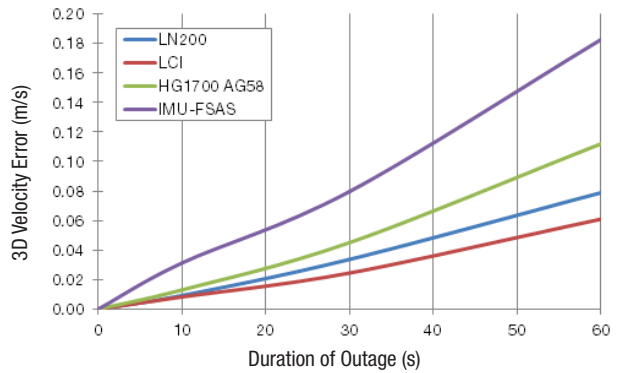
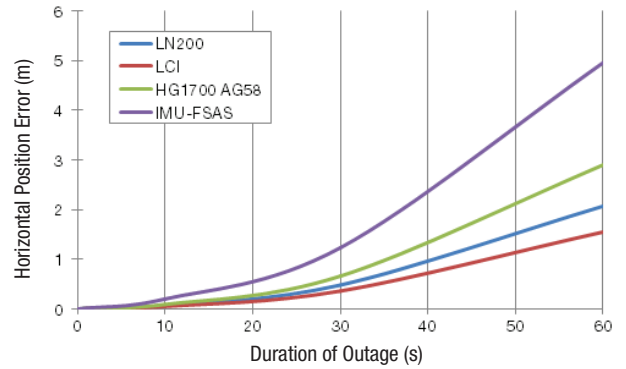
### IMU SPECS

Power Consumption	Export Control	Data Rate	Gyro Bias	Gyro Technology	Available as OEM
16 W	ITAR	200 Hz	1.0 deg/hr	FOG	+
16 W	Varies	200 Hz	<1.0 deg/hr	FOG	
8 W	ITAR	100 Hz	1.0 deg/hr	RLG	+
16 W	Varies	200 Hz	<0.75 deg/hr	FOG	

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

RTK <sup>2</sup>			PP <sup>3</sup>		
Roll	Pitch	Heading	Roll	Pitch	Heading
0.010	0.010	0.020	0.005	0.005	0.008
0.007	0.007	0.018	0.005	0.005	0.008
0.010	0.010	0.021	0.007	0.007	0.010
0.008	0.008	0.023	0.008	0.008	0.012

### 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 respect to full GPS, RTK trajectory.

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# SPAN Inertial Measurement Units (IMUs)

## Mid Performance IMUs

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### OEM-HG1900

The HG1900 is a gyro based MEMS 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 MEMS Interface Card (MIC) to integrate with NovAtel GNSS receivers.

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

**Weight:** <460 g

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### 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

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### 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

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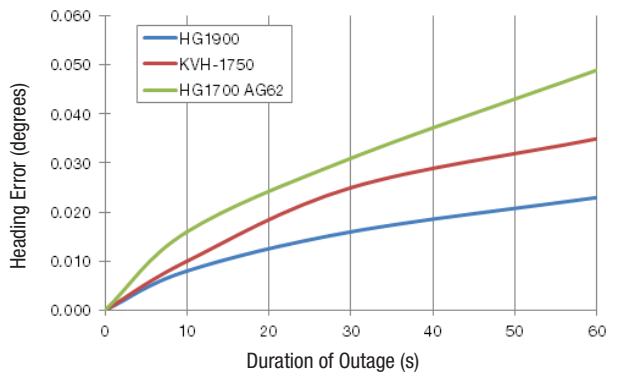
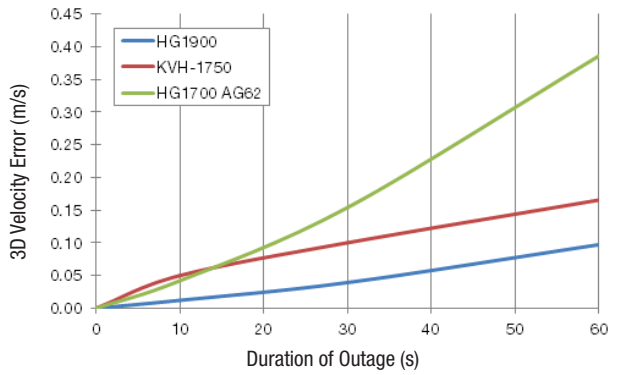
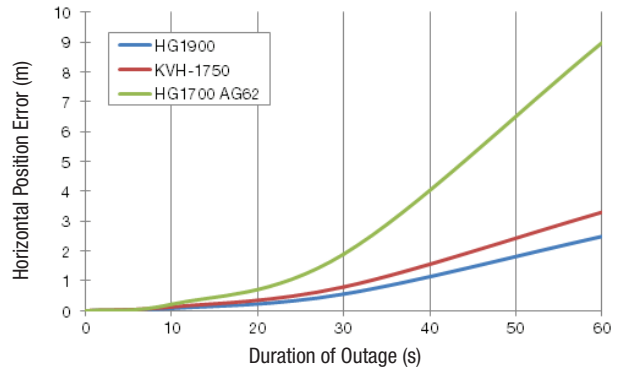
### IMU SPECS

Power Consumption	Export Control	Data Rate	Gyro Bias	Gyro Technology	Available as OEM
<3 W	ITAR	100 Hz	5.0 deg/hr	MEMS	+
8 W	Commercial	200 Hz	2.0 deg/hr	FOG	
8 W	ITAR	100 Hz	5.0 deg/hr	RLG	+

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

RTK <sup>2</sup>			PP <sup>3</sup>		
Roll	Pitch	Heading	Roll	Pitch	Heading
0.010	0.010	0.030	0.008	0.008	0.020
0.015	0.015	0.035	0.015	0.015	0.035
0.012	0.012	0.035	0.012	0.012	0.030

### SPAN PERFORMANCE



# 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. It enables precision measurements for applications that require low cost, high performance and rugged durability in a small form factor. When integrated with NovAtel's SPAN technology, this IMU is ideal for airborne and ground applications that require accurate 3D position, velocity and attitude (roll, pitch and azimuth) data.

The OEM-STIM300 requires a NovAtel MEMS Interface Card (MIC) to integrate with NovAtel GNSS receivers.

**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 NovAtel 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-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 very small form factor.

The OEM-ADIS-16488 requires a NovAtel MEMS Interface Card (MIC) to integrate with NovAtel GNSS receivers.

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

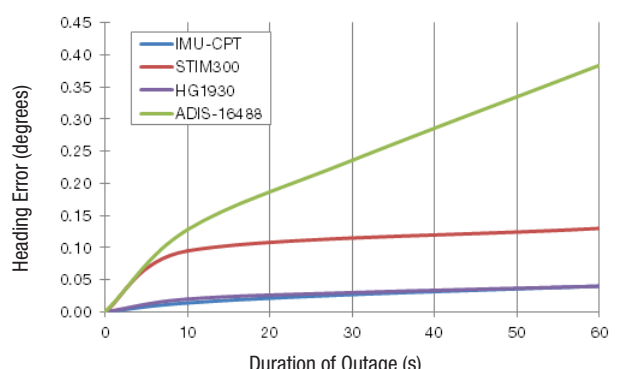
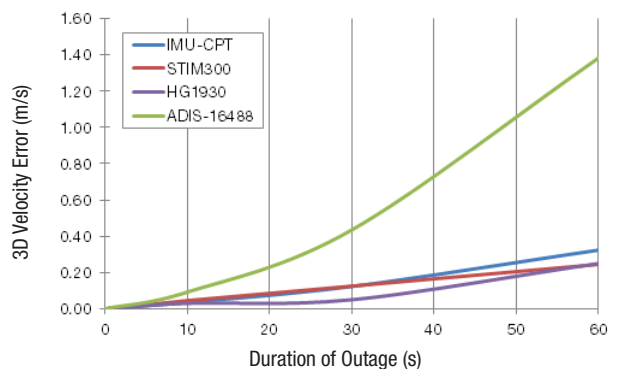
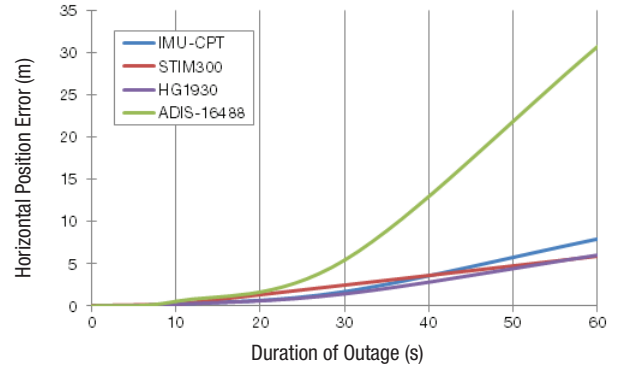
### IMU SPECS

	Power Consumption	Export Control	Data Rate	Gyro Bias	Gyro Technology	Available as OEM
A1	13 W (max)	Commercial	100 Hz	20.0 deg/hr	FOG	
	2.5 W	Commercial	200 Hz	6.0 deg/hr <sup>4</sup>	MEMS	
S1	<4.6 W	Commercial	125 Hz	0.5 deg/hr <sup>4</sup>	MEMS	
		Commercial	125 Hz	0.5 deg/hr <sup>4</sup>	MEMS	+
	<3 W	ITAR	100 Hz	20.0 deg/hr	MEMS	+
	Commercial		200 Hz	6.0 deg/hr <sup>4</sup>	MEMS	+

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

	RTK <sup>2</sup>			PP <sup>3</sup>		
	Roll	Pitch	Heading	Roll	Pitch	Heading
	0.020	0.020	0.060	0.015	0.015	0.030
	0.035	0.035	0.150	0.035	0.035	0.150
	0.015	0.015	0.080	0.015	0.015	0.080
	0.015	0.015	0.080	0.015	0.015	0.080
	0.060	0.060	0.100	0.045	0.045	0.090
	0.035	0.035	0.150	0.035	0.035	0.150

### 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.  
 4. Values are in-run bias stability figures.

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## Contact Information



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### TELEPHONE

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<b>General</b>	403-295-4900
<b>Fax</b>	403-295-4901
<b>US &amp; Canada</b>	1-800-NOVATEL (1-800-668-2835)
<b>China</b>	0086-21-54452990-8011
<b>Europe</b>	44-1993-848-736
<b>SE Asia &amp; Australia</b>	61-400-883-601

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### ADDRESS

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<b>Novatel Inc.</b>	1120 - 68th Avenue N.E. Calgary, Alberta, Canada T2E 8S5
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### WEB

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<b>Main site</b>	<a href="http://www.novatel.com">www.novatel.com</a>
<b>SPAN information</b>	<a href="http://www.novatel.com/span">www.novatel.com/span</a>
<b>Waypoint information</b>	<a href="http://www.novatel.com/waypoint">www.novatel.com/waypoint</a>
<b>Sales offices</b>	<a href="http://www.novatel.com/sales">www.novatel.com/sales</a>
<b>NovAtel Dealers</b>	<a href="http://www.novatel.com/where-to-buy/dealers">www.novatel.com/where-to-buy/dealers</a>

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### E-MAIL

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<a href="mailto:sales@novatel.com">sales@novatel.com</a>	<a href="mailto:support@novatel.com">support@novatel.com</a>
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