SPAN Brochure



## SPAN GNSS+INS technology

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



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# **SPAN technology**

SPAN technology from Hexagon | NovAtel provides continuous 3D positioning, velocity and attitude determination even when satellite reception may be compromised for short periods of time.

SPAN technology integrates our industry leading Global Navigation Satellite System (GNSS) technology with Inertial Measurement Units (IMUs) to create a deeply 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 information on SPAN technology, visit novatel.com/span.

The accuracy of our real-time SPAN solution can be optimized with best-in-class Waypoint post-processing software. For more information, go to 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.

## **Combined GNSS+INS systems**

Single enclosure receiver and IMU





### CPT7 and CPT7700

- Compact, single enclosure GNSS+INS receiver, powered by NovAtel's world class OEM7 technology.
- Features a NovAtel OEM7 receiver and a Honeywell HG4930 IMU
- The dual antenna CPT7 also provides an ALIGN heading system from a single enclosure
- 16 GB of internal data logging storage

Dimensions: 90 x 60 x 60 mm

#### Weight: 500 g

Operating Temperature: -40°C to +71°C

GPS L1 C/A, L1C, L2C, L2P, L5 + GLONASS L1 C/A, L2 C/A, L2P, L3, L5 + BeiDou B1I, B1C, B2I, B2a, B2b, B3I + Galileo E1, E5 AltBOC, E5a, E5b, E6 + NavIC L5 + SBAS L1, L5 + QZSS L1 C/A, L1C, L2C, L5, L6 + L-Band<sup>5</sup>

## PwrPak7-E1 and PwrPak7D-E1

- Advanced OEM7 receiver provides an all-constellation, multi-frequency positioning solution
- The dual antenna PwrPak7D-E1 also provides an ALIGN heading solution from a single enclosure
- 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 125 x 55 mm

#### Weight: 510 g

Operating Temperature: -40°C to +75°C

GPS L1 C/A, L1C, L2C, L2P, L5 + GLONASS L1 C/A, L2 C/A, L2P, L3, L5 + BeiDou B1I, B1C, B2I, B2a, B2b, B3I + Galileo E1, E5 AltBOC, E5a, E5b, E6 + NavIC L5 + SBAS L1, L5 + QZSS L1 C/A, L1C, L2C, L5, L6 + L-Band<sup>6</sup>

### PwrPak7-E2 and PwrPak7D-E2

- Advanced OEM7 receiver provides an all-constellation, multi-frequency positioning solution
- The dual antenna PwrPak7D-E2 also provides an ALIGN heading solution from a single enclosure
- Integrated Epson G370N MEMS IMU offers improved INS performance and higher data rate
- Multiple communication interfaces for easy integration and installation
- Built-in Wi-Fi and 16 GB of internal data logging storage

#### Dimensions: 147 x 125 x 55 mm

#### Weight: 560 g

Operating Temperature: -40°C to +75°C

GPS L1 C/A, L1C, L2C, L2P, L5 + GLONASS L1 C/A, L2 C/A, L2P, L3, L5 + BeiDou B11, B1C, B21, B2a, B2b, B3I + Galileo E1, E5 AltBOC, E5a, E5b, E6 + NavIC L5 + SBAS L1, L5 + QZSS L1 C/A, L1C, L2C, L5, L6 + L-Band<sup>7</sup>



				SPAN SYSTEM ATTITUDE ACCURACY (DEGREES) <sup>1</sup> RM					E MS
	IMU S	PECS			RTK <sup>2</sup>		Post Processed <sup>3</sup>		
Power Consumption (typical)	Export Control	Data Rate	Gyro Technology	Roll	Pitch	Heading	Roll	Pitch	Heading
M 6	Commercial	100 Hz or 400 Hz	MEMS	0.010	0.010	0.030	0.003	0.003	0.010
3.4 W (PwrPak7-E1) 4.15 W (PwrPak7D-E1)	Commercial	125 Hz or 200 Hz	MEMS	0.020	0.020	0.090	0.009	0.009	0.044
3.4 W (PwrPak7-E2) 4.15 W (PwrPak7D-E2)	Commercial	200 Hz	MEMS	0.013	0.013	0.070	0.005	0.005	0.010



**SPAN PERFORMANCE** 

When SPAN is in RTK mode. Based on 0 seconds outage duration. 0 seconds outage on land vehicle application. RMS, incremental error growth from steady state accuracy. Computed with GPS, RTK trajectory using Waypoint Inertial Explorer. Typical, GPS + GLONASS only, 12 V, 25°C. BeiDou B31, Galileo E6 and QZSS L6 are available only on the CPT7700. BeiDou B31, Galileo E6 and QZSS L6 are available only on the PwrPak7-E1. BeiDou B31, Galileo E6 and QZSS L6 are available only on the PwrPak7-E2. 1. 2. 3.

Duration of Outage (s)

4. 5. 6. 7.

## Inertial Measurement Units (IMUs)

**High performance IMUs** 



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## 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 a commercial product that can be licensed under the U.S. Department of Commerce for customers outside the United States.

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

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

Post Processed<sup>3</sup>

Pitch

0.003

Roll

0.003

0.003

0.004

0.004

0.003

Heading

0.004

0.006





**SPAN PERFORMANCE** 

When SPAN'S in Fit A fillow: O seconds outage on land vehicle application. RMS, incremental error growth from steady state accuracy. Computed with GPS, RTK trajectory using Waypoint Inertial Explorer.

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0.008

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# 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. The HG1900 is a commercial product that can be licensed under the U.S. Department of Commerce for customers outside the United States.

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 is a commercial product that can be licensed under the U.S. Department of Commerce for customers outside the United States.

A NovAtel Universal IMU Controller (UIC) is required to integrate an OEM-HG1900 with NovAtel 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-IC

The µIMU-IC 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: 2.57 kg



## HG1700 AG62

The HG1700 AG62 is a tactical grade IMU from Honeywell containing servo accelerometers and ring-laser gyros. 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.

The HG1700 AG2 is a commercial product that can be licensed under the U.S. Department of Commerce for customers outside the United States.

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

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

IMU SPECS						RTK <sup>2</sup>			Post Processed <sup>3</sup>		
Power Consumption	Export Control	Data Rate	Gyro Technology	Available as OEM	Roll	Pitch	Heading	Roll	Pitch	Heading	
8 W (typical)	Under the jurisdiction of The U.S. Department of Commerce	100 Hz	MEMS	+	0.010	0.010	0.030	0.004	0.004	0.010	
<3 W	Under the jurisdiction of The U.S. Department of Commerce	100 Hz	MEMS		0.010	0.010	0.030	0.004	0.004	0.010	
8 W (max)	Commercial	200 Hz	FOG		0.015	0.015	0.040	0.005	0.005	0.020	
11 W (typical)	Commercial	200 Hz	MEMS	+	0.010	0.010	0.030	0.004	0.004	0.015	
8 W	Under the jurisdiction of The U.S. Department of Commerce	100 Hz	RLG	+	0.010	0.010	0.025	0.004	0.004	0.012	



**SPAN PERFORMANCE** 





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

## Inertial Measurement Units (IMUs)

## **Entry-level performance IMUs**



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

#### **IMU SPECS**

Data Rate

100 Hz or 400 Hz

200 Hz

님

125

125 Hz

100 Hz

200 Hz

125 Hz or 200 Hz

200 Hz

s					Post Processed <sup>3</sup>			
o Technology	ilable as OEM		4.	ading		ч,	ading	
Gyr	Ava	Rol	Pito	Hea	Rol	Pito	Hea	
MEMS	+	0.010	0.010	0.030	0.003	0.003	0.010	
MEMS		0.035	0.035	0.150	0.013	0.013	0.066	
MEMS		0.015	0.015	0.080	0.008	0.008	0.022	
MEMS	+	0.015	0.015	0.080	0.008	0.008	0.022	
MEMS	+	0.015	0.015	0.030	0.006	0.006	0.015	
MEMS	+	0.013	0.013	0.070	0.005	0.005	0.010	
MEMS	+	0.020	0.020	0.090	0.009	0.009	0.044	
MEMS	+	0.035	0.035	0.150	0.013	0.013	0.0.66	



**SPAN PERFORMANCE** 

Duration of Outage (s)



9 -0.20

1. 2. 3.

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

**A1** 

Power Consumption

<3 W

2.5 W

<4.6 W

1.5 W

<3 W

0.1 W

0.1 W

0.9 W (typical)

**Export Control** 

Commercial

Commercial

Commercial

Commercial

of The U.S. Department of Commerce Under the jurisdiction

Commercial

Commercial

Commercial



# About Hexagon | NovAtel

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications. Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future.

NovAtel, part of Hexagon, is a global technology leader, pioneering end-to-end solutions for assured positioning for land, sea, and air. NovAtel designs, manufactures and sells high precision positioning technology developed for efficient and rapid integration. Its solutions are empowering intelligent positioning ecosystems in vital industries that depend on the ability to tackle the most complex challenges in the most demanding environments. Learn more at novatel.com.



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