PwrPak7-E2

OEM7 enclosure with SPAN GNSS+INS technology from Hexagon | NovAtel provides improved performance and higher data rates

World-leading GNSS+INS technology

SPAN GNSS+INS technology brings together two different but complementary technologies: Global Navigation Satellite System (GNSS) positioning and Inertial Navigation System (INS). The absolute accuracy of GNSS positioning with the stability of inertial measurement unit (IMU) gyro and accelerometer measurements generate a 3D navigation solution that is stable and continuously available. Deeply coupling the GNSS and inertial measurements through SPAN technology enables better bridging through GNSS interruptions and rapid reacquisition of signals.

PwrPak7-E2 advantages

The PwrPak7-E2 contains an Epson G370N MEMS IMU to deliver world-class SPAN technology in an integrated, single-box solution. Built on top of the reputable PwrPak7 family with a higher performance Epson IMU, the PwrPak7-E2 provides seamless positioning, quick alignment and leading performance. This product is commercially exportable and provides an excellent midrange price/performance/size GNSS+INS solution.

Future-proofed scalability

Capable of tracking all present and upcoming GNSS constellations and satellite signals, the PwrPak7-E2 is a robust, high-precision receiver that is software upgradeable in the field to provide the custom performance required for your application demands.

The PwrPak7-E2 has a powerful OEM7 GNSS engine, integrated MEMS IMU, built-in Wi-Fi, onboard NTRIP client and server support and 16 GB of internal storage. It also has enhanced connection options including serial, USB, CAN and Ethernet.

Precise thinking makes it possible

Our GNSS products are developed for efficient and rapid integration and 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. Our products are backed by a team of highly-skilled design and customer support engineers ready to answer your integration questions.

Benefits

- Small, low-power, all-in-one GNSS+INS enclosure
- Easy integration into space and weight constrained applications
- Commercially exportable system
- Rugged design ideal for challenging environments
- Enhanced connection options including serial, USB, CAN and Ethernet
- Future-proof for upcoming GNSS signal support

Features

- Low-noise commercial grade gyros and accelerometers
- Dedicated wheel sensor input
- TerraStar Correction Services supported over multi-channel L-Band and IP connections
- Spoofing detection, interference detection and mitigation provided by GNSS Resilience and Integrity Technology (GRIT)
- SPAN GNSS+INS capability with configurable application profiles
- 16 GB of internal storage
- Built-in Wi-Fi support
- Supports Precision Time Protocol (PTP)
- Hardware variants available without Wi-Fi or internal storage

Performance[1]

Signal tracking

GPS	L1 C/A, L1C, L2C, L2P, L5
GLONASS[2]	L1 C/A, L2 C/A, L2P, L3, L5
Galileo[3]	E1, E5 AltBOC, E5a, E5b, E6
BeiDou	B1I, B1C, B2I, B2a, B2b, B3I
QZSS	L1 C/A, L1C, L1S, L2C, L5, L6
NavIC (IRNSS)	L5
SBAS	L1, L5
L-Band	up to 5 channels

Horizontal position accuracy (RMS)

Single point L1/L2	1.2 m
SBAS[4]	60 cm
TerraStar-L[5]	40 cm
TerraStar-C PRO[5]	2.5 cm
TerraStar-X[5]	2 cm
RTK	1 cm + 1 ppm

Maximum data rate

GNSS measurements	up to 20 Hz
GNSS position	up to 20 Hz
INS solution	up to 200 Hz
IMU raw data rate	200 Hz

Time to first fix[6]

Cold start	< 34 s (typ)
Hot start	< 20 s (typ)

Time accuracy[7] < 5 ns RMS

Velocity limit[8] 600 m/s

IMU performance[9]

Gyroscope performance

Technology	MEMS
Dynamic range	450 °/s
Bias instability[10]	0.8 °/hr
Angular random walk[10]	0.06 °/√hr

Accelerometer performance

Technology	MEMS
Dynamic range	10 g
Bias instability[10]	0.012 mg
Velocity random walk[10]	0.025 m/s/√hr

Environmental

Temperature

Operating	-40°C to +75°C
Storage	-40°C to +85°C

Humidity 95% non-condensing

Ingress protection rating IP67

Vibration (operating)
Random MIL-STD 810H, Method 514.8
Profiles:
- Rail CAT 11 – 0.5 g RMS
- Composite wheeled vehicle CAT 4 – 2.24 g RMS
- Aircraft propeller CAT 13 – 4.5 g RMS

Acceleration (operating) MIL-STD-810H, Method 513.8, Procedure II (16 g)

Bump (operating) IEC 60068-2-27 (25 g)

Shock (operating) MIL-STD-810H, Method 516.8, Procedure 1, 40 g 11 ms terminal sawtooth

Compliance

FCC, ISED, CE and Global Type Approvals

Physical and electrical

Dimensions 147 x 125 x 55 mm

Weight 560 g

Power

Input voltage	+9 to +36 VDC
Power consumption[11]	3.4 W

Antenna LNA power output

Output voltage	5 VDC ±5%
Maximum current	200 mA

Connectors

Antenna	TNC
USB device	Micro A/B
USB host	Micro A/B
Serial, CAN, Event I/O	DSUB HD26
Ethernet	RJ45
Power	SAL M12, 5 pin, male

Communication ports

1 RS-232	up to 460,800 bps
2 RS-232/RS-422 selectable	up to 460,800 bps
1 USB 2.0 (device)	HS
1 USB 2.0 (host)	HS
1 Ethernet	10/100 Mbps
1 CAN Bus	1 Mbps

1 Wi-Fi
3 Event inputs
3 Event outputs
1 Pulse Per Second (PPS) output
1 Quadrature wheel sensor input

Status LEDs
Power, GNSS, INS, Data logging, USB

Included accessories

- Power cable
- USB cable
- DSUB HD26 to DB9 RS-232 cable

Optional accessories

- Full breakout cable for DSUB HD26
- DSUB HD26 to M12 IMU cable

Performance during GNSS outages[12, 13, 14]

Outage duration	Positioning mode	Position accuracy (m) RMS		Velocity accuracy (m/s) RMS		Attitude accuracy (degrees) RMS	
		Horizontal	Vertical	Horizontal	Vertical	Roll/Pitch	Heading
0 s	RTK[15]	0.02	0.03	0.015	0.010	0.013	0.070
	TerraStar-C PRO PPP	0.025	0.05				
	Single point	1.00	0.60				
10 s	RTK[15]	0.17	0.13	0.040	0.020	0.022	0.085
	TerraStar-C PRO PPP	0.17	0.15				
	Single point	1.15	0.70				
60 s	RTK[15]	5.00	1.03	0.220	0.035	0.035	0.120
	TerraStar-C PRO PPP	5.00	1.05				
	Single point	6.00	1.60				
	RTK with Land profile and DMI	2.50	0.65	0.115	0.030	0.035	0.120
0 s	Post Processed using Inertial Explorer	0.01	0.02	0.015	0.010	0.005	0.010
10 s		0.02	0.02	0.015	0.010	0.005	0.010
60 s		0.17	0.06	0.017	0.010	0.005	0.012

1. *Typical values under ideal, open sky conditions.*
2. *Hardware ready for L5.*
3. *E1bc and E6bc support only.*
4. *GPS-only.*
5. *Requires a subscription to TerraStar correction service.*
6. *Cold start: no almanac or ephemerides and no approximate position or time.*
   Hot start: almanac and recent ephemerides saved and approximate position and time entered.
7. *Time accuracy does not include biases due to RF or antenna delay.*
8. *Export licensing restricts operation to a maximum of 600 m/s, message output impacted above 585 m/s.*
9. *Supplied by IMU manufacturer.*
10. *From room temperature Allan variance method.*
11. *Typical values using serial port communication without interference mitigation. See manual for power supply considerations.*
12. *Performance may be impacted in conditions with unmitigated vibration or significant temperature variations. May vary from part to part.*
13. *Performance with one antenna, no DMI, and no SPAN profile unless otherwise specified.*
14. *Typical. Based on mixed urban road vehicle dynamics and benign GNSS conditions.*
15. *1 ppm should be added to all position values to account for additional error due to baseline length.*

Contact Hexagon | NovAtel

sales.nov.ap@hexagon.com 1-800-NOVATEL (U.S. and Canada) or 403-295-4900 | China: 0086-21-68882300 | Europe: 44-1993-848-736 | SE Asia and Australia: 61-400-883-601.
For the most recent details of this product: novatel.com

D24938 Version 4 | 04 May 2023 | Printed in Canada