COMPACT OEM7® ENCLOSED DELIVERS NOVATEL’S LEADING SPAN® GNSS+INS TECHNOLOGY

SPAN: WORLD LEADING GNSS+INS TECHNOLOGY
Synchronous Position, Attitude and Navigation (SPAN) technology brings together two different but complementary technologies: Global Navigation Satellite System (GNSS) positioning and inertial navigation. The absolute accuracy of GNSS positioning and the stability of Inertial Measurement Unit (IMU) gyro and accelerometer measurements are tightly coupled to provide an exceptional 3D navigation solution that is stable and continuously available, even through periods when satellite signals are blocked.

SPAN ENABLED MEMS RECEIVER
The PwrPak7-E1 contains an Epson G320N MEMS IMU to deliver world class NovAtel SPAN technology in an integrated, single box solution. This product is commercially exportable and provides an excellent price/performance/size GNSS+INS solution.

FUTURE PROOFED SCALABILITY
Capable of tracking all present and upcoming GNSS constellations and satellite signals, the PwrPak7-E1 is a robust, high precision receiver that is software upgradable in the field to provide the custom performance required for your application demands. The PwrPak7-E1 has a powerful OEM7 GNSS engine, integrated MEMS IMU, built in Wi-Fi, on board 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
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 design and customer support engineers, ready to answer your integration questions.
PERFORMANCE

Channel Configuration 55S Channels

Signal Tracking
GPS L1 C/A, L1C, L2C, L2P, L5
GLONASS L1 C/A, L2C, L2P, L3, L5
Galileo E1, E5 AltiBOC
BeiDou B1, B1C, B2I, B2a, B3I
QZSS L1 C/A, L1C, L2C, L5, L6
NavIC IRNSS L5
SBAS L1, L5
L-Band up to 5 channels

GNSS Horizontal Position Accuracy (RMS)
Single point L1 1.5 m
Single point L1/L2 1.2 m
SBAS 60 cm
DGPS 40 cm
TerraStar-L 40 cm
TerraStar-C PRO 4 cm
RTK 1 cm + 1 ppm
Initialization time <10 s
Initialization reliability >99.9%

Maximum Data Rate
GNSS Measurements up to 20 Hz
GNSS Position up to 20 Hz
INS Position/Attitude up to 200 Hz
IMU Raw Data Rate 125 Hz

Time to First Fix
Cold start<16 <40 s
Hot start<16 <19 s

Time Accuracy< 20 ns RMS
Velocity Limit< 515 m/s

IMU PERFORMANCE<11

Gyrocopter Performance
Input range ±150 deg/s
Rate bias stability 3.5 deg/hr
Angular random walk 0.1 deg/v/hr

Accelerometer Performance
Range ±5 g
Bias stability 0.1 mg
Velocity random walk 0.5 m/s/v/hr

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
3 Event inputs
3 Event outputs
1 Pulse Per Second output
1 Quadrature Wheel Sensor input

PHYSICAL AND ELECTRICAL
Dimensions 147 x 125 x 55 mm
Weight 510 g
Power Input voltage +9 to +36 VDC
Power consumption< 1.8 W
Antenna LNA Power Output Output voltage 5 VDC ±5%
Maximum current 200 mA

Attitude Accuracy (DEGREES)
Roll 0.020
Pitch 0.020
Heading 0.090

PERFORMANCE DURING GNSS OUTAGES<1
Outage Duration Positioning Mode POSITION ACCURACY (M) RMS VELOCITY ACCURACY (M/S) RMS ATTITUDE ACCURACY (DEGREES) RMS
0 s RTK<4 0.02 0.03 0.020 0.015 0.020 0.020 0.008 0.008 0.038
SP 1.00 0.60 0.020 0.015 0.020 0.020 0.008 0.008 0.038
pp<11 0.01 0.02 0.015 0.010 0.040 0.040 0.040 0.040 0.130
10 s RTK<4 0.25 0.15 0.065 0.025 0.040 0.040 0.040 0.040 0.130
SP 1.25 0.70 0.065 0.025 0.040 0.040 0.040 0.040 0.130
pp<11 0.01 0.02 0.015 0.010 0.008 0.008 0.008 0.008 0.038

1. Typical values. Performance specifications subject to GNSS system characteristics, Signal-In-Space (SIS) operational degradation, ionospheric and tropospheric conditions, satellite geometry, baseline length, multipath effects and the presence of intentional or unintentional interference sources.
2. Hardware ready for L1 and L5.
3. E1c and E6b support only.
4. Designed for BeiDou Phase 2 and 3, B1, B2 and B3 compatibility.
5. GPS only.
6. Requires a subscription to a TerraStar data service. Subscriptions available from NovAtel.
7. Typical value. No almanac or ephemerides and no approximate position or time.
8. Typical value. Almanac and recent ephemerides saved and approximate position and time entered.
9. Time accuracy does not include biases due to RF or antenna delay.
10. Export licensing restricts operation to a maximum of 515 metres per second, message output impacted above 500 m/s.
11. Supplied by IMU manufacturer.
12. Typical value. Consult the OEM7 User Documentation for power supply considerations.
13. GNSS only. IMU measurements may not be valid.
14. 1 ppm should be added to all position values to account for additional error due to baseline length.
15. Post-processing results using Inertial Explorer software. The survey data used to generate these statistics is ground vehicle data collected with frequent changes in azimuth (i.e., as normally observed in ground vehicle environments).

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

OPTIONAL ACCESSORIES
- Full breakout cable for DSUB HD26 connector
- DSUB HD26 to M12 IMU cable
- RJ45 Ethernet cable
- VEXXIS® GNSS-500 and GNSS-800 series antennas
- ANT series antennas
- GrafNav/GravNet®
- Inertial Explorer®
- NovAtel Connect

For the most recent details of this product: www.novatel.com/products/gnss-receivers/enclosures/pwrpak7-E1

novatel.com
sales@novatel.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

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HIGH PERFORMANCE ANTENNA FOR TERRESTRIAL APPLICATIONS

PATENTED TECHNOLOGY
The VEXXIS GNSS-500 series antennas provide outstanding circularly polarized, symmetric radiation patterns with superior multipath rejection performance. This is achieved with a patented multi-point feeding network which provides uniquely low loss and frequency independent amplitude/phase balance. Strictly balancing signals and sequentially feeding the GNSS antenna at multiple points is the key to achieving remarkable performance.

OPTIMIZED FOR TERRESTRIAL APPLICATIONS
The GNSS-501 antenna is designed with a low profile, aerodynamic enclosure, ideal for ground vehicles in applications such as agriculture, machine control and mobile mapping. Magnetic mounts makes the antenna easy to install or move between ground vehicle platforms. The combination of intelligent enclosure design along with multi-constellation and L-Band support makes it ideal for any terrestrial application.

RUGGEDIZED FOR CHALLENGING ENVIRONMENTS
The GNSS-501 has been thoroughly tested to withstand even the most challenging environments. It endured over 1000 hours of intense vibration testing to earn its MIL-STD-810G rating. It is also water resistant under heavy rainfall or high pressure spray, ensuring its long survivability under the toughest operating conditions.

FEATURES
+ Supports single-frequency GPS, GLONASS, Galileo and BeiDou signals
+ L-Band signal reception, supporting correction services such as TerraStar
+ Multi-point antenna feed provides stable phase center and enhanced multipath rejection
+ Designed for high quality performance when used with NovAtel’s STEADYLINE® technology
+ Low-profile design ideal for machine control applications

If you require more information about our antennas, visit www.novatel.com/antennas
PERFORMANCE

Signal Received
- GPS L1
- GLONASS L1
- Galileo E1
- BeiDou B1
- L-Band

Pass Band (typical)
Upper passband 1569.0 ± 43.0 MHz

Out-of-Band Rejection
- Band edges ± 50 MHz 15 dB (typical)
- Band edges ± 100 MHz 25 dB (typical)

LNA Gain
29 dB (typical)

Gain at Zenith (90°)
- L1/B1/E1/G1 +4.0 dBic minimum
- L-Band +4.0 dBic minimum

Gain Roll-Off (from Zenith to Horizon)
- L1/B1/E1/G1 12 db
- L-Band 12 db

Phase Center Stability
<5.0 mm

Noise Figure
2.5 dB (typical)

VSWR
≤2.0 : 1

Group Delay Ripple
<15 ns

Nominal Impedance
50 Ω

PHYSICAL AND ELECTRICAL

Dimensions
155 mm D × 45 mm H

Weight
450 g

Connector
TNC female

Mounting
2 × magnetic mounts
2 × M4 screw inserts

Power
- Input voltage +3.3 to +18.0 VDC
- Current 20 mA (typical)

ENVIRONMENTAL

Temperature
- Operating -40°C to +85°C
- Storage -55°C to +85°C

Humidity
95% non-condensing

Salt Fog
MIL-STD-810G (CH1), 509.6

Water/Dust Resistance
IP67, IP69K

Vibration (operating)
- Random MIL-STD-810G (CH1), 514.7 (15 g) Annex E Procedure 1, Category 24

Shock
MIL-STD-810G (CH1), 516.7 (40 g) Procedure 1

Bump
IEC 68-2-27 Ea (25 g)

Regulatory Compliance
FCC, CE

RoHS
EU Directive 2011/65/EU
VEXXIS™ Antennas  GNSS-502

HIGH PERFORMANCE ANTENNA FOR TERRESTRIAL APPLICATIONS

PATENTED TECHNOLOGY
The VEXXIS GNSS-500 series antennas provide outstanding circularly polarized, symmetric radiation patterns with superior multipath rejection performance. This is achieved with a patented, multi-point feeding network which provides uniquely low loss and frequency independent amplitude/phase balance. Strictly balancing signals and sequentially feeding the GNSS antenna at multiple points is the key to achieving remarkable performance.

OPTIMIZED FOR TERRESTRIAL APPLICATIONS
The GNSS–502 antenna is designed with a low profile, aerodynamic enclosure, ideal for ground vehicles in applications such as agriculture, machine control and mobile mapping. Magnetic mounts make the antenna easy to install or move between ground vehicle platforms. The combination of intelligent enclosure design along with multi-constellation and L-Band support makes it ideal for any terrestrial application.

RUGGEDIZED FOR CHALLENGING ENVIRONMENTS
The GNSS–502 has been thoroughly tested to withstand even the most challenging environments. It endured over 1000 hours of intense vibration testing to earn its MIL-STD-810G rating. It is also water resistant under heavy rainfall or high pressure spray, ensuring its long survivability under the toughest operating conditions.

FEATURES
- Supports dual-frequency GPS, GLONASS, Galileo, BeiDou and SBAS signal reception
- L-Band signal reception, supporting correction services such as TerraStar
- Multi-point antenna feed provides stable phase center and enhanced multipath rejection
- Designed for high quality performance when used with NovAtel’s STEADYLINE® technology
- Low-profile design ideal for machine control applications

If you require more information about our antennas, visit www.novatel.com/antennas
**PERFORMANCE**

- **Signal Received**
  - GPS: L1, L2
  - GLONASS: L1, L2
  - Galileo: E1, E5b
  - BeiDou: B1, B2
  - L-Band

- **Pass Band (typical)**
  - Upper passband: 1569.0 ± 43.0 MHz
  - Lower passband: 1220.0 ± 31.0 MHz

- **Out-of-Band Rejection**
  - Band edges ± 50 MHz: 15 dB (typical)
  - Band edges ± 100 MHz: 25 dB (typical)

- **LNA Gain**: 29 dB (typical)

- **Gain at Zenith (90°)**
  - L1/B1/E1/G1: +4.0 dBic minimum
  - L2/B2/E5b/G2: +4.0 dBic minimum
  - L-Band: +4.0 dBic minimum

- **Gain Roll-Off (from Zenith to Horizon)**
  - L1/B1/E1/G1: 12 dB
  - L2/B2/E5b/G2: 12 dB
  - L-Band: 12 dB

- **Phase Center Stability**: <5.0 mm

- **Noise Figure**: 2.5 dB (typical)

- **VSWR**: ≤2.0 : 1

- **L1-L2 Differential Propagation Delay**: 7 ns (maximum)

- **Group Delay Ripple**: <15 ns

- **Nominal Impedance**: 50 Ω

**PHYSICAL AND ELECTRICAL**

- **Dimensions**: 155 mm D × 45 mm H
- **Weight**: 450 g
- **Connector**: TNC female
- **Mounting**: 2 × magnetic mounts, 2 × M4 screw inserts

- **Power**
  - Input voltage: +3.3 to +18.0 VDC
  - Current: 20 mA (typical)

**ENVIRONMENTAL**

- **Temperature**
  - Operating: -40°C to +85°C
  - Storage: -55°C to +85°C

- **Humidity**: 95% non-condensing

- **Salt Fog**: MIL-STD-810G (CH1), 509.6

- **Water/Dust Resistance**: IP67, IP69K

- **Vibration (operating)**
  - Random: MIL-STD-810G (CH1), 514.7 (15 g) Annex E Procedure 1, Category 24
  - Shock: MIL-STD-810G (CH1), 516.7 (40 g) Procedure 1

- **Bump**: IEC 68-2-27 Ea (25 g)

- **Regulatory Compliance**
  - FCC, CE
  - EU Directive 2011/65/EU

For the most recent details of this product: www.novatel.com/products/gnss-antennas/vexxis-series-antennas/gnss-500-series-antennas/