COMPACT DUAL ANTENNA ENCLOSURE DELIVERS SCALABLE POSITIONING PERFORMANCE WITH INTERNAL STORAGE

FUTURE PROOFED SCALABILITY
Capable of tracking all present and upcoming Global Navigation Satellite System (GNSS) constellations and satellite signals, the PwrPak7D is a robust, high precision receiver that is software upgradable in the field to provide the custom performance required for your application.

DUAL ANTENNA INPUT
Multi-frequency, dual antenna input allows the PwrPak7D to harness the power of NovAtel CORRECT® with RTK and ALIGN functionality. This makes the PwrPak7D ideal for ground vehicle, marine or aircraft based systems, providing industry leading GNSS multi-constellation heading and position data in static and dynamic environments.

BASE STATION OR ROVER
Compact and lightweight, the PwrPak7D is well suited for base or rover applications. It has a powerful OEM7® GNSS engine inside and offers 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.

FEATURES
+ 555 channel, all-constellation, multi-frequency positioning solution
+ Multi-channel L-Band supports TerraStar correction services
+ Multiple communication interfaces for easy integration and installation
+ Built-in Wi-Fi support
+ ALIGN® heading solution
+ 16 GB of internal storage
+ SPAN® INS functionality

If you require more information about our enclosures, visit www.novatel.com/products/gnss-receivers/enclosures/
**PwrPak7D**

**PERFORMANCE**

**Channel Configuration**
555 Channels

**Signal Tracking**

**Primary RF**
- GPS: L1 C/A, L1C, L2C, L2P, L5
- Galileo: E1, E5 AltBOC, E5a, E5b
- BeiDou: B1I, B1C, B2I, B2a
- QZSS: L1 C/A, L1C, L2C, L5
- NavIC (IRNSS): L5

**Secondary RF**
- GPS: L1 C/A, L1C, L2C, L2P, L5
- Galileo: E1, E5 AltBOC, E5a, E5b
- BeiDou: B1I, B1C, B2I, B2a
- QZSS: L1 C/A, L1C, L2C, L5
- NavIC (IRNSS): L5

**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: 2.5 cm
- RTK: 1 cm + 1 ppm
- Initialization time: <10 s
- Initialization reliability: >99.9%

**Maximum Data Rate**
- Measurements: up to 100 Hz
- Position: up to 100 Hz

**Time to First Fix**
- Cold start: <40 s
- Hot start: <19 s

**Signal Reacquisition**
- L1: <0.5 s (typical)
- L2: <1.0 s (typical)

**Time Accuracy**
- 20 ns RMS

**Velocity Accuracy**
- 0.03 m/s RMS

**Velocity Limit**
- 515 m/s

**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: 500 g
- Power:
  - Input voltage: +9 to +36 VDC
  - Power consumption: 1.8 W

**2 Antenna LNA Power Outputs**
- Output voltage: 5 VDC ±5%
- Maximum current: 200 mA

**Connectors**
- 2 Antenna: SMA
- USB device: Micro A/B
- USB host: Micro A/B
- Serial, CAN, Event I/O: DSUB HD26
- Ethernet: RJ45
- Data Logging: Push button
- Power: SAL M12, 5 pin, male

**Status LEDs**
- Power
- GNSS
- INS
- Data Logging
- USB

**ENVIRONMENTAL**
- **Temperature**
  - Operating: -40°C to +75°C
  - Storage: -40°C to +85°C
- **Humidity**
  - 95% non-condensing
- **Waterproof**
  - IEC 60529 IPX7
- **Dust**
  - IEC 60529 IP6X
- **Vibration (operating)**
  - Random MIL-STD-810G, Category 24, 20g RMS
  - Sinusoidal: IEC 60068-2-6
- **Bump**
  - ISO 9022-31-06 (25g)
- **Shock (non-operating)**
  - MIL-STD-810G, Method 516.6
  - Procedure 1: 16 g
  - Procedure II: 25g

**FEATURES**
- NovAtel OEM7 positioning engine
- Standard 16 GB internal storage
- Support for logging to external USB storage device
- Built-in Wi-Fi support
- Optional integrated Epson G320N MEMs IMU
- Web GUI

**FIRMWARE SOLUTIONS**
- ALIGN®
- SPAN®
- RTK
- RTK ASSIST™
- TerraStar PPP
- API

**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/pwrpak7D](http://www.novatel.com/products/gnss-receivers/enclosures/pwrpak7D)

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**Version 2** Specifications subject to change without notice.

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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.
3. Hardware ready for L3 and L5.
4. Designed for BeiDou Phase 2 and 3, B1 and, B2 compatibility.
6. Typical value. Almanac and recent ephemerides saved and approximate position and time entered.
7. Typical value. No almanac or ephemerides and no approximate position or time.
8. Time accuracy does not include biases due to RF or antenna delay.
9. Time accuracy not included in the case of a signal loss or antenna delay.
10. Typical value. Consult the OEM7 User Documentation for power supply considerations.
SPAN® IMU-ISA-100C

HIGH PERFORMANCE TACTICAL GRADE IMU COMBINES WITH NOVATEL’S GNSS TECHNOLOGY TO DELIVER 3D POSITION, VELOCITY AND ATTITUDE SOLUTION

SPAN: WORLD-LEADING GNSS+INS TECHNOLOGY

NovAtel’s 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.

OVERVIEW

The IMU-ISA-100C features Northrop-Grumman Litef GMBH’s proven inertial measurement technology offering exceptional performance when paired with a NovAtel SPAN receiver. A near navigation grade sensor, the IMU-ISA-100C contains fiber optic gyros and fully temperature compensated Micro ElectroMechanical Systems (MEMS) accelerometers. The IMU-ISA-100C operates from 10-34 VDC and interfaces with NovAtel’s FlexPak6™ or ProPak6™ through a highly reliable IMU interface. IMU measurements are used by the SPAN receiver to compute a blended GNSS+INS position, velocity and attitude solution at rates up to 200 Hz.

ADVANTAGES OF IMU-ISA-100C

The IMU-ISA-100C offers extremely high performance and precise accuracy at an affordable price point. It is commercially exportable and offers an ideal solution for applications such as platform stabilization, general purpose navigation, photogrammetry, remote sensing and ground mobile mapping.

IMPROVE SPAN IMU-ISA-100C ACCURACY

Take advantage of NovAtel CORRECT™ to receive your choice of accuracy and performance, from decimetre to RTK-level positioning. For more demanding applications, Inertial Explorer® post-processing software from our Waypoint® Products Group can be used to post-process SPAN IMU-ISA-100C data for the highest level of system accuracy.

BENEFITS

- High performance IMU
- Commercially exportable
- Easy integration with NovAtel’s SPAN capable GNSS+INS receivers
- Ideal for aerial and hydrographic survey as well as industrial applications

FEATURES

- Low noise fiber optic gyros and MEMS accelerometers
- 200 Hz data rate
- SPAN INS functionality

If you require more information about our SPAN products, visit www.novatel.com/span
IMU-ISA-100C

**SPAN SYSTEM PERFORMANCE**

**Horizontal Position Accuracy (RMS)**
- Single point L1/L2: 1.2 m
- NovAtel CORRECT™
  - SBAS\(^2\): 60 cm
  - DGPS: 40 cm
  - PPP\(^3, 4\): 4 cm
  - RTK: 1 cm + 1 ppm

**Data Rate**
- IMU measurements: 200 Hz
- INS position: 200 Hz
- INS velocity: 200 Hz
- INS attitude: 200 Hz
- Time Accuracy: 20 ns RMS
- Max Velocity: 515 m/s

**IMU PERFORMANCE**

**Gyroscope Performance**
- Input range: ±495 deg/sec
- Bias stability: ≥ 0.5 deg/hr
- Scale factor repeatability: ≤ 100 ppm
- Scale factor non-linearity: ≤ 100 ppm
- Angular random walk: 0.012 deg/√hr

**Accelerometer Performance**
- Range: ±10 g
- Bias repeatability: ≥ 1250 μg
- Scale factor repeatability: ≤ 100 ppm
- Scale factor non-linearity: ≤ 100 ppm
- Velocity random walk: ≤ 100 μg/√hr

**Physical and Electrical**

**Dimensions**
- 180 x 150 x 137 mm
**Weight**
- 5.0 kg
**Power**
- Power consumption: 18 W (typical)
- Input voltage: +10 to +34 V

**Connectors**
- Power: SAL M12, 5 pin, male
- Data: SAL M12, 4 pin, female
- Wheel sensor: SAL M12, 8 pin, male

**ENVIRONMENTAL**

**Temperature**
- Operating: -40ºC to +55ºC
- Storage: -40ºC to +85ºC
**Humidity**
- MIL-STD-810G, Method 507.5
**Random Vibe**
- MIL-STD-810G, Method 514.6 (2.0 g)
**MTBF**
- > 46,100 hrs

**INCLUDED ACCESSORIES**
- Power cable
- Communication cable
- Wheel sensor cable

**OPTIONAL ACCESSORIES**
- Inertial Explorer post-processing software

For the most recent details of this product: [www.novatel.com/products/span-gnss-inertial-systems/span-imus/](http://www.novatel.com/products/span-gnss-inertial-systems/span-imus/)

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SE Asia and Australia 61-400-883-601

**PERFORMANCE DURING GNSS OUTAGES**

<table>
<thead>
<tr>
<th>Outage Duration</th>
<th>Positioning Mode</th>
<th>POSITION ERROR (M)</th>
<th>VELOCITY ERROR (M/S)</th>
<th>ATTITUDE ERROR (DEGREES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Horizontal</td>
<td>Vertical</td>
<td>Horizontal</td>
</tr>
<tr>
<td>0 s</td>
<td>RTK(^5)</td>
<td>0.02</td>
<td>0.05</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>PPP</td>
<td>0.06</td>
<td>0.15</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>1.20</td>
<td>0.60</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>PPP(^6)</td>
<td>0.01</td>
<td>0.02</td>
<td>0.010</td>
</tr>
<tr>
<td>10 s</td>
<td>RTK(^5)</td>
<td>0.07</td>
<td>0.10</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>PPP</td>
<td>0.11</td>
<td>0.20</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>1.25</td>
<td>0.65</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>PPP(^6)</td>
<td>0.01</td>
<td>0.02</td>
<td>0.010</td>
</tr>
<tr>
<td>60 s</td>
<td>RTK(^5)</td>
<td>0.72</td>
<td>0.45</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>PPP</td>
<td>0.76</td>
<td>0.55</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>1.90</td>
<td>1.00</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>PPP(^6)</td>
<td>0.04</td>
<td>0.02</td>
<td>0.030</td>
</tr>
</tbody>
</table>

1. Typical values. Performance specifications subject to GPS system characteristics, US DOD operational degradation, ionospheric and tropospheric conditions, satellite geometry, baseline length, multipath effects and the presence of intentional or unintentional interference sources.
2. GPS-only.
3. Requires subscription to TerraStar data service. Subscriptions available from NovAtel.
4. An OEM628, OEM638, FlexPak6 or ProPak6 receiver is required.
5. 400 Hz data is an optional configuration. Contact NovAtel for details.
6. Time accuracy does not include biases due to RF or antenna delay.
7. Export licensing restricts operation to a maximum of 515 metres/second.
8. Supplied by IMU manufacturer.
9. Receiver sustains tracking up to 4 g.

Statements related to the export of products are based solely on NovAtel’s experience in Canada, are not binding in any way and exportability may be different with respect to the export regulations in effect in another country. The responsibility for re-export of product from a Customer’s facility is solely the responsibility of the Customer.
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
- GLONASS
- Galileo
- BeiDou
- 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 dBi minimum
- L-Band: +4.0 dBi 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
- 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/

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SE Asia and Australia 61-400-883-601

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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

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**PERFORMANCE**

<table>
<thead>
<tr>
<th>Signal Received</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS</td>
<td>L1, L2</td>
</tr>
<tr>
<td>GLONASS</td>
<td>L1, L2</td>
</tr>
<tr>
<td>Galileo</td>
<td>E1, E5b</td>
</tr>
<tr>
<td>BeiDou</td>
<td>B1, B2</td>
</tr>
<tr>
<td>L-Band</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pass Band (typical)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper passband</td>
<td>1569.0 ± 43.0 MHz</td>
</tr>
<tr>
<td>Lower passband</td>
<td>1220.0 ± 31.0 MHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Out-of-Band Rejection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Band edges ± 50 MHz</td>
<td>15 dB (typical)</td>
</tr>
<tr>
<td>Band edges ± 100 MHz</td>
<td>25 dB (typical)</td>
</tr>
</tbody>
</table>

| LNA Gain | 29 dB (typical) |

<table>
<thead>
<tr>
<th>Gain at Zenith (90°)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L1/B1/E1/G1</td>
<td>+4.0 dBic minimum</td>
</tr>
<tr>
<td>L2/B2/E5b/G2</td>
<td>+4.0 dBic minimum</td>
</tr>
<tr>
<td>L-Band</td>
<td>+4.0 dBic minimum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gain Roll-Off (from Zenith to Horizon)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L1/B1/E1/G1</td>
<td>12 dB</td>
</tr>
<tr>
<td>L2/B2/E5b/G2</td>
<td>12 dB</td>
</tr>
<tr>
<td>L-Band</td>
<td>12 dB</td>
</tr>
</tbody>
</table>

| 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**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>155 mm D × 45 mm H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>450 g</td>
</tr>
<tr>
<td>Connector</td>
<td>TNC female</td>
</tr>
<tr>
<td>Mounting</td>
<td>2 x magnetic mounts</td>
</tr>
<tr>
<td></td>
<td>2 x M4 screw inserts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power</th>
<th>Input voltage 3.3 to 18.0 VDC, 20 mA (typical)</th>
</tr>
</thead>
</table>

**ENVIRONMENTAL**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Operating -40°C to +85°C, Storage -55°C to +85°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity</td>
<td>95% non-condensing</td>
</tr>
<tr>
<td>Salt Fog</td>
<td>MIL-STD-810G (CH1), 509.6</td>
</tr>
<tr>
<td>Water/Dust Resistance</td>
<td>IP67, IP69K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vibration (operating)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Random</td>
<td>MIL-STD-810G (CH1), 514.7 (15 g) Annex E</td>
</tr>
<tr>
<td></td>
<td>Procedure 1, Category 24</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL-STD-810G (CH1), 516.7 (40 g) Procedure 1</td>
</tr>
<tr>
<td>Bump</td>
<td>IEC 68-2-27 Ea (25 g)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regulatory Compliance</th>
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</tr>
</thead>
<tbody>
<tr>
<td>FCC, CE</td>
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</table>

| RoHS                 | EU Directive 2011/65/EU |

For the most recent details of this product: