Duro®
PRODUCT SUMMARY

Ruggedized Multi-Band, Multi-Constellation Centimeter-Accurate GNSS

Swift Navigation, in partnership with Carnegie Robotics, offers Duro—an enclosed version of the Piksi® Multi dual-frequency RTK GNSS receiver. Built for the outdoors, Duro combines centimeter-accurate positioning with military ruggedness at a breakthrough price.

BUILT TO BE TOUGH
Duro leverages design principles typically used in military hardware and results in an easy-to-deploy sensor, protected against weather, moisture, vibration, dust, water immersion and unexpected circumstances that can occur in long-term, outdoor deployments.

EASY INTEGRATION
Duro’s M12 connectors are sealed and industry standard, which balances ruggedization perfectly with user-friendliness and ease of integration. No external sealing is required to deploy in even the harshest conditions. A variety of interfaces are supported, including RS232 and Ethernet, to allow for simple and easy integrations.

CENTIMETER-LEVEL ACCURACY
Autonomous platforms require precise positioning—especially those that perform critical functions. Swift Navigation’s Piksi Multi receiver within Duro utilizes real-time kinematic (RTK) technology, providing location solutions that are 100 times more accurate than traditional GNSS solutions.

FAST CONVERGENCE TIMES
Multiple signal bands enable faster convergence times to high-precision mode. Single band RTK systems converge in minutes, while Piksi Multi converges to a high-precision solution within seconds. This allows for faster time to first fix (TTFF), as well as faster reacquisition times which are critical in high dynamic autonomous applications within a variety of environments.

LEVERAGES PIKSI MULTI
Multiple signal bands enable fast convergence times and multiple satellite constellations enhances availability. Piksi Multi supports GPS L1/L2, GLONASS G1/G2, BeiDou B1/B2 and Galileo E1/E5b for RTK measurements and positioning along with SBAS for robust sub-meter positioning in non-RTK mode.

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BENEFITS
• Ruggedized Sensor for Long-Term Deployment
• Uses Swift Navigation’s Piksi Multi
• Highly-Competitive Pricing
• Flexible Mounting Interfaces
• Future-Proof Hardware with In-Field Software Upgrades
• Intuitive LEDs for Status and Diagnostics
• Electrical Protection on all I/O
• Durable and Chemical Resistant Powder-Coating
• Passive Thermal Design

FEATURES
• IP67 rated
• Centimeter-Level Positioning
• Dual Frequency RTK GNSS
• Raw IMU Measurements from the On-Board MEMS IMU

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**Duro**

**Physical & Environmental**
- **Dimensions**: 130 mm x 130 mm x 65 mm
- **Weight**: 0.8 kg (Cast Al Housing)
- **Temperature**: Operating -40° C to +75° C, Storage -40° C to +85° C
- **Humidity**: 95% non-condensing
- **Sealing**: IP67
- **Vibration**: Operating and Survival (Random Vibe), 7.7 g, Operating and Survival (Sinusoidal Vibe), 5 g
- **Mechanical Shock**: Operating 40 g, Survival 75 g

**Communication**
- **Navigation Outputs**: SBP and NMEA 0183 (Configurable)
- **Reference Inputs / Outputs**: RTCM 3.x
- **Network Protocol Supported**: NTRIP Client

**Position Performance Specifications**
- **Horizontal Position Accuracy** (CEP 50 in SBAS Mode): 0.75 m
- **Velocity Accuracy**: 0.03 m/s RMS
- **Time Accuracy**: 60 ns RMS
- **Real Time Kinematic (RTK Accuracy 1σ)**
  - Horizontal: 0.01 m + 1 ppm
  - Vertical: 0.015 m + 1 ppm
- **RTK Initialization Parameters**
  - Initialization Time: < 10 s
  - Initialization Reliability: > 99%
  - Solution Latency: < 30 ms

**Electrical & I/O**
- **Power**
  - Input Voltage: 10 - 35 V DC
  - Typical Power Consumption: 5.0 W
- **Antenna LNA Power Specifications**
  - Output Voltage: 4.85 V DC
  - Max Output Current: 100 mA
- **External Connector Ports**
  - 2 x RS232 Serial Ports with Optional Hardware Flow Control
  - Ethernet Support up to 100 Mbps
  - PPS, PV, 3 x Event Inputs
  - Configurable Digital Inputs and Outputs
  - 12 V at 1A and 5 V at 250 mA Power Outputs

**GNSS Characteristics**
- **GNSS Signal Tracking**
  - GPS L1/L2, GLONASS G1/G2, BeiDou B1/B2, Galileo E1/E5b
  - SBAS (WAAS, EGNOS, GAGAN, MSAS)
- **GNSS Data Rates**
  - Measurements (Raw Data): Up to 10 Hz
  - Standard Position Outputs: Up to 10 Hz
  - RTK Position Outputs: Up to 10 Hz
  - Swift Binary Protocol (SBP) and NMEA-0183
- **Maximum Operating Limits**
  - Velocity: 515 m/s

**Duro Input/Output**

**Position, Velocity & Time Accuracy**
- Horizontal Position Accuracy: 0.75 m (CEP 50 in SBAS Mode)
- Velocity Accuracy: 0.03 m/s RMS
- Time Accuracy: 60 ns RMS
- Real Time Kinematic (RTK Accuracy 1σ)
  - Horizontal: 0.01 m + 1 ppm
  - Vertical: 0.015 m + 1 ppm
- RTK Initialization Parameters
  - Initialization Time: < 10 s
  - Initialization Reliability: > 99%
  - Solution Latency: < 30 ms

1. Maximum allowed input Voltage range. Recommended Voltage input range from 12 - 24 V.
2. Power draw ~ 5W.
3. Please refer to the Piksi Multi product summary for additional specifics.
4. As required by the U.S. Department of Commerce to comply with export licensing restrictions.
5. In open sky and strong signal conditions.