The Tersus GNSS-Aided Inertial Navigation System (INS-T-306) is OEM version of new generation, fully-integrated, combined L1 & L2 GPS, GLONASS and BeiDou navigation and high-performance strapdown system, that determines position, velocity and absolute orientation (Heading, Pitch and Roll) for any device on which it is mounted. Horizontal and Vertical Position, Velocity and Orientation are determined with high accuracy for both motionless and dynamic applications.

State-of-the-art algorithms for different dynamic motions of Vessels, Ships, Helicopters, UAV, UUV, UGV, AGV, ROV, Gimbals and Land Vehicles.
INS-T-306

Key Features

- Commercially exportable GNSS-Aided Inertial Navigation System
- 73 x 47 x 33 mm size and 145 gram weight
- High precision IMU (1 deg/hr gyroscopes and 5 micro g accelerometers Bias in-run stability)
- GPS L1/L2, GLONASS, BeiDou, DGPS, SBAS, RTK supported signals
- Compatibility with LiDARs (Velodyne, RIEGL, FARO)
- Up to 200 Hz IMU, 50Hz GNSS positions and 20 Hz GNSS measurements data rate
- Advanced, extendable, embedded Kalman Filter based sensor fusion algorithms
- State-of-the-art algorithms for different dynamic motions of Vessels, Ships, Helicopters, UAV, UUV, UGV, AGV, ROV, Gimbals and Land Vehicles
- Implemented ZUPT, GNSS tracking angle features
- Full temperature calibration of all sensing elements, Environmentally sealed (IP67)

INS-T-306 Performance during GNSS outages

<table>
<thead>
<tr>
<th>Outage duration</th>
<th>Positioning mode</th>
<th>Position accuracy (meters, RMS)</th>
<th>Velocity accuracy (meters/sec, RMS)</th>
<th>Attitude accuracy (degree, RMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Horizontal</td>
<td>Vertical</td>
<td>Horizontal</td>
</tr>
<tr>
<td>0 sec</td>
<td>RTK</td>
<td>0.01 + 1ppm</td>
<td>0.02 + 1ppm</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>1.2</td>
<td>1.0</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>PP</td>
<td>0.02</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>60 sec</td>
<td>RTK</td>
<td>7</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>8</td>
<td>3</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>PP</td>
<td>0.3</td>
<td>0.2</td>
<td>0.03</td>
</tr>
</tbody>
</table>

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Gyroscopes Allan Variance, deg/hr

Accelerometers Allan Variance, μg
Electrical and Mechanical interface drawing

Power and interface harness

<table>
<thead>
<tr>
<th>Power</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER IN</td>
<td>RED</td>
</tr>
<tr>
<td>GROUND</td>
<td>BLACK</td>
</tr>
<tr>
<td>Rs232 – Rx1</td>
<td>PINK</td>
</tr>
<tr>
<td>Rs232 – Tx1</td>
<td>ORANGE</td>
</tr>
<tr>
<td>Rs232 – Rx2</td>
<td>WHITE</td>
</tr>
<tr>
<td>Rs232 – Tx2</td>
<td>GREEN</td>
</tr>
<tr>
<td>Rs232 – Rx3</td>
<td>YELLOW</td>
</tr>
<tr>
<td>Rs232 – Tx3</td>
<td>BROWN</td>
</tr>
<tr>
<td>PPS</td>
<td>PURPLE</td>
</tr>
<tr>
<td>UPDATE 1</td>
<td>GREY</td>
</tr>
<tr>
<td>UPDATE 2 (G)</td>
<td>TAN</td>
</tr>
</tbody>
</table>

Indication harness

<table>
<thead>
<tr>
<th>Power</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER (3.3V)</td>
<td>RED</td>
</tr>
<tr>
<td>GROUND</td>
<td>BLACK</td>
</tr>
<tr>
<td>SDA</td>
<td>WT/BROWN</td>
</tr>
<tr>
<td>SCL</td>
<td>WT/BLACK</td>
</tr>
<tr>
<td>INS GRN LED</td>
<td>WT/GREEN</td>
</tr>
<tr>
<td>INS RED LED</td>
<td>WT/ORNG</td>
</tr>
<tr>
<td>GNSS PV LED</td>
<td>BLUE</td>
</tr>
</tbody>
</table>

The names of the signals are given relative to the device, i.e. the Rx pin is the input pin of the INS, Tx is the output one.

Main electrical parameters

- **Supply voltage**: 9 to 36 VDC
- **Power consumption**: 3.0 W
- **Output Interface**: RS-232/RS-422
- **Output data format**: Binary, TSS-1, NMEA 0183 ASCII characters

Note 1: 26AWG stranded wires - by Alpha Wire for main harness; 28AWG stranded wires - by Alpha Wire for indication harness; 300mm length, stripped and tinned

Note 2: TNC Female Bulkhead to MCX Plug Right Angle Cable 150mm length RG174 Coax

Note 3: Weight 145g
Technical Specifications – INS-T-306

Performance

Output Signals: Positions, Heading, Pitch & Roll, Velocity, Accelerations, Angular rates, Barometric data, Pulse Per Second

IMU update rate: 1...200 Hz
Start-up time: < 1s

GNSS:

Supported Navigation Signals: GPS L1/L2, GLONASS, BeiDou, DGPS, SBAS, RTK
Number of Antennas: Single
Channel Configuration (3): 120 channels
GNSS Positions data rate (4): 50 Hz
GNSS Measurements (raw) data rate: 20 Hz
Velocity accuracy, RMS: < 0.03 m/s
Initialization time: <50s (cold start), <30s (hot start)
Time accuracy (clock drift) (6): 20 ns

Navigation:

Horizontal position accuracy (GPS L1/L2), RMS: 1.2m
Horizontal position accuracy (DGPS), RMS: 0.4m
Horizontal position accuracy (post processing) (3): 0.02m
Horizontal position accuracy (RTK), RMS: 0.01m+1 ppm
Vertical position accuracy, RMS: <1m
Velocity accuracy, RMS: 0.03 m/s
PPS timestamps accuracy: 20 ns

Electrical

Supply Voltage: 9V~36V DC
Power Consumption: 3.0W
Output Interface (options): RS-232/RS-422
Output data format: Binary, TSS-1, NMEA 0183 ASCII characters

Physical

Size: 73x47x33mm
Weight: 145g

Environmental

Operating Temperature: -40°C ~ +70°C
Operating Temperature: -50°C ~ +85°C
MTBF: 55,500 hours

Orientation:

Heading
Range: 0 to 360 deg
Static Accuracy (1): 1 deg
Dynamic accuracy (GNSS) (5): 0.1 deg RMS
Post processing accuracy (1): 0.03 deg RMS

Pitch and Roll
Range: Pitch, Roll: ±90, ±180 deg
Static Accuracy in whole Temperature Range: 0.01 deg
Angular Resolution: 0.01 deg
Dynamic Accuracy (5): 0.1 deg RMS
Post processing accuracy (1): 0.006 deg RMS

Sensors:

Gyrosopes
Measurement range: ±450 deg/sec
Bias in-run stability (RMS, Allan Variance): 1 deg/hr
Noise density: 0.004 deg/sec/√Hz

Accelerometers
Measurement range: ±8 g
Bias in-run stability (RMS, Allan Variance): 0.005mg
Noise density: 0.025 mg/√Hz

Magnetometers
Measurement range: ±2 Gauss
Bias in-run stability, RMS: 4 nT
Noise density, PSD: 10 nTV/√Hz

Pressure
Measurement range: 300 – 1100 hPa
Bias in-run stability (RMS, Allan Variance): 2 Pa
Noise density: 0.8 Pa/√Hz

Notes:

(1) RMS, post-processing results use third party software
(2) calibrated in whole operational temperature range, in homogeneous magnetic environment, for latitude up to ±65 deg
(3) tracks up to 60 L1/L2 satellites
(4) according to the INS configuration decision
(5) dynamic accuracy may depend on type of motion
(6) time accuracy does not include biases due to RF or antenna delay
Tersus GNSS Inc.

Global Accuracy Easier

Tersus is a leading GNSS RTK solution provider. Our engineers have been pioneers in the design of GNSS products to support high-precision positioning applications.

Our products include GNSS RTK & PPK OEM boards and receivers, as well as integrated solutions such as the David GNSS Receiver, Oscar GNSS Receiver, MatrixRTK, and GNSS-aided Inertial Navigation System.

Designed for easy and rapid integration, our GNSS solutions offer centimeter-level positioning accuracy and flexible interfaces for a variety of applications including: unmanned aerial vehicle (UAVs), surveying, mapping, construction engineering, and precision agriculture.

To learn more, visit: www.tersus-gnss.com
Sales inquiry: sales@tersus-gnss.com
Technical support: support@tersus-gnss.com

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