



# TR-3S DUO INS

GNSS-Aided Inertial Navigation System



## Key Features

- All GNSS Constellations
- Spoofing & Jamming Detection
- Fast Acquisition Channels
- Full attitude determination
- Small Size
- Light weight

The TR-3S DUO INS is a small, advanced OEM GNSS-aided Inertial Navigation System that combines two complementary technologies: GNSS and INS. The footprint is suitable for any application requiring precise, uninterrupted navigation and attitude within a compact size. Patented anti-spoofing and jamming detection enhances resilience, complemented by a comprehensive suite of interfaces for various applications.

Accelerometers and gyroscopes are fully calibrated, temperature-compensated, and mathematically aligned to an orthogonal coordinate system.

# TR-3S DUO INS Specifications



|                            |                              |               |                                                                                |              |                   |                  |
|----------------------------|------------------------------|---------------|--------------------------------------------------------------------------------|--------------|-------------------|------------------|
| Tracking                   | Total Channels               |               | 874                                                                            |              |                   |                  |
|                            | GPS                          |               | L1 C/A, L1C, P1, P2, L2C, L5                                                   |              |                   |                  |
|                            | GLONASS                      |               | L1 C/A, P1, P2, L2 C/A, L3                                                     |              |                   |                  |
|                            | Galileo                      |               | E1, E5, E5A, E5B, E6                                                           |              |                   |                  |
|                            | BeiDou                       |               | B1, B1C, B2B, B2, B2A, B3                                                      |              |                   |                  |
|                            | QZSS                         |               | L1C C/A, L1C, L2C, L5, L6, L1S, L1Sb, L5S                                      |              |                   |                  |
|                            | SBAS                         |               | L1, L5                                                                         |              |                   |                  |
|                            | NavIC                        |               | L1, L5, S                                                                      |              |                   |                  |
|                            | L-Band                       |               | 1525 - 1560 Mhz                                                                |              |                   |                  |
| Performance*               |                              |               | Horizontal (m)                                                                 |              | Vertical (m)      |                  |
|                            | Standalone                   |               | 1.000                                                                          |              | 1.500             |                  |
|                            | SBAS                         |               | 0.500                                                                          |              | 0.850             |                  |
|                            | DGPS                         |               | 0.250                                                                          |              | 0.500             |                  |
|                            | RTK                          |               | 0.008 + 1 ppm                                                                  |              | 0.015 + 1 ppm     |                  |
|                            | Heading                      |               | < .09 deg (2 m baseline)                                                       |              |                   |                  |
|                            | Free inertial, land vehicles |               | 0.5%** , DT (with velocity constraints/ZARU/ZUPT aiding)                       |              |                   |                  |
| Anti-Jamming               | Jammer-to-Signal Ratio       |               | Up to 57 dB                                                                    |              |                   |                  |
| GNSS+INS Accuracy (RMS)*** | Outage (s)                   | Position Mode | Position Accuracy                                                              |              | Attitude Accuracy |                  |
|                            |                              |               | Horizontal (m)                                                                 | Vertical (m) | Heading (deg)     | Pitch/Roll (deg) |
|                            | 0                            | Stand Alone   | < 1                                                                            | < 1.5        | < 0.1             | < 0.05           |
|                            |                              | RTK           | < 0.008                                                                        | < 0.015      |                   |                  |
|                            | 60                           | Stand Alone   | < 8                                                                            | < 4          | < 0.15            | < 0.09           |
|                            |                              | RTK           | < 7                                                                            | < 2          |                   |                  |
| Time to First Fix          | Cold Start                   |               | < 35 s                                                                         |              |                   |                  |
|                            | Warm Start                   |               | < 5 s                                                                          |              |                   |                  |
|                            | Reacquisition                |               | < 1 s                                                                          |              |                   |                  |
|                            | RTK Initialization           |               | 2 - 6 s                                                                        |              |                   |                  |
| Output Rate                | Position                     |               | up to 100 Hz                                                                   |              |                   |                  |
|                            | Heading                      |               | up to 100 Hz                                                                   |              |                   |                  |
|                            | Measurements                 |               | up to 100 Hz                                                                   |              |                   |                  |
| Wired I/O                  | Main Connector               |               | 25-pin micro D-SUB connector with screw lock (MDSM25PE-Z10-VR17 by ITT Cannon) |              |                   |                  |
|                            | GNSS Antenna                 |               | 2 x MMCX, +5 VDC Ports (0.16A max)                                             |              |                   |                  |
|                            | USB                          |               | 1 x USB 2.0 Full Speed. Up to 12 Mbps RS232 speed                              |              |                   |                  |
|                            | Serial                       |               | 1 x RS232 up to 460.8 kbps<br>2 x RS232/RS422 up to 460.8 kbps                 |              |                   |                  |
|                            | CAN                          |               | 1 x CAN 2.0                                                                    |              |                   |                  |
|                            | Time                         |               | 1 x IRIG                                                                       |              |                   |                  |
|                            | 1PPS                         |               | 1 x 1PPS                                                                       |              |                   |                  |
|                            | Event Marker                 |               | 1 x Event Marker                                                               |              |                   |                  |
| Storage                    | Non-removable                |               | Up to 64 GB                                                                    |              |                   |                  |
| Power                      | Input                        |               | +5.5 to +36 VDC                                                                |              |                   |                  |
|                            | Power Consumption            |               | 2.8 W typical                                                                  |              |                   |                  |

# TR-3S DUO INS Specifications



|                                  |                            |                                                                                  |               |               |               |
|----------------------------------|----------------------------|----------------------------------------------------------------------------------|---------------|---------------|---------------|
| IMU Performance<br>(KERNEL-110)  | Gyroscope performance      | Technology                                                                       | MEMS          |               |               |
|                                  |                            | Dynamic range                                                                    | ± 2000 °/s    |               |               |
|                                  |                            | Bias in-run stability                                                            | 2 °/hr        |               |               |
|                                  |                            | Noise, Angular Random Walk (ARW)                                                 | 0.3 °/√hr     |               |               |
|                                  | Accelerometer performance  | Technology                                                                       | MEMS          |               |               |
|                                  |                            |                                                                                  | Kernel 110-08 | Kernel 110-15 | Kernel 110-40 |
|                                  |                            | Dynamic range                                                                    | ± 8 g         | ± 15 g        | ± 40 g        |
|                                  |                            | Bias in-run stability                                                            | 0.1 mg        | 0.03 mg       | 0.05 mg       |
| Noise, Angular Random Walk (ARW) | 0.02 m/s/√hr               | .045 m/s/√hr                                                                     | 0.06 m/s/√hr  |               |               |
| IMU Performance<br>(KERNEL-201)  | Gyroscope performance      | Technology                                                                       | MEMS          |               |               |
|                                  |                            | Dynamic range                                                                    | ± 450 °/s     |               |               |
|                                  |                            | Bias in-run stability                                                            | 0.7 °/hr      |               |               |
|                                  |                            | Noise, Angular Random Walk (ARW)                                                 | 0.065 °/√hr   |               |               |
|                                  | Accelerometer performance  | Technology                                                                       | MEMS          |               |               |
|                                  |                            |                                                                                  | Kernel 201-08 | Kernel 201-40 |               |
|                                  |                            | Dynamic range                                                                    | ± 8 g         | ± 40 g        |               |
|                                  |                            | Bias in-run stability                                                            | 0.005 mg      | 0.025 mg      |               |
| Noise, Angular Random Walk (ARW) | 0.015 m/s/√hr              | 0.045 m/s/√hr                                                                    |               |               |               |
| Magnetometers                    | Measurement range          | Gauss                                                                            | ±8.0          |               |               |
|                                  | Bias in-run stability, RMS | μGauss, 1σ                                                                       | 8             |               |               |
|                                  | Noise density, PSD         | μGauss /√Hz, 1σ                                                                  | 15            |               |               |
|                                  | SF accuracy                | ppm, 1σ                                                                          | 500           |               |               |
| Physical                         | Dimensions                 | 60x100x31 mm                                                                     |               |               |               |
|                                  | Weight                     | 135g                                                                             |               |               |               |
| Environmental                    | Operating Temperature      | -40°C to +80° C                                                                  |               |               |               |
|                                  | Storage Temperature        | -40°C to +85°C                                                                   |               |               |               |
|                                  | Shock & Vibration          | MIL-STD-810G<br>ISO-9022-31-06 Shock, Severity 5<br>IEC 60068-2-6 Sine Vibration |               |               |               |

\*Dual-antenna GNSS measurements are dependent on GNSS RTK performance.

GNSS performance is dependent on signal quality, satellite geometry, ionospheric and tropospheric conditions, baseline length, multipath effects and RF interference.

\*\* Under ideal conditions, including proper static alignment and suitable in-field dynamic motion during GNSS signal loss.

\*\*\*Performance may degrade under unmitigated vibration or significant temperature variation; unit-to-unit variation may occur.

Refer to the user manual for full specifications. Specifications may be changed without notice.