

# iSULONA-II

## Dead Reckoning NAV System for Tactical Grade Position Determination

Dead Reckoning is the way to make (D)GPS more accurate and reliable when tracking or steering vehicles or when surveying their trajectories, e.g. in defense applications. iSULONA is a hybrid INS/GPS system, complemented by vehicle motion sensor input. It provides reliable information of position and heading also during GNSS outages.

- Used to provide orientation & position of support, supply and logistics vehicles
- Robust, compact, light
- MEMS gyro technology
- L1 GNSS (GPS+GLONASS BEIDOU+QZSS); SBAS capability
- Output of all navigation data, like position, heading, attitude and many more, also during GNSS outages
- Position accuracy typ. 2 m
- Interfaces: UART RS232 & 422 / CAN / Ethernet / USB for real-time data output and RS232 for DGPS correction input; NMEA183 / iXCOM
- 32 GByte internal memory

All iSULONA navigation systems contain a full triade of gyros and three accelerometers and an

integrated (D)GNSS receiver to detect position, velocity, true heading, roll and pitch. An interface to odometer / VMS is available to measure the vehicle velocity.

iSULONA continues to provide positions with high data rate also during GNSS signal blockages or disturbances, such as in tunnels, in urban canyons as well as in case of GNSS loss due to temporary jamming, if an odometer is connected (automatic dead-reckoning mode).

By optimal fusion of all sensor data inside the powerful signal processor of iSULONA, the current

vehicle position can be calculated with higher accuracy, even when GPS or DGPS signals are blocked for a certain time. The fusion is based on a 42+ state extended Kalman filter, including automatic odometer scale factor estimation, misalignment estimation and on-the-fly alignment without any need to perform any "calibration drives". **iSULONA provides an automatic initialization, calibration and operation.**

Besides using its internal GNSS receiver, iSULONA can be made operable with nearly all common available (D)GPS receivers like Javad, NovAtel, Trimble, Ashtec, Rockwell, Garmin, NavStar etc. as long as they provide position, velocity, standard deviations, time stamp and PPS for synchronization with reasonable accuracy.

The "stored heading / stored position" feature is a standard feature in the iSULONA and allows a fast start-up even if GNSS is not available during power-up. The iSULONA is delivered with the MS Windows™ based configuration software iXCOM-CMD,

which is also available under Linux and MacOS. All output data can be displayed and stored online on the user's notebook, tablet or process computer.

iSULONA can also be used without odometer aiding for UAV applications.

Versions with higher grade (iPRENA, iCOMBANA) and lower grade (iSULONA-IV and -V) are also available (with compatible data interface).

The iSULONA is free of any export control or ITAR regulations.



**iSULONA- II**



## Technical Data iSULONA-II/S, iSULONA-II/S-DA and iSULONA-II/M

|                                      |   |
|--------------------------------------|---|
| System performance:<br>(PE and CEP): | <p><b>Heading accuracy:</b> • 2 mil [RMS], on the move with L1-GNSS <sup>1</sup></p> <ul style="list-style-type: none"> <li>• 4 mil / L[m] [RMS] with <u>integrated</u> dual-antenna GNSS engine (L = antenna baseline in [m])<br/>i.e. 2 mil at 2 m baseline (for iSULONA-II/S-DA version)</li> <li>• ~10 mil with magnetometer (option iMAG)</li> <li>• 1 mil/min heading drift during short GNSS outage</li> </ul> <p><b>Attitude accuracy:</b> • 1 mil [RMS] (after sufficient GNSS aiding) <sup>1</sup></p> <ul style="list-style-type: none"> <li>• 6 mil [RMS] (static alignment, without any GNSS)</li> </ul> <p><b>Position accuracy:</b> • 0.2 % of distance traveled during GNSS outages <sup>2</sup></p> <ul style="list-style-type: none"> <li>• 1...8 m (typ. 2 m) with GNSS (S/A off)</li> </ul> <p><b>Altitude accuracy:</b> • 0.5 % of distance travelled</p> <ul style="list-style-type: none"> <li>• typ. 3 m with GNSS (S/A off)</li> </ul> |
| Data Output:                         | Position, velocity, heading, roll/pitch, standard deviations, status via UART RS232/RS422, CAN, Ethernet (TCP/IP, UDP), USB   |
| Alignment Time:                      | not required (stored heading/pos.) or < 1 minute for first GPS acquisition  |
| Roll, pitch, azimuth rate:           | ±400 °/s  |
| Acceleration:                        | ±10 g all axes  |
| Integrated GNSS receiver:            | iSULONA-II/M: L1 GPS+GLONASS+GALILEO (+Beidou) / SBAS;<br>iSULONA-II/S: L1L2 GPS, GLONASS, GALILEO (+others) / SBAS;<br>iSULONA-II/S-DA: L1L2 GPS, GLONASS, GALILEO (+ others) – dual antenna;<br>for heading determination even at standstill condition  |
| Odometer Interface / VMS:            | one (A) or two (A/B) lines for odometer counts (RS422 level);<br>mode selection (e.g. usage of forward/backward signal) by software   |
| Communication Interfaces:            | Ethernet (TCP/IP, UDP), 2 x UART RS422/232, 2 x CAN,<br>PPS (RS422 level), 2 x SYNC-IN, SYNC-OUT, USB,<br>UART RS232 for GNSS correction data input   |
| Data Input:                          | iMAG-DMC-LS (option), external GNSS receiver (option)   |
| Power Supply:                        | 9...34 V DC / approx. 8.5..10 W (depending on version)  |
| Temperature range:                   | -40°C to +71°C operating, -56 °C to +85 °C storage  |
| Shock; Vibration:                    | 60 g, 11 ms half-sine (endurance); 5g, 5 to 2'000 Hz (endurance)  |
| Environment:                         | per MIL-STD-810G (vibration, shock, humid.) and MIL-STD-461G (EM/EMC)   |
| MTBF / MTTR:                         | 35'000 hrs (estimated), 5 min.  |
| Built-In-Test:                       | Power up and continuous BIT   |
| Dimensions, Weight:                  | approx. 102 x 138 x 65 mm <sup>3</sup> (WxDxH) ; approx. 800 grams  |
| Additional Features:                 | Stored Heading/Position after Power-Off/On etc.   |
| Signal Processing:                   | iMAR's advanced extended Kalman filter based SD/DR-algorithms   |
| Parameter Setup:                     | For most accurate measurements, beside of other parameters the lever arms between the system and the odometer and the GPS antenna and the user definable virtual reference point can be stored via a Windows™ or Linux based tool iXCOM-CMD on the iSULONA hardware.  |
| GUI / HMI software:                  | <a href="#">iXCOM-CMD</a> visualization, command and configuration software; SDK and Python scripts available   |

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<sup>1</sup> under sufficient motion dynamics and GNSS aiding; ask for "iSULONA-II-improved" for higher attitude accuracy

<sup>2</sup> only applicable, if the system is aided with odometer (wheel sensor)

