iSULONA-IV-A-DA

Dead Reckoning INS/GNSS System for Tactical Grade Position Determination

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

- Used to provide orientation & position of support, supply and logistics ground vehicles
- Robust, compact, light
- MEMS gyro technology
- integrated multi-frequency / all constellation GNSS engine
- 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; NMEA 0183 / iXCOM
- 32 GByte internal memory

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All iSULONA navigation systems contain a full triade of each gyros and accelerometers and an integrated RTK capabe GNSS receiver to detect position, velocity, true heading, roll and pitch. An interface to odometer / VMS is available to measure the vehicle velocity.

Due to the robust internal sensor data fusion, iSULONA continues to provide position, heading and attitude 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).

The sesor data 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 GNSS receivers incl. military receivers like ERGR, NavHub, TopStar etc. (SAASM, M-Code, …)

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 **leading motion detection feature** allows suer sufficient zero velocity (ZUPT) updates for automatic performance improvements. The iSULONA is delivered with the configuration software iXCOM-CMD, which is available under MS Windows, Linux and MacOS. All output data can be displayed and stored online on the user’s notebook, tablet or mission computer.

iSULONA / iNAT-M300 can also be used without odometer aiding for UAV applications.

Versions with higher grade (iPRENA, iCOMBANA) performance are also available with compatible data interface.

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

Technical Data iSULONA-IV-A, iSULONA-IV-A-DA

System performance: (PE and CEP):	**Heading accuracy:**	● 6 mil [RMS], on the move with GNSS [1] ● 4 mil / L[m] [RMS] with integrated dual-antenna GNSS engine (L = antenna baseline in [m] i.e. 2 mil at 2 m baseline (for iSULONA/TLD-D version) ● ~10 mil with magnetometer (option iMAG) ● 0.05 mil/sec heading drift during short term GNSS outages
	Attitude accuracy:	● 1.5 mil [RMS] (after sufficient GNSS aiding) [1] 2 mil [RMS] (static alignment, without any GNSS)
	Position accuracy:	● 0.5 % of distance traveled during short GNSS outages [2] ● 1…8 m (typ. 2 m) with GNSS (S/A off), 2 cm with RTK GNSS
	Altitude accuracy:	● 1 % of distance travelled ● typ. 3 m with GNSS (S/A off), typ. 6 cm with RTK GNSS
Data Output & Rate:	Position, velocity, heading, roll/pitch, standard deviations, status via UART RS232/ RS422, NMEA 0183, CAN, Ethernet (TCP/IP, UDP), USB; integer divisor of 500 Hz	
Alignment Time:	not required (stored heading/pos.) or < 1 minute for first GPS acquisition (warm start)	
Gyroscopes:	±500 °/s (option: 2'000 or 125 °/s) | ARW 0.15 °/$\sqrt{hr}$ | bandwidth > 500 Hz	
Accelerometers:	±8 g all axes (option: 40 g) | noise density 23 µg/$\sqrt{Hz}$ | bandwidth > 500 Hz	
Integrated GNSS receiver:	iSULONA-IV-A iSULONA-IV-A-DA with -DA = dual antenna for heading determination even at standstill condition	all frequencies / all constellations GPS/GALILEO/GLONASS/BEIDOU/ SBAS / RTK (economic grade) etc. (see ICD) multi frequencies / multi constellations / SBAS / RTK (economic grade)
Odometer Interface / VMS:	one (A) or two (A/B) lines for odometer counts (up to 28 V, opto-coupler input); mode selection (e.g. usage of forward/backward signal) by software	
Communication Interfaces:	Ethernet (TCP/IP, UDP), 2 x UART RS422/232, 1 x CAN, PPS (RS422 level), 1 x EVENT-IN (opto-coupler), USB	
Data Input:	iMAG-DMC-LS (option), external MIL grade GNSS receiver (option)	
Power Supply:	10...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:	designed to meet MIL-STD-810G (vibration, shock, temp, humid.) and MIL-STD-461G (EM/EMC)	
MTBF / MTTR:	35'000 hrs (estimated) / 5 min.	
Built-In-Test:	Power up and continuous (PBIT, CBIT)	
Dimensions, Weight:	approx. 102 x 112 x 65 mm^3 (WxDxH) w/o connectors; approx. ~370 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 GNSS antenna and the user definable virtual reference point can be stored via a Windows™ or Linux based tool iXCOM-CMD or via command interface on the iSULONA hardware.	
GUI / HMI software:	iXCOM-CMD software; SDK and Python scripts and ROS 2 node available	
Part Number:	00190-04504-041i (i=6: single / i=7: dual antenna GNSS)	

iMAR Navigation GmbH • Im Reihersbruch 3 • D-66386 St. Ingbert / Germany
Phone: +49-(0)6894-9657-0
www.imar-navigation.de • sales@imar-navigation.de

[1] under sufficient motion dynamics and GNSS aiding; ask for "iSULONA/TLN-2-advanced" for higher attitude accuracy
[2] only applicable, if the system is aided with odometer (wheel sensor)