

iNAV-FJI-001-LSURV

Inertial Navigation System for Advanced Land Surveying Applications

iNAV-FJI is an INS product family for inertial navigation and guidance, stabilisation, gyro compassing and dynamically motion analysis with advanced fiber optical gyros that covers applications, which require high accuracy, reliability and an open interface to the user.

- high performance inertial navigation and surveying system for land based applications
- FOG technolog with very low angular random walk and very high angular resolution
- very high bandwidth, fast response
- integrated time synchronisation module and GPS
- Interfaces: Ethernet TCP/IP, CAN, RS232, odometer, DGPS

The derivation iNAV-FJI-LSURV for advanced land and road surveying applications consists of three high precision fiber optical gyroscopes with exceptional low random walk of $0.001 \text{ deg}/\sqrt{\text{h}}$ and angular resolution of 0.002 arcsec (iNAV-FJI measures were other systems only interpolate - even during GPS outages), three servo accelerometers, a powerful strapdown processor and an open and flexible interface, which can be customized.

As an option the modular designed system provides interfaces to (D)GPS/GLONASS, external trigger input/output and external I/Os for e.g. laser altimeter, SAR or camera platform control, stabilisation and synchronisation. Possible outputs are Ethernet (TCP/IP or UDP), RS232/422, HDLC or analog as well as internal data storage on silicon-disk. Furthermore application specific interfaces can be realized on request (e.g. ARINC 429).

Due to the modular hardware and software architecture special adaptation of housing and

mechanical dimensions to customer's requirements is also possible even if only small quantities shall be purchased. Data processing (strapdown algorithms, global or local navigation, north-seeking, north keeping or motion monitoring, platform stabilisation and control) inside of the iNAV-FJI-LSURV is as well possible as data transmission of pure or corrected raw data.

A key feature is its high available data rate of up to 1000 Hz and its unique resolution ($0.002 \text{ arcsec} = 5.6 \text{ E-}07 \text{ degree}$ in roll/pitch/yaw) as well as superior accuracy e.g. for stabilisation tasks. As an option special de-



iNAV-FJI-LSURV on a surveying vehicle, equipped with Omnistar DGPS and wheel mounted odometer

signed algorithms allow to output most stable angular and position information during definable time windows e.g. for radar or laser scanning applications (HPST² = High Precision Short Time Tracking Mode) also under difficult motion conditions.

The iNAV-FJI-LSURV can be operated in online mode as well as in post-processing mode e.g. to perform advanced Kalman filtering and smoothing. For advanced users iMAR's XIO interface is available to have full access to result data as well as full compensated or uncompensated

inertial raw data. It is even possible to integrate user specific online software on the IMU, which is running on a 32 bit realtime OS.



Technical Data of iNAV-FJI-001-LSURV:

Data Output:	Heading, Roll, Pitch, Angular Velocity, Velocity (body and world), Position, Raw data, internal status information, tbd	
True Heading:	< 0.05 deg sec(lat) inertial, < 0.01 deg absolute with DGPS aiding	
Attitude Accuracy:	< 0.01 [0.02] deg; < 0.002 [0.004] deg with DGPS aiding	
Position Accuracy:	< 0.2 % distance travelled (unaided); ca. 5 cm with RTK-DGPS; ca. 10 cm after 15 s GPS outage; ca. 30 cm after 60 s GPS outage ca. 1 m after 60 s GPS outage; < 30 cm with INS/DGPS post-proc	
Velocity Accuracy:	ca. 5 [20] mm/s (online, with DGPS and odometer aiding)	
Alignment Time:	< 5 minutes static (in-motion alignment capable)	
Range:	± 500 ^{*)} deg/s (no angle limitation)	± 5 g (option 2/7/25 g)
	^{*)} The INS shall be switched on while angular rate is < 150 deg/s	
Drift stability / Offset:	< 0.003 deg/h (const temp.)	< 5 μ g (const. temp.)
	< 0.01 deg/h (Over Temp. Range)	< 60 [100] μ g (OTR)
Random Walk:	0.001 deg/ \sqrt{h}	< 8 [100] μ g/ \sqrt{Hz}
Resolution:	< 0.01 μ rad (0.002 ^{*)}), < 0.001 deg/s	< 1 μ g
Axis Misalignment:	< 30 μ rad	< 50 μ rad
Nonlinearity / Scalef.:	< 10 ppm (30 ppm scale factor error)	< 20 μ g/g ² (60 [100] ppm)
Data Output Rate:	1...1000 Hz	
Data Output Latency:	< 2 ms (sampling accuracy better 0.1 μ s, synchronised to PPS)	
Output (options):	RS232/422, Ethernet, pulse-per-time PPT, motor control output for 3D gimbaled platform stabilisation; Protocols: XIO, PIO, NMEA, tbd (D)GPS (option: RTK-GPS/GLONASS integrated) , event trigger	
Inputs (options):	Synchronization: Input for pulse-per-second [PPS] (if available)	
Power:	19...34 V DC or 10...18 V (optional MIL 9...36 V), < 25 W	
Connectors:	according to MIL-C-38999-III	
Temperature:	-5...+55 °C (operating, standard temp. range) -40...+55 °C (oper. with selected option of internal heating at low temp.) -40...+71 °C (operating with slightly degraded specification) -40...+85 °C (storage)	
Rel. Humidity:	8...100 %, IP67	
MTBF / MTTR:	> 25,000 hrs (estimated for surveying appl.) / < 30 minutes	
Shock:	25 g, 11 ms ; 60 g, 5 ms (operating)	
Weight:	approx. 12 kg (depends on housing; light weight version on request)	
Total Size:	IMU: approx. 370 x 213 x 180 mm (other on request)	

iMAR has extended longtime experience in the manufacturing and development of inertial navigation and guidance systems for all application areas. All systems manufactured by iMAR are maintained at iMAR in Europe / Germany.

In the iNAV-FJI inertial navigation and guidance systems iMAR uses advanced European FOG technology. The



version with reduced accel. spec. (see [...]) requires only an European export license for the total system, the version with advanced QA-2000/3000 accelerometers requires an US export license for the accelerometers.

Please do not hesitate to contact us for further information or for a demonstration.

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