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iNAV-FMS-E-DA

Dual Antenna Inertial Measuring System for Surveying and Navigation

iNAV-FMS-E-DA is an IMS for inertial navigation and guidance, stabilisation, true heading determination and dynamically motion analysis with fiber optical gyros that covers applications, which require true heading, high accuracy, reliability and no export license.

- inertial navigation and surveying system for airborne, naval, surface and railway applications
- FOG technolog with low angular random walk and high angular resolution (0.75 °/hr, 1.5 mg)
- Integrated dual antenna GPS with RTK capability to determine heading
- high data rate, open interface
- integrated 2 cm accurate GNSS / RTK-GPS/GLONASS/GALILEO
- Interfaces: Ethernet TCP/IP - UDP, CAN, RS232, ext. GPS / RTK-GPS; optional MI_STD 1553B interface

The iNAV-FMS-E-DA for advanced airborne, naval, surface and railway applications consists of three high accurate fiber optical gyroscopes with low random walk of $0.1 \text{ deg}/\sqrt{\text{hr}}$ and gyro angular resolution of 0.00003 deg, three servo accelerometers, a powerful strapdown processor and an open and flexible interface, which can be customized.

The system provides internal (D)GPS/GLONASS/GALILEO, external trigger input/output and external I/Os for e.g. laser altimeter, SAR, DVL or camera platform control, stabilisation and synchronisation. Possible outputs are Ethernet (TCP/IP or UDP), RS232/422, CAN, MIL-Bus or analog as well as internal data storage on silicon-disk. Furthermore application specific interfaces can be provided (e.g. ARINC 429).

Data processing (strap-down algorithms, global or local navigation, GNSS aided true heading determination or platform stabilisation and control) is as well available as data transmission of raw data.

A key feature is its high available data rate of up to 400 Hz, its high internal gyro sensor resolution of 0.1 arcsec and its true heading capability due to an integrated dual-antenna GNSS receiver.

The iNAV-FMS-E-DA 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 it is even possible to integrate user specific online software on the IMU, which is running on a 32 bit realtime OS.

The system is qualified according to MIL-STD-810F, MIL-STD 461E and transient protection according to MIL-STD 704 and DO-160E.

The system iNAV-FMS-E-DA **does not require any export license**, it is not covered by any ITAR regulations.

The system is form/fit/function compatible by interface and size to the systems of type iNAV-RQH-100x and iNAV-FJI-001, which provide additionally autonomous gyro compassing / north seeking and to iNAV-FSLG-01 and iNAV-FCAI-02, which provide enhanced gyro and accelerometer noise for higher accuracy..



Technical Data of iNAV-FMS-E-DA:

Measurement parameters:	Roll, pitch, yaw, acceleration, velocity, rate, position
Measurement range:	± 450 °/s angular rate
Accuracy:	± 10 g acceleration (5g / 20 g as option) < 0.1 ° true north (with GPS/GNSS under motion) 0.1 ° true north with dual-antenna GPS and 5 m antenna distance < 1 °/hr heading drift (during outages of GPS) < 0.1 ° roll/pitch (initially after power-on) < 0.05 ° roll/pitch (INS/GPS under dynamic flight conditions) < 0.03 ° roll/pitch (INS/GPS under static flight conditions)
Position error:	< 10 m with GPS (S/A off) < 1 m with DGPS, Omnistar supported [< 10 cm RTK mode option]
Velocity error:	< 0.1 m/s (aided with DGPS)
Alignment duration:	< 1 minute on land (for roll pitch inertially, heading by dual-antenna GPS) < 4 minutes on the fly with GPS aiding
Resolution:	0.1 arcsec (roll/pitch/yaw) / < 50 μ g (accel.) (averaged)
Nonlinearity:	< 300 ppm (gyro) < 100 μ g/g ² (accel.)
Scale factor error:	< 500 ppm (gyro) $< 1'500$ ppm (accel.)
AngularRandomWalk / Accel. Noise:	0.15 deg/sqrt(hr) 100 μ g/sqrt(Hz)
Bias Repeatability:	0.75 deg/hr (1 sigma) 2 mg (1 sigma)
Bias Stability (AllanVarriance):	< 0.1 deg/hr < 10 μ g
Dynamics capability:	$> 1'500$ °/s ²
Axis misalignment	< 200 μ rad
Sampling rate; Output rate:	400 Hz; 1...400 Hz (Ethernet, CAN, MIL-Bus)
Latency:	< 3 ms (time stamp ± 10 μ s)
Data output (options):	Ethernet 10/100/1000BaseT, TCP/IP, UDP, RS232RS422 UART, CAN, MIL-STD1553B (all data with time stamp)
Data input (options):	internal/external (RTK)GNSS, marker event trigger, 3 x odometer, (RS422 level), [PPS / SYNC] integrated L1/L2 GPS/GLONASS/GALILEO receiver, dual antenna approx. 9.5 kg
GNSS aiding:	
Weight:	approx. 9.5 kg
Size:	approx. 360 x 213 x 179 mm or 299 x 213 x 179 mm
MTBF:	$> 20,000$ hrs (estimated for surveying applications)
Temperature:	-40...+71 °C operating and -45...+85 °C storage (case temper.)
Shock, Vibration:	25 g, 11 ms; 60 g, 5 ms; 3 g rms 10...2'000 Hz endurance
Qualification:	MIL-STD-810F, MIL-STD-461E, MIL-STD-704D, DO160E
Power supply:	11...34 V, < 50 W; 50 ms hold up time according to DO160E
Software:	NavCommand realtime, open I/F XIO, iWP+ postproc

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-FMS inertial surveying and guidance systems iMAR uses advanced German FOG techno-



logy. System not covered by any export control

iNAV-FMS is running in many applications in torpedo navigation, UAVs, vehicle dynamics testing, train location, aircraft testing, airborne imaging, airborne platform stabilisation and surveying.

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