

# iNAT-FSSG-1 • iNAT-FSSG-1-DA

## Inertial Measuring System for Navigation Applications with optional Dual-Antenna GNSS supported True Heading

iNAT-FSSG-1 is part of the IMS product family of systems for inertial navigation and guidance, north finding, stabilization, true heading determination and for dynamically motion analysis with fiber optical gyros, that covers applications, which require accuracy, reliability, a flexible interface and easy usage.

- GNSS single antenna or dual-antenna (-DA) supported true north referencing, inertial navigation and surveying system for land / surface, airborne, naval and other applications
- FOG technology, high angular resolution
- Integrated VMS / odometer interface
- integrated time synchronisation module and GPS / RTK-GPS with single or dual antenna; SAASM capability as option. Integrated atomic clock as option.
- Internal 32 GByte non-volatile memory ("black-box")
- high data rate, lowest latency & jitter for advanced steering applications, open interface: Ethernet TCP/IP - UDP, CAN, RS422, ARINC, ext. GNSS corrections (option)
- Small size, low weight, low power; integrated surveying markers and aiding support points on the enclosure (to support also advanced surveying applications).

iNAT-FSSG-1-DA consists of three fiber optical gyroscopes with low random walk and high gyro angular resolution, three servo accelerometers, a powerful strapdown processor and an open and flexible interface, which can be customized on request.

The system's data as attitude, heading, position, velocity, rates and acceleration are sent with up to 500 Hz and with time stamp related to UTC/PPS. Possible output interfaces are Ethernet (TCP/IP or UDP), RS232/422, CAN, Dig-I/Os. Furthermore, application specific interfaces can be provided on request. As an option, the system provides interfaces to an external GNSS engine, external I/Os for synchronization or a counter interface for a vehicle motion sensor (VMS) / odometer.

The dual-antenna capability (iNAT-FSSG-1-DA) allows the system to determine true heading also at standstill conditions, where other systems of this class cannot provide stable heading.

The baseline (distance) of the both antenna depends on the application – the longer, the higher the GNSS based true north accuracy.



iNAT-FSSG-1 is usually operated in online mode, however, it also provides the possibility of post-processing, e.g. to perform additional reverse Kalman filtering and smoothing.

The iNAT-FSSG contains a tightly or loosely coupled INS/GNSS based data fusion, using iMAR's highly sophisticated 42+ state Kalman filtering incl. dead-reckoning, ZUPT support etc.

The powerful iXCOM-CMD user software supports configuration, data acquisition and visualization incl. moving map and waypoint navigation as well as maintenance via network.

The system is neither covered by dual-use export control nor by any ITAR regulations.

Furthermore, if higher accuracy is required, with iNAT-FSLG gyro compassing FOG based systems are available and with iNAT-RQT and iNAT-RQH we provide highest performance also in free inertial navigation mode with integrated ring laser gyro technology.



## Technical Data of iNAT-FSSG-1 and iNAT-FSSG-1-DA

Data Output:	Heading, Roll, Pitch, Angular Velocity, Velocity (Body and World), Position, Raw Data of INS / GNSS / VMS incl. time-stamp, Internal Status Information		
Performance: (data fusion)	True Heading:	0.1° [RMS]	with at least single antenna GNSS and under sufficient motion (no dual antenna required)
		0.025° [RMS]	with sufficient RTK GNSS aiding and sufficient motion
		< 0.2° [RMS]	with 1 m baseline between the two GNSS antennas (-DA)
		< 0.05° [RMS]	with 4 m baseline between the two GNSS antennas (-DA)
	Position accuracy:	1...2 m [RMS]	(GPS, S/A off)
		0.3...1 m [RMS]	(GNSS, SBAS)
		0.02 m [RMS]	(RTK mode, GPS+GLONASS)
		0.2 % DT [CEP]	(during GNSS outages; with VMS)
	Altitude:	< 5 m [RMS]	(GPS, S/A off)
		0.06 m [RMS]	(RTK mode)
	Attitude Accuracy:	0.03° / 0.1° <sup>1</sup> [RMS]	(GPS, S/A off)
		0.01° [RMS]	(RTK, under sufficient motion and observations)
	Heave accuracy:	< 5 cm or 5 % (RMS) whichever is highest	
Alignment Time:	< 2 min. GNSS cold start, < 1 min. GNSS warm start; < 30 sec with stored heading		
Range:	± 450 °/s	(no angle limitation)	±5 g (option: ±10 g or ±20 g)
Noise:	< 0.15 deg/√h	(gyros)	< 0.05 mg/√Hz (accels)
Linearity / Scalefactor:	0.03 % / 0.05 %	(gyros)	0.2 % / 0.2 % (accels)
Drift (unaided) / Offset:	< 1°/hr	(gyros)	< 1.5 mg (accels)
Bias Stability (AV):	< 0.1 °/hr	(gyros)	< 50 µg (accels)
GNSS Receiver (integrated):	up to L1L2 GPS+GLONASS+GALILEO+BEIDOU, RTK/PPP, L-Band; SAASM capability as hardware option; high speed range version (< 515 m/s) available as option (iNAT-FSSG-HRS, requires export license)		
Input Interfaces (options):	external GNSS receiver (standard: integrated GNSS receiver); event trigger (PPS / SYNC, RS422 level), odometer (opto-coupler input up to 32 V, A/B quadrature or counts & direction, RS422 level compliant)		
Output Interfaces (options):	UART RS232/422, Ethernet TCP/IP / UDP, CAN, ARINC429, ARINC825, HDLC/SDLC, PPT (Pulse Per Time), PPS, SYNC; PTP / NTP Server (since HW rev. 4); NTRIP caster; PPD MIL-C-38999 Series III for signals and power, TNC for antenna		
Connectors:	MIL-C-38999 Series III for signals and power, TNC for antenna		
Data Output Rate:	1...500 Hz, internal data rate 1'000 Hz		
Data Latency and Jitter:	< 1 ms (sampling accuracy better 1 µs, time-stamped according to PPS; jitter < 1 ms)		
Data storage:	32 GByte on internal non-volatile memory		
Atomic Clock TimeRef. (opt.):	external optional high precision clock, drift < 100 ps/s (= 90 µs / 10 days) for -15...+55 °C ambient temperature		
Temperature, rel. Humidity:	-40...+71 °C operating (case), -55...+85 °C storage; 8...100%, IP67		
Magnetic. insensitivity:	< 500 µTesla (5 Gauss)		
MTBF / MTTR:	> 35,000 hrs (estimated for surveying applications) / < 30 minutes		
Shock, Vibration, Altitude:	25 g / 11 ms, 60 g / 5 ms (operating); 20...2'000 Hz, 3 g rms; 60'000 ft		
Qualification:	MIL-STD-810G, MIL-STD-461G, MIL-STD-704F, DO160G		
Power, Start-up-Time:	10...35 V DC, < 22 W (incl. GNSS); 50 ms hold up time according to DO160; continuous overvoltage protection up to 60 V; < 15 sec		
Weight / Size:	≤ 4.3 kg / approx. 187 x 128 x 196 mm <sup>3</sup> (WxHxL), w/o connectors		
Installation:	installation in all arbitrary orientations allowed		
Software:	iXCOM communication protocol; iXCOM-CMD GUI / HMI software under MS Windows and Linux available; INS/GNSS post-proc iWP+ / iLP+; integrated real-time Kalman filter (42+ states); on request customized applications can be integrated		

iMAR Navigation manufactures and designs inertial navigation, surveying, guidance, control and stabilization systems for defence, airborne, industrial, automotive, agriculture, mining, drilling, surveying and many other applications. All systems are manufactured and maintained by iMAR Navigation in Germany.

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