iNAT-M200/xLx-FLAT & -OEM

Ultra Flat precise MEMS Based Inertial Navigation System with
All-Frequency / Multi-Constellation / Single & Dual Antenna GNSS Engine

iNAT-M200/xLN and iNAT-M200/xLD are members of the advanced iNAT series (iMAR Navigation and Timing) and one of the smallest powerful MEMS based INS/GNSS inertial navigation, measurement, surveying and control systems on the market for applications on the surface (land/sea) and in the air. The –OEM and –FLAT versions provide these devices as an unhoused PCB version (-OEM) and as an lite housed version (-FLAT). As an option, the –OEM version is additionally available with external vibration and shock dampers.

The iNAT-M200 provides all kinematic measurements like acceleration, angular rate, attitude, true heading, velocity and position of the target vehicle in real-time with an data update rate of up to 500 Hz and with precise timestamp.

- robust, compact, miniature, light weight system, 550 grams with enclosure (-FLAT), down to 320 grams w/o enclosure (-OEM)
- based on high grade MEMS gyro & accel technology and up to **all-frequency multi-constellation GNSS** with optional dual-antenna (option: -DA) heading, PPP and RTK support
- integrated GNSS engine, up to RTK all frequ./const. (4 types of engines available: /TLN, /SLN, /RLN, /MLN)
- odometer / wheel sensor aiding capability
- output of angular rate, acceleration, attitude, true heading, CoG, velocity and position in realtime with up to 500 Hz (adjustable)
- several processing modes: Standard mode with 1 m position accuracy and RTK mode with 0.02 m position accuracy
- interfaces: UART RS232 & RS422 / CAN / Ethernet for realtime data output and RS232 for DGPS/RTK correction input; **clock output;** minimum latency
- up to **128 GByte** internal memory (“black-box”)
- easy to use, easy to configure; powerful GUI
- iXCOM data interface compatible to other iNAT devices

Beside of GNSS aiding, for land vehicles additionally an odometer aiding capability is available; the scale factor of the wheel sensor is estimated automatically.

The iNAT-M200/xLx-OEM & -FLAT are available with two classes of inertial sensors. The performance data can be found in the datasheets of the iNAT-M200/SLN (high performance MEMS based) and iNAT-M200/SLD (standard performance MEMS based).

The **iNAT-M200/xLx-OEM** provides the same electronics architecture and most features of the iNAT-M200, but comes without any enclosure. This allows the user to integrate it into its own electronics or sensor compartment. EMI/EMC protection and extensive power supply filtering is under the obligation of the integrator. As an option this version can be supplied with additional vibration / shock isolators (two versions available, i.e. long or wide body, see figure) for extreme environmental requirements.

The **iNAT-M200/xLx-FLAT** comes with an additional lite enclosure to protect the PCB of the iNAT-M200/xLx-OEM according to IP41. EMI/EMC protection and extensive power supply filtering is under the obligation of the integrator.

The iNAT-M200 is delivered with the MS Windows (or LINUX or MacOS alternatively) based configuration software iXCOM-CMD. This software allows to configure the output interfaces, furthermore all output data can be displayed and stored online on the user’s notebook, tablet or process computer or/and on the iNAT-M200 device itself. It also allows powerful playback capabilities and provides data export in many formats (csv, xml, GoogleEarth, InertialExplorer, GrafNav). With iREF-GNSS, iMAR also provides a GNSS reference station to provide RTK corrections for centimeter level accuracy on demand.

A powerful postproc software iPosCAL-SURV for batch processing is available to allow post-mission processing including a multi station GNSS correction data solution and a direct visualisation of the results in Google Earth™.

Technical Data iNAT-M200-FLAT/xLx, iNAT-M200-OEM/xLx (HW rev. 14+):

Range:	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Bias Stability (AV):	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Bias (filtered):	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Bias day-to-day:	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Angles (Attitide, Hdg.):	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Position:	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Velocity:	see datasheet of iNAT-M200/SLN and iNAT-M200/xLD
Noise:	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Resolution:	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Linearity error:	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
Scale factor error:	see datasheet of iNAT-M200/xLN and iNAT-M200/xLD
INS / GNSS / ODO proc.:	integrated advanced 42+ state INS/GNSS/+ extended Kalman filter data fusion (GPS, GALILEO, GLONASS, …)
Internal GNSS Engine:	version /TLx: high performance all frequencies / all constellation RTK GNSS engine (single & dual antenna available) version /SLx: performance up to all frequency / constellation geodedic class RTK GNSS engine (single or dual antenna) version /RLx: commercial multi frequencies / multi constellation RTK GNSS engine (single & dual antenna available) version /MLx: economic grade L1 GPS+GLONASS, SBAS, Beidou, QZSS engine
	raw data output interface for data rate up to 100 Hz directly available via separate Ethernet interface (/SLx) high speed range version (< 515 m/s) available as option (iNAT-M200/SLx-HRS (requires export license)
Data Processing Rate:	integer divisor of 500 Hz; PPS timing accuracy better 10 ns
Data Output Rate:	see datasheets of iNAT-M200/xLN and iNAT-M200/xLD
Synchronisation:	PPS_OUT (RS422 level, latency < 1 µs); 2x EVENT_IN (RS422 or TTL level, latency < 2 ms)
Output (options):	CAN, 4 x UART RS232/422, Ethernet 100 MBit/s, NMEA 0183, ARINC825, TCP/IP, UDP; NTRIP caster capability with RTCM 104 rev 3 (can serve as a GNSS reference station); PTP / NTP Time Server capability
Inputs:	DGPS/RTK/PPP correction data from base station, if available (via RS232 UART or via NTRIP / Ethernet); odometer (A or A/B for levels up to 30 V, RS422 level compatible)
EMI/EMC Protection:	galvanic insulated voltage input stage with surge and over-voltage protection; I/O ESD protection extended EMI/EMC protection, lightning protection etc. is under responsibility of the integrator
Connectors:	iNAT-M200/SLx-FLAT: LEMO EGG / EGJ Series, SMA (antennas) iNAT-M200/SLx-OEM: HARWIN M80 Series, MCX (antennas)
Integrated Data Storage:	up to 128 GByte (lasts for several days continuous data sampling as “black-box” feature)
Graphical User Interface:	MS Windows or LINUX or MacOS based software iXCOM-CMD for configuration, visualization, data recording, data converting and playback operation
Power Supply:	9...34 V DC, approx. 8.5 …10 W (dep. on options); < 14 W for < 1 sec after power-on; no internal hold-over capacitor included (option: external hold-over capacitor)
Temperature; MTBF:	-40...+71 °C (outer case temperature) operating, -40…85 °C storage; 35’000 hrs
Shock / Vibration:	60 g, 11 ms, 10…2’000 Hz 5 g rms (endurance); 20...2’000 Hz 2 g rms (operation)
Environmental Protection:	iNAT-M200/SLx-OEM device in light weight open frame design (protection to be provided by user if any); IP41 for iNAT-M200/SLx-FLAT lite enclosed vesion; Note: See iNAT-M200/SLx (no “-FLAT” / no “-OEM” version) for our fully protected versions incl. EMI/EMC protection and integrated hold-over capacitor
Mass, size:	approx. 320 grams, 125 x 100 x 29 mm (iNAT-M200/SLx-OEM version, w/o enclosure); approx. 550 grams, 195 x 104 x 33 mm (iNAT-M200/SLx-FLAT version, with IP41 enclusure) (plus carrier with vibratation isolators, if desired [for iNAT-M200/SLx-OEM only])
Built-In-Test:	PBIT, CBIT, IBIT
Deliverables:	- iNAT-M200/xLx-FLAT or iNAT-M200/xLx-OEM, GNSS antenna(s), cable set (options), GNSS configuration and memory size as specified in purchase order (options) - integrated odometer interface for velocity aiding during longer GNSS outages (position error is then correlated to wheel sensor performance, typically 0.1 % of distance travelled) - integrated NTRIP interface for RTK aiding - Python scripts available for interfacing, SW-Development Kit with code examples under Qt / C) - Windows based GUI software (option) iXCOM-CMD
Options:	- up to all-frequency / multi-constellation RTK capability of the integrated GNSS receiver - dual-antenna GNSS based true heading (iNAT-M200/xxx-FLAT-DA & -OEM-DA) allows heading determination even at standstill conditions -> up to 0.2° at 1 m baseline

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