

# iPRENA-II /-III /-IV

## Family of precise Inertial/GNSS/VMS based Navigation Systems

iPRENA-II...IV is a product family of highly precise Inertial Navigation and Timing systems (iNAT).

It is used for north finding, navigation, surveying and dynamic motion measurements and contains ring laser gyros (RLG). The family covers applications, which require highest accuracy and reliability to the user.

- High performance inertial navigation and surveying systems for military applications in airborne, naval, underwater or surface platforms
- True North Reference, fast and accurate gyro compassing
- Integrated L1 GPS/GLONASS/GAL or SAASM GPS (up to L1L2 RTK as option)
- Interface for mil. Grad P/Y code GPS receivers
- Various parallel Interfaces: Ethernet TCP/IP, UDP, CAN, RS422/RS232 UART, ARINC825/429. PTP server capability
- Small size, low weight, low power.

iPRENA-II...IV consists of three high precision ring laser gyroscopes (RLG), three accelerometers, a powerful strapdown processor and an open and flexible interface.

The system contains GNSS receivers for GPS, GLONASS, GALILEO, BEIDOU etc.; it can also be operated with external GNSS receivers. Available COM I/Os are Ethernet (TCP/IP, UDP), RS422/232 UART, CAN, ARINC429, ARINC825, CANaero, NMEA 0183 as well as an internal data storage on solid-state non-volatile 32 GB memory.

Data processing (strapdown navigation, gyro compassing, north keeping or motion monitoring) is performed inside of the iPRENA as well as also data transmission and data storage.

A key feature is its high data rate of up to 400 Hz and its long time superior accuracy stability, which is a key factor of RLG technology.

iMAR's HMI software iXCOM-CMD allows the user full control of the system as well as data storing, visualization and to perform maintenance activities (e.g. download of stored data).



The iPRENA-II...IV systems come with the major advantages of optical gyros (e.g. no significant aging, i.e. high long time performance of gyro bias and scale factor as well as high reliability), and they do not suffer from the strong disadvantages of higher performance FOG based systems (like aging or degraded bias accuracy under vibration and temperature gradients etc.).

Due to the modular system architecture, the iPRENA systems can be delivered with customized data interfaces and connectors, e.g. to replace obsolete navigation systems of any other provider in a form, fit & function manner.

The system is only covered by European dual-use export control (no ITAR).



## Technical Data of iPRENA-II, iPRENA-III, iPRENA-IV (RMS)

Data Output:	Azimuth (True Heading), Elevation and Position, including standard deviations, Roll, Pitch, Angular Velocities etc.
Azimuth / True Heading iPRENA-II	[all values: sec Lat, free inertial / gyro compassing]: < 0.7 mil gyro compassing within 10 min.; 0.2 mil with GNSS on the move < 1.5 mil gyro compassing within 2 min.; 0.2 mil with GNSS on the move
iPRENA-III:	< 1 mil gyro compassing within 7 min.; 0.2 mil with GNSS on the move < 3 mil gyro compassing within 3 min.; 0.2 mil with GNSS on the move
iPRENA-IV:	< 2 mil gyro compassing within 8 min.; 0.2 mil with GNSS on the move < 3 mil gyro compassing within 4 min.; 0.2 mil with GNSS on the move
Elevation (Pitch), Roll:	< 0.5 mil (< 0.2 mil dynamically, with sufficient GNSS aiding and suff. dynamics)
Position and Velocity Accuracy:	< 2 m and < 0.05 m/s with GNSS aiding (S/A off); < 0.8 nm/hr CEP and < 1 m/s free inertial drift (iPRENA-II) <sup>1</sup> < 1.5 nm/hr CEP and < 1.5 m/s free inertial drift (iPRENA-III, iPRENA-IV) <sup>1</sup> < 0.1 % distance travelled (odometer available or ZUPTs during GNSS outages)
Altitude Accuracy (all versions):	< 3 m GNSS (S/A off) < 0.15 % distance travelled (odometer available or ZUPTs during GNSS outages)
Alignment Methods:	Static and Dynamic Alignment, Stored Heading/Position Alignment
Aiding Methods:	GNSS and/or VMS and/or ZUPT and/or waypoint
Data storage:	up to 32 GByte on internal non-volatile memory
Software:	iXCOM communication protocol; iXCOM-CMD GUI software under MS Windows and Linux available; integrated real-time Kalman filter (42+ states); customized applications can be integrated
Inertial Sensor Ranges:	± 395 °/s and ± 20 g (others as option)
GNSS Receiver (integrated):	up to L1L2 GPS+GLONASS+GALILEO+BEIDOU, RTK/PPP, L-Band SAASM as hardware option
Data Output Rate / bandwidth:	1...400 Hz; internal data rate 3'200 Hz
Output (options):	RS232/422 UART, Ethernet TCP/IP / UDP, PPT (Pulse Per Time), PPS, CAN, ARINC429, ARINC825, CANaero, NMEA 0183, USB; PTP / NTP
Inputs (options):	internal/external GNSS (standard: GPS/GLONASS/GALILEO integrated by hardware), marker event trigger, odometer (opto-coupler input up to 32 V, RS422 level compliant), PPS / SYNC
Temperature (case); rel hum.:	-30...+65 °C operating (-40...+71 °C degraded), -55...+85 °C storage ; 8...100 %, IP67
Shock, Vibration, Altitude:	6 g, 20 ms (operating); 10...2'000 Hz, 3.4 g rms; 60'000 ft
MTBF / MTTR:	> 25,000 hrs (estimated for surveying applications) / < 30 minutes
Qualification:	MIL-STD-810G, MIL-STD-461F, MIL-STD-704G, DO160G
Power:	10...35 V DC, < 20 W (incl. GNSS receiver); 50 ms hold up time according to DO160G
Weight / Size:	< 6.9 kg / approx. 187 x 128 x 296 mm <sup>3</sup> (without connectors)
Connectors:	MIL-C-38999 III, TNC

iMAR is manufacturing and developing inertial navigation and guidance systems for all application areas. All systems manufactured by iMAR are maintained at iMAR in Europe / Germany.

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<sup>1</sup> Can be improved if sufficient GNSS aiding and motion is available before switching to free inertial mode