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 multi-constellation / multi-frequency GNSS receiver (up to RTK / PPP)
- Interface for external mil. grade P/Y code GPS receivers (SAASM)
- Various interfaces: Ethernet TCP/IP, UDP, CAN, RS422/RS232 UART, ARINC825 /429. PTP and NTP server capability
- Small size, low weight, low power, high rel.
- As an option a version with integrated gun-fire approved isolators available (larger enclosure)

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

The system contains an GNSS receiver 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 a large internal data storage on solid-state non-volatile memory.

Data processing (strapdown navigation, gyro compassing / north seeking, north keeping or motion monitoring) is performed inside of the iPRENA as well as 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 configuration and maintenance activities (e.g. download of stored data).

The iPRENA-II…IV systems come with the major advantages of ring laser 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) and elevation, position and velocity (including standard deviations), roll, pitch, angular rates, acceleration, system status (BIT) etc.
Azimuth / True Heading	[all values: sec Lat, free inertial / gyro compassing]:
iPRENA-II	< 0.5 mil gyro compassing within 10 min.; 0.2 mil with GNSS on the move[1] < 1 mil gyro compassing within 5 min.; 0.2 mil with GNSS on the move[1]
iPRENA-III:	< 1 mil gyro compassing within 7 min.; 0.2 mil with GNSS on the move[1] < 3 mil gyro compassing within 3 min.; 0.2 mil with GNSS on the move[1]
iPRENA-IV:	< 2 mil gyro compassing within 8 min.; 0.2 mil with GNSS on the move[1] < 3 mil gyro compassing within 4 min.; 0.2 mil with GNSS on the move[1]
Elevation (Pitch), Roll:	< 0.5 mil (< 0.2 mil dynamically[1])
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)[2] < 1.2 nm/hr CEP and < 1.3 m/s free inertial drift (iPRENA-III) [2] < 1.5 nm/hr CEP and < 1.5 m/s free inertial drift (iPRENA-IV) [2] < 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/ Stored Position Alignment
Aiding Methods:	GNSS and/or VMS and/or ZUPT and/or waypoint aiding
Data storage:	up to 128 GByte on internal non-volatile memory; processed data and sensor raw data
Software:	iXCOM communication protocol; iXCOM-CMD HMI software under MS Windows and Linux available; integrated real-time Kalman filter (42+ states)
Inertial Sensor Ranges:	± 395 °/s and ± 20 g (others as option); GNSS altitude unlimited
Data Output Rate:	1…400 Hz; internal data rate 3'200 Hz
GNSS Receiver (integrated):	up to all-frequencies / all constellations GPS+GLONASS+GALILEO+BEIDOU, RTK/PPP, L-Band; option: independent heading determination with GNSS dual-antenna support, providing 4 mil / L [m] with L = antenna baseline (according to SIL demands)[3]
GNSS external receiver support:	Rockwell-Collins ERGR™ with SAASM / PPS (Precision Positioning Service) capability, other on request
Output Interfaces (options):	RS232/422 UART, Ethernet TCP/IP / UDP, PPT (Pulse Per Time), PPS, CAN, ARINC429, ARINC825, CANaero, NMEA 0183, USB; PTP / NTP Time Server
Input Interfaces (options):	internal/external GNSS (standard: integrated GNSS engine), marker event, PPS, trigger, odometer (opto-coupler input up to 32 V, RS422 level compliant)
Qualification:	MIL-STD-810G, MIL-STD-461F, MIL-STD-704G, DO160G
Temperature (case); rel humid.:	-30...+65 °C operating (-40…+71 °C degraded), -55...+85 °C storage ; 8...100 %, IP67
Shock, Vibration, Altitude:	6 g, 20 ms (operating); 5…2'000 Hz, 6.3 g rms (operating); 60'000 ft
MTBF / MTTR:	> 25,000 hrs (estimated for surveying applications) / < 30 minutes
Power Supply & Consumption:	10...35 V DC, < 20 W (incl. internal GNSS receiver); 50 ms hold up time according to DO160G
Weight / Size:	< 6.9 kg / approx. 187 x 128 x 296 mm³ (without connectors)
Connectors:	MIL-C-38999 Series III, TNC
Export license:	Standard Dual-Use equipment, not covered by ITAR

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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[1] with sufficient GNSS aiding and sufficient dynamics
[2] can be improved if sufficient GNSS aiding and motion is available before switching to free inertial mode
[3] under sufficient GNSS conditions