

# iNAV-RQH-RAIL

## Inertial Navigation System for Advanced Railway Surveying

iNAV-RQH is an INS product family for inertial navigation, gyro compassing and dynamically motion measurement with ring laser gyros that covers applications, which require highest accuracy, reliability and an open interface to the user.

- advanced navigation and surveying system for rail vehicle applications
- RLG technolog with very low angular random walk and high angular resolution
- high bandwidth, fast response
- integrated time synchronisation module and GPS
- Interfaces: Ethernet TCP/IP, CAN, RS232; Odometer, DGPS

The derivation iNAV-RQH-RAIL for advanced railway applications consists of three high precision ring laser gyroscopes (Dig-Gyro), three servo accelerometers



iNAV-RQH-RAIL is in use with the German Rail (picture: LIMEZ II) and with UK Railway companies

(Q-Flex), a powerful strapdown processor and an open and flexible interface, which can be customized.

As an option the modular designed system provides interfaces to (D)GPS, external triggers, speed sensor and external I/Os e.g. for position markers. Possible outputs are Ethernet, RS232/422 or analog as well as internal data storage on hard-disk or on silicon-disk. Furthermore application specific interfaces can be realized on request.

Due to the modular hardware and software architecture special adaptation of housing and mechanical dimensions to customer's requirements is also possible even if only small quantities shall be purchased. Data processing (strap-down algorithms, global or local navigation, north-seeking, north keeping or motion monitoring and control) inside of the iNAV-RQH-RAIL is as well possible as data transmission of pure or corrected raw data.

A key feature is its high available data rate of up to 1000 Hz and its unique resolution (0.001 degree in roll/pitch/yaw) as well as supe-



rior accuracy. As an option special railway surveying specific output data (e.g. inverse radius of curvature, measurement of displacement between boofie and waggon) can be provided.

## Technical Data of iNAV-RQH-RAIL

(different classes of accuracy available, separated by "/" in the following table):

Data Output:	Heading, Roll, Pitch, Angular Velocity, Velocity (body and world), Position, Raw data, internal status information, tbd	
Range:	$\pm 500$ deg/s (no angle limitation)	$\pm 10$ g (option 2/5/25 g)
True Heading:	$< 0.025 / 0.05 / 0.1$ deg sec(lat)	
Attitude Accuracy:	$< 0.02 / 0.025 / 0.03$ deg (0.005 deg available as option)	
Position Accuracy:	$< 1$ m (GPS / odometer aided); 1cm with DGPS and postproc with iKP+	
Velocity Accuracy:	$< 1$ mm/s (integrated Kalman based odo scale factor estimator)	
Alignment Time:	$< 10$ minutes	
Drift (unaided) / Offset:	$< 0.002 / 0.003 / 0.01$ deg/h	$< 60$ $\mu$ g
Bias stab. (const. temp.):	$< 0.002$ deg/h	$< 10$ $\mu$ g
Random Walk:	$< 0.0018 / 0.003 / 0.01$ deg/ $\sqrt{h}$	$< 8$ $\mu$ g/sqrt(Hz)
Resolution:	0.0003 deg (1,13"), 0.001 deg/s	
Linearity Error:	$< 10$ ppm	$< 20$ $\mu$ g/g <sup>2</sup> ( $< 100/60$ ppm)
Data Output Rate:	1...500 Hz (optional 1500 Hz), data with time stamp	
Data Latency:	$< 2$ ms (time stamp accuracy better 10 $\mu$ sec)	
Output (options):	RS232/422, Ethernet, CAN	
Inputs:	(D)GPS (option: GPS/GLONASS integrated) , event trigger (option)	
Synchronization:	Input for pulse-per-second [PPS] (if available)	
Power:	12...34 V DC, $< 40$ W	
Temperature:	-40...+65 °C (operating, case temperature) -40...+85 °C (not operating)	
Rel. Humidity:	8...100 %, IP67	
MTBF / BITE / MTTR:	$> 35,000$ hrs (estimated) / Build In Test capability / $< 30$ minutes	
Shock, vibration:	25 g, 11 ms ; 60 g, 5 ms (operating); 10...2000 Hz, 3 g	
Weight:	9.8 kg (depends on housing; light weight version on request)	
Size:	IMU: 299 x 213 x 179 mm	

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.

iMAR is being licensed by Honeywell Inc. to use their latest high reliable basic ring laser gyros (Dig-Gyro GG1320) in its own advanced inertial navigation and guidance systems for industrial and defence applications.

Please do not hesitate to contact us for further information or for a demonstration.



iMAR GmbH • Im Reihersbruch 3 • D-66386 St. Ingbert / Germany

Phone: +49-(0)-6894-9657-0 • Fax: +49-(0)-6894-9657-22

<http://www.imar-navigation.de> • [sales@imar-navigation.de](mailto:sales@imar-navigation.de)