

iTraceRT-R300

Most Accurate Real-Time Vehicle Trajectory and Attitude Surveying - Deeply Coupled INS/GNSS -

iTraceRT-R300 is a most precise ring laser gyro based INS/GNSS deeply coupled inertial navigation, measurement, surveying and control system for applications on the surface (land/sea) and in the air. It provides all kinematic measurements, like acceleration, angular rate, attitude, true heading, velocity and position of the target vehicle in real-time with a data update rate of up to 300 Hz.

- robust, compact, light weight
- Hi-Rel ring laser gyro technology (RLG)
- supports GNSS (GPS and GLONASS) in both uncorrected and corrected (RTK, DGPS) mode
- output of angular rate, acceleration, attitude, true heading, course over ground, velocity and position via USB, RS232/422 and Ethernet in real-time with up to 300 Hz
- CAN interface (100 Hz, up to 1 MBd)
- true heading determination by gyro compassing due to high gyro performance
- accuracies: 2 cm position, 0.003° roll/pitch/heading, 25 µg acceleration and 0.005 m/s velocity with RTK L1/L2 GNSS
- suitable in high dynamic environment (20 g, 450 °/s)
- lowest gyro drift allows long free inertial navigation in case of GNSS outages
- shortest re-acquisition time after loss of RTK

To determine the motion of a vehicle with centimeter accuracy, RTK aiding of the INS with GNSS data is required. While conventional systems are only suitable in an environment which guarantees an open sky all over the measurement (no bridges, no urban canyons), the deeply coupled INS/GNSS inside the iTraceRT overcomes this lack of those systems. Inside of the iTraceRT, the RTK GPS information is used to aid the INS, and additionally the accurate INS position and velocity solution is fed back to the GPS engine to improve the signal tracking and signal processing inside of the advanced GPS receiver and to reduce multipath impacts dramatically. At the end of a period of GPS outage the receiver knows its own position from the INS and this leads to the superior re-acquisition time and system performance.

The re-acquisition time for RTK performance is therefore significantly reduced.



Classical INS/GPS Coupling



iTraceRT: Deeply Coupled INS/GPS

The deeply coupled solution and aiding between INS and GNSS, using a most precise ring laser gyro based inertial measurement system (RLG-IMU) of class 0.003 deg/hr, provides the high system performance and system reliability which is required in all advanced tasks of vehicle motion dynamics testing, automated vehicle steering, trajectory surveying and motion control (car / truck / naval vessel / civil and military aircraft).



For land vehicles additionally an odometer aiding capability is available as an option. The iTraceRT-R300 is delivered with Windows-based configuration software. With reduced position accuracy, iTraceRT can also be operated without RTK GNSS correction data (stand-alone GPS / GLONASS or DGNSS).



Technical Data: iTraceRT-R300 (all rms values)

	Rate	Acceleration	Attit./Heading	Position (LLA)	Velocity (ENU/Body)
Range:	± 450°/s	± 20 g	unlimited	unlimited (no phys. limitations)	
Accuracy (1σ):	0.003°/h 0.002°/h	0.025 mg 0.025 mg	pure INS, unaided, day-to-day, OTR pure INS, after 5 minutes RTK-GPS aiding		
Angles:		0.003° RP, 0.008° Y ¹ 0.003° RP, 0.008° Y 0.003° RP, 0.008° Y 0.05° Side slip angle (v > 10 m/s) ²	(INS/RTK-GPS) (after 60 sec GPS outage) (after 180 sec GPS outage)	
Position horizontal / vertical:			± 2 cm / 5 cm + 2 ppm (INS/RTK-GNSS) ± 5 cm / 8 cm (10 s RTK outage) ± 50 cm / 15 cm (60 s RTK outage, no ODO) ± 2 cm / 5 cm (postproc, RTK GNSS) ± 10 cm / 8 cm (postproc, 60 s RTK outage)	
Velocity:				0.005 m/s (INS/RTK-GPS) 0.007 m/s (10 s GNSS outage) 0.010 m/s (60 s GNSS outage)
Noise:	< 0.002°/√h	< 10 μg/√Hz	0.001°	< 1 mm	< 0.002 m/s
Resolution:	< 0.001°/s	< 10 μg	0.001°	< 0.5 mm	< 0.001 m/s
Scalefactor error:	< 0.0005%	< 0.015%	< 0.0005%		
Initial Alignment:	automatic, with deeply coupled (bidirectional) INS/GNSS Kalman filter				
Data Processing Rate:	300 Hz; PPS timing accuracy better 10 ns				
Data Output Rate:	LAN / USB 2.0: 1...300 Hz; CAN: 100 Hz; RS232/422 up to 230.4 kBd				
Synchronization:	PPS output (TTL); with each PPS a time message is sent via CAN bus				
Output:	USB Host, RS232, CAN (1 MBd), Ethernet LAN (100 MBd)				
Inputs:	RTK-Base (RS232); odometer (A or A/B at RS422 level) as an option				
Graphical User Interface:	Windows based software iTraceRT-Command				
Power Supply:	11...34 V DC, 35 W				
Temperature,:	-40...+63°C operating (outer case temperature); -55...+85 °C storage				
Shock, Vibration:	30 g / 11 ms, 3 g rms (20-2000 Hz) endurance				
Mass, Size, Protection:	approx. 7.5 kg / approx. 186 x 250 x 124 mm (WxDxH) plus connector; IP66				
Qualification:	MIL-STD 810F, MIL-STD 461E (temperature, vibration, sand&dust, humidity, altitude, salt fog, EMI/EMC)				
Deliverables:	<ul style="list-style-type: none"> - RLG based INS with integrated L1/L2-RTK-GNSS, GPS/GLONASS antenna - Windows based GUI software iTraceRT_Command 				
Options:	<ul style="list-style-type: none"> - Odometer interface for aiding during longer GPS outages (position error then limited to approx. 0.1% of distance travelled) - TerraStar based SBAS correction data interface; GLONASS option - Wireless data transmission for correction data from GPS base station - GSM or GPRS based wireless modem for internet based correction data - iREF-L1L2 GNSS Reference Station (RTK capability) - Interface for ABD Steering Robot and Ethernet data output - Optional QZSS, Beidou and Galileo support. 				

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¹ RPY = Roll/Pitch/Yaw (Azimuth = -Yaw)

² The side slip angle is the angle between course over ground (CoG) and true heading. It is calculated from the longitudinal and transversal velocity of the vehicle. Its accuracy therefore increases with increasing velocity. At standstill the side slip angle is undefined.

