iTraceRT-MVT-100/RLD-M-DA

Economic Miniature MEMS Based Inertial Navigation System with integrated MF/MC RTK Dual-Antenna INS/GNSS/ODO/xxx Data Fusion

iTraceRT-MVT-100/RLD-M-DA is a member of the advanced iTraceRT-MVT series and directly derived from iMAR's iNAT series (Navigation and Timing) and one of the smallest powerful MEMS based INS/GNSS inertial navigation measurement systems on the market for automotive surveying and control applications. It provides PNT (positioning, navigation & timing) relevant data as all kinematic measurements like acceleration, angular rate, attitude, true heading, velocity and position of the target vehicle in real-time incl. timestamp and standard deviation with a data update rate of up to 500 Hz.

iTraceRT-MVT-100/RLD-M-DA comes in a miniature, light-weight enclosure and is fully compatible with the other iTraceRT-MVT systems as well as with iSWACO-ARGUS. It is also available as open-frame OEM version (without enclosure, **iTraceRT-MVT-100/RLD-OEM-DA**). All versions provide single antenna and dual antenna GNSS support.

- robust, compact, light weight system, ~370 grams, excellent SWaP; fully **IP67** protected enclosure
- **Low power consumption: typ. < 5 W**
- based on high grade MEMS Gyro, Accel technology with integrated multi-frequency / multi-constellation (MF/MC) GNSS with dual-antenna heading and RTK support
- support of simultaneous GPS, GALILEO, GLONASS, BeiDou, multi-frequency
- Options for high/low range angular rate (-HRR/-LRR) and high range acceleration (-HRA) available
- odometer / wheel sensor aiding capability
- output of angular rate, acceleration, attitude, true heading, CoG, velocity, position, timestamp and standard deviations in realtime with up to 500 Hz (adjustable). Also raw data for post-proc available
- several processing modes: Standard mode with 1 m position accuracy and RTK mode with 0.02 m position accuracy
- interfaces: UART / CAN / Ethernet / USB / PPS_OUT, TRIG for realtime data output and DGPS/RTK correction input; odometer
- up to 128 GByte internal memory ("black-box")
- easy to use, easy to configure; powerful GUI

Depending on the application, environmental conditions and required realtime accuracy, the data fusion includes INS, GNSS, VMS or any other external sensor, providing position and/or velocity, standard deviation and time stamp.
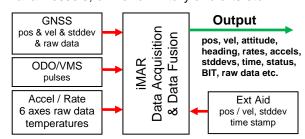
In urban canyons often the number of observable satellites is quite limited and therefore the iTraceRT-MVT-100/RLD supports an all GNSS constellation data fusion. The 42+ state Extended Kalman Filter processing guarantees a significant better and more robust position and velocity result compared to standard solutions.

For land vehicles additionally an odometer aiding capability is available as an option, the scale factor of the wheel sensor is estimated automatically.

The iTraceRT-MVT-100/RLD provides system performance and system reliability which is required in standard tasks of navigation, guidance and control, mapping, vehicle motion dynamics testing, trajectory surveying and platform control tasks for cars, trucks, naval vessels, civil and military aircrafts etc.

The iTraceRT-MVT-100 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. It also allows powerful playback capabilities and provides data export in many formats (csv, xml, GoogleEarth, Inertial-Explorer, GrafNav). With iREF-GNSS, iMAR presents a GNSS reference station to provide RTK corrections for centimeter level accuracy on demand.

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

Technical Data iTraceRT-MVT-100/RLD-M-DA (typical, rms):

	Rate	Acceleration	Attit./Heading	Position	Velocity	Height
Range[1]:	± 500 °/s	± 8 g	unlimited	unlimited	515 m/s	unlimited
Bias Stability (AV)[1]:	< 2.5 °/h	< 0.1 mg			(without	
Bias (filtered[2]):	< 5 °/h	< 1 mg			export	
Bias day-to-day[3],[1]:	< 0.2 °/s	< 2 mg			control)	

Angles (Attitide, Hdg.):		0.1° / 0.3° | 0.05° / 0.15° RP/Y	(INS / GNSS, w/o | with RTK)
		0.15° / 0.35° | 0.1° / 0.2° RP/Y	(after 10 s GNSS outage, w/o | with RTK)
		0.1 deg heading for 2 m baseline in dual-antenna setup (/RLD-DA) [2]	
Position (horizontal plane) [4]:	*for iTraceRT-MVT-100/RLD:*		+/- 0.03 m CEP (INS/GNSS RTK real-time)
			+/- 0.02 m CEP (INS/GNSS RTK post-proc)
			+/- 0.4 m CEP (INS/GNSS with SBAS)
			+/- 1.8 m CEP (INS/GNSS)
			0.8 % of DT CEP (with VMS, during GNSS RTK outage)[5]
Velocity:			0.02 m/s (INS / RTK GNSS)

	Rate	Acceleration	Attit./Heading	Position	Velocity
Noise:	0.15 °/sqrt(hr)	23 µg/√Hz	0.02 °	< 0.01 m	< 0.01 m/s
Resolution:	< 0.000'1 °/s	< 20 µg	0.001 °	< 0.001 m	< 0.001 m/s
Linearity error:	< 0.2 %	< 0.5 %	< 0.2 %		
Scale factor error:	< 0.3 %	< 0.1 %			
Scale factor (filtered)	< 0.1 %	< 0.07 %	< 0.1 %		

g / g² depenent gyro drift:	< 32 °/h/g / 1.8 °/h/g² (internally compensated)
INS / GNSS / ODO proc.:	integrated advanced 42+ state INS/GNSS/+ extended Kalman filter data fusion
Internal GNSS Engine:	multi-frequency / multi-constellation GPS / GLONASS / GALILEO / BeiDou, SBAS, QZSS, RTK; > 150 channels
Data Processing Rate:	up to 500 Hz; PPS timing accuracy better 10 ns
Data Output Rate:	1...500 Hz; all data available in real time, latency < 3 ms, jitter < 1 ms
Synchronisation:	1 x PPS_OUT (LVTTL level, latency < 1 µs); 1x EVENT_IN (LVTTL level, latency < 3 ms)
Real-Time-Clock (RTC):	available as option
Output (options):	1 x USB, 1 x CAN, 1 x UART (LVTTL), 1 x UART (RS232 or RS422), Ethernet 100 Mbit/s (TCP/IP, UDP, NTRIP caster with RTCM 104 rev 3 (can serve as a GNSS reference station); NTP Time Server)
Inputs:	odometer (A or A/B opto-coupler; 3.5 …30 V, 5 mA)
Data Latency:	< 1 ms (sampling accuracy better 1 µs, time-stamped according to PPS; jitter < 1 ms) in RTK mode
Connectors:	MIL-C-38999 III (data), SMA (antenna), M12 (Ethernet)
Integrated Data Storage:	32 GByte (option: 128 GByte); lasts for several days continuous data sampling as "black-box"
Graphical User Interface:	MS Windows or LINUX or MacOS based GUI / HMI software iXCOM-CMD for configuration, visualization, data recording, data converting and playback operation
Power Supply:	9...34 V DC; < 5 W; reverse an overvoltage protection up to 60 V;
Temperature; MTBF:	-40...+71 °C (outer case temperature) operating, -40…85 °C storage;
Shock, Vibration, Altitude:	60 g, 11 ms, 10…2'000 Hz 5 g rms (endurance); 10...2'000 Hz 2 g rms (operational); 60'000 ft
Mass, size; IP:	370 grams , ≈ 101 x 81 x 63 mm³ (without connectors); IP67
Part Number:	00190-06504-0407 (iTraceRT-MVT-100/RLD-M-DA, standard range +/- 500 deg/s, +/- 8 g)
Deliverables:	- MEMS based INS with integrated GNSS receiver, GNSS antenna, cable set
	- dual-antenna GNSS based true heading (**iTraceRT-MVT-100/RLD-M-DA**) allows heading determination even at standstill conditions → typ. 0.2° at 1 m baseline; this feature is default delivery for standard purchases
	- odometer (VMS) interface for velocity aiding during longer GNSS outages (position error is then correlated to wheel sensor performance, typically 0.1 % longitudinal error of distance travelled)
	- iXCOM-CMD MS Windows or LINUX or MacOS based GUI software
Options:	- SW-Development Kit with DLL available (with SDK under Qt / C)
	- Python and ROS 2 interface available
	- interface to iMAR Dynamic Mesh Communication System of up to 128 vehicles on a proving ground (car-2-base and car-2-car simultaneously with up to video data rate and latency < 50 ms (rms))
	- interface to ABD driving robot (via Ethernet)
	- fully compatible to the holistic Proving Ground Automation Tool Chain iSWACO-ARGUS

iMAR Navigation GmbH • Im Reihersbruch 3 • D-66386 St. Ingbert / Germany
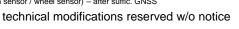## Phone: +49-(0)-6894-9657-0 • Fax: +49-(0)-6894-9657-22

www.imar-navigation.de • sales@imar-navigation.de