iTraceRT-MVT-600

Ultra Precise Inertial Measuring System for Vehicle's Trajectory & Dynamic Surveying and Vehicle Guidance & Control Applications

iTraceRT-MVT-600 is part of the iTraceRT-MVT product family of compact Inertial Measurement and Navigation Systems. It is applied for true heading determination and for dynamically motion analysis with ring laser gyros, serving applications, which require accuracy, reliability, a flexible interface and easy usage.

- High performance ring laser gyro based inertial navigation and surveying system for land applications; self-alignment / gyro compassing; ultra-high gyro scalefactor accuracy.
- Integrated time synchronization module and GPS / RTK-GNSS engine with single or dual antenna. External atomic clock as option.
- High data rate, open interface: UART RS422 / RS232, Ethernet TCP/IP - UDP, CAN, ARINC429, ARINC825, NMEA 183.
- Integrated VMS / odometer interface.
- Internal 32 GByte non-volatile memory ("black-box")
- Small size, low weight, low power; integrated surveying markers and aiding support points on the enclosure (to support also advanced surveying applications).

The [iTraceRT-MVT-600](#) consists of three high precision ring laser gyroscopes, three servo accelerometers, a powerful strapdown processor and an open and modular architecture, which allows also adaptations to customer's demands.

The system contains an L1L2 RTK capable GNSS receiver (GPS, GLONASS, GALILEO, Beidou) with several Dig-I/Os (e.g. for odometer, laser altimeter, DVL). Optional communication I/Os are Ethernet (TCP/IP, UDP), RS422/232 UART, CAN, ARINC429, ARINC-825 as well as internal data storage on non-volatile memory. Data processing (strapdown navigation, gyro compassing or motion monitoring) is performed inside of the iTraceRT-

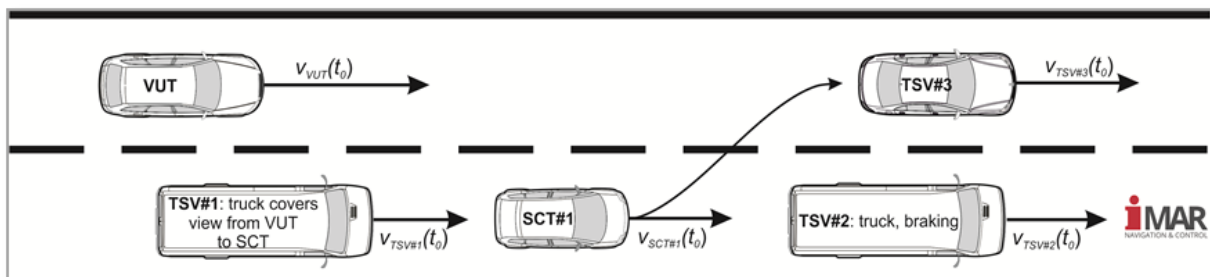MVT-600, and also data transmission and storage of pure or corrected raw data is available.

A key feature is its high data rate of up to 400 Hz and its unique resolution (0.001 degree in roll/pitch/yaw) as well as its superior accuracy (e.g. for high performance localization e-

ven during longer GNSS outages). The Multi-Vehicle-Tracking Mode (MVT) is an algorithm and feature, which allows an exchange of information between several iTraceRT-MVT systems without the need of any additional computation power. iTraceRT-MVT-600 can also operate as PTP time server as an option.

The iTraceRT-MVT-600 contains a tightly or loosely coupled INS/GNSS based data fusion, using iMAR's highly sophisticated 42+ state Kalman filtering incl. gyro compassing, free inertial or dead-reckoning navigation etc.

The system iTraceRT-MVT-600 is not ITAR controlled but only covered by standard European dual-use export control. With iTraceRT-MVT-xx, several fit-function (FF) compatible systems are provided on MEMS, HRG and FOG technology. With iTraceRT-MVT-500-DA a compatible system with dual-antenna GNSS technology is provided, which even does not require any export license.

Technical Data of iTraceRT-MVT-600 (rms values)

Data Output:	Heading, Roll, Pitch, Angular Velocity, Velocity (Body and World), Position, Raw Data of INS / GNSS / VMS incl. time-stamp, Internal Status Information
True Heading	0.086° sec(lat) free inertial; < 0.01° with GNSS, < 0.008° post-proc RTK
Attitude Accuracy:	< 0.025° (< 0.01° with GNSS, < 0.0025° postproc with RTK aiding)
Position Accuracy	< 1.5 nm/hr free inertial [CEP]; typically < 1.6 m GPS (S/A off) and < 10 cm RTK online (+1 cm under sufficient GNSS conditions) < 0.6 m [rms] SBAS (WAAS/EGNOS), < 0.1 m DGPS / TerraStar and 2 cm RTK/INS (post-proc.) < 0.1 % distance travelled [CEP] (with odometer and GPS, application dependant)
Velocity Accuracy:	5 mm/s (aided with L1/L2 RTK GPS, < 3 mm/s postproc RTK)

ARW / bias / alignment Time:

Gyroscopes		Accelerometer		0.25°	0.15°	0.10°	0.086°
< 0.0050 °/$\sqrt{h}$	0.010 °/hr	< 12 µg/$\sqrt{Hz}$	100 µg	2 min	4 min	8 min	10 min @ lat 0°
				4 min	8 min	35 min	75 min @ lat 50°

	Gyroscopes	Accelerometer
Range:	± 395 °/s	± 20 g
Bias Stability (AllanVariance):	< 0.0015 °/hr	< 12 µg
Resolution:	0.00033 ° (1,2"), < 0.001 °/s	< 5 µg (depends on data rate)
Scale/Linearity Error:	< 15 ppm / < 10 ppm	< 100 ppm / < 30 µg/g²
Axis Misalignment:	< 30 µrad	< 50 µrad

GNSS Receiver (integrated):	up to L1L2 GPS+GLONASS+GALILEO+BEIDOU, SBAS, RTK/PPP
Input Interfaces (options):	external GNSS receiver (standard: integrated GNSS receiver); event trigger (PPS / SYNC, RS422 level), odometer (opto-coupler input up to 32 V, A/B quadrature or counts & direction, RS422 level compliant); interface to ABD steering robot
Output Interfaces (options):	UART RS232/422, Ethernet TCP/IP / UDP, CAN, ARINC429, ARINC825, HDLC/SDLC, PPT (Pulse Per Time), PPS, SYNC; PTP / NTP Time Server (since HW rev. 4)
System Interfaces (options):	I/F for iDMN Dynamic Mesh Communication Network, iSWACO-ARGUS, iXCOM-CMD
Data Output Rate:	1…400 Hz, internal data rate 3'200 Hz
Data Latency:	< 5.3 ms (sampling accuracy better 1 µs, time-stamped according to PPS; jitter < 1 ms)
Data storage:	32 GByte on internal non-volatile memory
Atomic Clock TimeRef. (opt.):	External high precision clock, drift < 100 ps/s (= 90 µs / 10 days) for -15…+55 °C ambient temperature
Connectors:	MIL-C-38999 Series III for signals and power, TNC for antenna
Temperature (case):	-30...+65°C operating, -55...+85°C storage
Rel. Humidity:	8...100%, IP67
MTBF / MTTR:	> 25,000 hrs (estimated for surveying applications) / < 30 minutes
Shock, Vibration, Altitude:	6 g, 20 ms (operating); 10…2'000 Hz, 3.4 g rms; 60'000 ft
Qualification:	MIL-STD-810G, MIL-STD-461G, MIL-STD-704F, DO160G
Power:	10...35 V DC, < 20 W (incl. GNSS); 50 ms hold up time according to DO160E; continuous overvoltage protection up to 60 V
Weight / Size:	approx. 6.9 kg / approx. 187 x 128 x 296 mm³ (w/o connectors);
Installation:	Installation in all arbitrary orientations allowed
Software:	iXCOM communication protocol; iXCOM-CMD GUI software under MS Windows and Linux available; INS/GNSS post-proc iWP+ / iIP+; integrated real-time Kalman filter (42+ states); on request customized applications can be integrated

iMAR Navigation manufactures and designs inertial navigation, surveying, guidance, control, stabilization and automation systems for defence, airborne, industrial, automotive, agriculture, mining, drilling, surveying and many other applications. All systems are manufactured and maintained by iMAR Navigation in Europe / Germany.