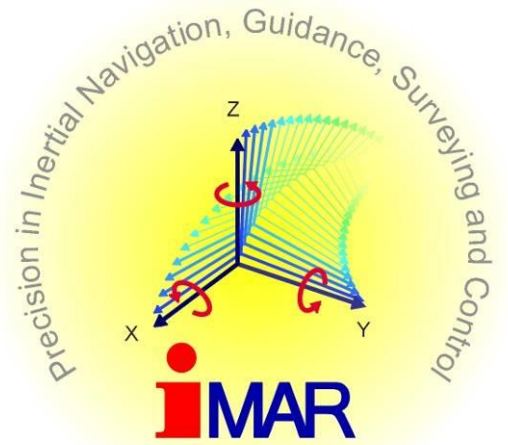
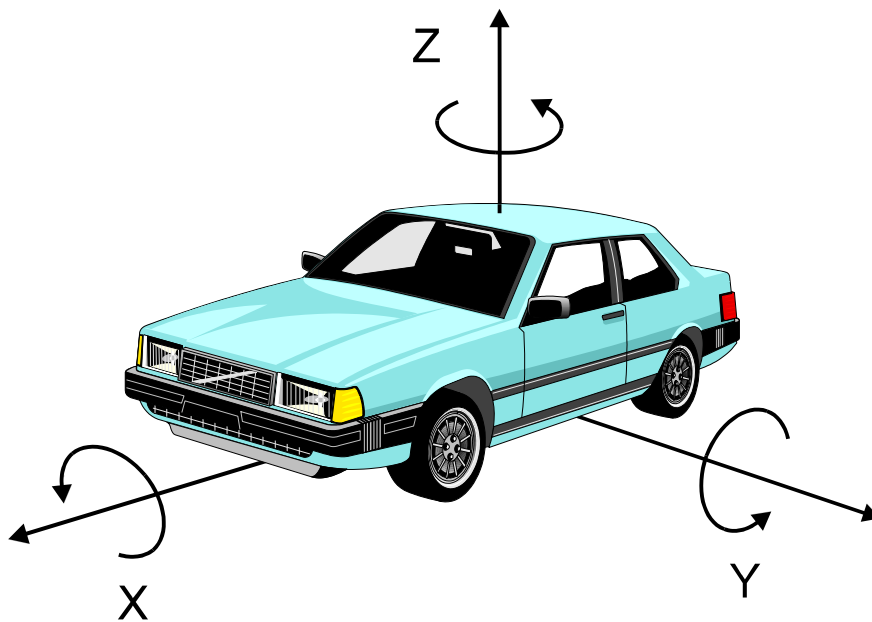


**use
iNAT-FSSG or iTraceRT
for new projects!**



iDIS

... when it comes to motion analysis



Measurement of Dynamical Motions
and 3D Topology Surveying
with Advanced Inertial Measuring Systems

iMAR GmbH, D-66386 St. Ingbert / Germany



iDIS

...when it comes to motion analysis

iDIS is an inertial measuring system for determining all kinematic data of a moved object. In specific these data are acceleration, rotation rate, angles, velocity or position. Contrary to conventional, disturbance sensitive gimballed platform systems iDIS uses strap-down technique. Therefore the system shows advanced features like a high accuracy, a high robustness, no maintenance and nevertheless a simple use.

The standard version of iDIS consists of three rotation rate sensors, three accelerometers, a digital signal processing unit and an interface for the data output. Depending upon the system's options the measurement data are processed by an algorithm which compensates the earth rotation rate and the

gravity either in real time or off-line on different computer systems which can be external or integrated in the sensor package. For data output there is a variety of choices available (e.g. RS232, analog, Ethernet, CAN, memcard). The systems are delivered with our software DIS_Command to operate them from an external laptop or customized interface.

In order to offer different accuracy classes, iDIS has a wide range of sensor technologies available as there are the closed-loop and open-loop fiber optical gyroscopes (FOG), the ring laser gyros (RLG) or optional piezo-vibrating gyros (PVG), micro-machined gyros (MEMS) and mechanical dynamically tuned gyros (DTG).

| System's Name | System Configuration |
|---------------|---|
| iVRU-SSA5 | PVG, LC_Acc Low Precision |
| iVRU-FC | OL-FOG, Servo-Acc Medium Precision |
| iDIS-FMS | MX-FOG, Servo-Acc High Precision |
| iDIS-FMS-M | MX-FOG, Servo-Acc for Motorcycles |
| iDIS-FMS-E | MX-FOG, Servo-Acc Standard Precision |
| iNAV-RQH | RLG, Servo-Acc Ultra High Precision |
| iDIS-CUSTOM | Custom Specific Solution |

- Options:
- (D)GPS coupling
 - PPS Synchronization
 - Virtual Measuring Point
 - Various Analog/Digital-I/Os
 - User-Interface with RS232
 - CAN Interface
 - Realtime Kalman Filter
 - Additional Sensor Aiding
 - Navigation Kernel
 - Customer specific configuration

Applications:

- Analysis of motion dynamics and position of cars, trucks, motorcycles and rail vehicles according to DIN/ISO 70 000.
- 3D Topology surveying of test roads.
- Measurement of the vector of acceleration, rotation rate and angle of arbitrary moved objects.
- Determination of position and direction of watercrafts.
- Analysis of driving comfort.
- Chassis optimisation.
- Antenna platform stabilisation.
- Control of 3D motion simulators
- Navigation and control of vehicles on land, at sea and in the air.
- Kinematic measurement of buildings and dynamically stressed structures.
- Geodetic survey. GPS/INS systems
- Highly precise direction reference.

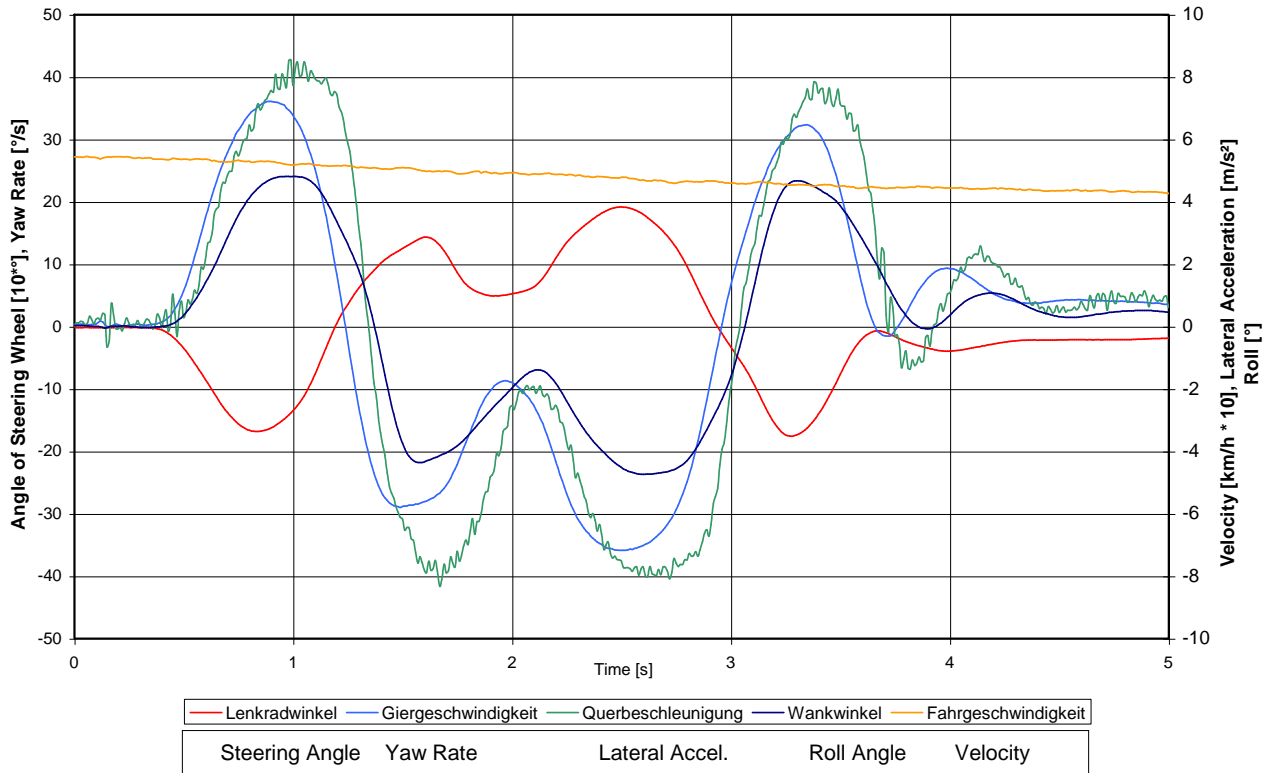
Example: Elktest, measured with iDIS-FMS

Double Change of Lane (Elk Test)

ZF Lemförder Fahrwerktechnik, Januar 2002

Inertial Measuring system: iDIS-FMS (iMAR)

Speed during change of state: $v=54\text{km/h}$



References (excerpt):

- Mercedes Benz AG, Stuttgart (PKW und NFZ)
- Continental - TEVES, Frankfurt
- DaimlerChrysler AG, Stuttgart
- Opel AG, Rüsselsheim; FORD AG, Köln
- Wehrtechnische Dienststellen / BWB, Koblenz
- Deutsche Bahn AG, München und Minden
- SMART, Böblingen; Siemens VT AG, Berlin
- ZF, Friedrichshafen; Toyota; Honda
- ZF Lemförder Fahrwerkstechnik, Lemförde
- BMW AG, München; Audi AG, Ingolstadt
- GIF, Aachen; PD&E Niederlande
- SACR, Schweiz; Arsenal Wien; DEKRA
- TRW; GM; FKFS, Stuttgart
- Uni der Bundeswehr, Hamburg
- Steyr-Daimler-Puch, Steyr;
- Uni of Federal Armed Forces Hamburg
- BAE SYSTEMS, GEC, United Kingdom
- Omnicom, United Kingdom
- PD&E Automotive, NedCar, Niederlande
- DLR, Oberpfaffenhofen; IFI, Hannover
- CMI Belgien; GP Korea
- SkyGate B.V., Niederlande/Bulgaria
- Schiffbauversuchsanstalt Potsdam
- IGGF, München; IAPG, München
- Audi, Ingolstadt; Siemens VDO
- LRDE, India
- Honda Germany; Toyota Belgium
- Dongfeng Motors, China
- Nanjing University, China
- Wuhan Ledor, China
- etc.

Highlights iDIS-FMS / iNAV-FMS:

- Motion Dynamics Analysis up to 400 Hz data rate
- Accurate determination of position, attitude and heading
- Autonomous vehicle guidance, steering robots, navigation of service robots
- 3D-Topology surveying of test roads
- iDRPOS-algorithm for accurate GPS-coupling
- minimized size and weight: 6.5 kg, height 132 mm

| TECNICAL DATA | iVRU-FC | iDIS-FMS [iDIS-FMS-E] | iNAV-RQH |
|---|---|---|--|
| Rotation Rate Range Resolution Linearity/scalef. error Gyro Drift | ± 200 deg/s 0.001 deg/s < 0.3 % / 0.3 % < 15 deg/h ²⁾ | ± 500 [450] deg/s < 0.0005 deg/s < 0.03 % / 0.03% 0.75 deg/h | ± 500 deg/s 0.0001 deg/s 0.001 % / 0.001 % < 0.01 °/h |
| Roll, Pitch, Yaw-angle (ϕ, θ, ψ) Range Accuracy (time dep.) Resolution Linearity Error | ± ∞ 0.25 deg 0.01 deg < 0.3 % | ± ∞ 0.05 [0.15] deg 0.001 deg < 0.03 % | ± ∞ 0.005deg 0.0003 deg 0.001 % |
| Acceleration Range Accuracy Resolution Linearity/scalef. error | ± 2 g 5 mg 1 mg < 0.2 % / 0.2 % | ± 5 g 1 mg [2 mg] 0.05 mg < 0.03 % / 0.05 % [0.15 %] | ± 10 g / 25 g < 0.1 mg 0.001 mg < 0.005 % / 0.016 % |
| Data Output Analog Channels Dig. Data Storing | 6 (opt.) | 10 (opt.) ✓ | 10 (opt.) ✓ |
| Ext. Inputs Analog Channels Digital Channels | - - | opt. (up to 15) opt. | opt. opt. |
| Inertial Velocity Measuring | - | with GPS aiding | with GPS aiding |
| I. Position Measuring | - | with GPS aiding ⁴⁾ | with GPS aiding ⁴⁾ |
| DR Position Measuring | - | ✓ (opt.) ⁴⁾ | ✓ (opt.) ⁴⁾ |
| Input for external Velocity Aiding (Odo) v_x | optional ¹⁾ | optional ¹⁾ | optional ¹⁾ |
| Internal GPS-Receiver | optional | yes | yes (opt.) |
| North seek. with Gyros | no | no ³⁾ | yes, better < 0.1° |
| North seek. with GPS | no | yes ³⁾ | yes |
| Bandwidth | 100 Hz | 200 Hz | 500 Hz |
| Output Frequency | ≤ 200 Hz | ≤ 400 Hz | ≤ 2000 Hz |
| Sensor Technology | Open-loop Fiber Gyro (FOG) | Closed-loop Fiber Gyro (FOG) | Laser Gyro (RLG) |
| Strapdown Computer | µC | embd. Pentium | embd. Pentium |
| Mass | 1.5 kg | 6.5 kg | 9.5 kg |
| Size | a) | b) | c) |
| Power Supply | 11...34 V DC | | |
| Warm-up Time | < 1 minute | - | - |
| Shock | 90 g, 11 ms | 60 g, 11 ms | 60 g, 11 ms |
| MTBF (Sensors) | > 20,000 h | > 20,000 h | > 50,000 h |
| Temperature | -30...+60 °C (case temp., other optional) | | |
| Options | | | |
| Laptop-Softw. | VRU_Command | NavCcommand | NavCcommand |
| Virtual Measuring Point | | ✓ | ✓ |
| Trajectory Surveying | | ✓ | ✓ |
| Lane Marking Detection I/O | | ✓ | ✓ |
| CAN-Bus-Interface | ✓ | ✓ | ✓ |
| Ethernet 10/100BaseT-Interf. | | ✓ | ✓ |
| Additional I/O | | ✓ | ✓ |
| GPS for initial Alignment | ✓ | ✓ | ✓ |
| (D)GPS, PPS-Sync | ✓ | ✓ | ✓ |

Size of the housing:

- a) approx. 120*120*135 mm³
b) approx. 265*145*132 mm³
c) approx. 350*212*180 mm³

- 1) Odometer input opto-isolated (A, A/B, A+forw./backward)
2) After initial alignment
3) Option GPS for initial alignment recommended
4) Option: Inertial or Dead-Reckoning (with Odometer)

iMAR GmbH

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

eMail: sales@imar-navigation.de

<http://www.imar-navigation.de>