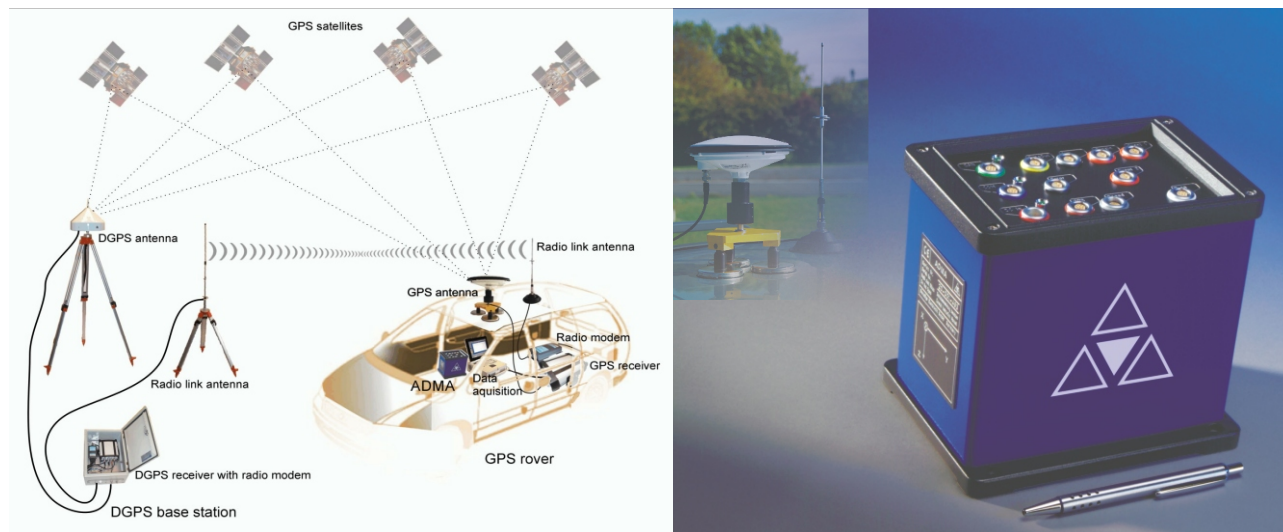




## ADMA-G: Automotive Dynamic Motion Analyzer with DGPS



### Gyro system and Precision GPS for Automotive Testing

The ADMA (Automotive Dynamic Motion Analyzer) gyro system was developed especially for the dynamic testing of automobiles. Using the ADMA all dynamic movements of a vehicle such as acceleration, speed, position, turning speed and angle of the vehicle can be tracked with a high degree of accuracy.

#### Special features

- Measurement of vehicle motion in three axes
- Dynamic attitude (pitch& roll) and heading determination
- Precise acceleration and position calculation due to extended Kalman filter
- Accurate position data with internal WAAS/EGNOS DGPS receiver (< 1 m)
- Highly accurate position data with internal RT2 DGPS receiver and DGPS-base station (2 cm)
- Robust inertial strap-down measurement technology without moving parts
- CAN-Bus data interface compatible with DIAdem (NI) software

#### Range of applications

- |   |   |
|---|---|
| Vehicle driving dynamics analysis       | Deceleration/acceleration testing         |
| Adjustment of chassis systems           | Tyres testing                             |
| Road holding test                       | Road survey                               |
| Kinematic and elasto-kinematic analysis | Track analysis                            |
| Verification of simulation models       | GIS data acquisition                      |
| Steering robot navigation               | Verification of driver assistance systems |

**Improved design: smaller, lower weight, GPS inside, Kalman filter, software upgradable**

Sensor technology for automotive testing and tunnelling  
Inclination-, gyro-, laser- metrology  
Industrial image processing



## Description

The ADMA gyro system was especially developed for dynamic testing of vehicles. The ADMA-G continuously measures both the acceleration and position in all three axes and the pitch, roll and heading angle of a moving vehicle. The system can also be used for the dynamic calculation of speed. The ADMA-G is the sophisticated ADMA version with an integrated GPS receiver for highly accurate measurements.

The system comprises

- Three fibre optic gyros (unaffected by acceleration) for detecting rotational motion
- three servo accelerometers for determining acceleration
- an internal GPS receiver for accurate position update with WAAS- or RTK-DGPS corrections
- a 32 bit processor unit that continuously calculates the angular orientation and position from internal sensor signals and external information (e.g. velocity sensors).

The package is implemented in Strap-Down-Technology without moving parts and is therefore extremely robust and resistant against shocks and vibration. Additionally all components for DGPS data generation (antennas, radio link ...) are provided.

The calculation algorithms are optimised for dynamic vehicle tests such as slalom and circular movement and take account of the gravitational acceleration and rotation of the earth. In addition to the integrated DGPS receiver an external speed signal (odometer or Correvit) can be connected in order to improve the accuracy of positional data and heading angle stability. The extended Kalman filter merges the internal with the external sensor data to achieve high frequency output as well as high accuracy. In this way positional accuracy in the centimetre range can be obtained while the vehicle is in motion.

Data output is transmitted via CAN bus. This way data exchange with "off-the shelf" data acquisition systems (e.g. DIAdem) can be easily performed. In addition to simple operation synchronisation with other measuring signals is ensured.

## Technical Data

Gyros:	Quantity / type: 3 closed-loop fibre optic gyros Measuring range heading / roll / pitch $\pm 320 / 100 / 100$ °/s Resolution heading / roll / pitch 0.00004 / 0.000012 / 0.000012 °/s Zero stability better than 6 °/h, optional 1 °/h Gyro noise better than 0.6 °/ h, typ. 0.2 °/ h Scale factor accuracy better than 0.1 %, typ. 0.06 %
Accelerometers:	Quantity / type: 3 Servo accelerometers Measuring range $\pm 5$ g Measuring accuracy better than 1 mg Measuring resolution 300 $\mu$ g
GPS:	Measuring accuracy 0.01 / 0.2 / 0.45 / 0.8 / 1.2 / 1.5 / 1.8 m (GPS receiver dependent) Measuring precision 0.075 / 0.2 / 6 / 25 cm (GPS receiver dependent) Data update rate: up to 50 msec (internally interpolated from 20 to 2.5 msec) WAAS/EGNOS-DGPS corrections or RT2-DGPS corrections (via radio link)
Total system:	Angle measuring range heading / roll / pitch: $\pm 180 / 60 / 60$ ° Angle measuring accuracy static / dynamic: better than 0.05 ° / typical 0.1 ° Angle resolution: 0.005 °  Measuring axis misalignment < 1 mrad Initial alignment with internal GPS receiver or by manual input Interface: RS 232, 115200 Baud or CAN Data update rate: 50 - 400 Hz  Sync input and output: TTL, optically isolated Event input (e.g. for lap index): TTL, optically isolated Input for GPS antenna and radio link for DGPS corrections Speed input: 2 x (Vx, Vy), analogue 14 bit or TTL pulse Interface for internal software upgrade  Power supply: selectable 12 / 24 / 48 VDC, $\pm 10$ %, 15 Watt Dimensions (W x L x H): 110 x 170 x 180 mm Weight: 3.0 kg Temperature range: -20 to +60 °C

Status: May 2004