GeneSys

Sensor & Navigation Solutions

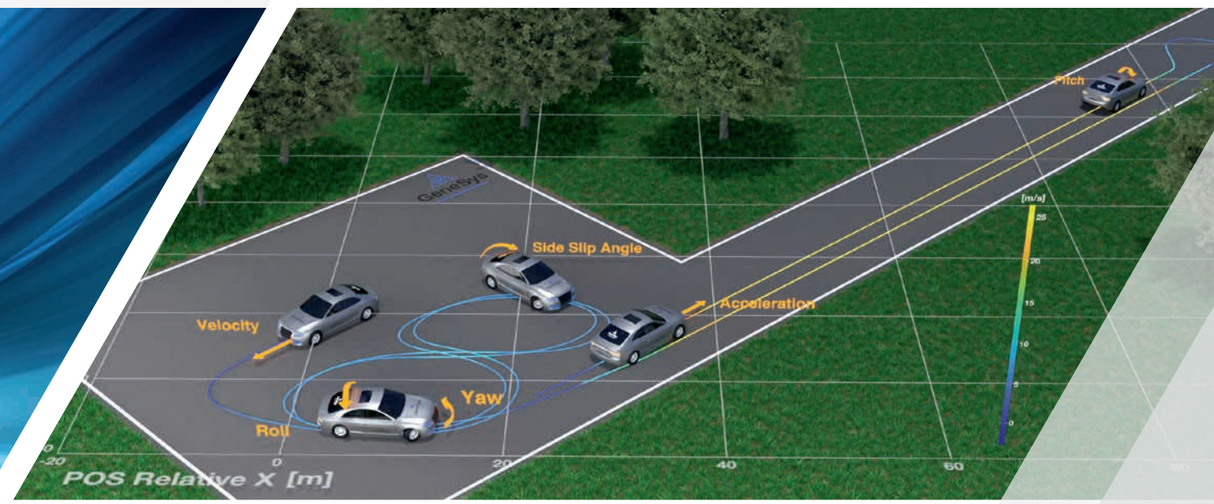
Automotive Testing Equipment

ADMA-Slim included
Integrated solutions

ADMA

Automotive Dynamic Motion Analyzer with 1000 Hz

State of the art:
ADMA GPS/Inertial System for vehicle dynamics testing



ADMA Applications

The strap-down technology ensures that the ADMA is stable and resistant to unwanted vibration during use. This means the ADMA is very well suited for evaluation of Vehicle Dynamics and Driver Assistance Systems.

The ADMA system is successfully used for Motorsports, Driverless Systems and Construction Machines. It is proven itself in the areas of Route, Track Wear and Railway measurements.

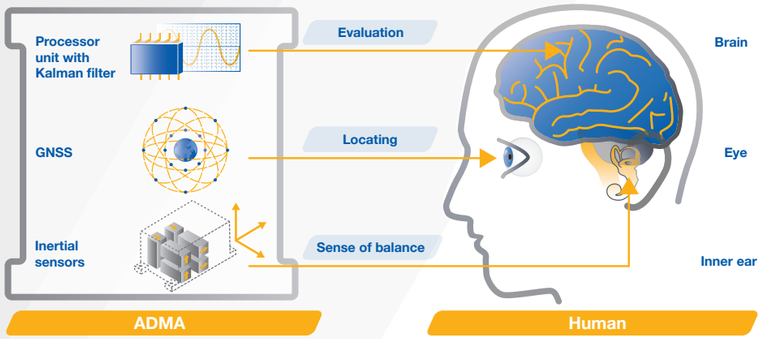
What is ADMA?

ADMA stands for **A**utomotive **D**ynamic **M**otion **A**nalyzer. This acronym refers to our highly precise Inertial Measurement Unit (IMU) using DGNSS (Differential Global Navigation Satellite System).
The system was developed particularly for Vehicle Dynamics Testing in the automotive sector. The Genesys ADMA system allows for constant measurement of acceleration, speed and position of moving vehicles in all three dimensional axes. Pitch, roll and course angles can be continuously and precisely measured with ADMA as well as course and sideslip angles as well as angular rates. This makes GeneSys ADMA system the best choice where challenging measurements with maximum accuracies are required.

How does it work?

Thanks to a keen sense of balance, humans orientate themselves very quickly and control their movements with extreme accuracy.

ADMA is based on this same principle. Like the inner ear, the accelerometers of the inertial platform measure linear motion and create a reference to gravitational acceleration. Three orthogonally positioned gyroscopes sense the rotational motion. From this, speed, location and spatial position are calculated in real-time by the signal processor via Kalman filter with centimeter precision.
Potential sensor drift is compensated for by using GNSS (Global Navigation Satellite System, e.g. GPS). This is similar to visual information in support of sense of balance, of humans. In this regard, it does not make any difference if the GNSS signal is disturbed or briefly interrupted. As such, the acceleration dependency and high data latency of the GNSS signals do not have any significant impact on the measurement.



The function of ADMA corresponds to the human sense of balance.

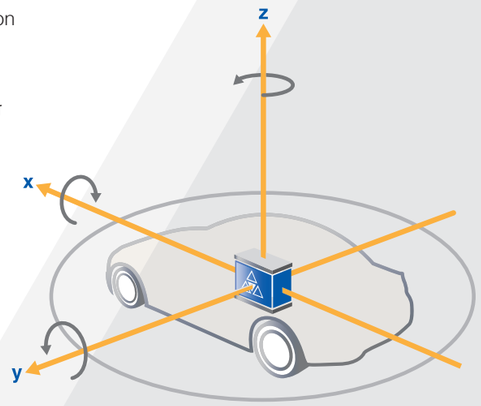
The Measurement System

Inertial technology corrected by GNSS

The algorithms used by the ADMA have been optimized for vehicle dynamics testing like slalom and steady-state circular testing. Even the Earth's gravitational acceleration and rotation are taken into account. Due to the fact that the ADMA has no moving parts, the systems are fault-tolerant. So reliability and robustness are assured.

Our latest ADMA 3.0 generation also uses the CAN bus or Ethernet interface to output the data. This guarantees easy and reliable operation and data synchronization utilizing conventional data acquisition systems.

- At the heart of ADMA are three gyroscopes, all recording rotational motion in space.
- The gyro system also includes three accelerometers to record linear movements.
- Absolute position is accurately determined by an internal GNSS receiver by means of WAAS or RTK DGNSS correction. All components for DGNSS data acquisition are included. If required, the ADMA system is also available with an external GNSS receiver.
- Inertial sensor signals and GNSS information are applied by an integrated processor unit featuring DSP and FPGA to continuously determine the orientation angle, speed and position.



ADMA highlights

- ▲ Data output rate up to 1000 Hz
- ▲ Data output via 5 CAN bus interfaces and Ethernet
- ▲ Configuration via Ethernet
- ▲ Forwarding of GNSS correction data and relative data calculation (e.g. distance) via WiFi in real-time for multi-vehicle operation
- ▲ GNSS synchronized DAQ synchronization signal, high clock frequency
- ▲ Inputs for the recording of analog signals
- ▲ Output of GNSS raw data via Ethernet interface
- ▲ Indoor GNSS interface
- ▲ Dual GNSS antenna option
- ▲ Data latency < 1 ms
- ▲ Compatible with all common steering and driving robots

ADMA features

- ▲ Measurement of vehicle motion in three axes, even during GNSS signal loss
- ▲ Dynamic attitude and heading angle determination
- ▲ Precise acceleration, speed and position data due to extended Kalman filter
- ▲ Precise position data with integrated WAAS/EGNOS-DGNSS receiver (< 1 m)
- ▲ High precision position data (1 cm) with internal RTK2 DGNSS receiver and GNSS Base Station
- ▲ Robust inertial sensors and strapdown technology without moving parts

Our Products for any Requirements

The ADMA models differ in performance of the applied inertial sensors. Higher precision sensors are less sensitive to GNSS interferences or outages. All models are available with variable GNSS accuracy, ranging from simple L1 receivers with meter accuracy to L1/L2 RTK receivers with centimeter accuracy. Our gyro systems do not require an export license.

▲ ADMA-G-PRO+

The fiber-optic gyro system with three fiber-optic rotation rate sensors and three servo acceleration sensors class 1 mg provides high-precision data even in the case of strong GNSS interferences. Complies with all international test standards.

▲ ADMA-G-ECO+

Even in the event of slight GNSS interferences, this economic model precisely records all movements according to international standards thanks to fiber-optic rotation rate sensors and servo acceleration sensors class 1 mg.

▲ ADMA-G-ECO

This system corresponds to ADMA-G-Eco+, however, it is equipped with MEMS class 5 mg accelerometers.

▲ ADMA-G-EntryLevel+

Thanks to the applied sensor technology, this cost-efficient model provides the same look and feel as the standard version. It is recommended for vehicle dynamics testing with predominantly undisturbed GNSS reception.

▲ ADMA-G-EntryLevel

This system corresponds to ADMA-G-EntryLevel+, however, is equipped with MEMS class 5 mg accelerometers.

▲ ADMA-Speed

Similar performance as ADMA-G-EntryLevel. Easy installation due to inertial sensors and GNSS antenna in a single housing.

▲ ADMA-Slim

Similar performance as ADMA-G-EntryLevel. Miniaturised version.

Comparison chart on pages 8/9.

ADMA Fields of Application

Applications	ADMA-G-PRO+	ADMA-G-ECO+	ADMA-G-ECO	ADMA-G-EntryLevel+	ADMA-G-EntryLevel	ADMA-Speed	ADMA-Slim
General vehicle dynamics testing	✓	✓	✓	✓	✓	✓	✓
Vehicle dynamics testing according to test standards e.g. ISO lane change	✓	✓	✓				
Determination of track deviation	✓	✓	✓	✓	✓	✓	✓
Sideslip angle measurement	+++	++	++	+	+	+	+
Braking/Acceleration measurement	✓	✓	✓	✓	✓	✓	✓
Chassis tuning	+++	++	++	+	+	+	+
Validation of driver assistance systems, e.g. ACC, FCW, AEB (VRU, Car2Car), LSS (LDW, LKA)	+++	++	++	+	+	+	+
Assessment of inertial sensors	✓	✓	✓	✓	✓	✓	✓
ABS/ESP ISO 26262 certification	✓	✓	✓	✓	✓	✓	✓
Driving comfort analysis	✓	✓	✓	✓	✓	✓	✓
Validation of simulation models	+++	++	++	+	+	+	+
Navigation of steering robots	✓	✓	✓	✓	✓	✓	✓
Road survey	✓						
Track analysis (e.g. for PEMS)	✓						
Test drives on public roads. Validation of autonomous driving Level 1 to 5, Platooning	✓						
Robustness against GNSS interference	+++	++	++	+	+	+	+

ADMA-options – extending capabilities

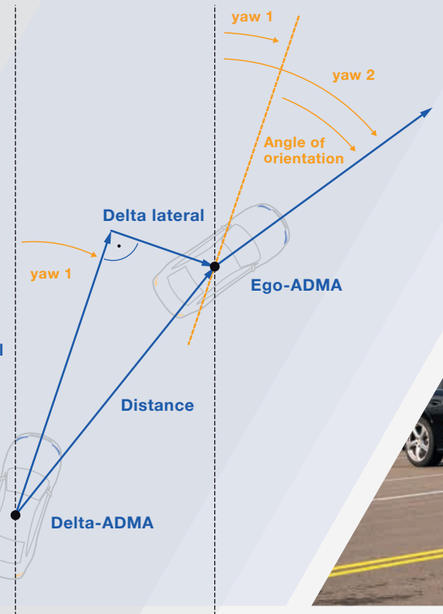
With ADMA3 product family we are proud to have established new functions, driven by the customer's requirements.

The goal is to improve the usability and to increase the productivity.

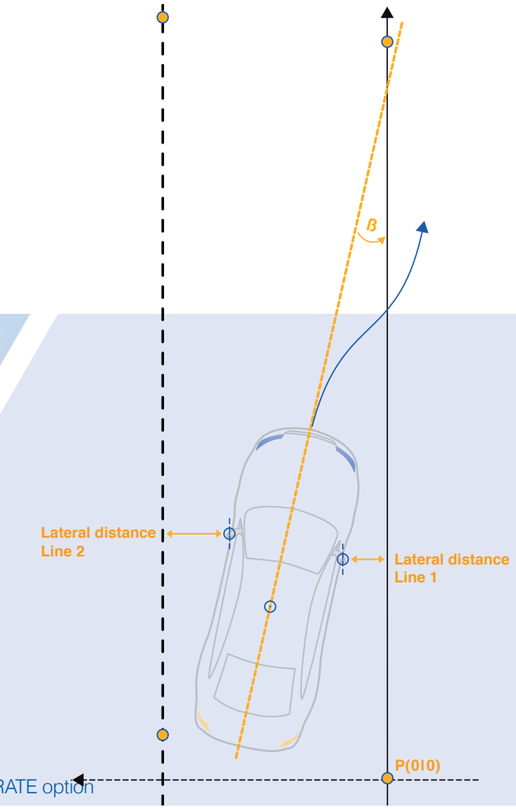
We have created firmware options, called ADMA Add-Ons. The options are activated by upload of a license code to the ADMA.

The license upload can be done at any instant giving the highest degree of flexibility.

DELTA option



LATDEV option



ACCELERATE option

Overview

▲ DELTA option

Relative data calculation (e.g., distance) via WiFi in real-time for multi-vehicle operation

The "DELTA" option enables the direct output of relative data between two vehicles, for example distance, velocity and angle. Other than a WiFi connection between the two ADMAs, no additional hardware is required. Data is provided in real time with minimum latency. This option is widely used for ADAS tests, especially AEB, FCW and ACC. Our customers rely on the ADMA option both when establishing a precise distance reference and for distance control of steering robots.

DELTA option is available for all ADMA models.

▲ BRAKING option

Real-time calculation of brake performance data according to international regulations

The "Braking" option is the sophisticated solution for brake performance measurement. Enabling brake pedal triggered as well as velocity threshold triggered measurement, all relevant parameters, including mean deceleration, brake distance and trigger speed are provided. Both full brake and fading test are supported.

BRAKING option is available for all ADMA models.
For ADMA-Speed it is included, even in the basic version.

BRAKING option Ethernet Logger software

The **GeneSys Ethernet Logger software** includes acoustic driver guidance features and is provided free of charge. Running on a Laptop or Tablet PC, it allows for real time monitoring of measured parameters. All braking results can be stored both as a result chart and a full data stream.

NEW!

▲ DGPS option

Correction data via Ethernet

The "DGPS" option provides the capability to receive DGNSS correction data forwarded from several ADMAs via WiFi. This is the preferred option for multi-vehicle applications, e.g., LSS, ACC, AEB and FCW testing.
This option is used in place of radio modems, increasing the availability of DGNSS correction data, especially on public roads.

DGPS option is available for all ADMA models.

▲ GPS-RAW option

Output of GPS raw data via Ethernet interface

The "GPS-RAW" option provides raw GNSS data via Ethernet connection. GNSS raw data is required to improve GNSS accuracy in post processing, for instance with our ADMA-PP post processing engine. We provide Ethernet logger software free of charge which can be used to record the data.

GPS-RAW option is available for all ADMA models.

▲ LATDEV option

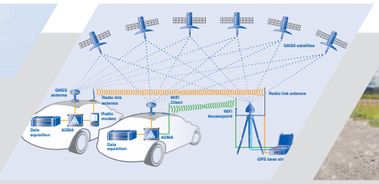
Real-time calculation of lateral deviation.

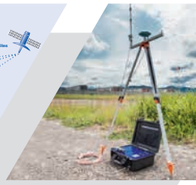
The Addon LATDEV is used to test and validate lane departure warning systems (LDW/LSS systems).
It calculates the distance to two predefined straight lines, a fixed object, angle to the straight lines, the lateral speed and acceleration in real time, related to three user defined POIs (Point of Interests).

LATDEV option is available for all ADMA models.

Brake test

DGPS correction on public roads





GNSS RAW data logging for precise positioning

System	ADMA-G-PRO+	ADMA-G-ECO+	ADMA-G-ECO	ADMA-G-EntryLevel+	ADMA-G-EntryLevel
GYROS					
Quantity / Type	3 closed-loop fiber optic gyros	3 open-loop fiber optic gyros	3 open-loop fiber optic gyros	3 MEMS gyros	3 MEMS gyros
Measurement range	± 320 °/s	± 200 °/s	± 200 °/s	± 100 °/s	± 100 °/s
Resolution roll / pitch / yaw	0.00004 °/s	0.0012 °/s	0.0012 °/s	0.004 °/s	0.004 °/s
Bias variation over temperature range	better than 6 °/h, optional 1 °/h	0.005 °/s / °C	0.005 °/s / °C	0.025 °/s / °C	0.025 °/s / °C
In-run-bias typically	0.1 °/h	1 °/h	1 °/h	4 °/h	4 °/h
Gyro noise typically	0.12 °/√h	0.08 °/√h	0.08 °/√h	0.15 °/√h	0.15 °/√h
Scale factor accuracy	better than 0.1 %, typ. 0.05 %	better than 0.1 %	better than 0.1 %	better than 2 %, typ. 0.7 %	better than 2 %, typ. 0.7 %
Sensor bandwidth	8000 Hz	1000 Hz	1000 Hz	60 Hz	60 Hz
ACCELEROMETERS					
Quantity / Type	3 servo accelerometers	3 servo accelerometers	3 MEMS accelerometers	3 servo accelerometers	3 MEMS accelerometers
Measurement range	± 5 g	± 5 g	± 2 g	± 5 g	± 2 g
Measurement accuracy (without Kalman filter corrections)	better than 1 mg	better than 1 mg	better than 5 mg	better than 1 mg	better than 5 mg
In-run-bias typically	10 µg (1 σ)	10 µg (1 σ)	10 µg (1 σ)	10 µg (1 σ)	10 µg (1 σ)
Scale factor stability	0.015 % (1 σ)	0.015 % (1 σ)	0.025 % (1 σ)	0.015 % (1 σ)	0.025 % (1 σ)
Measurement resolution digitized	100 µg	100 µg	250 µg	100 µg	250 µg
Sensor bandwidth	500 Hz	500 Hz	200 Hz	500 Hz	200 Hz
GPS-RECEIVER					
Position accuracy (DGNSS receiver RMS dependent)	0.01 / 0.2 / 0.4 / 0.6 / 1.2 / 1.5 m (depending on license model and DGNSS corrections)	0.01 / 0.2 / 0.4 / 0.6 / 1.2 / 1.5 m (depending on license model and DGNSS corrections)	0.01 / 0.2 / 0.4 / 0.6 / 1.2 / 1.5 m (depending on license model and DGNSS corrections)	0.01 / 0.2 / 0.4 / 0.6 / 1.2 / 1.5 m (depending on license model and DGNSS corrections)	0.01 / 0.2 / 0.4 / 0.6 / 1.2 / 1.5 m (depending on license model and DGNSS corrections)
Data update rate	up to 50 msec (internally interpolated from 20 to 2,5 msec. optional 1 msec)	up to 50 msec (internally interpolated from 20 to 2,5 msec. optional 1 msec)	up to 50 msec (internally interpolated from 20 to 2,5 msec. optional 1 msec)	up to 50 msec (internally interpolated from 20 to 2,5 msec. optional 1 msec)	up to 50 msec (internally interpolated from 20 to 2,5 msec. optional 1 msec)
WAAS/EGNOS-DGNSS-correction	via satellite	via satellite	via satellite	via satellite	via satellite
DGNSS- or RTK2-DGPS-correction	via NTRIP-/ RF Modem or Ethernet (optional)	via NTRIP-/ RF Modem or Ethernet (optional)	via NTRIP-/ RF Modem or Ethernet (optional)	via NTRIP-/ RF Modem or Ethernet (optional)	via NTRIP-/ RF Modem or Ethernet (optional)
Satellite tracking	GNSS single antenna (standard)	GNSS single antenna (standard)	GNSS single antenna (standard)	GNSS single antenna (standard)	GNSS single antenna (standard)
GLONASS / Galileo / BeiDou / L-Band	optional	optional	optional	optional	optional
Dual antenna version	optional	optional	optional	optional	optional
COMPLETE SYSTEM					
Angle Measurement range heading / roll / pitch	± 180 / 60 / 60 °	± 180 / 60 / 60 °	± 180 / 60 / 60 °	± 180 / 60 / 60 °	± 180 / 60 / 60 °
Angle Measurement accuracy roll & pitch / heading / sideslip	0.01 (1 σ) / 0.015 (1 σ) / 0.05 ° RMS	0.01 (1 σ) / 0.025 (1 σ) / 0.1 ° RMS	0.015 (1 σ) / 0.025 (1 σ) / 0.1 ° RMS	0.015 (1 σ) / 0.05 (1 σ) / 0.15 ° RMS	0.02 (1 σ) / 0.05 (1 σ) / 0.15 ° RMS
Angle resolution	0.005 °	0.005 °	0.005 °	0.005 °	0.005 °
Velocity accuracy*	0.03 km/h RMS	0.03 km/h RMS	0.04 km/h RMS	0.04 km/h RMS	0.05 km/h RMS
Lateral velocity*	0.05 % RMS	0.1 % RMS	0.15 % RMS	0.15 % RMS	0.2 % RMS
GNSS outage position error*	after 10 / 30 / 60 sec: 0.1 / 0.6 / 2.0 m RMS	after 10 / 30 / 60 sec: 0.2 / 1.2 / 5.0 m RMS	after 10 / 30 / 60 sec: 0.3 / 2.5 / 10.0 m RMS	after 10 / 30 / 60 sec: 0.3 / 4.0 / 30.0 m RMS	after 10 / 30 / 60 sec: 0.4 / 5.0 / 40.0 m RMS
GNSS outage velocity error*	after 10 / 30 / 60 sec: 0.01 / 0.03 / 0.07 m/sec RMS	after 10 / 30 / 60 sec: 0.03 / 0.12 / 0.25 m/sec RMS	after 10 / 30 / 60 sec: 0.04 / 0.2 / 0.4 m/sec RMS	after 10 / 30 / 60 sec: 0.05 / 0.4 / 1.2 m/sec RMS	after 10 / 30 / 60 sec: 0.06 / 0.5 / 1.8 m/sec RMS
GNSS outage pitch / roll angle error*	after 10 / 30 / 60 sec: 0.00 / 0.01 / 0.02 ° RMS	after 10 / 30 / 60 sec: 0.01 / 0.02 / 0.03 ° RMS	after 10 / 30 / 60 sec: 0.02 / 0.03 / 0.06 ° RMS	after 10 / 30 / 60 sec: 0.03 / 0.10 / 0.25 ° RMS	after 10 / 30 / 60 sec: 0.05 / 0.15 / 0.35 ° RMS
GNSS outage heading angle error*	after 10 / 30 / 60 sec: 0.01 / 0.01 / 0.02 ° RMS	after 10 / 30 / 60 sec: 0.03 / 0.1 / 0.2 ° RMS	after 10 / 30 / 60 sec: 0.05 / 0.15 / 0.3 ° RMS	after 10 / 30 / 60 sec: 0.1 / 0.2 / 0.4 ° RMS	after 10 / 30 / 60 sec: 0.1 / 0.3 / 0.5 ° RMS
Axis misalignment	< 1 mrad	< 1 mrad	< 1 mrad	< 1 mrad	< 1 mrad
Initial heading alignment	with internal GNSS receiver or by manual input, northfinding function on request	with internal GNSS receiver or by manual input	with internal GNSS receiver or by manual input	with internal GNSS receiver or by manual input	with internal GNSS receiver or by manual input
Interface	3 x Ethernet, 5 x CAN, 2 x RS232	3 x Ethernet, 5 x CAN, 2 x RS232	3 x Ethernet, 5 x CAN, 2 x RS232	3 x Ethernet, 5 x CAN, 2 x RS232	3 x Ethernet, 5 x CAN, 2 x RS232
Data update rate / calculation latency	50 - 1000 Hz / 1 ms	50 - 1000 Hz / 1 ms	50 - 1000 Hz / 1 ms	50 - 400 Hz (1000 Hz optional) / 1 ms	50 - 400 Hz (1000 Hz optional) / 1 ms
Sync output	4 TTL, galvanically isolated	4 TTL, galvanically isolated	4 TTL, galvanically isolated	4 TTL, galvanically isolated	4 TTL, galvanically isolated
Event input (e.g. for lap index)	4 TTL, galvanically isolated or analogue 16 bit	4 TTL, galvanically isolated or analogue 16 bit	4 TTL, galvanically isolated or analogue 16 bit	4 TTL, galvanically isolated or analogue 16 bit	4 TTL, galvanically isolated or analogue 16 bit
Input for GNSS antenna and radio link for DGPS corrections	✓	✓	✓	✓	✓
Speed input	2 x (Vx, Vy), analogue 16 bit or TTL pulse	2 x (Vx, Vy), analogue 16 bit or TTL pulse	2 x (Vx, Vy), analogue 16 bit or TTL pulse	2 x (Vx, Vy), analogue 16 bit or TTL pulse	2 x (Vx, Vy), analogue 16 bit or TTL pulse
Barometric sensor input	TTL pulse	TTL pulse	TTL pulse	TTL pulse	TTL pulse
Interface for internal software upgrade	✓	✓	✓	✓	✓
Power supply	12 VDC nominal (9 - 32 VDC) max. 25 W	12 VDC nominal (9 - 32 VDC) max. 25 W	12 VDC nominal (9 - 32 VDC) max. 25 W	12 VDC nominal (9 - 32 VDC) max. 25 W	12 VDC nominal (9 - 32 VDC) max. 25 W
Dimensions (W x L x H)	110 x 170 x 197 mm	110 x 170 x 197 mm	110 x 170 x 197 mm	110 x 170 x 197 mm	110 x 170 x 197 mm
Weight	3.3 kg	3.2 kg	3.2 kg	3.2 kg	3.2 kg
Temperature range	-20 to +60 °C	-20 to +55 °C	-20 to +55 °C	-20 to +60 °C	-20 to +60 °C

*typical values according to internal test standards with settled Kalman filter, without use of RTK.
Technical data ADMA-Slim / ADMA-Speed on page 12/16.

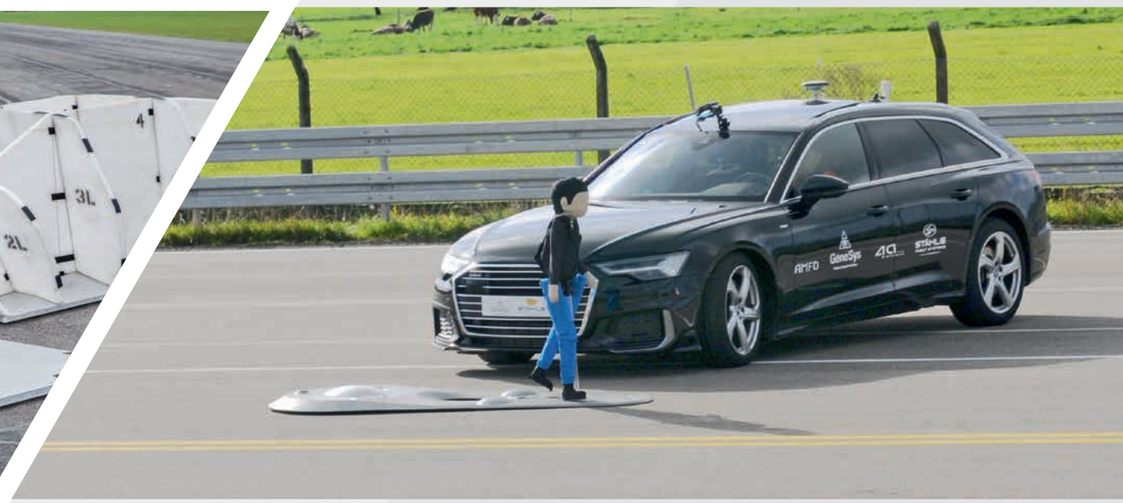
NEW!

ADMA-Slim

Miniaturized GNSS/Inertial System

messtec+sensor masters award 2018 winner

If size and weight matters



Range of applications

- Motion Tracking for applications with size and weight restrictions, e.g.:
  - Vulnerable road users (VRU) e.g. pedestrians, bikers
  - Over-runnable platforms (e.g. VRUs and GSTs)
  - Motorbikes
  - Sports cars, Jet-Skis, Snow mobiles
  - ATVs (All Terrain Vehicles)
- Vehicle dynamics testing with MEMS performance
- ADAS testing with MEMS performance

About ADMA-Slim

ADMA-Slim is a fullfledged GNSS/Inertial System based on MEMS gyroscopes and accelerometers and a high performance geodetic GNSS receiver. Performance-wise it is comparable to our ADMA-G-EntryLevel or ADMA-Speed models. The ADMA-Slim has been designed for applications with space or weight restrictions, e.g. to be integrated in over-runnable platforms for GSTs (Guided Soft Targets) or VRU (Vulnerable Road User) dummies. The miniaturised GNSS/inertial system is compatible with all established overunnable platforms and therefore also with the GST from ABD, the UFO from Humanetics or the 4activeFB from 4a.

Ordering Variants

ADMA-Slim is available in three different versions:

- Standard version with 7 LEMO connectors in a waterproof aluminium housing
- Single connector version with MIL connector in a waterproof aluminium housing
- OEM version: housing optional

ADMA-Slim is available either with an L1 GNSS receiver with SBAS and DGNSS correction data reception capability or with an L1/L2 GNSS receiver with RTK2 correction data reception capability, allowing for position accuracy down to the centimeter.

Options

In addition, the following options are available for ADMA-Slim:

- **OPT-GLONASS / -BEIDOU / -GALILEO**
  Improvement of satellite visibility due to GLONASS-, BeiDou or GALILEO reception capability
- **OPT-10g**
  Accelerometers ± 10g
  Measuring range ± 5g
- **OPT-15g**
  Accelerometers ± 15g
  Measuring range ± 5g
- **OPT-DUAL-ANT:**
  2 antenna version for course angle without initialization (e.g. low speed applications)
- **OPT-1KHZ**:
  1 kHz data output rate via Ethernet, as opposed to standard 400 Hz
- **OPT-DELTA** *
- **OPT-BRAKING** *
- **OPT-DGPS** *
- **OPT-LATDEV** *
- **OPT-GPS-RAW** *

* Refer to page 6 and 7 for more details

Scope of Delivery

- ADMA-Slim module
- GPS / GLONASS / Galileo / BeiDou patch antenna *
- Power cable *
- GNSS antenna cable *
- CAN cable *
- Ethernet cable *
- GNSS receiver configuration cable *
- Documentation, including test protocol and calibration report
- Software package for configuration and data recording *
- Transport case *

* not included in OEM version package


Standard Version


OEM Version


Single Connector Version

Technical Data

COMPLETE SYSTEM	
Angle Measurement range heading / roll / pitch	± 180 / 60 / 60 °
Angle Measurement accuracy roll & pitch / heading / sideslip*	0.02 (1 σ) / 0.05 (1 σ) / 0.15 ° RMS
Angle resolution	0.005 °
Velocity accuracy*	0.04 km/h RMS
Lateral velocity*	0.2 % RMS
GNSS outage position error*	after 10 / 30 / 60 sec: 0.4 / 5.0 / 40.0 m RMS
GNSS outage velocity error*	after 10 / 30 / 60 sec: 0.06 / 0.5 / 1.8 m/sec RMS
GNSS outage pitch / roll angle error*	after 10 / 30 / 60 sec: 0.05 / 0.15 / 0.35 ° RMS
GNSS outage heading angle error*	after 10 / 30 / 60 sec: 0.1 / 0.3 / 0.5 ° RMS
Axis misalignment	± 0.05 °
Initial heading alignment	with internal GNSS receiver or by manual input
Data update rate / calculation latency	50 – 400 HZ (1000 Hz optional) / 1ms
INTERFACES	
Ethernet	1 x Gbit, for data output, configuration and firmware update, driving robot data output, optional for relative data calculation (e.g. range) and DGPS routing, input/output
CAN	1 x CAN 2b, 1 Mbit, for data output
COM	1 x RS232
Signal inputs	up to 4 x TTL, isolated (e.g. for light barrier or brake trigger)
Signal outputs	up to 4 x TTL, isolated (e.g. for synchronization and error indication)
DGNSS correction data input	1 for NTRIP-/ RF Modem
Connector type for digital signals and power	7 x LEMO-connector (standard version)
	1 x MIL-connector (single connector version)
GNSS antenna input	1 x SMA (2 x SMA optional)
MISCELLANEOUS	
Power supply	12 VDC nominal (9-32 VDC), 14 Watt typ.
Dimensions (W x L x H)	130 x 177 x 47 mm (housed version)
	125 x 100 x 30 mm (unhoused OEM version)
Weight	1.50 kg (housed version)
	0,3 / 0,645 kg without/with mounting frame
Protection class	IP 67 (housed version)
Temperature range	-20 to +60 °C (housed version)

* typical values according to internal test standards with settled Kalman filter, without use of RTK

Technical Data

GYROS	
Quantity / Type	3 MEMS gyros
Measurement range	± 450 °/s
Resolution roll / pitch / yaw	3 x 10^{-7} °/s
Bias variation over temperature range typically	± 0.0025 °/s / °C (1 σ)
In-run-bias typically	6 °/h (1 σ)
Gyro noise typically	0.3 °/√h
Scale factor	± 1 %
Sensor bandwidth	330 Hz
ACCELEROMETERS	
Quantity / Type	3 MEMS accelerometers
Measurement range	± 5 g, optional ± 10 g, optional 18 g
Measurement accuracy (without Kalman filter corrections)	better than 5 mg
In-run-bias typically	32 µg (1 σ)
Scale factor	± 0.5 %
Digitized measurement resolution	3.8 x 10^{-9} g
Sensor bandwidth	330 Hz
GPS-Receiver	
Position accuracy	0.01 / 0.2 / 0.4 / 0.6 / 1.2 / 1.5 m (depending on license model and DGPS corrections)
Data update rate	up to 50 msec (internally interpolated from 20 to 2.5 msec, optionally 1 msec)
WAAS/EGNOS-DGNSS corrections	via satellite
DGNSS corrections	via NTRIP-/ RF Modem or Ethernet (optional)
RTK2-DGNSS	via NTRIP-/ RF Modem or Ethernet (optional)
Satellite tracking	GNSS single antenna (standard)
GLONASS / Galileo / BeiDou / L-Band	optional
Dual antenna version	optional

Auxiliary Accessories

- Signal-In cable (for brake/light barrier trigger)
- Signal-Out cable (for synchronization and error signals)
- NTRIP-DGPS-Box 4 with accessories for RTK network connection
- RF modem set with accessories for DGNSS correction data reception from local GPS Base Station
- WiFi Kit for remote access
- Mounting kit with 4 high power magnets

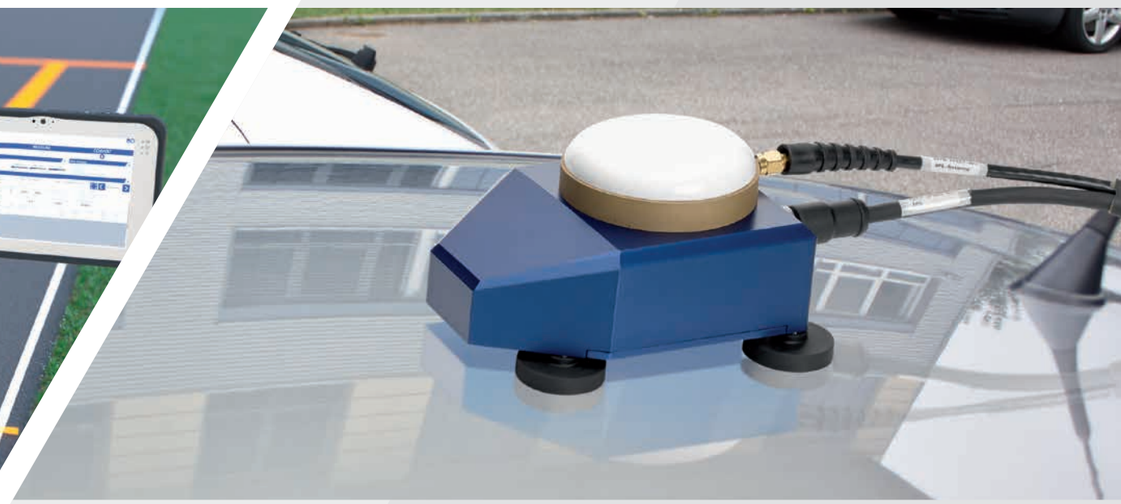
▲ All options of ADMA (refer to page 6-7) are also available for ADMA-Slim

ADMA-Speed

Speed and Braking Distance Sensor

WINNER MESSTEC & SENSOR Masters 2016 AWARD

Precise speed measurement and more

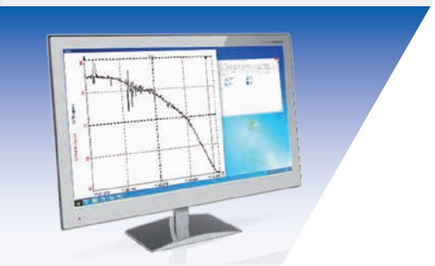


Range of applications

- Brake test
- Precise speed measurement
- Acceleration and deceleration testing
- Basic vehicle dynamics testing
- Road holding test
- Tire testing
- ADAS (Advanced Driver Assistant System)
- Verification of automotive inertial sensors
- ABS / ESP ISO 26262 certification

About ADMA-Speed

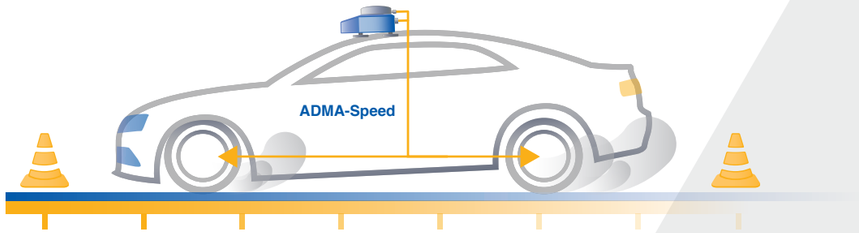
ADMA-Speed is a GNSS speed sensor. It is optimized for brake tests. For easy installation, the inertial sensors are integrated in the GNSS antenna. All motion data of the vehicle is calculated by means of the tried and tested ADMA technology. In the basic version accelaration, speed braking distance and position is transmitted via the CAN and Ethernet interface. ADMA-Speed eliminates the known disadvantages of GNSS speed sensors.



Options

Optionally, ADMA-Speed can be expanded to a fullfledged GPS-aided inertial system, e.g. for vehicle dynamics testing or verification of ADAS systems.

- Output of lateral deviation
- Output of all motion states (acceleration, velocity, position, angular rate, angle)
- 2 antenna version for course angle without initialization
- 2 cm position accuracy
- Data output rate 1 kHz
- Relative data calculation (e.g. range) via WiFi in real-time for multi-vehicle operation



Braking distance measurement

Properties

- User-friendly handling thanks to the combination of GPS antenna and inertial sensors in one housing
- Mounting by means of powerful magnets on the vehicle roof
- Pitch compensation during braking
- Considerably smoother speed signal in comparison to GNSS
- Compensation of GNSS data latency
- Correction of acceleration-dependent GNSS signal distortion
- Speed calculation at the vehicle center of gravity
- Data processing unit with tried and tested Kalman filter technology
- Output of acceleration, speed and braking distance via CAN interface in real-time
- Speed and signal-triggered braking distance
- Signal inputs for braking trigger or light barrier

Scope of Delivery

- Data processing unit
- Sensor unit with GNSS-antenna
- CAN cable 5 m
- Ethernet cable 2 m
- GNSS antenna cable 4 m
- IMU cable 4 m
- Power cable 4 m
- Documentation
- Transport Case
- Ethernet Data Logger Software with Brake Test Function

Technical Data

Data processing unit ADMA-Speed

GPS-RECEIVER	
Position accuracy	0.01 / 0.2 / 0.4 / 0.6 / 1.2 / 1.5 m (depending on license model and DGPS corrections)
Data update rate	up to 50 msec (internally interpolated from 20 to 2.5 msec, optionally 1 msec)
WAAS / EGNOS-DGPS correction	via satellite
DGPS correction	via NTRIP / RF modem
RTK2-DGPS	via NTRIP / RF modem (optional)
Satellite tracking	GPS single antenna (standard)
GLONASS / Galileo / BeiDou / L-Band	optional
Dual antenna version	optional
SYSTEM PERFORMANCE	
Angle measuring range heading/roll/pitch	± 180 / 60 / 60°
Angle measuring accuracy roll & pitch / heading / slip	0.02 (1σ) / 0.05 (1σ) / 0.15° RMS
Angle resolution	0.005°
Velocity accuracy*	0.04 km/h RMS
Lateral velocity*	0.2 % RMS
GNSS outage position error*	after 10 / 30 / 60 sec: 0.4 / 5.0 / 40.0 m RMS
GNSS outage velocity error*	after 10 / 30 / 60 sec: 0.06 / 0.5 / 1.8 m/sec RMS
GNSS outage pitch / roll angle error*	after 10 / 30 / 60 sec: 0.05 / 0.15 / 0.35 ° RMS
GNSS outage heading angle error*	after 10 / 30 / 60 sec: 0.1 / 0.3 / 0.5 ° RMS
Data update rate / calculation latency	50 - 400 Hz (up to 1000 Hz optional) / 1 ms
Stopping distance accuracy*	5 cm RMS
INTERFACES	
Ethernet 1	1 Gbit, for data output, configuration and firmware update
Ethernet 2	1 Gbit, for driving robot, output
Ethernet 3	1 Gbit, optional for relative data calculation (e.g. range) and DGPS routing, input/output
CAN	CAN 2b, 1 Mbit, for data output
Signal inputs	3 TTL, galvanically isolated (e.g. for light barrier or brake trigger)
Signal output	4 TTL, galvanically isolated (e.g. for synchronization and error indication)
GNSS antenna input	1, optional 2
IMU input	1 (ADMA components only)
DGNSS correction data input	1 (NTRIP/RF modem interface)
MISCELLANEOUS	
Initial alignment	with internal GPS receiver
Power supply	12 VDC nominal (9-32 VDC), 18 Watt typ. with ADMA-Speed-Ant, without other devices
Dimensions (W x L x H)	225 x 235 x 75 mm
Weight	2.3 kg
Protection class	IP 50 (IP 65 on request)
Temperature range (operational)	-20 to +60° C

* typical values according to internal test standards with settled Kalman filter without use of RTK

Technical Data

Sensor unit ADMA-Speed-ANT

GYROS	
Quantity / Type	3 MEMS gyros
Measurement range	± 450 °/s
Resolution	3 x 10^{-7} °/s
Bias temperature drift typically	± 0.0025 °/s / °C (1σ)
In-run-bias typically	6 °/h (1σ)
Gyro noise typically	0.4 °/√h
Scale factor	± 1 %
Sensor bandwidth	330 Hz
ACCELEROMETERS	
Quantity / Type	3 MEMS accelerometers
Measurement range	± 5 g, optional ± 10 g
Measurement accuracy	better than 5 mg (without Kalman filter corrections)
In-run-bias typically	32 µg (1σ)
Measurement resolution	3.8 x 10^{-9} g
Sensor bandwidth	330 Hz
SATELLITE RECEPTION	
ADMA-Speed-Ant-GG1 (standard)	GPS L1, GLONASS L1, GALILEO E1/E2/L6, Compass B1, IRNSS L1, L-Band
ADMA-Speed-Ant-GG2 (optional)	GPS L1/L2/L5, GLONASS L1/L2, GALILEO E1/E2/E5/E5a/E5b/E6/L6, Compass B1/B3, IRNSS L1/L5, L-Band
MISCELLANEOUS	
Dimensions (W x L x H)	110 x 130 x 70 mm (with magnets), 87 x 130 x 60 mm (without magnets)
Weight	0.75 kg
Protection class	IP 67
Temperature range	-40 to +85 °C

Ordering Variants

- ▲ **ADMA-SPEED-BASIC**
  Standard version of data processing unit for speed and brake distance
- ▲ **ADMA-SPEED-ANT-GG1**
  Sensor unit with single band antenna for ~ 1 m accuracy
- ▲ **ADMA-SPEED-ANT-GG2**
  Sensor unit with dual band antenna for ~ 2 cm accuracy
- ▲ **ADMA-SPEED-GLONASS / -BEIDOU / -GALILEO**
  GNSS receiver license option; improvement of GLONASS, BeiDou or GALILEO satellite visibility
- ▲ **ADMA-SPEED-OPT-RTK2**
  GNSS receiver license option; position accuracy 2 cm
- ▲ **ADMA-SPEED-OPT-10g**
  Accelerometers ± 10g
- ▲ **ADMA-SPEED-OPT-DUAL-ANT**
  2 antenna version for course angle without initialization (eg low speed application)
- ▲ **ADMA-SPEED-OPT-1KHZ**
  1 kHz data output rate via Ethernet
- ▲ **ADMA-SPEED-OPT-FULL-INS**
  Firmware license option for full ADMA data set
- ▲ **ADMA-SPEED-OPT-ANT-SEP** *
  Firmware Licence option for separate GNSS-antenna
- ▲ **ADMA-SPEED-OPT-DELTA** *
- ▲ **ADMA-SPEED-BRAKING** *
- ▲ **ADMA-SPEED-DGPS** *
- ▲ **ADMA-SPEED-OPT-LATDEV** *
- ▲ **ADMA-SPEED-GPS-RAW** *

* Refer to page 6 and 7 for more details

Auxiliary Accessories

- ▲ Signal-In cable (for brake/light barrier trigger)
- ▲ Signal-Out cable (for synchronization and error signals)
- ▲ Ethernet cable for driving robot (in combination with FULL-INS option)
- ▲ NTRIP-DGPS-Box 4 with accessories for RTK network connection
- ▲ RF modem set with accessories for DGPS correction data reception from local GPS Base Station
- ▲ Display with WiFi adapter for driver guidance and data storage

- ▲ Includes BRAKING option
- ▲ All options of ADMA (refer to page 6-7) are also available for ADMA-Speed

ADMA Accessories

GPS-Base /// NTRIP-DGPS-Box 4 /// ADMA-PP ///
WiFi-Kit /// SP80 /// Integrated solutions

Precise altitude and position determination

High Level Accuracy by ADMA

ADMA accessories provide reliable and highly accurate measurement data. Thanks to GPS-Base and NTRIP-DPGS-Box 4, the position accuracy is considerably improved.

ADMA-PP can considerably improve data accuracy through post processing.

Overview

▲ GPS-Base

The GPS outdoor base station provides RTK2 DGNSS correction data. In combination with the mobile GNSS receiver, a high positional accuracy data of up to 2 cm is achieved. Data transmission takes place via RF modem or WiFi.
The system has been tested and proven in mobile applications.

▲ ADMA-PP

The ADMA-PP post processing software merges ADMA inertial data, GNSS data and external reference data offline. Using this method, calculations can be made that are not possible in real-time operation. Post processing ensures data integrity and considerably increases accuracy. A further advantage: RTK DGNSS correction data do not have to be applied in real-time.

▲ NTRIP-DGPS-Box 4

The NTRIP-DGPS-Box 4 can be connected to all ADMA models.
It receives DGNSS RTK2 correction data from RTK network providers like SAPOS and AXIO-Net, SmartNet or TopNET. With the RTK2 license activated, the system provides position data, with centimeter accuracy, in real-time.

▲ WiFi-Kit

We provide WiFi-Kits for data transmission from vehicle to vehicle or from a vehicle to a remote control station.
A standard and an outdoor version is available. Our WiFi kits are based on industrial type high power dual band WiFi accesspoints with a range of up to 1000 m.

▲ SP80

With the modified GNSS receiver from Spectra Precision, parking lots can be measured easily.
Slow moving objects can be tracked precisely and wirelessly.

▲ Integrated solutions

Thanks to various cooperation - depending on the application - both software solutions for the acquisition and evaluation of synchronous ADMA measurement data as well as hardware solutions for controlled driving and robot systems are available.

Mounting accessories

For all ADMA systems, various accessories are available for installation in the test vehicle. These installation options are critical for safety. And, thanks to quick and easy mounting, make it possible to focus on what is really important: productive testing.

Seat rail adapter with ADMA mounting plate
Provides secure fit even in the event of impacts and vibrations. The fixture can be easily installed and is suitable for almost any vehicle type, including convertibles.

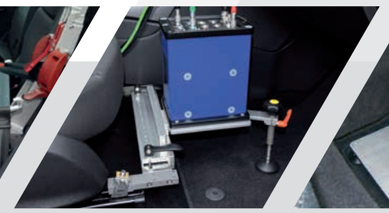
Mounting plate with quick-installation mounting pole
This 8 mm metal plate with dimensions of 28 cm x 28 cm, can be quickly and easily installed in the test vehicle, e.g. in the footwell or trunk. The mounting pole has a span of 100 to 175 cm. Other spans are also available on request.

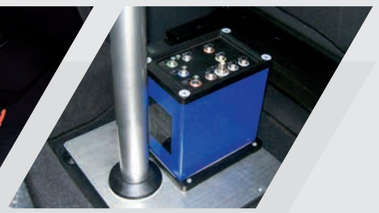
Installation support for ADMA and data acquisition systems with on-seat adapter
This option combines the ADMA system and the data acquisition system into one unit. By simply fixing it with the seat belt, short installation times can be achieved if the total measurement system must be relocated.

Standard accessories
All of our ADMA systems are supplied with PC software for configuration and data logging. All needed cables are also included.


RT-Strut

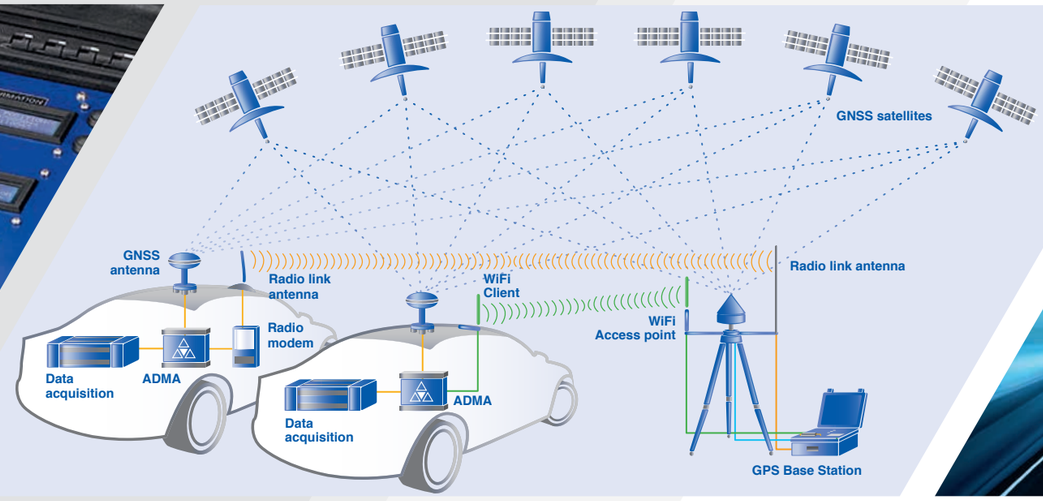

on-seat adapter


seat rail adapter


mounting plate with pole

GPS Outdoor Base Station

Local DGNSS correction data



Private DGNSS correction data for RTK operation

The GPS Outdoor Base Station has been particularly developed for vehicle dynamics testing. It provides DGNSS correction data used by mobile GNSS receiver and enables highly precise measurements with position accuracy of up to 2 cm. The base station can be quickly installed on the proving ground. It is robust, weatherproof and easy to use.

Features and options

Features

- Quick installation on the proving ground
- Based on NovAtel L1/L2 GNSS receiver PAC™
- Connections for internal or external radio modem
- Ethernet correction data output
- Complete system with tripod, antenna and cables
- Packed in a rugged transport case
- User-friendly operating terminal with SD card for saving local coordinates
- Manual or automatic position input (averaging)

Options

- GLONASS / BeiDou / Galileo
- Radio modem kits for integration in the GPS Outdoor Base Station, e.g. 403 to 473 MHz, max. 1 W output power, range up to 3 km (subject to approval in Germany) or 869 MHz, max. 0,5 W output power, range < 1 km (license free in Germany and other countries), others on request
- External radio modems with up to 35 W output power (subject to approval in Germany and other countries)
- WiFi-Kit for connection to the GPS Outdoor Base Station with WiFi router Dualband 802.11 a/b/g/n, range up to 1 km

Technical Data

Satellite systems	GPS, optional GLONASS, Galileo or BeiDou
Correction data	CMR, RTCA, RTCM v3.1, RTCM v3.2
TTFF (Time to first fix)	< 20 s (hot), < 40 s (cold)
Self initialization time	< 10 min (for precise relative data) < 72 h (for precise absolute data)
Power supply	IN: 10-30 VDC, max. 60W
	OUT: 12 VDC, max. 12 V / 1 A for external radio modem
Ethernet Port	RJ45, passive PoE 12 VDC
RS232 interfaces	DSUB15 for internal RF modem
	DSUB9 for external RF modem
Antenna connection	TNC for GNSS antenna
	TNC for radio modem antenna
Battery	24V, 7Ah, Lead-Gel
Charging time	7 hours
Operating time	> 10 hours (without WiFi)
Dimensions (W x L x H)	464 x 394 x 191 mm
Memory	SD card for 10 local coordinates
Weight	13,5 kg
Operating temperature	-20°C to +55 °C

NTRIP-DGPS-Box 4

Global DGNSS correction data

Mobile High-Precision Positioning

The NTRIP-DGPS-Box 4 establishes a connection to an RTK network provider such as SAPOS, AXIO-NET, SmartNet or TopNET to provide DGPS correction data for position detection, accurate within a centimeter. This allows driving tests to be carried out on public roads with high-precision RTK positioning.

Features and scope of delivery

Features

- Reception of DGNSS correction data via NTRIP from an RTK-network provider
- User-friendly operating software for entering the network parameters
- Automatic dial-in and redial-in after connection failure
- 3G / 4G cellular interface supporting LTE and HSPA+ networks worldwide
- Dual-SIM provides redundant connection
- Roaming capability

Scope of delivery

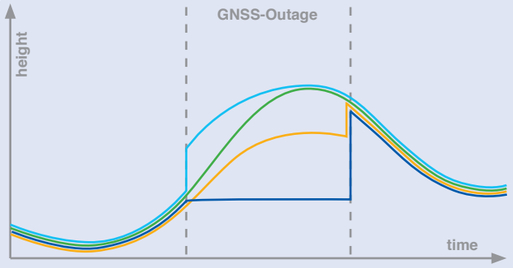
- NTRIP-DGPS-Box 4 to receive correction data from correction data services
- 2 x NTRIP mobile antenna with magnetic base for mounting on vehicles with antenna cable, ANT-GSM-MAGBASE
- 2 x NTRIP plug-in antenna for connection to NTRIP-DGPS-Box
- NTRIP-DGPS-Box Ethernet cable
- Connection cable to the ADMA
- Power Supply unit 220 VAC / 12 VDC
- Software package for device parameterization

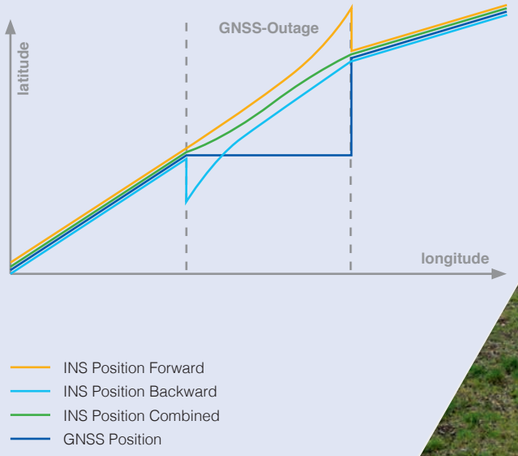
Technical Data

Cellular standards	3G / 4G / LTE / HSPA+
Operating modes	850/900/1800/1900
Antenna connection	SMA 50 Ohm
NTRIP antenna	✓
supply	9 - 30 VDC
Current consumption depending on reception conditions	0,03 A - 1,6 A @ 12 V
RS232 Interface	✓
Dimensions (W x D x H)	131 x 100 x 32 mm
Weight	0.49 kg
Enclosure material / rating	Industrial (Metal) / IP30
Operating temperature	-35 to +50 °C
Storage temperature	-40°C to +85°C
Humidity, non-condensing	95 %
SIM cards	(2x) Mini-SIM
Roaming capability	✓

ADMA-PP

Post Processing Software





NEW!

Moving Base

with ADMA-PP

Increased Accuracy

More and more often, the GeneSys ADMA system is used to validate Driver Assistance Systems as well as surveys on public roads. In order to achieve required accuracies, GeneSys has developed the ADMA-PP post processing software. ADMA-PP optimizes the recorded ADMA data by adding GNSS correction after the acquisition.

ADMA-PP combines the inertial and GNSS data post-measurement,using identical online and offline algorithms.

The core component of the software is a Kalman filter which optimizes the merging of GNSS and inertial data. Additionally, information received from auxiliary sensors like barometers or odometers may be added to the calculation.

Compared to the real-time solution which is also available, the offline calculation offers two distinct advantages.

1) Firstly, GNSS correction data can simply be downloaded for each respective mission. This facilitates installation when conducting the measurement. In contrast to post-processing, GNSS correction data have to be consistently supplied during real-time driving measurements via radio or GPRS connection. GNSS correction data reception may not be available on public roads.

2) Secondly, ADMA-PP calculates the position both forward and reverse in the time-domain. This leads to considerably higher accuracies compared to the real-time method. Signal data integrity is improved and much higher accuracies can be achieved in the event of GNSS signal drops or interference.

Technical data and properties

Features

- Improved accuracy by combining the forward/backward navigation solution
- Much higher position accuracy during total GPS shading
- No jumps in position on GNSS recovery (e.g. on emergence from a tunnel)
- Increased DGNSS positional accuracy
- Easiest possible operation with the help of a configuration wizard
- Customization and functional extension via a plug-in interface

Applications

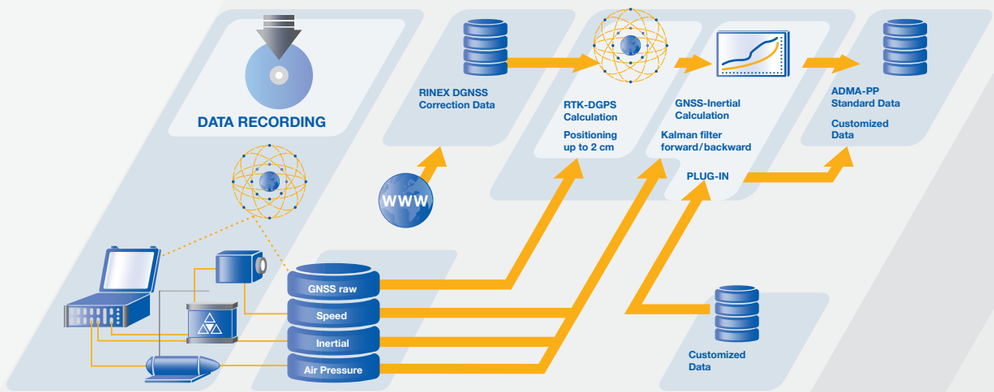
- Track analysis
- Road mapping
- GIS data acquisition
- Precise altitude profiling
- Power train optimization
- Consumption optimization
- Verification of simulation models
- Underground and tunnel survey

System requirements

- Windows 7, 10
- USB port for license dongle

Relative distance calculation via post processing

In particular for applications on public roads, the use of online RTK2 correction data via NTRIP in real-time could be expensive, unreliable or even impossible. In this case, the use of a fixed base station is unsuitable.
The Moving Base function allows a distance calculation in post processing between two or more vehicles with a relative position accuracy of +/-2cm – without the need of online or offline RTK correction data. The accuracy will be achieved by combining the pseudo range-, carrier phase- and doppler-measurements of the Hunter and Target-ADMA. Post processing requires an ADMA-Raw-Data log only.
A further advantage is that post processing does not require a radio link between the participants. Thus, it saves setup effort, time, and in addition there are no sample lost due to connection breakdowns.



WiFi-Kit

WiFi Data Transmission

Connecting multiple instruments

WiFi is a standard for data transmission from vehicle to vehicle or from a vehicle to a remote control station. It provides high bandwidth and good reliability at an affordable cost.
Based on industrial type high power dual band WiFi router, the typical range of our WiFi-Kits is 500m to 1000m, depending on the data throughput. Pre-configured to run either as an access point or a client.The antenna is directly connected to the router.

Technical data and properties

Ethernet port	1 x 10/100/1000 Mbit
Wireless	5 GHz | 2.4 GHz
Output power	1300 mW max.
Protocols	802.11 ac | 802.11 b/g/n
PoE in	✓
Input voltage	10 - 30 VDC
Power consumption	11 W max.
Operating temperature	-40°C bis +70°C tested
Waterproof	✓
Antenna type	Dual band, omnidirektional
Antenna gain	8 dBi | 6 dBi
Antenna mounting	Magnetic base and side window clamp

Included with delivery

- WiFi router
- WiFi omni dual band antenna
- Angled N connector for WiFi antenna
- WiFi router mounting kit with magnetic base and side window clamp
- WiFi router Ethernet cable
- WiFi router PoE injector
- WiFi router power supply
- 5-Port unmanaged Gigabit switch with accessories
- Preconfigured settings as access point or client
- user friendly configuration software

Easy configuration via PC software

SP80

Smart Antenna solution

High-precision position tracking with SP80

Assuming that good quality GNSS reception is attainable, pure GPS based tracking devices are the preferred solution when the primary position and velocity of an object have to be located for testing purposes.
The main applications are the tracking of slow moving objects such as VRUs (for example pedestrians or bicyclists) and surveying the environment (for instance parking lots, road marking or vehicle dimensions).

GeneSys provides a GNSS based tracking solution: a customized SP80 GNSS from Spectra Precision.

Technical data and properties

Update frequency	20 Hz max.
Satellite reception	GNSS / SBAS / GLONASS / BeiDou Galileo, BeiDou B1, B2 / Galileo E1, E5a, E5b
Position accuracy	RTK2 accuracy horizontal 8 mm + 1.0 ppm (depending of DGNSS correction data vertical 15 mm + 1.0 ppm)
DGNSS correction data input	UHF Modem (optional) / NTRIP
Correction data format	RTCM2, RTCM3, CMR, CMR+
UHF Modem	410 - 470 MHz (optional)
Cellular standards	GSM, 3.5G, UMTS
NMEA data output	WiFi, Serial, Bluetooth, Ethernet TCP/IP, internal memory, SD card
GNSS antenna	internal
Battery runtime	10 h
Dimensions (W x L x H)	19,4 x 22,2 x 7,5
Weight	1.2 kg
Protection class	IP 67
Operating temperature	-45°C – +65°C

General Features SP80

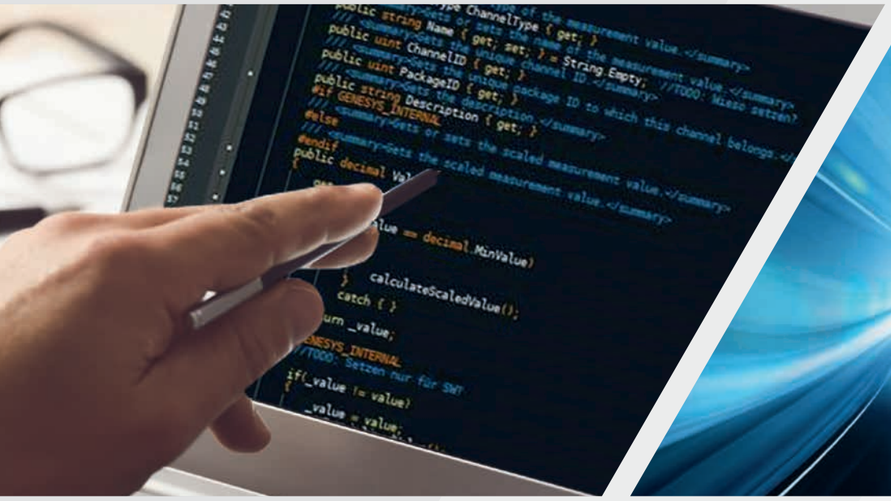
- Easy to use
- Battery powered
- Data output of NMEA 0183 logs via WiFi
- Fully cableless operation
- GPS and GLONASS reception with an accuracy of up to 1cm+1.0ppm horizontal (RTK2)
- BeiDou and Galileo reception (optional)
- Simultaneous operation of multiple devices possible
- Compatible with the GeneSys GPS base station
- Compatible with Dewesoft GRS-1 plug-in for automated data syncing in combination with ADMA products

Included with delivery

- SP80
- 2x Lithium-Ion-battery
- Battery charger
- Transport case
- User Manual
- Configuration Software
- Surveying rod

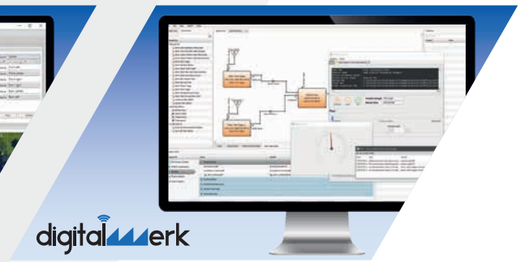
Integrated solutions

Software solutions for synchronized measurement data acquisition



Hardware solutions for driving and robot systems

Oxygen

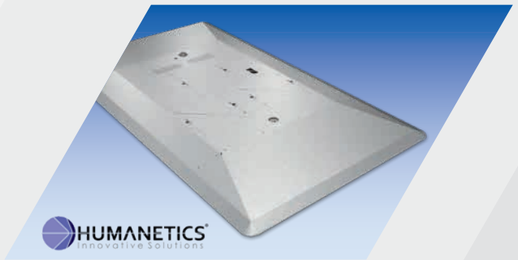


ADTF

DEWESOFT X3

CANape

ROS driver



Library of programs DLL

Ethernet Logger

Indoor Positioning

Accurate position detection in buildings

LPM indoor locating system

With the LPM (Local Position Measurement), driving tests and crash tests of new sensor systems and safety functions can be tested in indoor test facilities under constant ambient conditions.

The radar-based locating system is based on the functional principle of measuring the transit time of radio signals between transponders (on objects such as vehicles, GVTs, etc.) and base stations. The object positions are calculated out of the individual signal propagation times in the control station. These are available for further processing in real time. With this method position accuracies of up to +/-3 cm can be achieved.

Technical data

Properties

- Position accuracy: ± 10 cm (dynamic); ± 3 cm (static)
- max. Measuring frequency: 1000 Hz
- frequency band: 5,725 – 5,875 GHz
- Max. Measuring radius: 1.000 m
- Multicell: possible

Range of applications

- Cooperative vehicle safety functions with networked sensor systems and Car2X
- Validation of predictive vehicle safety functions with camera, radar, lidar sensors, etc.
- Crash tests with complete vehicle and components
- Continuous crash tests (with pre-crash-phase)
- Covered car park tests
- Park-assist test and validation in enclosed environment
- ADAS and vehicle dynamics test in special environment

DWS-CAN

Rotation Sensor with CAN Interface

Precise rotation angle measurement

The DWS-CAN single axis precision fibre optic gyro (FOG) by GeneSys is used for the continuous tracking of rotational motions. It is exceptionally well suited for demanding stabilisation tasks and for exact dynamic angular orientation measurement. Easy integration in civil and industrial applications is provided by the standardized CAN interface.

Range of applications

- Antenna stabilisation
- Torsion monitoring
- Camera stabilisation
- Crane control
- Platform alignment
- Construction machinery control
- Machine alignment
- Structural monitoring
- Reference yaw rate sensor
- Automated guided vehicles

Technical data and properties

Features

- Measurement of rotational motion
- Simultaneous data output of rotation angle and angular rate
- Earth rotation rate and angular offset compensation capability
- Easy operation via CAN interface
- Robust and maintenance-free fibre optic technology without moving parts
- Wide range power supply input
- Internal temperature compensation

Gyro

- Type: maintenance-free fibre optic gyro
- Measurement range: selectable ± 20, 100 or 327 °/s
- Bias stability: better than 6 °/h, typically 1 °/h (selected accuracy available)
- Bias stability /short term): typically 0,2 °/h
- Non-linearity: better than 0,1 %, typically 0,06 %
- Gyro noise: better than 0,6 °/√h, typ. 0,2 °/√h
- Gyro bandwidth: 8 kHz

Complete system

- Processor core: 16 Bit DSP, 80 MHz clock frequency
- Sensor error compensation: temperature
- Interface: CAN-Bus CAN 2.0b, 1 MBaud (optional 500 kBaud)
- CAN-Identifier: Standard (11 bit) selectable from 50d to 1499d
- Data output: Angular rate, Angle, Status
- Data output rate: 10 - 1000 Hz selectable
- Measurement range (angle): 0...360 ° or -180 ... +180 ° selectable
- Resolution (angle): 0.01 °
- Resolution (angular rate): 0.001 °/s
- Parameter input (via CAN): Earth rotation rate and angle offset
- Power supply: 9 - 36 Volt DC
- Power consumption: max 300 mA
- Weight: 465 g
- Housing protection class: IP 54
- Dimensions (W x L x H): 111 x 92 x 52 mm (without flange)
- Dimensions (W x L x H): 111 x 108 x 60 mm (with flange)
- Shock: 100 g; 11 ms / 800 g; 0.5 ms (18 bumps, 6 directions)
- Vibration: 0.1 g /Hz, 10 Hz ... 2 kHz
- Operation temperature range: -20 to + 65 °C
- Storage temperature range: -40 to + 70 °C

ADAS Evaluation

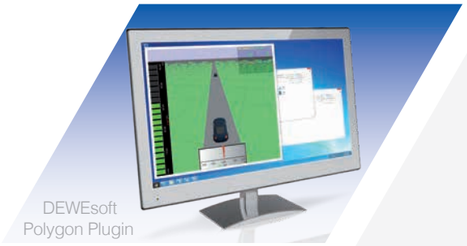
Advanced Driver Assistance Systems

User Advantages

- Easy installation and operation
- Pre-configured, sophisticated and tested system
- Uncomplicated, quick installation in vehicles
- All data of all vehicles are available online at a glance
- Reproducible driving maneuvers using online driver guidance
- Online 3D distance measurement between moving objects (vehicles, pedestrians) and fixed objects (lane, obstacles)
- Suitable for pedestrian tracing
- Data security by in-situ quality assurance
- Time saving by automatic reporting
- No synchronization of data required

Validation of Driver Assistance Systems

In cooperation with its partner companies DEWETRON and DEWEsoft, GeneSys Elektronik GmbH has developed a user firendly ADAS test suite. One and the same system enables quick and precise evaluation of driver assistance systems through synchronized data acquisition of relative movements vehicle-to-vehicle and vehicle-to-environment. The user is supported by an online visualization and an In-situ-evaluation of recorded data.



DEWEsoft
Polygon Plugin

ADAS Testsuite

ADMA Models and more

The ADAS Testsuite is compatible with all ADMA models featuring RTK2-DGNSS. By this means, a position accuracy of 2 cm can be achieved. The **ADMA-G-Pro+** system meets all accuracy requirements and partially disturbed GNSS reception is tolerated. The **MEMS based systems** requires good GNSS reception.

ADMA-Slim and SP80 can be used to trace pedestrians and to localize fixed objects.

Solutions for real time detection of audio-visual warnings are available as well.

Measurement Data Recording

DEWETRON and DEWEsoft offer various data acquisition systems: These distinguish themselves by perfect synchronization of all data, either ADMA data, vehicle data (CAN, FlexRay, XCP) analog data (e.g. Signalgong) or video data (e.g. Dashboard).

Thanks to GNSS-Sync-Clock WiFi transmission, the data of all devices are synchronously calculated, displayed and recorded on a single DAQ.

By means of the DEWETRON or DEWEsoft software, all data including vehicle movements are visualized and recorded and the ADMAs are controlled. Individual online and offline calculations are possible.

DGNSS Correction Data

NTRIP modem
For online reception of correction data from a service provider (SAPOS, AXIO-NET, SWEPOS, etc.), particularly on public roads.

GPS Base Station
Wireless modem or WiFi for transmission of DGNSS correction data to local proving grounds.

Possible Applications

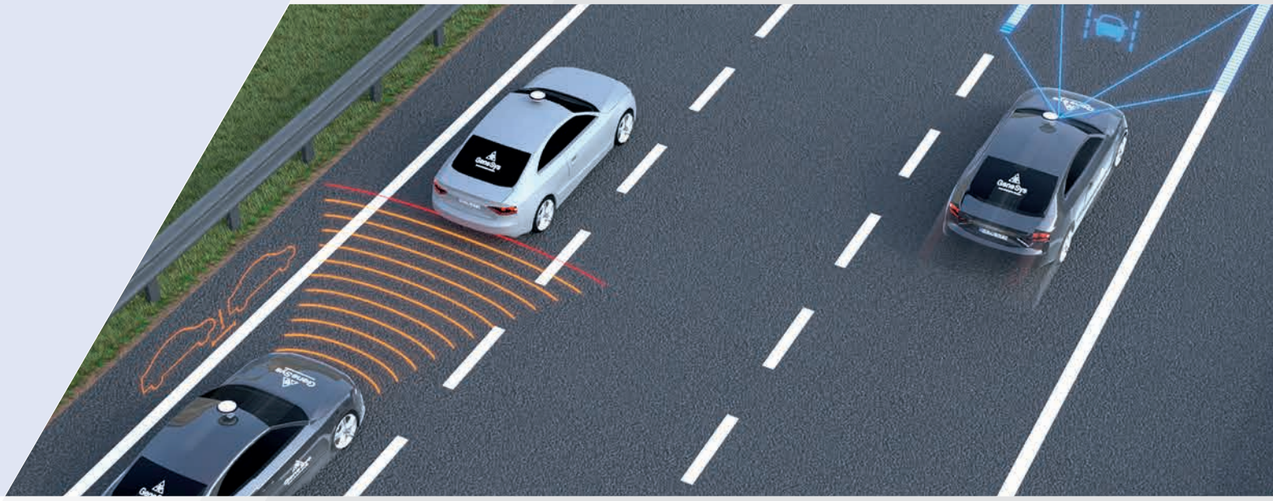
Driver assistance
- Ultrasonic sensors
- Long range Radar
- Video systems

Active safety
- ACC (Adaptive Cruise Control)
- FCW (Forward Collision Warning)
- BA/AEB (Braking Assistant, Autonomous Emergency Brake)
- Blind Spot Detection

Passive safety
- Crash detection
- Rollover detection
- Pedestrian safety

Lane Deviation

LDW, Functional Safety



Precise Lane Tracing

The ADAS Testsuite can also be deployed for precise lane tracing or measurement of vehicle lane deviation.

The components are identical: ADMA, DEWETRON or DEWEsoft DAQ, DGPS correction data.

The reference lane for measuring the vehicle deviation can be generated in various ways: by means of ADMA or SP80 measurement, KML import or by propagading the covered track (straight, circular).

BirdsEye
DEWETRON Plugin

Possible Applications

- LSS (Lane Departure Warning, LDW, Lane Keeping Assistant, LKA)
- PA (Parking Assistant)
- Lateral Offset (braking, load change)
- Cross wind sensitivity
- Steady state circular test (braking, load change)
- Lane change
- Traffic Sign Recognition
- ISO 26262 (Functional Safety of Road Vehicles, e.g. for ESP and EPS)

GeneSys
Sensor Navigation Solutions

DEWESoft®
measurement innovation

DEWETRON

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Our Company

GeneSys - **Gene**ration of **Sys**tems

Well on track worldwide
with Know How from the Black Forest in Germany

GeneSys
Sensor & Navigation Solutions

About us

What started in 1996 with the founders Bertold Huber and Christian Zimmermann in a small team of six engineers has been developed into an internationally operating company. Today the innovative small business is managed by Bertold and David Huber.
The core competence of GeneSys Elektronik GmbH is the development and production of intelligent and customized sensor systems.
GeneSys systems are used in quality assurance in automated production, for construction machines and in tunneling. With ADMA, GeneSys has developed a measurement system for vehicle dynamics testing that is today used by the automotive industry worldwide.

Versatile and focused

GeneSys works in a high-contrast and broad business segment. Our engineers combine GPS and inertial measurement technology, inclination measurement, industrial image processing and laser technology to meet the requirements of our customers and according to individual fields of application. Mechanics, electronics, optics and software are constantly being developed at GeneSys so as to provide individual and efficient solutions.

Quality made in Germany

Our efforts are centered on reliability towards our customers and outstanding product and service quality. Highly intelligent electronics in combination with complex precision mechanics and highly sensitive sensor technology in resistant housings can only be achieved at GeneSys thanks to the efficient and interdisciplinary cooperation of various specialists from different fields.
With engineering on-site in Germany, we comply with the requirements expected of our products in a pragmatic and targeted way. Our sales and service partners support our customers on short distance, worldwide.

References (extract)

Automotive manufacturers

Audi
BMW
Changan
Chrysler
Daimler
Honda
Opel
Volkswagen

Automotive suppliers

Autoliv
Bosch
Continental
Knorr-Bremse
Magna Steyr
Omron
ZF

Railway

Deutsche Bahn
Deutzer Technische Kohle
SBB CFF FFS
Siemens

Commercial vehicles

Daimler Trucks
Kamaz
MAN
Scania

Research and Development

bast
CITEAN
Fachhochschule Osnabrück
Fraunhofer IVI
Hochschule München
Korea Transportation Safety Authority
National Technical University of Athens
Ohio State University
Technische Universität Darmstadt
TU Braunschweig
TU Graz
TU Ulm
TÜV Süd Automotive

Miscellaneous

KMW
KOMATSU
Liebherr

Notes

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