



Sensor technology for
vehicle automation



Innovation in Guidance



www.goetting-agv.com

Four decades developing ideas for tomorrow



Since 1965, Götting KG has stood for innovations. We are known for our ability to embrace new challenges. In the beginning, our company started with constructing and selling amateur radio equipment and has subsequently gradually moved into other technical areas. Since 1980 we have been producing equipment and systems for automation, traffic control and HF measurement

*From left to right – C. Meyer, Technical Sales;
B. Zeugner, Order Processing;
T. Neugebauer, Head of Development;
H.-H. Götting, CEO*

engineering and general radio engineering. We also serve companies from the car manufacturing, electrical engineering and broadcasting industries. Major brands choose Götting KG products, particularly companies in the automotive, materials handling and plant engineering industries. In 2000, our FOX department expanded our range by automating mass-produced commercial vehicles: trucks, pay loaders and industrial tractors. And we have won many prizes for our excellent innovative achievements.



Our company has been managed by the owner from the beginning. Today Hans-Heinrich Götting runs the business.

In many product segments, Götting KG is a market leader. And in the future this is the position we want to maintain. At the same time our goal is to include new markets in our portfolio.

Our varied range of sensors for track guidance of automated guided vehicles and driver assistance is unique. We are known throughout the industry for our ability to adapt and innovate. Götting KG combines two strengths: The tradition and the dedication of a second generation, family-run

enterprise, as well as the experience and professionalism of an approx. 50-strong workforce. About 15 engineers track down productive innovations. We produce tomorrow's technology every day, and stay in touch with the future of technology through our many connections with universities and institutes.



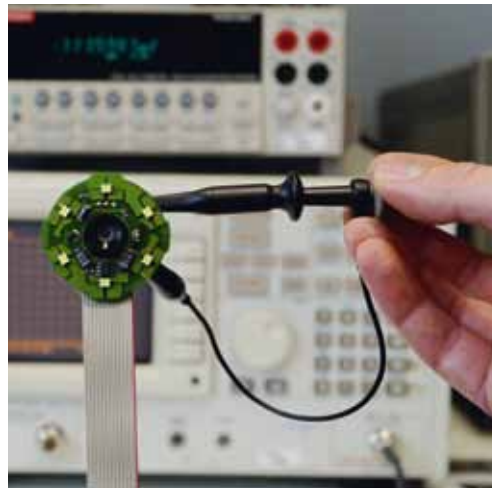
KATE: Small autonomous transportation unit

Left page, top left: The first trucks as Automated Guided Vehicles (AGV) in industrial usage

Left page, top right: RMG (Rail Mounted Gantry) with transponder positioning for the Container Location Tracking

Left page, bottom left: Optical, track-guided heavy goods transporter

Left page, bottom right: Two AGVs transporting compressors



Right page, top left: Developing a camera system

Right page, top right: EMC testing of an RDS coder

Right page, bottom: CAD for electronic layouts, in-house development provides quick response



Gaining a competitive edge, drawing on versatility With Götting KG's radio and sensor technology

Guide wire Götting KG launched its start into the field of sensors for track guidance of AGVs with guide wire technology. Guide wires have proved to be reliable and good value in many long-term applications. The range spans simple, slow and small AGVs as well as large vehicles transpor-

ting people at up to 100 km/h. As a result, Götting KG can offer an extensive portfolio of different generators, guide wire sensors and interpreter cards.

Optical track guidance along lines It is easier to apply lines to the roadway to guide vehicles than guide wire. Track recognition is carried out with modern cameras and image processing systems. Depending on the requirements, even interrupted lines do not constitute processing obstacles. The latest

technology offers the ability to recognize coded tracks or optical markers.



Track guidance using guide wire



Optical track guidance along lines



Ground markers: Transponders

Götting KG has been working on positioning systems using transponders as landmarks since back in 1985 and has demonstrated a high level of skill in this area. Using the transponders, either specific positions are determined along a line- or track-guided system, or virtual tracks are defined. The transponders are activated by

the transponder reader/antenna, transmit their identification signal and their position is then detected with an accuracy of millimetres or centimetres. So the vehicle can identify the position lengthways and/or crossways.

Artificial bearing markers

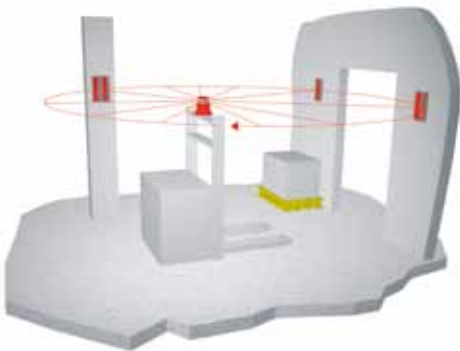
If a high level of flexibility in track guidance is required, retro-reflecting optical markers at the edge of the roadway, e.g. on the walls, are an option. With the Götting laser scanners, in the space concerned the vehicle can identify its position and the direction it is going with

particular accuracy. As an alternative to laser scanners, Götting KG can also offer camera-guided processes. Instead of on the walls, the bearing markers can be placed to greater advantage on the ceilings.

Identifying the position with transponders



Identifying the position with a laser scanner



Actively-transmitting markers / satellite navigation

By using radio procedures, exact positioning in any outdoor (satellites) and even in larger indoor spaces is possible. In this case, Götting KG can offer both the technology and customised

integration. Depending on the process, position accuracies of just a few centimetres are possible.

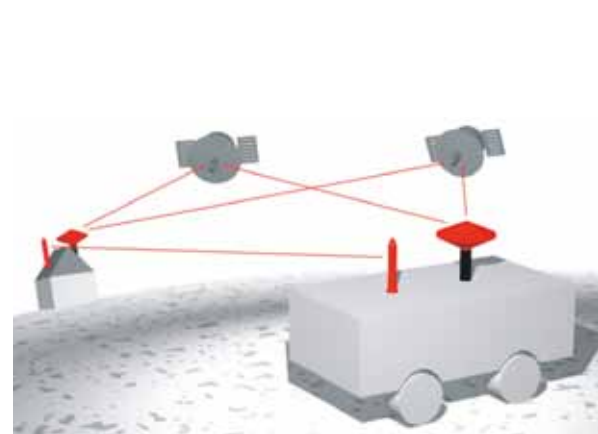
Other products

Depending on the circumstances, environment and application involved, different sensors and data transmission systems are required for guiding vehicles. Thanks to its experience and with a variety of systems at hand, Götting KG can offer the best in customised and application-specific solutions here as well. Active and passive distance and odometry sensors are also integrated.

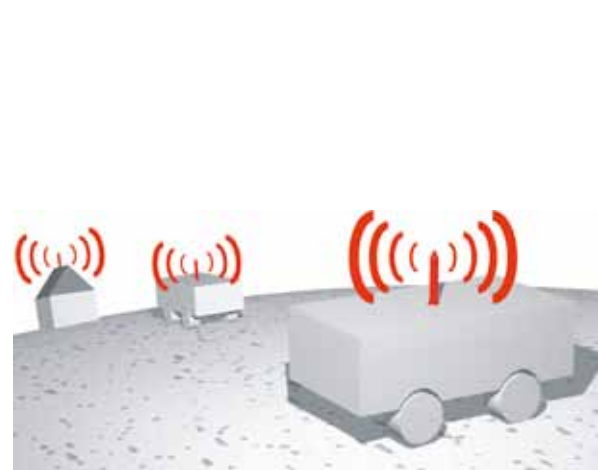
The position is calculated on the track guidance computer and the vehicle is guided on the track. Götting KG's scope of radio data transmission systems ranges from the lowest frequency range (50 kHz) to the highest frequency range (several gigahertz.) We offer state-of-the-art technologies.



Navigation with satellites



Radio data transmission products / Leaky-wave cables



The right product for every project

Due to the diverse demands placed on track guidance technology, all projects are different. Götting KG has the most extensive range of sensors for guiding vehicles and can therefore provide customers with the most suitable technology for their requirements.

We also support our customers in route control, including the associated control technology.

| |  Physical guiding lines | |  Ground markers | |  Artificial bearing markers | |  Actively-transmitting markers | |
|------------------------------|--|------------------------------------|--|---------|---|---|---|-------------------------------|
| | Guide wire | Optical track guidance along lines | Passive transponders | Magnets | Artificial markers (reflectors) | Native markers (landmark: objects, walls) | GPS (realtime) | Local Positioning Radar (LPR) |
| Accuracy | ***** | ***** | *** | *** | *** | ** | * | * |
| Flexibility | * | ** | *** | ** | ***** | *** | ***** | ***** |
| Installation size (small) | ***** | ***** | *** | *** | ** | *** | * | * |
| Insensitivity (against dirt) | ***** | * | ***** | ***** | * | ** | ***** | ***** |
| Reliability | ***** | *** | *** | *** | *** | ** | ** | ** |

Automated guided vehicles: Creating versatility

Vehicle guidance components are used in the most varied of applications. The range covers basic requirements for line-guided vehicles (at affordable prices and in large numbers), to more demanding requirements for products that are particularly vibration-proof and have to be totally reliable, even in tough ambient conditions and at extreme temperatures.

As a result, even fast vehicles transporting people, cranes in seaports, or vehicles on rough terrain and in very hot or cold conditions, can be guided reliably.



Betonwerk Lintel



Toyota Industries Corp., Aichi, Japan

Top left: Automatically-driven stacker crane with GPS navigation

Top right: Driverless container transporter with navigation along transponders for the transshipment of goods in ports



E&K Automation, Rosengarten



AFT, Schopfheim

Bottom left: Three laser-guided AGVs

Bottom right: Inductively-guided AGVs

Tried and tested under the toughest of conditions



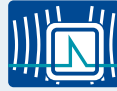
Reliable operation at high and low temperatures



Insensitive to dust



Smooth operation in wet conditions



Perfect operation even under influence of vibrations and shocks



Independent of lighting conditions



Top left: Inductively-guided AGVs

Top right: ULTra vehicle at Heathrow airport

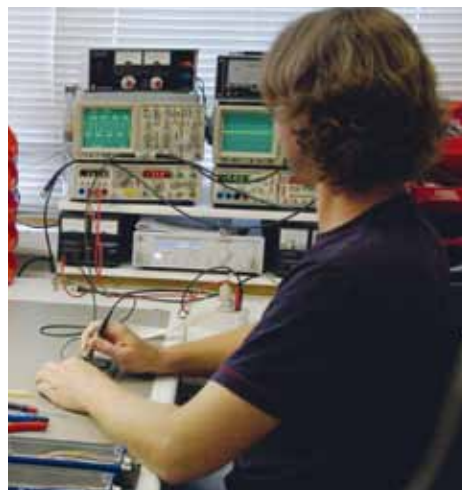
Bottom: Inductively-guided, heavy-duty AGV transports vast aircraft wings



Reliability - from the planning stage to operation

Our customers come back to us again and again because we are flexible, offer extensive service and make our deliveries on-time. And there are many reasons for this:

- We manufacture equipment and components in our own production facilities. With our qualified experts, the necessary manufacturing equipment, measuring instruments and facilities, all our products are assembled, tuned and tested in-house. Our range covers individual solutions, pilot runs and mass-produced series. Our own component procurement department has good contacts with suppliers. Combined with our production planning department this ensures precise planning of the production sequence.
- Thanks to its structure, in addition to mass-produced products, our production department can very flexibly and quickly produce customised equipment in the most varied of types and to a high standard of quality.
- We closely co-operate with dependable production partners and test all our equipment in-house. Consequently, we have been able to achieve a high level of production quality in our entire product range for years.

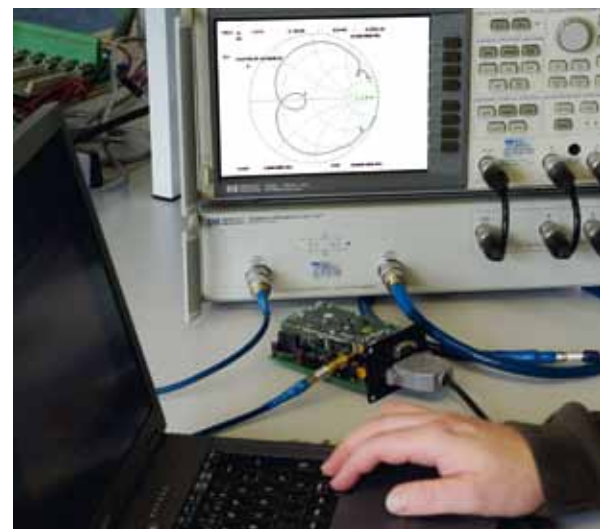


Top left: SMDs fitted by qualified partners

Top right: Fitting and the first functional check.

Bottom left: Manufacturing of electro-mechanic components

Bottom right: Recording a measurement log for an HF module





- Our team is highly professional and versatile, so we can turn customers' specifications into reality. If required, we can do radio measurements, site surveys or operation tests on site already during the planning stage. We also carry out commissioning on site and our after-sales service offers a quick response, due to direct contact between developers and customers.
- All Götting KG's processes are ISO 9001 certified. Because of the tough demands we place on our suppliers, we can guarantee that the quality of our products is maintained. Before shipping our products, they are subjected to in-depth final inspections.

Many of our products have been in operation in difficult industrial environments for more than 25 years.

Top: Service on an industrial electric tractor

Bottom left: Commissioning automatic track guidance in the E-house of a container crane

Bottom left: Carrying out measurements for inductive track guidance of a people mover (Eurotunnel)



In use the world over

Götting KG has developed successful solutions for a whole host of projects. And we support any project as required by carrying out commissioning and extensive on-site service. We offer direct service, or via our partners, world-wide.



Götting KG

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