Made in Germany

www.lenord.com



Product line

Vehicle sensors

for electric traction drives

- Railroad rolling stock
- Packaging machines
- Machine tools
- General mechanical engineering
- Renewable energies
- **E-mobility**
- Maritime applications





Motion sensors and integrated drive technology

LENORD +BAUER

Finding solutions.
Founding trust.

Our profession for 40 years

Electric traction drive sensors

The future of vehicle drives is electrical: electric vehicle motors are emission-free, silent and less maintenance-intensive. Efficient drive control using high-resolution sensors is vital. This not only increases the motor performance and reliability, but also energy efficiency.

We offer you tailored solutions for both synchronous and asynchronous motors. Our systems are designed for the requirements set out in ISO 26262 (ASIL) standards.

You can trust our expertise in drive technology because we have been supplying motor manufacturers for decades and are a recognized development partner and system supplier for individual applications. We harmonize your technological and economic system requirements.

From small to large series: our robust, durable and reliable products are pioneering solutions from a single source!



Your advantages at a glance

- Speedy C-sample development
- Tried and tested quality
- Customized manufacturing (CtO)
- Future-proof development

First-class sensors for first-class drives



We are a series supplier for the NIO platform. Over 150,000 sensors are already in use and have stood the test. You too can trust our expertise in electromobility!

The ideal solution for all applications

Electric drive motors are becoming more compact, and have to accommodate more and more power per kilogram of drive weight. Modern sensor technology must be able to adapt to these requirements with flexibility.

We believe: we have to adapt to the motor, the motor does not have to adapt to our sensor.

Passenger transport vehicles
When certain requirements are placed on drive efficiency and ride comfort, speed sensors with integrated pulse multiplication are the right solution to combine robustness and reliability with improved resolution. They can reduce the motor's energy consumption and noise generation as a result of torque ripple.

Accurate power control for trouble-free startup under load



Central motor

Vehicle platforms
Compact, inductive sensors can be easily integrated into motor designs where installation space is limited and every gram of weight is vital. The sensor's high accuracy and achievable resolution enable safe and efficient torque vectoring, for example for single wheel drives in vehicle platforms.

Flexible installation in very diverse motor situations



In-wheel motor

Heavy truck transport
Large electric motors in industrial vehicles have to cope with specific requirements in terms of efficiency and service life. Deploying accurate and high-resolution sensors makes it possible to run motors at low vibration even in extreme stress situations, such as extremely slow shunting operations involving high loads.

Effective energy utilization for long-distance use



Twin motor

Mobile machines
No matter what purpose they serve, mobile machines must be powerful, always available and reliable. Mobile machines are usually used in extreme environmental conditions. Lenord+Bauer's robust sensors are the ideal solution in such cases, as they are resistant to dust, moisture, strong temperature fluctuations, shock loads and vibrations.

Resistant to extreme loads such as temperature changes and shocks



Hydraulic motor

Asynchronous or synchronous

– at home in both systems

Efficiency, noise and durability of electric traction motors depend on the control performance. Our operating speed sensors and rotor position encoders provide you with highly accurate feedback data for drive speed and torque control.

The configurable, inductive rotor positon encoder provides stable, offset-free sine and cosine signals corresponding to the number of pole pairs of the synchronous machine. This signal quality is vital for optimal analog/digital conversion of the controller, as offsets and amplitude errors lead to incorrect quantification and thus incorrect calculation of the angle. This has a direct influence on the drive control accuracy.

Its compact design, insensitivity to stray electromagnetic fields, and cost-effective construction and connection technology make it a superior alternative to resolver systems commonly in use today.

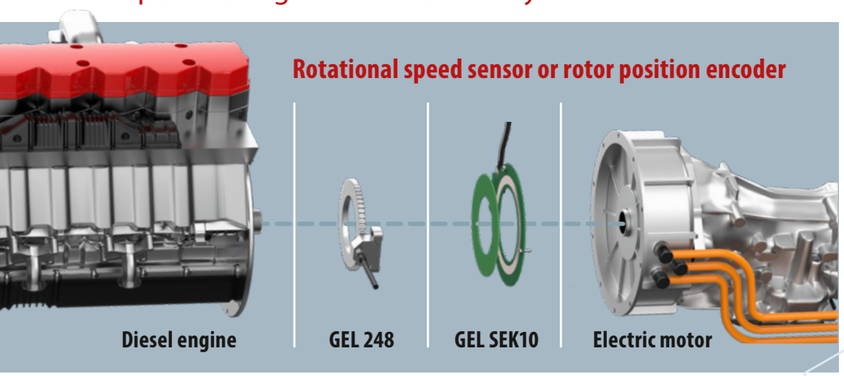
Do you use asynchronous motors in your vehicles? You can rely on our robust incremental encoders. These encoders provide AB signals and are suitable as an option for safety-critical applications thanks to their self-diagnostic capability or defined standstill signals.

Take advantage of our easy-to-mount sensors. Our web-based support tools also allow you to check installation accuracy quickly and reliably.

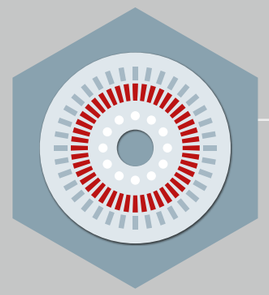


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Space-saving solution also for hybrid motors

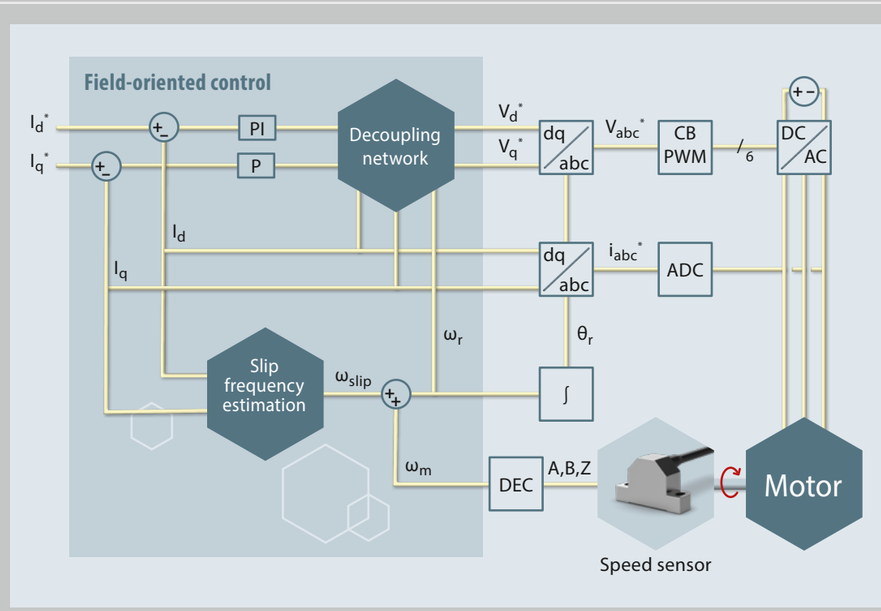


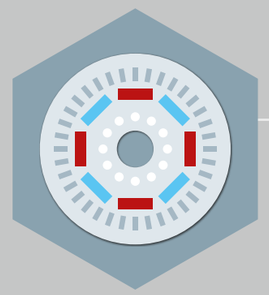
Take advantage of increased design freedom and install the sensor where it suits you best!



Asynchronous machine structure

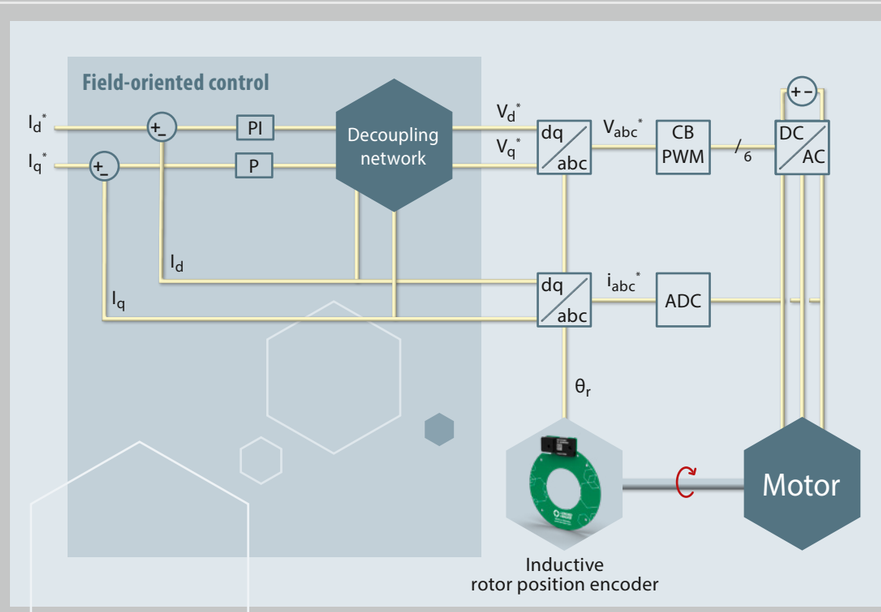
Asynchronous motors require the rotor speed of the motor to calculate the magnetic flux angle at the rotor. The higher the resolution of the speed sensor signals, the faster the smallest speed deviations are detected. The field-oriented control reacts optimally and ensures low-vibration running.





Synchronous machine structure

In synchronous machines, a defined magnetic field is already applied to the motor rotor. This is usually created by permanent magnets. Here, field-oriented control can be carried out directly with the rotor angle, since it is equal to the angle of magnetic flux. The smaller and more accurately the smallest angular change can be measured, the better the field-oriented control can ensure low-vibration operation.



Power is nothing without control

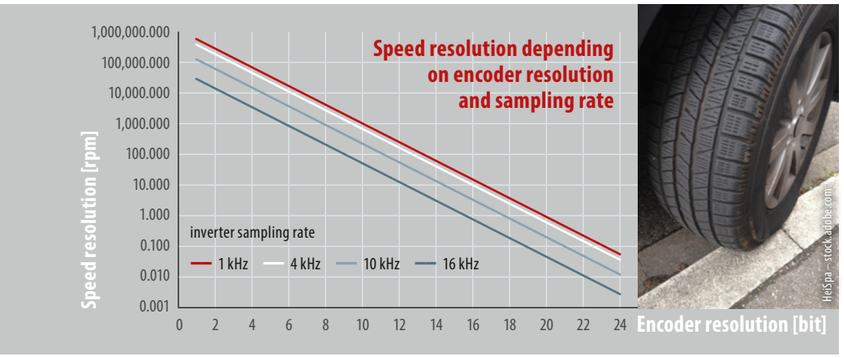
The right sensor for every motor

Electric vehicle drives are exposed to different load situations during operation. Stop-and-go traffic, rapid acceleration, hitting a curb, or “cruising” at a constant speed with low load place very different demands on the dynamics and quality of the drive control. In all situations, the aim is to avoid torque ripples as far as possible, as these cause detrimental vibrations and noises. At the same time, energy would be wasted, thus reducing the range of battery-powered drive systems.

The motor feedback system is an important component in this context. The more accurately and speedily the slip frequency in asynchronous machines and the rotor position angle or the position of the permanent magnetic field on the synchronous motor rotor can be determined by the control system, the better the current can be impressed into the motor phases via the inverter. Lenord+Bauer’s sensors provide vital support in producing the maximum torque per watt at the motor shaft.

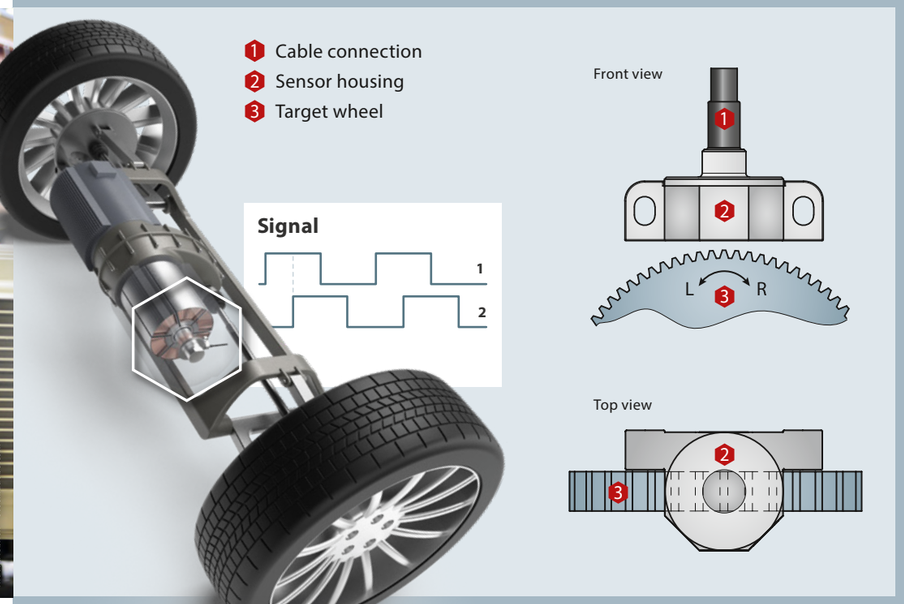


Jerk-free and safe control of electric drives



Inductive rotor positon encoders provide faster and more accurate signals than conventional sensor systems like resolvers, for example. Benefit from ripple-free load-torque curves thanks to higher accuracy. This is useful particularly in situations where high torque is required at low speed. Jerk-free start-up is possible even under high load on inclines.

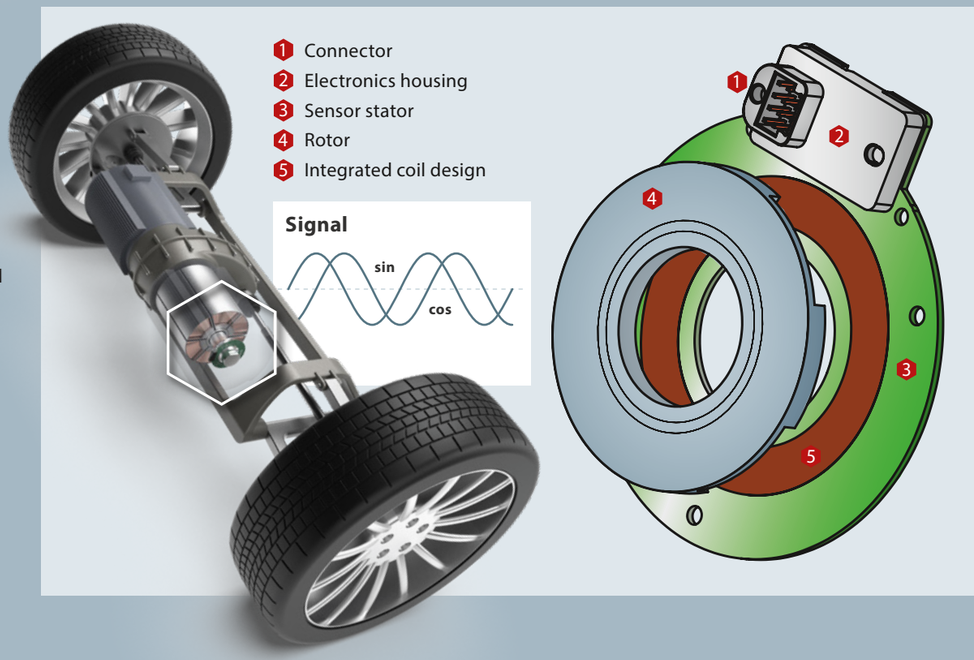
Speed sensor



The jitter-free and phase-true signals of Lenord+Bauer’s speed sensors make it possible to evaluate all four edges of the AB signal for speed calculation purposes. This makes it possible to achieve a four times higher resolution. High resolution is critical for low vibration motor operation at low speed and under high load.

Rotor positon encoder **Vario**CODER

The power supply to the active sensor is 5 V DC and directly delivers offset-free and amplitude-stable sine and cosine signals, which is the best prerequisite for latency-free and high-resolution analog to digital conversion and calculating the rotor position angle accurately. This is the key to efficient field-oriented control of a synchronous machine.



Focus on the customer

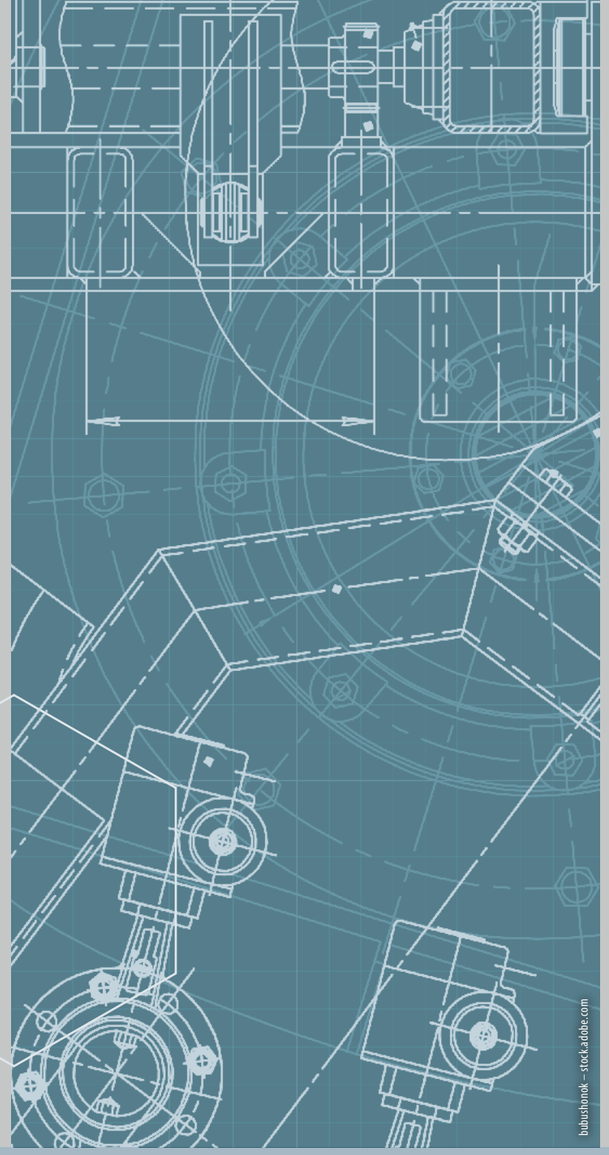
You have requirements. We have solutions.

Tailor-made solutions, fast reaction times and low costs are no contradiction for Lenord+Bauer. We use innovative production processes to manufacture individual systems from small batches to many thousands of units per year.

A customized solution would also be ideal for your application, because using standard sensors requires too much installation space?

Then you have come to the right place. Without time-consuming development work, we create a modular installation solution that truly fits your design.

We clarify your requirements in the shortest possible time in a personal meeting.



Speedy C-sample development

Your project needs to be implemented quickly and you cannot afford lengthy development cycles? Thanks to our engineers' know-how and using rapid prototyping, we can supply you with sample devices tailored to your needs in a short time, allowing you to test our solution in advance in your motor test stand.

Tried and tested quality

We want you to be satisfied with us. That is why new products are tested in our in-house test lab during the development stage. This shortens innovation cycles and minimizes reaction times.

Many of our products are installed in durable capital assets such as rail vehicles, for example, which have to operate without a hitch. We also offer a reliable sensor solution for your application. We are happy to meet your challenge!

The configure-to-order process for **Vario**CODER

In just a few steps, we will help you find your individual sensor solution.



Understanding requirements
In an initial meeting, we discuss the details of your application, the installation location and available installation space, mechanical tolerances and interfaces with your control system.

Product planning
We configure a suitable product for you based on your specifications.





Creating a C-sample
You will receive your individual C-sample within a few weeks.

Customized qualification
If necessary, we can perform additional tests in our in-house laboratory.





Start of delivery
After receiving your approval for series delivery, we utilize digital and automated supply chains.

Bilder: Gorodenkoff – stock.adobe.com

Sensor solutions overview

for electric traction drives

Speed sensors

- Reliable speed sensors with HTL or TTL AB signals
- Robust design with various cable protection systems for mounting on the outside of the motor

Features

- Standard – drill hole pattern
- Low jitter signals
- Phase-true signals by adjusting to the target wheel module of the application
- Stable duty cycle of the individual tracks
- Optimum protection against environmental influences due to stainless steel housing
- Self-diagnostic function and thus ASIL B capable
- High speed applications up to 40 kHz input frequency

Advantages

- Good EMC behavior thanks to back-bias magnet technology and passive measuring scales
- Technology has been tried and tested in heavy-duty applications for years, with over one million sensors in traction machines globally

Fields of application

- Asynchronous or induction motors for on- and off-road vehicles
- Asynchronous or induction motors for ship propulsion systems

Rotor positon encoder **Vario**CODER

- Reliable rotor positon encoder with sine and cosine signals as single ended or differential
- Installation kit for direct integration in the motor
- Compatible with all standard controllers and inverters with SIN/COS interface

Features

- Offset-free signals with very good amplitude synchronization over the entire temperature range
- Attainable angular accuracy < 0.5°el.
- Immune to stray magnetic fields from the motor due to magnet-free technology
- Suitable for high-speed motors > 50,000 rpm
- ASIL C as an individual sensor or ASIL D as a multiple sensor

Advantages

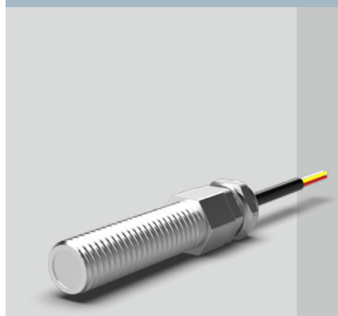
- Configurable for the specific installation location in the motor
- Significantly more mounting options are possible than with conventional resolver systems
- Immediate signal output for calculating the angle after switching on without reference search routine
- High reliability with regard to mechanical loads
- Customized function samples and C-samples available within a few weeks
- Price/performance similar to mass-produced sensors

Fields of application

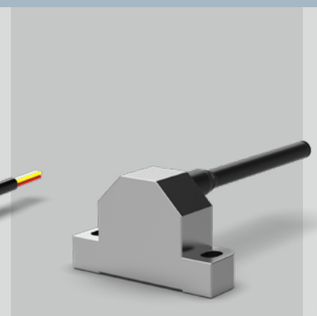
- Synchronous PM, IPM and reluctance motors in on- and off-road vehicles
- Industrial vehicles
- Agricultural and forestry vehicles
- Ship propulsion systems

Speed sensors

VarioCODER



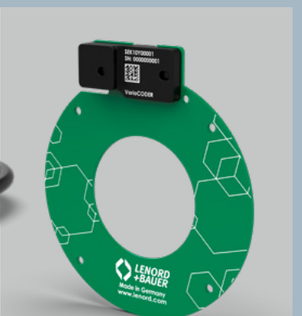
GEL 2460



GEL 248



GEL SEI10



GEL SEK10



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Expertise at your side

Our know-how gives you a technological advantage

We are an international specialist in the field of motion sensors and integrated drive technology. We develop, produce and distribute leading technology solutions that are used in the most demanding applications. Among other things, our products ensure that high-speed trains run safely, packaging machines are set up with minimum effort, tool spindles are precisely monitored and automotive electric drives are controlled in an energy-efficient manner. For over 60 years, our customers have been benefiting from extensive technical consultancy competence and our knowledge of applications.

We are the competent partner for you when it comes to efficiently integrating sensors and actuators, intelligently transforming signals into value-added functions and making them accessible interactively. With us, data streams become usable information at the point of origin. Integration into your system environment thus becomes possible intuitively.

Rely on our experience, which guarantees you low lifecycle costs, high availability and digital future reliability.

Lenord+Bauer – Finding solutions. Founding trust.



High quality standards

To ensure excellent product quality and high failsafe performance, we naturally have a consistent process landscape and are certified as per DIN EN ISO 9001, DIN EN ISO 14001 and DIN EN ISO 22163 (IRIS). This process landscape is monitored and confirmed annually by an external body. In addition, you can of course audit us as a supplier.

Active in future markets worldwide

1965
Lenord, Bauer & Co. GmbH is set up in a basement in Oberhausen

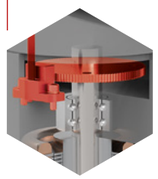




1973
The company headquarters is built in Oberhausen

1993
Sensors for high precision and speed in machine tool applications





1996
Robust and wear-free sensor solutions for rail traffic

1999
Pole wheel position and speed encoders prove themselves under extreme operating conditions in ship propulsion systems





2008
Drive technology for packaging machines: The first generation of positioning drives is launched on the market

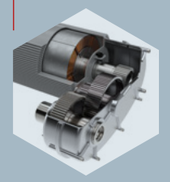
2011
Internationalization: New subsidiary is established in Shanghai





2012
New production plant in Gladbeck is inaugurated

2019
Sensor for electromobility: Efficient drive control for synchronous and asynchronous motors



2021
Lenord+Bauer Italy and USA are launched

2022
VarioCODER: technologically innovative inductive rotor position encoder



2025
Establishment of Lenord+Bauer India



2026
Establishment of the Spanish subsidiary



2022: MMP RWTH Aachen University / 2025: WESTOCK – stock.adobe.com / 2026: dementiez – magnific.com

The optimum solution for you

Personal consultation for your project

Test us out and tell us your specifications. No matter which construction type, interface and function you require: together we configure the sensor that is right for your application. Take advantage of our many years of know-how in system integration!

Still have questions? From initial contact to after-sales service, we offer you comprehensive support:

Technical consultation

+49 208 9963 215 // support@lenord.de

Order processing

+49 208 9963 216 // sales@lenord.de



We are available to offer you advice and support at every stage of your project.



Fit for the future with i³SAAC

New mobility concepts bring change. For example, vehicles are leased out by large leasing companies to rotating drivers, who often do not provide immediate feedback on the vehicle's condition. This increases the need for permanent monitoring and online retrieval. Our systems, which are tried and tested in numerous industrial applications, will increasingly be able to support you also in efficient condition monitoring. Our customers play a major role in shaping the functions we realize with integrated, intelligent and interactive sensors. Get in touch with our experts today and tell us your requirements for the future!

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Finding solutions.
Founding trust.