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Linear and Rotary Sensors

From Small Magnetic Multiturn Sensors to fast Position Transducers:

Where position sensor technology for automation is concerned, versatility is key. Popular characteristics are robustness, speed, accuracy and – especially with regard to Industry 4.0 – communication capacity. All the same, it is the the measuring task at hand that determines the choice of measuring principle and suitable sensor.

Novotechnik informs about the current state of the art and trends in linear and rotary positioning at the SPS 2019 in Nuremberg.

- **Great Accuracy in the Face of Great Measuring Distances:** Magnetostrictive Linear Sensors
- **Rotary Position Sensing:** Hall, Hall with GMR Effect or Potentiometer?
- **IO-Link:** Added Value without Additional Cost
- **Non-contacting - With small Footprint and Digital Interface:** Multiturn Sensors for Smart Service Robots
- **Meets the highest EMC Requirements:** Position Sensor TM1 series, for Mobile Hydraulics and Mechanical Engineering
- **Definitely:** novosafety

Diversity in Modern Position Sensor Technology: Technologies Matched to Your Applications

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With more than 70 years of experience in the development and production of efficient position sensor technologies, we have developed a large assortment of linear and rotary sensors which have proven themselves in the most diverse industrial and mobile applications.

The selection is extensive, both for linear and rotary sensors, and ranges from inexpensive potentiometers to non-contacting technologies with future-oriented features.

Great Accuracy in the Face of Great Measuring Distances: Magnetostrictive Linear Sensors

Magnetostrictive sensors are utilized for all those applications, where the sensing of positions and speeds requires great reliability and high precision, particularly in the face of great distances. They are available in profile (TP1) and rod design (TH1), are also suitable for mounting directly in hydraulic cylinders and are deliverable for gauge lengths up to 4250 mm.
Not only do these products provide integrated monitoring and linearization of measurements, but they also guarantee a maximum in safety and dynamics for data transmission tasks.
The resolution is independent of the measuring distance and consistently rates at 1 micrometer. The high mechanical robustness in combination with the measuring principle provides for extensive imperviousness to shock and vibrations.

Besides analog power and voltage interfaces, we also offer start/stop interfaces for up to three position markers, Synchronous Serial Interfaces (SSI), CAN interfaces, or IO-Link interfaces.

Rotary Position Sensing: Hall, Hall with GMR Effect or Potentiometer?

Regardless of which functional principle - in order to prove itself in everyday industrial life, an angle sensor should meet at least four important criteria: It must be mechanically robust, provide sufficient protection against environmental influences and can be installed both electrically and mechanically uncomplicated.
Only the sum of these properties determines whether a measuring principle can be used successfully in practice.

Potentiometric and non-contact angle sensors are available in a wide variety of variants and sizes, starting with inexpensive versions in plastic housings up to heavy-duty solutions in robust metal housings. Depending on the area of application and requirements, the user can choose between different measuring principles even with the same housing design.

Conventional **conductive plastic potentiometer** example of the series SP-2800 convince in many applications by their good price / performance ratio. These sensors with resistance and collector track made of conductive plastic convert the angle of rotation into a proportional voltage. The independently resilient precious metal multi-finger wiper ensures a reliable contact. The potentiometer can be fully rotated mechanically, the electrical working angle is a maximum of 340 degrees. Even under the toughest operating conditions, life expectancy is around 50 million revolutions.

For high-frequency or constantly spinning operation the user usually offers better advice with **contactless measuring methods**.

For angle of rotation between 30 and 360 degrees, the contactless sensor of the series RSC-2800, in simple and redundant form, is almost predestined.

The basic functionality is easy to understand: A magnet is attached on the shaft and depending on the angle of rotation changes the orientation of the magnetic field and thus the signals of opposite sensor element. This signal change convertes within the sensor IC into a rotation angle proportional analog signal. The sensor has an internal resolution of 0.1 ° and an independent linearity of typ. +/- 0.3 %.

This is Novotechnik: From Small Magnetic Multiturn Sensors to fast Position Transducers

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Contactless multiturn sensors of the RSM-2800 series, for example, use the GMR effect (giant magneto-resistance) in addition to the Hall effect. They provide absolute position values, require no reference signals and do not need a power supply or buffer battery to detect the revolutions. The measuring range is up to 16 revolutions; measurements are output as SPI or SSI signals.

IO-Link: Added Value without Additional Cost

With regard to Industry 4.0, the communication capacity of position sensors has become an important feature, so that IO-Link is a key issue.

IO-Link allows for the full utilization of the sensors‘ “Intelligence” in the automation cluster. On startup, the user can easily change such parameters as point zero or rotational direction, thus reducing the number of possible variants. In addition to purely positional data, other information, such as status or diagnostics messages can also be exchanged.

Control circuit errors are easily located, thanks to the central storage of settings parameters. This allows for speedy sensor exchanges.

IO-Link therefore offers a clear value-add in the absence of additional costs, making it interesting for both automation technology and machine engineering.

Non-contacting - With small Footprint and Digital Interface: Multiturn Sensors for Smart Service Robots

Magnetic multiturn sensors utilizing the principle of Giant Magnetoresistance (GMR-effect) are small and non-contacting, and they provide absolute positional data while requiring neither power supply nor buffer battery for rotational sensing.

They are typically used in so-called „True Power on Systems“ for a large variety of different industrial applications, such as printing presses, drive and steering systems, for automated door and gate mechanisms, hydraulic lifts, and generally as an alternative to multiturn potentiometers or comparatively sophisticated optical encoders.
And, now, these versatile sensors have also made their way into robotics, where they are used to control the motility of the neck and hip joints of a novel service robot.

Therefore, an absolute rotary multiturn sensor series RSM-2800 was used for the position sensing of the joints. The Multiturn utilizes micromagnetics and Giant Magnetoresistance (GMR effect).

The magnetic principle provides for non-contacting operation, free of wear and tear and without the need of a buffer battery.
Even during the idle interval, revolutions are detected across the entire measuring range, and even shutdowns or unexpected power outages do not result in the loss of positional data. From the time of startup, there is constant output of accurate positional data.

Meets the highest EMC Requirements: Position Sensor TM1 series, for Mobile Hydraulics and Mechanical Engineering

The new TM1 series of linear transducers is developed for position detection directly in the pressure range of hydraulic or pneumatic cylinders. The sensors reliably detect the position and speed of mobile machines even in harsh environmental conditions with a resolution of 0.1 mm.

They are suitable for measuring lengths up to 2,000 mm and are optimized for use in applications with the highest EMC requirements.
The linear transducers comply with EN 13309 for construction machinery and ISO 14982 for agricultural and forestry machinery, are protected against HF fields up to 200 V / m according to ISO 11452-2 and thus exceed the E1 requirements of the German Federal Motor Vehicle Office.
The measured signal can be transmitted as an analog current or voltage signal or via field bus interfaces (CANopen, CAN SAE J1939).
Variants with CE conformity are suitable for example for applications in mechanical engineering.
Position marker are available as ringshaped or for one-sided mounting in U-shaped versions. Level measurements are also possible with a magnetic floating position marker.

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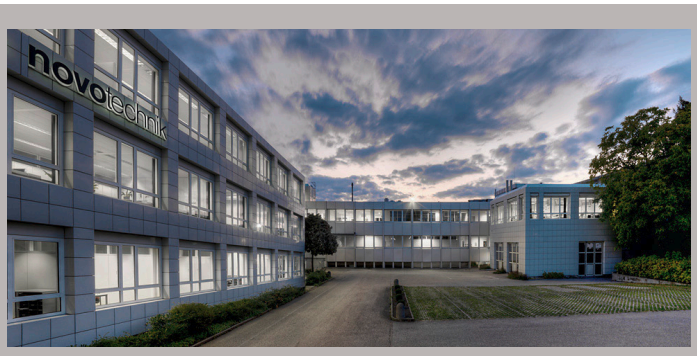
Definitely: novosafety
The goal is to limit the risk of endangerment of human beings, the environment, and investment goods. This is to be demonstrably achieved with systematic error avoidance, error detection, and in particular error control.

All devices and systems, which can result in the death or injury of human beings, in catastrophic damage to the environment or in destruction, for example of production systems, in the case of an error must be classified as „safety-relevant“.
The applicable safety standards must then be applied during their design, development, manufacture and operation.
Today we find safety-relevant systems in many industries supplied by Novotechnik. In the industrial sector this is the case, for example, in the automation of production systems, for railway applications, in mobile driven machines such as forklift trucks or construction and agricultural machines, in medical technology and of course to a high degree in the field of automotive applications.
To comply with the normative specifications and with the requirements of the market and our customers, a management system for functional safety was implemented in the quality management system (ISO 9001, ISO TS 16949) which already exists at Novotechnik.



Wherever precise determinations of positions and angles are required, sensors from Novotechnik are the first-choice solution. The measuring technology expertise that we have gathered in the course of 70 years constitutes just one of the secrets behind a success story that began back in 1947:

The other cornerstones of our success include a passion for technology and an obsession with precision and reliability. Then, there is our love of solution-oriented thinking, coupled with a fascination with new materials and production methods.

And of course, there is our constant awareness of the importance of providing sound advice and top-class service, complementing our overall goal of continuous improvement of our measuring systems.
The greatest secret of our success, however, has been the passionate pursuit of the best possible solution for each individual customer application. And to ensure that we remain the first-choice partner for our customers, we will continue to focus on the strengths that made us the successful company that we are today.

Leading OEMs from a whole spectrum of industries put their trust in position transducers and rotary sensors made by Novotechnik: be it general engineering, hydraulics, pneumatics, measuring technology, medical technology or automotive engineering.

And, talking of the automobile industry, every day more than 50,000 of our sensor components are installed into new cars, each and every day.

Representatives worldwide
Today, Novotechnik is represented in all of the world’s major markets - be it with our own subsidiaries or by approved dealers.
Wherever our customers will be, thanks to this tightly-knit network we can ensure that, they can rely on first-class service and customer care.

Your contacts can be found https://www.novotechnik.de/nc/en/service/representatives/