

Press Release nov172, 09/2011



Inductive, magnetostrictive and with GMR effect:

Trends in contactless position and angle measuring technology

Novotechnik presents several new series of position transducers and angle sensors which will open up additional applications for contactless position measurement. These include inductive linear sensors which may be a wear-free replacement for classic potentiometer solutions, interference-resistant- high-precision magnetostrictive position transducers for large measuring ranges and multiturn sensors that use the GMR effect. There is a new linear sensor for the steering angle detection on hydraulic cylinders which operates inductively and is, for example, suitable for all steel cylinders with a trough-going piston rod commonly used today.

Inductive position transducers with practice-oriented features

With the inductive position transducers of the LS1 series, Novotechnik has now added a wear-free alternative to virtually all small linear potentiometers with a square cross-section commonly available on the market to its product range. The position transducers, which operate according to the NOVOPAD method, feature dimensions which are completely compatible with the potentiometers of the

T series. They are available either with an integrated return spring and measuring ranges between 25 and 100 mm, or as position transducers with a backlash-free ball coupling for pulling or pushing applications and measuring ranges between 25 and 200 mm. The integrated signal processing function provides the measured value as an absolute current or voltage signal at the output. In many application cases, the integrated teach-in function with a status LED which is also integrated is especially practical. At the press of a button directly on the position transducer it is possible, for example, to select the zero and end point of the measurement, turn or invert the characteristic line or set the desired signal excursion. In contrast to potentiometers, a separate measuring transducer is not required for this purpose. The position transducers offer convincing arguments with a good repetitive accuracy (better than 0.025 % of the measuring range), a high resolution (12 or 13-bit) and linearity (up to +/- 0.1 %). The update rate of the output signal is approx. 1 kHz, which is more than sufficient for a large number of applications. The fact that the inductive position transducers are completely unaffected by magnetic fields is sure to be an additional advantage in many applications.

Actual value detection on hydraulic steering cylinders

We also present a new linear sensor for the steering angle detection on hydraulic cylinders which operates inductively and is, for example, suitable for all steel cylinders with a through-going piston rod commonly used today. The LAS170 steering axis sensor basically consists of two components, i.e. the signal PCB with the integrated evaluation electronics and a freely moveable position sensor, which is fastened directly on the piston rod. The inductively and therefore contactlessly determined measured value is output as a linear, analogue voltage signal. As the measuring system supplies absolute values, no readjustment is necessary, even after an interruption in the power supply – for example, after checking or changing the vehicle battery. The steering axis sensor is designed completely redundantly and meets all applicable safety criteria. It operates with a resolution of 0.1 mm, and the repetitive accuracy is 0.2 mm. In addition, the sensor is extremely rugged, resistant to steam jets and all chemical substances which may potentially occur at its workplace and is suitable for ambient temperatures between -40°C and +50 °C.

Magnetostrictive position transducers set new standards

For long measuring ranges, position transducers which operate according to the magnetostrictive NOVOSTRICTIVE method are an ideal choice. The TP1 series is available for measuring ranges between 50 and 4,500 mm with either a free, i.e. contactless, or a guided position sensor. Both the mechanical system and the measuring element and evaluation electronics have been optimised to achieve the highest possible resistance to interference. Even with interference fields in the surrounding area, machine vibrations or shock loads, the measuring transducers supply stable output signals with linearity values of up to 10 µm as a result. The resolution is independent of the measuring length and is 1 µm for digital variants. Particular importance was placed on the safety of the internal measured value processing in the position transducers, and on the data output with an update rate of 16 kHz. The position value is calculated by the electronics from the value of the digitalised measuring time and the known speed of the torsion wave. The determined position value is checked for plausibility, linearised and processed in accordance with the interface. In addition to analogue current and voltage interfaces, Start-Stop, SSI and DyMoS interfaces are also available. Versions with an incremental or quadrature interface are suitable as a replacement for complex rotary transducer solutions for linear movements. And they are also the chosen means as a more rugged alternative to glass scales, as for many applications the required accuracy with magnetostrictive position transducers is entirely achieved. The position transducers meet the requirements of the protection type IP67 or IP68 as standard, and that even in critical applications over the entire service life; this is mechanically virtually unlimited thanks to the contactless measuring principle.

Robust multiturn sensors for automotive and industrial sector

Multiturn sensors based on common operating principles tend to be unsuitable for many applications in the industrial or automotive sector. Either they require a continuous power supply, use gearing subject to wear for the rotation counter or are too complex and therefore often too expensive for the application. To provide a remedy here, we have developed GMR (Giant Magneto-Resistance) technology to commercial viability and use it in the multiturn sensors of the RSM 2800 series. The measuring range can be adjusted between 2 and 16 rotations

and is output as a continuous, analogue characteristic. In addition, there is also a version with different supply and output voltages. The resolution of the analogue interface is currently 16 bits. Speeds up to 800 rpm are possible. By implementing digital interfaces (SSI, SPI and CAN), a total resolution (angle and rotation) of up to 18 bits will be achieved in future. At the same time there are also two-channel versions, also making the multiturn suitable for safety-relevant applications. And the GMR sensors also offer convincing accuracy: The linearity deviations over the entire measuring range are below 0.05 %. The rugged sensors meet the requirements up to the protection type IP67 as standard, i.e. they are dust-tight and protected against temporary submersion. And they can be integrated well in the respective application. The shaft has been designed so that it can be mounted simply and angle-indexed by a corresponding mating piece provided by the customer. Typical areas of use for the sensors include so-called true-power-on systems, for example in motor vehicle engineering for electronic steering systems and in a wide variety of industrial applications.

Captions:

- 1.) With a cross-section of 18 x 18 mm, the contactless inductive position transducers are built very compact, making them suitable as a contactless alternative to many potentiometers with the same cross-section.
- 2.) The inductive steering angle sensor, which is suitable for all common steel cylinders with a through-going piston rod common today, consists of a PCB with integrated evaluation electronics and the position sensor.
- 3.) The rugged magnetostrictive position transducer is available with effective lengths up to 4,500 mm. Even under rather unfavourable ambient conditions, they supply stable output signals with linearity values of up to 10 µm.
- 4.) In addition to the rotary angle signal, in the deenergised state, the multiturn sensor based on the GMR effect can currently also count and permanently save up to 16 rotations without a buffer battery and without gearing.