The buzzwords of late are fieldbus functionality and miniaturization. Sensor technology specialist Novotechnik for instance presents a number of innovations and advancements of this type: single-channel, partially or completely redundant touchless linear position sensors, and rotary position sensors, which are now available with a CANopen interface. The company also offers flat rotary position sensors, which are suitable for applications in machine and automotive engineering.

The allrounder: a touchless rotary position sensor

The rotary position sensor RFC 4800 (Figure 2), which determines the measurement angle based on the positional change of a magnetic field, has proven itself in quite diverse applications. It can be found in countless applications in machine engineering and plant design as well as in mobile applications. This sensor, which conforms to the protection requirements of IP69K, is even utilized for hydropower plants. These compact sensors are now also available with CANopen interfaces, opening additional diagnostic avenues to the user, and providing additional features, such as cam switch, limit switch, speed data, etc. The CANopen version is available in single-channel or dual-channel designs, with one or two connections. This allows for a stub connection or the loop-through of the bus. There are also different plating options available: The selection includes models with cable outlets, as well as 5-pin M12 connectors, and the AMP or Deutsch connectors favored for mobile applications. In the near future, the CAN protocol SAE J1939 for utility vehicles will be supported as well.

This durable rotary position sensor demonstrates versatility and integratability in other aspects, too. The physical separation of the completely potted, 15 mm sensor component and the magnetic position marker allows for sensor placement in up to 1,5 mm distance from the position marker. With the help of an available stronger position marker, larger separation distances of up to approximately 4 mm are possible. A marking indicates the correct alignment with the sensor. Since neither shaft nor bearings are required, and because the sensing distance is variable, application-specific installation tolerances are not a problem. The non-contacting sensing of the measurement angle eliminates mechanical wear and tear, and yields absolute measurements over the entire 360° range. These measurements are provided with a 14-bit resolution (0,022°). In addition, a high resolution speed signal is available to the control system. The independent linearity is ±0,5 %, with a repeatability of 0,1 %.

Linear position sensor for hydraulic cylinders

The TIM series linear position sensors for absolute measurements are magnetostrictive linear position sensors suitable for position sensing in the pressure ranges of hydraulic cylinders (Figure 1). These non-contacting sensors, which are practically free of wear and tear, are now also available with a CAN interface (i.e. SAE J1939). In addition, node ID, bit-rate, transmission mode, transmission cycle time, gradient, and direction, as well as other
parameters are freely configurable, and diagnostic and limit features are available. Typical applications include shaft and steering cylinders of agricultural or forestry vehicles and machinery as well as lifting jacks in the control systems of hydraulic cultivators.

The component series is offered in lengths of 50 mm to 2500 mm and can withstand many hydraulic fluids. The sensors are precise and reliable even under tough environmental conditions. Their linearity is ±0,04 %, with a repeatability of 0,1 mm, independent of the measuring distance.

The sensors can withstand operating pressures of up to 350 bar, and thanks to a plug-in connector system, they can be installed quickly and without soldering, crimping, or use of screws: The insulator of the M12 connector is already connected to the sensor’s lead wires and passed to the outside through a bore in the cylinder housing. The connecting flange just needs to be plugged in.

Heavy-duty rotary position sensor

Nowadays, the CANopen technology is utilized even for rather tough applications. These are expected to become the typical applications for the noncontacting rotary position sensor RSX-7900 with CANopen interface (Figure 4). All standard bus diagnostic features as well as additional features (cam switch, limit switch) are available for use. The sensor function itself can be reliably monitored; an example is the detection of real values directly at the steered shaft of electro-hydraulic steering systems. Potholes, road salt, and other untoward road factors do not interfere with the functioning of these sensors, so that the diagnostic capabilities of the CAN protocol can be utilized for these applications as well.

This heavy-duty sensor is available for measuring ranges of up to 360 °, and it allows for continuous mechanical rotation. It is available in single-channel or dual-channel designs. The completely redundant version can be utilized for applications where safety is a concern; it complies with the requirements of ISO 13849 PL-d. With a diameter of 79 mm and its height of 35 mm, this component can be integrated into the mechanics of construction, agricultural, and forestry machinery, as well as into the rudder steering systems of maritime vessels and the like. Type E1 approval has been obtained from the German department of motor vehicles (KBA).

Magnetostrictive linear position sensors

The latest generation of linear position sensors, namely the TP1 series (profile standard design, Figure 3), and the TH1 series (hydraulic cylinder standard design, Figure 5), are...
available with CANopen as well. All the advantages of the CANopen protocol, combined with measurement capabilities of these systems, allow the plug-and-play use of these sensors even where demanding measuring tasks are concerned.

Linear position sensors utilizing the Novostrikiv principle are available in measuring ranges of up to 4250 mm. They meet the protection requirements of IP67/IP68. The permissible operating temperatures are -40 °C to +85 °C. The internal sensor resolution is independent of the measuring range and amounts to 1 µm, which can be a deciding factor, especially where large measuring distances are concerned.

**Extreme miniaturization – ideal for OEM applications**

Many applications call for rotary position sensors that are non-contacting, small in size, and preferably inexpensive. The spectrum of possible uses ranges from steering angle and gear sensors in vehicles over medical-technical applications to motorized doors, grippers, or maritime applications. This is where the non-contacting RFD-4000 series can shine (Figure 6). These sensors are non-contacting and utilize the Hall effect. They feature a measuring range of 360°, a 12-bit resolution, and an independent linearity of ±0.5 %. And they are available in single-channel, partially or completely redundant designs. The housing measures 7 mm in height. The matching position marker also features a small footprint, with a diameter of 22.2 mm and a height of 5.6 mm. Functionality is not compromised by lateral installation offsets of up to ±1.5 mm. This allows for an easy integration of the miniaturized sensor into many OEM applications. Single leads molded into the housing are available for the electrical connections.

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**Bauma 2016 Various sensors with CANopen**

At the Bauma, Gefran (Italy) launches three series: angular, inclination, and displacement sensors. They are specifically designed for mobile hydraulics applications.

**Read on**

**Bauma 2016 Tape sensors with integrated pulley**

ASM (Germany) has enlarged its Positape tape extension sensor product line with an additional feature: the WBR models are equipped with an integrated pulley mounted directly onto the sensor.

**Read on**

**Wire-actuated encoder Stroke measurement in the hydraulic cylinder**

The wire-actuated encoder SGH10 by Siko measures absolute, direct cylinder strokes in hydraulic cylinders. With this measurement system, cost-intensive drilling of the piston is no longer required.

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