



The State of Technology and Current Trends:

Non-Contacting Position Sensing Technology for Automation

In the fields of industrial and mobile automation, position sensors need to meet a large number of demands. Sought-after characteristics are robustness, speed, accuracy and – especially with regard to Industry 4.0 – communication capacity. At the same time, it is also the measuring task at hand that determines the choice of measuring principle and the suitable sensor. As is the case with many technologies, there aren't any all-encompassing solutions in position sensing technology. This is where some guidance is important, especially in light of the cost factor, which is a considerable issue with many applications.

This year's SPS/IPC/Drives at Nuernberg is yet another opportunity to get updated on the state of technology, the latest trends, and the variety of non-contacting operating principles in regards to linear and rotary position sensors. As in prior years, sensor specialist Novotechnik (see box copy) will again be exhibiting a large variety of products at its trade fair booth. These range from a new series of magnetostrictive linear position sensors over highly dynamic inductive linear position sensors to exceptionally compact magnetic sensors suitable for many applications with very tight installation spaces. At the same time, Industry 4.0 is a key topic: By now, the majority of linear and rotary sensors have CAN and IO-Link

communication capabilities. This allows full utilization of their “intelligence” within the automation cluster.

New Position Sensing Technology for Mobile Hydraulics and Machine Engineering

The new linear position sensors of Novotechnik’s TM1 series have been developed to fit directly into the pressure areas of hydraulic or pneumatic cylinders. They reliably acquire the positions and speeds of mobile machinery – at a resolution of 1mm, and even under adverse environmental conditions. The successor of the proven TIM series is suitable for measuring positions of up to 2,000mm and optimized for applications with the highest EMV requirements. They conform to EN 13309 for construction machinery as well as to ISO 14982 for agricultural and forestry machinery, and they feature protection against RF fields of up to 200V/m according to ISO 11452-2, thereby by far surpassing the E1 requirements of the German federal motor vehicle office, the Kraftfahrtbundesamt (KBA). The measured signal can be transmitted as an analog current or voltage signal or via field bus interfaces (CANopen, CAN SAE J1939).

The sensors also impress with high pressure resistance (up to 350bar, and up to 450bar for pressure peaks), high temperature resistance (from -40°C to +105°C), and their very high life expectancy, which is owed to the non-contacting measuring principle that is free of wear and tear. The series features a protection rating of IP6K9K. And an innovative connector system allows for the quick installation of the sensors into closed bore cylinders or cylinders that are open at one end – without the need for soldering, crimping, or screws. The contact carrier of the M12 plug-in connector is pre-wired to the sensor’s signal leads; the carrier exits the cylinder through a bore. The connecting flange can simply be snapped onto the contact carrier and attached on the outside. For double-acting cylinders, the model equipped with a plug-in flange is fully integrable.

Cylinder-external mounting is also possible. CE compliant builds are suitable for machine engineering applications, for example. Available position markers include annular as well as U-shaped models for easy installation. The use of magnetic floats allows for liquid level sensing.

Highly Dynamic Inductive Linear Positioner

The inductive linear position sensor TF1 is predestined for rapid positioning tasks. It is available in standard lengths of 100 to 1,000mm. The measuring system's update rate is $\geq 10\text{kHz}$, resulting in a time lag of only 2 milliseconds between the actual position and the corresponding measurement value. This dynamic allows for shorter cycle times in production lines, since the target positions can be reached at higher speeds. The sensor is operating at a resolution of up to 1 micrometer.

Some typical applications are linear drives; injection molding and die casting equipment; presses and punches for sheet metal processing; packaging or wood processing equipment; and in general position sensing in rapid motion units of production lines. Of interest to metal-processing companies in particular is the fact that metal dust or flakes will not collect on the non-magnetic position marker. The measured signal is provided as an analog current/voltage signal or digitally, via SSI. Additionally, CANopen standard or IO-Link communication interfaces are available.

IO-Link: Value-Add At No Additional Cost

In light of Industry 4.0, the communication capabilities of position sensors have become an important feature, so that IO-Link is a key issue. IO-Link allows for the full utilization of the sensors' "Intelligence" within the automation cluster, providing a distinct value-add at no additional cost. This benefits automation technology and machine engineering alike: On startup, the user can easily change such parameters as point zero or rotational direction, thus reducing the number of stock positions. In addition to purely positional data, other information, such as status or diagnostics messages are also exchanged. Control circuit errors are easily located, thanks to the central storage of settings parameters. It is thus even

possible to exchange a sensor or to modify its parameters within a short timeframe.

Compact Magnetic Sensors for Rotary and Linear Measuring Tasks

The magnetic, dual-component RFD-4000 rotary sensors have been specifically designed for integration into existing applications with tight installation spaces. At a height of 7mm, the sensor's housing is quite flat. The position marker does not require any mechanical couplings, and at a diameter of 22.2mm and a height of 5.6mm, it also requires little space. The sensors feature a protection rating of up to IP6K9K and are well-suited for a wide variety of applications, even under the most challenging environmental conditions. They are capable of acquiring measurement angles of up to 360° with a 12 bit resolution. The independent linearity is $\pm 0.5\%$. The TFD-4000 allows for linear position measurements of up to 50mm. This linear position sensor can be utilized wherever the repeatable measuring of short distances without wear and tear is required. Since this sensor does not need a push rod, it is superior to many standard short stroke position sensors.

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