



## Magnetic Rotary Sensors – the Practical Multi-Talents

# Non-contacting Sensors in the Packaging Industry

*Magnetic principles are among the operating principles most frequently used for non-contacting rotary sensing. They provide absolute measurements, they are reliable under adverse environmental conditions, and they can meet almost any demand in regards to communication capabilities. What 's more, their cost-benefit ratio is quite favorable when compared to other principles, making them well-suited for countless mobile applications as well as for machinery and factory automation. A typical application for magnetic rotary sensors is the packaging industry.*

Film packaging represents a practical and efficient solution for protecting different types of products from environmental influences and damages. The film is light and transparent, so that the condition and quantities of the packaged goods are immediately apparent. The semi- or fully automated film packaging machines of Reiner Diez GmbH for completely sealed packages are therefore employed in the most diverse of industries, from printing and toy manufacturing over chemical building supplies, automotive parts, and tires to textiles, cosmetics, and food products.

### **Position Sensing of Dancer Arms**

The film is automatically fed into the packaging machines. In order to maintain the film 's feeding speed (of up to 50m/min) at a constant rate, a so-called dancer arm is needed. This dancer arm features a rotary sensor in its center of rotation. The sensor detects the dancer 's current position, thereby capturing the steadily decreasing circumference of the bobbin. This data is utilized by a frequency inverter to adjust the speed of the bobbin 's drive and to compensate for varying take-off speeds.

In the past, potentiometric rotary sensors were used for these rotary sensing tasks. Then, about four years ago, the packaging machine specialist opted for a non-contacting solution. This change of sensor technology was driven by two reasons: For one, there was the life span, and for the other, installation was relatively involved before, since an adapter was needed to connect the potentiometer to the dancer shaft. The new solution from the standard portfolio of sensor specialist Novotechnik is superior in regards to both aspects: During film take-off, magnetic rotary sensors of the RFC 4800 series detect the dancer 's current position. Since the sensors are non-contacting and do not comprise any movable parts, mechanical wear and tear has been eliminated; the only moving part is the position marker. Installation has also become easier with the new sensors.

### **Ease of Installation, Reliable Operation**

The ease of integration into the application is closely related to the operating principle: For rotary sensing, the rotating shaft is equipped with a position marker featuring a built-in magnet; this unit is positioned opposite to the sensor. Depending on the rotational position of the position marker, the orientation of the magnetic field and thus the signals of the flat sensor of only 14mm footprint, vary. These signals are then converted within the sensor into a signal output that is proportional to the rotation angle and sent to the higher-level control unit.

The fact that sensor and position marker are physically separate components simplifies the installation process, as the sensor can be placed at a distance of up to 4mm from the position marker. Larger distances of more than 4mm are also possible, when using other types of position markers. A marking on the position marker identifies the correct orientation in relation to the sensor. The sensor housing is made of high-quality, temperature-resistant polymer. Mounting tabs with elongated holes (or, optionally, round bores) simplify installation and mechanical alignment, so that there is no need for special alignment devices during the installation process. The sensor features a potted housing, making it impervious to contaminants. The cables or single wires for the electrical connections are molded into the housing.

Reiner Diez GmbH appreciates the given advantages for the installation process. Since the setup includes neither shaft nor bearing, and the measuring distance is variable, installation onto the automatic film dispensers is quick – should service ever be required, sensor replacement is easy; which, in light of the sensor 's robustness, should be a rare exception. In recent years, the sensor has proven itself in rotary sensing applications involving dancer arm configurations for many different packaging tasks. The sensor impressed both the equipment manufacturers and the users with its robustness, reliability, and accuracy.

### **Precise, Robust, and Communicative**

The sensor is operating at a resolution of up to 14bit – it typically features an (independent) linearity of  $\pm 0.3\%$ , which makes for precise rotary sensing. Available supply voltages are 5V, 18...30V or 9...32V. In the previously described application, the measurements are provided as a signal output of 0...10V. In general, the sensor allows for rotation angle acquisitions of up to  $360^\circ$ . Application-specific measuring ranges are available in 10 degree increments. For instance, the acquisition of the

dancer position requires a measuring range of 30 or 60 degrees, depending on the film dispenser 's design.

And yet, the magnetic rotary sensors have other characteristics as well, which allow them to shine in practical use and to serve as the multi-talented components for countless applications in machine engineering and plant design, but also for mobile applications: They are reliable even when exposed to high mechanical impact and vibration. Their approved ambient temperature range is -40 to +125° C and they comply with ingress protection standards IP67 and IP69K. They are available in single-channel and redundant designs, and they meet almost any demand in regards to communication capabilities. This is owed to the fact that the position data can be output not only via voltage or current interfaces, but also via SSI, incremental, CANopen, SPI, and most recently also IO-Link interfaces.

#### **Mit IO-Link gerüstet für Industrie 4.0**

IO-Link allows full utilization of the sensors ' "intelligence" within the automation cluster. On startup, the user can easily change parameters as point zero or rotational direction, thus reducing the number of builds. In addition to purely positional data, other information, such as status or diagnostic messages can be exchanged. Faults in the control circuitry are easily located, thanks to centrally stored setup parameters. This means that sensors can be exchanged in minimal time. Ultimately, IO-Link provides a clear value-add without additional costs, benefitting both automation technology and machine engineering alike.

Text: Dipl.-Ing. Stefan Sester, Head of Technical Sales at Novotechnik, and Ellen-Christine Reiff, M.A., Redaktionsbüro Stutensee