



(Photo: TWK/Getty Images)

Sensors for ship cranes

TTS NMF was founded as Neuenfelder Maschinenfabrik in Hamburg in 1970. Today, it is a leading manufacturer of ship cranes, focusing on heavy deck cranes.

With lifting capacities (SWL) of up to 1000 t and 2000 t, the cranes manufactured at TWK are the most powerful in the world when operated in tandem. The fact that complex technology is used in these mighty systems is clearly revealed by the control technology, and particularly the sensor system that is implemented. Important parameters that have to be registered include e.g. the boom angle, the turret position (azimuth), and the winch speed for the lifting speed. The ship's heel (list) is additionally registered by means of an inclinometer. If the ship reaches a specific limit value when "rolling" around its longitudinal axis and a corresponding boom angle is registered, the function is limited due to safety reasons. TWK has

been supplying TTS NMF with sensors since 1986. Type PP27 potentiometric angle of rotation encoders were initially supplied. These encoders use contacts for sampling, and have a limited electrical working range. These small, robust rotary encoders that are suitable for industrial use were used primarily in smaller deck cranes to determine the distance between the load on the crane hook and the revolving crane (working radius). Type TBA50 contactless absolute rotary encoders are now increasingly being used. They come with CANopen Safety option and support CiA 301, Version 4.1, CiA 406 Version 3.0, as well as CiA 305.

The T series rotary encoders operate internally using Hall technology, i.e. magnetically. They are designed in ▶



Figure 1: Sensor model TBA50 (Photo: TWK)

dual-chamber which e.g. enables the electronics to be cast. The extended temperature range of $-40\text{ }^{\circ}\text{C}$ to $85\text{ }^{\circ}\text{C}$ is standard. Thanks to its wall thickness of 5 mm to 10 mm, the housing, which is manufactured from aluminum or, in this case, stainless steel, is extremely robust. With a diameter of 12 mm, the stainless steel shaft can cope with loads of up to 250 N axially and radially. A Simmering seal ensures leak tightness. Protection class IP69K can be achieved by casting the electronics in the housing. This encoder series is particularly suitable for harsh environments that are characterized by wet conditions and extreme temperatures.

It can be networked together with other sensor system and actuator system subscribers in e.g. CANopen using a network interface. SIL2 and TÜV-certified variants are also available (CANopen Safety). In automating complex assemblies, these perform a number of tasks as position feedback sensors and speed sensors.

Rotary encoder

One further rotary encoder that has been developed specifically for cranes is an absolute multiturn encoder with slewing ring functionality. These enable the number of teeth of the slewing ring and rotary encoder pinion to be set directly in the rotary encoder. As a result, all conceivable gear ratios can be implemented, and the rotary encoder can be adapted precisely to the respective slewing ring by the customer. The rotary encoder then supplies the position of the slewing ring in degrees (resolution adjustable) and its speed in degrees/unit of time (unit of time adjustable) as output values. An optional play-free gear ZRS from TWK is available for coupling to the slewing ring. Manufactured from special, permanently elastic plastic, this gear is particularly resistant to temperature influences, moisture, aggressive substances, and permanent mechanical stress. The special tooth shape guarantees that a tooth's flanks are constantly in contact with the gear that is to be measured. This prevents falsification of the measurement signal on switching between forwards and backwards rotation (backlash).

In the field of inclinometers, TWK has developed the NBx65 model series based on so-called Mems technology.

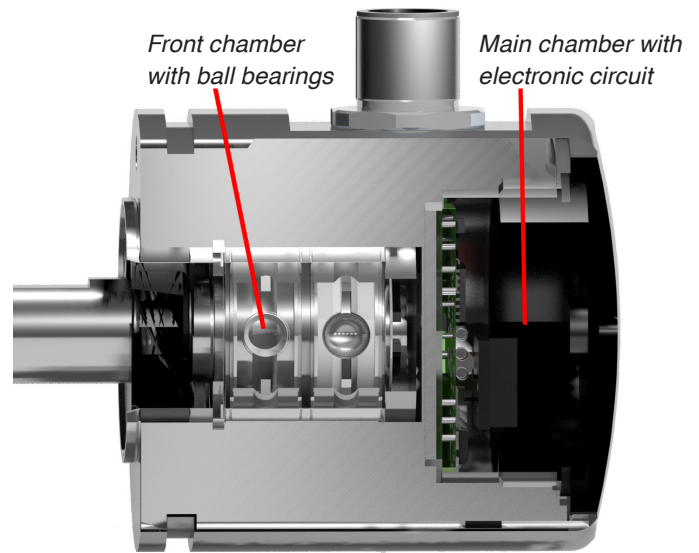


Figure 2: Cross-section of a rotary encoder from TWK (Photo: TWK)

Registration over $\pm 90^{\circ}$ for one or two axes and signal output with all relevant industrial interfaces are possible. TÜV-certified safety variants are also available in this case. Thanks to the solid housing made of seawater-resistant aluminum or stainless steel, with wall thicknesses of up to 5 mm, these encoders are particularly suitable for maritime use. ◀



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CAN Newsletter Online: TWK

The CAN Newsletter Online reports briefly about products and services.



Draw-wire sensor

Measures up to 10 m

The 125-D draw-wire sensor by TWK uses a CANopen encoder. It operates from -20 °C to +85 °C. The sensor based on rotary encoders is intended for outdoor applications.

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CANopen

Safety sensor for wind power

The safety vibration sensor NVA115 from TWK has been developed to protect wind power plants from damage caused by oscillations and vibrations. Data output is carried out via the CANopen interface.

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Vibration sensor

For SIL-2 applications

TWK (Germany) has added the NVA/S3 to its family of inclinometers and vibration sensors. It is able to output a safe vibration value between 0,1 Hz and 60 Hz via CANopen Safety or analog output.

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Rotary encoder

Slewing ring functionality

TWK Elektronik (Germany) has equipped its rotary encoders of the TRT and NOCN model series with a slewing ring functionality. The encoders come with CANopen.

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Inclinometer

With SIL2 certificate and CANopen Safety

The NBN 65 by TWK (Germany) is an inclination sensor supporting CANopen Safety. They are now also available with TÜV certification.

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Encoder can be integrated into axle pins

TWK (Germany) has introduced the TBN 37. It is a sensor with a shaft loadability of up to 500 N radially and 100 N axially with a housing diameter of 25 mm. It can therefore be integrated within an axle pin.

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SIL2 inclinometer with CANopen Safety

At the Sensor + Test 2013 TWK (Germany) has introduced the NBN/S3 inclinometer supporting CANopen Safety. The SIL2 certified sensors can be mechanically adjusted up to $\pm 7,5^\circ$ using elongated holes.

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