

QUICK READ

Conventional encoders are often no match for the harsh operating environments that occur in the field of mobile machinery. Shock, temperature change as well as humidity and moisture considerably limit the lifetime of the devices used. To remedy this situation, Turck has now also implemented on the new and compact QR20 series the contactless resonant circuit measuring principle that was used on the contactless encoders of the QR24 series. The QR20 encoders with IP68/69K protection were specially developed to meet the requirements of mobile machinery.

Multi-Resistant

The compact and wear-free Ri360-QR20 miniature encoder from Turck, with contactless resonant circuit measuring and IP68/69K protection, is especially designed for use in mobile machinery

Virtually every sector has its special features. In the food sector, joints and cracks are considered undesirable as they tend to accumulate dirt. In the automotive sector technical components also have to be able to withstand the occasional exposure to weld spatter and must not be disturbed by electromagnetic interference. The mobile equipment sector likewise places very special requirements on the automation used.

For example, EMC requirements are particularly demanding in the field of mobile equipment. Vehicle electrical systems are normally designed for low voltages and have voltage fluctuations which should have no effect on the signals of a sensor. As a result, an extended operating voltage range of 8 to 30 VDC and the so-called load-dump protection are widely used. Components for mobile equipment also have to be particularly mechanically robust. Diesel engines and work units on concrete mixers, wheel loaders or other mobile machinery are a source of intense vibration and shock. Fully encapsulated technical components protect the electronics in these applications from electrical disturbance.

Standard encoders are often unable to cope

The degree of robustness required in the mobile equipment sector presents several problems for virtually all encoders. Design factors require virtually all sensor types and measuring principles to involve the direct linking of rotation axis and sensor – regardless of whether potentiometric encoders, optical systems or Hall encoders are used. This means that vibrations or shocks are transferred via the shaft to the encoder, so that it is put under stress until it finally fails. Besides the vibrations, penetrating dirt and humidity also present possible problems that may likewise ultimately lead to the failure of the encoder.

Turck has solved many of these challenges for years with the contactless encoders of the Ri360-QR24 series and the contactless Ri360-QR14 angle sensor. Due to the special resonant circuit measuring principle used, these devices are not only absolutely wear-free, but also highly resolved and vibration-resistant as well as providing lasting protection to IP68/69K. This measuring principle makes it possible to design a fully encapsulated sensor housing without seals that is separated



The QR20 is available with Deutsch, AMP or M12 plug connectors, as well as with open ended cables

from the positioning element. The possibility of dust or water penetrating into the electronics is fully excluded – even when condensation is present. The encoder can compensate for vibrations and movement of up to 1 millimeter.

While the QR24 has been tried and tested in several applications in factory automation, it was only used in individual cases in the mobile equipment sector. In this area of application it is often too big for the very restricted spaces involved. Only the CAN bus variant is used here. Customers in this sector more often use the smaller QR14. However, it is not a conventional encoder in terms of its resolution, accuracy and speed, and so it is also considered as an angle sensor.

QR20 closes the gap

Turck closes the gap between both products with the Ri360-QR20. The new encoder series provides virtually the same level of performance as its "big brother" the QR24, but comes in a compact 71 x 64 x 20 mm housing that is designed for the mobile equipment market. The key feature: The housing fully surrounds the position-

A mounting option in which the positioning element is protected by the housing is a real breakthrough in contactless measurement technology. The sensor protects the positioning element so that complex auxiliary structures are no longer necessary.

Compact and robust:
Turck's contactless
RI360-QR20 encoder
fully covers the internal
positioning
element



ing element and thus provides it with full protection from the outside. A cylindrical recess in the cube-shaped housing provides sufficient space for the positioning element – without requiring a mechanical connection to it. This new principle offers a high level of mounting flexibility and easy mounting as well as maximum device protection. This not only reduces the planning work for the designer but also offers mechanical protection as well as protection from dust and moisture, as no protruding parts have to be taken into account. The housing is also permanently sealed. Even the often problematic potential points of leakage such as LED lenses are eliminated since the QR20 uses a transient plastic at these points, through which the internal LED shines. Even the capillary penetration of water in this fully encapsulated housing from one piece is impossible.

The encoder is not only precisely tailored to the requirements of the mobile equipment market in terms of design but also electrically. This is underlined, for example, with an EMC immunity of 100 V/m, which is also required for the standard market E1 certification. The encoder is also protected from line-conducted interference according to DIN ISO 7637-2 or SAE J113-11. Salt spray or rapid temperature changes, as well as diesel, kerosene or vibrations have no effect on the device. With an operating temperature range from -40 to + 85 °C there are virtually no climatic conditions that could be critical for the QR20.

Ready for everything

With a 12-bit resolution, corresponding to around 0.09 degrees, the RI360-QR20 offers a degree of accuracy that is sufficient for most applications on the market. The output signal ranges from 0.5 to 4.5 VDC (LU4). If the sensor does not detect a positioning element, the value jumps to 5 volts, clearly indicating an incorrect measurement that can be distinguished clearly from a

cable break. The user can choose between four connection types: Deutsch plug connectors, AMP plug connectors, M12 plug connectors or open ended cables. The positioning element supplied with the device allows versatile connection to different shaft diameters. With the new QR20 encoder Turck customers can choose between seven preset angle variants: These are 20°, 40°, 60°, 90°, 120° and 240° as well as 360°.

Applications

As in many other cases, Turck has also closely worked together with customers on the development of the QR20, such as in the field of agricultural machinery. The device is ideally suited for operation in agricultural machinery, such as on a field sprayer. On this machine the encoder can detect the extension of the sprayer arm. Previously, Turck's smaller QR14 was used here, but this did not provide the possibility of flush mounting the positioning element. Many customers therefore mount guards over the encoders where it is necessary. Whoever wishes to avoid this in future will find the RI360-QR20 to be the right alternative.

In another project, a supplier of gear motors worked closely together with Turck. The supplier is now fitting its gear motors with the RI360-QR20 in series production for detecting the currently selected gear. To do this the encoder detects the particular rotation angle between 0 and 320° which determines the current gear.

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