

DRIVE ENGINEERING

Optical Multiturn Encoders without gears

Two Worlds become One

Up to now the fields of application for encoders have been strictly separated. Either the focus was on the accuracy and magnetic insensitivity of optical encoders or it was small, rugged magnetic encoders that were required. In order to answer the changing demands in automation, Kübler has developed a series of optical multiturn encoders that does without gears and is both compact and robust.

Nowadays it is hard to imagine the world of positioning without absolute multiturn encoders. For a long time it was clearly broken down into two areas: on the one hand there were application areas in which the accuracy, high resolution and magnetic insensitivity of optical encoders were required. Simple, magnetic encoders on the other hand are small, economical, work on a non-contact principle and offer a long service life. They were used everywhere that ruggedness and very compact dimensions were required. However current trends, including advancing automation and miniaturisation, have resulted at times in a wide gap between application requirements and technological solutions. At the same time, compact drives demand high-precision feedback, whilst position data must not be corrupted by magnetic fields.

In sectors such as the packaging industry or medical technology, sensors as well as actuators are also getting smaller and smaller, whilst at the same time having to maintain the same level of functionality. Kübler has therefore combined the advantages of both measuring principles in its new Sendix F36 encoder series. The new technology is based on an OptoASIC with high integration density. This opens up new possible areas of application. Where, previously, compact potentiometers had been employed for space reasons, now optical encoders will fit – including their 8 mm diameter through hollow shaft.

Optical, compact, insensitive

The new encoder series combines the advantages of a mechanical with those of an electronic multiturn stage. Where did this idea come from? The aim had been to develop an encoder specially to meet the needs of drive engineering; initially, in order to avoid interference caused by magnetic fields, magnetic principles were ruled out. Instead the company focused on a combination of optical and electronic principles. The F 36 is a purely optical multiturn encoder that is 100% resistant to magnetic fields. Despite its optical sensor technology it requires no gears, as it evaluates rotations wholly electronically; it has no moving parts and is thus free from wear. The compact encoder is of a 36 mm size but still offers a through hollow shaft of 8 mm or a standard solid shaft of 10 mm. The normal rule that high-resolution optical multiturn encoders are always associated with large dimensions (primarily because of the size of their mechanical multiturn module) no longer applies. This also disproves the perception that optical multiturn stages necessarily contain mechanical, and hence a large amount of, components, which would entail high susceptibility to wear and the probability of failures. As a result of a highly integrated OptoASIC the new encoder series contains a minimum of components. Many components that could be damaged by vibration or that were susceptible to breakage were done away with, resulting in encoders that are robust, reliable, with a long service life. The gearless design means that many components prone to wear, such as gear wheels, or sensitive to magnetic fields, such as reed switches, can be dispensed with. The result is non-contact, magnetically insensitive multiturn scanning with a long service-life.

Faster and Safer - with Real-time and Safety Lock

In many operational environments for the new encoder series, safety and speed functions are critical for the success of the application. It is thus important that these encoders, with their rugged Safety Lock Design bearings, make a long-term contribution to the avoidance of machine shutdowns and repairs. It is also important that the sturdy IP67 protected die-cast housing and the wide temperature range make the series ideal for use outdoors, especially in difficult environmental conditions. The encoders are able to withstand temperature fluctuations between -40 and 90 °C. All important functions - including the sensor technology, voltage and temperature – can easily be monitored and evaluated by means of a status output.

Moreover, the highly integrated OptoASIC technology provides the basis for the real-time capabilities of the devices, with a data update of the position value of less than one microsecond. The short control cycles ensure high productivity whilst at the same time the open interfaces offer flexibility and autonomy. The SSI interface allows clock rates of up to 2 MHz; the all-digital BiSS interface works up to 10 MHz.

Incremental encoder included

The encoders offer a total resolution of up to 41 bits. This results from the combination of a tailor-made programmable multiturn encoder with up to 16 million revolutions and an accurate singleturn with up to 17 bits resolution. This opens up numerous new application possibilities for these versatile devices. Twin incremental outputs, SinCos or RS422, are supplied with the package. They provide the system – also in real time – with high resolution feedback. The compact encoder thus offers in effect two devices in one – including an incremental encoder. This saves not only on costs but also on the space that a second encoder would have taken up.

TECHNOLOGY IN DETAIL

Optical Encoders

Compared with their magnetic opposite numbers – generally classified as particularly robust – optical encoders have the advantage, as a rule, of higher accuracy and insensitivity to magnetic fields. Optical encoder technology is based on a code disc, usually made of glass or metal. An LED sends out light, which is modulated by a code pattern on the disc. This pattern is applied to the rotating pulse disc; this is detected by a special OptoASIC. A unique bit pattern is assigned to each position, which with absolute encoders is normally available as Gray code. Since space requirements are playing an increasing role in plant and machinery, then it is the size of optical encoders that has often been the deciding argument against their use. However, by integrating the multiturn stage onto an OptoASIC, highly accurate optical encoders are now able to be extremely compact. Nowadays there is no problem implementing protection levels of IP67 for optical encoders. More and more the application fields for optical and magnetic encoders are tending to overlap.

Abb. Bzw. Fotos

Turning two into one: Technology makes it possible.

The F36 encoders are available as singleturn and multiturn, absolute and incremental.

Trained eyes see more. The first and very important element within a multi-stage test process for encoders is and remains the visual inspection.

The encoders have a high total resolution of up to 41 bits.

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