Drive Automation

Encoders SIL 3:
Certified dual-channel performance with only a single encoder.

The move towards Integrated Safety

Encoders for functional safety

Not all encoders are alike. Moreover, if safety functions of a higher order are called for, then special measures must definitely be taken. The best scenario would be if the motor encoder could be designed as a safe encoder – and one that could be used up to PLe. Kübler has a solution to this.

Whether in high rack storage areas or in theatre backdrops, the integration of safety functions directly in the inverter affords added value through higher availability. The assessment of the hazard potential of a machine is carried out in line with safety standards DIN EN 61508, Functional Safety, and EN ISO 13849-1, Machinery Directive.
Depending on the severity of the possible injury and the potential frequency of occurrence of a failure, the machine has to be designed in accordance with the requirements of the determined safety class. These are divided into Performance Levels (PL) from 'a' to 'e'. Depending on the level required, a higher performance factor is necessary when it comes to failure recognition/ diagnostics (Diagnostic Coverage DC) as well as the common occurrence of failures (Common Cause Failure CCF).
Machines are equipped with a wide variety of speed- or position controlled drives. These movements can sometimes have a considerable hazard potential, from which the user has to be protected. The main measures taken to achieve this protection include light curtains or protective enclosures and motion limiting switches, allied with switching the machines off.
A de-energised idle drive means a safe condition. However it may be necessary for a person to be within the danger area of a machine whilst it is running, for example to eliminate a fault. This of course means that the safety function has to be widened to cover the movements of the machine, in the form of reduced speed, safe working area or limitation of the torque. For the user this means that his plant can be considerably more profitable.
Depending on their PLs, these higher-value safety functions require special measures to be taken and structures followed in respect of the components forming the sensor, control and actuator chain. Many inverters have to be equipped with an additional safety module in order to achieve this functional safety. In conjunction with safe positioning limit switches can then be cut down on and the scope of the original safety control system considerably reduced. This can bring not only a gain in functions but also a saving on costs. Of course, this can then also put extra demands on the encoder. This often means that a further encoder has to be used, redundant to the motor encoder. A time-consuming and expensive solution.

"The use of just one encoder requires a 100% reliable mechanical connection."
Dr. Dirk Clemens, Kübler

The best scenario would be to design the motor encoder as a safe encoder that could be used up to PLe. Then there would be no need for the extra encoder and the space requirement would stay the same – a big advantage for the user when it comes to costs and installation.
The SENDIX SIL encoders for functional safety from the Kübler company are exactly this type of encoder. A number of variants are available: firstly the SENDIX SIL incremental encoders with pure Sin/Cos signals and secondly the SENDIX SIL absolute single/multiturn encoders with additional absolute SSI data. These encoders are certified for use up to PLe. This is achieved by monitoring the sine/cosine signals with the help of the function $\sin^2 + \cos^2 = 1$. In order to obtain safe information regarding the position – even after a power-down condition – the safety module compares the internal position from the incremental signals with the absolute value of the encoder.

The absolute and incremental encoders
are certified for applications up to SIL3 and PLe.

The use of just one encoder requires a 100% reliable mechanical connection. Suitable sturdy fixing elements help eliminate the risk of failures and guarantee a 100% safe shaft connection. Magnetic insensitivity as a result of purely optical scanning as well as mechanical multiturn gears guarantee error-free operation even in environments susceptible to interference, as can occur for example with magnetic brakes. The wide temperature range from –40 up to 90 degrees Celsius, together with a protection level of up to IP67, allow for use in a wide range of applications.
There are numerous applications, where the integration of the safety function directly in the inverter and the use of a safe encoder have brought additional benefits as a result of higher availability.
They include, for example, the automation of high rack storage systems or of backdrops in theatres and event halls. Here, where people are constantly present under suspended loads, the highest safety level PLe applies.
Here the absolute multiturn variants reliably detect the position of the loads. The encoders can either be mounted directly on the drive of the backdrops, or on chain hoists. All drives are equipped with electromagnetic double brakes.

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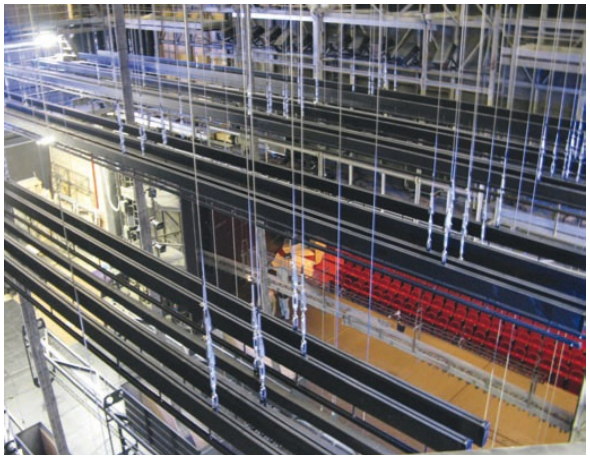

The inner workings of theatre stages – precise positioning of scenery backdrops. Encoders play a role in this.

Location Germany

Kübler expands in Villingen-Schwenningen

Together with the mayor Dr. Rupert Kubon, the representatives of the construction services provider Vollak, Rainer Kracht and Mirjam Arnu, and Georg Seeck from the office of Economic Development, the Kübler Group recently held a groundbreaking ceremony for their factory extension in Schwenningen.
With this 1500 m^2 extension, the company is doubling the area available for product development and industrialisation, and creating space for further production cells.
The reasons behind the new extension are the current good economic situation, the successful acquisition of new customers and markets as well as a multiplicity of new innovations, which Kübler wish to bring to market.
Being one of the leading manufacturers of counting and sensor technology, the Group is continuing to focus on profit-oriented growth. “The building extension here in Schwenningen will create the foundation for this, and is a clear commitment to our being located in Germany,” stresses Lothar Kübler. Meanwhile the company now has 250 employees in Schwenningen and more than 360 worldwide. The production area of the Schwenningen site had only just recently in 2007 been extended by 2500 m^2.