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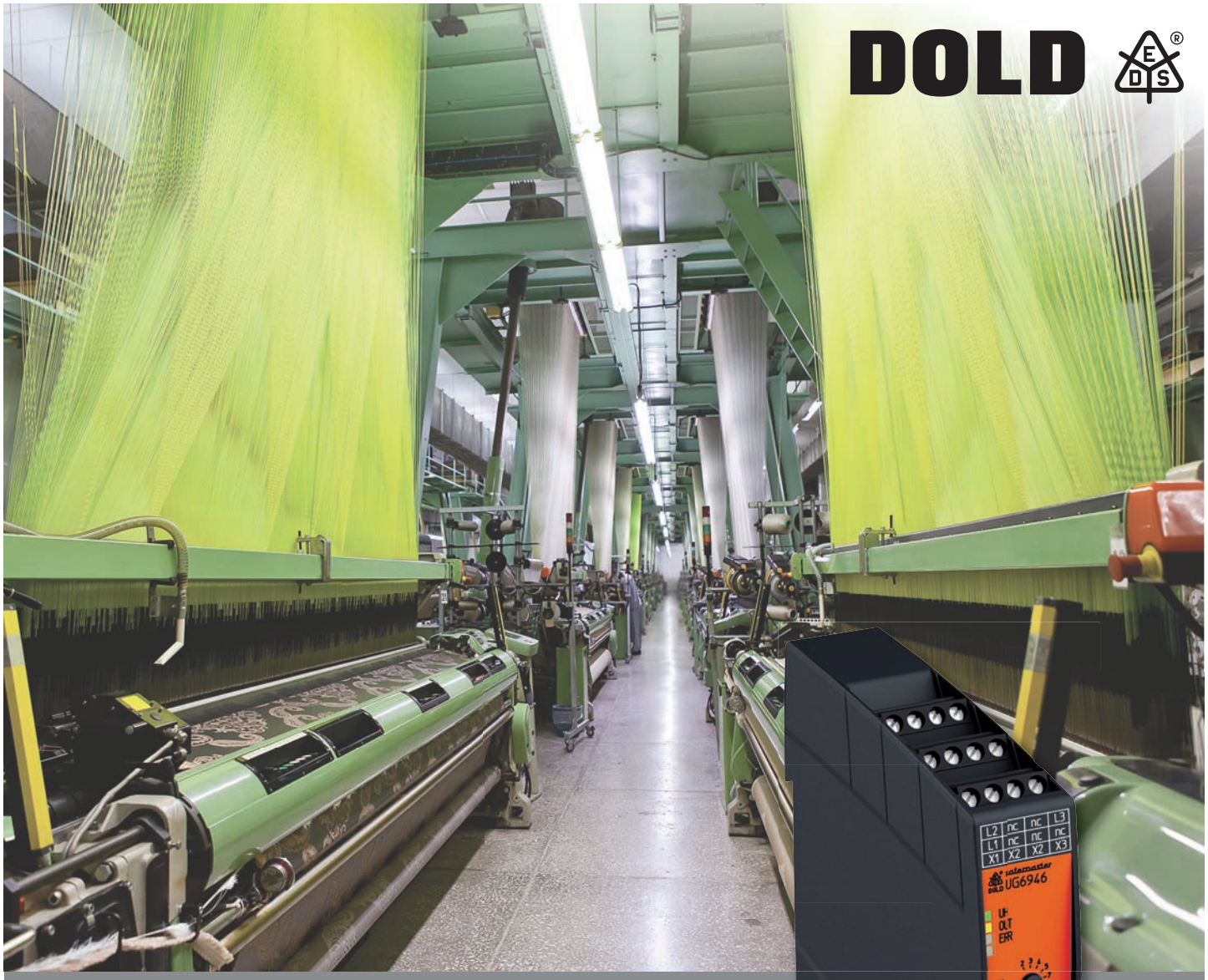

Eliminating hazards by electric drives

Technical contribution: Standstill monitoring without sensors

Electric drives are dynamic and can generate high forces and torques. Therefore, they are indispensable for modern mechanical and plant engineering. What is of advantage for the performance of the machine involves dangers at the same time. Thus, in many applications people must be protected from moving plant components. Safety fences with safety gates are often the adequate solution. If people stay within the safety area it must be ensured that dangers are excluded.

In many applications in mechanical and plant engineering drive technology plays a major part. Electromotors drive spindles of machine tools, they transport goods in conveyor technology or machine products in automated production lines. In such applications the operating personnel must be protected from moving plant components. In many cases safety fences, safety gates or other mechanical barriers prevent people from entering the hazardous areas.

Access only at standstill

A strict or permanent separation of machines and operating personnel is only possible in very rare cases, however. Depending on the application it is necessary for staff to directly interfere at the machine. This may be the case if the workpiece in a machining centre needs to be changed or if maintenance or repair work must be performed. If people work inside the safety range it must be ensured that they are not endangered by moving machine parts. The norm DIN EN ISO 14119:2013 stipulates that safety gates must be locked in such a way that they cannot be opened as long as the plant still poses any risks. Furthermore, the protection system must be designed in such a way that, e.g. in case of an emergency stop, parts of the machine do not move any longer when a person reaches the hazardous area.

Persons must be safely protected from moving machine parts. It must only be possible to open safety doors when there is no longer any danger.

For setup and maintenance work, however, drives sometimes need to be moved although people are in immediate proximity. In such cases the safety solution must ensure that a certain speed of the machine parts moved is not exceeded. In this case safety installations can ensure that the maximum rotational speed of the electromotor is limited.

Monitoring of rotational speed and standstill

For the safety-related functions described above monitoring the rotational speed of the drive is an efficient solution. A simple disconnection of the electric drive, however, cannot ensure that the moving parts of the machine have actually come to a standstill. Depending on the type of machine and drive movable parts can run on for quite a while and therefore pose a danger.

In order to monitor the rotational speed of a drive so-called encoders or initiators are often used. These sensors are directly connected to the rotating shaft and transmit a certain number of signals per rotation (depending on the model) to the connected evaluation electronics that determines the rotational speed. Such sensor-based solutions can monitor both the rotational speed and the standstill. If, however, existing machines and plants need to be retrofitted this involves engineering effort and therefore costs.

Solutions of sensorless monitoring

Standstill monitors which detect voltages at the windings of the electromotor constitute an alternative solution that does not require any additional sensors. This also works if the motor is disconnected, as the decelerating drive induces voltages in the windings by remanence. The new sensorless standstill monitor UG 6946 from the SAFEMASTER S series by DOLD is based on this functional principle. It measures the induced voltage at the clamps of the winding by two redundant measuring channels. Only if the inductive voltages in both channels fall below the response threshold the device detects the motor standstill and activates the output relay. In order to adapt the device to a variety of motors and applications the voltage threshold below which the UG 6946 detects the standstill can be adjusted. The same applies to the standstill time - only if the set voltage falls below for this period the standstill monitor finally signals the standstill. Line breakages at the measuring lines are also detected. The UG 6946 fulfils SIL 3 resp. PL e/cat. 4 and can be used, among other things, for the release of a safety interlock or the activation of a holding brake. As no sensors are required the installation and wiring are very simple and cost-effective. For this reason and because of the narrow width of just 22.5 mm the UG 6946 is also ideally suited for the retrofitting of existing plants.

The standstill monitor UG 6946 of the series SAFEMASTER S does not require any sensors which allows for easy installation into existing plants.

Portfolio for safe drive monitoring

DOLD offers a comprehensive portfolio for safe drive monitoring. The series SAFEMASTER S consists of different rotational speed and standstill monitors which detect the standstill and rotational speed of machines and plants in safety applications and emit respective switching signals. Sensorless devices such as the UG 6946 described above, rotational speed and frequency monitors UH 6937 and devices operated by encoders or other sensors are available. With respective switching the safety functions STO (safe torque off), SOS (safe operational stop), SLS (safely limited speed), SSM (safe speed monitoring) and SSR (safe speed range) can be realised. In this way applications that require highest safety up to cat. 4 /PL e res. SIL 3 can be equipped.

More information at www.dold.com

The series SAFEMASTER S includes different rotational speed and standstill monitors such as UG 6946, UH 6937, UH 6932 and UH 5947.

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