

# Product note

## DCS800 „Safe Torque Off“ option

### Principle

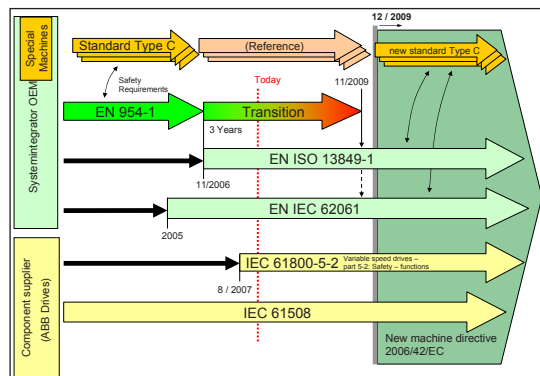
For small cleaning type work or inspection of production machine, it must be possible for machine operators to prevent unexpected start up of drive motors.

The armature converter is disconnected from supply. Typically air circuit breakers or contactors are used on AC side. Very big drives are typically equipped with High speed DC breakers which can also be used to open and prevent armature current. The pure blocking of field current as well as blocking of firing pulses of armature bridge does not guarantee NO TORQUE AT SHAFT. The solution provides NO torque at the shaft, BUT it does not provide electrical mains OFF (no voltage) of all live parts (no voltage at motor terminals).

### Standards

Under machine directive EN 60204-1 the safety Standard EN 954-1 with the categories B,1,2,3 are well known.

2009 EN 954-1 is replaced by new Safety standard EN ISO 13849-1. The content is influenced by EN 61508 Control devices and EN 62061 for machine devices.



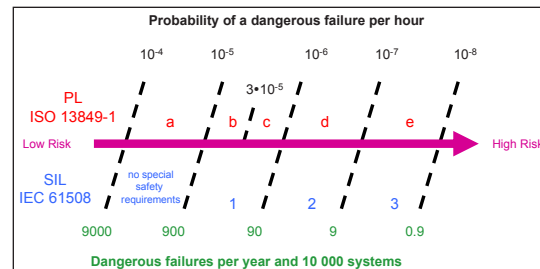
The new standards are also adopted by local standards.

OSHA for north America • GOST R for Russia • CCC for China • OH&S for Australia.

The safety is given in Safety Integrity Level (SIL) or Performance Level (PL).

The new standard EN ISO 13849-1 takes care on prevention of hazard situation by calculation of malfunction of electric devices. The PL calculation is based on MTBF of electronic devices multiplied with size of human injury. The calculation takes also in account the wiring, how devices are wired (e.g. redundant or not redundant) and discovery of fault (continues fault monitoring or fault monitoring only during boot).

Performance level and SIL level are never related to a complete drive, the values are related to a certain function (safety function).



### Product description

DCS800 STO is an option for DCS800-A enclosed converter as well as DCS800-E panels or DCS800-R TYRAK revamp kits. DCS800 option STO circuit is built on redundant wiring, monitoring of redundant wiring and monitoring by safety relays Dold BD5935. The activation is displayed by Feedback lamp. The circuits designed under the safety principles in accordance with EN ISO 13849-1.

### Safemaster module BD 5935

- According to EU Directive for machines 98/37/EG
- According to IEC/EN 60204-1
- Safety category 4 according to EN 954-1
- Output: optionally 1 NO / 1 NC or 3 NO / 1 NC
- Gold plated contacts to switch low loads
- 1- or 2-channel connection
- Line fault detection on ON push-button
- Operating state display
- LED display for channels 1 and 2
- Overvoltage and short circuit protection
- Optionally automatic ON function when the operating voltage is applied or activation via the ON pushbutton
- Optionally cross fault detection in emergency-stop



Approvals and marking



<sup>1)</sup> pending  
\* see variants

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## Function description of option STO

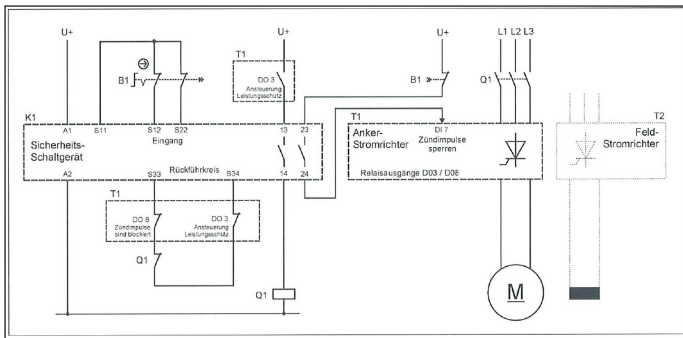
The circuit of „Safe Torque Off“ (STO) is an option of enclosed converter DCS800-A, DCS800-E Drive panel or DCS800-R TYRAK revamp kit. This safety function provides the protection „prevention of unexpected start up“ as in Standard DIN EN 1037 described.

The safety function is designed according category 3 of EN ISO 13849-1.

The principle behind the Function „Safe Torque Off“ is a prevention of any torque at the motor shaft by opening armature circuit.

The design is based on two independent circuits by removing Digital input 7 (=0) the current is suppressed as fast as possible and later on the firing pulses are blocked. The second channel is the opening the main circuit breaker, AC contactor or high-speed DC breaker.

One single fault does not disturb the safety function. If a fault is detected the ON is blocked and Reset is not possible. Not all possible (device) faults can be discovered (DC diagnostic coverage).



## Ratings

PL = d

Details:

MTTF d = 69 years  
=  $1/1.8 \cdot 10^{-7}$  h

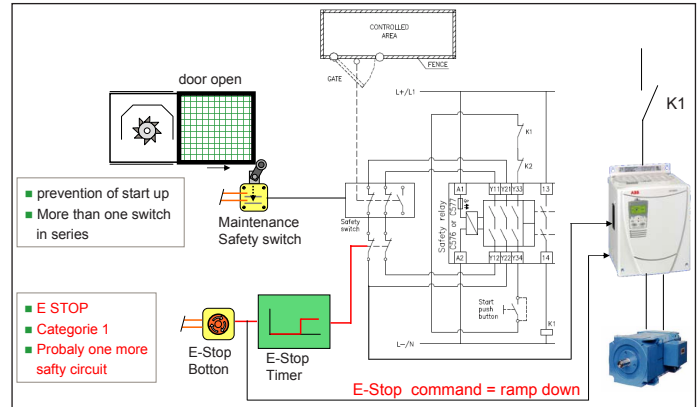
DC avg = 61%

Structure = Category 3

CCF = 90

## E-Stop

The function E-Stop means electrical stop (braking) as fast as possible and has nothing to do with STO.



In case of different stop categories EN 60204 (e.g. ramp stop) the DCS800 STO solution can be combined with E-Stop circuit and E-Stop command.

Sometimes the E-Stop circuit is also equipped with a safety relay, which requires a different second relay.

Certified E-Stop requires a separate approval.

For more information please contact:

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