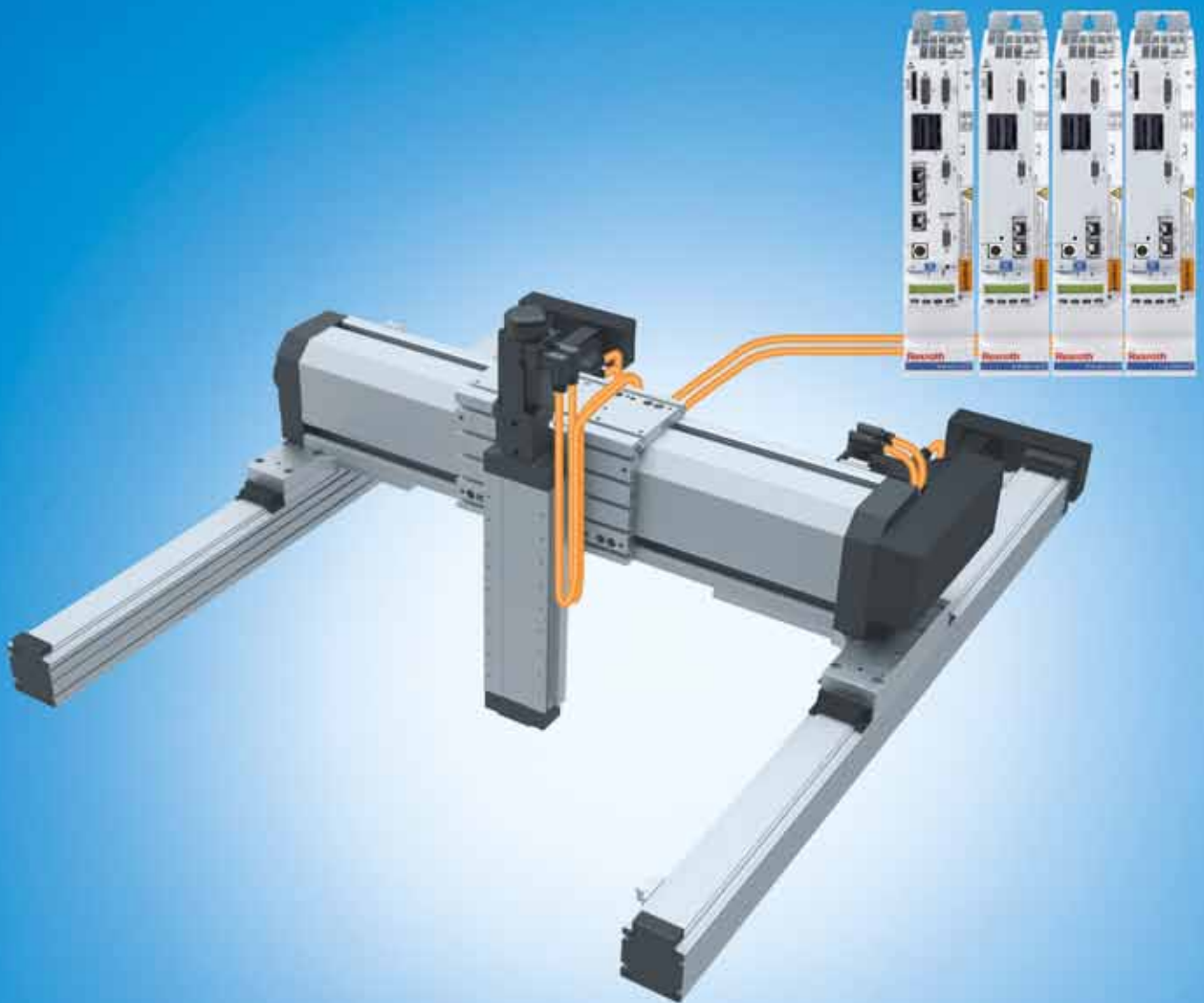


# EN ISO 13849-1

Control and Drive Components with Integrated  
Safety Functions for Linear Motion Systems

R310EN 2419 (2010.07)

The Drive & Control Company



## Integrated safety functions for Linear Motion Systems

### New standards with new requirements – no problem, thanks to Rexroth

Whether the task involves machine tools, packaging and printing machines, assembly, handling or robot applications, the protection of personnel, machines and tools is absolutely paramount. Safety is therefore a topic of prime concern to users and manufacturers alike, and one which demands intensive cooperation between the automation partner and the machine manufacturer. As an all-around automation partner, Rexroth provides access to unique know-how across all drive and control technologies and complying with requirements such as “safe motion”, “safe processing of peripheral signals” and “safe communication.”

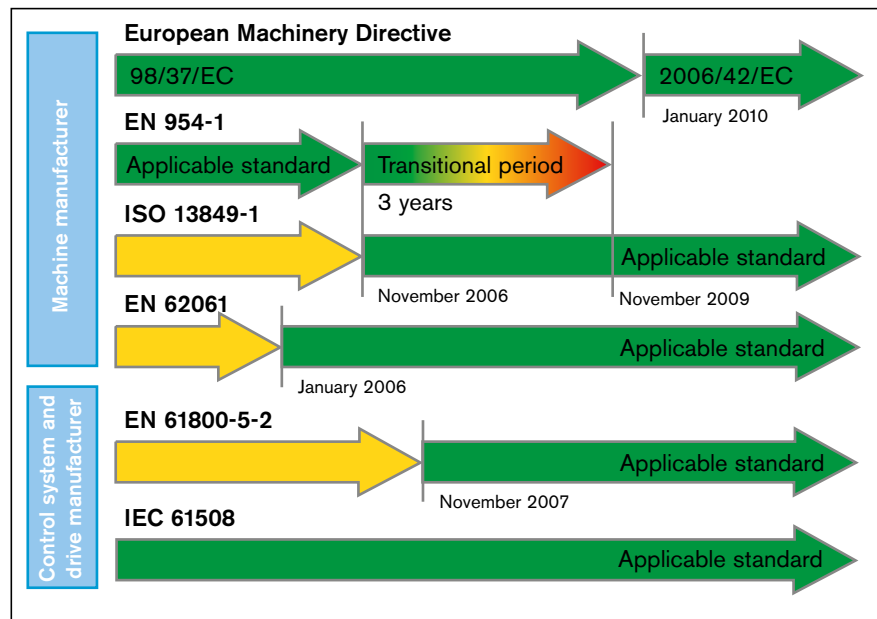
As a technology leader, Rexroth offers consistent functional safety on all automation levels: from components through to system solutions including software, Rexroth provides machine manufacturers and end users with high-quality products based on the newest safety engineering.

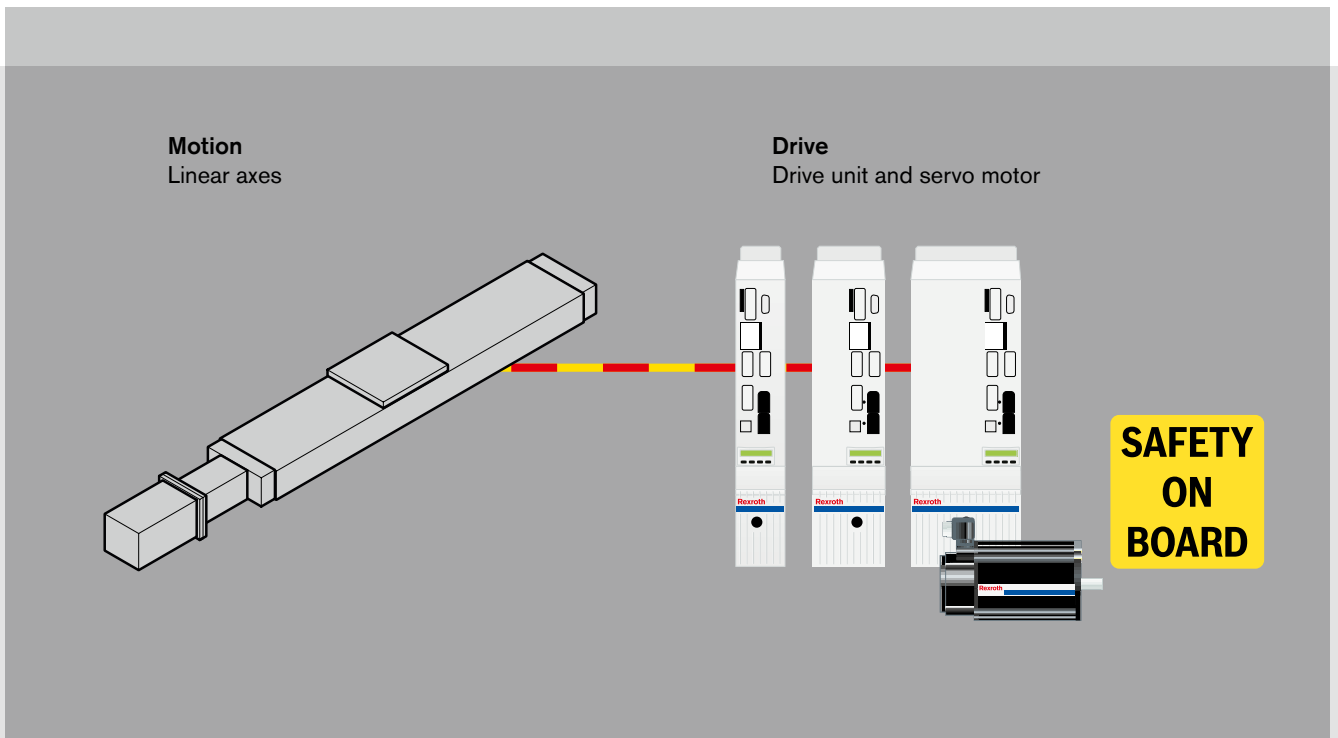
Every manufacturer of plant and machinery is responsible for ensuring that his products meet basic safety requirements. The new European Machinery Directive 2006/42/EC and the Machinery Safety Standards EN ISO 13849-1 – in the latest revision – and EN 62061 provide the framework: In an extensive evaluation with statistical parameters, machine manufacturers must proof protection of personnel under consideration of all components and systems installed into the machine or production system.

The goal is to identify and reduce risks. Intrinsically safe designs therefore always have higher priority over protective safeguards and warning notices in the documentation. If hazards are to be minimized by the use of safety-critical control components, the EN ISO 13849-1 comes to bear. The machine manufacturer must specify the required performance level, i.e. the reliability, of the safety functions.

### Your tasks...

- In order to comply with the standards, machine manufacturers and their suppliers must perform the following tasks:
- As per European Machinery Directive 2006/42/EC: Risk assessment and reduction of risks.
  - As per EN ISO 13849-1: Estimation of the reliability of safety functions dependent upon, e.g.
    - the hardware-oriented structure
    - the mean time to dangerous failure (MTTFd)
    - the diagnostic coverage (DC) of a safety function.



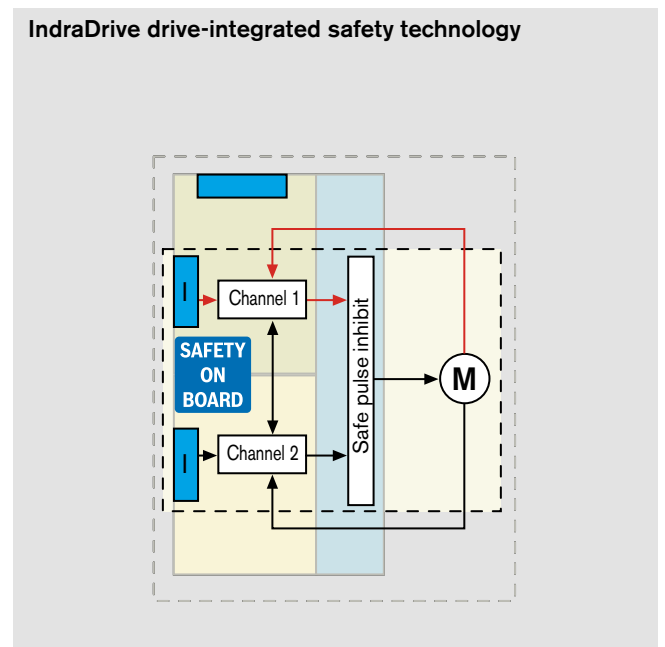
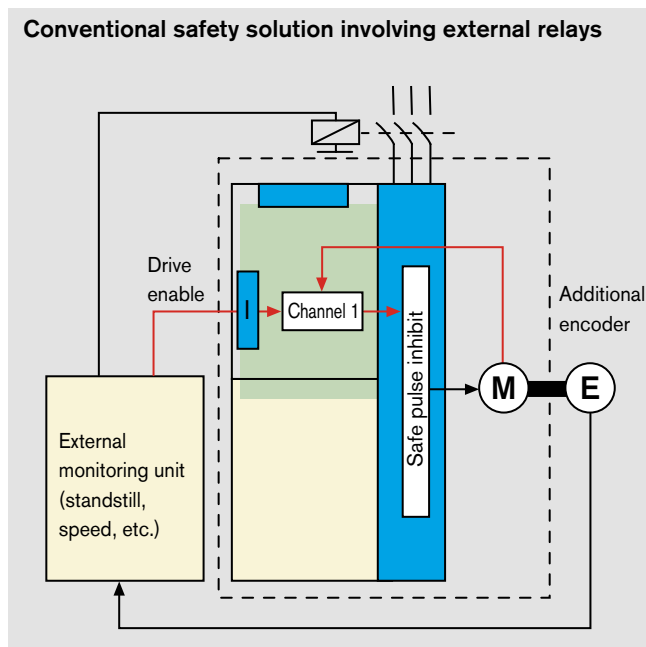


**...our solutions**

Rexroth provides perfectly matched certified control systems, controllers and motors with integrated functional safety, thereby making work easier for designers and machine manufacturers.

The benefits for you are:

- **reduced development effort** to comply with the new standards, e.g. through automation products with certified safety functions, certified components and tested circuits;
- **simplified design process** for safe machinery through single-source drive and control technologies;
- **effective protection of personnel** through safe movements in all drive technologies and the fast reaction of monitoring functions.



# Integrated safety functions for Linear Motion Systems

## Our drives and controls – your safety

The safety technology is exclusively available for linear axes with MSK motors and IndraDrive.

### SAFETY ON BOARD

Safety on Board merges drive-based and controller-based safety solutions to form a smart comprehensive safety concept.

These safety solutions in our drive systems (IndraDrive) and controllers assure a high level of diagnostic coverage and hence a high availability of the safety functions.

#### Your advantages:

- Maximum protection for personnel
- Maximum safety and reliability
- Safety components tested and certified in accordance with the latest safety standards
- Functional and legal assurance
- Reduced downtime
- Increased availability
- Simplified start-up and validation
- Minimized cost and effort for validation
- Easy upgrading of standard components to full-fledged safety components
- Flexible use as stand-alone safety components or as part of a system solution

### SafeMotion

The drive-integrated safety technology in IndraDrive from Rexroth monitors movements where they are generated. The results are very rapid response times of just 2 milliseconds upon triggering of the internal monitors.

Even in the case of a power failure, a hydraulic feed axis with mechanical clamping can come to a safe stop within milliseconds.

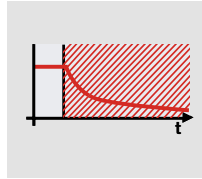
Rexroth provides these intelligent drive solutions as certified safety components with all the necessary proofs. SafeMotion is thus the first step in the realization of safe machine concepts.

#### Your advantages:

- Effective protection of personnel
- High reliability thanks to certified and integrated solution
- Maximum assurance against tampering through drive-integrated monitoring system
- Reduced design effort through savings on time and money spent on certification
- Increased availability through reduced downtimes
- Increased machine productivity as a result of shorter special mode times
- No unnecessary idle times because the line circuit breaker does not have to be opened when undertaking work on the machine
- No need for re-synchronization of coupled axes after intervention work on the machine
- Savings on limit switches, measurement and analysis units and control cabinet size
- Fault detection without the need for any periodic machine shutdown
- Can be integrated into any kind of system architecture
- Easy start-up
- Easy to service

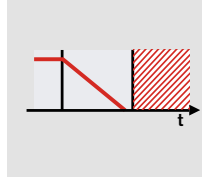
For more information, refer to the brochure “Safety on Board – Functional Safety in Automation Technology”, R911 322 823.

## SafeMotion – Certified safety functions



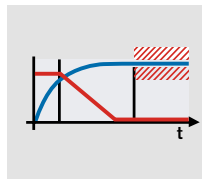
### Safe Torque Off (STO)

Stop category 0 in accordance with EN 60204-1: Safe drive torque cut off



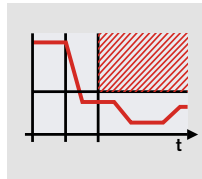
### Safe Stop 1 (Emergency Stop) SS1ES

Stop category 1 in accordance with EN 60204-1: Safely monitored stop, control or drive controlled with safe drive torque cut off



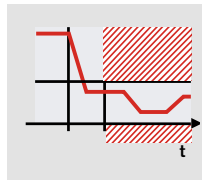
### Safe Stop 2 (SS2)

Safe Operating Stop (SOS)  
Stop category 2 in accordance with EN 60204-1: Safely monitored standstill at controlled torque



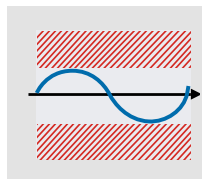
### Safely Limited Speed (SLS)

If enable signal is given, a safely limited speed is monitored in special operating mode



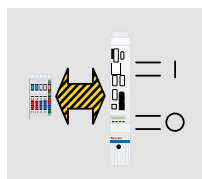
### Safe Direction (SDI)

A safe direction (clockwise, counterclockwise) is also monitored in addition to safe motion



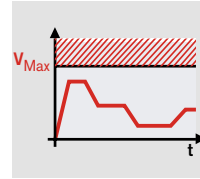
### Safely Monitored Position (SMP)

A safe absolute position range is also monitored in addition to safe motion



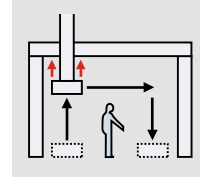
### Safe Inputs/Outputs (SIO)

Dual-channel safety peripherals can be connected to the drive and made available to the controller via the safety bus



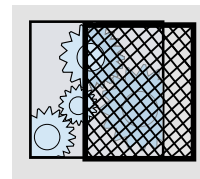
### Safe Maximum Speed (SMS)

The maximum speed is safely monitored irrespective of the mode of operation



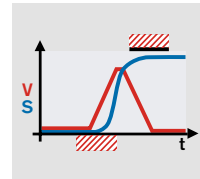
### Safe Braking and Holding System (SBS)

The safe braking and holding system controls and monitors two independent brakes



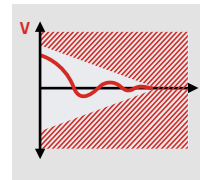
### Safe Door Locking (SDL)

When all the drives in one protection zone are in safe status, the safety door lock is released



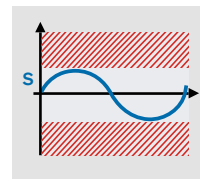
### Safely Limited Increment (SLI)

If enable signal is given, a safely limited increment is monitored in special operating mode



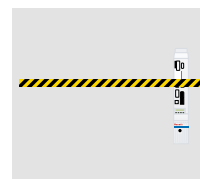
### Safely Monitored Deceleration (SMD)

Safely monitored deceleration ramp when stopping



### Safely Limited Position (SLP)

Monitoring of safe software limit switches



### Safe Communication (SCO)

Selection/deselection of safety functions and transfer of process data (e.g. actual position values) via safety bus

All safety functions are certified as compliant with standards ISO 13849-1:2006<sup>1)</sup>, EN 61800-5-2:2007<sup>1)</sup>, IEC 61508:1998-2000<sup>1)</sup>, EN 62061<sup>1)</sup>, ISO 13849-1:1999, EN 954-1:1996, ISO 13849-2:2003, EN 60204-1:1997, EN 50178-1:1997, EN 61800-3:2004, UL 508C R7.03, C22.2 No. 0.8-M86 (R2003), CAN/CSA C22.2 No. 14-95, NFPA 79:2007 ER1 through TÜV Rheinland, TÜV Rheinland North America Inc. and SIBE Switzerland.

1) In preparation

Bosch Rexroth AG  
Linear Motion and  
Assembly Technologies  
Ernst-Sachs-Straße 100  
97424 Schweinfurt, Germany  
Tel. +49 9721 937-0  
Fax +49 9721 937-275  
[www.boschrexroth.com/dcl](http://www.boschrexroth.com/dcl)

**Find your local contact person here:**

[www.boschrexroth.com/addresses-dcl](http://www.boschrexroth.com/addresses-dcl)

Subject to technical modifications

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