

Motion Safety: Improving Productivity with Safety in Mind

Safe Motion Control from One Source



KOLLMORGEN

Because Motion Matters™

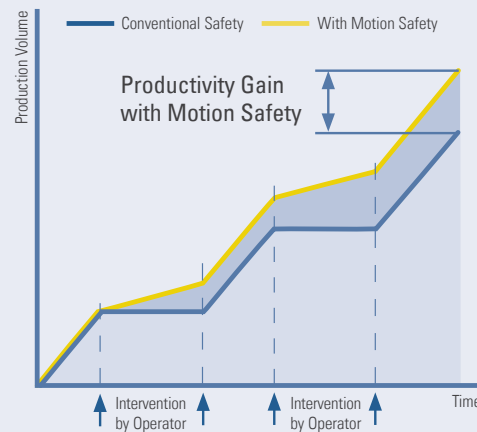
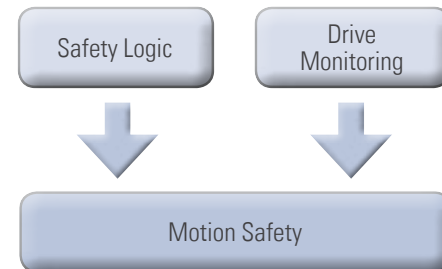
Motion Safety - Improved Productivity without Compromise

Motion Safety is innovative safety technology from Kollmorgen and means: Safe sensor and actuator signal processing, safe motion monitoring and safe communication directly inside the motion control system. The result: significantly higher productivity compared to conventional safety technology.

Motion Safety: Safe Motion vs. safe stop.

Safe Motion combines safety logic and drive monitoring into the motion control system.

Conventional safety technology keeps the operator away from areas with hazardous motion. Motion Safety, however, allows operator intervention without process interruption. The safety logic controls individual aspects of the machine motion to ensure that safe intervention is possible without having to stop the entire machine.



Productivity Gain with Motion Safety

Intelligent Safety functions monitor areas with hazardous motion allowing the machine to effectively intervene with minimal process interruption. Functions such as safe position limit the range of machine motion to ensure that personnel remains safe. Machine zones that pose no risk to the operator remain running. The diagram shows the gain in productivity. You can see from the yellow line that production continues during user intervention with Kollmorgen Motion Safety technology.

Kollmorgen - Your skilled partner for Safe Motion Solutions

Kollmorgen's safety systems were developed using IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems. They are suitable for use applications following these standards:

- ISO 13894 machine safety requirements up to PL e
- IEC 62061 up to SIL 3
- ANSI B11 U.S. based standards for machine safety
- Emergency stop per U.S. guidelines found in NFPA 79-2012 (NEC).



Motion Safety - A Secure Investment in the Future

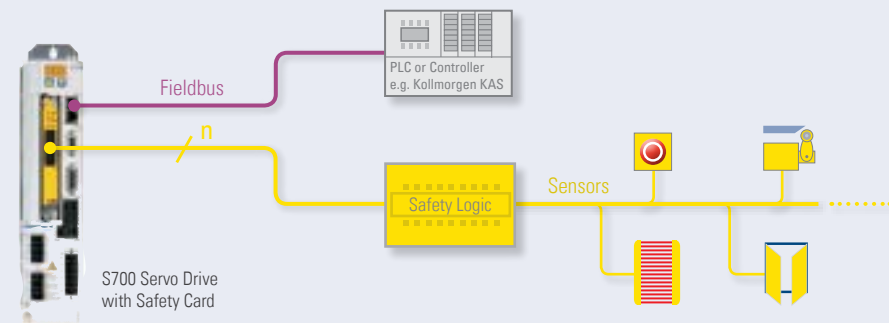
Take advantage of the Motion Safety concept of Kollmorgen

- | | |
|--|---|
| <ul style="list-style-type: none"> • Higher Productivity | <ul style="list-style-type: none"> • Motion Safety allows user intervention in the ongoing process • Safe movement rather than safe shutdown • Risk-dependent activation of safety functions |
| <ul style="list-style-type: none"> • Lower system costs | <ul style="list-style-type: none"> • Optimal adaptation to the requirements through modular design • Wide range of standard products • Safety controller and drive monitoring in one device |
| <ul style="list-style-type: none"> • Flexibility | <ul style="list-style-type: none"> • Modular design, easy retrofitting to existing engines • Seamless transition from hard-wired logic to configurable safety logic |
| <ul style="list-style-type: none"> • Fast and easy implementation | <ul style="list-style-type: none"> • Important motion-relevant safety functions are integrated • Predefined safety function blocks • Intuitive tools for programming and parameterization in the field by the customer |

The roadmap to the safe future

With Motion Safety, you are free to choose the appropriate safety technology. Whether local or networked, hardwired or freely configurable, Kollmorgen provides the migration path between the security technologies of today and tomorrow.

Demanding Safety Solutions - Efficiently Implemented



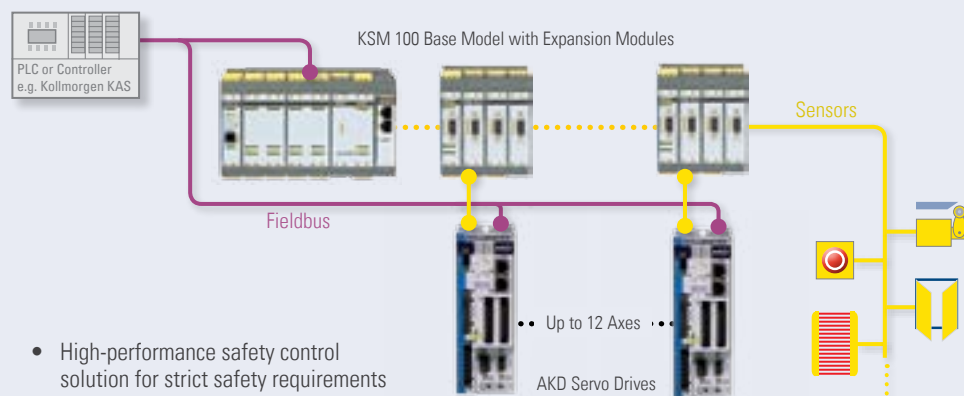
- Safe one-axis motion with minimal response time.

S700 Safety concept: The S700 can be equipped with optional safety expansion cards S1-2 or S2-2 to have safety functions available.



- Compact and simple solution for 1 or 2 axes

The Safety Module KSM-compact with the AKD servo drive for up to 2 axes and up to 32 safe I/O.

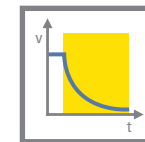


- High-performance safety control solution for strict safety requirements

KSM-modular: The modular safety control for demanding safe motion control applications with up to 12 axes and up to 200 safe I/O

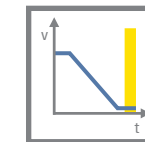
Extensive Functions for Safe Motion

STO (Safe Torque Off)



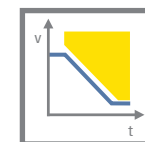
STO interrupts the power supply to the motor safely in the servo amplifier. The motor has no torque.

SS1 (Safe Stop 1)



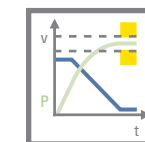
The drive is stopped by controlled braking. Thereafter, the power supply for the motor is interrupted safely and the motor generates no torque.

SS2 (Safe Stop 2)



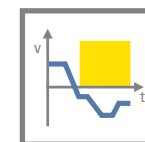
The drive is stopped by controlled braking and then remains at a controlled standstill. The control functions of the drive remain.

SOS (Safe Operating Stop)



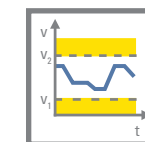
Monitors the stop position reached and triggers for deviations above the prescribed limits SS1. The control functions of the drive remain active.

SDI (Safe Direction)



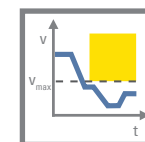
The SDI function ensures that the drive can only move in a defined direction. In case of error SS1 is triggered.

SSR (Safe Speed Range) 1



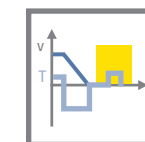
Monitors the drive to maintain a defined speed range. In case of error SS1 is triggered.

SLS (Safe Limited Speed)



Monitors the drive to maintain a defined speed limit. In case of an error SS1 is triggered.

SBC (Safe Brake Control), SBT



Controls external brakes
SBT (Safe Brake Test) (not standardized)
 Test function for external and internal brake motor holding brake

SLP (Safe Limited Position)

SLI (Safe Limited Increments)

Motion Safety Concept S700: Scalable Safety Solution

The safety concept S700 is certified for level SIL 3 or PL e. Standard commercial of-the-shelf (COTS) components allow for flexible and cost effective solutions without the need to customize and can lead to cost savings of up to 25%. Additionally, safe processes help to increase machine uptime and consequently lead to improved productivity of up to 20%.

From Motion Control to Safe Motion Control: The Safety Expansion Card

The S700 can be equipped with optional safety expansion cards to have safety functions available that are activated by an external safety logic. The upgrade is very simple: the cards are inserted into the S700 card slots, and then configured using the SafetyGUI configuration tool. Done!

Category	Function	S700	S700+S1-2	S700+S2-2
	Level	SIL2/PL d	SIL3/PL e	SIL2/PL d
Safe Stop Functions	STO	✓	✓	✓
	SS1	—	✓	✓
	SS2	—	✓	✓
	SOS	—	✓	✓
Safe Speed Functions	SSR	—	✓	✓
	SLS	—	✓	✓
Safe Direction Functions	SDI	—	✓	✓
Safe Brake Function	SBC	—	✓	—
Safe Position Functions	SLI	—	✓	✓
	SLP	—	✓	—



S2-2 Safety Card

S1-2 Safety Card

Safety Solutions with S700

- Easy integration
 - Hardwired, compatible with virtually any safety controller
 - Ideal for upgrading existing safety solutions
 - No external safety logic necessary
- Flexibility
 - Option cards can be retrofitted
- Highest functionality
 - Comprehensive safety functions are included
 - Very short response time with direct access to the control electronics

Easy Customization and Configuration

Installation and Commissioning

The optional safety expansion card S1-2 or S2-2 are inserted into the appropriate slot of the servo amplifier S700. For each function, there is a clear input window.

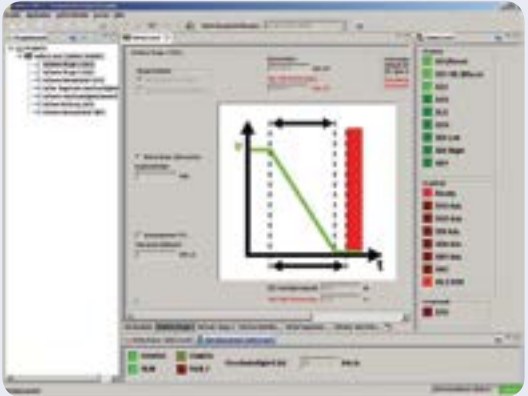
- Changes in projects is possible only with password
- Intuitive and flexible configuration safe motion functions
- TÜV approved safety level up to SIL 3 or PL e



Online Operation with Status Monitoring

In online mode, the status displays of the digital inputs and outputs facilitate setting up the functions. Detailed messages in plain text help in the analysis if the monitoring has responded.

- SI units can be used
- The parameter set is linked to the serial number of the card
- The parameter set can be saved to a memory card.



Status Query using Parameterization

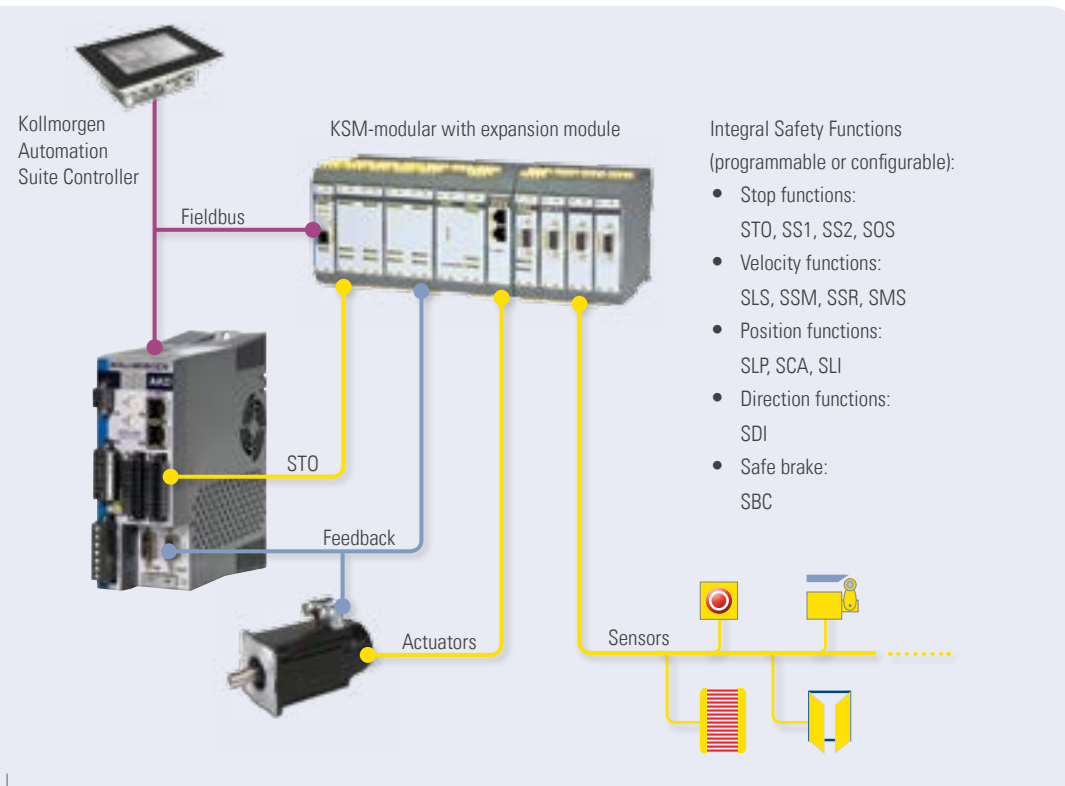
Status information can be queried via the parameterization tool DriveGUI. For the analysis of the messages a detailed cause analysis function is available.

- Close link between motion functions and safety functions
- Extensive debugging functions for error analysis
- Graphical monitor for status display of all transaction data



KSM - The Complete Solution for Efficient and Safe Control

The KSM safety controller achieves PL e / SIL 3, which is critical for supporting the requirements of modern functional safety. Whether your application consists of 2 axes requiring only a few safe I/O or it consists of many axes requiring 100 or more safe I/O and is used in combination with the AKD servo drive and other Kollmorgen automation solutions: You can develop expandable and safe motion systems with better performance, improved productivity and reduced system costs.



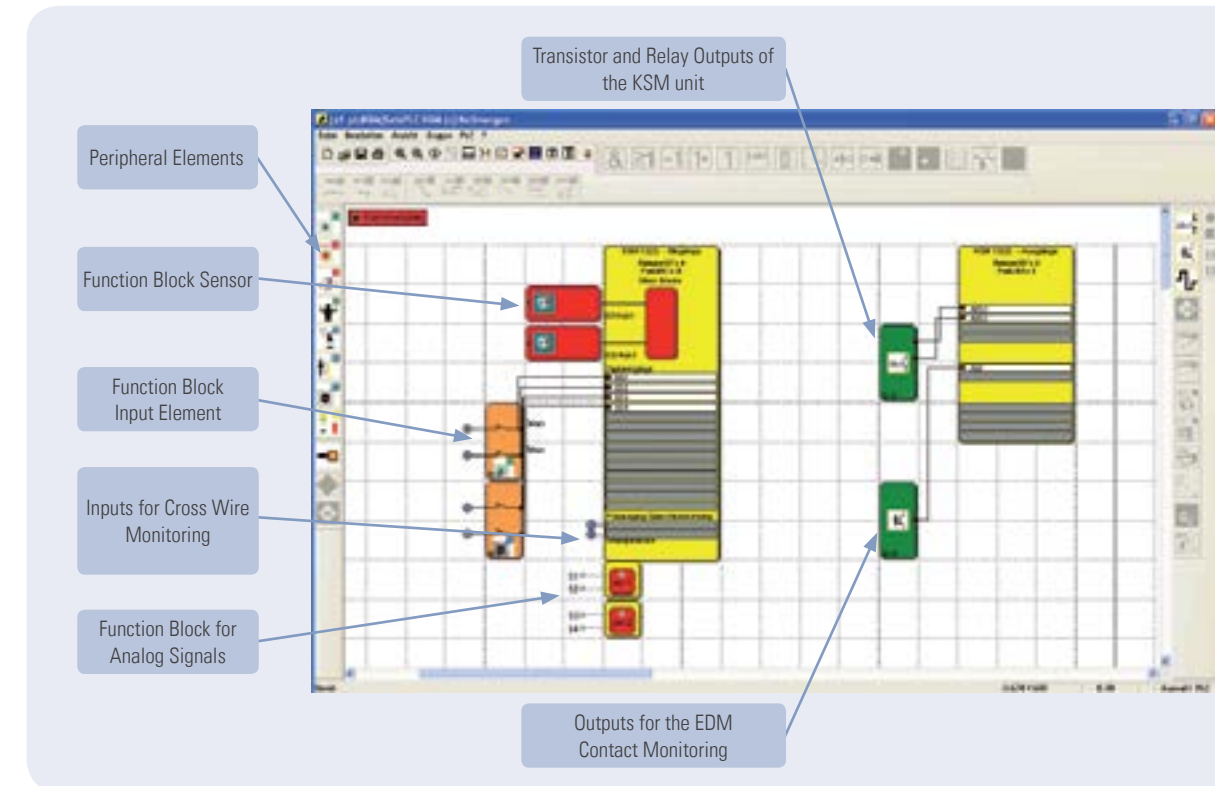
Example solution using the Kollmorgen Motion Safety concept.

KSM Safety Controllers - Your advantages:

- Improved Productivity
 - Allows operator intervention without process interruption
 - Safe motion rather than safe shutdown
 - Activation of Safety functions depends on risk for machine operator
- Reduced system costs
 - Safety control and drive monitoring in one device
 - Servo drive and resolvers are standard components
 - Short development times through efficient programming tools
 - Comprehensive safety function library reduces development time
- Investment for the future
 - Modular design, easy upgrade for changing requirements
 - Combining different safety concepts poses no problem

Ease of Use: SafePLC® and SafePMT®

Take advantage of the comprehensive function library delivered with SafePLC and start immediately programming the KSM modules or develop your own library for very specific safety programs. Practical and safe: With the tool SafePMT you or your client configure the safety controller by changing shared parameters without opening the program.



SafePLC: Safety Programming without Limits

- Graphical hardware configuration via terminal plan
- Certified, configurable function blocks
- Individual program components are stored as a macro
- Linking elements such as timers, flip-flops, terminal blocks or signaling channels can be defined
- Universal monitor, diagnostic and analysis tools
- Scope monitor for motion safety functions

SafePMT: Safe Parameterization onsite

- On site configuration by the user
- Safe - No change to the programming
- Easy to use

KSM-compact: Versatile Safety Controller for 1 or 2 Axes

KSM compact transforms a drive train into a safe drive train. And important safety and monitoring functions for motion as well as function blocks to process sensor and actuator signals are already included. Develop highly efficient and safe motion systems combining KSM compact with other components from Kollmorgen, such as the AKM motors.



KSM-compact
A self-contained safety controller



Certified function blocks for KSM-compact and KSM-modular

- Emergency Stop
- Door monitoring with interlock
- Two-hand buttons, Permission switch
- Release, start, reset buttons
- Operating mode selection switch
- Light curtains, scanners
- Muting

KSM-modular: Safety Controller up to 12 Axes

KSM-modular is the best choice if complex safety features and a large number of interfaces are required. The modular system is flexible and can be easily adapted to changing requirements at any time. With up to 3000 function blocks the KSM-modular is a powerful safety PLC.



KSM-modular
Base unit KSM 100 with expansion modules for demanding applications



KSM-compact Safety Controller

- For PL e / SIL 3
- For 1 or 2 axes
- Up to 2 expansion modules
- Base unit with 16 safe I/O
- Expandable up to 60 safe I/O
- 1 Safe relay, expandable
- 2 Pulse outputs, 2 standard outputs
- Expandable up to 6 pulse outputs and 6 standard outputs
- Up to 800 function blocks
- Space-saving, compact design

KSM-modular Safety Controller / Safety PLC

- For PL e / SIL 3
- Up to 12 axes
- Up to 8 expansion modules
- Base units with 56 safe I/O
- Expandable up to 200 safe I/O
- 1 Safe relay, expandable
- 2 Pulse outputs, up to 10 standard outputs
- Expandable up to 14 pulse outputs and 22 standard outputs
- Up to 3000 function blocks
- For demanding applications with complex safety logic and many I/O

	KSM-compact Base Units		Expansion Modules up to 2 Modules		
	KSM 11/-2 ²⁾	KSM 12/-2 ²⁾	KSM 31	KSM 31R	KSM 5x
Safe Axes	1	2	—	—	—
Safe In	14	14	12	12	—
Safe Out	2	2	—	2	—
Safe I/O	—	—	10	—	—
Safe Relay	2	2	—	4	—
Safe Analog In	—	—	—	4	—
Communication ¹⁾	With KSM 5x		—	—	Yes

1): Either EtherCAT, CANopen or PROFINET

2): KSM 11-2 and KSM 12-2 with 2 sensor interfaces for safe velocity and position monitoring



About Kollmorgen

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For assistance with your application needs in North America, contact us at: 540-633-3545, support@kollmorgen.com or visit www.kollmorgen.com for a global contact list.

- Application Centers
- Global Design & Manufacturing
- Global Manufacturing



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