

SIRIUS Safety Integrated –
Industrial Controls with Integrated Safety



safety
INTEGRATED



SIEMENS

Leaving competitors in the dust: **Safety Integrated**

The guarantee of safety in automated processes is not only a question of human responsibility, but also of commercial sense. Our long-standing commitment to consistent and sustainable progress in the field of safety technology has always been subject to this principle, which was first formulated by Werner von Siemens in 1880. Consistently and sustainably. We place a clear focus on intelligent strategies which meet current as well as future requirements in terms of efficiency and flexibility while assuring maximum personal and machine protection.

Identifying potentials, exploiting advantages

Safety technology is no longer a mere means to an end. Innovative and mature safety strategies offer enormous economic potentials both to machine manufacturers and system operators.

With **Safety Integrated**, we offer comprehensive and consistent solutions for the production and process industry, which can be combined with excellent services throughout all life phases of a safety system or machine.

The prevention of accidents must not be understood as a regulation required by law, but as a precept of human responsibility and economic reason.

Werner von Siemens, 1880

Seamless communication: **All Options**

Safety Integrated combines safety technology and standard automation in a matched overall system. This facilitates data transparency between the safety level and standard components of a system without any further interfaces. The reason it's so unique is the following: The safety-relevant data are transmitted via the already existing standard bus. This results in enormous savings in terms of installation and engineering.



Opt for efficiency: PROFINET, PROFIBUS and AS-Interface

Safety Integrated uses the proven field bus systems PROFINET, PROFIBUS and AS-Interface for failsafe communication. This makes the work of system engineers both faster and more efficient as the engineering tools and methods are known. Safe I/O modules can be combined with standard modules, safe data for diagnostic purposes can be re-used on the standard level and safe components of other manufacturers can be easily connected.

Easy satisfaction of high requirements: PROFIsafe

PROFIsafe® was the first communication standard in accordance with IEC 61508 to allow for the transmission of standard and safety-related communication on a single bus cable. The advantage: Retrofitting is extremely easy as the existing wiring can be further used. For the safe communication, PROFIsafe uses the PROFINET and PROFIBUS services. Sensors such as EMERGENCY-STOP commanding devices and electro-sensitive protective equipment (light curtains, laser scanners) are connected to distributed I/O and transmitted to the control via PROFIsafe profile. The disconnection signals generated by the control are forwarded via the PROFIBUS with PROFIsafe profile and the Safety Motorstarter Solution PROFIsafe selectively switches off the hazardous movement.

PROFINET and PROFIBUS with PROFIsafe cover the highest requirements up to Category 4 in accordance with EN 954-1 and SIL 3 in accordance with IEC 61058. PROFIsafe is thus optimally suited for application in the production and process industries.

PROFIsafe represents an open solution for safety-oriented communication via standard field buses. Numerous manufacturers of safety components as well as end users have contributed to its standardization.



Easy and safe connection: ASIsafe

ASIsafe® is the safety-technical version of the AS-Interface system. It allows for the integration of safety components such as EMERGENCY-STOP units, safety position switches, light grids, light curtains and laser scanners in AS-Interface. As with standard components, the connection is realized easily and rapidly via the yellow AS-Interface cable. Safe stations are installed and operated in a mixed network with the standard I/O modules.

Within the scope of ASIsafe, you can choose between the "small" ASIsafe Solution local (ASIsafe as a "safe island" under a standard PLC as well as standard AS-i master and safety monitor) and the cell-spanning, system-wide ASIsafe integration via STEP 7 Distributed Safety with the help of the DP/AS-i F-Link under a failsafe control (ASIsafe Solution PROFIsafe).



Safely mastering solutions on the cell level

The conventional switching technology of SIRIUS Safety Integrated reliably masters safety applications in machines and systems. For these tasks, 3TK28 safety relays are optimally suitable.

They form the basic modules of an integrated and efficient safety chain. Whether EMERGENCY-STOP disconnection, protective door monitoring or optimum protection of presses and punches – our comprehensive portfolio ranges from economic standard devices down to innovative and highly flexible multi-function units. We offer a seamless range which not only covers almost any application, but also combines tried-and-tested technology with innovative components and practice-oriented functionality.

For example: Integrated diagnostic options and monitoring systems allow for fast troubleshooting, reduce costly downtimes and thus ensure a higher availability of your machines and systems.

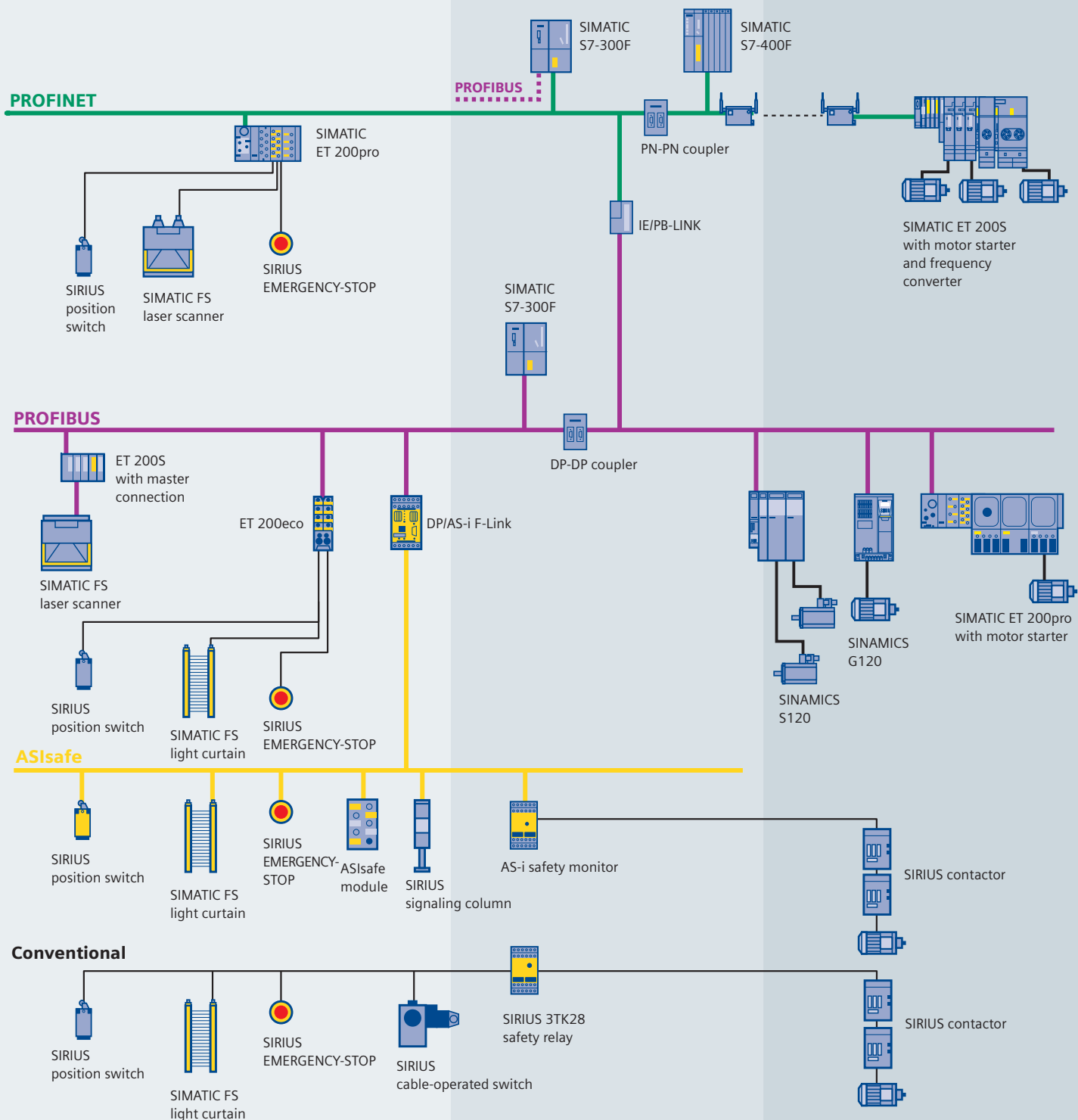
The clear conclusion: SIRIUS safety relays facilitate a particularly reliable as well as considerably faster, easier and more cost-favorable assembly of the complete safety chain.

Safety Integrated – safety solutions for almost all applications

Detecting

Evaluating





Reacting

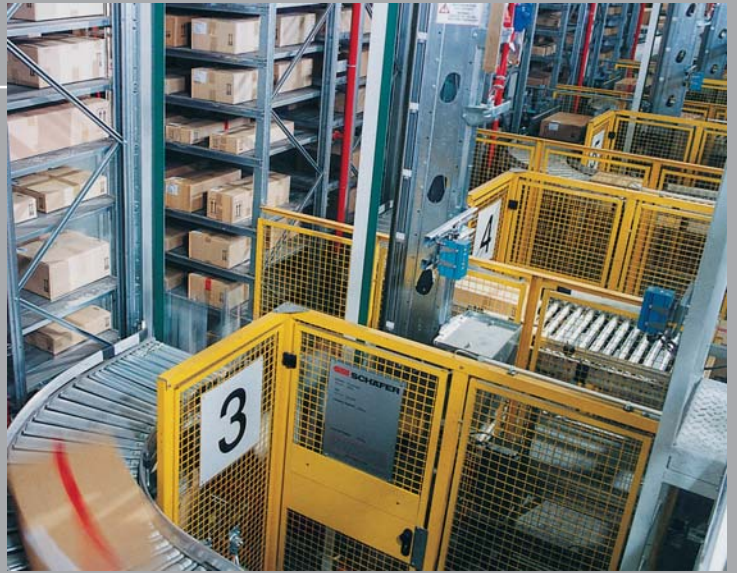


Precise and reliable: detecting, commanding and signaling

Whether for monitoring protective doors or hazardous motions of machine parts: SIRIUS detection devices offer reliable solutions for all applications up to SIL 3 in accordance with IEC 62061 or up to Category 4 in accordance with EN 954-1. The mechanical sensors scan the motions and transmit them in the form of electrical signals in a way which assures that machines and systems can be immediately disconnected in case of a failure. In accordance with IEC 60947-5-1, all mechanical position switches are equipped with positively opening contacts.

Furthermore, we offer a complete portfolio of reliable commanding and signaling devices such as Emergency-STOP commanding devices or two-hand operating consoles for maximum safety at presses and punches, effective cable-operated switches, which can also be employed as Emergency-STOP devices in particularly long and hazardous areas, down to integrated signal lamps. Moreover, many of our SIRIUS commanding and signaling devices are communication-capable via AS-Interface.

Product range				
Function	Detecting			
				
Product	3SE5 standard position switches	3SE5 position switches with separate actuator	3SE5 position switches with/without solenoid interlocking	3SE5 hinge switches
Description	For the mechanical monitoring of protective equipment	For the mechanical monitoring of protective equipment	For the mechanical monitoring of protective equipment and protective door interlockings	For the mechanical monitoring of protective doors or flaps
Optional connection to AS-Interface (ASIsafe)	●	●	●	●
Application	Protective door monitoring, position detection of movable machine parts	Protective door monitoring, position detection of movable machine parts	Protective door monitoring with/without solenoid interlocking	Protective door monitoring
Category in acc. with EN 954-1 SIL in acc. with IEC 62061	Up to Category 4 Up to SIL 3	Up to Category 4 Up to SIL 3	Up to Category 4 Up to SIL 3	Up to Category 4 Up to SIL 3
Standard B10 value	10,000,000	10,000,000	1,000,000	1,000,000






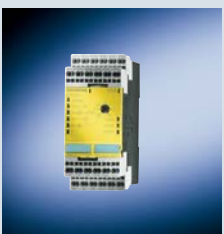
Commanding & signaling					
					
3SE6 magnetically operated switch	3SB3 Emergency-STOP	3SE7 cable-operated switch	3SB38 6 two-hand operating console	3SE9 foot switch	8WD42/8WD44/8WD53 signaling columns/integrated signal lamps
For contactless monitoring of protective doors	Emergency-STOP for failsafe disconnection of the safety circuit	Safe disconnection via a rip cord, monitoring of particularly long, hazardous areas	Manual safe initiation of hazardous motions, required two-hand control, simultaneous operation < 0.5 sec	Interlocking by foot operation	Acoustic and visual signaling devices
	●	●	●		●
Protective door monitoring	Emergency-STOP applications in the production industry	Emergency-STOP applications in the production industry with expansive machines and systems	Safety for presses and punching machines	Safe operation by foot outside the hazardous area	State signaling at machines and systems
	Up to Category 4 Up to SIL 3				
	Twist-released 100,000 Strain-released 30,000	1,000,000	1,000,000		

Consistent and reliable: monitoring and evaluating





The smooth and highly available operation of systems subject to safety requirements necessitates monitoring. The range of our SIRIUS switching devices, which has proven itself in practical applications over many years, ranges from economic standard to innovative multi-function devices for almost all applications. Integrated diagnostic and monitoring options offer fast troubleshooting, reduce unwanted downtimes and facilitate a high availability of your machines and systems.

Clear summary: The SIRIUS switching devices do not only allow for a particularly reliable and simple safety chain layout, but also offer considerable time and cost savings.

ASIsafe is the safety-technical variant of the AS-Interface system. Using ASIsafe, safety-oriented components such as Emergency-STOP devices, safety position switches and light curtains can be integrated into AS-Interface. As with standard components, this integration is realized via the yellow AS-Interface cable. This way, safe stations are mixed, installed and operated with standard I/O modules in one and the same network.

Evaluating: 3TK28/3RA71 safety relays				
	Standard functionality			Extended functionality
				
Product	safety relays 3TK282.1/3.	safety relays 3TK2840-42	safety relays 3TK285.	safety relays 3TK2845
Type	3TK282. basic units 3TK2830 expansion units 3TL2834/35 press control devices	3TK2840. standard units 3TK2841./42. basic units	3TK2850-53 basic units 3TK2856-57 expansion units	3TK2845 basic units
Description	Relays: For the monitoring and evaluation of floating safety-oriented sensors	Electronics: For the monitoring and evaluation of non-floating and floating safety-oriented sensors	Contact relays: For the monitoring and evaluation of non-floating and floating safety-oriented sensors	Relays/electronics: For the monitoring and evaluation of non-floating and floating safety-oriented sensors; two safety sensors can be evaluated at a time
Category in acc. with EN 954-1 SIL in acc. with IEC 62061	Up to Category 4 Up to SIL 3			



Failsafe communication with ASIsafe				
	Safety monitors or DP/AS-i F-Link		Slaves	
				
Product	ASIsafe Solution Local with safety monitor 3RK11	ASIsafe Solution PROFIsafe with 3RK3141 DP/AS-i F-Link	With direct ASIsafe connection	With ASIsafe modules
Combination	For the local monitoring and linking of safe stations and for safe disconnection <ul style="list-style-type: none">• With one or two release circuits• Configuration via asimon V2 plus PC software	For the transmission of safe ASIsafe input signals to superior PROFIsafe architectures <ul style="list-style-type: none">• No separate enabling circuit required• Configuration via STEP 7 Distributed Safety	Control cabinet application (IP20)	
			3SF5 AS-i F-adapter	SlimLine module S22,5F
			Field application (IP65/67)	
			3SF5 Emergency-STOP 3SE5 position switches 3SF2 cable-operated switches 3SF7 3SF2 light curtains 3SF7 laser scanner	K20F compact module K45F compact module K60F compact module
Application	Applicable for numerous local safety functions through parameterization	For optimum transition from ASIsafe to PROFIsafe		
Category in acc. with EN 964-1 SIL in acc. with IEC 62061	Up to Category 4 Up to SIL 3			

Central and distributed: Responding

With safety-oriented applications realized on the control level, the Safety Motorstarter ET 200 Solutions ensure safe shut-down and disconnection. They can, for example, be employed as an insular solution directly on site in the field or for selective disconnection in PROFIsafe applications.

The finely modular architecture of the SIMATIC ET 200 system provides an optimum representation of all applications – whether in terms of an

individual machine or the entire system. Thanks to the considerably reduced configuration and wiring expenditures, our Safety Motor Starter Solutions are also convincing with regard to economic efficiency. This applies to all areas of production and process automation as our solutions fulfill your applications' requirements wherever availability and flexibility are of the essence.

Standard Motor Starters

- Direct and reversing starters
- Power range up to 12 A / 5.5 kW
- Self-assembling power bus:
ET 200S up to 40 A
ET 200pro up to 25 A
- Small number of variants thanks to wide-range overload protection*
- Remote reset*
- Power transmission via PROFIBUS/PROFINET*
- Comprehensive diagnostic functions*

High-Feature Motor Starters

- Direct and reversing starters
- Electronic motor starters for high switching frequencies with parameterizable soft starter function*
- Small number of variants thanks to wide-range overload protection
- Selective, bus-parameterizable motor protection concept
- Remote reset
- Power transmission via PROFIBUS/PROFINET
- Power range:
ET 200S up to 16 A / 7.5 kW
ET 200 pro up to 12 A / 5.5 kW
- Self-assembling power bus:
ET 200S up to 50 A
ET 200 pro up to 25 A
- Short-circuit strength ET 200S: coordination type Category 2
- Comprehensive diagnostic functions

Failsafe Motor Starters

In addition to all features offered by the High-Feature motor starters, the ET 200S Failsafe motor starters offer the following features:

- Intrinsic safety on the basis of TÜV-certified (German technical inspectorate) self-monitoring and internal redundant disconnection acc. to Category 4 in acc. with EN 954-1 or SIL 3 in acc. with IEC 61508
- Allocation to one of six safety-oriented disconnection groups

*only applies to ET 200pro

ET 200pro station with Standard and High-Feature Motor Starters





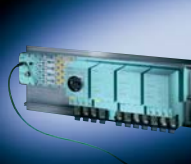
ET 200S station with Standard and High-Feature Motor Starters



ET 200S station with Failsafe Motor Starters





Safety Motor Starter Solution local			Safety Motor Starter Solution PROFIsafe	
	Motor starter	Safety module	Motor starter	Safety module
Safety Motor Starter Solution with ET 200S				
IP20		Standard Motor Starter or High-Feature Motor Starter	Standard Motor Starter or High-Feature Motor Starter	PM-D F1 (monitored start) PM-D F2 (automatic start) PM-D F3 (delayed disconnection, 0.5–30 sec) PM-D F4 (station extension for line layout) PM-D F5 (contact multiplier)
		Failsafe Motor Starter	Failsafe Motor Starter	PM-D F PROFIsafe (contact multiplier) PM-D F2 (automatic start)
Safety Motor Starter Solution with ET 200pro				
IP65		Standard Motor Starter or High-Feature Motor Starter		PM-D F PROFIsafe (with 6 disconnection groups)
		F-RSM (Safety Local repair switch module: Emergency-STOP or protective door; monitored or automatic start) ASM 400 V (disconnection module up to 400 V)		

With the Safety Motor Starter Solution local, local safety-oriented solutions can be realized with a standard PLC.

The Safety Motor Starter Solution PROFIsafe, on the other hand, is predestined for applications requiring safety technology on the control level.

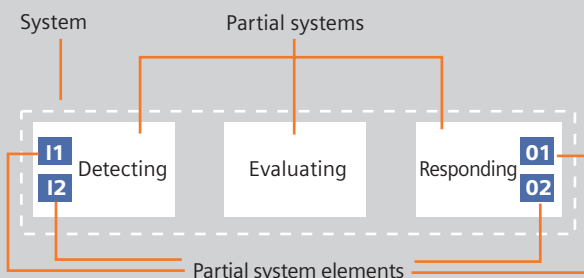
Reduced risks thanks to functional safety

The introduction of the IEC 61508 standard characterized the term “functional safety”, which stands for the protection against hazards caused by incorrect functions. For example, protective door functions are to be realized in a manner which assures that a failure does not lead to a directly increased machine-induced risk.

Safety-oriented control functions are thus always considered as a whole. The objective is the initiation of a qualitatively measurable and high-grade procedure for risk minimization. For this purpose, all input information and signals as well as all output information are assessed.

EN ISO 13849-1:2006 and EN 62061:2005 – two new standards: determination and calculation of the safety integrity

Proactively preventing systematic faults and failures – and optimally mastering them if they do occur: Both standards for the first time consider the entire safety chain from the sensor to the actuator.



To attain a safety integrity level, the respective certification of the individual components is no longer sufficient. Now, the complete safety function must meet the defined requirements. This is why these standards call for an accurate calculation of the failure rates for all relevant electromechanical components.

The B10 value

The failure rates are calculated with the B10 value. For devices subject to wear, this value is expressed as the number of switching cycles. The rate stands for the number of switching or operation cycles after which 10% of the devices failed over the course of a service life test.

EN ISO 13849-1 uses the B10_d value, which stands for “dangerous”.

$B10_d = B10 / \text{percentage of dangerous failures}$

Calculation of the failure rate

With the B10 value and the help of a simplified formula, users can calculate the total failure rate of an electromechanical component.

EN ISO 13849-1 uses the term MTTF_d and EN 62061 uses the term Lambda λ_d.

Both terms are convertible: $MTTF = 1/\lambda$

EN ISO 13849-1: $MTTF_d = B10_d / 0.1 \times n_{op}$

EN 62061: $\lambda = 0.1 \times C / B10$

C as well as n_{op} stand for the operation cycle to be stated by the user.

SIRIUS standard B10 values of electromechanical components

SIRIUS product range	B10 value (switching cycles)	Percentage of dangerous failures
EMERGENCY-STOP commanding devices (with positively opening contacts)		
– released by rotation	100,000	20%
– released by pulling	30,000	20%
Cable-operated switches for EMERGENCY-STOP function (with positively opening contacts)	1,000,000	20%
Standard position switches (with positively opening contacts)	10,000,000	20%
Position switches with separate actuator (with positively opening contacts)	1,000,000	20%
Position switches with solenoid interlocking (with positively opening contacts)	1,000,000	20%
Hinge switches (with positively opening contacts)	1,000,000	20%
Pushbuttons (non-latching) (with positively opening contacts)	10,000,000	20%
Contactors/motor starters (with positively opening contacts)	1,000,000	75%

Structured approach

1. Specification of requirements and safety plan

The implementation of risk minimization must be considered throughout the entire life cycle. For this purpose, EN 62061 introduces the “plan of functional safety” or the safety plan. Even though this plan is not explicitly contained in EN ISO 13849-1, the user is recommended to also use such a plan in ISO 13849-1.

2. Determination of the required safety integrity

A required safety integrity is determined for every safety function in dependence of the risk assessment.

EN ISO 13849-1 offers a risk bar for determination and EN 62061 provides classification in the form of a SIL allocation table.

3. Draft of the control architecture

EN ISO 13849-1 allows for the use of so-called specified architectures on the basis of the categories, whereas EN 62061 uses partial systems for this purpose. The objective is basically identical.

4. Determination of the attained safety integrity

The safety integrity of the entire safety function can be determined on the basis of the failure probabilities derived from the failure rates with electromechanical components. Both standards use comparable terms:

EN ISO 13849-1: PL, as performance level
EN 62061: SIL, as safety integrity level

Safety integrity level (SIL)	Probability of a dangerous failure per hour	Performance level PL
1	$\geq 10^{-6}$ to $< 10^{-5}$	a
1	$\geq 3 \times 10^{-6}$ to $< 10^{-5}$	b
2	$\geq 10^{-6}$ to $< 10^{-5}$	c
3	$\geq 10^{-7}$ to $< 10^{-6}$	d
	$\geq 10^{-8}$ to $< 10^{-7}$	e

5. Validation of the safety function

In this last step, the actual fulfillment of the requirements is proven. ISO 13849-2 can be used for such validation.

SIRIUS Safety Integrated in use

SIRIUS Safety Integrated in the wheel mounting unit at Opel in Rüsselsheim

In addition to automated processes, the mounting of wheels to the completely assembled vehicle body-works also requires manual actions, resulting in correspondingly high safety requirements. To realize the necessary safety functions, ASIsafe is applied on the cell level, complementing the plant-spanning PROFIBUS.



The solution

The AS-Interface ASIsafe system extension combines the transmission of standard and safety signals on a single bus. This allows for an easy integration of safety-oriented functions such as Emergency-STOP, protective door interlocking, light grids or two-hand operating consoles – directly into the standard technology.

The advantages

- Assurance of productivity, quality and availability standards
- One safe and flexible overall system on the cell level
- Efficient installation, commissioning and maintenance

Integrated safety for the Crown Holdings packaging manufacturer in Vourles

Due to increased production volumes, the French Dekret 93-40 safety standard has become relevant. To comply with this standard, all 14 packaging machines had to be retrofitted.










The solution




The implementation of SIRIUS Safety Integrated involved the following measures: Non-monitored grids were replaced by light curtains and fixed protective grids. Instead of conventional control desks, SIMATIC touch panels are now used, which are each equipped with two Emergency-STOP commanding devices each. Furthermore, distribution boards and valve supply blocks were replaced.

The advantages

- Targeted improvement of the personnel and plant protection and compliance with Dekret 93-40 safety standard
- Halved test and wiring times
- Minimum downtimes during retrofitting

Failsafe sensors		Failsafe industrial controls	
Detecting		Detecting	
Sensitive		Non-sensitive	
			
SIMATIC sensors 1) Light curtains 2) Light grids 3) Light barriers	SIMATIC sensors Laser scanners	SIRIUS Position switches Hinge switches Short-stroke switches Magnetically operated switches (sensitive)	SIRIUS 1) EMERGENCY-STOP 2) Cable-operated switches 3) Two-hand operating consoles 4) Foot switches 5) Signaling columns/ integrated signal lamps
Sensitive protective equipment	Sensitive protective equipment	For the mechanical monitoring of protective equipment, protective door interlocking	1) EMERGENCY-STOP for a failsafe interruption of the safety circuit 2) Safe disconnection via rip cord (or integrated EMERGENCY-STOP button) 3) Manual safe initiation of hazardous movements 4) Interlocking through foot operation 5) Acoustic and visual signaling devices
Application Protection of hazardous spots and areas	Application Protection of hazardous areas at stationary and mobile systems	Application <ul style="list-style-type: none"> Protection of protective doors and flaps against unauthorized access Safe detection of hazardous movements 	Application <ul style="list-style-type: none"> EMERGENCY-STOP applications in the production and process industry State signaling at machines and systems
Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508 Up to type 4 in acc. with IEC 61496	Up to cat. 3 in acc. with EN 954-1 Up to SIL 2 in acc. with IEC 61508 Up to type 3 in acc. with IEC 61496	Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508	Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508
NFPA 79 NRTL-listed	NFPA 79 NRTL-listed	–	–
Safety functions 1)-3) Failsafe disconnection 1) Clock control 1)+2) Muting contactor control 3) Muting contactor control with evaluation unit 1) Fixed and floating blanking	Safety functions <ul style="list-style-type: none"> Failsafe disconnection Programmable protection fields Up to 4 switchable protection fields Horizontal and vertical protection: entry control, hazardous area protection, leg detection, arm and hand protection 	Safety functions <ul style="list-style-type: none"> Protective door interlocking Safe detection of hazardous movements 	Safety functions <ul style="list-style-type: none"> EMERGENCY-STOP Acknowledgement
Degree of protection IP65	Degree of protection IP65	Degree of protection IP65/67	Degree of protection IP65/67
Additional features 1) Resolution from 14 mm to 90 mm 2) 2-, 3- and 4-ray 3) 1-ray 1)+2) Configuration with optomagnetic key (teach-in) and SafetyLab diagnostics and parameterization software 1)+2) Possible connection of additional safety switches 1)+2) Diagnostics software	Additional features <ul style="list-style-type: none"> Resolution 150 mm, 70 mm, 50 mm, 40 mm, 30 mm 4-m protection field 15-m warning field Field switchover during operation Easy programming of protection and warning fields LS4soft software 	Additional features <ul style="list-style-type: none"> Metal or plastic enclosure in acc. with DIN EN 50047 Positively driven contacts Diverse drive variants Electrically isolated double-moving contacts Opening already after 4° rotation Manipulation-proof 	Additional features 1) Contact complements of different NC combinations 2) Application range up to a length of 50 m 3) Additional commanding devices attachable 4) Also for harsh environments 5) Modular combination options – incandescent lamp or LED elements
Communication ASIsafe, PROFIBUS (PROFIsafe profile)	Communication ASIsafe, PROFIBUS (PROFIsafe profile)	Communication Partially with direct ASIsafe connection	Communication Partially with direct ASIsafe connection

Failsafe communication with ASIsafe		Failsafe controls	Failsafe Motion Control Systems
Detecting via ASIsafe		Evaluating Conventional	Parameterizable
			
ASIsafe modules: SlimLine S22,5F Compact modules K45F, K20	FDP/AS-i F-Link (ASIsafe solution PROFIsafe)	SIRIUS 1) 3TK28 safety relays 2) 3TK28 safety relays (electronic) 3) ASIsafe safety monitors (ASIsafe Solution local)	Safety Unit TM121C
Detecting of safe signals in the control cabinet and in the field	For the optimum transition from ASIsafe to PROFIsafe	1) + 2) Monitoring of the assigned protective equipment Thanks to parameterization applicable for many local safety functions (3)	Compact device for movement monitoring, e.g. at presses
Application All safety applications in production automation (exception: safe drives)	Application All safety applications in production automation (exception: safe drives)	Application All safety applications in production automation	Application Forming technology, e.g. for the protection of manual loading stations
Up to cat. 4 in acc. with EN 954-1 and SIL 3 in acc. with IEC 61508	Up to cat. 4 in acc. with EN 954-1 and SIL 3 in acc. with IEC 61508	1) + 2) Up to cat. 4 in acc. with EN 954-1 2) + 3) Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508	Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508
NFPA 79 NRTL-listed	NFPA 79 NRTL-listed	NFPA 79 NRTL-listed	NFPA 79 NRTL-listed (Canada)
Safety functions <ul style="list-style-type: none"> Safe detection of mechanical and sensitive protective equipment 	Safety functions <ul style="list-style-type: none"> Safe gateway for the transfer of ASIsafe signals into the PROFIsafe telegram 	Safety functions 1) + 2) Safe evaluation of mechanical and sensitive protective equipment as well as press controls 3) Safe evaluation of mechanical and sensitive protective equipment incl. responding (e.g. switch-off) on 1–2 enable circuits	Safety functions <ul style="list-style-type: none"> Two-hand operation and foot operation EMERGENCY-STOP, light curtain Protective door and protective grid monitoring Safe operating mode selector switch Safety valve actuation Motion monitor control (frequency input)
Degree of protection IP65/67 or IP20	Degree of protection IP20	Degree of protection IP20	Degree of protection IP20
Additional features Design in IP20: Slimline 22.5F with 22.5 mm Designs in IP67: a) K20F 2F-DI: 20 mm width; AS-i connection via M12 round cable b) K45F 2F-DI: 45 mm width c) K45F 4F-DI: 45 mm width (double slave) d) K45F 2F-DI/2DO: 45mm width, optional supply of standard outputs with U_{aux} 24 V	Additional features Programming of the safety logic via Distributed Safety (SIMATIC) or SPL (SINUMERIK)	Additional features 1) + 2) Easy, cost-favorable solution for safety applications 3) Parameterizable safety function: via graphical software tool ASIMON	Additional features <ul style="list-style-type: none"> Safe evaluation of cam signals 32 failsafe inputs 8 failsafe outputs 2 failsafe frequency inputs Completely programmed function modules for press applications are parameterized and multiply usable
Communication ASIsafe	Communication ASIsafe and PROFIsafe	Communication ASIsafe	Communication RS232

Failsafe controls		Failsafe industrial controls		Failsafe drives	
Programmable		Responding Electromechanic/electronic		Detecting, evaluating, responding Electronic	
					
SIMATIC Controls for the process industry		SIMATIC Failsafe I/Os for the production industry		SIRIUS 1) Safety Motorstarter ET 200S Solution local 2) Safety Motorstarter ET 200S Solution PROFI-safe 3) Safety Motorstarter ET 200pro Solution local	
Scalable failsafe systems <ul style="list-style-type: none"> ET 200S F-CPU S7-300F S7-400F 		Scalable and redundant I/O systems <ul style="list-style-type: none"> ET 200eco ET 200M ET 200S ET 200pro Including <ul style="list-style-type: none"> Relay module Digital input modules Digital output modules Analog input modules Motor starters Frequency converters 		Safe disconnection with integrated motor protection 1) + 2) Motor starters for starting and safe disconnection with conventional industrial controls 2) Motor starters for starting and safe selective disconnection 1) + 3) On-site safety application with motor starters	
Application All safety applications for the production industry		Application All safety applications for the production/process industry		Application All safety applications in production automation and distributed drive tasks as in conveyor technology or lifting drives	
Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508		Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508		Up to cat. 4 in acc. with EN 954-1 Up to SIL 3 in acc. with IEC 61508	
NFPA 79 NRTL-listed		NFPA 79 NRTL-listed		NFPA 79, NFPA 85 NRTL-listed	
Safety functions <ul style="list-style-type: none"> Integrated diagnostic function and self-test routine In case of faults, the application can be flexibly transferred to and kept in a safe state 		Safety functions <ul style="list-style-type: none"> Integrated signal test and discrepancy time monitoring 		Safety functions <ul style="list-style-type: none"> Safe torque off Safe stop 1 Safely limited speed 	
Degree of protection IP20		Degree of protection IP67		Degree of protection 1) + 2) IP20, 3) IP65	
Additional features <ul style="list-style-type: none"> Coexistence of standard and failsafe programs in one CPU Prefabricated, TÜV-certified safety modules Software: STEP 7 FUP, KOP, S7 Distributed Safety F-library for press and burner applications 		Additional features <ul style="list-style-type: none"> Distributed I/O system with standard and failsafe input and output modules Configuration of signal test and discrepancy time visualization with STEP 7 		Additional features <ul style="list-style-type: none"> Possible group disconnection 1) + 2) Power range motor starters up to 7.5 kW 2) Selective switching 	
Communication Failsafe communication via PROFINET/PROFIBUS with PROFI-safe profile		Communication Failsafe communication PROFIBUS with PROFI-safe profile: all systems PROFINET with PROFI-safe profile: ET 200S, ET 200pro		Communication 2) Failsafe communication via PROFIBUS/PROFINET with PROFI-safe profile 1) + 3) Communication via PROFIBUS/PROFINET	
				Communication Failsafe communication via PROFINET/PROFIBUS with PROFI-safe profile	


SIMATIC ET 200pro FC

- 1) **SINAMICS G120**
- 2) **SINAMICS G120D**

SINAMICS S120

- 1) **SINUMERIK 840D powerline with SIMODRIVE 611 digital,**
- 2) **SINUMERIK 840D sl with SINAMICS S120**

System-integrated drive (frequency converter) with integrated, independent safety functions on sensorless standard asynchronous motors

- 1) Modular, central frequency converter
- 2) Distributed frequency converter with integrated, independent safety functions on sensorless standard asynchronous motors

Drive system for high-performance single- and multiple-axis applications in mechanical and plant engineering with integrated, independent safety functions

Numeric control with integrated safety technology in control and drive

Application
Distributed drive tasks, particularly for conveyor technology

Application
1) Conveyor technology, pumps, fans, compressors
2) Distributed drive tasks particularly for conveyor technology

Application
Motion control tasks in single- and multiple-axis applications in mechanical and plant engineering (printing, paper, packing, plastics machines, presses, punches, handling units, etc.)

Application
Machine tools, e.g. for protection during re-tooling with open protective door

Cat. 3 in acc. with EN 954-1
SIL 2 in acc. with IEC 61508

Cat. 3 in acc. with EN 954-1
SIL 2 in acc. with IEC 61508

Cat. 3 in acc. with EN 954-1
SIL 2 in acc. with IEC 61508

Cat. 3*) in acc. with EN 954-1
SIL 2*) in acc. with IEC 61508

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NFPA 79, NFPA 85
NRTL-listed

NFPA 79 *)
NRTL-listed *)

NFPA 79*)
NRTL-listed *)

- Safety functions**
- Safe torque off
 - Safe stop 1
 - Safely limited speed

- Safety functions**
- Safe torque off
 - Safe stop 1
 - Safely limited speed
 - Safe brake control (only G120)

- Safety functions**
- Safe torque off
 - Safe stop 1 and 2 (SS2)**)
 - Safe brake control**)
 - Safe operating stop (SOS)
 - Safely limited speed (SLS) **)
 - Safe speed monitor (SSM) **)

- Safety functions**
- Safe stop (= safe torque off) and safe operating stop
 - Safely limited speed
 - Safe software limit switches and cams
 - Safe programmable logic
 - Safe brake management
 - Integrated acceptance test

Degree of protection IP65

Degree of protection IP20

Degree of protection IP20

Degree of protection IP20

- Additional features**
- Power: 1.1 (1.5 kW)
 - Actuation of safety functions via Safety Local repair switch module (F-RSM) inputs
 - Distributed design without control cabinet
 - Flexibility thanks to free combination of ET 200pro modules with the frequency converter
 - Regenerative (brake resistance and chopper can therefore be dispensed with)
 - V/f control
 - Vector control with and without sensor

- Additional features**
- 1) Modular design for powers from 0.37 to 90 kW
 - 2) Distributed design in high degree of protection for powers from 0.75 to 7.5 kW
- 1+2) • Regenerative
• Regenerative operation with regenerative feedback without chopper or brake resistance
• V/f control
• Vector control with and without sensor

- Additional features**
- For ratings from 0.12 to 1200 kW
 - With integrated positioning functions
 - Servo control
 - Vector control
 - V/f control
 - Modular design
 - Automatic configuration with electronic rating plates

- Additional features**
- 64 safe inputs/outputs
 - High-speed processing with "look ahead"
 - Processing without tracking errors
 - Jerk-limited acceleration
 - NURBS interpolation
 - 5-axis functions

Communication
Failsafe communication via PROFIBUS with PROFIsafe profile

- Communication**
Failsafe communication via
- 1) PROFINET/PROFIBUS mit PROFIsafe profile
 - 2) PROFIBUS with PROFIsafe profile

Communication
Failsafe communication via PROFIBUS with PROFIsafe, PROFINET, CANopen

Communication
Failsafe communication via PROFIBUS with PROFIsafe profile

*) in preparation
**) for ratings up to approx. 100 kW (block size and book size devices)

*) with SINUMERIK 840D sl in preparation

Field bus technology for wood pellet pressing



The Holzwerke Wimmer GmbH in Pfarrkirchen, Germany, manufactures burnable wood pellets from pressed splints. This way, waste products are turned into environmentally compatible and efficient fuels. The modern plant can produce up to 3.7 tons of pellets per hour. The plant concept must, of course, also assure the safety of the operating personnel and machines.



The solution

Field bus technology with AS-Interface and PROFIBUS DP was installed in the new production plants for the pellets. The 95-m-long AS-Interface string accommodates 95 stations such as the Emergency-STOP commanding devices, protective doors as well as light grids with ASI-safe connection.

The advantages

- Safe signal transmission via the bus, facilitating flexible reactions to system modifications
- Possibility of partial system component shutdown via three safety monitors
- Efficiency thanks to the technology's remote monitoring

Safety concept at Madame Tussauds, Great Britain

Dynamic drives facilitate automated motions not only in production plants, but also in modern fun rides, as is the case with the "Spirit of London" tour through the famous waxworks. An efficient and reliable bus-based ASIsafe solution assures that visitors can enjoy themselves safely and without any inconveniencies.



The solution

In addition to standard signals, ASIsafe now also allows for the transmission of safety signals. Optical protective fields equipped with light curtains protect persons exiting the carriages during the ride.

The advantages

- Increased availability thanks to the integration of safety and standard systems
- Reduction of downtimes by 60 %
- Reduced wiring, simplified diagnostics and eased maintenance

More information on our safety technology

Order by fax: +49 911/978-3321 – CD/Z1324

Simply tick the brochures you wish to order, fill in the form and return it to us by fax:

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Order No.
E20001-A150-M103-V3-7600



☐ **Safety Integrated System Manual**

Order No.
6ZB5 000-OAA01-0BA0



☐ **Safety Integrated Functional Examples**

Order No.
6ZB5310-OMK01-0BA1



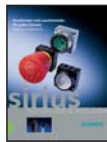
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Order No.
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E20001-A730-P305-X-7600



☐ **AS-Interface**

Order No.
E20001-A550-P305-V2-7600



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