SIRIUS 3SK
Safety Relays

Technical Slides

siemens.com/safety-relays

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Current requirements from the market

- „High functionality with small footprint“
- „More flexible than hardware parametri-zation“
- „Separation between safety and standard“
- „Drag and Drop instead of pro-gramming”
- „Long-life cycle and high switching capacity“
- „Communi-cation ability“

The answer:
Safety Relays SIRIUS 3SK2

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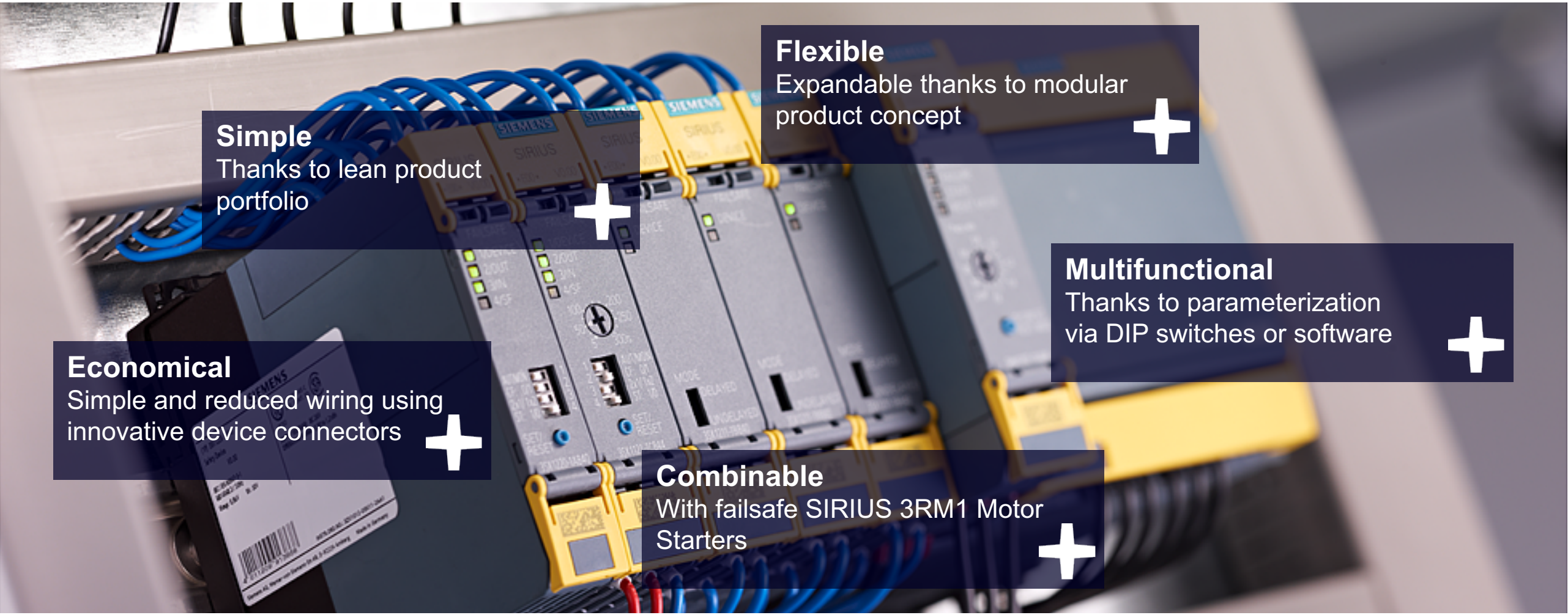
3SK is an integrated Safety-System – more simple, more flexible, more economic



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Agenda

- **implementation possibilities** **4**
- Typical applications 8
- SIRIUS Simulator 15
- Hardware 20
- Software parameterization 39
- Communication 59
- Operation modes 69
- Diagnostic- and commissioning functions 79
- License-concept 95

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Fields of application for 3SK2

If required by user:

Safety in parallel to Std-Automation system

→ Automation-philosophy: „Stand-Alone“

- smaller safety applications (low to medium I/O)
- Retrofit
- time-critical applications

Complex and flexible safety concepts

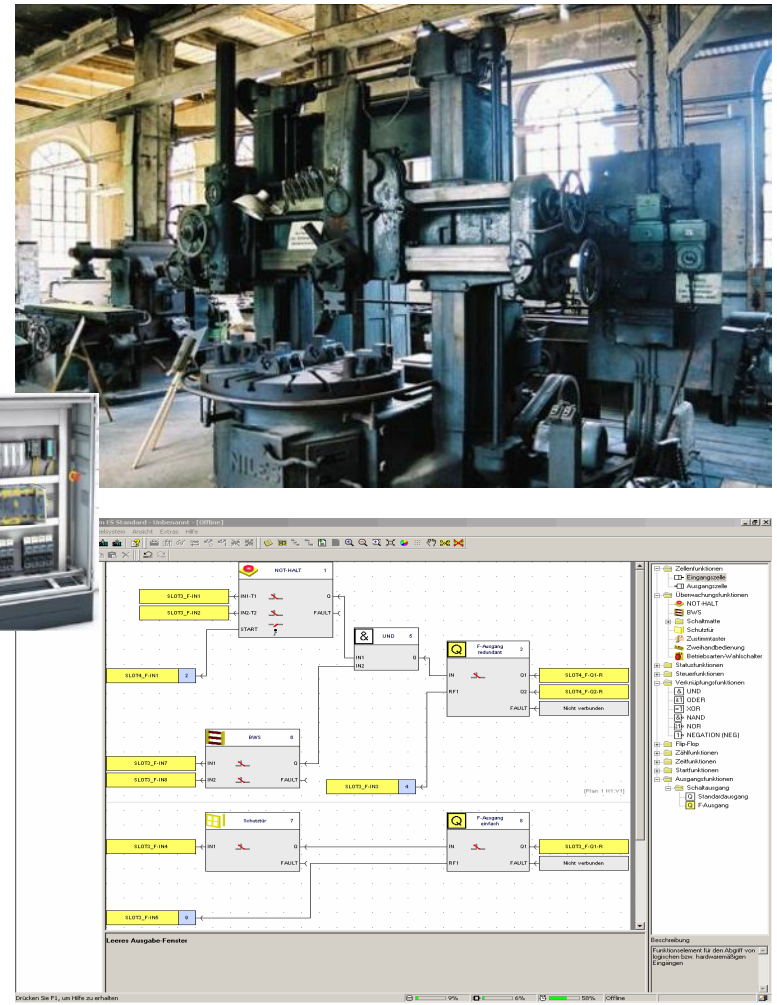
→ Creation of logic functions per engineering tool

- differentiation to Safety relays
- cost reduction/ increase in productivity

Less training effort

→ graphic parameterization instead of complex programming

- advantages due to Easy-Learning



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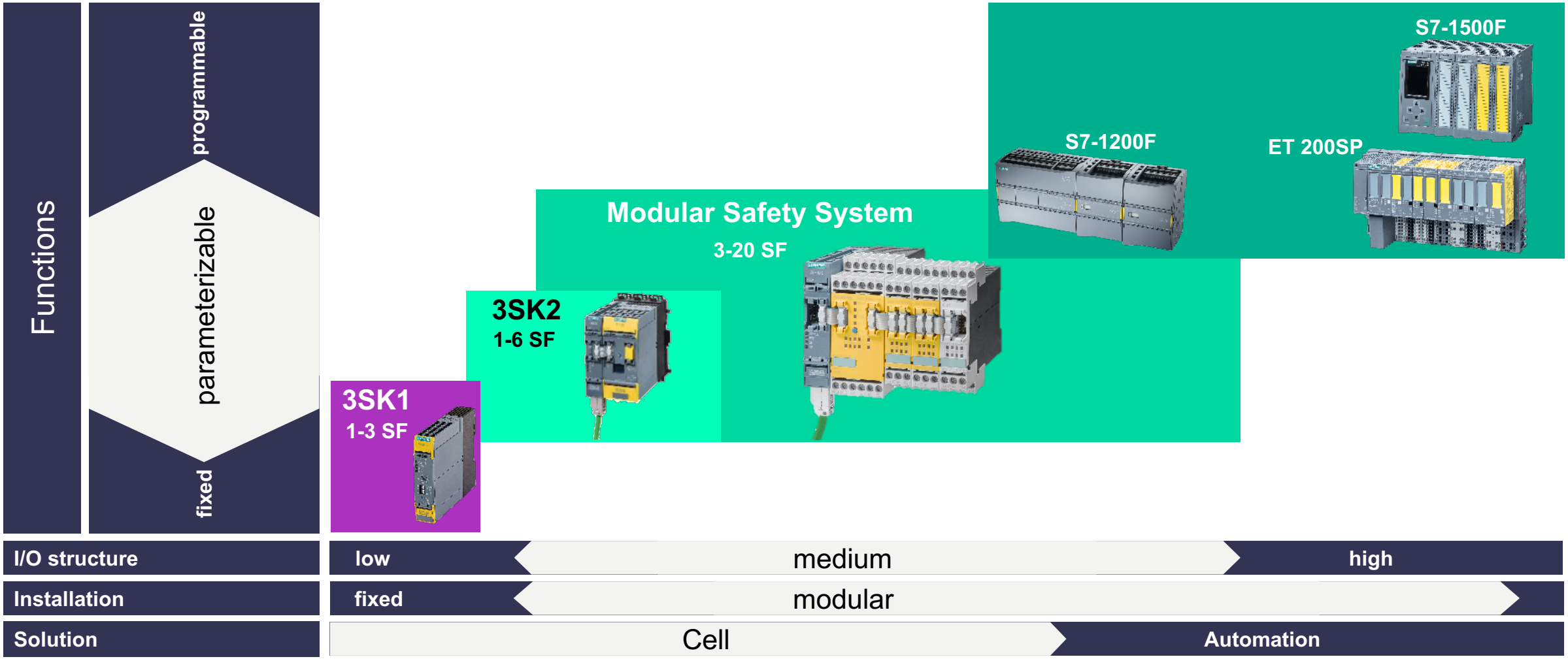
Position of 3SK2 within Safety-portfolio



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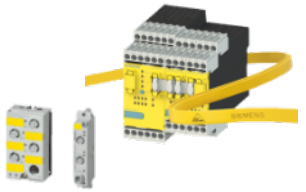
3SK2 connects 3SK1 and MSS to a continuous portfolio

Safety Integrated portfolio overview

	3SK1	3SK2	MSS ASIsafe	MSS 3RK3	F-CPU: S7-1200 / S7-1500 / ET 200SP
					
Evaluation device	Safety Relays SIRIUS 3SK		Modular Safety System SIRIUS 3RK3		Failsafe SIMATIC PLCs and distributed I/O
Engineering	Hardware-parameterized	Software-parameterized			Software-programed
Number of safety functions	Up to 3*	Up to 6	Up to 20		From 10
Communication	none				PROFIsafe
					AS-i
					PROFIBUS
					PROFINET

* Independent enabling circuits

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3SK1 – 3SK2
Applications

3SK1 Standard: „Safety as always – only better!"
3SK1 Advanced: „Safety as flexible like never before!"
3SK2: "For challenging safety applications"

3SK1 Standard-Basic units

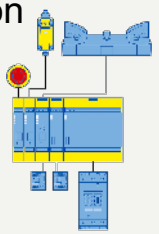
For simple applications

- Easy handling
- Less wiring
- Only one basic unit for mechanical and electronic sensors
- relay or semiconductor output

3SK1 Advanced-Basic units

For simple applications with a larger number of sensors

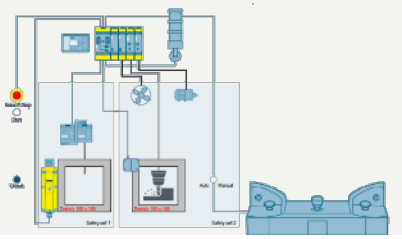
- Easy handling
- integrated parameterization concept
- Available with time delay
- Connecting to expansion modules via innovative device connectors
- Input expansion for additional sensors



3SK2 Basic units

For flexible applications with free I/O assignment

- Simple creation of more challenging application (e.g. operating mode)
- Muting
- performance capable semiconductor outputs
- Individual selectable time delay
- Free assignment of sensors and actuators
- Simple commissioning via: test operation, Forcing, comprehensive diagnosis
- Automated user documentation of realized applications



easy — **Safety Application** — challenging

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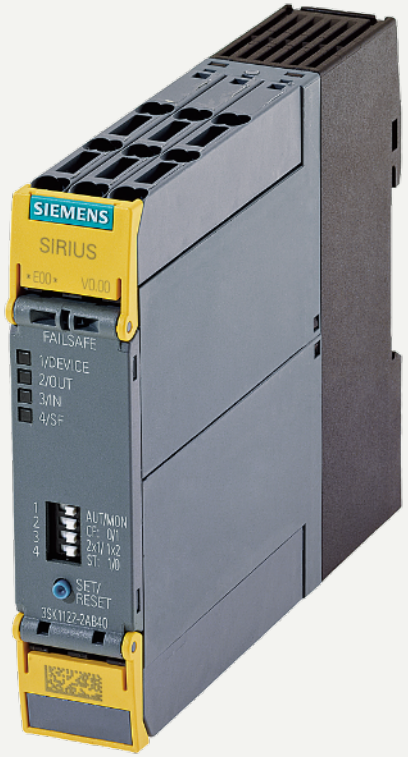
How do I select my 3SK1?

3SK1	Customer's requirement	3SK2
	most simplest logic	
	more complex logic	
	additional functions (e.g. Muting/Interlock)	
	only wiring allowed	
	Turn-off delay	
	complex time functions	
	powerful outputs	
	enhanced diagnostics	
	simplification of commissioning	
	less space consumption	
	Communication	

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Wheat mill with variable feeding Requirements

- Alternating monitoring of cone or vessel
- manipulation-proof switches
- door interlock of service door (crushing mill)
- door interlock of service door (vessel)
- nearly no space in cabinet

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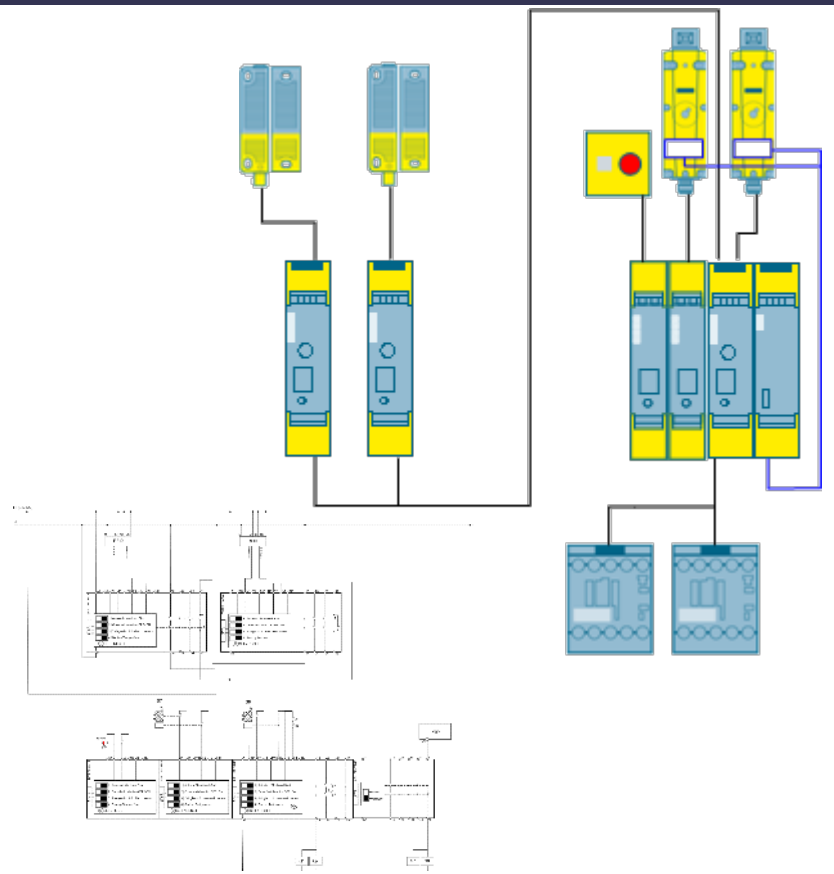
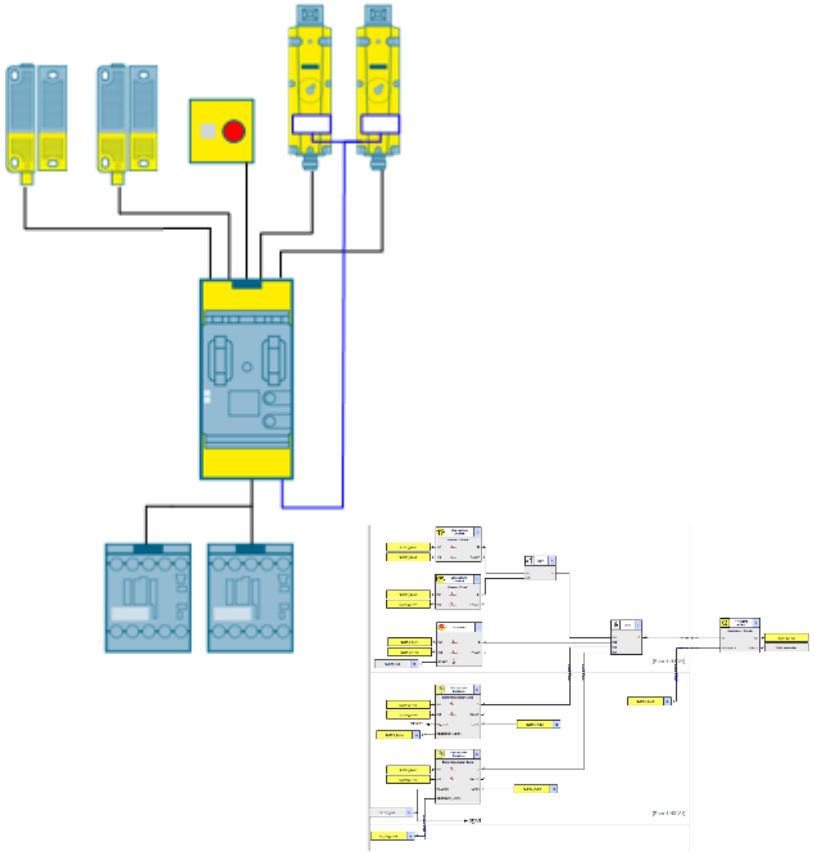
Mill with variable feeding
Solution

Solution with HW-parameterized Safety relays



Solution with SW-parameterized Safety relays 3SK2



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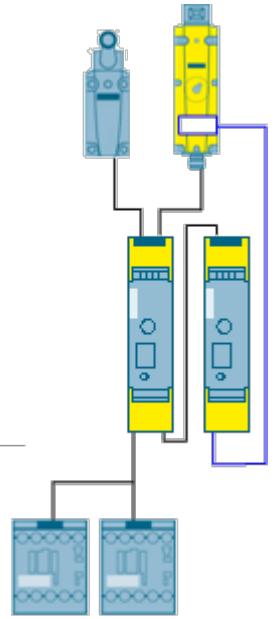
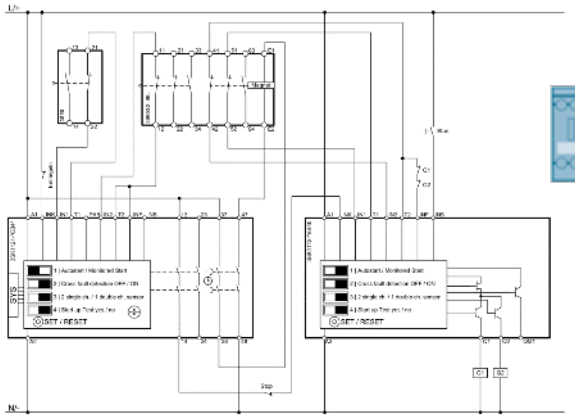
Safety function „door interlock“ economical realization with 3SK2

Solution with HW-parameterized Safety relays

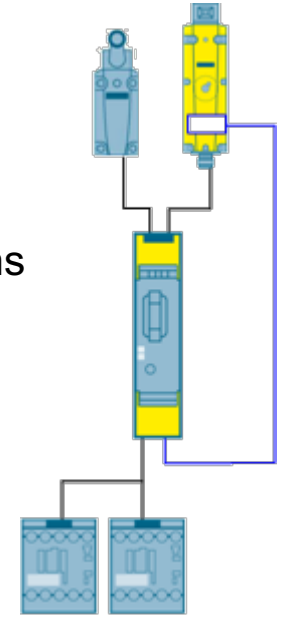
- one 3SK1 BU for door monitoring
- one 3SK1 BU for interlock
- rigid function (hardly to customize)
- only magnetic action

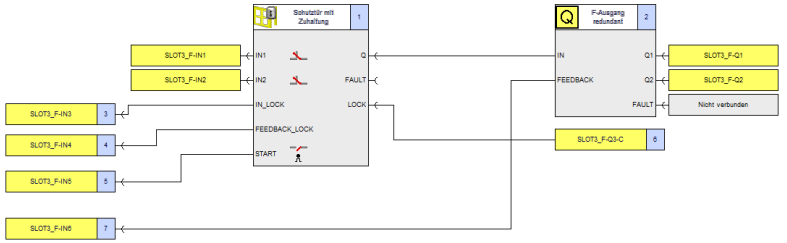




Solution with SW-parameterized Safety relays 3SK2

- full flexibility due to SW-elements
- easy to extend
- for all types of interlocks
- free I/O for additional Safety functions





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3SK2 PROFINET – Seamless integration into the automation level

Current demands from the market:

- No seperate programming cable
- A single interface for both user data and parametri-zation
- Seamless integration of diagnostics into the PLC
- Communica-tion as an add-on option
- Low space demand in the control cabinet

The answer:
SIRIUS 3SK2 PROFINET

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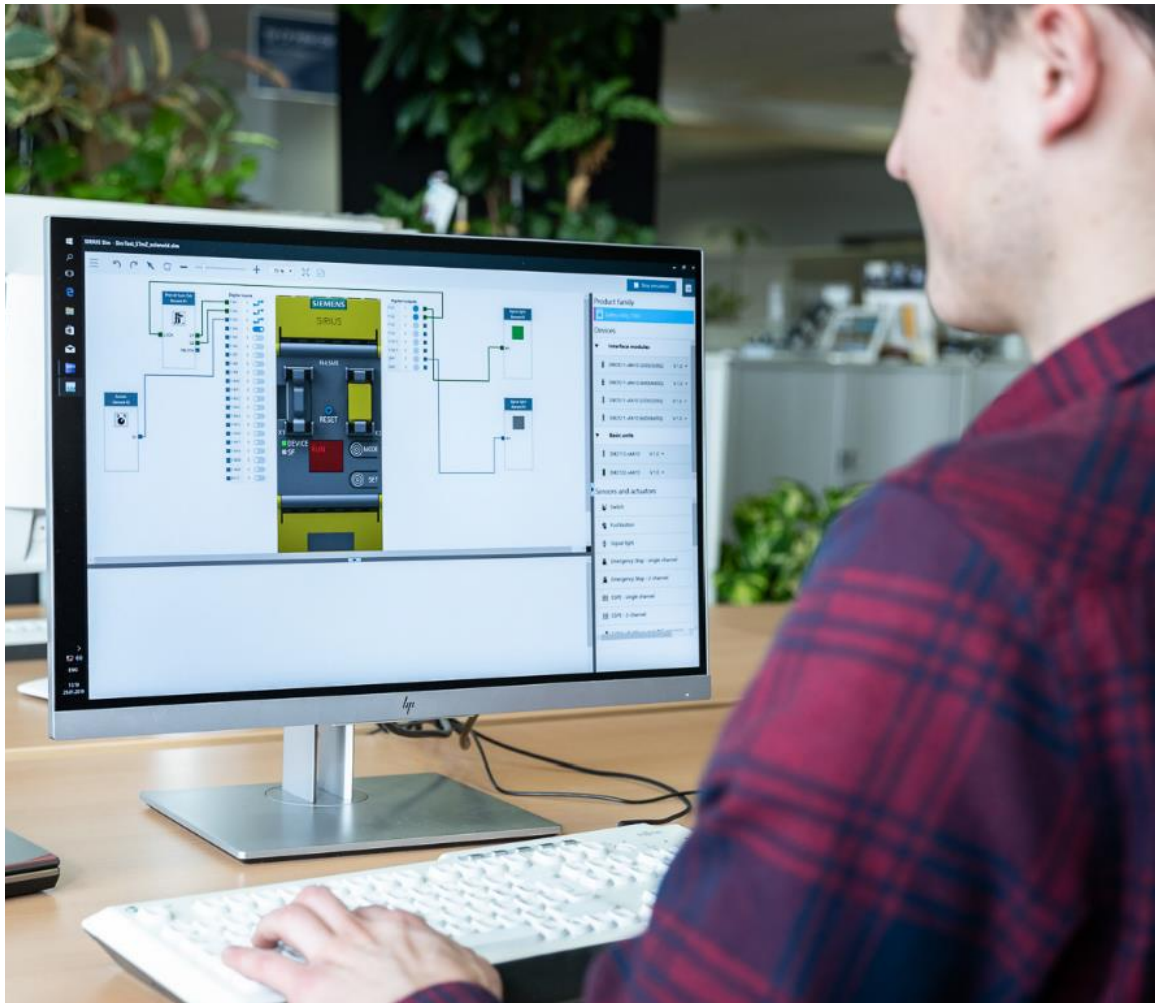
Simply clever: Simulating applications with the 3SK2 Simulator

- Free of charge (support.industry.siemens.com/cs/ww/en/view/109763750)
- Testing the whole funtional range of 3SK2
- Get to know 3SK2 with ready for action applications
- Create own Safety ES projects before testing them with the simulator

No need of real hardware → **Easy and fast adjusting of applications** → **Time and cost saving**

The answer:
SIRIUS Sim 3SK2



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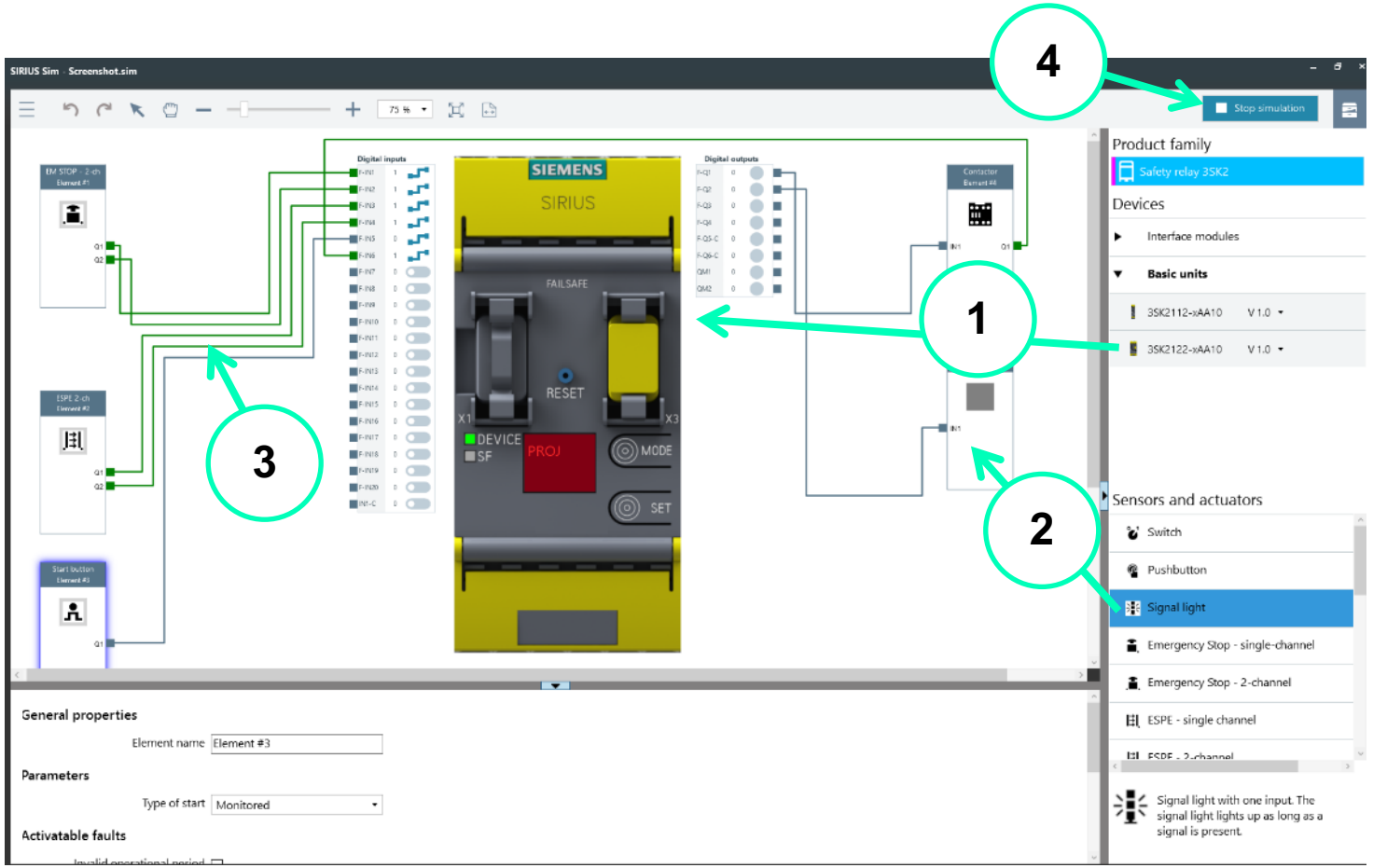
From the Safety ES project to testing the application in SIRIUS Sim 3SK2 – fast and easy

Creating a virtual 3SK2 in SIRIUS Sim



1. Select a 3SK2 variant
2. Add virtual sensors and actuators
3. Connect to the virtual 3SK2
4. Start simulation

→ Now the virtual 3SK2 behaves like a real, completely wired device from Safety ES´s viewpoint

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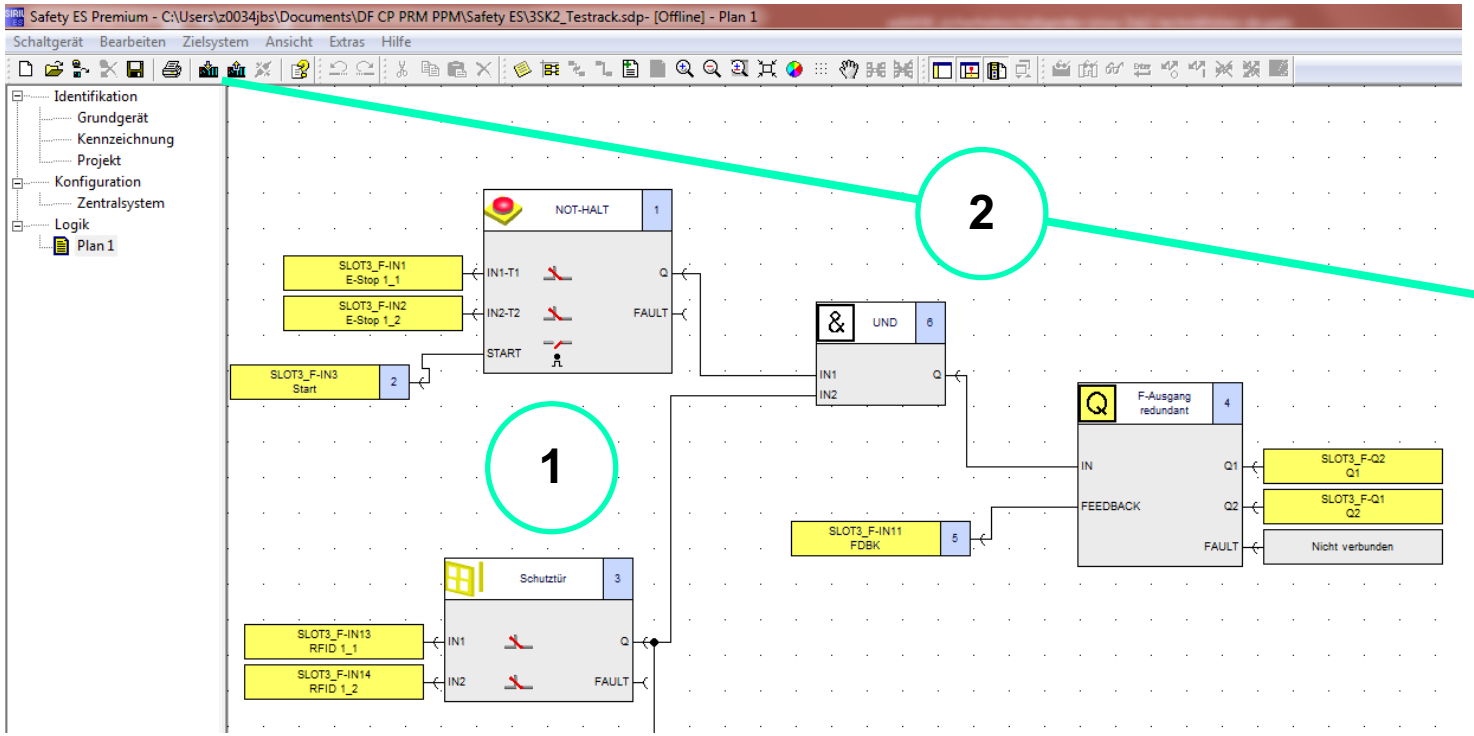
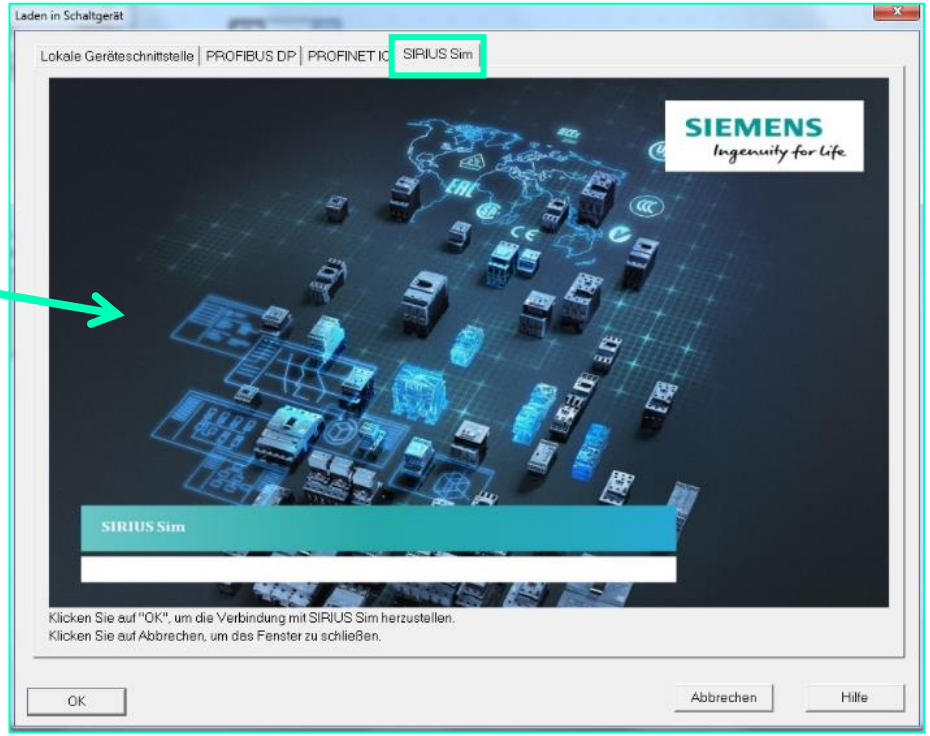
From the Safety ES project to testing the application in SIRIUS Sim 3SK2 – fast and easy

Safety ES projecting and transition to the simulator

1. Parametrize the logic in Safety ES – as before
2. Load to switching device – Virtually transfer the project to SIRIUS Sim rather than via real interface

→ Monitoring and testing of the application – like it was a real device (switching the sensors via SIRIUS Sim)





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3SK2 Sim: Easy and fast simulating of safety applications at the desk

Costumer benefits 3SK2 Sim

Feature / Function		Costumer benefit
Simulation of 3SK2 directly on the PC	>	• Support during the device selection • Ample testing of the device features
Simulation of comprehensive sensors and actuators	>	• Pre-Engineering am „Digital Twin“ • Simulation der späteren Applikation und Vorab-Erstellung der Projektierung
Easy interface between Safety ES and 3SK2 Sim	>	• Easy project loading to the simulator
Complimentary, licence-free download	>	• No additional costs for the costumer

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Top-Highlights 3SK2
World´s smallest software parametrizable safety relay

Top-Highlights 3SK2

Feature / Function		Benefits
• Software parametrizable via Drag&Drop	>	• High flexibility • Easy creation of demanding applications • No programming
• Selective shut off via individual release circuits • With individual time delay	>	• Tailor-made safety concepts and high plant availability
• 3SK2 offers a variety of in- and outputs at a narrow structural width	>	• Savings on control cabinet space • Cost saving
• Comprehensive diagnostics via SIRIUS-Safety ES Software including forcing • Diagnostic display	>	• Fast commissioning and simple troubleshooting

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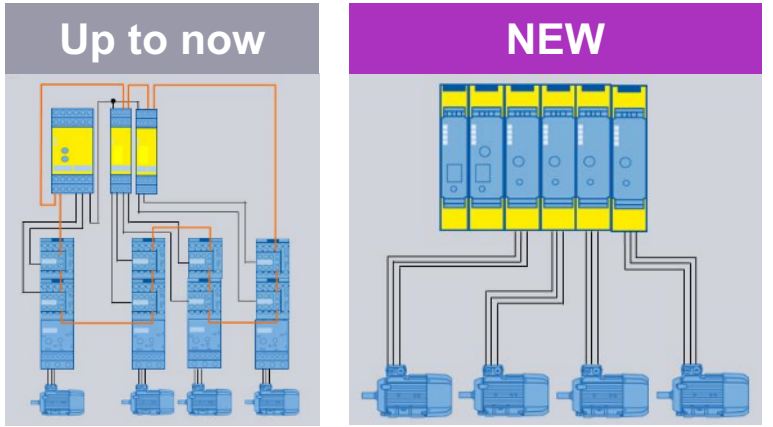
Top-Highlights 3SK System - even more simple, more flexible, more economic

Top-Highlights

Feature / Function		Benefits
• Comprehensive and complete portfolio	>	• Simply Engineering and fast startup
• Modular system	>	• Flexible adaptable to other applications
• Device connector	>	• Time saving and avoiding wiring errors
• Integration ability of the motor starter 3RM1 Failsafe	>	• Seamless integration in the main circuit



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The individual system components of 3SK are flexibly combinable

3SK2-extensions

Diagnose-Display

PROFINET Interface

per connecting cable

Input-expansions

230 V power supply

Sensor expansion

per device connector / wiring

Main devices

3SK2		Solid state 22 mm width	Software parametriz-able off-logic
		Solid state 45 mm width	
3SK1 Advanced		Relays	instantaneous and delayed
		Solid state	
		Solid state Mini	
3SK1 Standard		Solid state Mini	instantaneous
		Relays	
		Solid state	

per device connector / wiring

per wiring

Output-expansions

4RO	3RM1	3RO
SIL 3 / PL e	SIL 3 / PL e	SIL 3 / PL e

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Product details 3SK2
Both variants in comparison

Product details/-overview

	22,5 mm	45 mm
Integrated I/Os	• 10 F-inputs • 2 independent F-outputs (electronic) • 1 standard output (electronic) • 2 test pulse outputs (electronic)	• 20 F-inputs • 4 independent F-outputs (electronic) • 2 standard outputs (electronic) • 4 test pulse outputs (electronic)
Memory module	Integrated	External, exchangeable
Diagnosis	SIRIUS Safety ES, Diagnosis Module 3RK36	On Board Display, SIRIUS Safety ES, Diagnosis Module 3RK36
Dimensions (WxHxD)	22.5 mm x 100 mm x 124 mm	45 mm x 100 mm x 124 mm
Extensibility	Via device connectors up to 5 expansion modules can be used: • 3SK1 output expansions (5 A and 10 A) or • 3RM1-F failsafe motor starters	
Special Features	20 failsafe flags; several logbooks; behavior of electronic outputs is parameterizable	
Temperature range	-20° C to 60° C	
Software	SIRIUS Safety ES	

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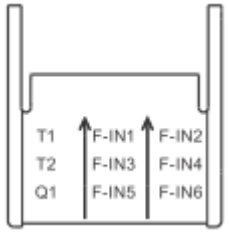
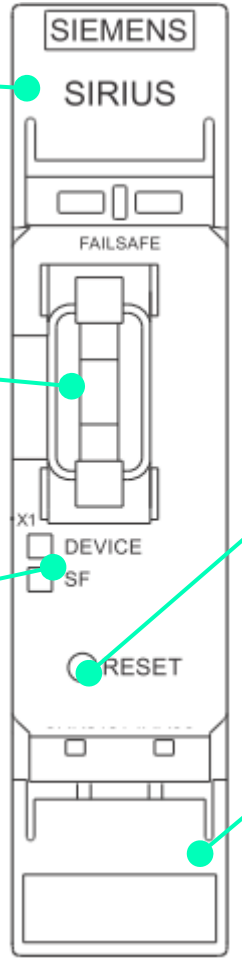
Product details 3SK2
Basic unit 3SK2 22,5mm- Design



Top terminals
- F- inputs
- Test outputs
- Signaling output

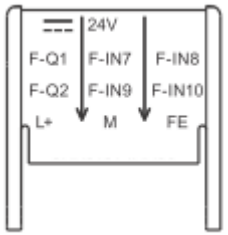
System interface for:
- PG/PC connection
- Diagnostic display
- DP-Interface

Diagnostic-LEDs
- Displays operation mode
- Displays faults



Reset button
- Fault acknowledgement
- Factory setting

Bottom terminals
- F- inputs
- F- outputs
- Power supply



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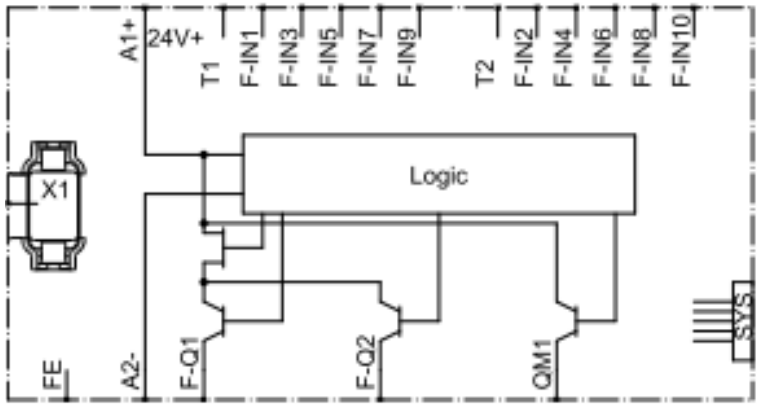
Product details 3SK2
Basic unit 3SK2 22,5mm- Terminals



T1	Test output for inputs F-IN1, F-IN3, F-IN5, F-IN7, F-IN9	• Test output T1 / T2 with different test signals • Connection for sensor contacts for detection of cross-wirings
T2	Test output for inputs F-IN2, F-IN4, F-IN6, F-IN8, F-IN10	
F-IN1… F-IN10	safety-related sensor inputs	Connection for safety sensor Combination for two-channel connection: • F-IN1 with F-IN2 • F-IN3 with F-IN4 • F-IN5 with F-IN6 • F-IN7 with F-IN8 • F-IN9 with F-IN10
QM1	electronic output	electronic Standard output (not safety-related)
F-Q1, F-Q2	safety-related electronic outputs	Two-channel electronic outputs for connection of actuators
A1+	power supply	DC 24V
A2-	frame	frame to DC 24V
FE	functional grounding	shield, equipotential bonding

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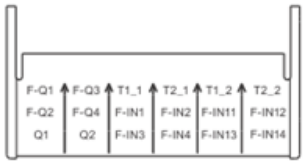
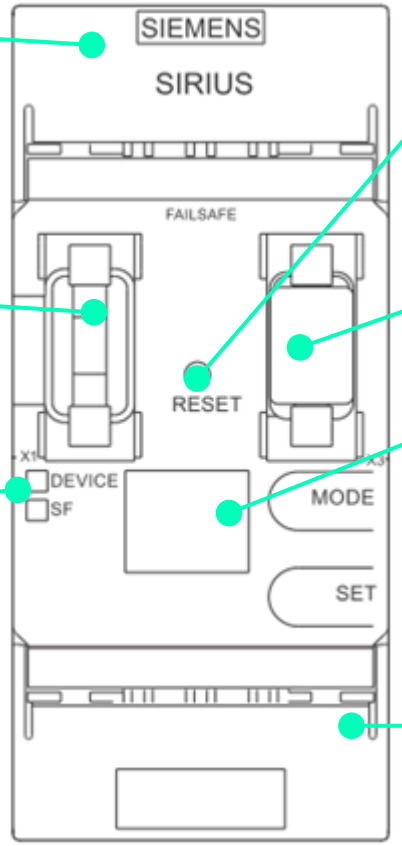
Product details 3SK2
Basic unit 3SK2 45mm- Design



Top terminals
- F-inputs
- Test outputs
- Signaling output

System interface for:
- PG/PC connection
- Diagnostic display
- DP-Interface

Diagnostic-LEDs
- Displays operation mode
- displays faults

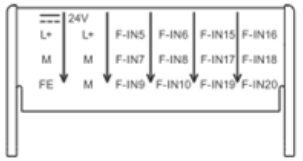


Reset button
- Fault acknowledgement
- Factory setting

Memory module

Device display
- Displays operation mode
- Displays faults
- State of I/O
- Operation included (MODE/SET)

Bottom terminals
- F- inputs
- F- outputs
- Power supply



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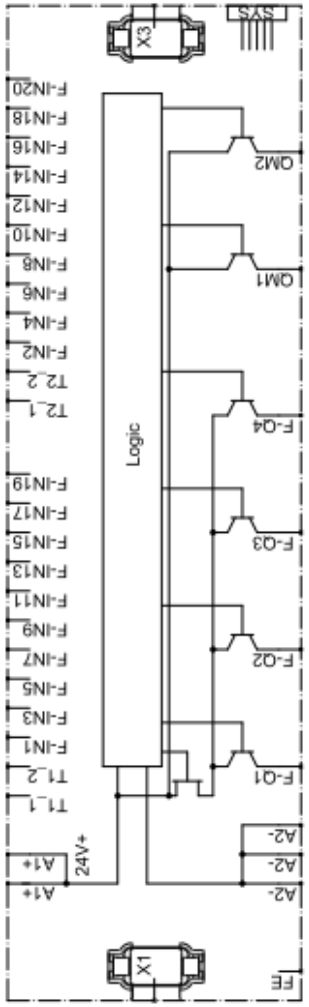
Product details 3SK2
Basic unit 3SK2 45mm-clamps



T1_1 **T2_1**	Test output for inputs F-IN1, F-IN3, F-IN5, F-IN7, F-IN9, F-IN11, F-IN13, F-IN15, F-IN17, F-IN19	• Test output T1_1 / T2_1 with different test signals • Connection for sensor contacts for detection of cross-wirings • T1_1/T2_1 unabhängig von T1_2 / T2_2
T2_1 **T2_2**	Test output for inputs F-IN2, F-IN4, F-IN6, F-IN8, F-IN10, F-IN12, F-IN14, F-IN16, F-IN18, F-IN20	
F-IN1… **F-IN20**	safety-related sensor inputs	Connection for safety sensor Combination for two-channel connection: • F-IN1 mit F-IN2 • F-IN3 mit F-IN4 • ... • F-IN9 mit F-IN10
QM1, QM2	electronic output	electronic Standard output (not safety-related)
F-Q1, F-Q4	safety-related electronic outputs	Two-channel electronic outputs for connection of actuators
A1+ (2 x)	power supply	DC 24V
A2- (3 x)	frame	frame to DC 24V
FE	functional grounding	shield, equipotential bonding

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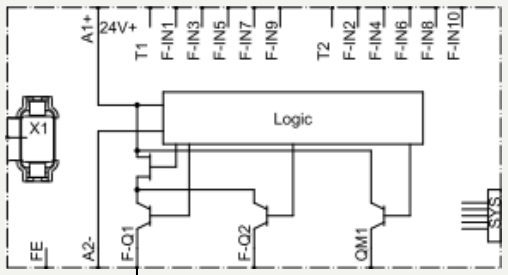
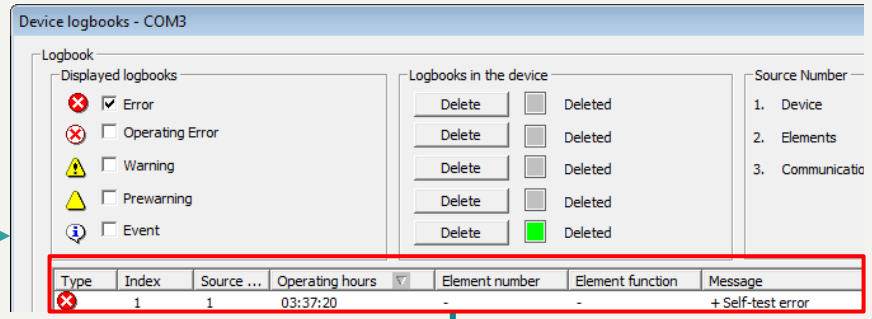
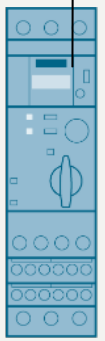
Individual customizing to the actuator‘s needs
Read back time of dark test

- Dark test: Monitoring of electronic F-outputs to its operativeness
- Possibly bad influence by capacitive actuators
- Adaption of read back times suppresses unmeant faults



Fault message of devices

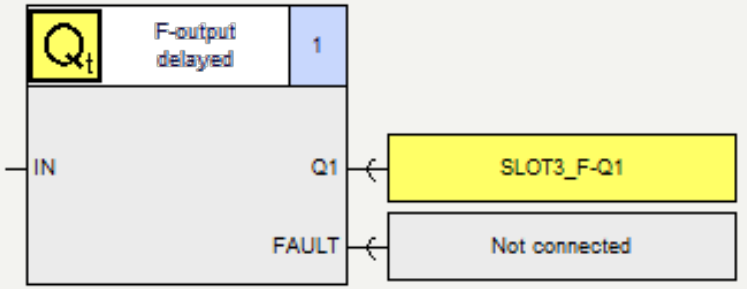




Actuator with capacitive load

Adaption of read back times (3-400ms)

use SW-element F-output delayed



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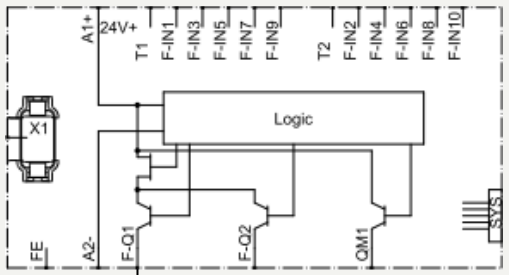
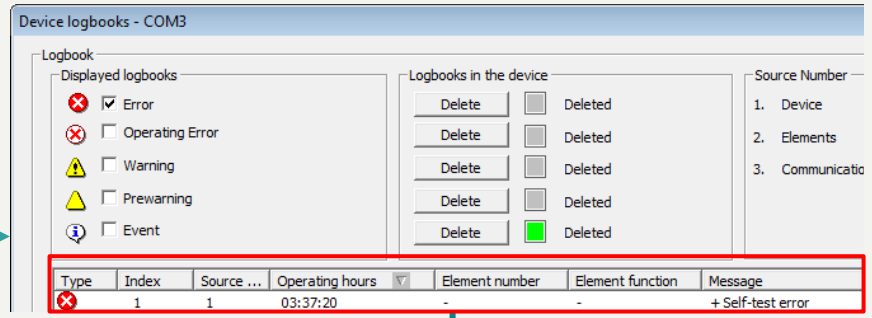
Individual customizing to the actuator‘s needs
Deactivate light test

- Light test : internal test, if F-output works properly
- Activated by default
- Influences SIL/ PL when deactivated
- In case of fault, 3SK2 changes to configuring mode



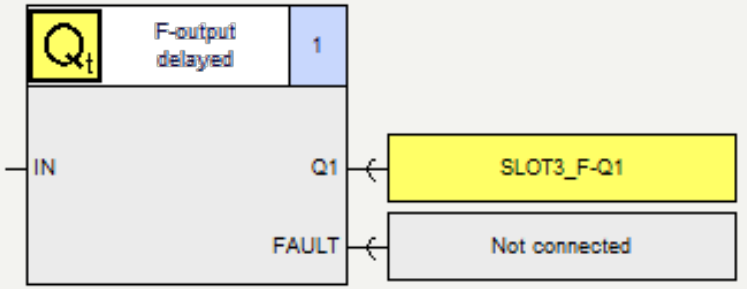
Fault message of devices



sensitive actuator, like LEDs

Light test can be
- activated
- deactivated

use SW-element F-output delayed



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Product details interface modules PROFINET and PROFIBUS comparison of both variants

Product details / data overview

	Interface module PROFINET	Interface module PROFIBUS
Accessory for	• MSS 3RK3 Advanced • MSS 3RK3 ASIsafe • 3SK2	• MSS 3RK3 Basic • MSS 3RK3 Advanced • MSS 3RK3 ASIsafe • 3SK2
Communication standard	PROFINET	PROFIBUS
Transmission rate	100 MBit/s	12 MBit/s
Power supply	24 V DC	
Structure of process data	32DI/32DQ or 64DI/64DQ	
Dimensions (WxHxD)	22,5 mm x 100 mm x 122 mm	45 mm x 113 mm x 124 mm
Temperature range	-20° C up to 60° C	
Software	• SIRIUS Safety ES • S7-Engineering (TIA Portal) via GSD file	

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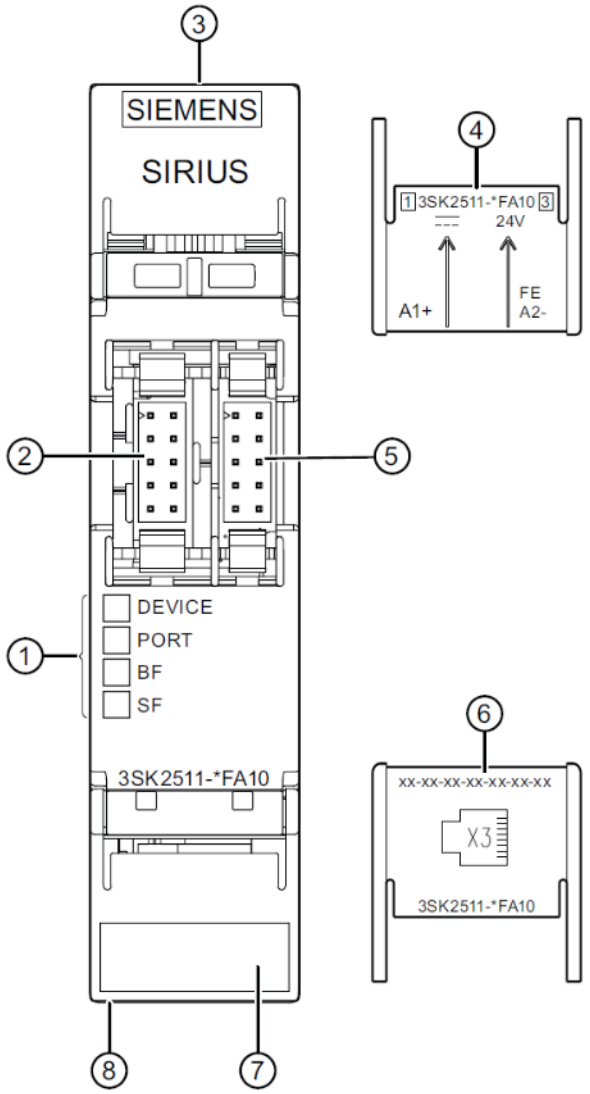
Product details PROFINET interface module
Design



1. Diagnostic-LEDs
2. Device interface (X1)
3. Top terminals (removable)
4. Labeling of top terminals (visible in folded-up state)
5. System interface (X2)
6. Labeling of bottom terminals (visible in folded-up state)
7. Labelling field
8. PROFINET interface (X3)

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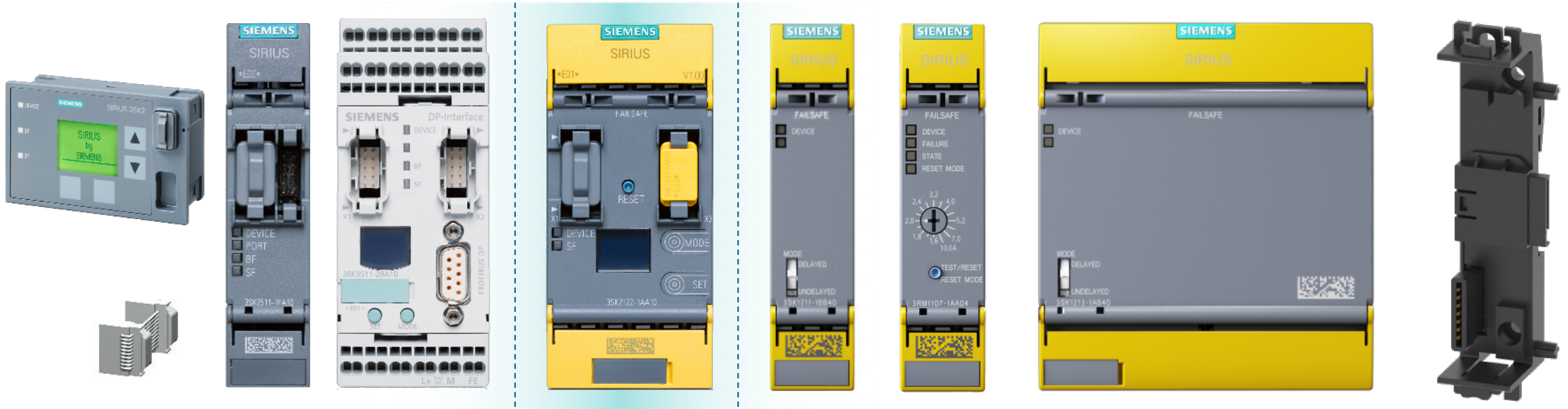
System design
expandability of SIRIUS 3SK2



On the left:

- Diagnostic display
- PROFINET interface module
- DP-Interface module (MSS)
- Connection via flat ribbon cable

On the right:

- Output expansion 4RO
- Motor starter 3RM1-F
- Output expansion 3RO Power
- Connection via device connector

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Safety relays SIRIUS 3SK1
Output expansions

- switching capacity 5 A
- 4 relay-enabling circuits
- connection via device connector 3ZY1 (optional)
- Slide switch for control selection (delayed/instantaneous)

- switching capacity 10 A
- 3 relay-enabling circuits
- connection via device connector 3ZY1 (optional)
- Slide switch for control selection (delayed/ instantaneous)

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Motorstarter SIRIUS 3RM1
Brief description

- width: 22.5 mm
- direct-on-line or reversing starter
- safety-related shutdown (SIL 3 / PLe)
- motor overload protection (ATEX)
- overload trip class: Class 10 A
- group configuration possible
- short-circuit current rating with circuit breakers / fuses up to 55 kA
- 3 versions to 7 A (0.1 to 0.5 A; 0.4 to 2 A; 1.6 to 7 A)
- rated operating voltage: 500 V

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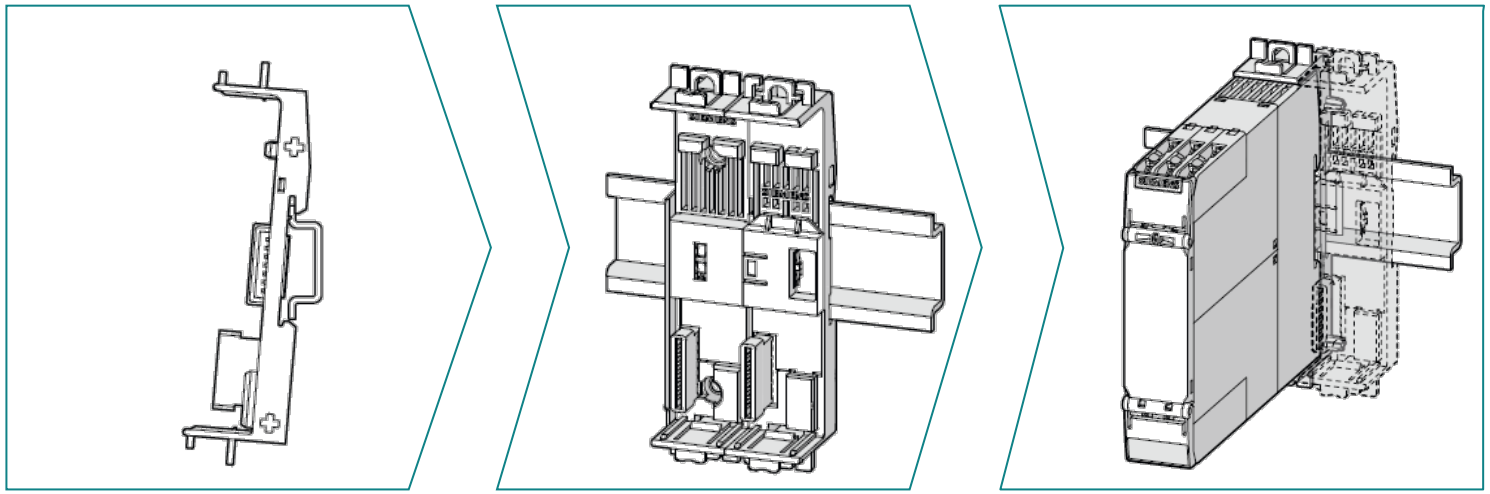
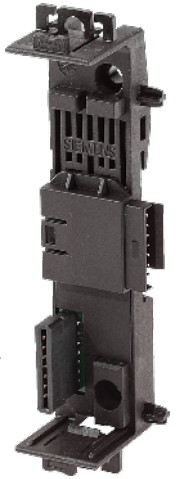
System design
Device connector

Device	Type
3SK1	Type 1
3SK2	Type 3
3RM1	Type 2



Features

- Loop-through of the control supply voltage
- Control of back-side F-outputs
- Feedback circuit monitoring
- Component monitoring



Device connector

Device termination connector

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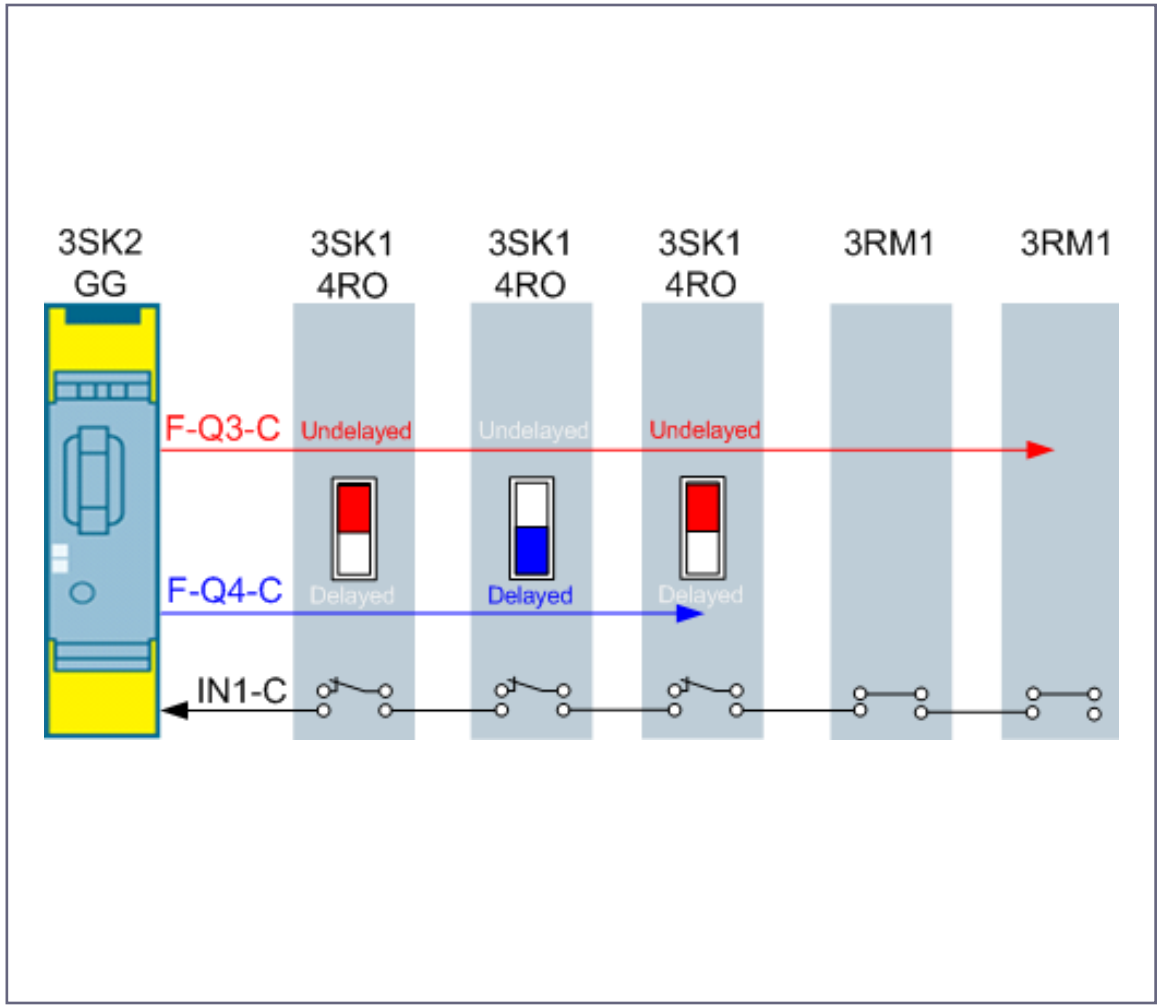
The easy Plug & Play Solution with device connectors

- Two independent safety signals per device connectors
- Allocation of 3SK1 output expansions via DIP-switches
- Fixed allocation of 3RM1-F (Q3-C resp. Q5-C)
- With the use of independent Output control, the monitoring via internal feedback loop (IN1-C) is not possible



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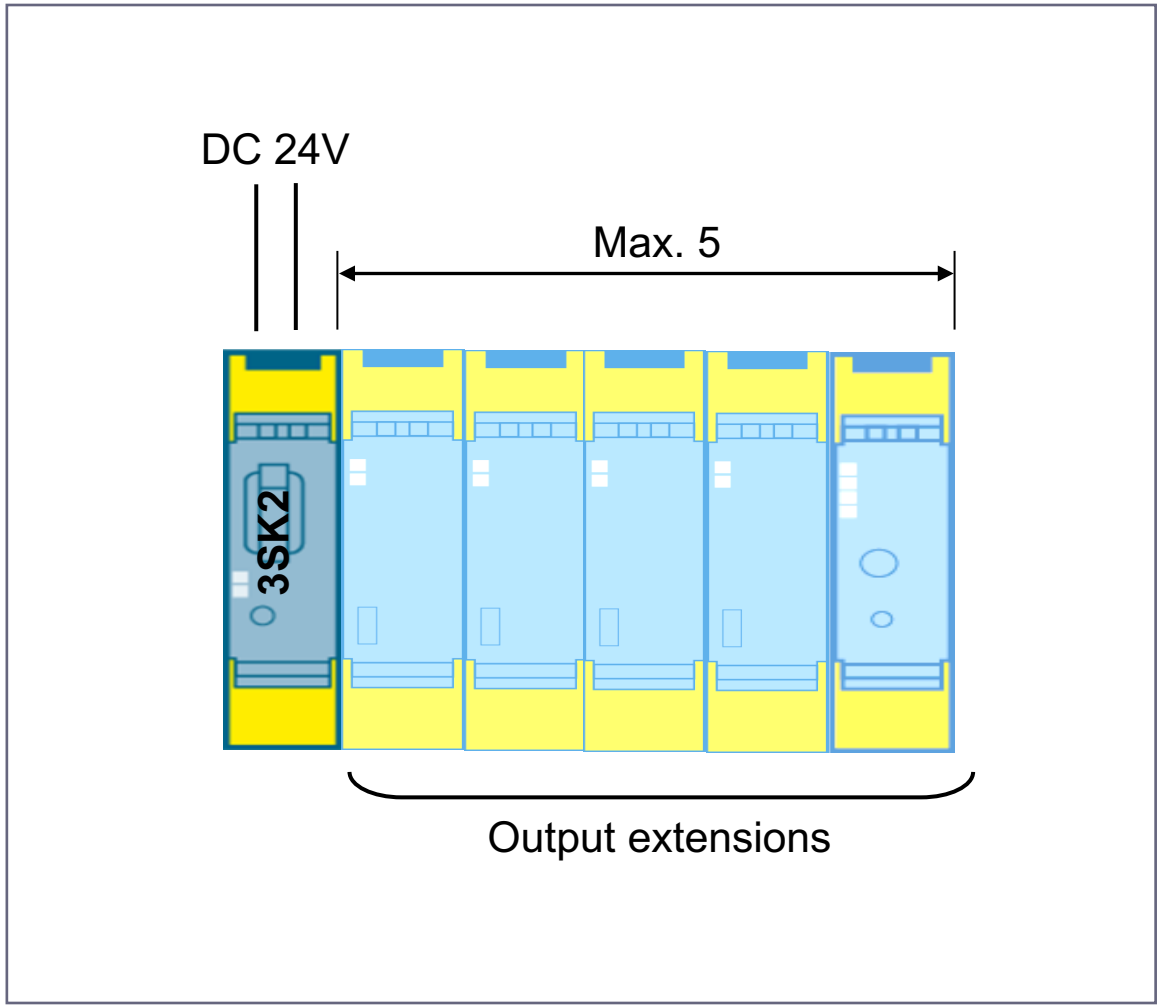
System structure installation guideline for external device supply

- Central infeed on the basic unit
- Power supply of the expansion modules via device connector
- device termination connector beneath last output expansion
- 2 independent shutdown signal for control of output expansion
- max. one output expansion 3RO Power possible



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Agenda

- implementation possibilities 4
- Typical applications 8
- SIRIUS Simulator 15
- Hardware 20
- **Software parameterization 39**
- Communication 59
- Operation modes 69
- Diagnostic- and commissioning functions 79
- License-concept 95

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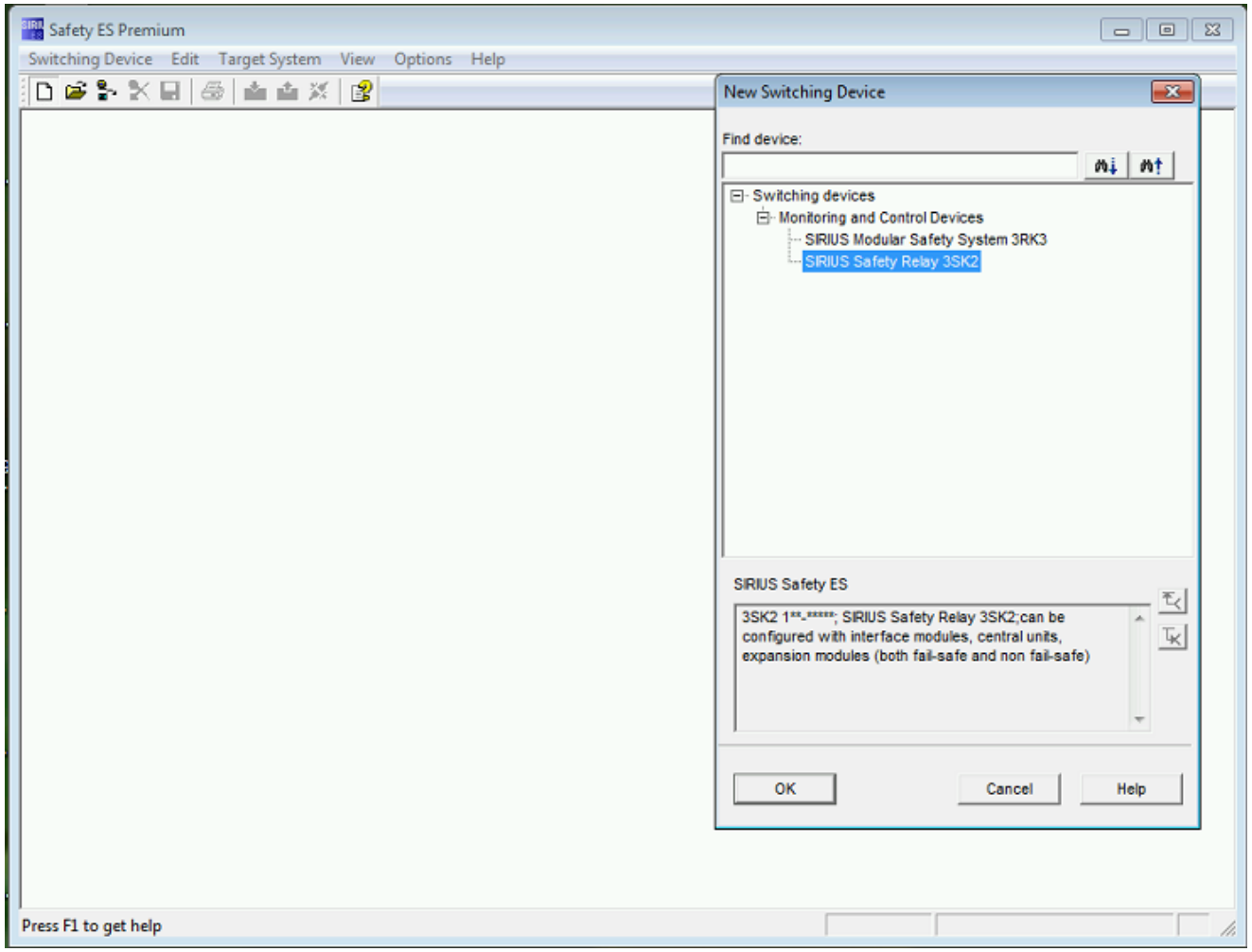
One common platform for all software based safety relays

Safety ES will be used for 3SK2 and MSS similarly

- Entry window SIRIUS Safety ES



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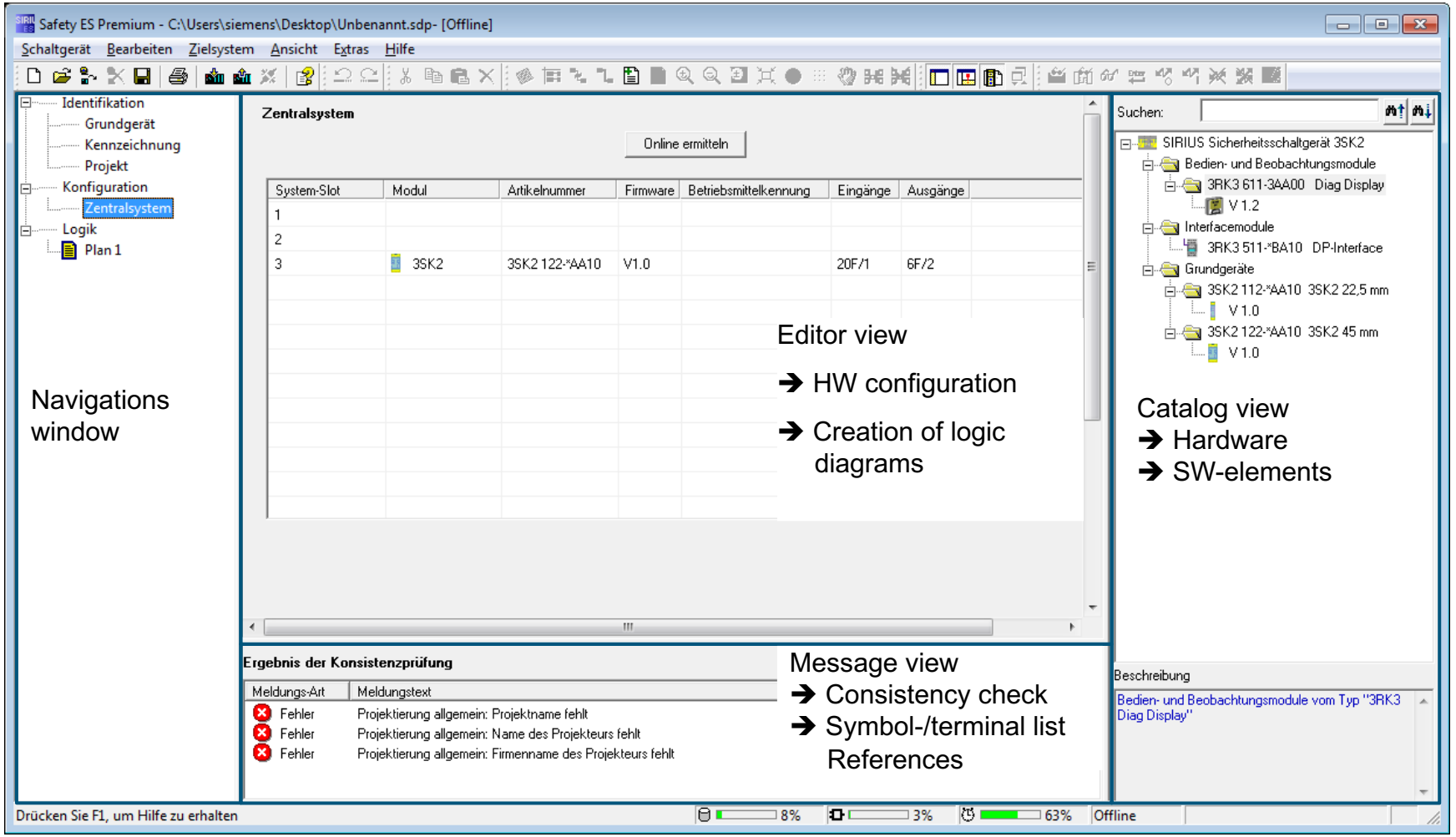
Clear layout of program views



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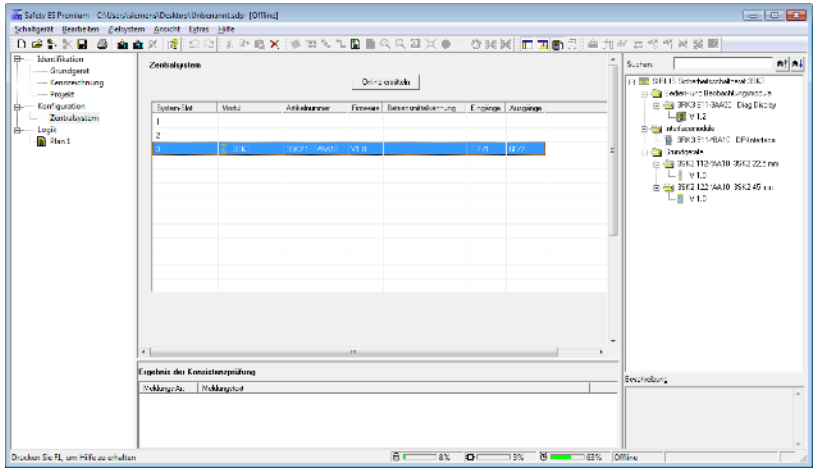
Creating a project is done in a few steps

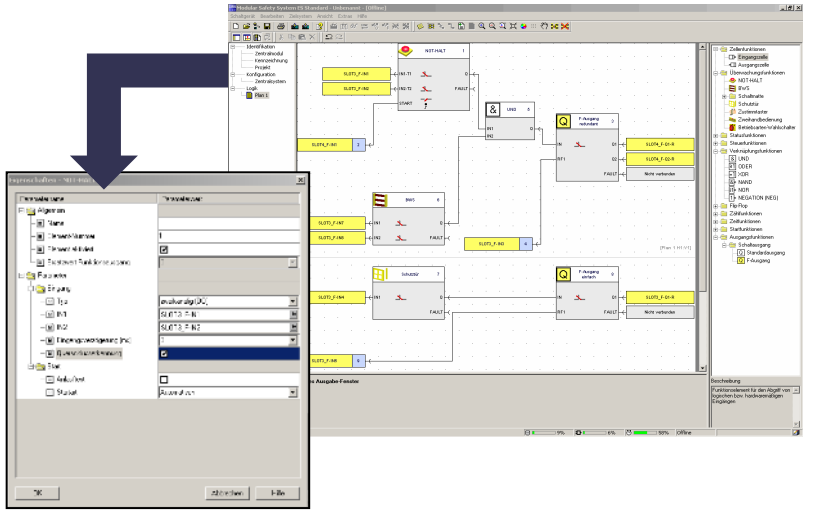
Hardware configuration and project identification

- Hardware components are dragged to the desktop from the selection catalog.
- Entry of project name and creator.
- Configuration of AS-i Bus (if relevant)



Parameterization of the safety function

- All function elements are available as blocks and can be parameterized.
- Function elements can be easily inserted and linked via drag & drop.



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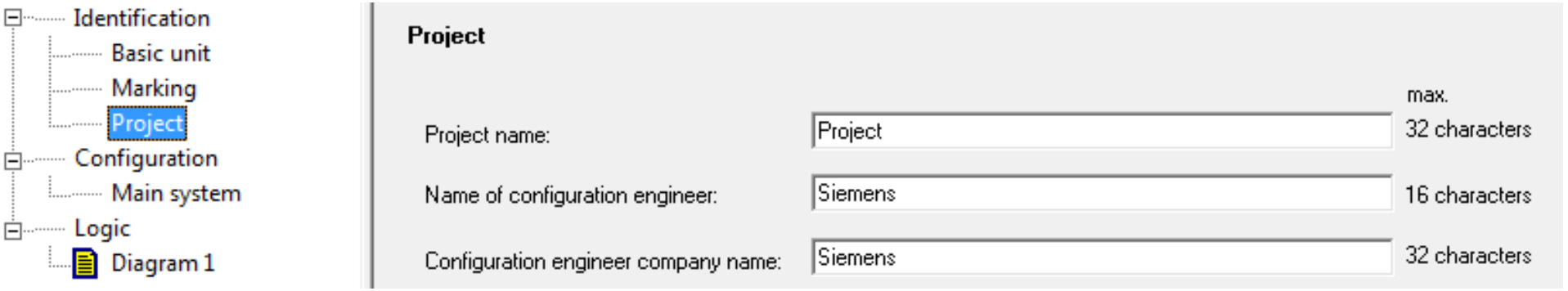
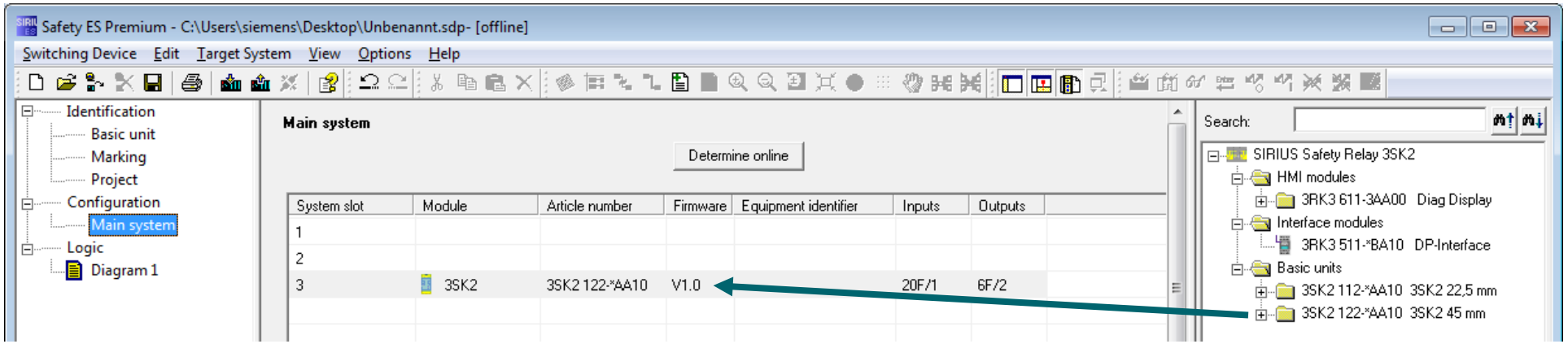
Setting up the project and parameterizing the Hardware

Filling in project data (mandatory)



Parameterizing the Hardware



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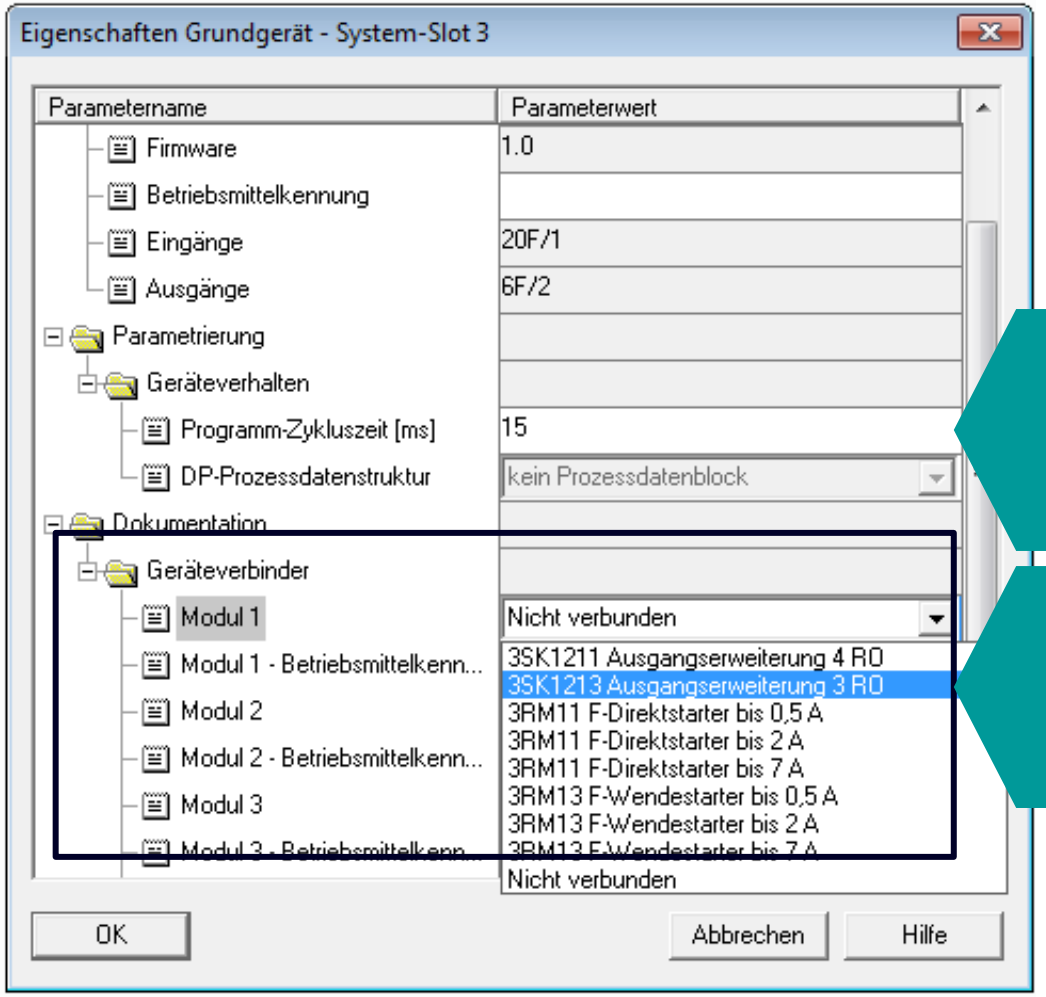
Properties of basic units



Minimum: 10ms

Maximum: 60ms

Selection of output expansions, connected via device connectors (Only for documentation Purposes)

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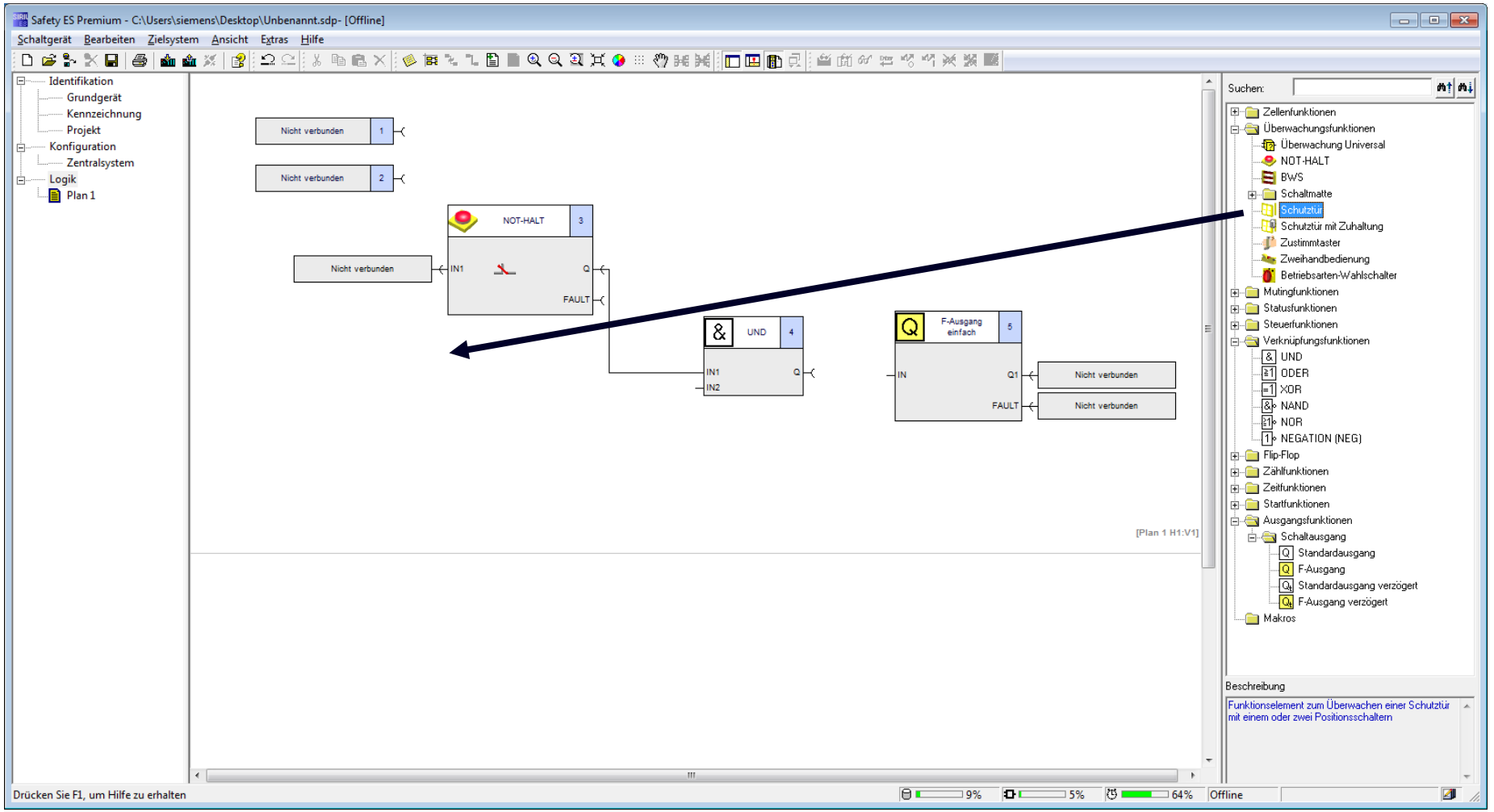
SW-elements are sorted by its function within the catalogue



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Which monitoring functions are available for each central module?

Designation	Symbol
Emergency stop	
Safety mat	
Guard door monitoring	
Guard door interlock	
Enabling switch	
Two-hand control	
Optical sensor monitoring	
Mode selector switch	
Monitoring Universal	
Muting (3x)	

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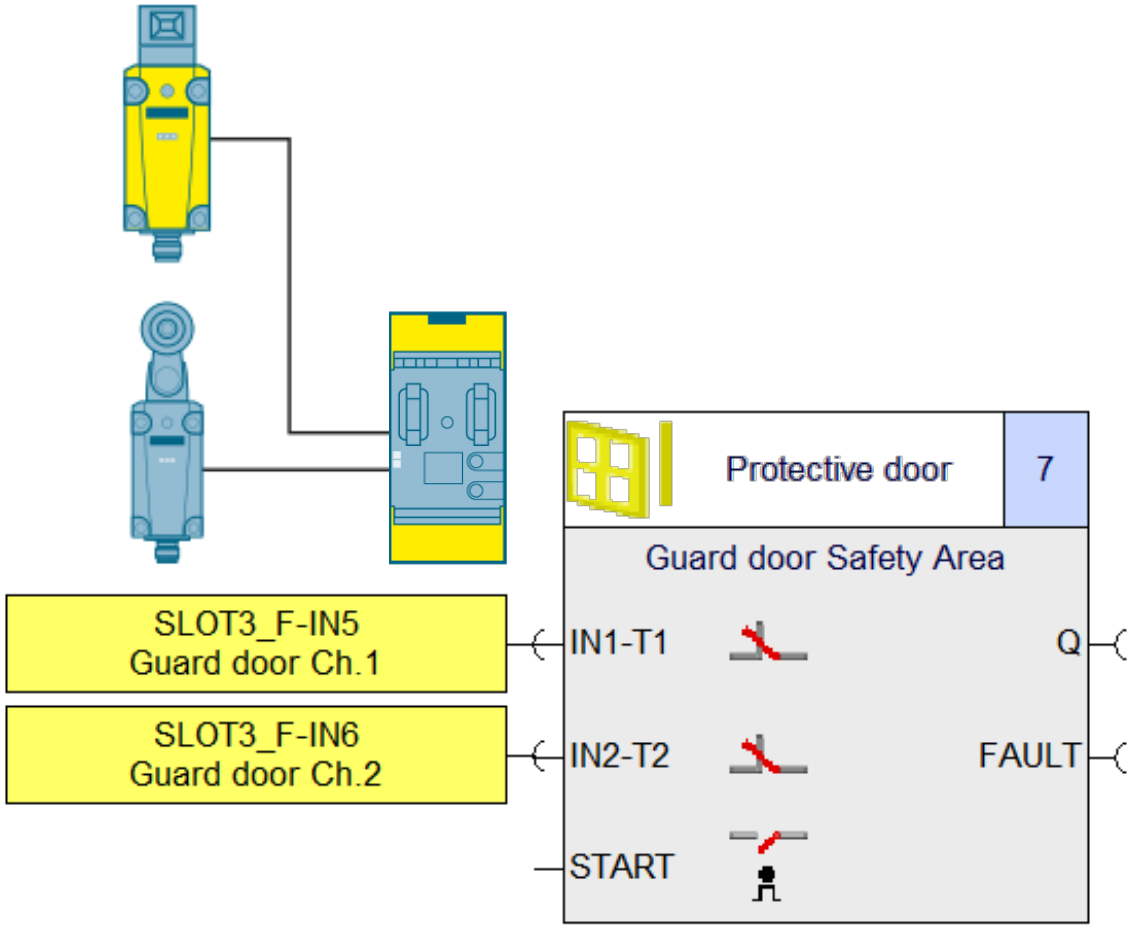
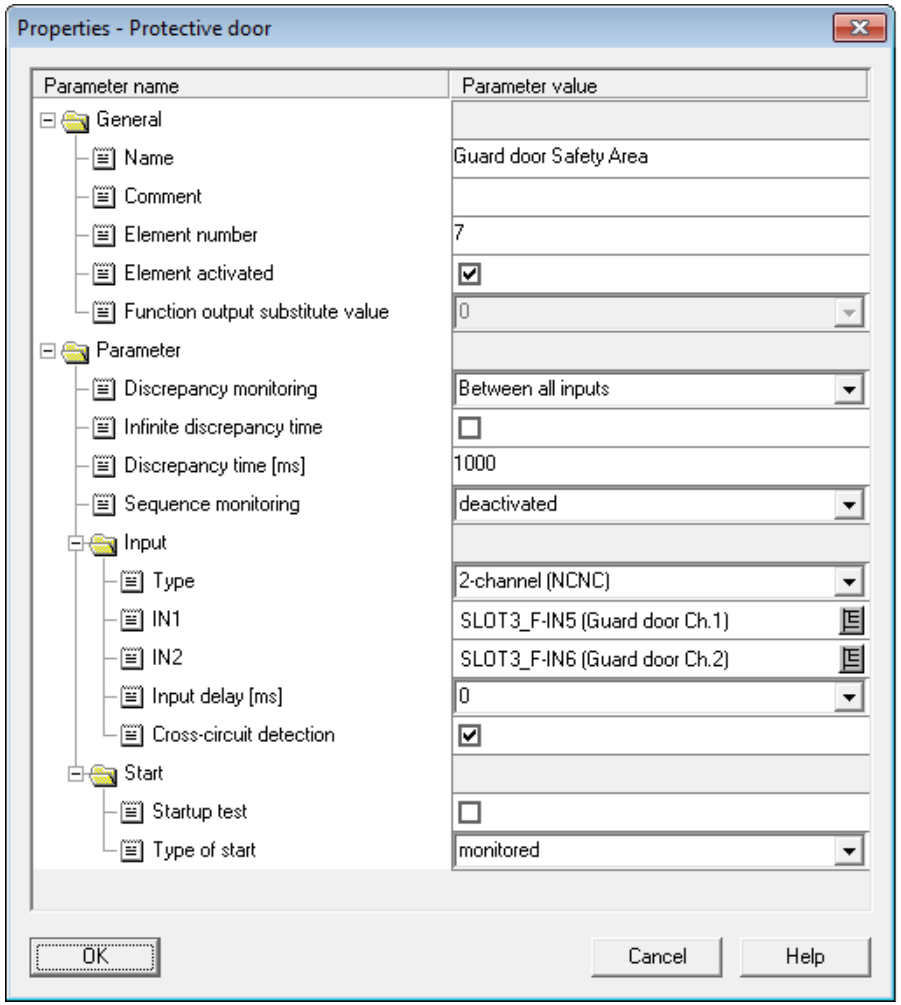
Safety function will be created simply with the help of a graphic parameterization

1. Setting up the parameters for monitoring elements





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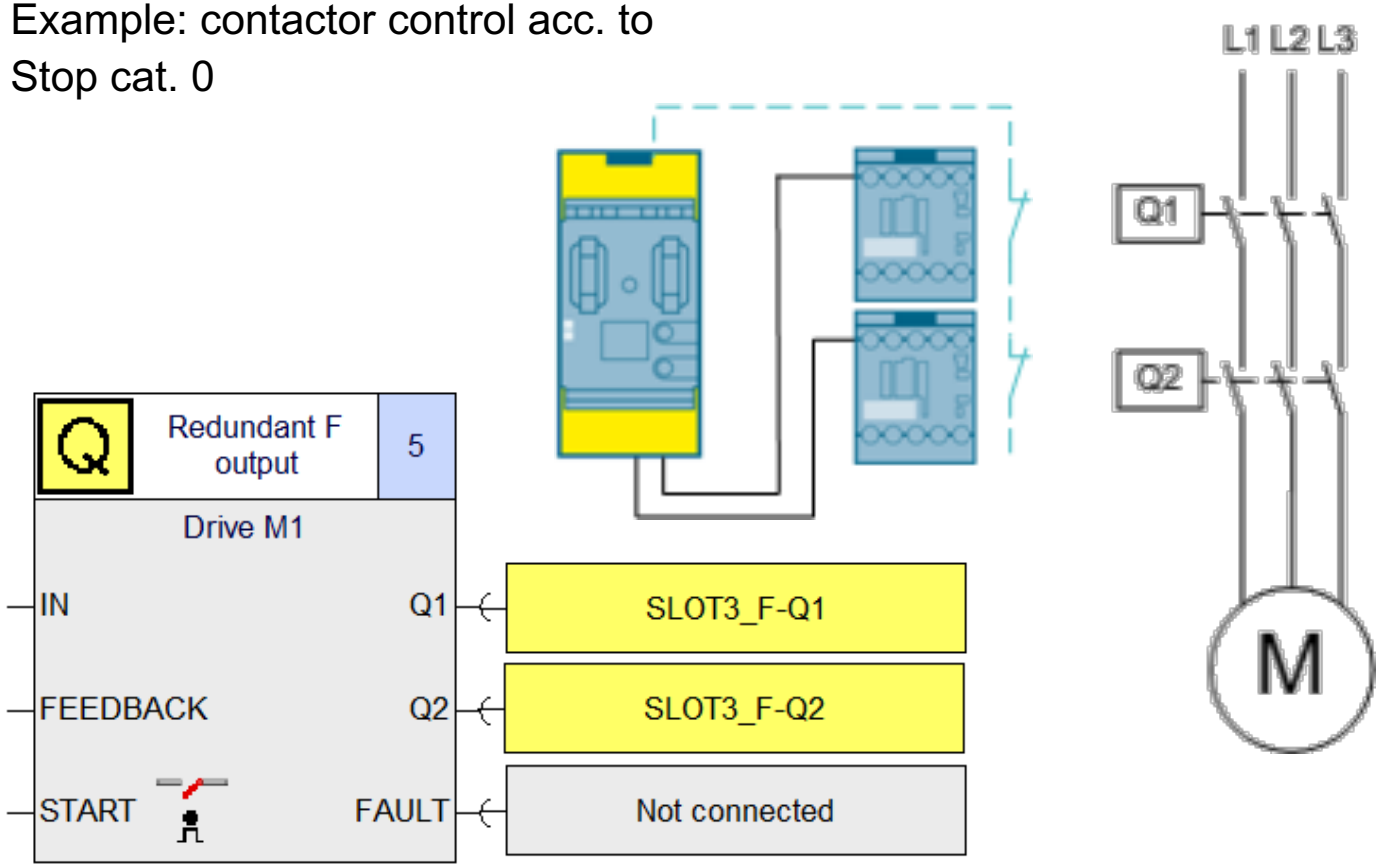
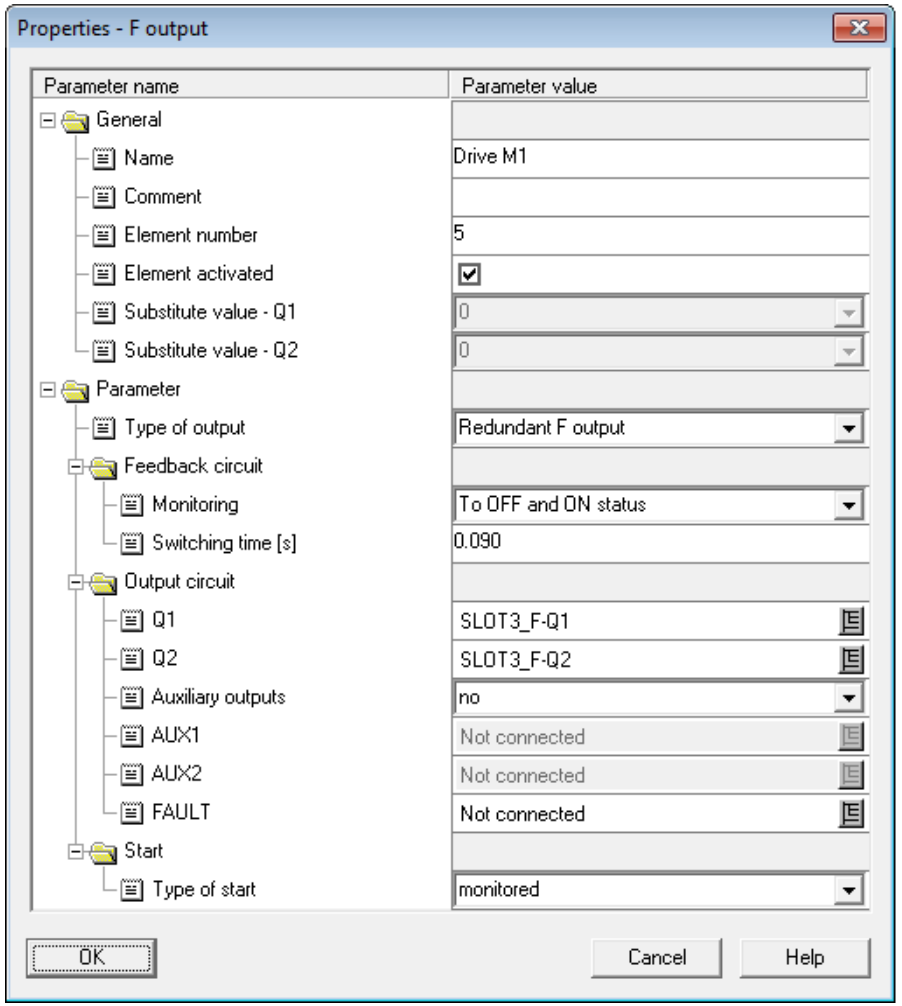
Safety function will be created simply with the help of a graphic parameterization

2. Setting up the parameters for output elements

Example: contactor control acc. to
Stop cat. 0





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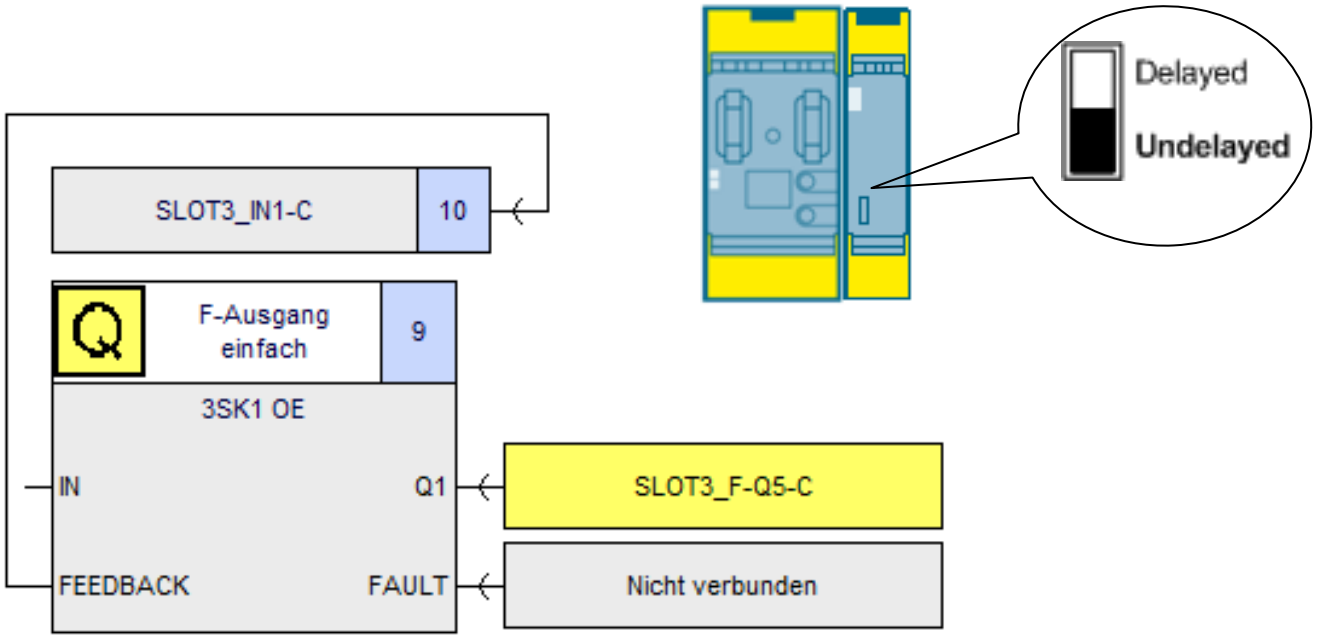
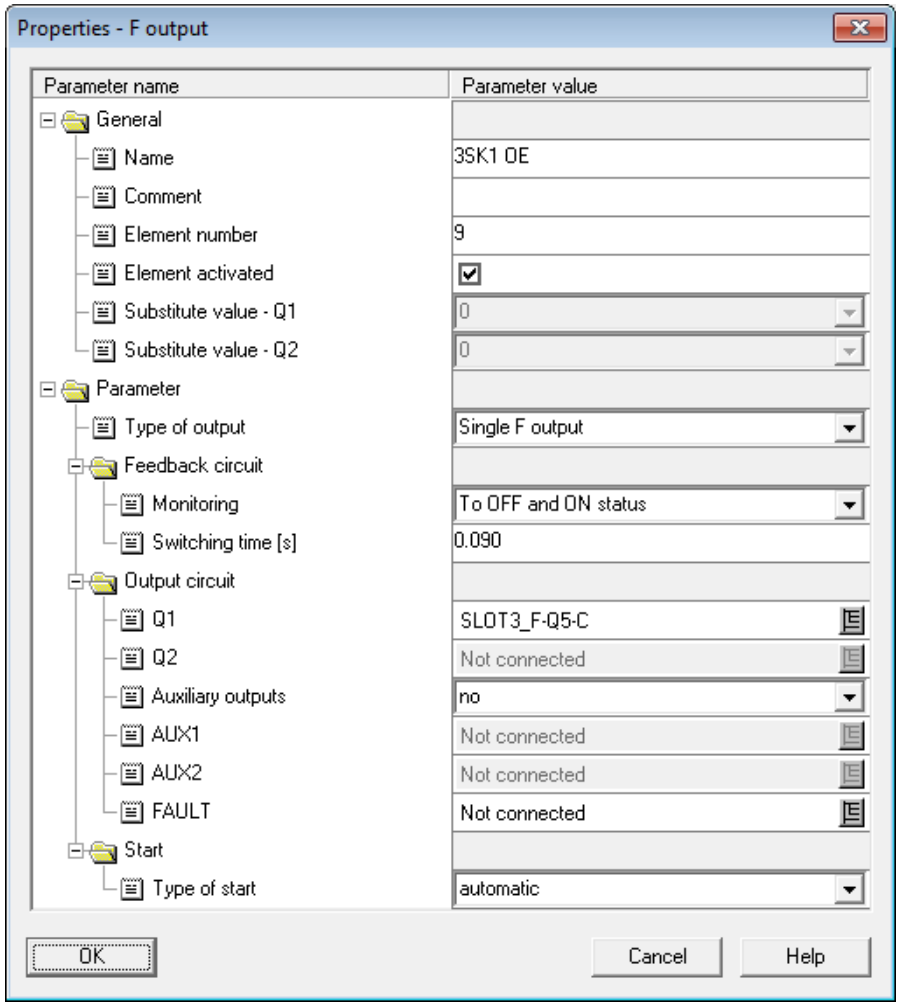
Safety function will be created simply with the help of a graphic parameterization

2. Setting up the parameters for output elements

Example: output expansion via device connector acc. to Stop cat. 0





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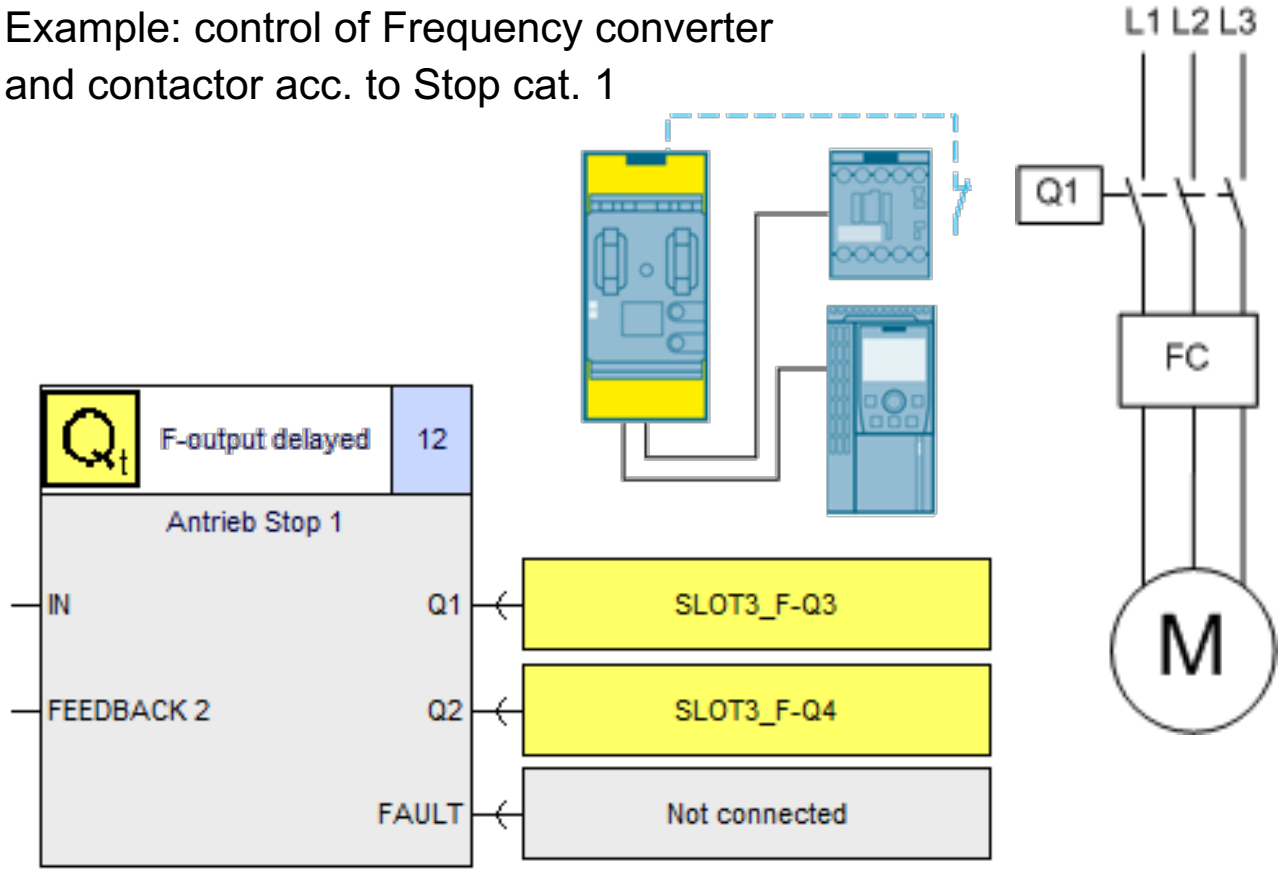
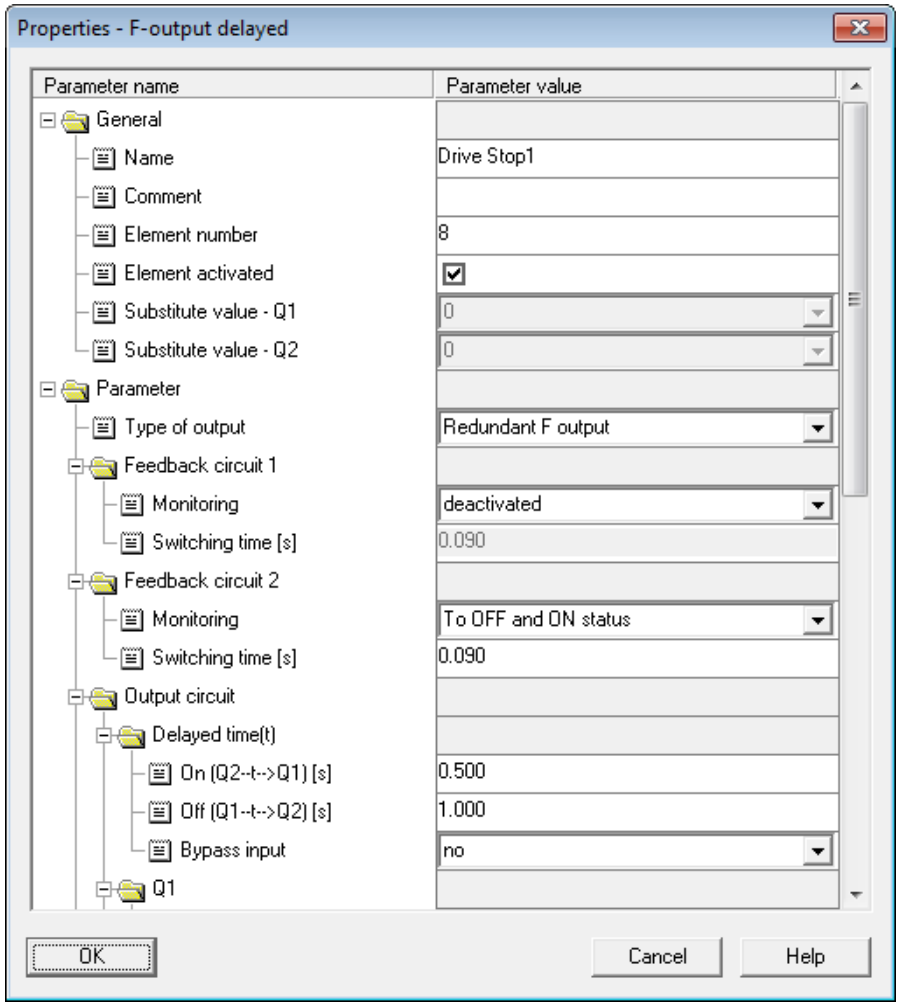
Safety function will be created simply with the help of a graphic parameterization

2. Setting up the parameters for output elements

Example: control of Frequency converter and contactor acc. to Stop cat. 1





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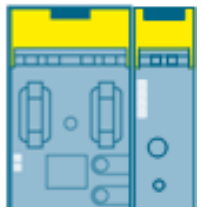
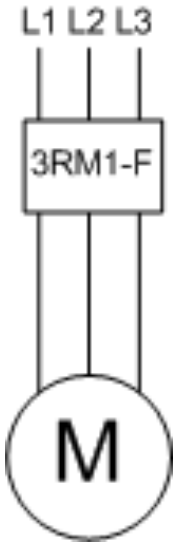
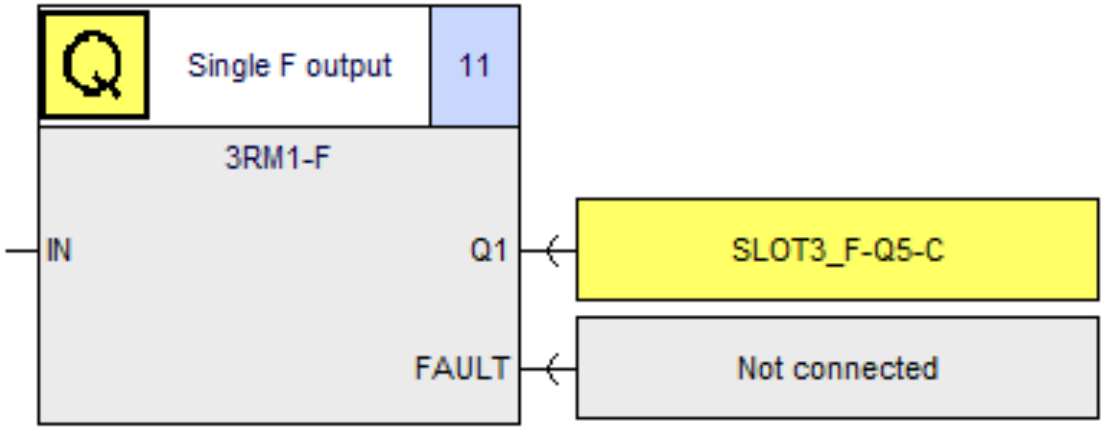
Safety function will be created simply with the help of a graphic parameterization

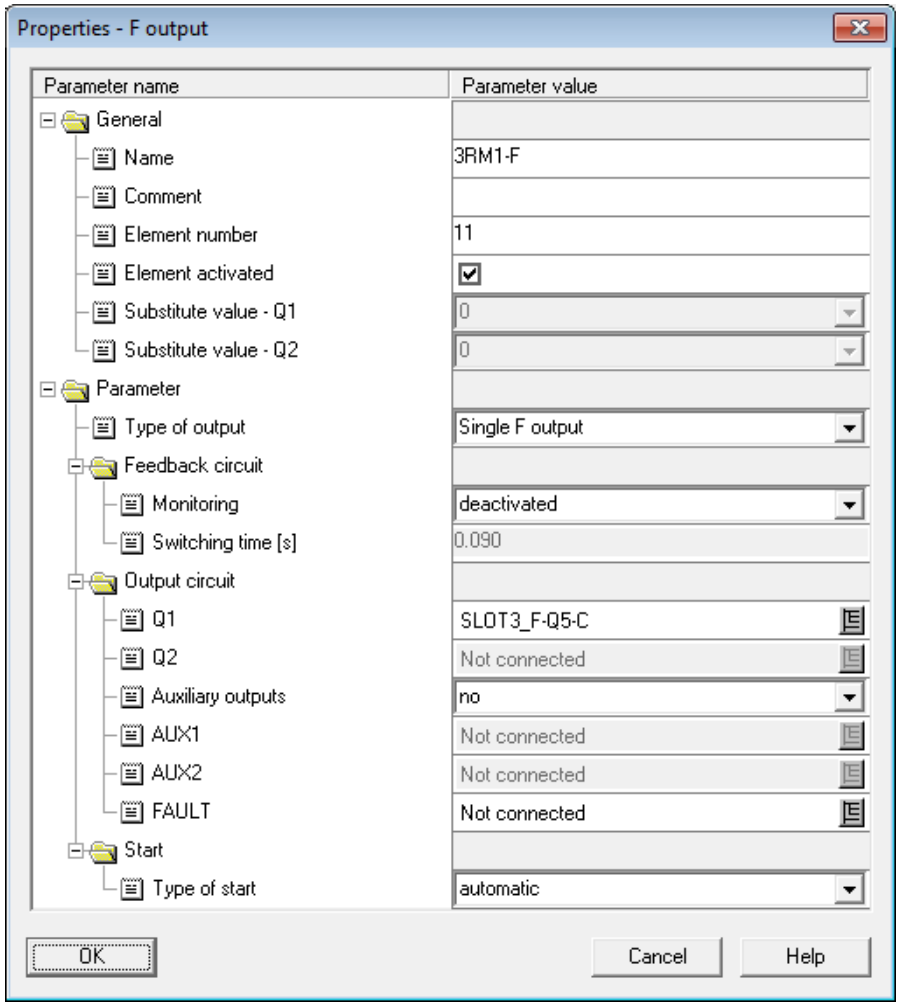
2. Setting up the parameters for output elements

Example: control of 3RM1-F motor starter
acc. to Stop cat. 0









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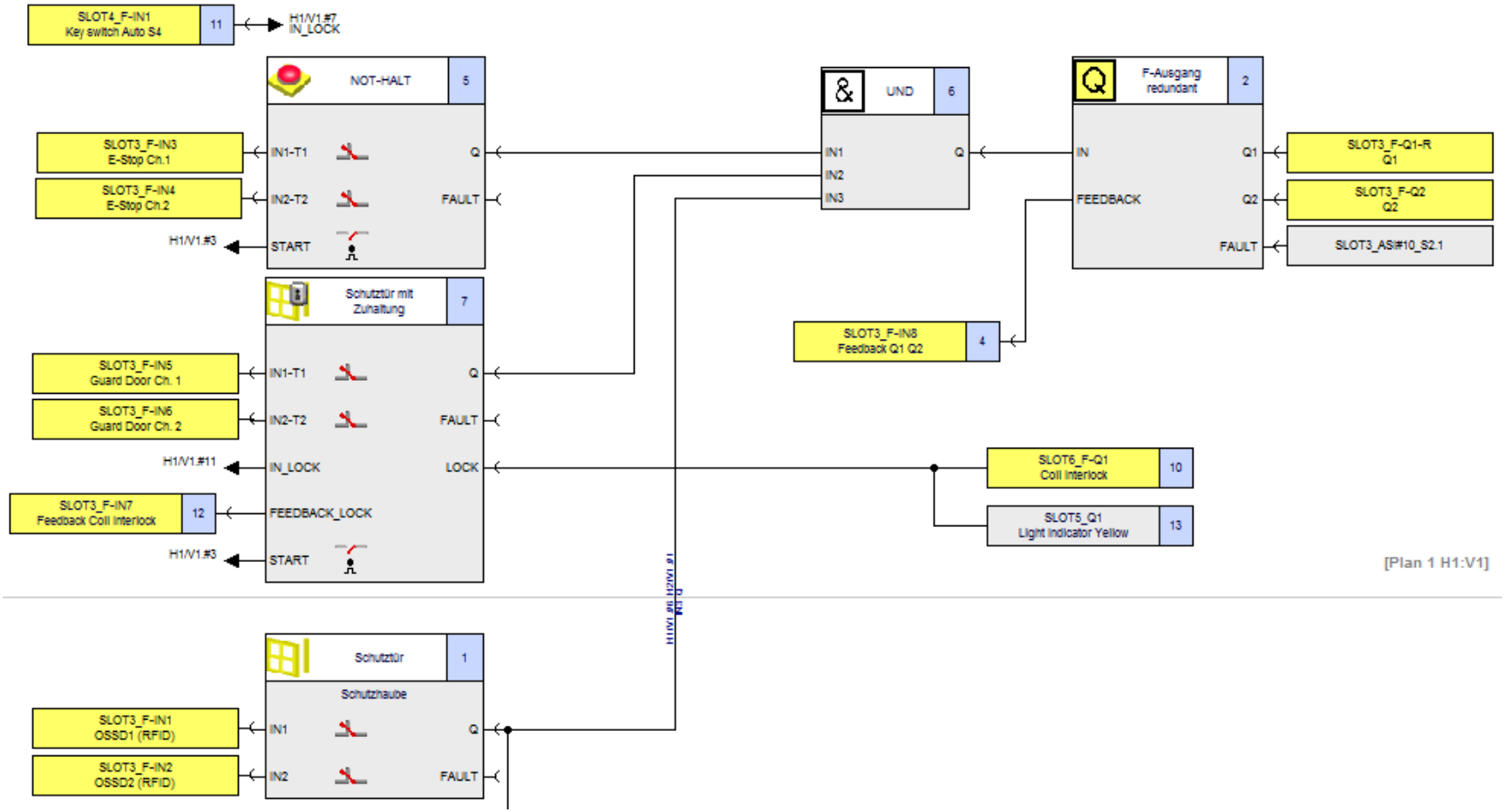
Safety function will be created simply with the help of a graphic parameterization

3. Logical connection of In/- and outputs



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Various software elements enables the individuality of safety applications

Logic operation							
	AND		OR		XOR		NAND
	NOR		Negotiation		Flip-flop		

Counter functions					
	Counter 0->1		Counter 1->0		Counter 0->1/1->0

Timer functions							
	On delay		Passing make contact		Off delay		Clock pulse generation

Start functions				output functions			
	Monitored start-up		Manual start-up		Standard output		F-output F-output delayed

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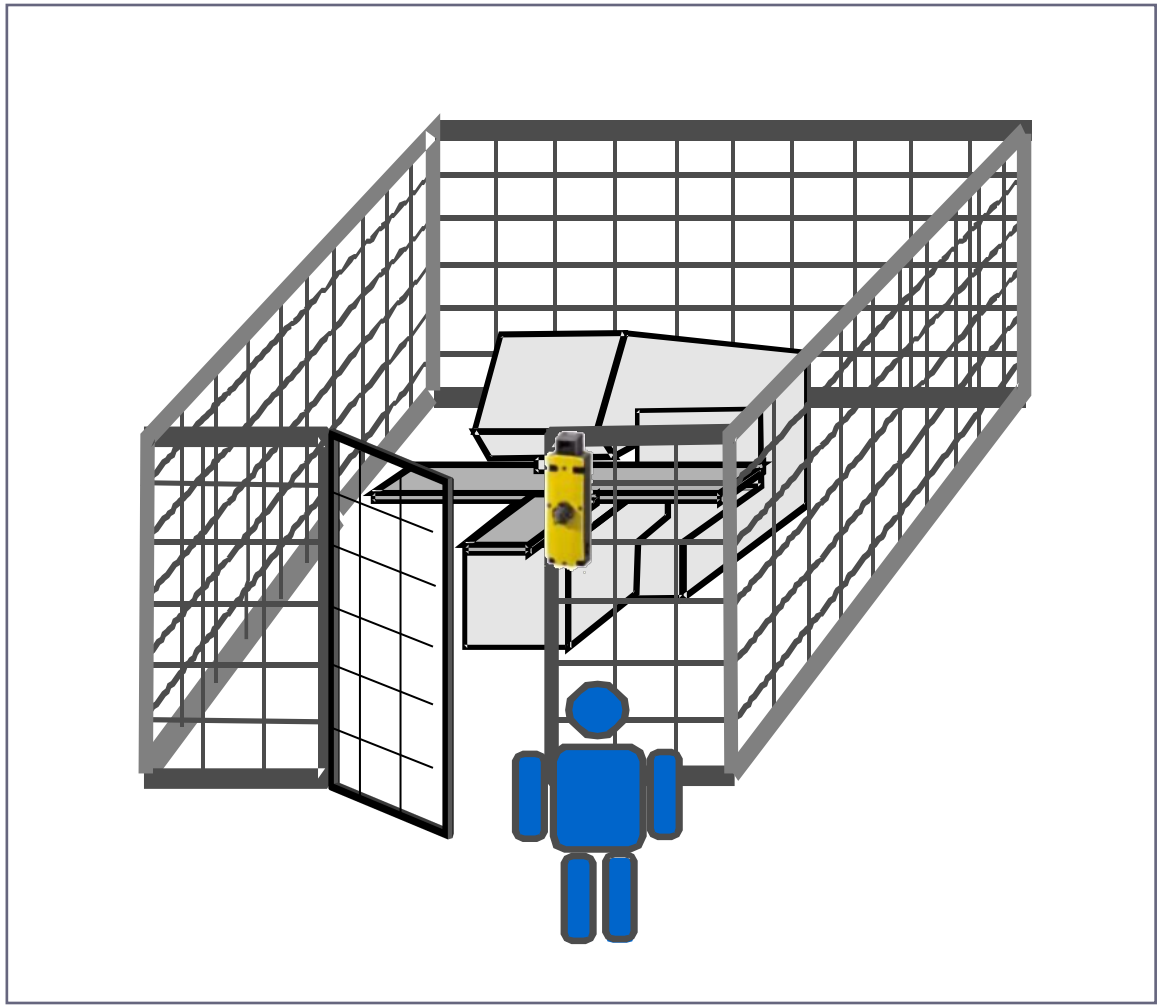
Protective door with interlocking

The protective door at a hazardous area is monitored and locked.

- This prevents the hazardous area from being entered
- A release signal releases the interlock

- release is performed:
  - manually (e.g. key switch)
- Or by
  - an external signal (e.g. standstill-/ speed monitor 3TK2810)



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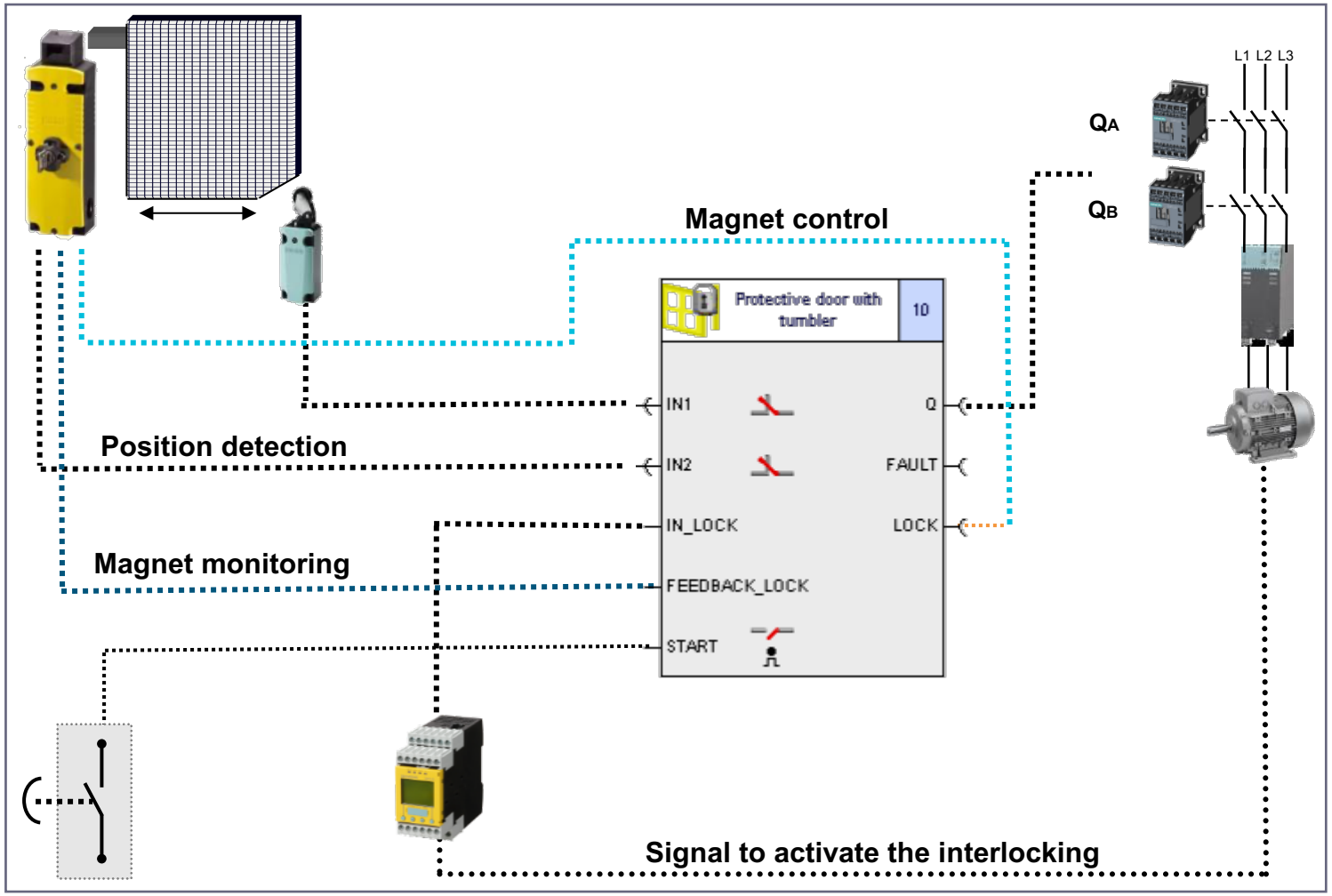
Schematic interconnection "Protective door with interlocking"

Function output Q of this element is only set to a value of "1" if the protective door is closed and locked.



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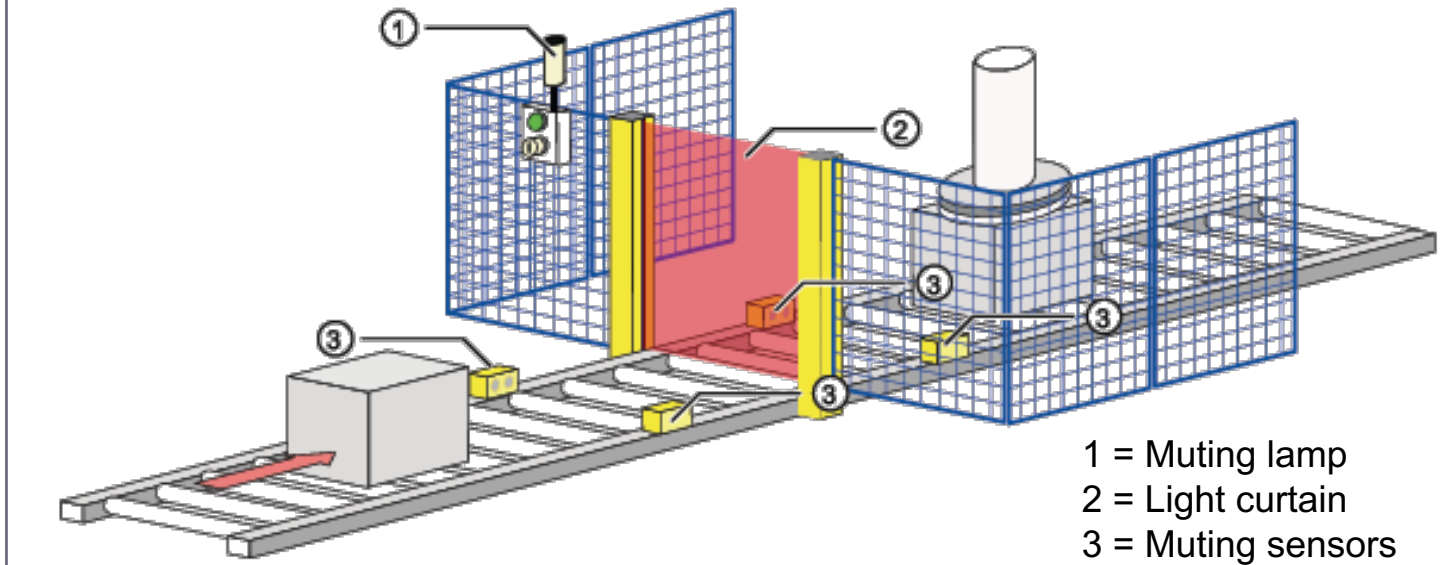
Muting

- The opening to the hazardous area is monitored with electro-sensitive protective equipment (ESPE).
- During material transport, the protective equipment is briefly deactivated or "bridged".



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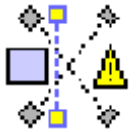
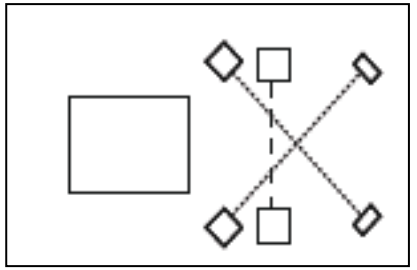
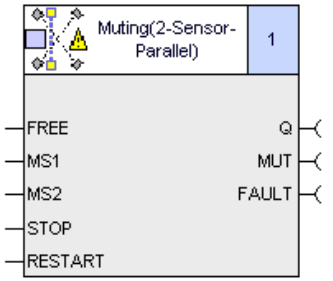
Muting

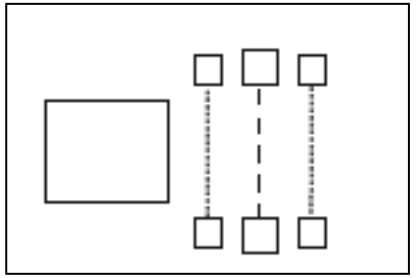


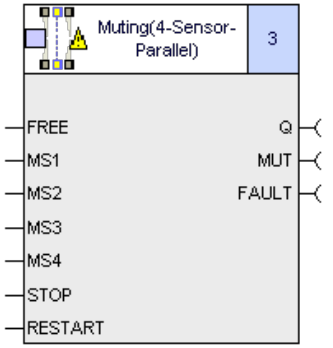
2-sensor parallel muting



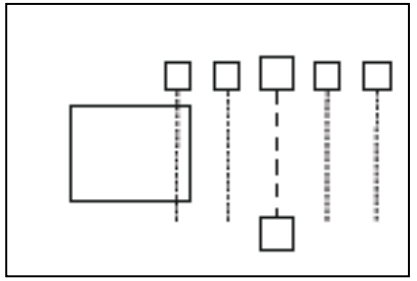


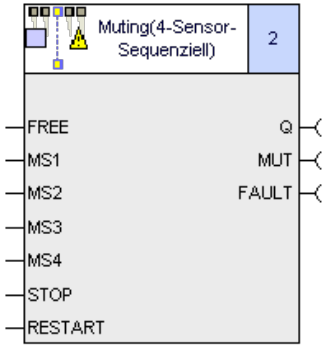
4-sensor parallel muting





4-sensor sequential muting





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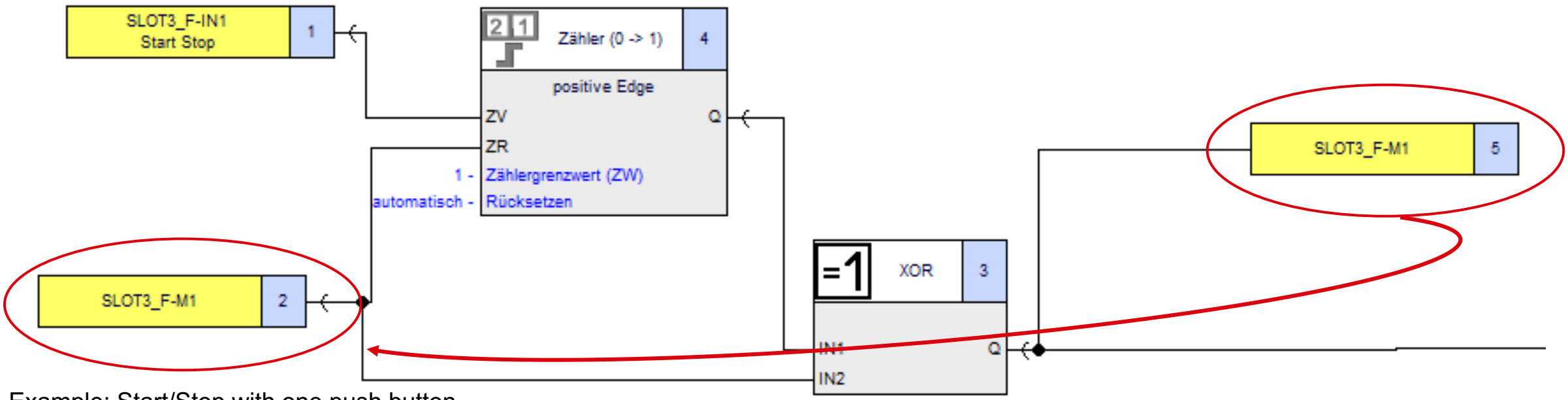
Markers enable to save interim values

- 20 marker available
- are used like failsafe in-/outputs
- saving of interim values
- Note: expansion of reaction times by one cycle



Example: Start/Stop with one push button

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3SK2 PROFINET complements the 3SK portfolio with contemporary communication

Highlights 3SK2 PROFINET

Feature / Function		Benefits
• PROFINET as optional add-on module	>	• Cost saving for the user
• Process data and parametrization via PROFINET	>	• Only one interface, no separate PC-cable needed
• Visualization of comprehensive diagnostic information on PLC and HMI		• Fast fault localization und short shutdown periods
• 22,5 mm width	>	• Space saving in the control cabinet
• Usable with 3SK2 and MSS 3RK3	>	• Reduction of variants during plant design and spare parts procurement

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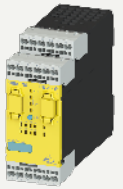
Compatibility of communication options for 3SK2 and 3RK3 MSS

	3SK2		3RK3 MSS			
	22,5mm	45mm	Basic	Advanced	ASIsafe basic 	ASIsafe extended
PROFINET®	✓	✓	✗	✓	✓	✓
PROFIBUS®	✓	✓	✓	✓	✓	✓

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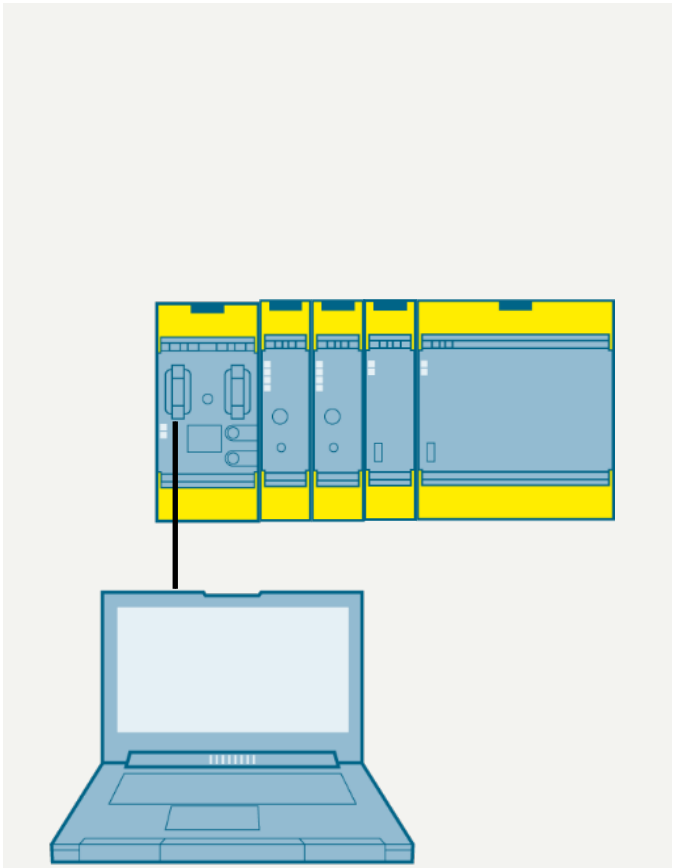
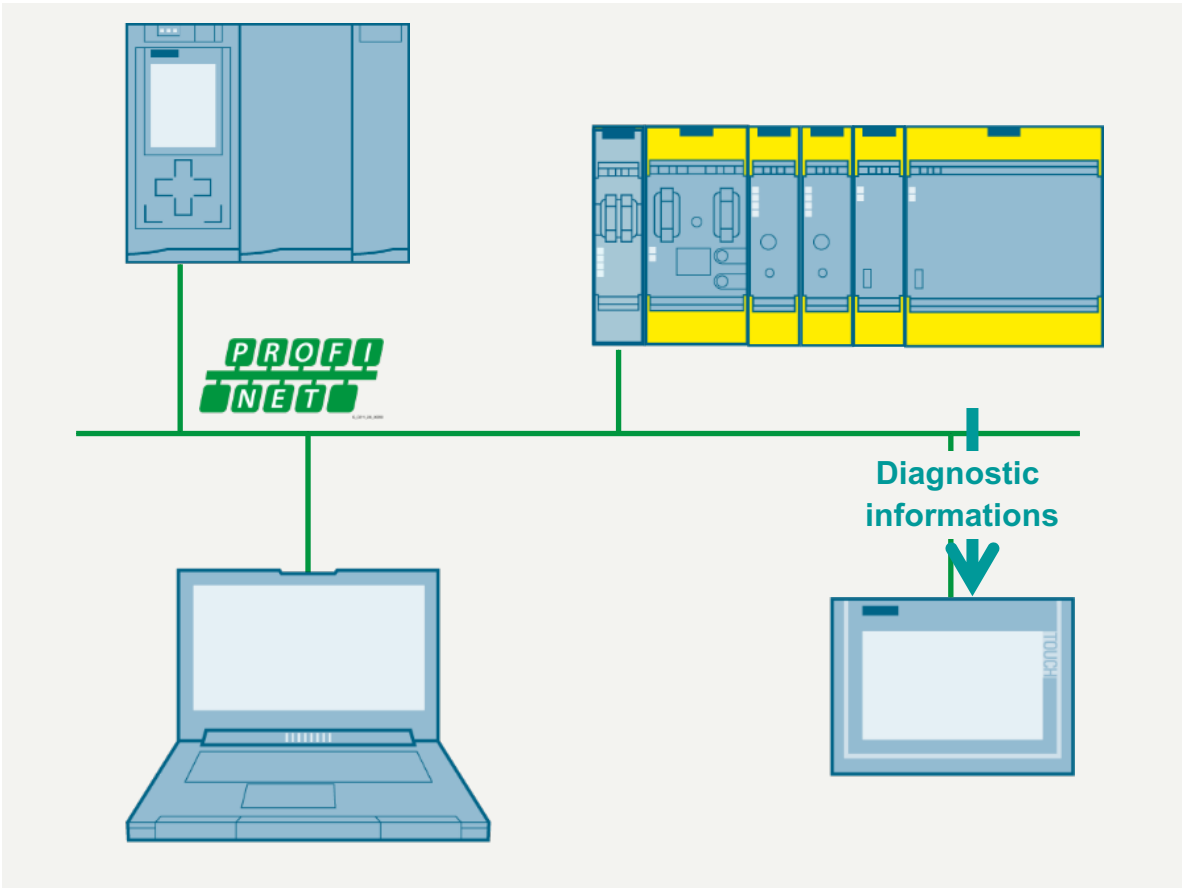
3SK2 PROFINET as add-on: Communication for safety relays easily added

From the stand-alone application …



… to the TIA-integrated safety relay



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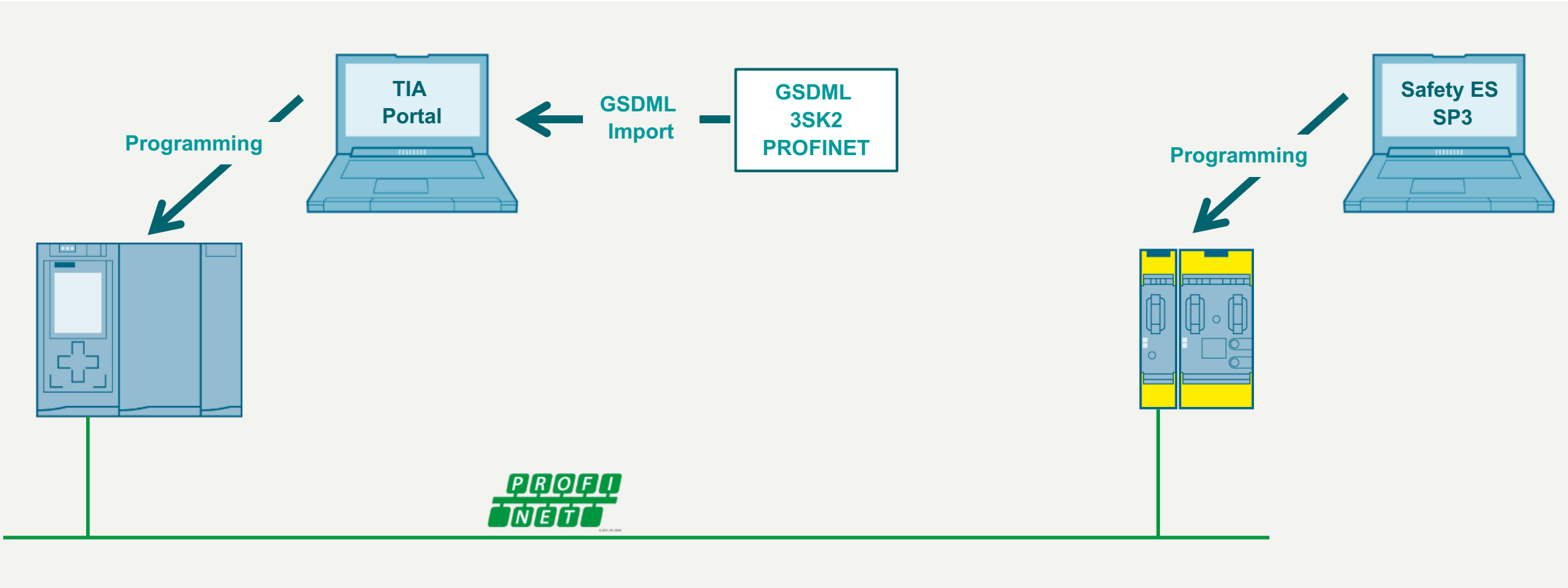
A TIA-version of Safety ES is not necessary for operating in the TIA-environment

3SK2-intergration in TIA-system easily via GSDML, without TIA-version of Safety ES.



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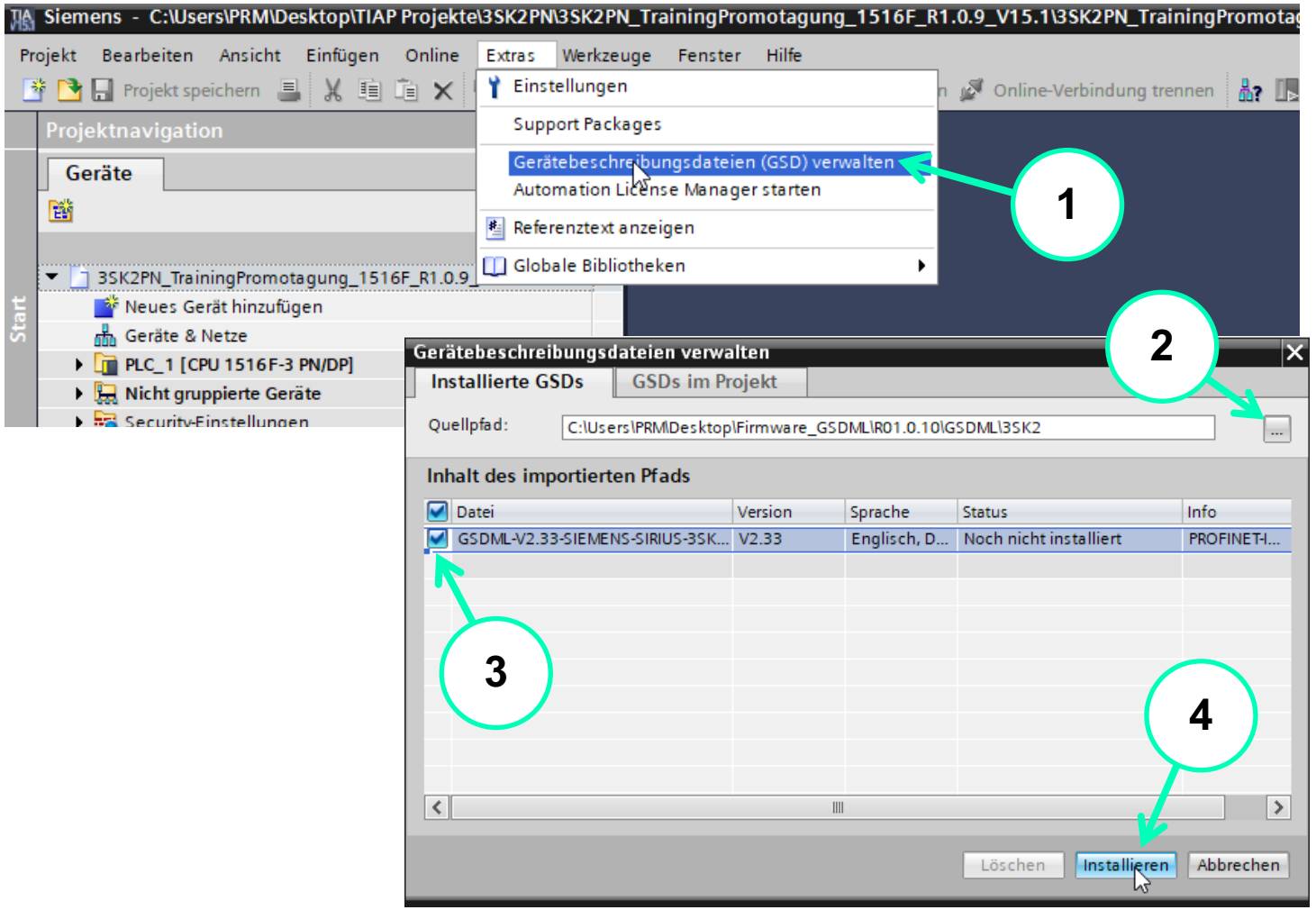
Installation of the GSDML-file in TIA Portal



1. „Options“ > „Manage GSD“
2. Select the path of the GSDML-file via „…“
3. Place a checkmark
4. “Install”

→ The installation and the following update of the hardware catalogues may take some time

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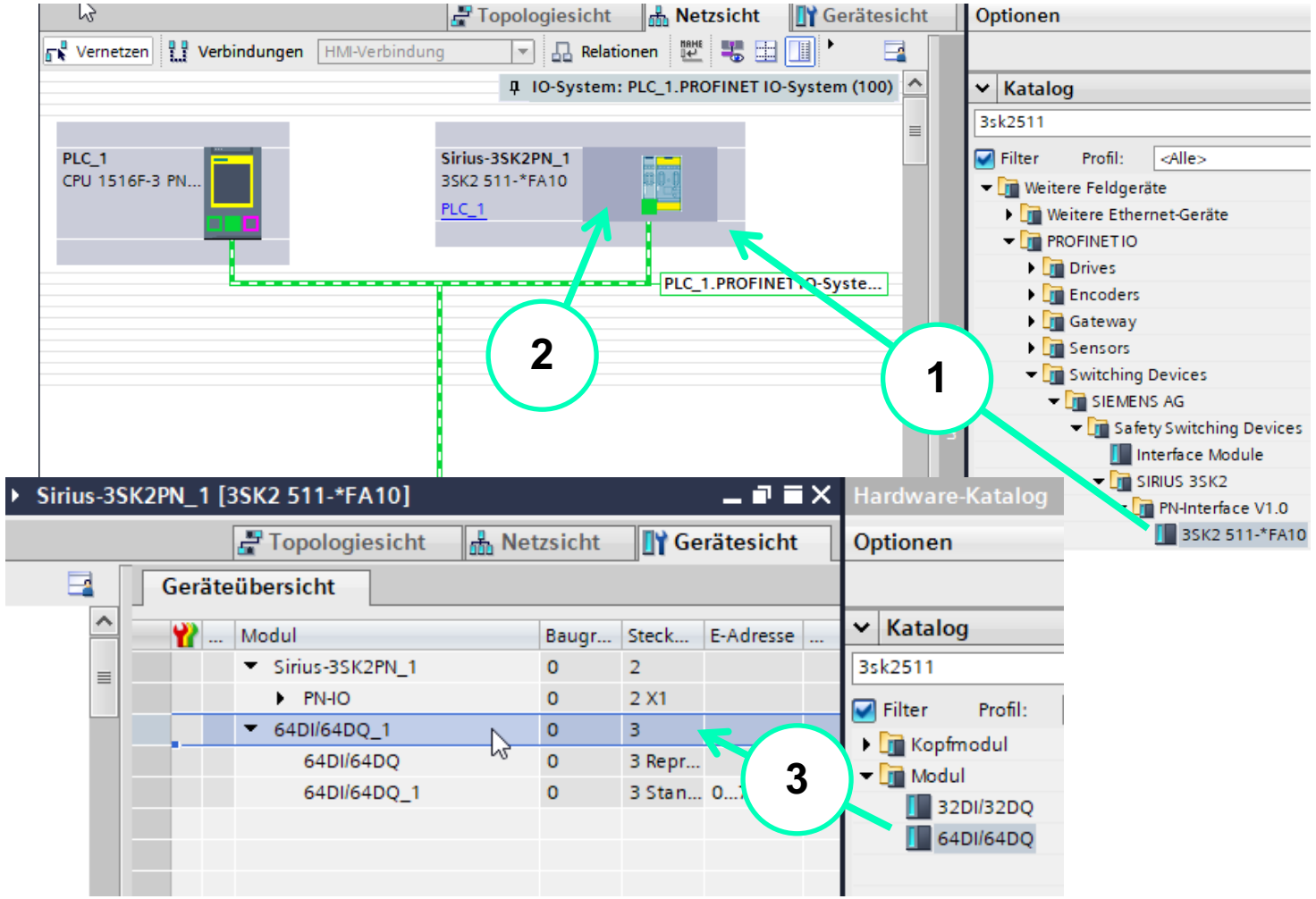
3SK2 PROFINET – Configuration in TIA Portal



1. Add the PN interface module from the HW-catalogue into the network view of the project
2. Via properties you can define IP-address, PROFINET device name etc.
3. Add process image for data exchange with the PLC into the device view (64DI/64DQ or 32DI/32DQ)

→ The chosen structure of process data must correspond to the structure chosen in Safety ES!

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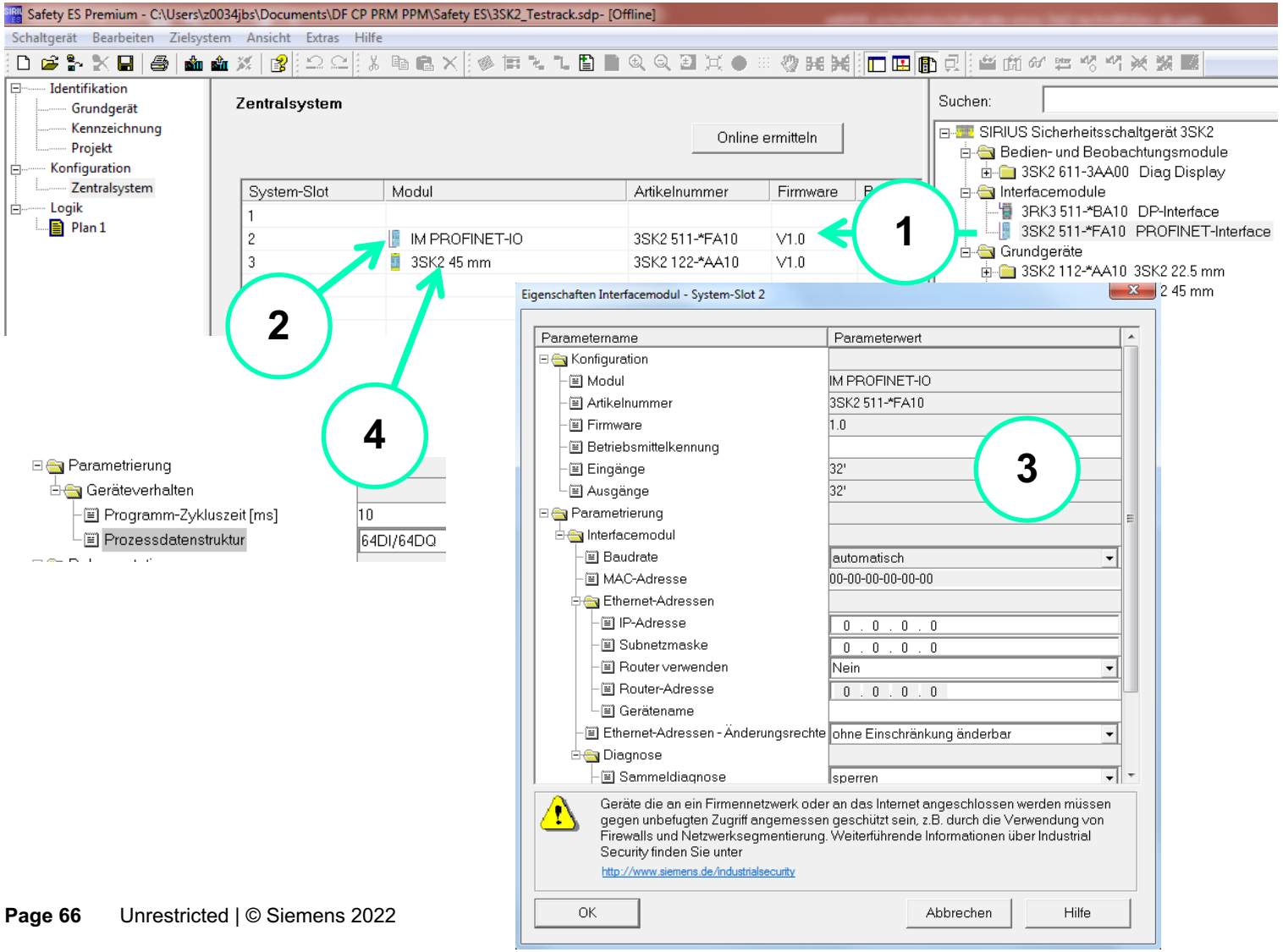
3SK2 PROFINET – Parametrization in Safety ES



1. Add the PN interface module from the HW-catalogue to the project
2. Open object properties (double-click)
3. Set IP-address, PROFINE device name, parameter for diagnosis etc.
4. properties of the 3SK2 basic unit: The chosen structure of process data must correspond to the one chosen in Safety ES

→ The chosen parameters must correspond to the parameters chosen in TIA Portal!

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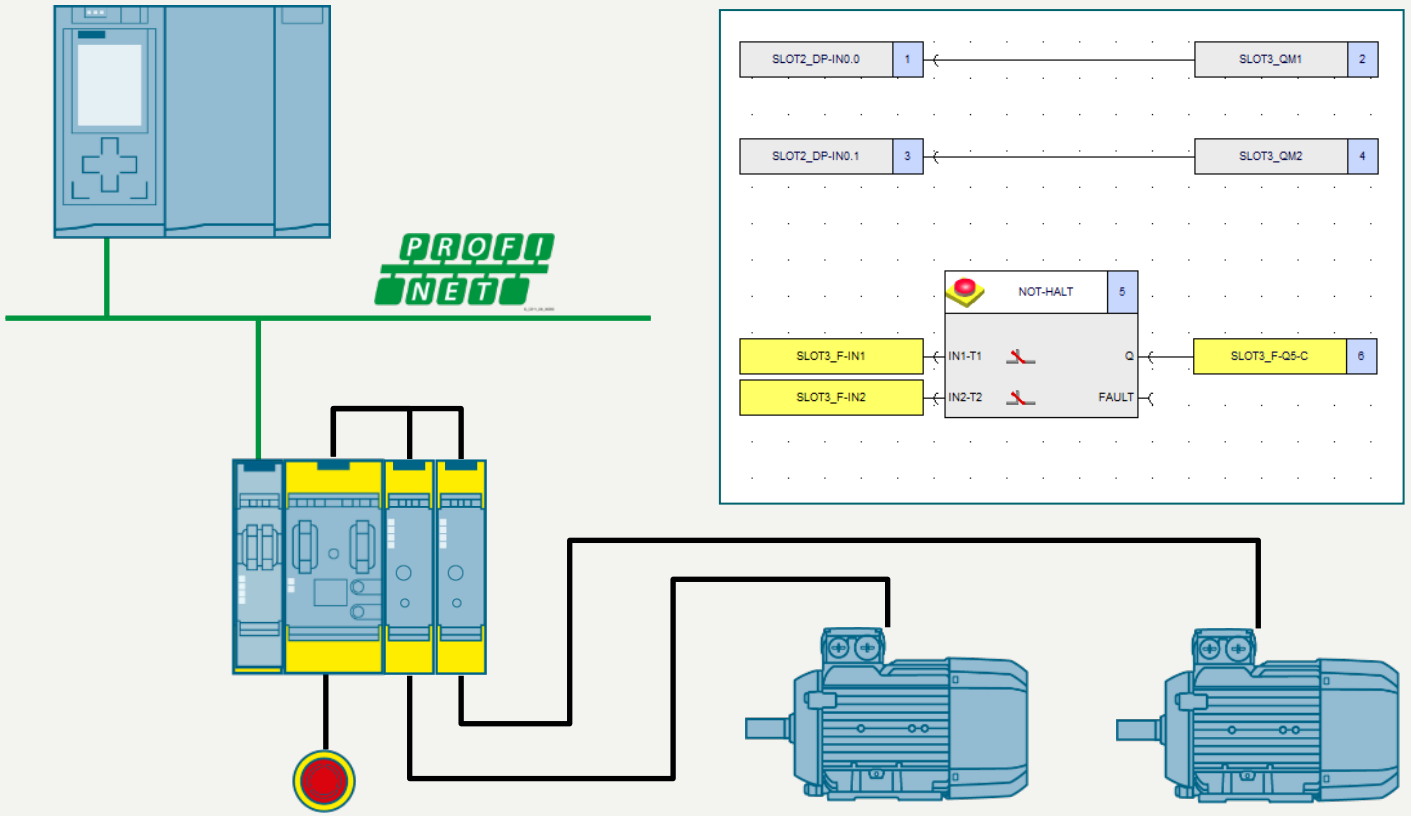
New application: Operational switching of 3RM1-Failsafe via PROFINET, failsafe switching via 3SK2



- Failsafe shutdown locally via device connector
- Standard-PLC switches 3RM1 via PROFINET and 3SK2 outputs
- 3RM1 control signals are being transmitted from PROFINET to the outputs in the 3SK2-logic

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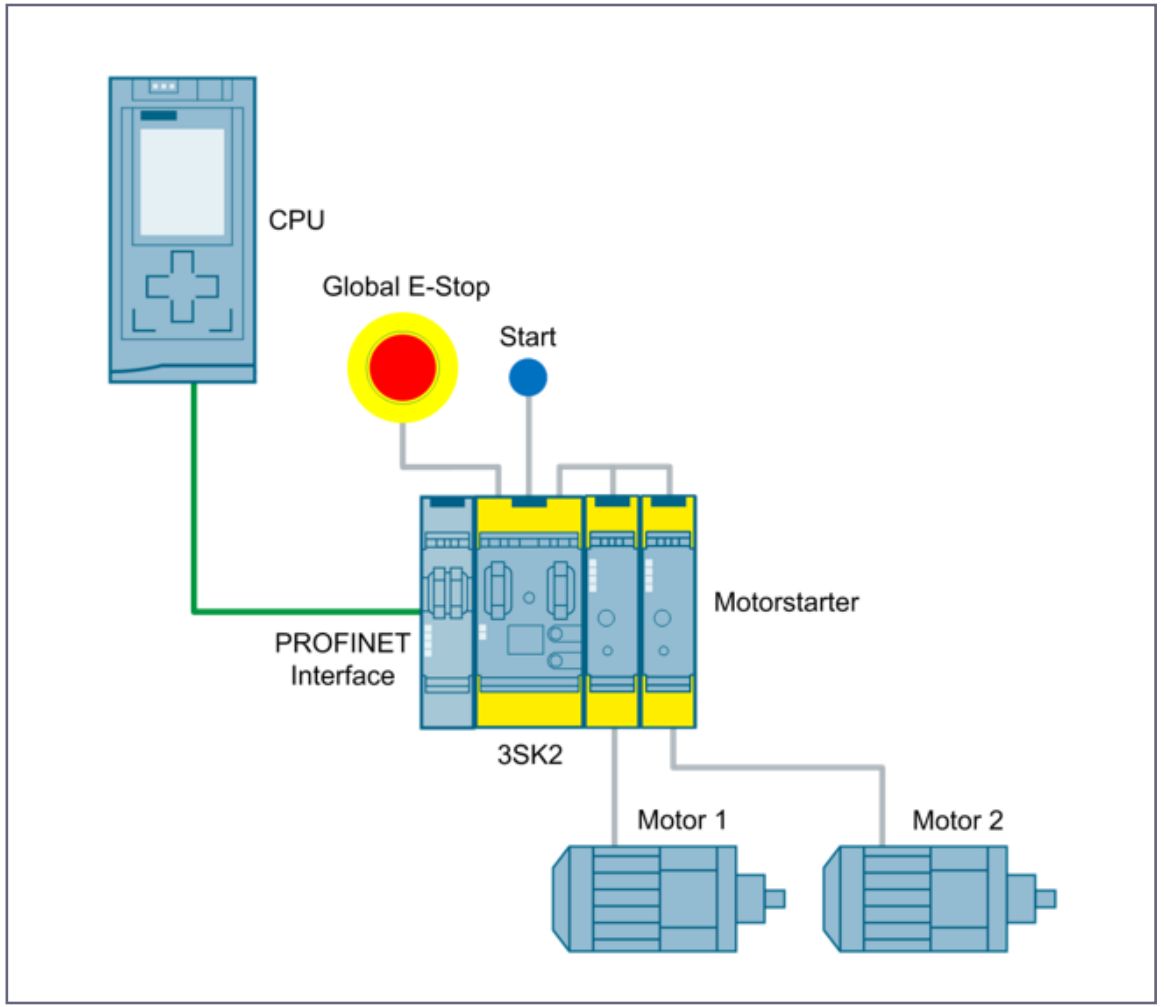
New applications

Applikation examples in SIAM

- Emergency stop shutdown to SIL 1 or PL c with a 3SK2 safety relay with PROFINET connection and failsafe motor starters
- Emergency stop group shutdown to SIL 1 or PL c with a 3SK2 safety relay with PROFINET connection and failsafe motor starters
- each including Safety ES and TIA Portal project together with circuit diagram and SET-calculation

support.industry.siemens.com/cs/de/en/view/81366718



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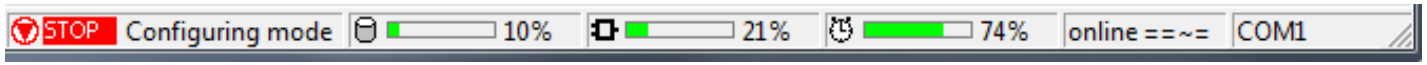
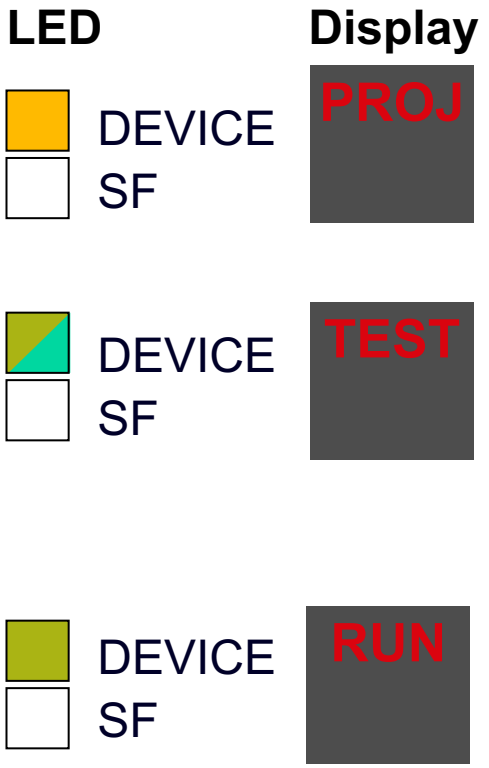
For each task the fitting operation mode

Change of operation mode will be done online

- automatic change to online view after SW-download or via command



- **Configuring mode: change of parameters**
  - Parameterization can be created or changed
  - Monitoring functions are deactivated
- **Test mode: commissioning**
  - Test of a project
  - Monitoring functions are activated
  - Forcing available
  - Connection to PG/PC has to be established
  - Password protected (password stored in CM)
- **Safety mode: efficient mode**
  - Monitoring functions are activated
  - Only applicable with approved configuration



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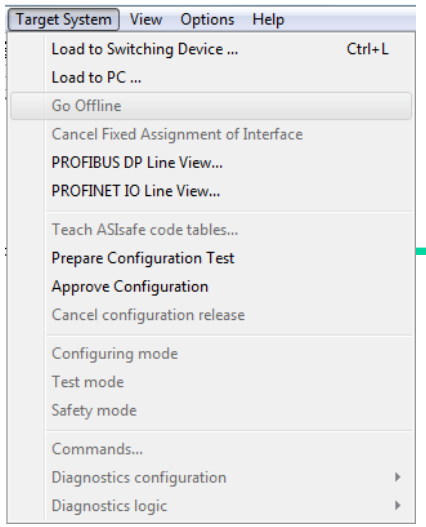
Preparation for Test mode
- Prepare configuration test

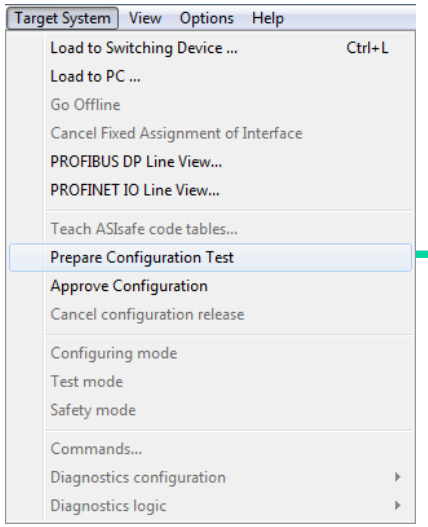
creation of documents, which support configuration test (commissioning test)

Preconditions

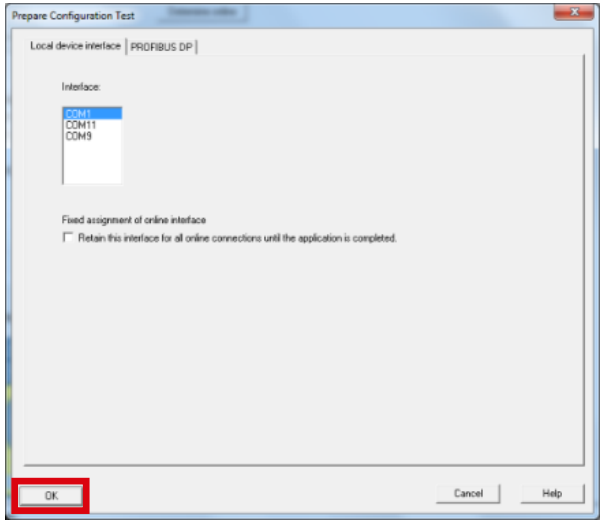
- Offline- project is opened.
- active connection to MSS per PC/PG cable or Profibus
- MSS 3RK3 is in Configuring mode
- MSS ES does a test if offline Project (PC/PG) and online project (MSS memory module) are identical...



e.g. if project has just been downloaded to MSS CM



Choose function



Select access assignment for On-/Offline comparison

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Preparation for Test mode
- Documentation of project

Safety ES creates a document, which contains all information bout MSS project

- identification data
- HW-configuration with parameters
- logic interconnections
- parameters of SW-elements
- symbol lists
- etc.

Identifikation

Zentralmodul

Bestellnummer	3RK3 131-1AC10
Kurzbezeichnung	3RK3 Advanced
System	Modular Safety System 3RK3
Hersteller	SIEMENS
PNO-Profil	unbekannt
Gerätefamilie	Sicherheitsgerichtete Geräte
Geräte-Subfamilie	Sicherheitsschaltgeräte
Geräteklasse	Modular
Funktionsgruppe	0
Feldbusschnittstelle	AS-Interface
Systemschnittstelle	SAFETY connect
Geräteschnittstelle	Local Interface
Ident-Nr.	0
HW-Ausgabestand	B01
FW-Ausgabestand	V1.0.25
Revisionszähler	0
I&M-Version	1.1
Unterstützte I&M-Daten	1, 2, 3
Seriennummer	
Zeitstempel	11.7.2011, 15:34

Kennzeichnung

Anlagenkennzeichen	
Ortskennzeichen	
Einbaudatum	
Beschreibung	
Autor	
Kommentar	

Projekt

Projektname:	MSS Advanced Schulungskoffer
Name des Projekteurs:	Siemens AG
Firmenname des Projekteurs:	Siemens AG
Projektierungs-CRC:	9D947316
Projektierungs-Zeitstempel:	26.9.2013, 10:15
Projektierung freigegeben:	Ja
Projektierungstool:	Modular Safety System BS

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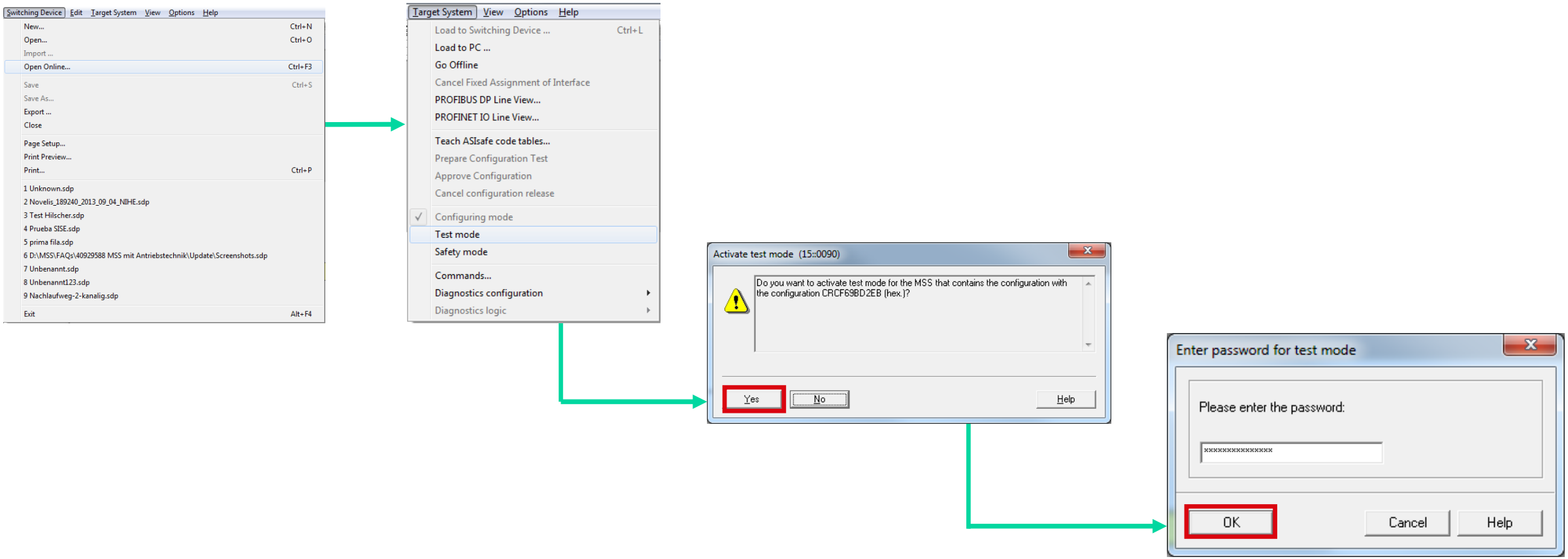
Change to test mode

- open online project (on basic unit)
- select test mode



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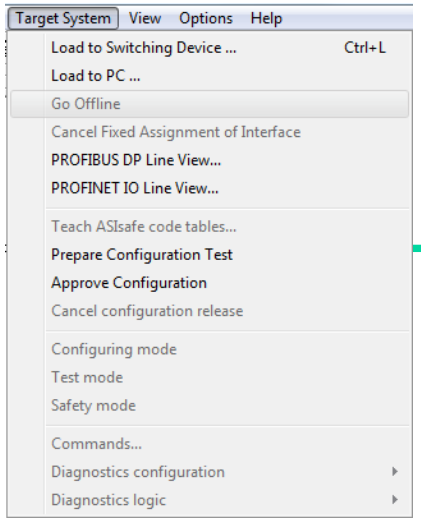
Preparation for Safety mode
- Approve configuration- On-/Offline check

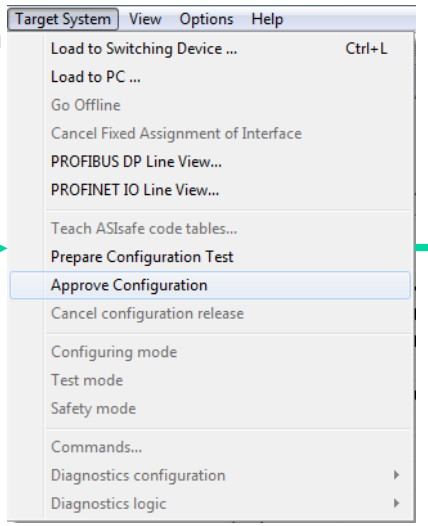
Preconditions:

- Offline-project is opened
- Active connection to 3SK2 per PC/PG cable or Profibus
- 3SK2 is in configuring mode

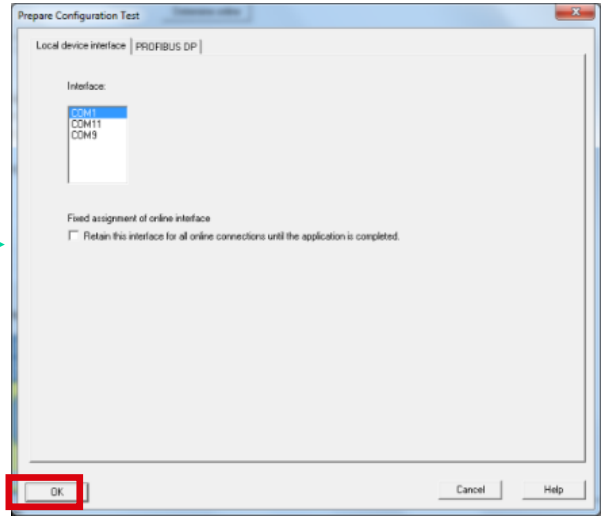
- Safety ES does a test if offline Project (PC/PG) and online project (MSS memory module) are identical...



e.g. if project has just been downloaded to 3SK2 BU



Choose function



Select access assignment for On-/ Offline comparison

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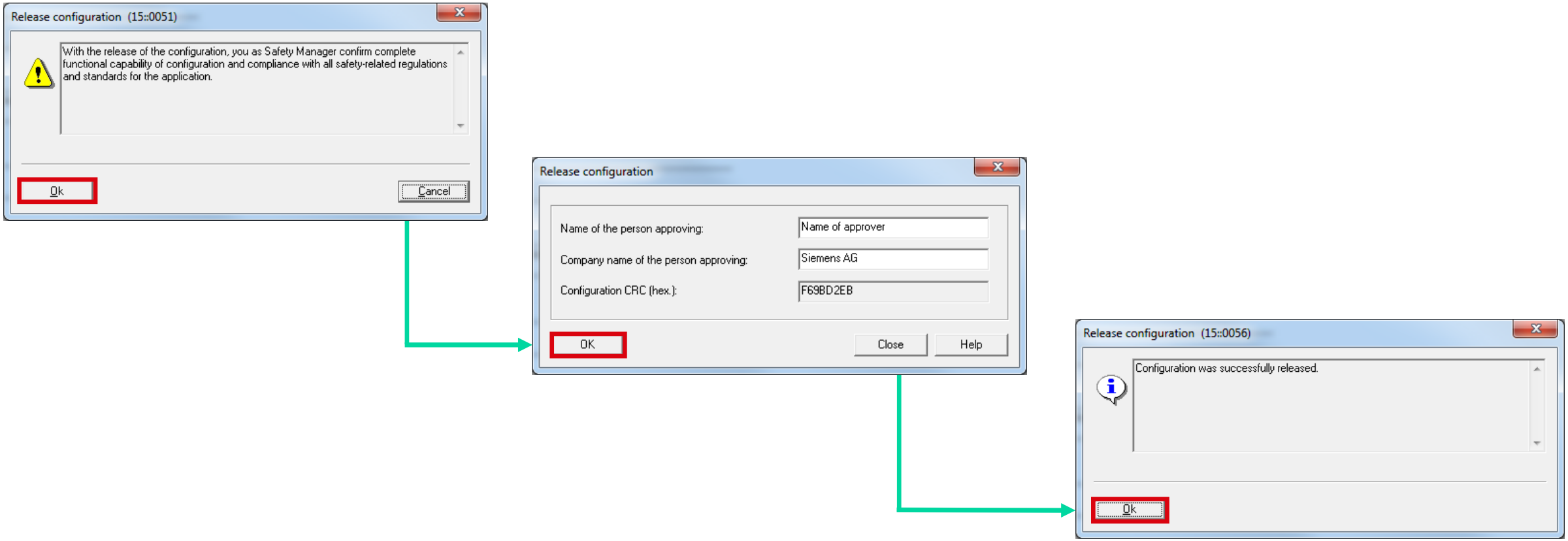
Preparation for Safety mode
- Approve configuration- Filling in approval information

...if yes, then configuration will be approved

Filling in approval information



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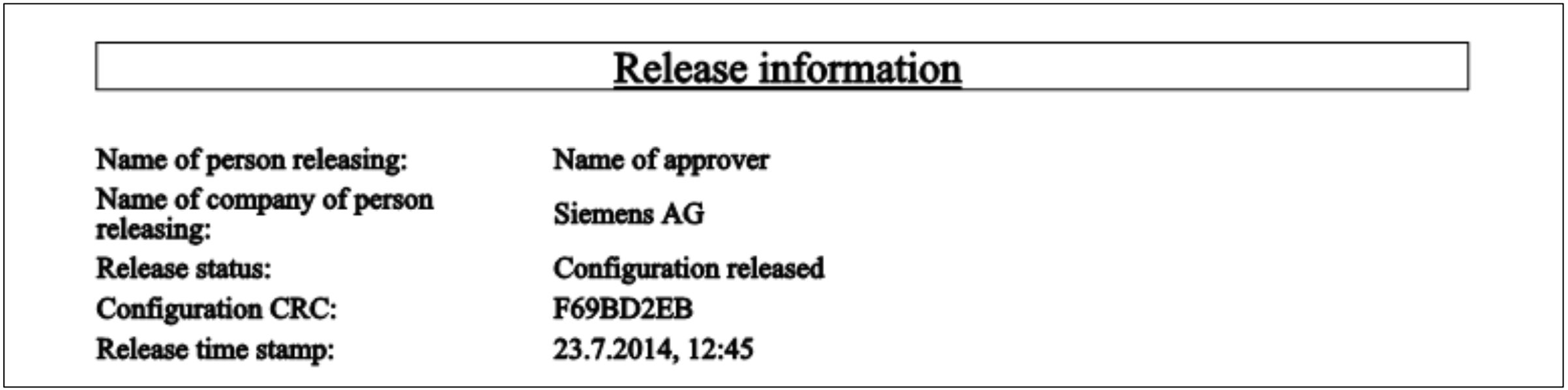
Preparation for Safety mode
- Documentation of approved configuration

- automatically generated PDF with information about approval
- release information is part of plant documentation
  → save or print out document



Release information

Name of person releasing:	Name of approver
Name of company of person releasing:	Siemens AG
Release status:	Configuration released
Configuration CRC:	F69BD2EB
Release time stamp:	23.7.2014, 12:45

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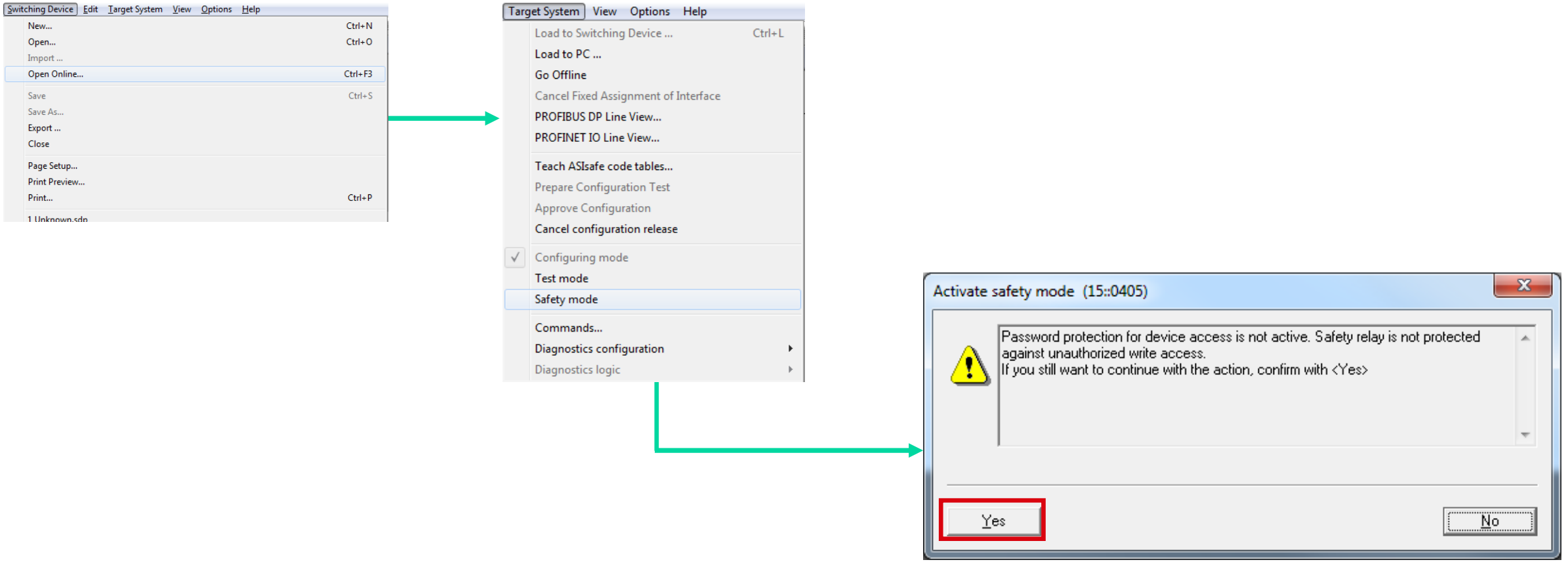
Change to safety mode

- open online project (on central module)
- select test mode



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What is when...

...release-Information (document) got „lost“

- Approval has to be generated new
  - Same procedure
  - CRC remains the same
  - Time stamp of approval will be generated new

...configuration test (document) got „lost“

- Document can be generated new every time
  - Independent if project is approved or not

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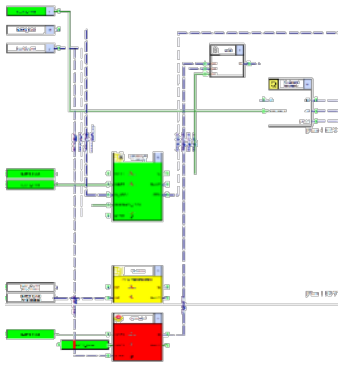
There are basically 5 possibilities for diagnostics

Basic unit 45mm	Basic units 22,5mm und 45mm			
Device display	**Device LEDs**	**Safety ES**	**Diagnostic display**	**with communication module PROFINET-/DP-Interface**
	DEVICE SF			
• On site diagnostics • Terminal status • Operating mode	• Device diagnostics	• Graphical online diagnosis • Terminal status • Logic messages	• Device diagnostics • Element messages • Terminal status	Diagnostic information on PLC/HMI etc. via • Process image or • Diagnosis-FB (support.industry.siemens.com/cs/de/en/view/109747831)

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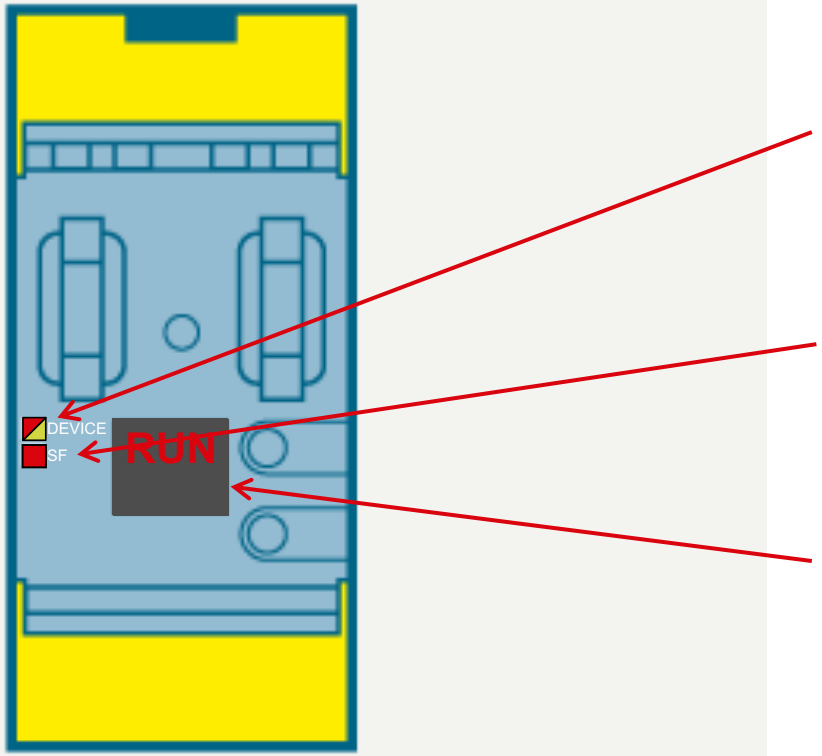
Device diagnosis with the help of LED and display at Basic unit



LEDs at basic unit

Device LED

- Operation mode/ device fault

SF LED

- Fault in configuration

Display (only 45mm)

- Operating mode
- Termination status
- Terminal status

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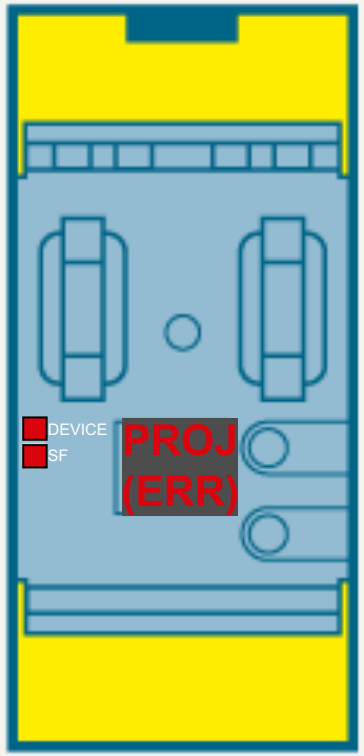
Error modes of Basic unit
Device faults or system faults



Device fault

causes a system stop (which can be overridden through re-start after disconnection and re-connection of the supply voltage

- communication no longer possible
- Red DEVICE-LED on the basic unit is illuminated
- if fault is pending after re-start → replace the basic device

LED	Display
DEVICE	Red
SF	Red

System fault

changeover to safe state (configuring mode)

- Communication still possible
- Reception of status and diagnostics messages

LED	Display
DEVICE	Red flashing (former safety mode) Yellow (former configuring mode
SF	Red

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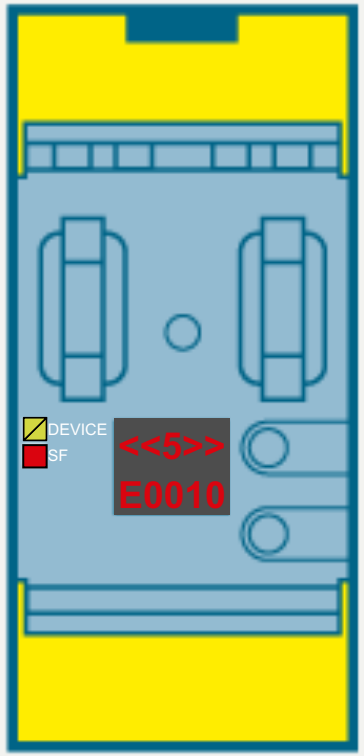
Error modes of Basic unit
Logic faults or wiring faults



Logic faults or wiring faults

- Detect by diagnostic settings in SW-elements
- Basic unit remains in test- or safety mode
- Acknowledgement after rectification of the fault cause

Fault types:

- Wiring fault (violation of feedback monitoring times, cross circuit)
  - Acknowledgement via RESET

LED	Display
SF	Red

Logic fault (Discrepancy monitoring, sequence monitoring)

- Self acknowledgement
- Logic warning (start condition not fulfilled, waiting for startup test)

LED	Display
SF	Red flashing

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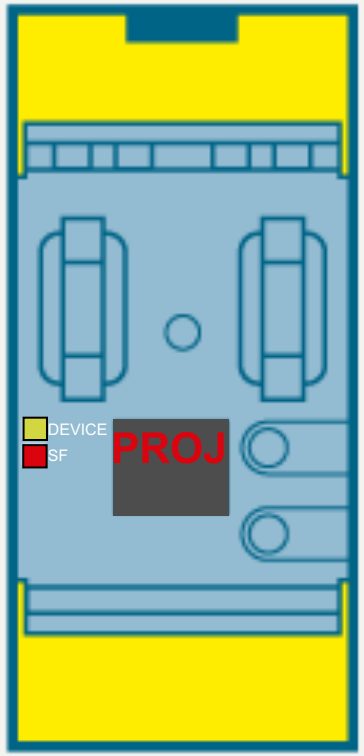
Error modes of Basic unit
Parameterization fault or configuration fault



Parameterization fault or configuration fault

e.g. no or faulty configuration

- Basic unit remains in configuring mode
- Acknowledgement after rectification of the fault cause

LED	Display
DEVICE	Yellow
SF	Red

Handshake-Fault

Communication interrupt between Safety ES and basic unit

- only in test mode
- Changeover to configuration mode

LED	Dispaly
DEVICE	Yellow
SF	Red

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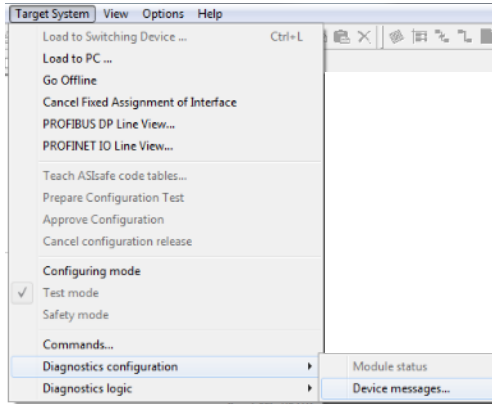
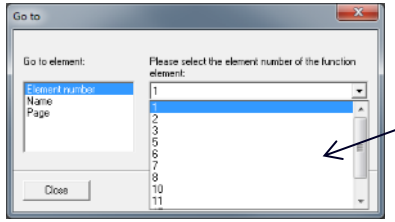
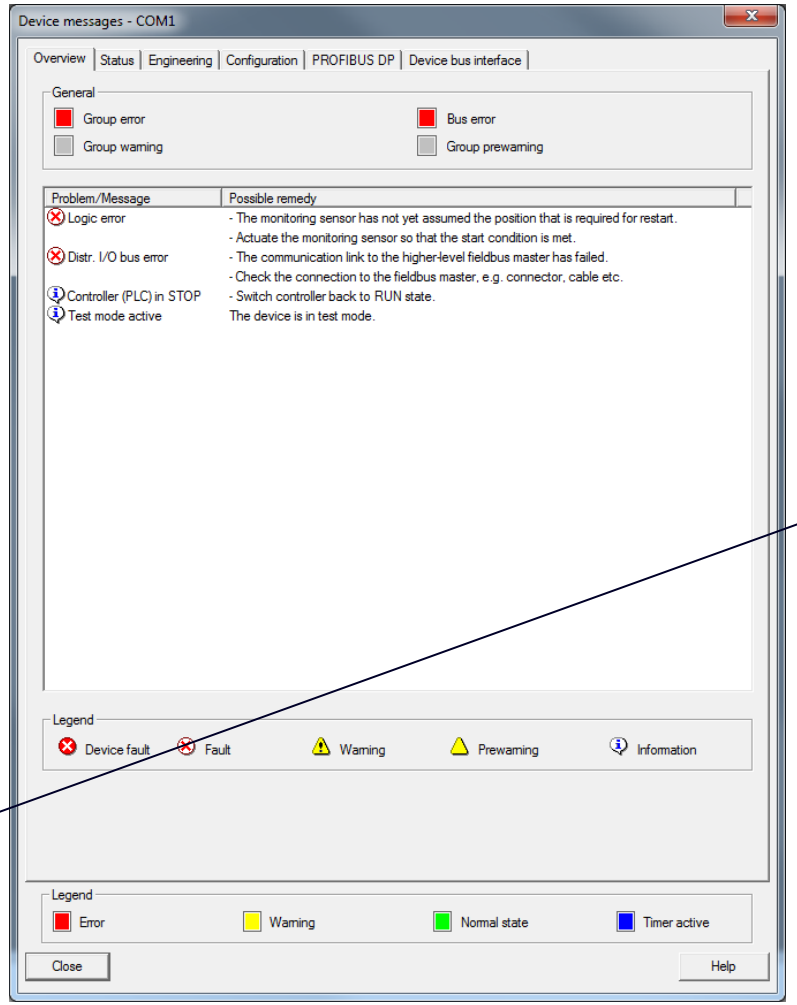
Device messages – General overview

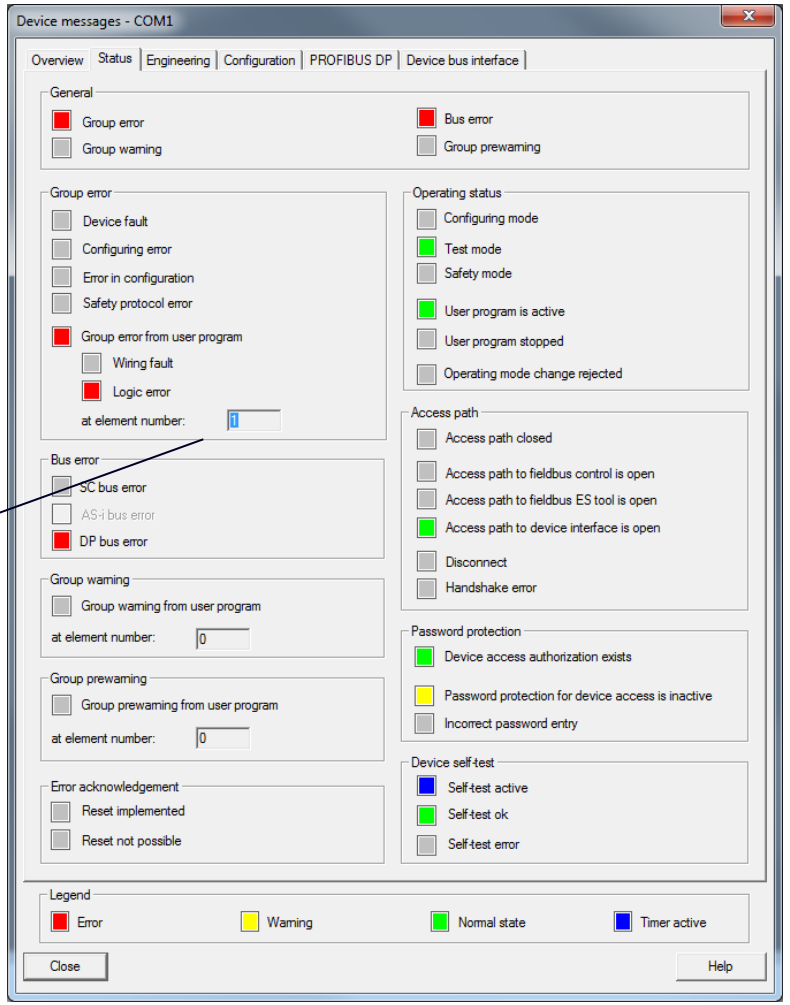
- centralized overview for all diagnostic messages
- for Hardware und Logic-parameters
- selectable by:



Tip:







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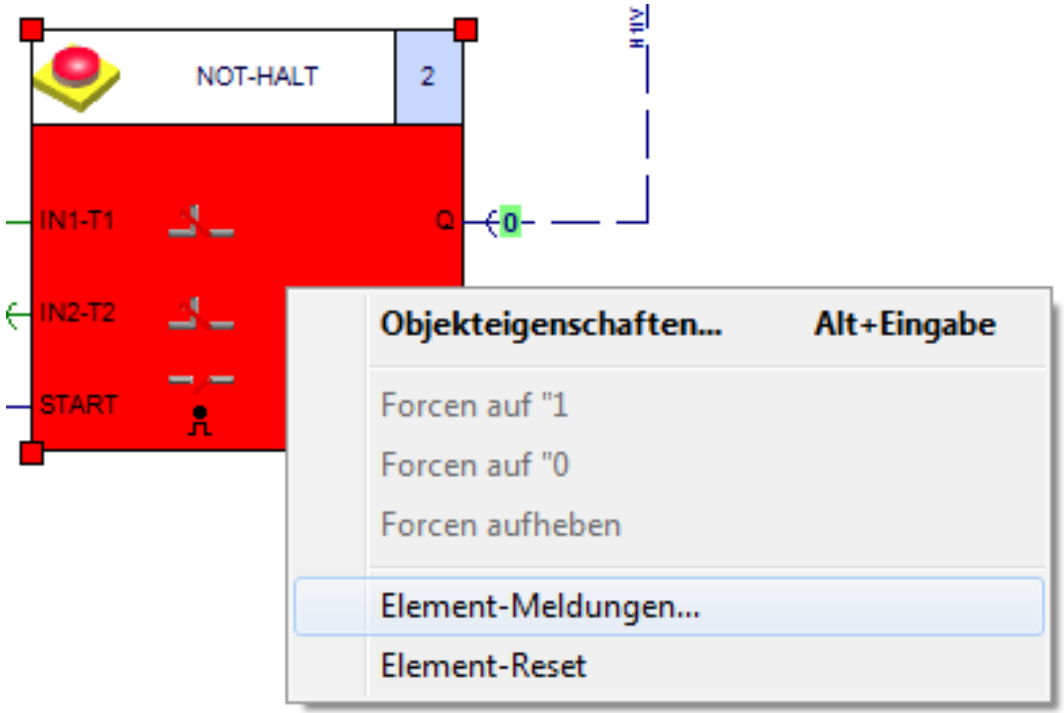
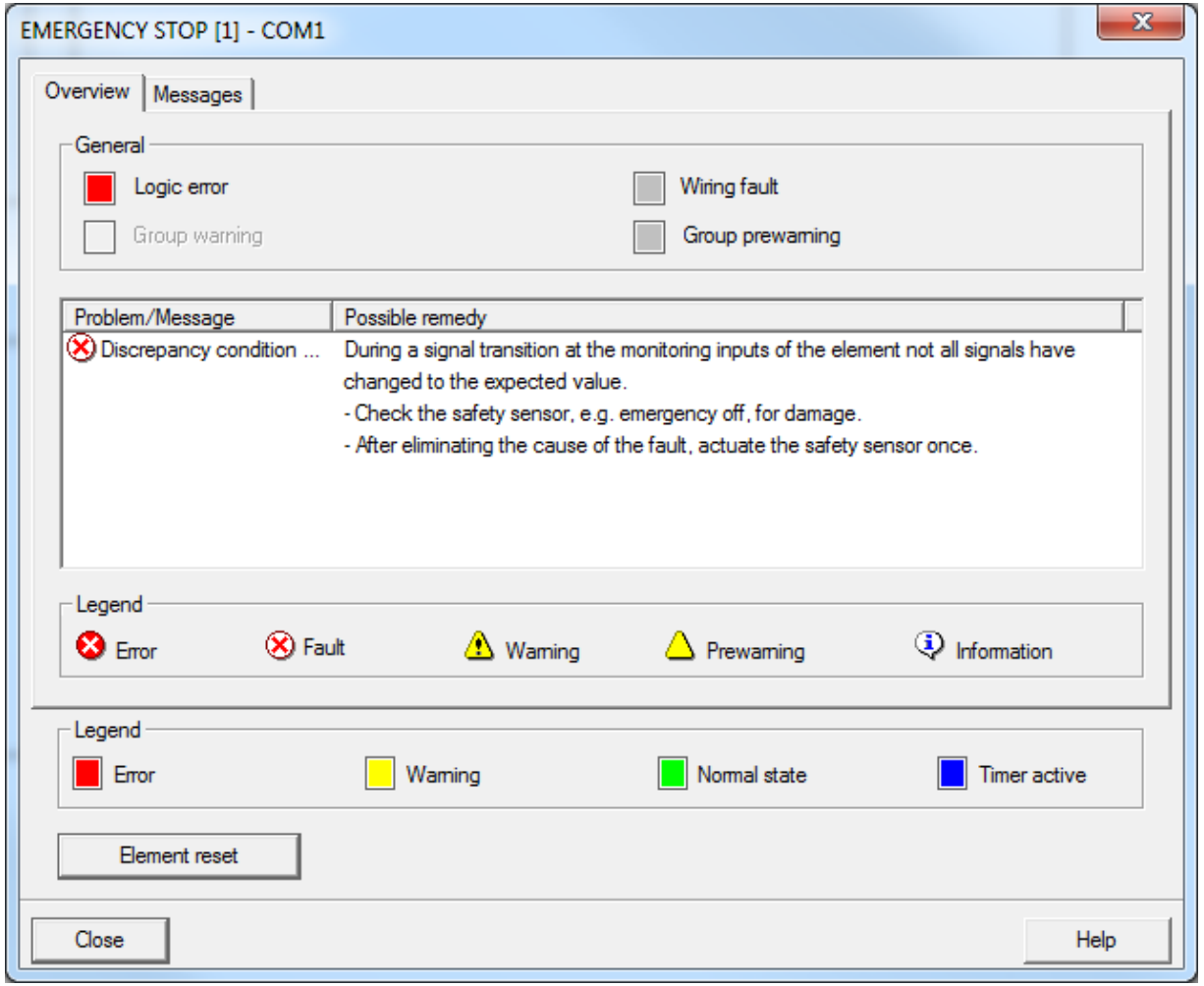
Element messages- What‘s wrong in detail?!

- select Element messages per right click on SW-element





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Online Monitoring- All signal in one view

graphical illustration of all signal- and element states

selectable by:

- active Elements/signals → green
- faulty elements → red/red flashing
- Messages → yellow/yellow flashing
  (e.g. safety sensor triggered)
- active time functions → blue
  (timer, monitoring times)

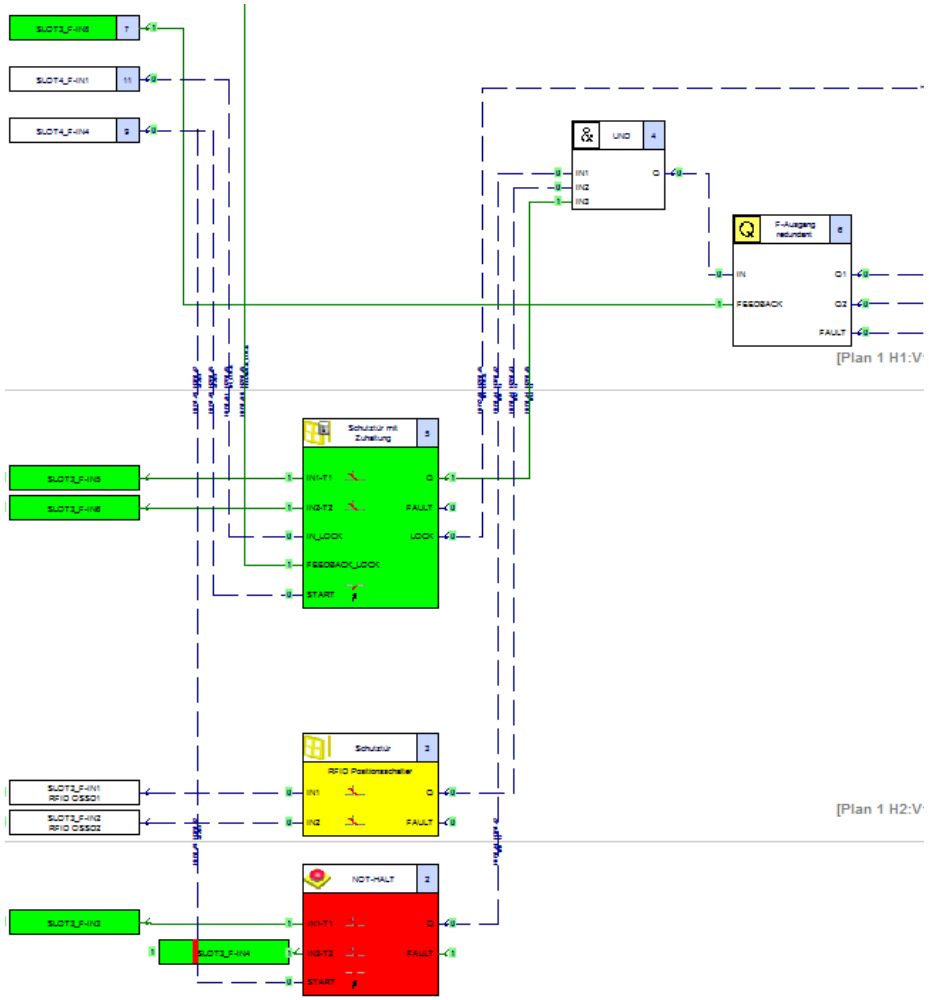

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Illustration of typical faults

Type of fault	Diagnosis	Comment
Discrepancy fault at sensor	Logic fault	All monitoring elements
Switching sequence violated	Logic fault	Diagnostic function of guard door and monitoring „universal“
Cross-circuit of sensor wiring	Wiring fault	Have to be activated, only available for 2-channel systems
P-circuit at sensor	Wiring fault	Will be detected via cross-circuit detection. All SW-elements are disturbed, which are using the same test signals like affected channel
Short circuit at output channel	Safety connect configuration error	MSS changes into locked configuring mode
Fault of feedback circuit	Wiring fault	Diagnostic function of „F-output“ element and „guard door with interlock (FEEDBACK_LOCK)“

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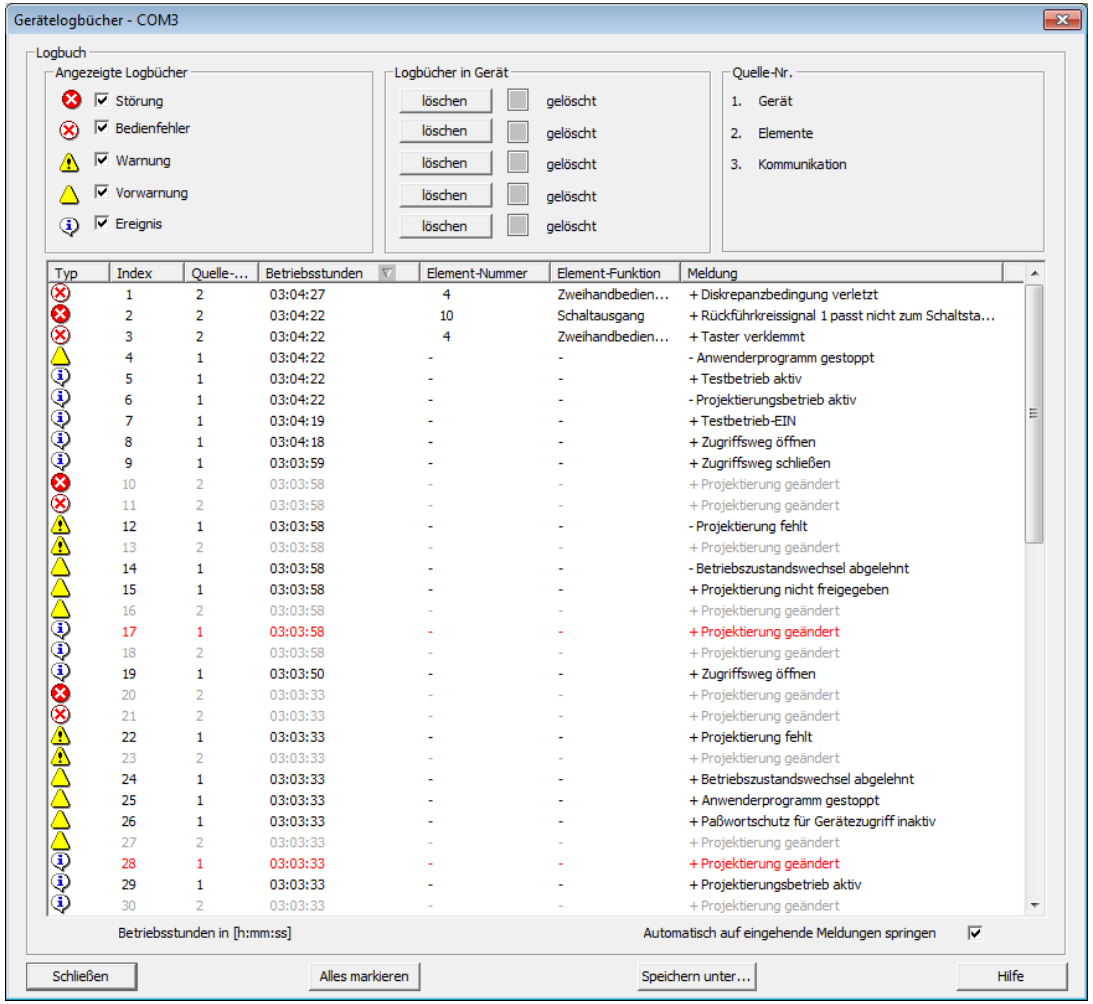
Saving events and faults nearly like a PLC

There‘s a logbook for each type of event

- Storing of all types of events and faults
- Time stamp for each entry
- available in online view of device
- Export to .csv possible
- entries not affected by setting back to factory state



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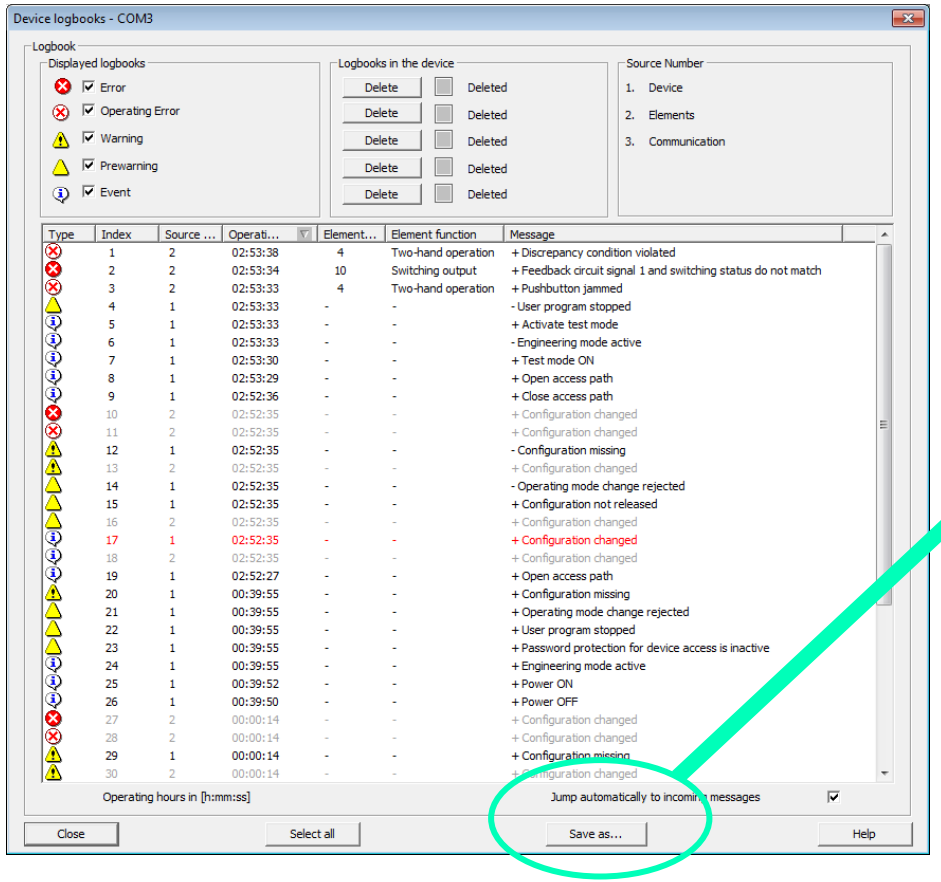
Exporting logbooks with the help of Safety ES

- Simplifies service activities significantly
- quick help by OEM/ Siemens service from offsite



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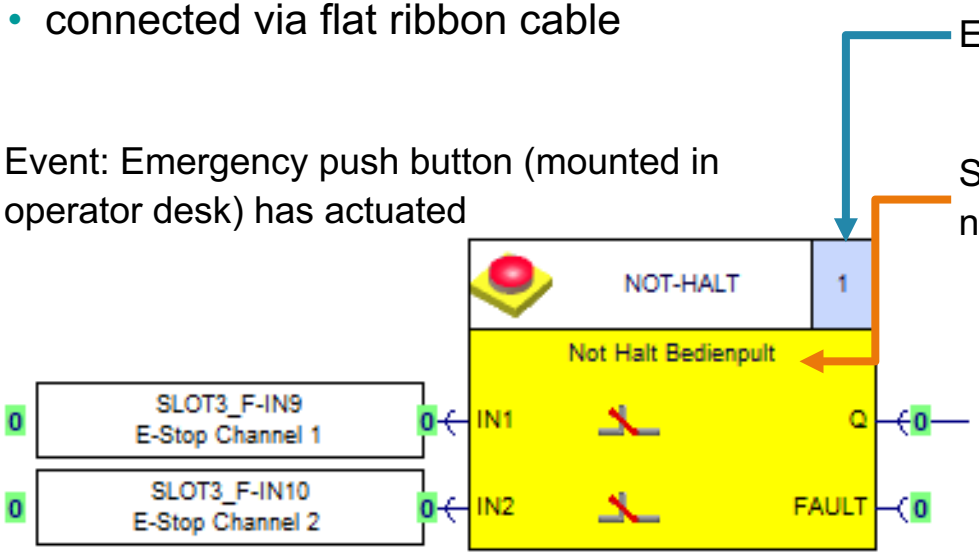
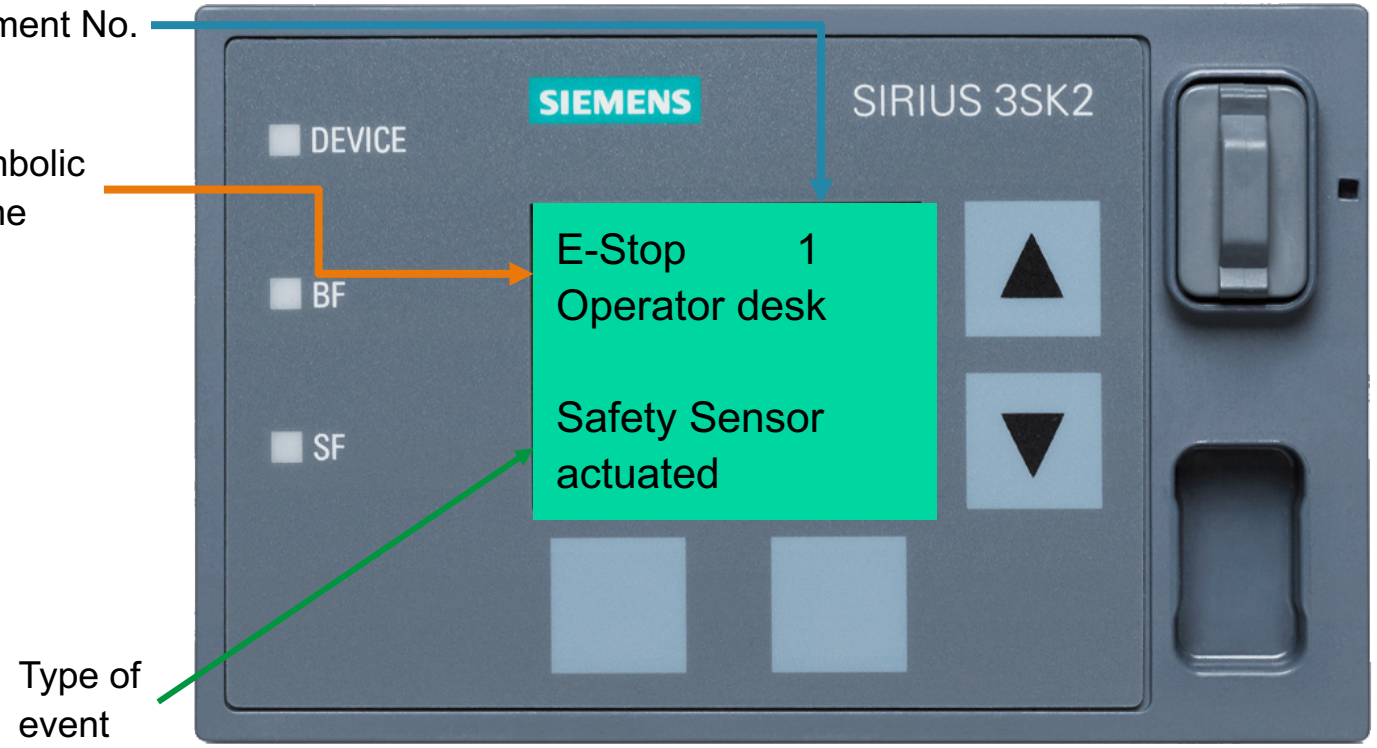
The 3SK2 own HMI delivers all information to the user

- Displays all types off events (device faults, SW-element faults/ warning etc.)
- using names for SW-elements supports the fault location
- no configuration in Safety ES necessary
- connected via flat ribbon cable

Event: Emergency push button (mounted in operator desk) has actuated





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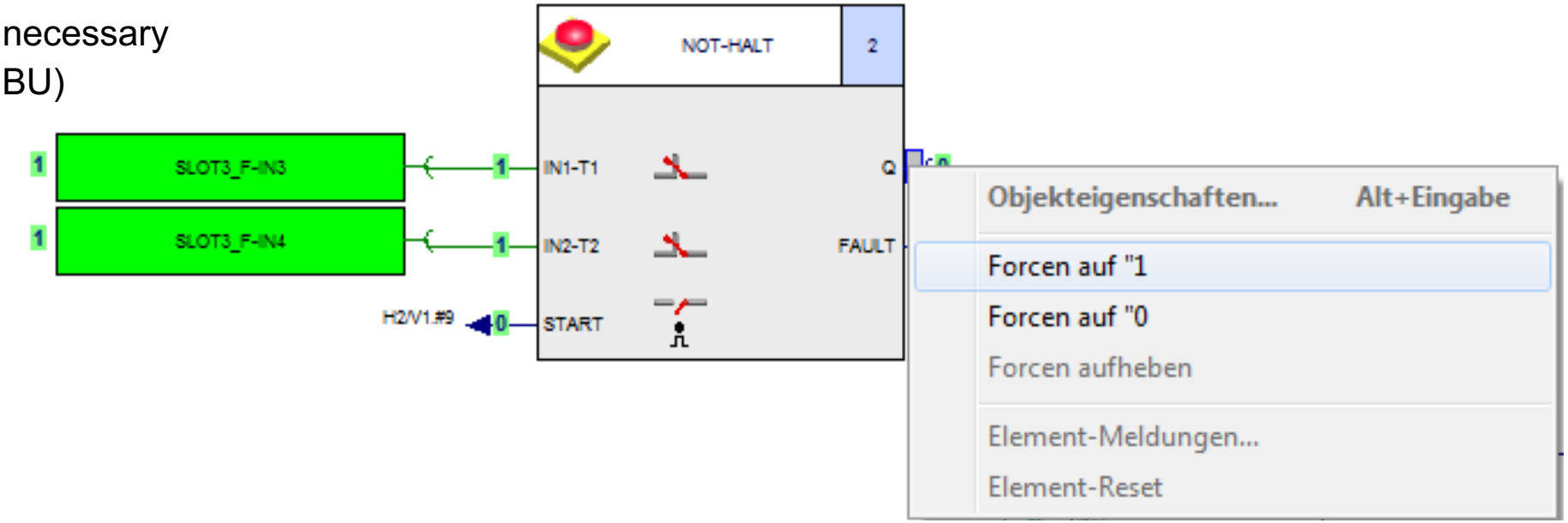
Forcing enables commissioning of the plant “without“ Hardware

Forcing

- available in Test mode
- manual manipulation of signal states
- output-pins of all elements can be forced
- test of safety logic through incomplete plant installation
- active connection to PC/PG necessary
  (Online-connection to 3SK2 BU)



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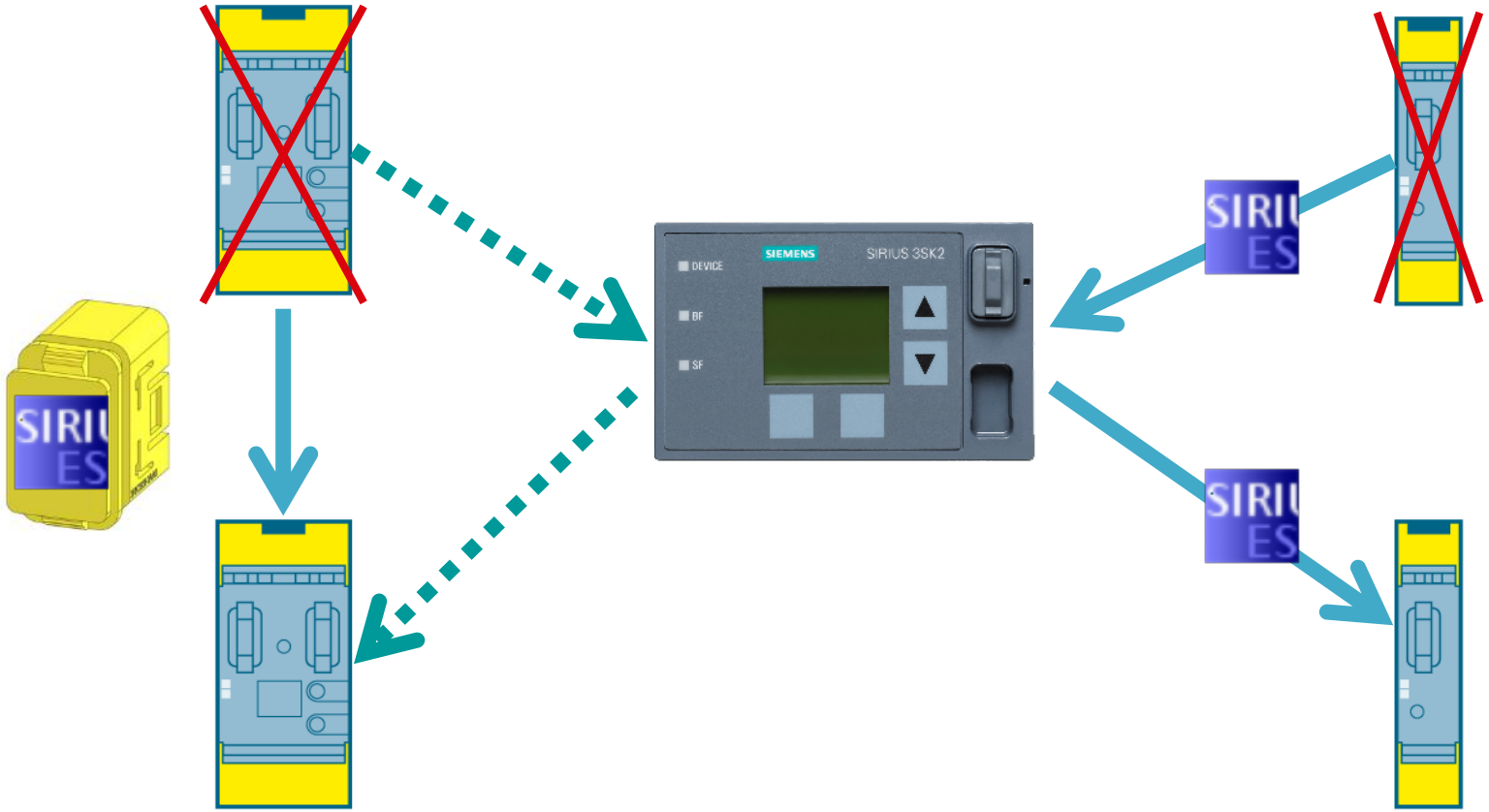
Replacement of devices will be done without any tools or computer

Project will be handed over via external memory module

Project is transferred by means of a memory module



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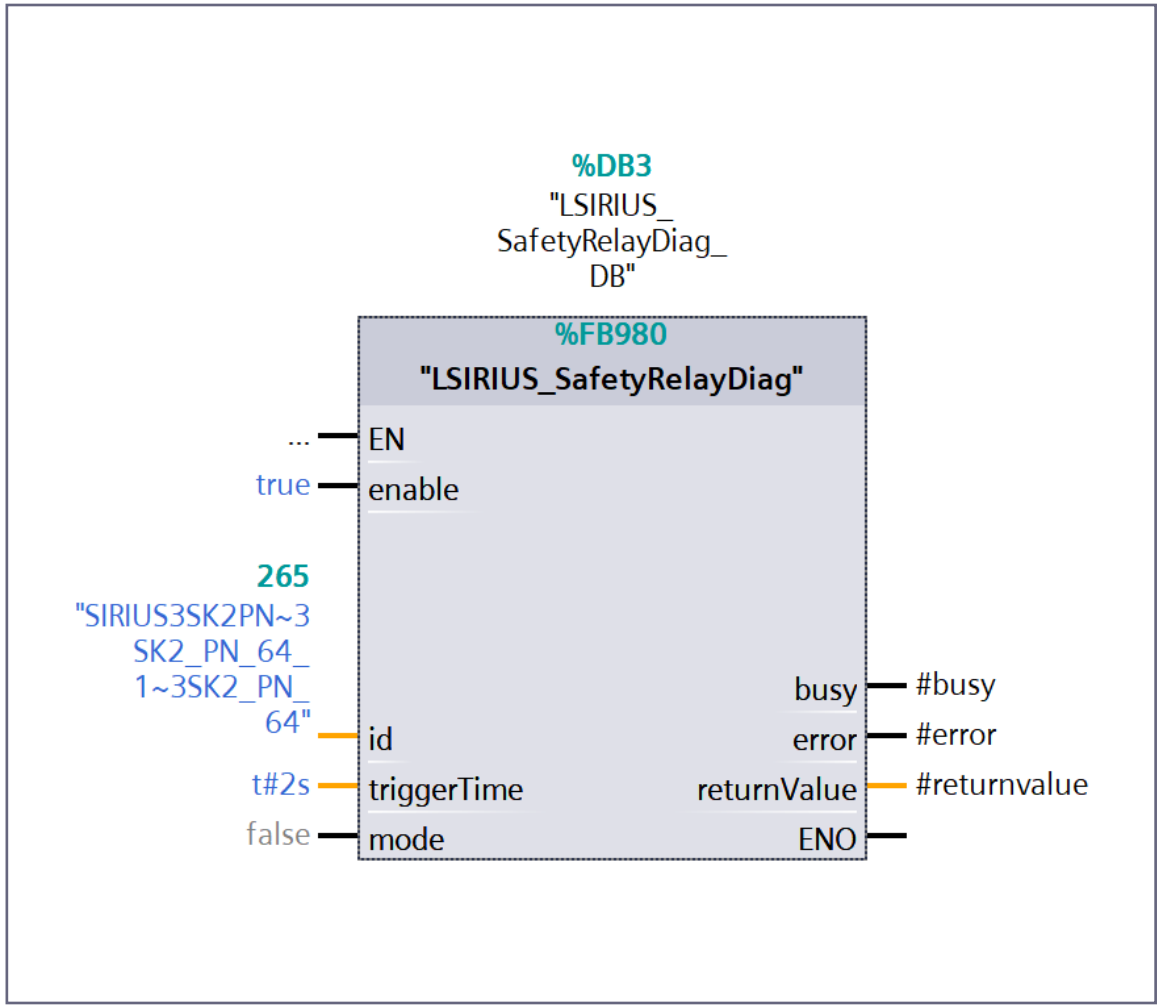
Diagnosis-FB "LSIRIUS_SafetyRelayDiag"

Call of diagnosis-FB in the STEP 7 (TIA Portal) project

- Diagnose a software-parameterizable safety relay SIRIUS 3SK2 or 3RK3 (MSS) out of a SIMATIC S7-PLC
- Read out diagnostic data via the optional PN- or DP-Interface during runtime:
  - Device status and diagnosis
  - Amount and status of all function elements that are configured in Safety ES
  - Further processing in PLC and random visualization, for instance via HMI or webserver
- Detailled description at support.industry.siemens.com/cs/de/en/view/109747831



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The existing licenses of MSS can be further used with SIRIUS Safety ES

License model SIRIUS Safety ES						
License type	**MSS ES License**			**SIRIUS Safety ES License**		
	Basic	**Standard**	**Premium**	**Basic**	**Standard**	**Premium**
MSS ES 2008	✓	✓	✓	X	X	X
SIRIUS Safety ES V1.0	✓	✓	✓	✓	✓	✓

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