



# Industry Information Live

Maskinsikkerhed med TIA-portalen  
– integreret og skalerbart



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**Moderator – Lars-Peter Hansen**





# Maskinsikkerhed med TIA-portalen - integreret og skalerbart

# Maskinsikkerhed med TIA-portalen – integreret og skalerbart

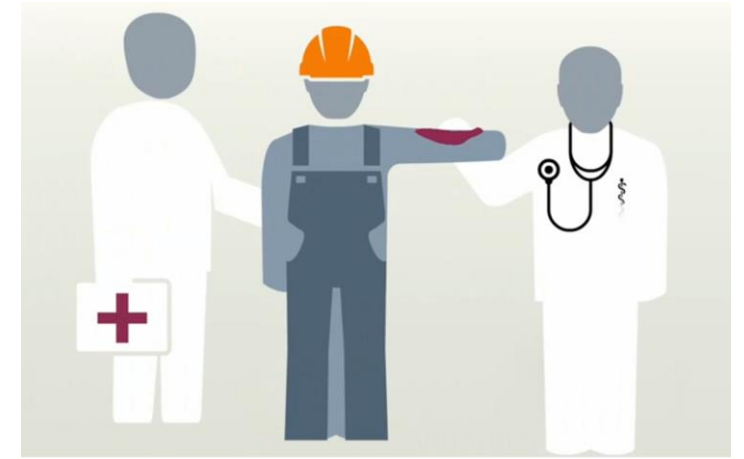
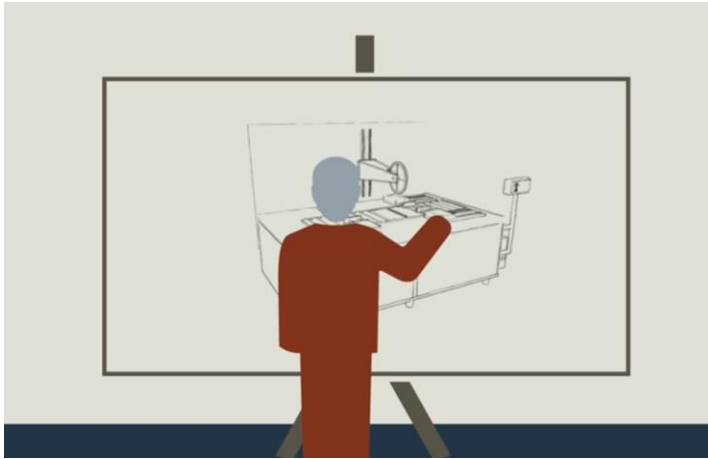


- **Hvad er Simatic Safety Integrated?**
- Hvordan kan man enkelt integrere safety-funktioner med TIA-portalen
- Eksempler på diagnosemuligheder
- Bonusinfo
- Q/A
- Kommende Webinar





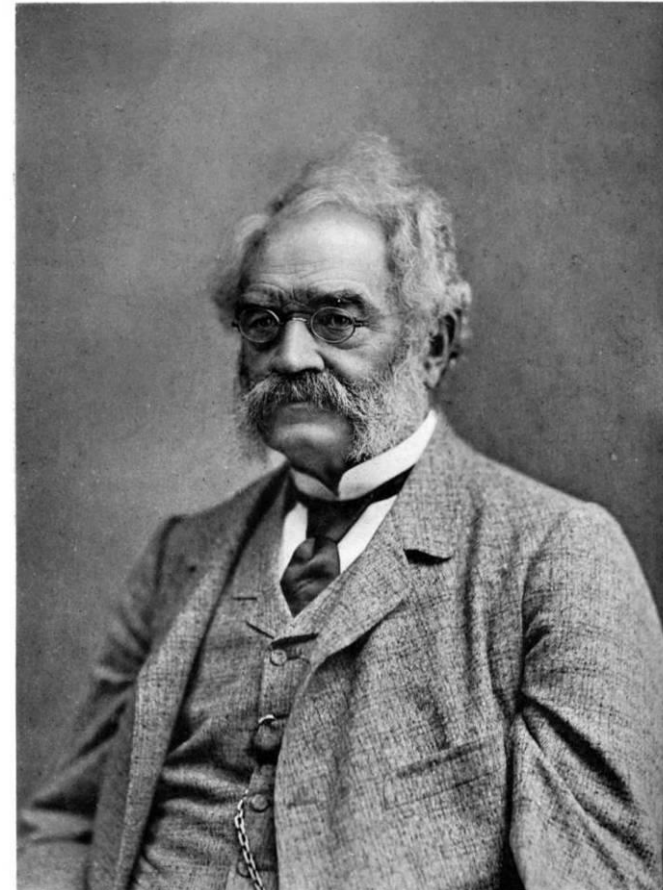
# Understanding and implementing Machine Safety



Werner von Siemens  
Berlin, 1880

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*Ingenuity for life*

**"The prevention of accidents must not be understood as a legal requirement, but as a precept of human duty and economic reason."**



*W. Siemens*





If you want to master this  
you have to deal with...

STO **Integrated added value**  
WEB server Scalability Shared Device Evaluation Tool EN ISO 12100  
**Safety Integrated** Openness CE marking  
Risk assessment One Engineering Everywhere **SIL and PL**  
Access  
**PROFISAFE** Proven components IEC 62061 Risk minimization  
ISO 13849-1 Digitalization **SIMATIC Controller** Usability

– ”

These topics define the SIMATIC Safety systems.

# What do we protect against with SIMATIC Safety Integrated!

Electric shock	Heat and fire	Dangerous radiation	Hazard due to functional faults
			

Safety Integrated for personnel, machines and the environment



# What is

## SIMATIC Safety Integrated!

- An easy way to integrate simple or complex Safety function in to your TIA automation platform.

# What are the System Advantages Of SIMATIC Safety Integrated!



- One Controller
- One Engineering framework
- One Network
- Channel granular diagnostic info
- Flexibility in regards to Sensors, Actuators and Implementation



The path to a safe machine is completed by the  
EC declaration of conformity and CE marking.

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## EC declaration of conformity

**EG-Konformitätserklärung**

Der Hersteller:     Muster GmbH,  
                          Musterstraße 65  
                          D-27635 Musterstadt  
                          Tel.: +49(0)48763/57647-0

erklärt hiermit, dass folgendes Produkt:

Produktbezeichnung:     Beispielmaschine  
Typenbezeichnung:     K380  
Seriennummer:         830489880  
Baujahr:                 2012

allen einschlägigen Bestimmungen der Richtlinie Maschinen (2006/42/EG) entspricht.  
Die Maschine entspricht weiterhin allen Bestimmungen der Richtlinie Elektromagnetische  
Verträglichkeit (2004/108/EG).

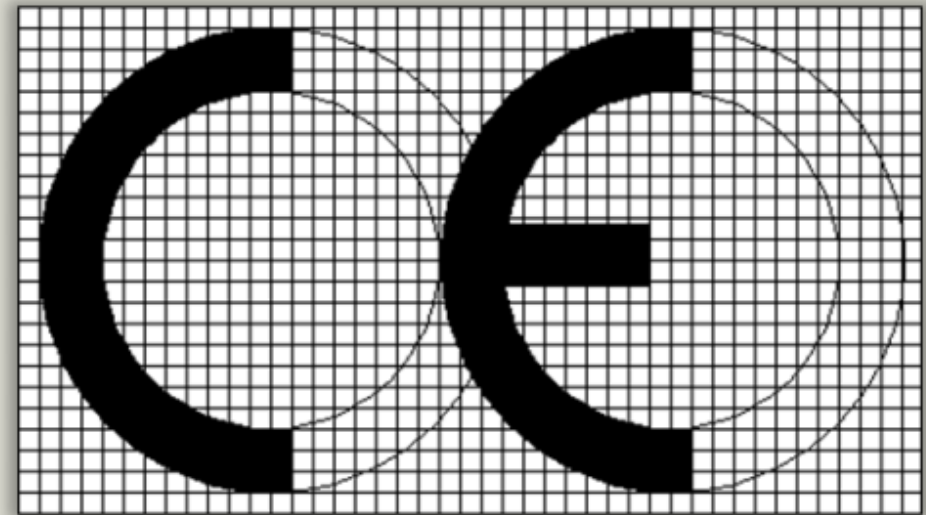
Folgende harmonisierte Normen wurden angewandt:

DIN EN ISO 12100	Sicherheit von Maschinen - Allgemeine Gestaltungsgrundsätze - Risikobeurteilung und Risikominderung
DIN EN 60204-1	Sicherheit von Maschinen - Elektrische Ausrüstungen von Maschinen, Teil 1: Allgemeine Anforderungen
DIN EN ...	
...	

Name des Dokumentationsbevollmächtigten: Hans Muster  
Adresse des Dokumentationsbevollmächtigten: siehe Adresse des Herstellers  
Musterstadt,

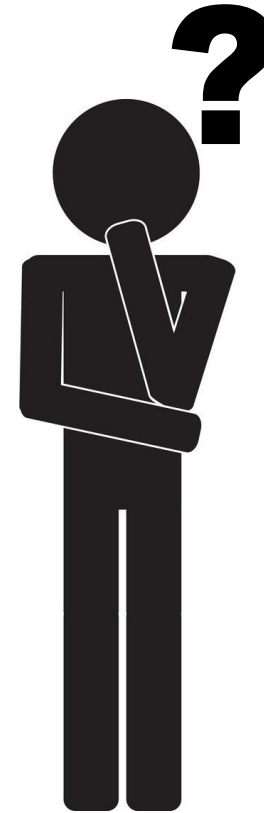
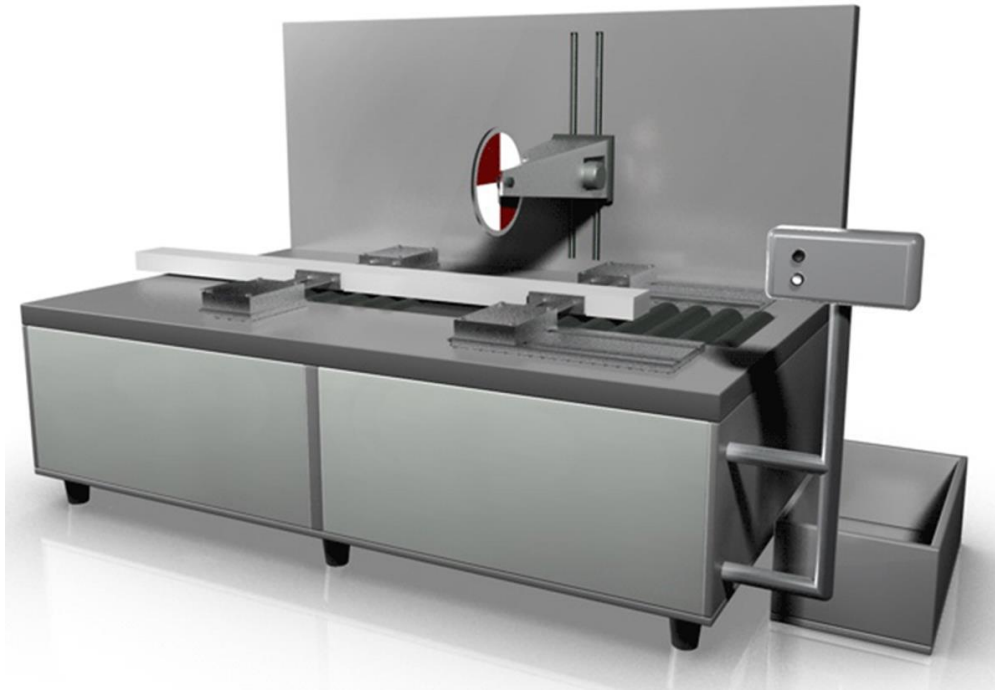
_____	_____	_____
Datum	Unterzeichner und Angaben zum Unterzeichner	Unterschrift

## CE marking



Where to start?

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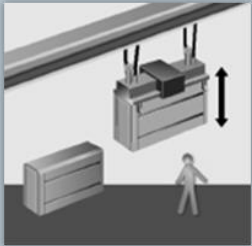

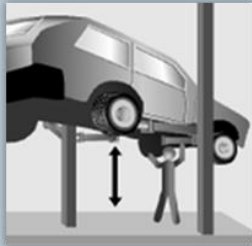

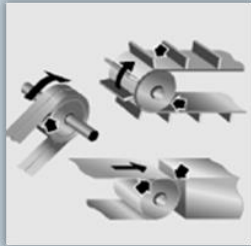


**Describe the machine and identify hazards**



The potential hazards can be identified according to EN ISO 12100.

## Risk assessment

Cutting	Dropping	Motion	Gravity	Approach	Rotation
					

The Machinery Directive involves three specific steps to achieve a safe machine.



A high initial risk must be reduced to an acceptable residual risk.

## Risk minimization



A high initial risk must be reduced to an acceptable residual risk.

## Risk minimization

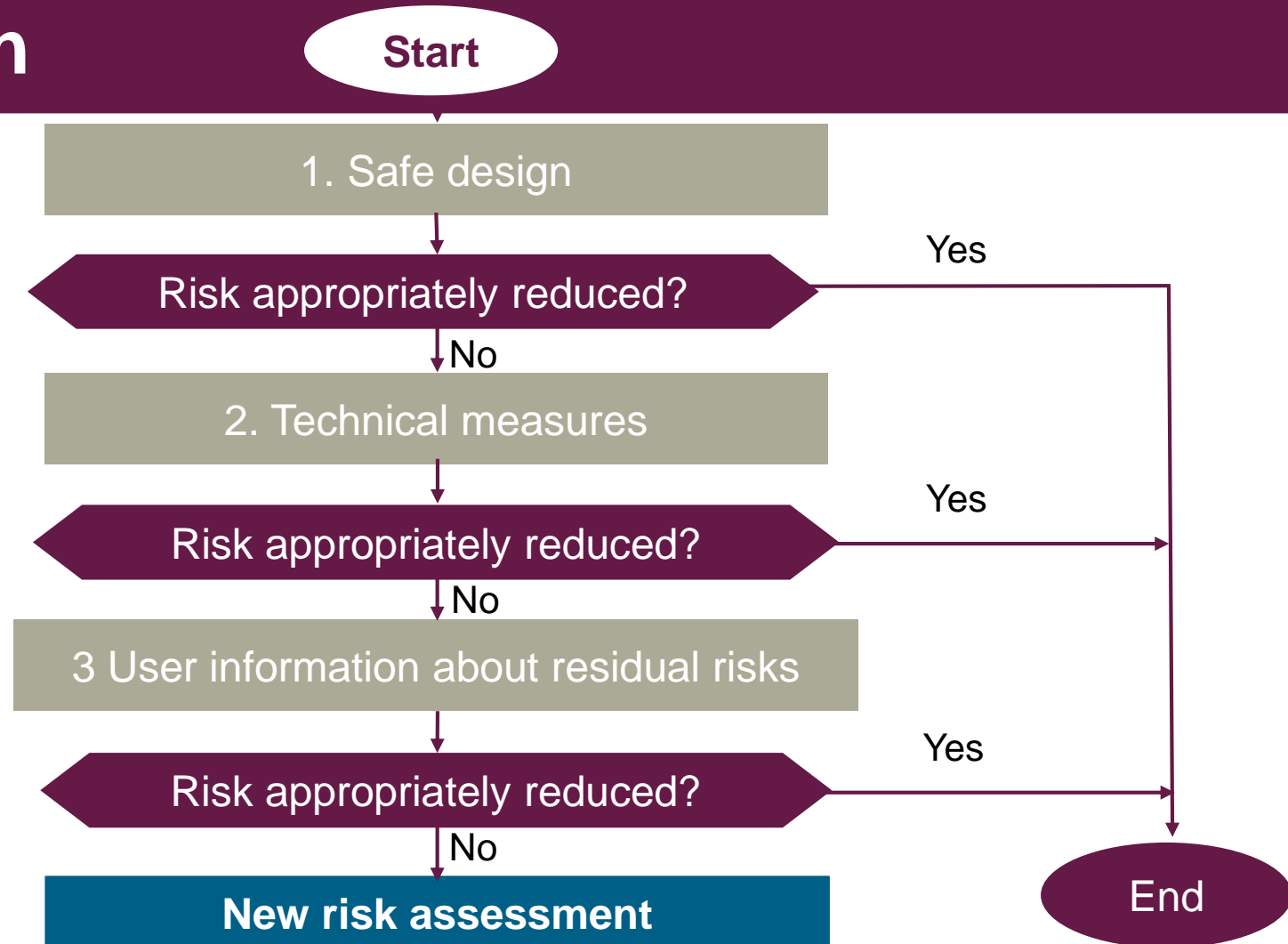
The defined safety category (SIL, PL) determines the magnitude of the acceptable residual risk, and therefore the demanded reliability of the safety system.

	PL a		$10^{-4}$	Use "proven components", Regular functional tests, Automatic fault identification, Redundant design, Redundancy + fault identification
SIL 1	PL b	$3 \cdot 10^{-6}$	$10^{-5}$	Not more than 1 potentially hazardous failure of the safety function in <b>10</b> years
	PL c		$10^{-6}$	
SIL 2	PL d		$10^{-7}$	Not more than 1 potentially hazardous failure of the safety function in <b>100</b> years
SIL 3	PL e		$10^{-8}$	Not more than 1 potentially hazardous failure of the safety function in <b>1000</b> years



The safety concept can be developed based on the 3-stage method according to EN ISO 12100.

## Risk minimization

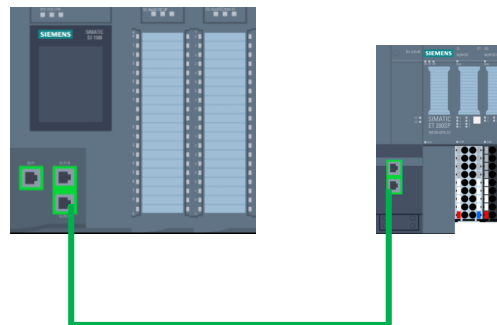


# The Machine after Risk assessment - mechanical

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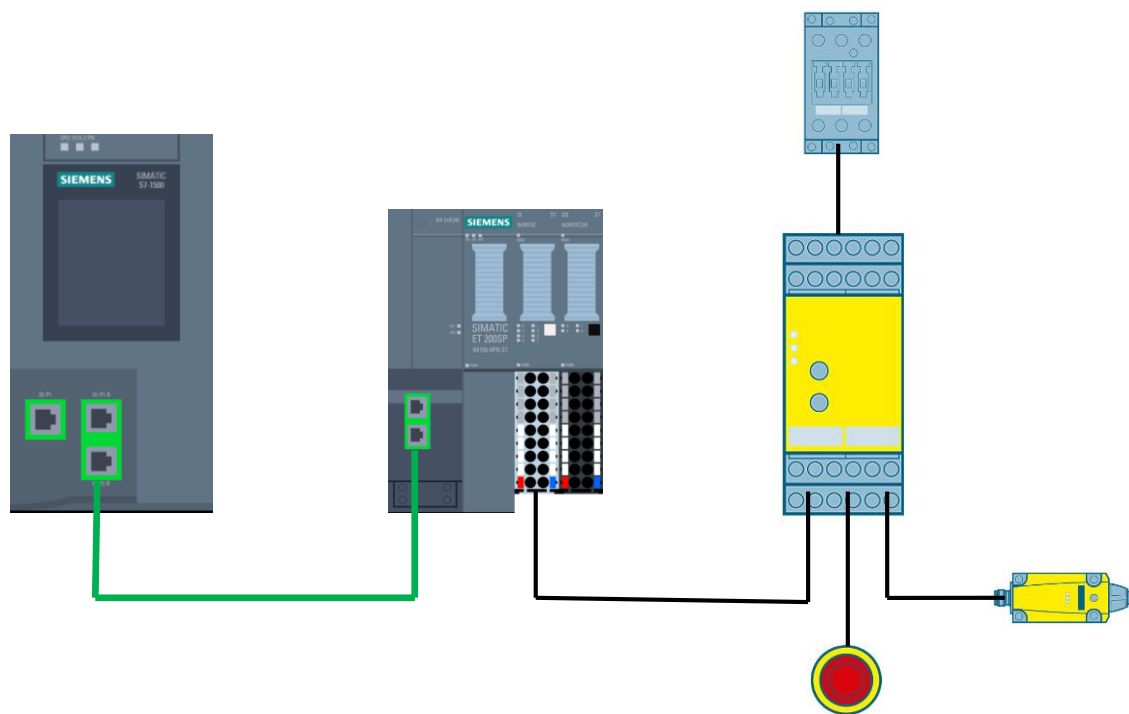


Risk minimization



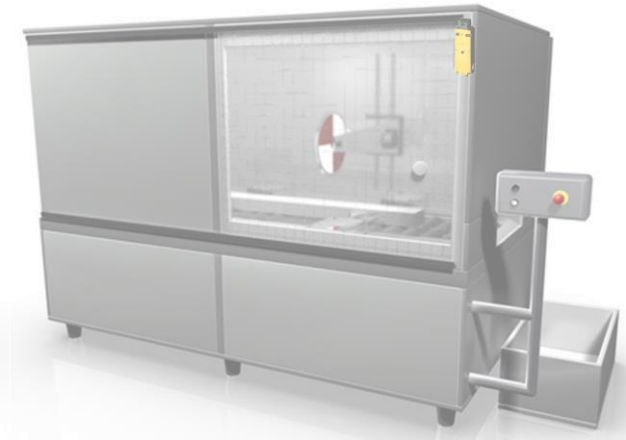
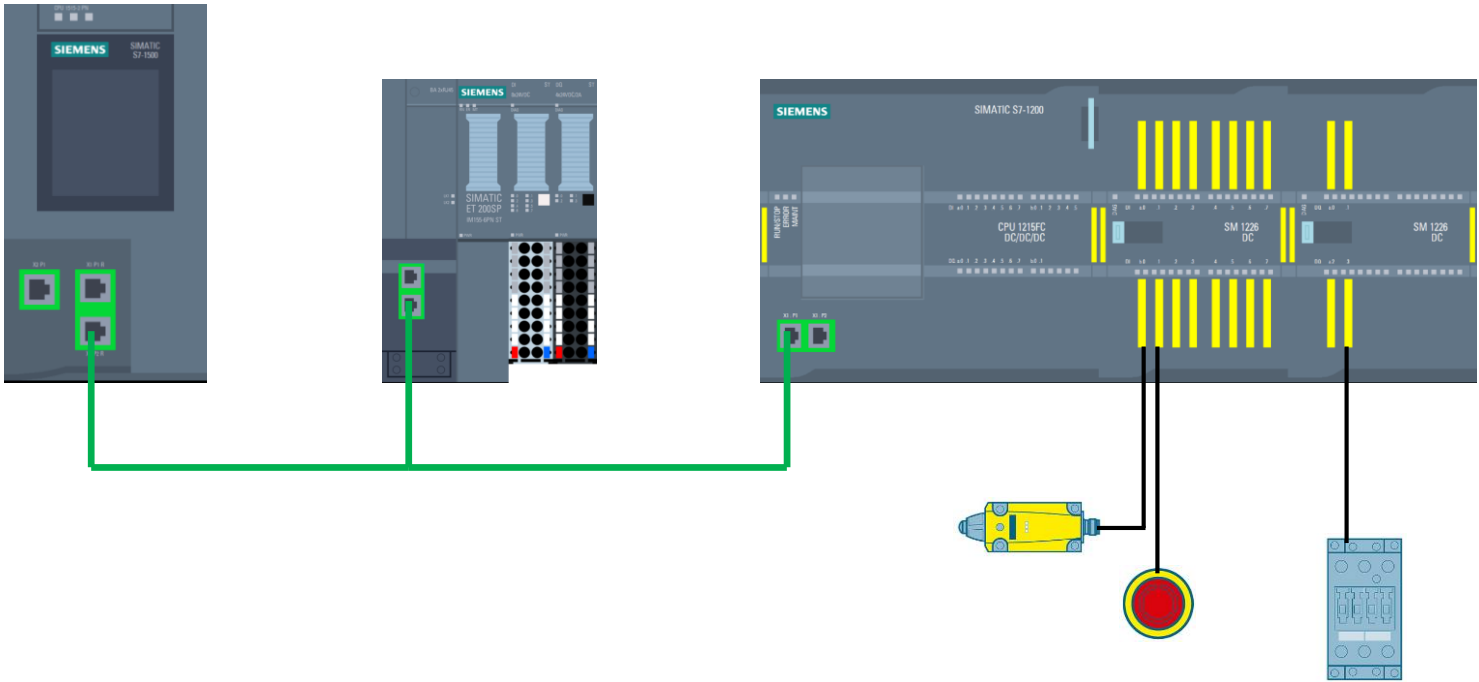
# The Machine after Risk assessment - electrical

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# Implementing Safety Integrated

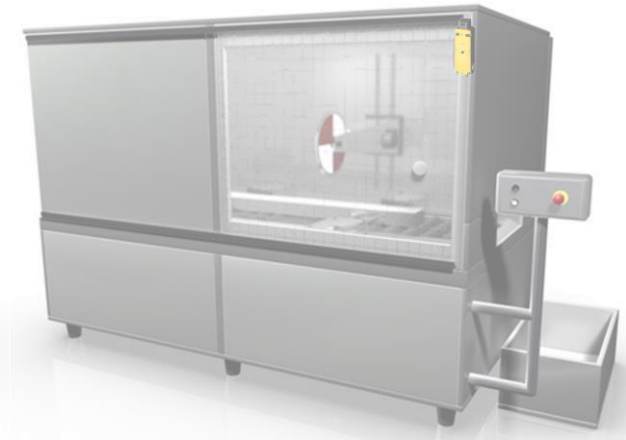
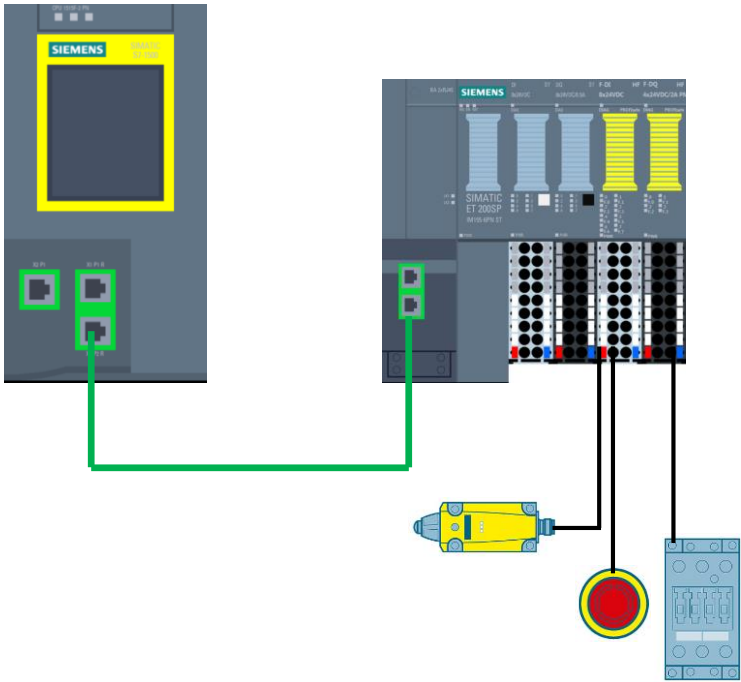
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# One Controller for Controlling and Safety

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# Maskinsikkerhed med TIA-portalen – integreret og skalerbart

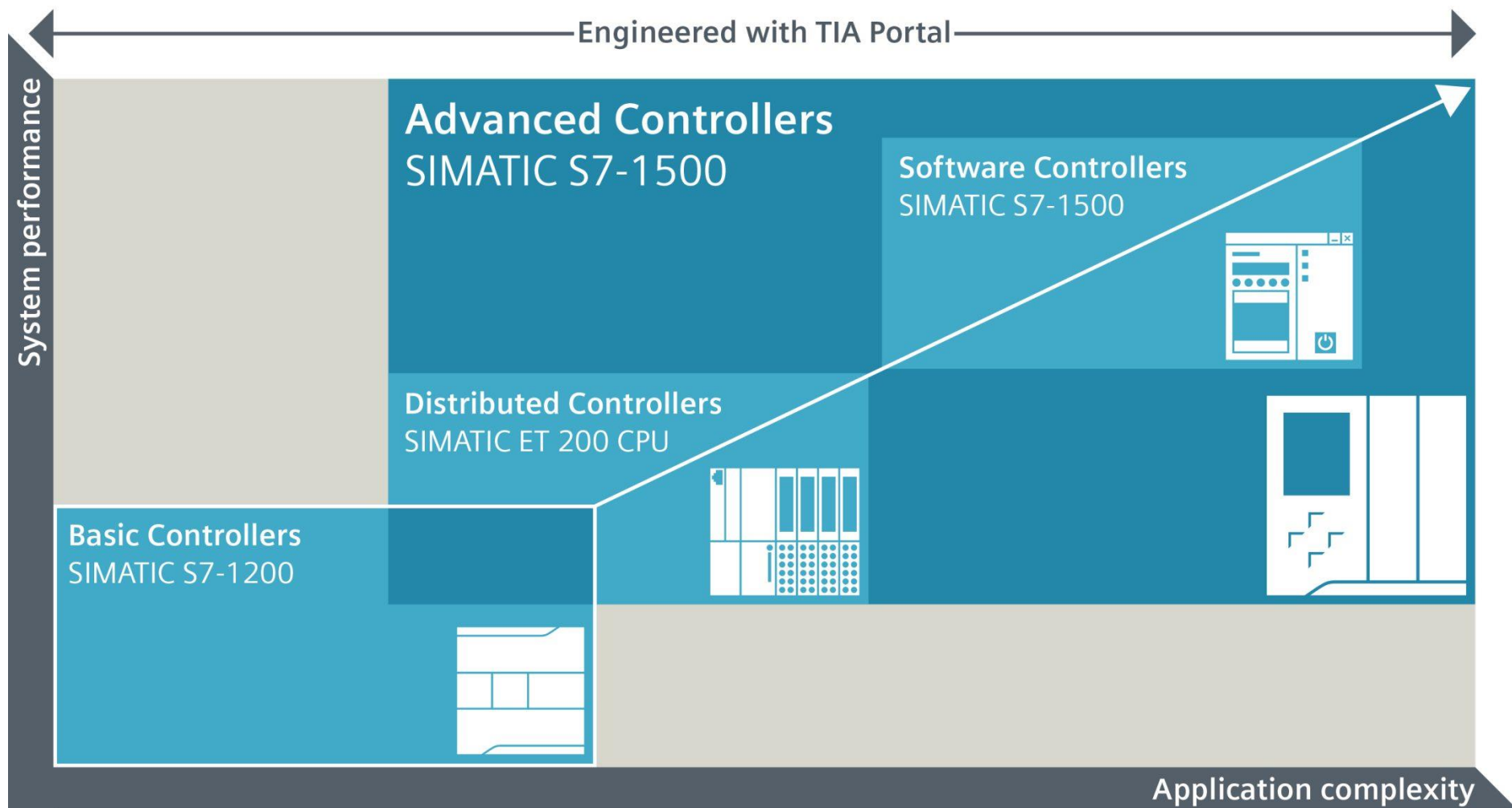


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# The SIMATIC Controller portfolio always provides the right controller - Plus integrated added value!

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**Efficient  
engineering**



**Innovative  
design**



**Range of  
diagnostic  
options**



**Safety  
Integrated**

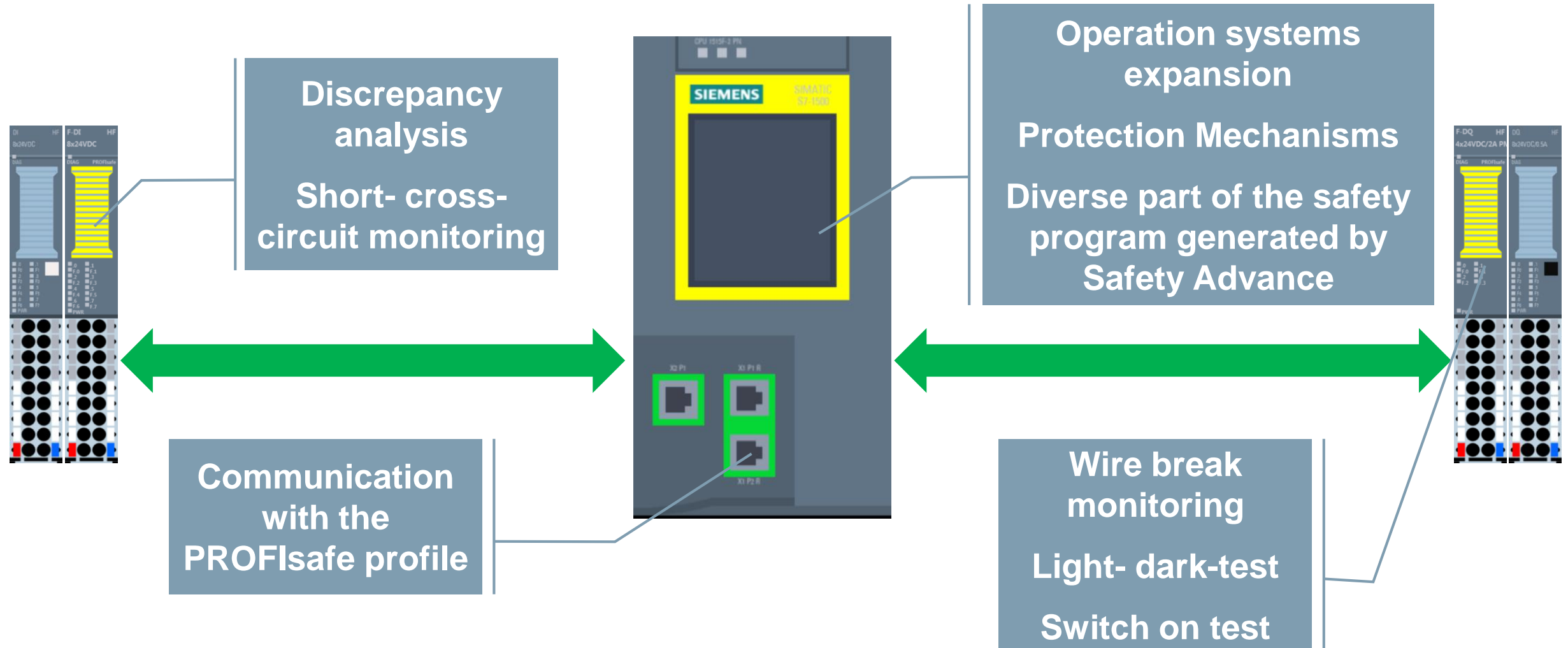


**Security  
Integrated**



**Technology  
Integrated**

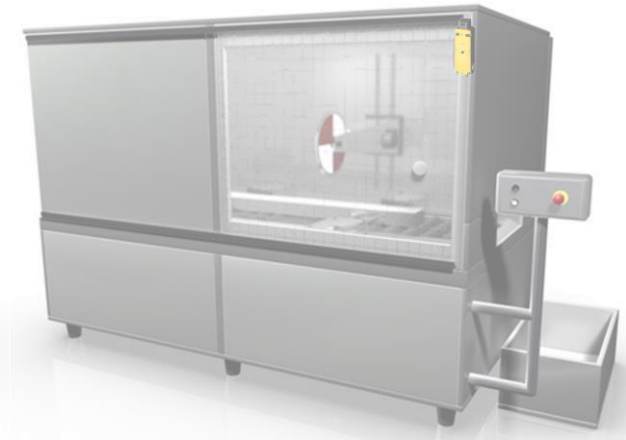
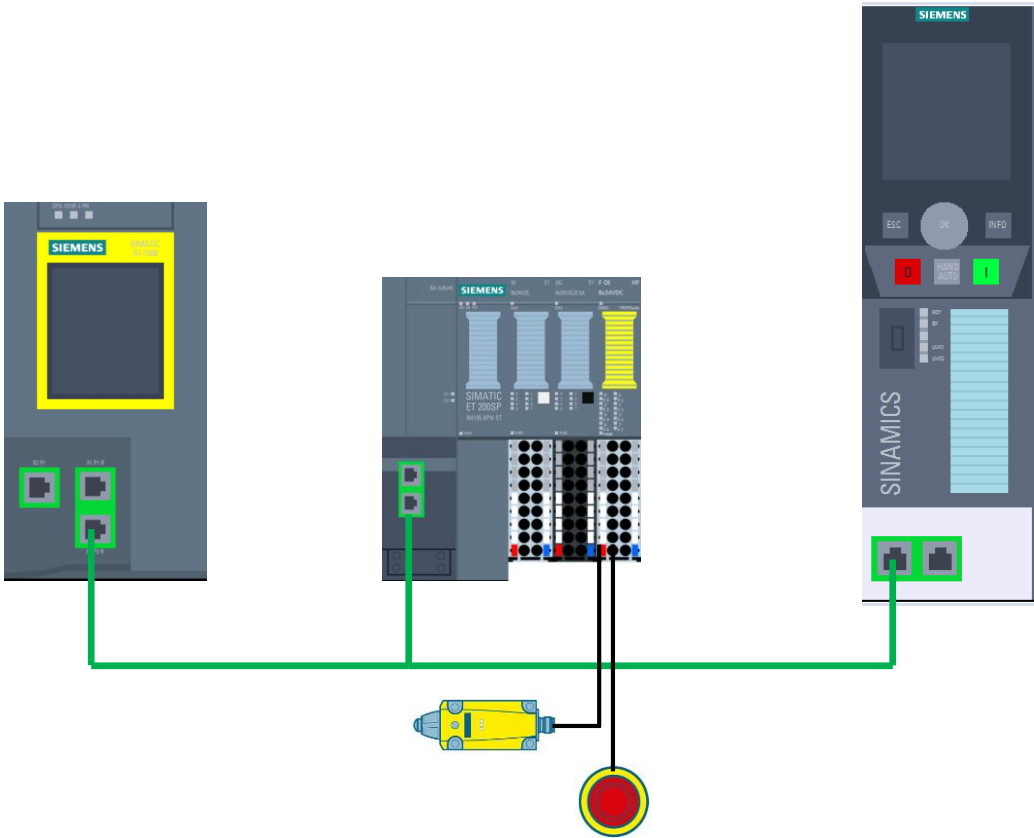
# Why is it safe?





# Scalability with Drives

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# Safety functions overview

## Overview of safety functions in the drive

SINAMICS	STO	SS1	SS2	SOS	SBC	SBT	SLS	SLA	SSM	SDI	SLP	SP	SCA	Transfer F-DI
V90	✓													
G110M / G120C	✓													
G120 modular	✓	✓			✓ <sup>2)</sup>		✓		✓	✓				✓
G120D	✓	✓					✓		✓	✓				✓
S210	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
G130 / G150	✓	✓			✓ <sup>3)</sup>						✓	✓		
S120 / S150	✓	✓	✓	✓	✓ <sup>3)</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓ <sup>4)</sup>

<sup>2)</sup> Only possible with CU 250S-2 with Safe Brake Relay

<sup>3)</sup> For Chassis and Cabinet Modules with Safe-Brake Adapter, for Blocksize formats with Safe Brake Relay

<sup>4)</sup> Only for CU310-2

# Safety functions overview

## Overview of safety functions in the drive

SINAMICS	STO	SS1	SS2	SOS	SBC	SBT	SLS	SLA	SSM	SDI	SLP	SP	SCA	Transfer F-DI
V90	✓													
G110M / G120C	✓													
G120 modular	✓													✓
G120D	✓													✓
S210	✓													
G130 / G150	✓													
S120 / S150	✓												✓	✓ <sup>4)</sup>

Select STO

Speed

STO

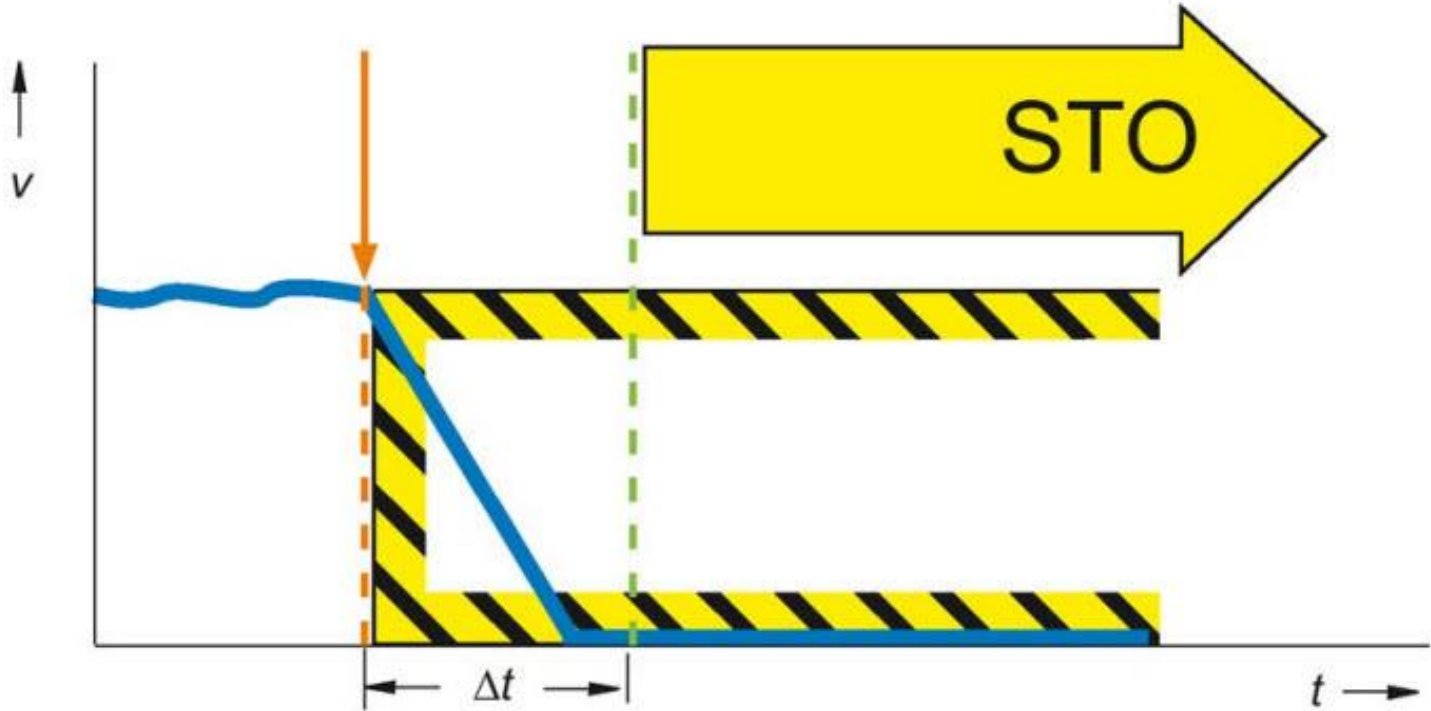
STO is active

<sup>1)</sup> CU 250S-2 with Safe Brake Relay  
<sup>2)</sup> size formats with Safe Brake Relay  
<sup>4)</sup> Only for CU310-2

# Safety functions overview

## Overview of safety functions in the drive

SINAMICS	STO	SS1	SS2	SOS	SBC	SBT	SLS	SLA	SSM	SDI	SLP	SP	SCA	Transfer F-DI
V90	✓													
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G120 modular	✓													✓
G120D	✓													✓
S210	✓													
G130 / G150	✓													
S120 / S150	✓												✓	✓ <sup>4)</sup>



CU 250S-2 with Safe Brake Relay  
size formats with Safe Brake Relay

<sup>4)</sup> Only for CU310-2

> > Drive\_1

### Send Safety Integrated telegram (Actual value)

Drive		→	Partner	
Name	Drive_1		PLC_1	
Role	Device		Controller	
IP address	192 . 168 . 0 . 5		192 . 168 . 0 . 1	
Telegram	PROFIsafe telegram 30			
F-address	9		1	
Slot	2			
Start address	PZD 1		I 37	
Length	6 bytes		6 bytes	
Extension	—		—	
Organization block			---	---
Process image			---	---
<input type="checkbox"/> Manual assignment of the F watchdog time				
F-monitoring time	150 ms			
<input type="checkbox"/> Manual assignment of the F-I/O DB number				
F-I/O DB number	30028			
F-I/O DB name	F00037_PROFIsafe_telegram_30			
Hardware identifier			296	

> > Drive\_1 \_\_\_\_\_  
Send Safety Integrated telegram (Actual value)

## > Application example SIMATIC - Failsafe library LDrvSafe to control the Safety Integrated functions of the SINAMICS drive family

02/18/2020

ID: 109485794

★★★★☆ (91)

Structure of block LDrvSafe\_SinaTlg903Status ... 2 Blocks of the library LDrvSafe Entry-ID:... 2  
Blocks of the library LDrvSafe Entry-ID:... SLP traversing range 1 ... 2 Blocks of the library  
LDrvSafe Entry-ID:... 32767 (100%) 2 Blocks of the library LDrvSafe Entry-ID:... Fault-free operation  
STOactive ... Safety Integrated Function Safe Torque Off (STO) 1:... STO inactive SS1active ...  
Safety Integrated Function Safe Stop 1 (SS1) 1:... SS1 inactive SS2active ... Safety Integrated  
Function Safe Stop 2 (SS2) 1:... SS2 inactive SS2Eactive ... Safety Integrated Function Safe Stop 2  
with ... stop (SS2E) 1:

For products: 6SL3244-0BB13-1FA0, 6SL3244-0BB13-1PA0, ... ▶ All products

+ Additional hits in the chapters of following attachments

Monitoring time 150 ms

☐ Manual assignment of the F-I/O DB number

F-I/O DB number 30028

F-I/O DB name F00037\_PROFIsafe\_telegram\_30

Hardware identifier

296



> > Drive\_1

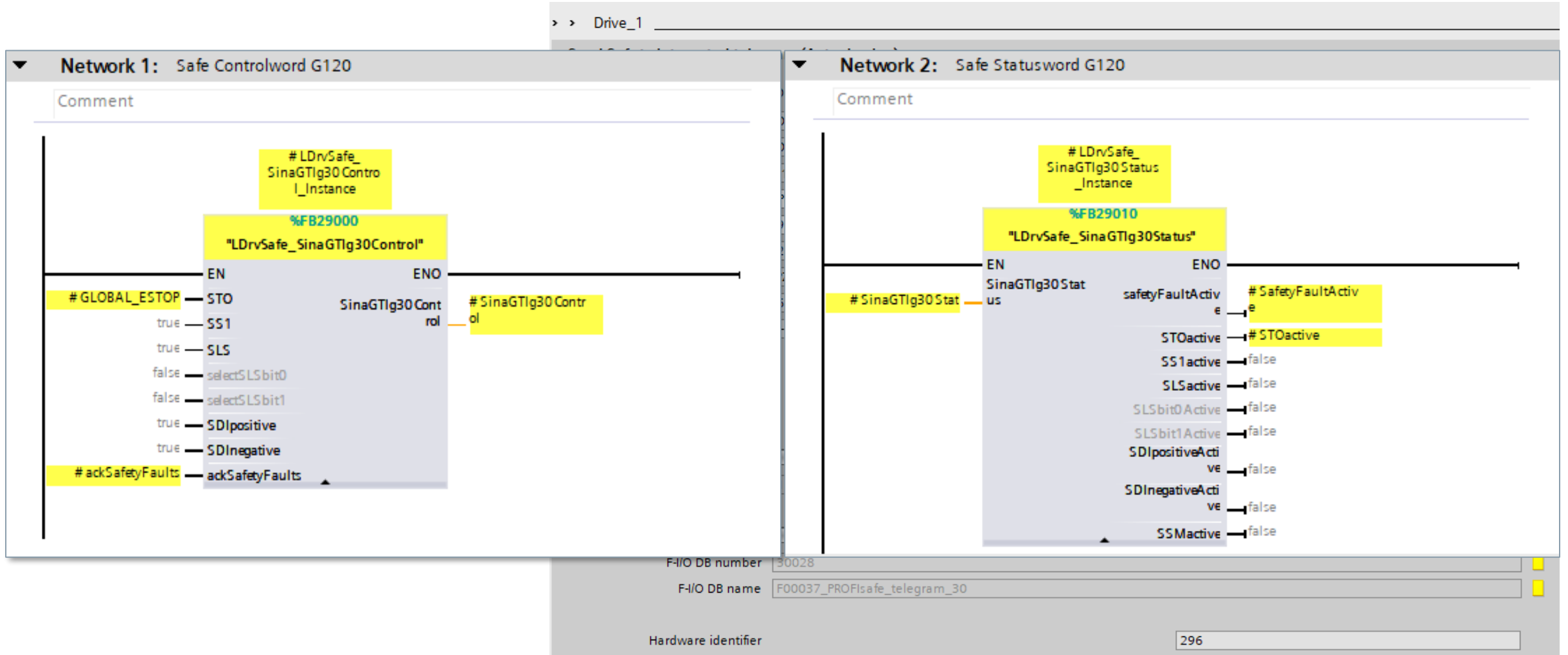
Send Safety Integrated telegram (Actual value)

Drive		→	Partner	
Name	Drive_1		PLC_1	
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Telegram	PROFIsafe telegram 30			
F-address	9		1	
Slot	2			
Start address	PZD 1		I 37	
Length	6 bytes		6 bytes	
Extension	---		---	
Organization block			---	...
Process image			---	...

> > Drive\_1

### Send Safety Integrated telegram (Actual value)

Drive		→	Partner	
Name	Drive_1		PLC_1	
Role	Device		Controller	
IP address	192 . 168 . 0 . 5		192 . 168 . 0 . 1	
Telegram	PROFIsafe telegram 30			
F-address	9		1	
Slot	2			
Start address	PZD 1		I 37	
Length	6 bytes		6 bytes	
Extension	—		—	
Organization block			---	
Process image			---	
<input type="checkbox"/> Manual assignment of the F watchdog time				
F-monitoring time	150 ms			
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F-I/O DB number	30028			
F-I/O DB name	F00037_PROFIsafe_telegram_30			
Hardware identifier			296	



# SINAMICS Startdrive V16

## Feature extension – Acceptance test

The screenshot displays the Siemens SINAMICS Startdrive V16 software interface. The title bar shows the project path: **Siemens - D:\TIA\_Projects\CU310-2\CU310-2**. The menu bar includes Project, Edit, View, Insert, Online, Options, Tools, Window, and Help. The toolbar contains icons for Save project, Go online, Go offline, and a search function labeled "<Search in project>".


The interface is divided into three main sections:

- Project tree (Left):** Shows the project hierarchy. The "CU310-2" folder is expanded, showing "Drive unit\_1 [S120 CU310-2 PN]" and "Acceptance test". The "Acceptance test" folder is selected, showing sub-items: "Drive control", "Drive axis\_1", and "Traces".
- Acceptance test Overview (Middle):** Shows the "Drive axis\_1" sub-item selected. It lists the test steps: "SS1-t", "Result transfer", and "Completion".
- Drive axis\_1 - Function selection (Right):** A panel for selecting functions to be tested. It contains two sections: "Stop functions" and "Brake functions".
  - Stop functions:** Includes "STO" (unchecked) and "SS1-t" (checked). Each function has a corresponding graph showing voltage (V) over time (t) with a yellow shaded area indicating the test range.
  - Brake functions:** Includes "SBC" (unchecked). It also has a corresponding graph showing voltage (V) over time (t) with a yellow shaded area.


# F-runtime group

F-runtime group 1 [RTG1]

**Fail-safe organization block**



Name

Event class 

Number


Cycle time   $\mu\text{s}$


Phase shift   $\mu\text{s}$

Priority

calls →

**Main safety block**



I-DB 

**F-runtime group parameters**


Warn cycle time of the F-runtime group	<input type="text" value="110000"/> $\mu\text{s}$
Maximum cycle time of the F-runtime group	<input type="text" value="120000"/> $\mu\text{s}$
DB for F-runtime group communication	<input type="text" value="(None)"/>
F-runtime group information DB	<input type="text" value="RTG1SysInfo"/>

# F-runtime group

F-runtime group 1 [RTG1]

Fail-safe organization block

Name: FOB\_R

Event class:  Cy

Number: 123

Cycle time: 10000

Phase shift: 0

Priority: 12

F-runtime group parameters

W

Maxim

DB for F-runtime group communication: (none)

F-runtime group information DB: RTG1SysInfo

PLC\_1 [CPU 1516F-3 PN/DP]

General | IO tags | System constants | Texts

General

Fail-safe

F-activation

F-parameters

PROFINET interface [X1]

PROFINET interface [X2]

DP interface [X3]

Startup

Cycle

Communication load

System and clock me...

SIMATIC Memory Card

System diagnostics

F-parameters

F-destination address range for PROFI-safe address type 1

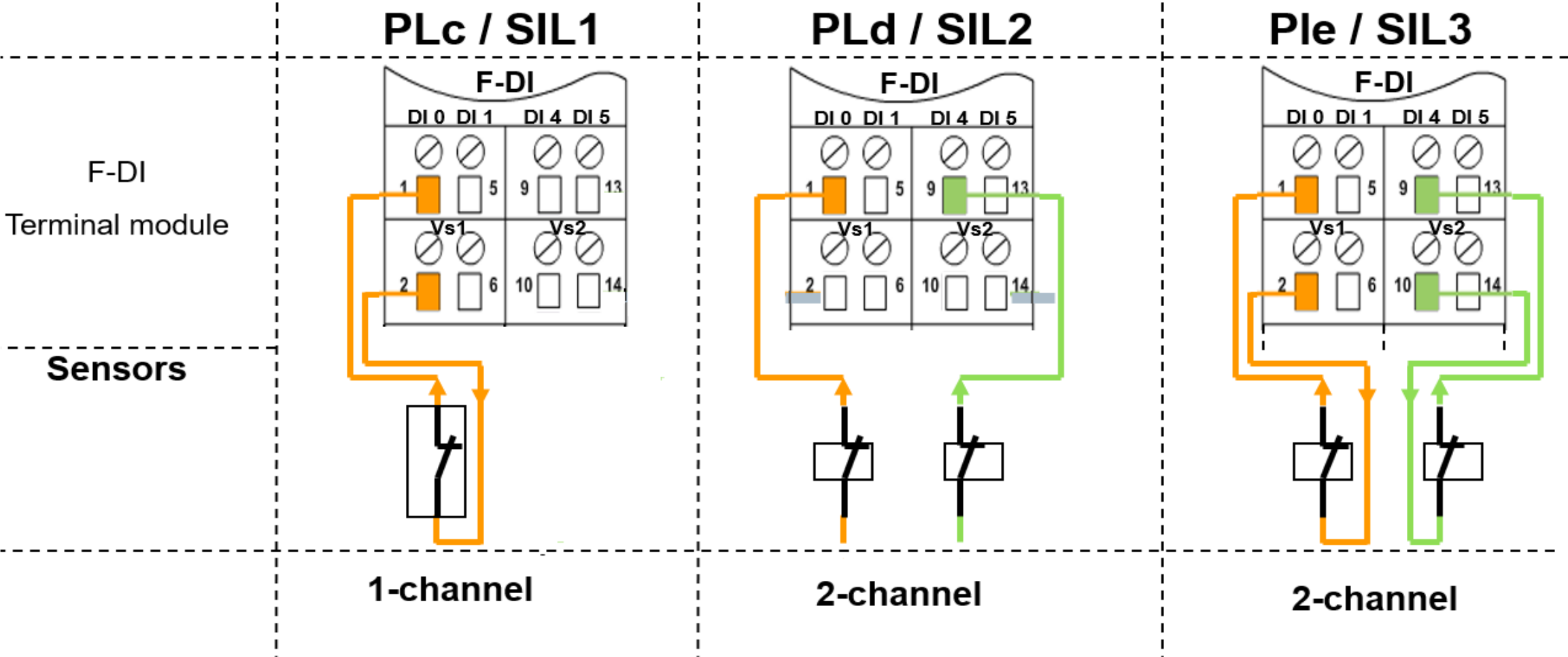
Low limit for F-destination addresses: 1

High limit for F-destination addresses: 99

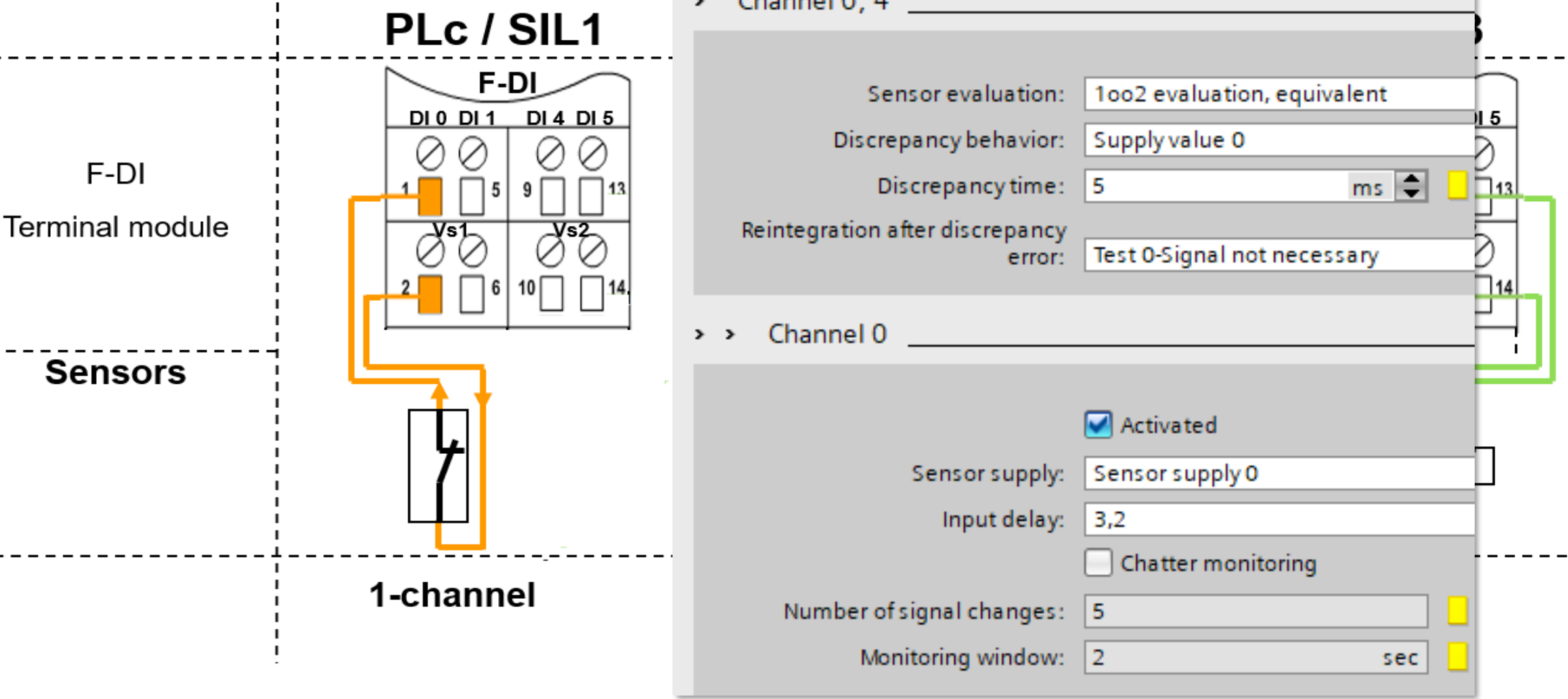
Central F-source address: 1

Default F-monitoring time for central F-I/O: 150 ms














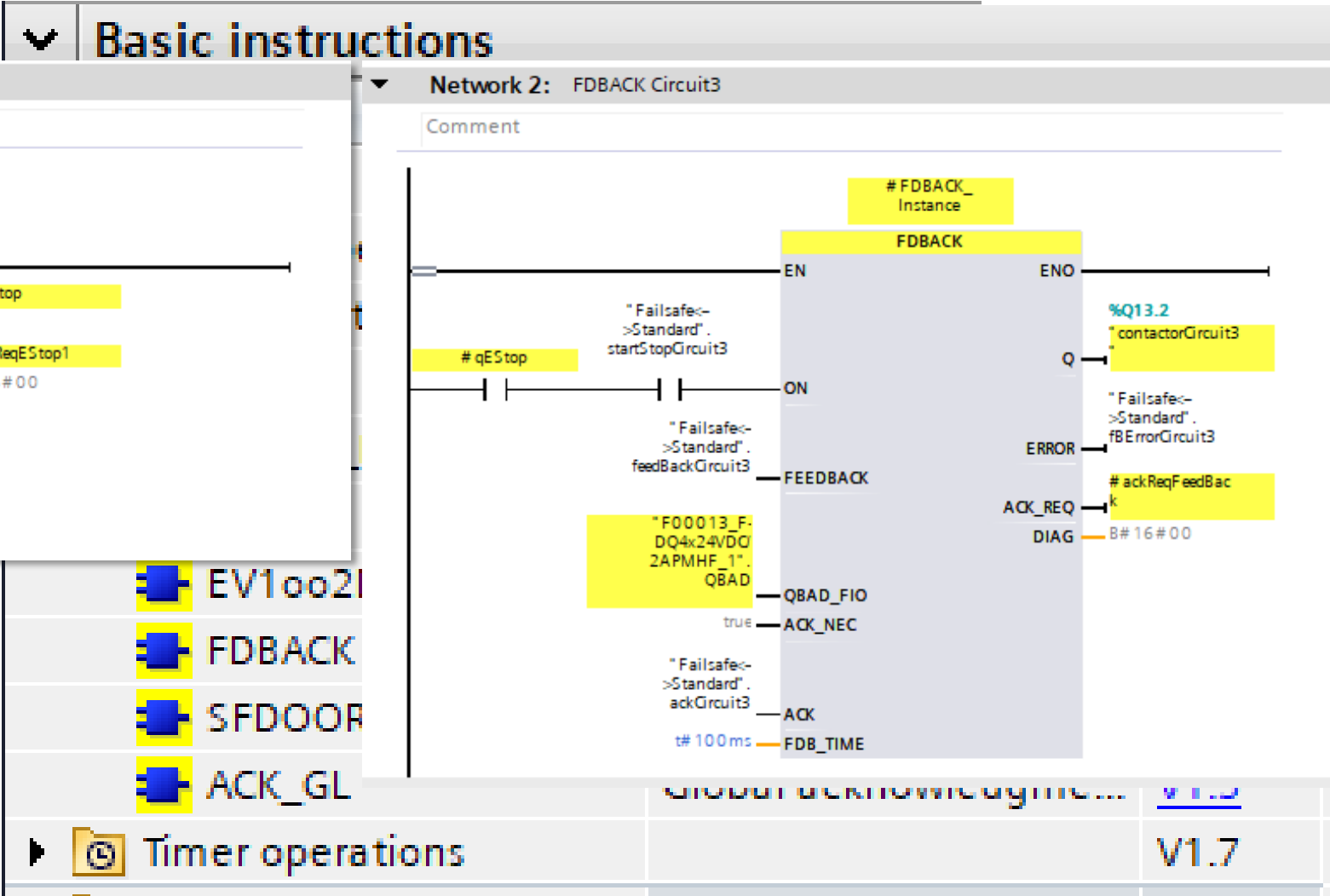


PL / SIL by design



# Safe instructions certified by TÜV

▼ Basic instructions		
Name	Description	Version
▶  General		
▶  Bit logic operations		
▼  Safety functions		V1.8
 ESTOP1	Emergency STOP/emergency stop	<a href="#">V1.6</a>
 TWO_H_EN	Two-hand monitoring ...	<a href="#">V1.3</a>
 MUT_P	Parallel muting	<a href="#">V1.4</a>
 EV1oo2DI	1oo2 evaluation with d...	<a href="#">V1.3</a>
 FDBACK	Feedback monitoring	<a href="#">V1.5</a>
 SFDOOR	Safety door monitoring	<a href="#">V1.3</a>
 ACK_GL	Global acknowledgme...	<a href="#">V1.3</a>
▶  Timer operations		V1.7



# How to get help and information Service og Support



**Safety Integrated  
programming guideline**

**Safety with the S7-1200 FC  
CPU**

**SLS specification via HMI**

**Configuration control with  
safety**

**PROFIsafe address  
assignment**

**Mode selection**

The screenshot shows a 'Filter criteria for entries' dialog box. At the top, there are two radio buttons: 'All Products' (selected) and 'My Products'. Below this is a 'Product tree' section with a dropdown menu currently set to 'All'. To the right of the product tree is a search bar containing the text 'simatic safety' with a magnifying glass icon and a close button. Below the product tree is a 'Product' search field with a magnifying glass icon and a '> Search product' link. To the right of the product search field is a dropdown menu for 'Entry type' which is currently set to 'Application example (728)'. Below the 'Entry type' dropdown is a dropdown menu for 'Example type' which is currently set to 'All'. To the right of the 'Entry type' and 'Example type' dropdowns is a 'Date' section with 'From' and 'To' input fields separated by a hyphen.

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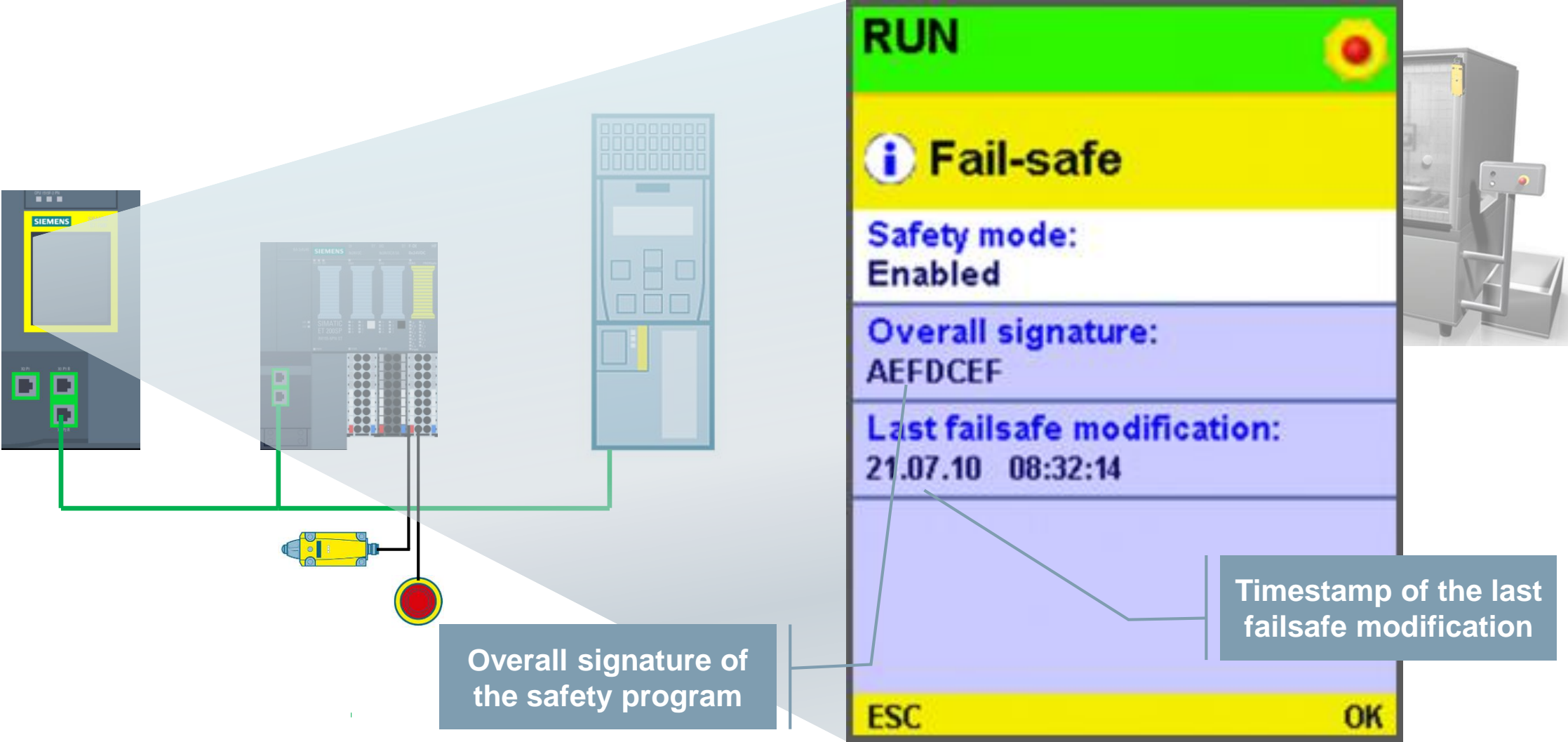


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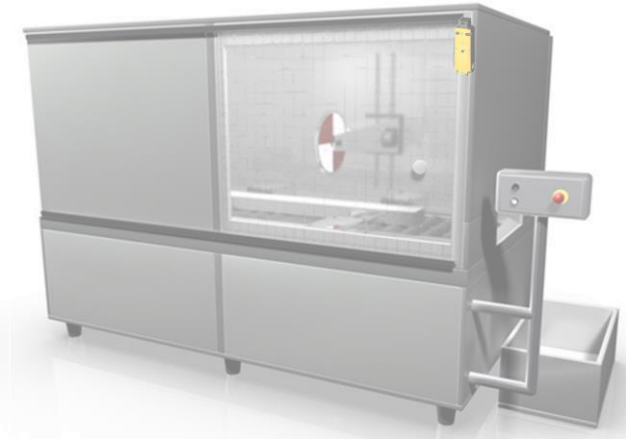
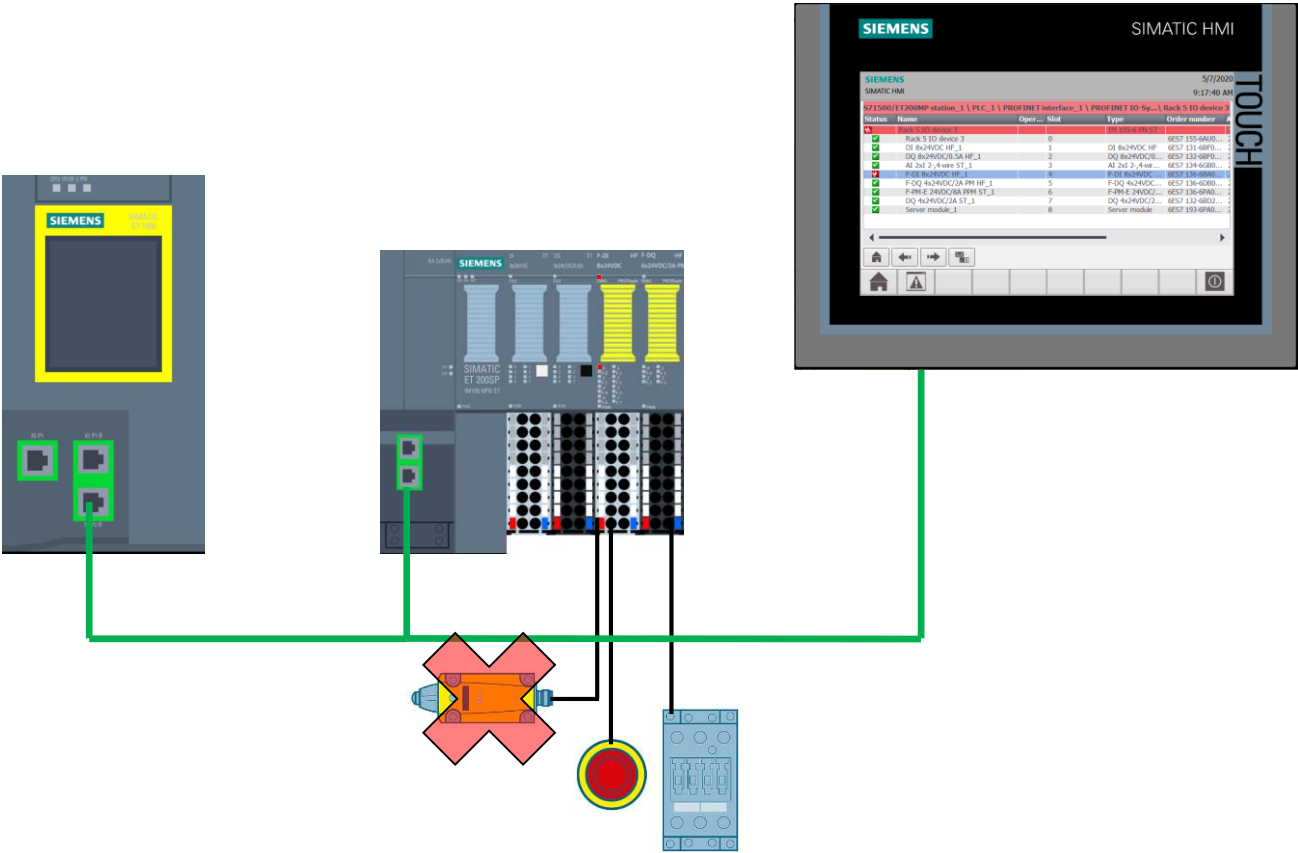


# Display information

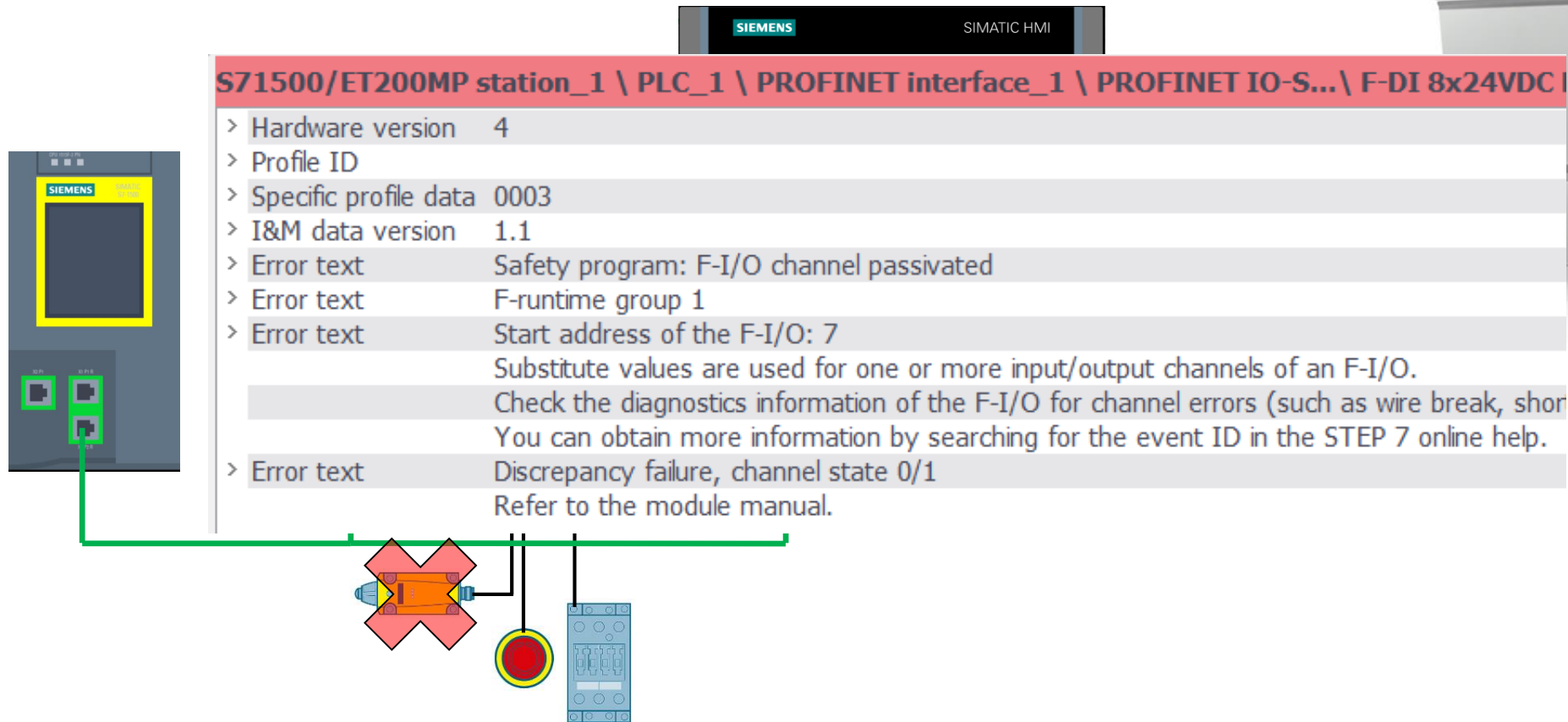


# Diagnostics in clear text

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# Diagnostics in clear text



# Safety functions

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Detection

Evaluation

Reaction



## Risk mitigation

### The checking of safety functions is a **MUST!**

- Prescribed by the standards EN ISO 13849 and EN 62061
- Safety concept must be evaluated and documented by way of the failure probability calculation
- Evaluation possible with SET: ***Safety Evaluation Tool***
- Free use of the online tool

The screenshot displays the Siemens Safety Evaluation Tool (SET) interface. On the left, a tree view shows the project structure under 'Projekte' > 'Eigene Projekte' > 'Projekt' > 'Sicherheitsbereich' > 'ERFASSEN' > 'Sensor-Gruppe'. The main area is titled 'Sensor-Gruppe - ISO 13849-1 - Allgemeine Beschreibung'. It contains several input fields: 'Name' (Sensor-Gruppe), 'Typ' (radio buttons for 'Anwenderdaten notwendig' and 'SIL/PL vorhanden'), 'Hersteller' (Siemens), 'Produktgruppe' (SIRIUS Erfassungsgeräte), 'Produkttyp' (Sicherheits-Positionsschalter mit Zuhaltung), 'Integrierte Kommunikationsanbindung' (ohne), 'Bestellnummer' (3SE53), 'Weitere Bestellnummern', and 'Betätigungen/Testintervall' (1 Pro Stunde). Below this, a section 'Betrachtung der Sicherheitsintegrität nach ISO 13849-1' shows 'CCF Maßnahmen (Punkte)' as ≥ 65 and a 'CCF ermitteln' button. At the bottom, a table 'Betrachtung der Sicherheitsintegrität' shows 'Sicherheitsfunktion' with 'PFHD' values (PL A, PL A, PL A) and 'E-04', 'E-05', 'E-06', 'E-07'.

Sicherheitsfunktion	PFHD	PL A	PL A	PL A	E-04	E-05	E-06	E-07

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## SITRAIN – Digital Industry Academy



### Følg med tiden og hold dig opdateret

Nye teknologier kommer hele tiden til, og det betyder, at vi løbende skal holde os opdateret. Hos SITRAIN kan du finde relevante uddannelser og kurser tilpasset dine og din virksomheds behov.

Du kan se alle vores kurser her og har du spørgsmål er du velkommen til at skrive til os.

[> Kursusliste](#)

Kender du allerede SITRAIN? Kom igang med det samme!

#### SITRAIN open

Siemens Industry Online Support



#### SITRAIN personal

Specifikke kursus tilbud fra Siemens



#### SITRAIN access

Webbaseret træning





## Summary

**SIEMENS**  
*Ingenuity for life*



**Now I am Safe 😊**

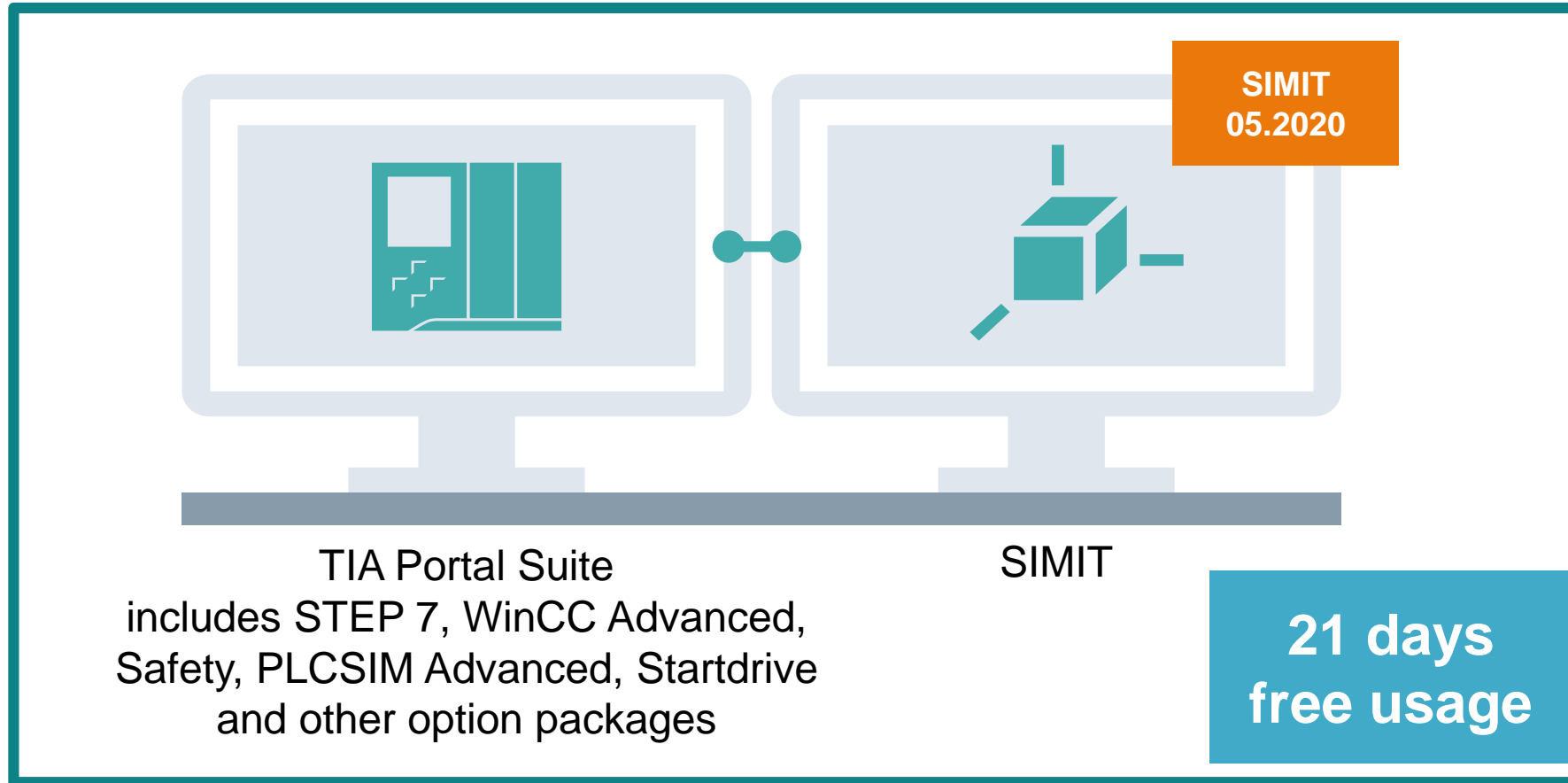
# Maskinsikkerhed med TIA-portalen – integreret og skalerbart



- Hvad er Simatic Safety Integrated?
- Hvordan kan man enkelt integrere safety-funktioner med TIA-portalen
- Eksempler på diagnosemuligheder
- **Bonusinfo**
- Q/A
- Kommende Webinar



# TIA Portal Cloud as TRIAL



## Customers

- Fore registered customers
- Free access via Voucher
- Test your skills
- Try all the Simulators
- No installations is needed
- All necessary updates is included

[www.siemens.com/simulation-cloud](http://www.siemens.com/simulation-cloud)

# TIA Portal Cloud as TRIAL

## How does it work (based on time limited Voucher)?

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### 1 Sign-up and register on website



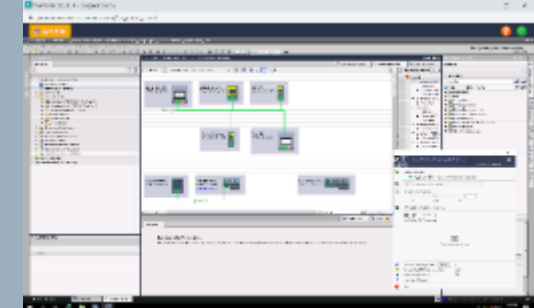
- ✓ DAMEX approval (Product and Customer)
- ✓ Terms & Conditions by User
- ✓ Creates and sends voucher with link to SISC
- ✓ User upgrades Account with Voucher credentials in SISC

### 2 Launch Industry Premium Portal



- ✓ Login with standard web browser
- ✓ Terms & Conditions (before use)
- ✓ No productive usage – only **TRIAL**

### 3 21 days free use



- ✓ TIA Portal V15.1 / V16
- ✓ WinCC Unified PC
- ✓ PLCSIM Advanced
- ✓ SIMIT (05/2020)

## Yderligere information



Gense webinar og download materiale på

[www.siemens.dk/di-webinarer](http://www.siemens.dk/di-webinarer)

Find tips og trick på YouTube

## Kontakt

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