

# SIMATIC Safety Integrated

for Factory Automation

# SIMATIC Safety Integrated

## For all industrial environments

Introduction

Concept

PROFIsafe

Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information

Safe und high available  
Main focus: process automation

Controller

- CPU 412H
- CPU 414H
- CPU 417H



Engineering

- CFC, Safety Matrix

Fail-safe  
Main focus: factory automation

Controller

for PROFIBUS

- ET 200S F-CPU
- CPU 315F/317F/319F
- CPU 416F



for PROFINET

- CPU 315/317F/319F
- CPU 416F

Engineering

- FUP, KOP

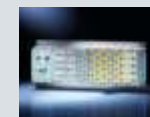
PROFIBUS with PROFIsafe-Profile

PROFINET with PROFIsafe-Profile

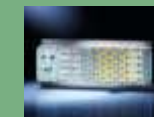
Actors  
Sensors



ET 200M ET 200eco ET 200S ET 200pro



ET 200S ET 200pro



Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

# The concept



# SIMATIC Safety Integrated

## The concept

Introduction

Concept

PROFIsafe

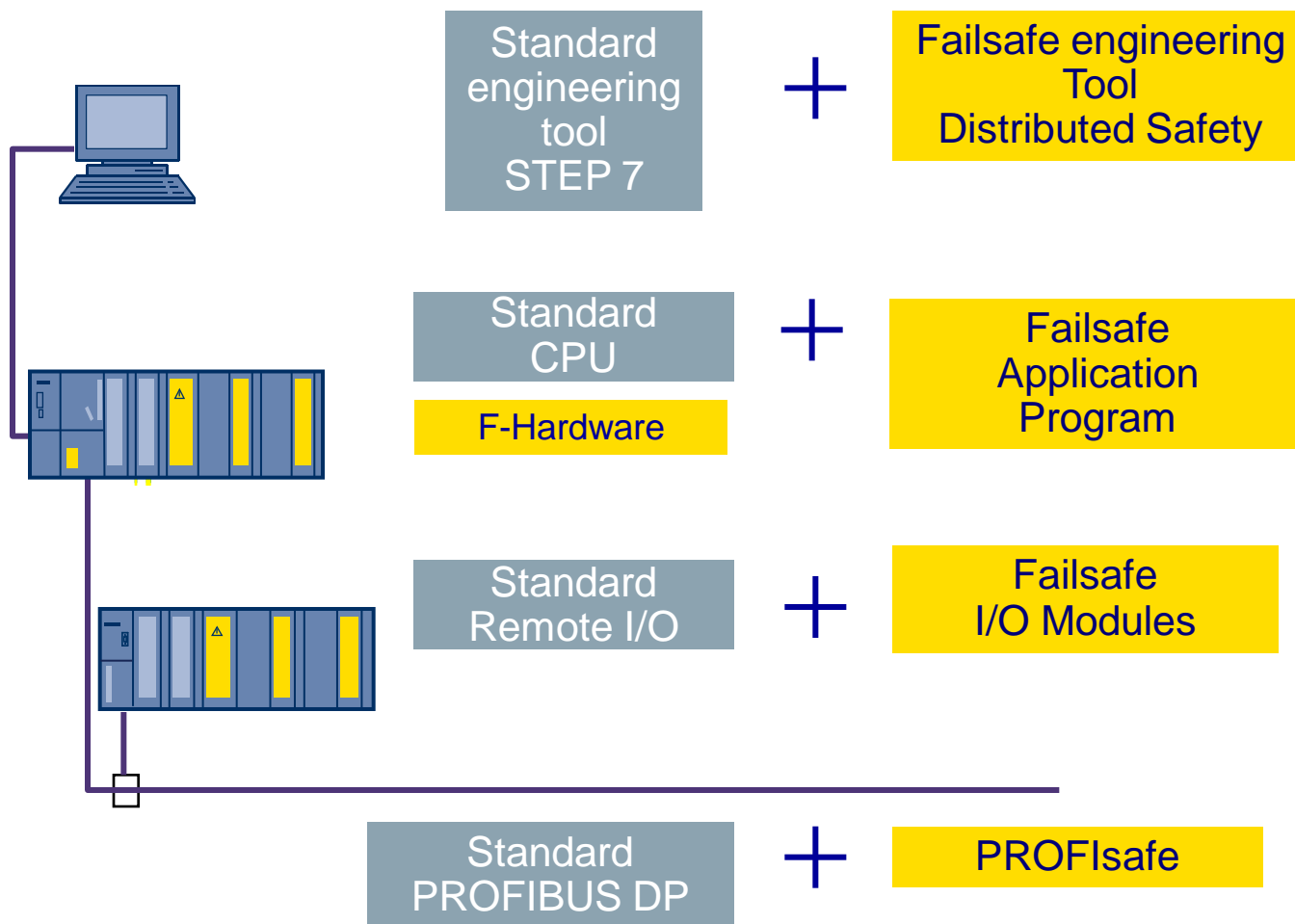
Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information



# SIMATIC Safety Integrated

## The concept

Introduction

Concept

PROFIsafe

Configurations

Product overview

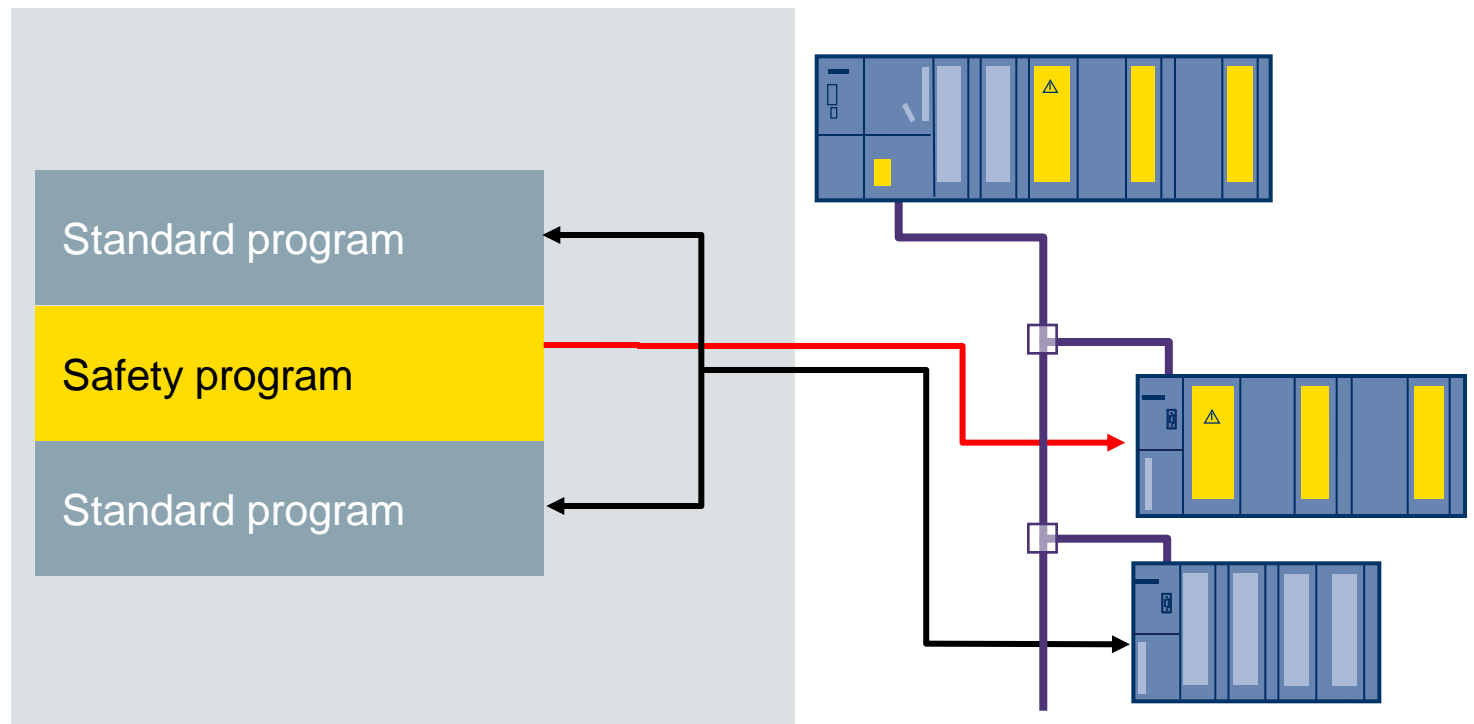
Periphery connection

S7 Distributed Safety

Further Information

Coexistence of standard program and safety-related program on one CPU

- Changes to the standard program have no effect on the integrity of the safety-related program section



Back-up

Industry Sector

# SIMATIC Safety Integrated

## The concept

Introduction

Concept

PROFIsafe

Configurations

Product overview

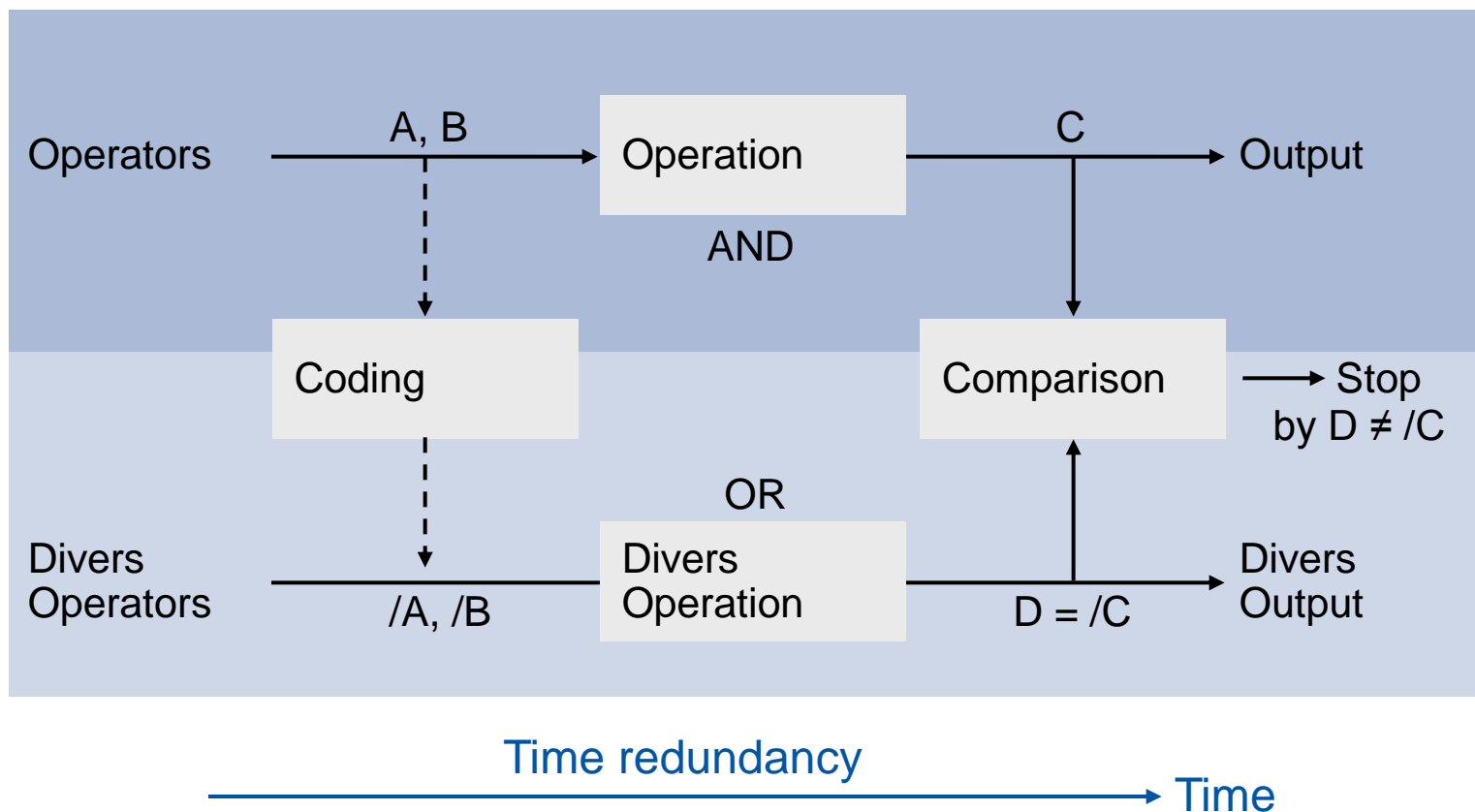
Periphery connection

S7 Distributed Safety

Further Information

### Coded Processing

Time redundancy and diversity replace complete redundancy



# SIMATIC Safety Integrated

## The concept

Introduction

Concept

PROFIsafe

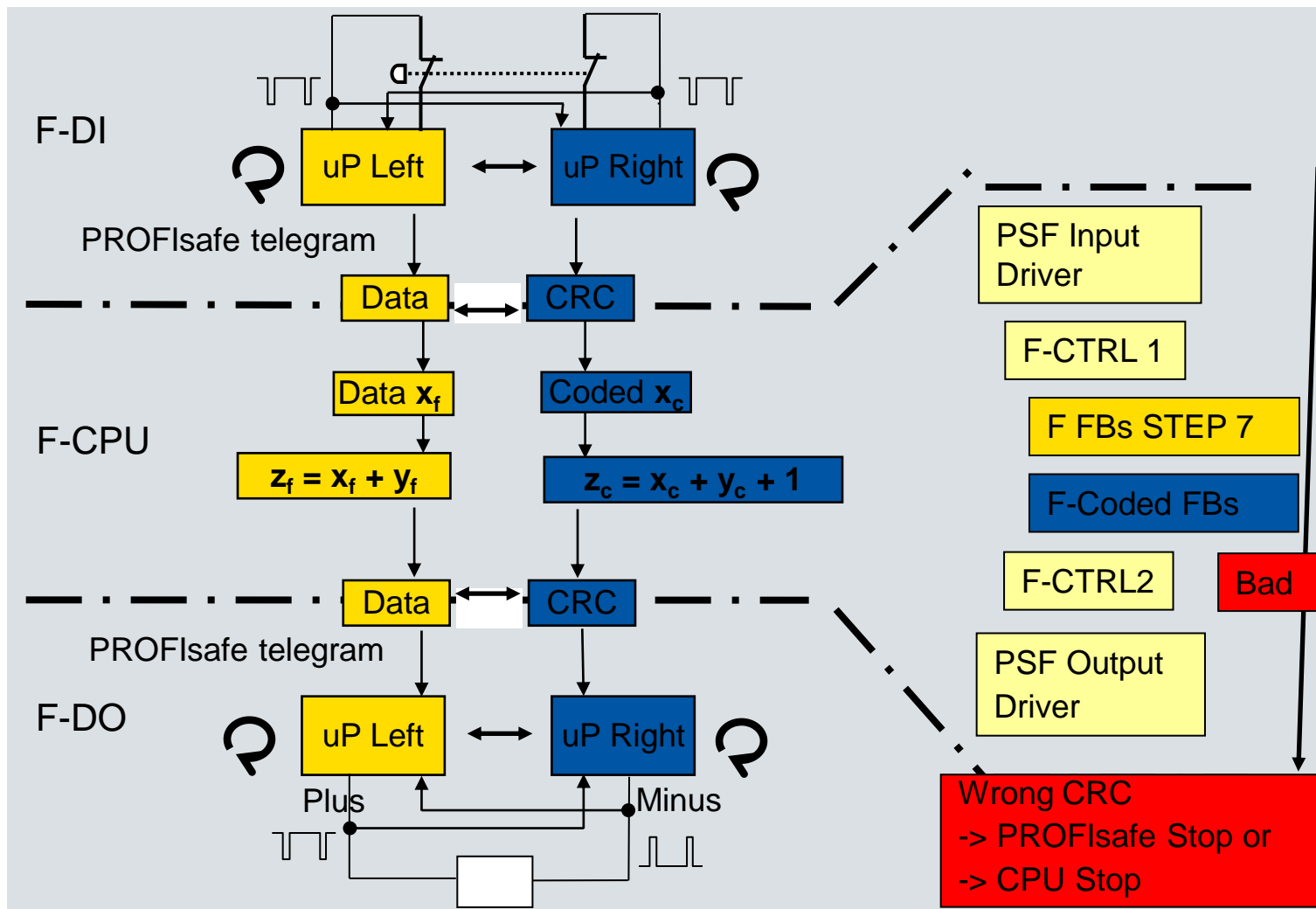
Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information



Introduction

Concept

**PROFIsafe**

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

# PROFIsafe





# PROFIsafe Introduction

Introduction

Concept

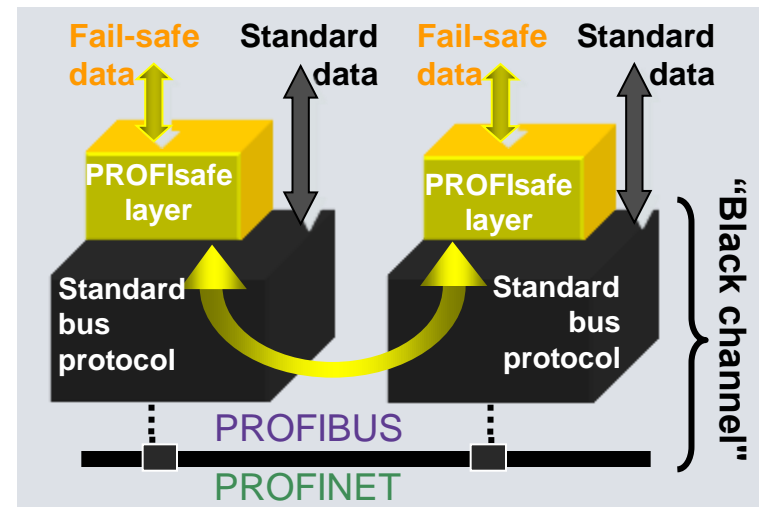
PROFIsafe

Configurations

Product  
overviewPeriphery  
connectionS7 Distributed  
SafetyFurther  
Information

## Safety-oriented communication via PROFIsafe-Profile

- First standard of communication in accordance with safety standard IEC 61508
- PROFIsafe-Profile supports the safe communication for the open standard bus PROFIBUS and PROFINET
- The PROFIsafe-Profile meets possible faults like address adulteration, deceleration, data loss with
  - Serial numeration of PROFIsafe-telegram
  - Time monitoring
  - Authenticity monitoring via unique addresses
  - Optimized CRC-checking



PROFIsafe supports standard- and failsafe  
Communication by one medium

# PROFIsafe PROFIsafe Specification V2.0

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

## Overview: Possible Errors and detection mechanism

Remedy:	Consecutive Number	Time Out with Receipt	Codename for Sender and Receiver	Data Consistency Check
Failure type:				
Repetition	✓			
Deletion	✓	✓		
Insertion	✓	✓	✓	
Resequencing	✓			
Data Corruption				✓
Delay		✓		
Masquerade (standard message mimics failsafe)		✓	✓	✓
Revolving memory failure within switches	✓			

# PROFIsafe PROFIsafe Specification V2.0

Introduction

Concept

PROFIsafe

Configurations

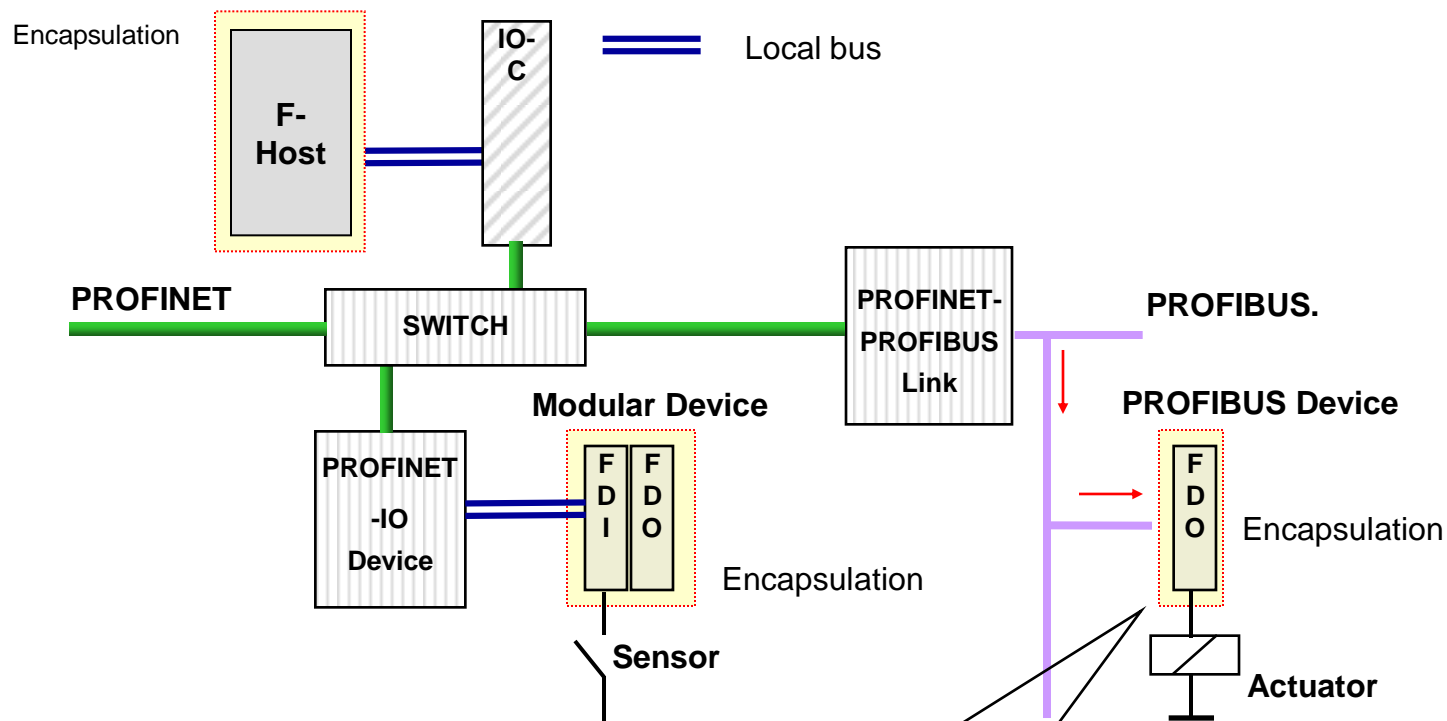
Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

Which protocol must be supported ?



F-DI      Fail-safe digital input  
F-DO      Fail-safe digital output  
IO-C      PROFINET IO-Controller

Zur sicheren Kommunikation muss auch der PROFIBUS Teilnehmer die möglichen Fehler des Switches beherrschen

# PROFIsafe PROFIsafe Specification V2.0



Introduction

Concept

**PROFIsafe**

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

Which protocol version applies when ?

- Goal: 100% compability
  - A PROFIsafe slave which supports the v2 mode must be able to replace an older version of this PROFIsafe slave which only supports the v1 mode without the need of any adaption

<b>PROFIsafe V2 Slave used in</b>	<b>Protocol with 8Bit-Counter (= PROFIsafe V1 mode)</b>	<b>Protocol with 24Bit-Counter (= PROFIsafe V2 mode)</b>
<b>PROFIBUS network only</b>	mandatory	mandatory
<b>PROFINET network only</b>	-	mandatory
<b>PROFIBUS / PROFINET network</b>	mandatory	mandatory

# PROFIsafe PROFIsafe Specification V2.0

Introduction

Concept

PROFIsafe

Configurations

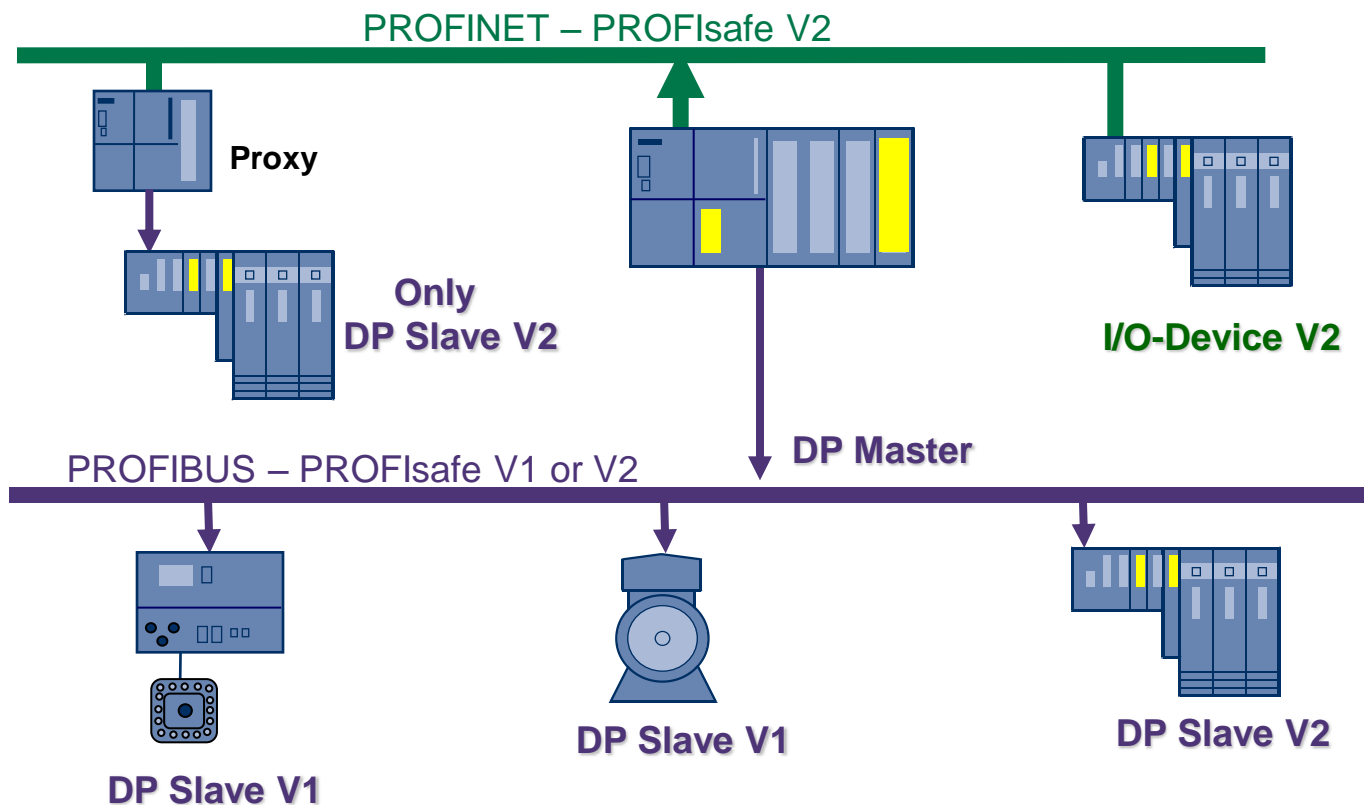
Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

Which protocol version applies when ?



V1 = PROFIsafe Profil V1  
V2 = PROFIsafe Profil V2

Introduction

Concept

PROFIsafe

**Configurations**

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

# Configurations



# Configurations Non-Safety and Safety in one System

Introduction

Concept

PROFIsafe

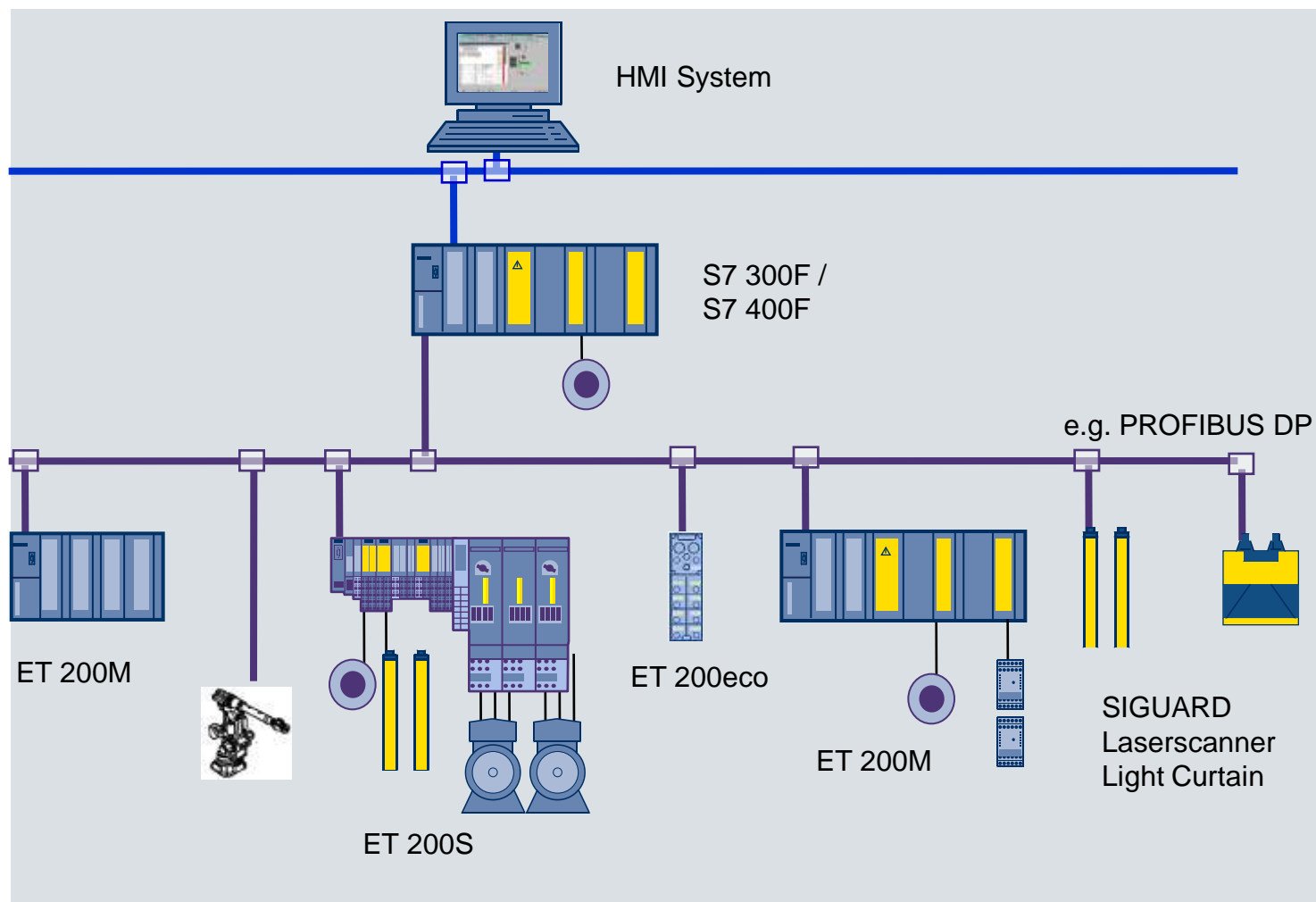
Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information



# Configurations Non-Safety und Safety in seperated PLCs

Introduction

Concept

PROFIsafe

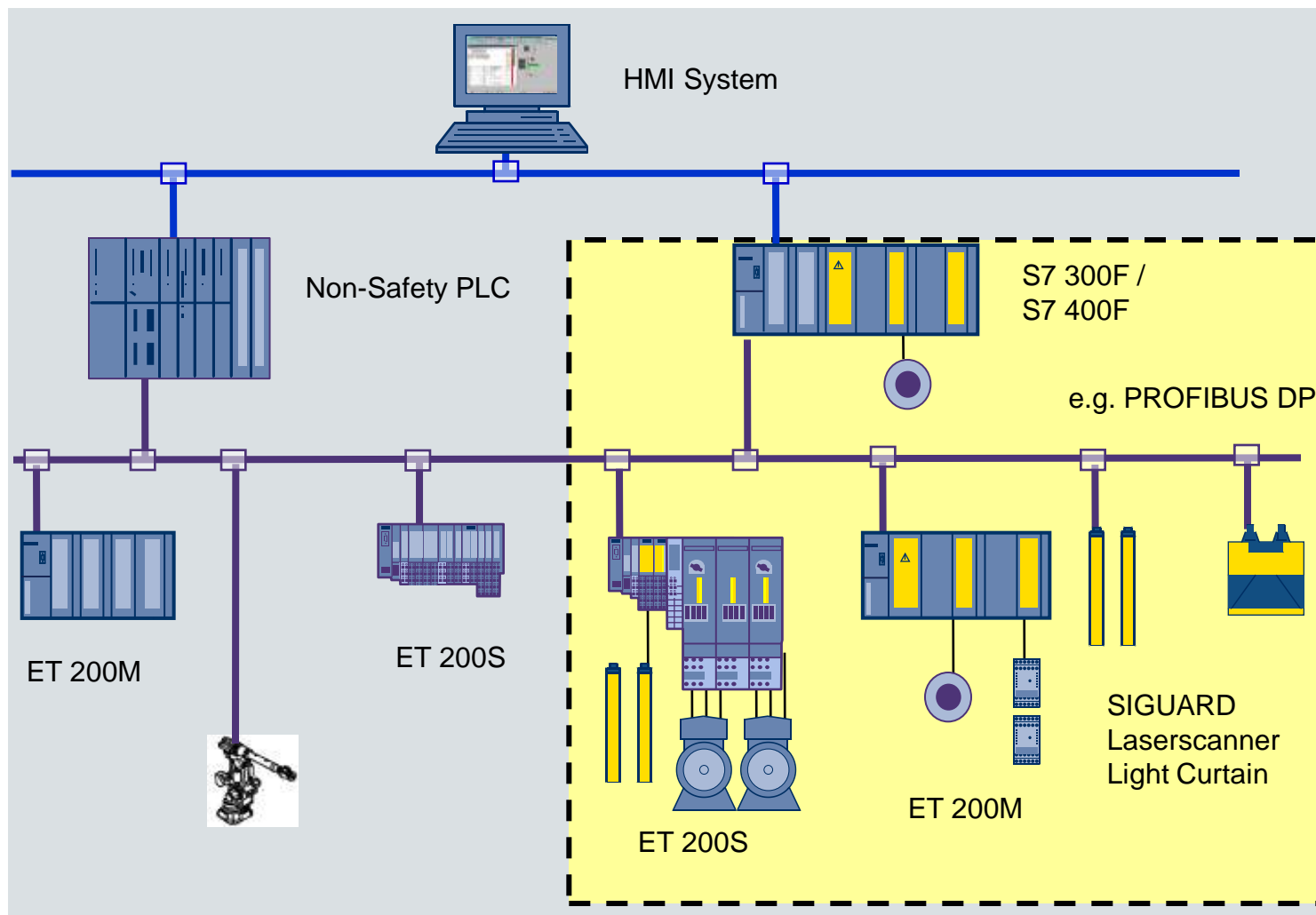
Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information





# Configurations Non-Safety und Safety in seperated Systems

Introduction

Concept

PROFIsafe

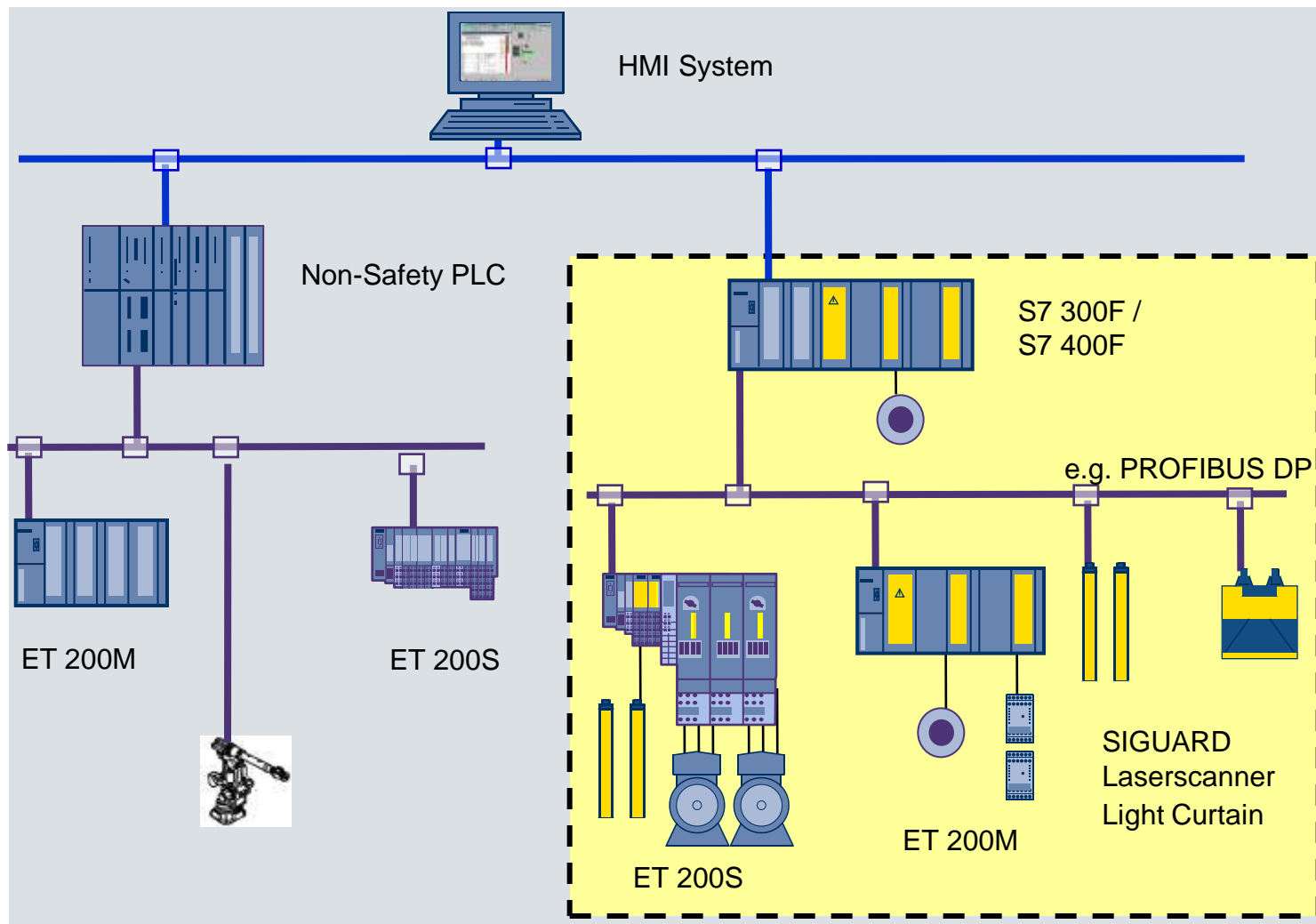
Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information



Industry Sector

# Configurations

## Decentralized approach

Introduction

Concept

PROFIsafe

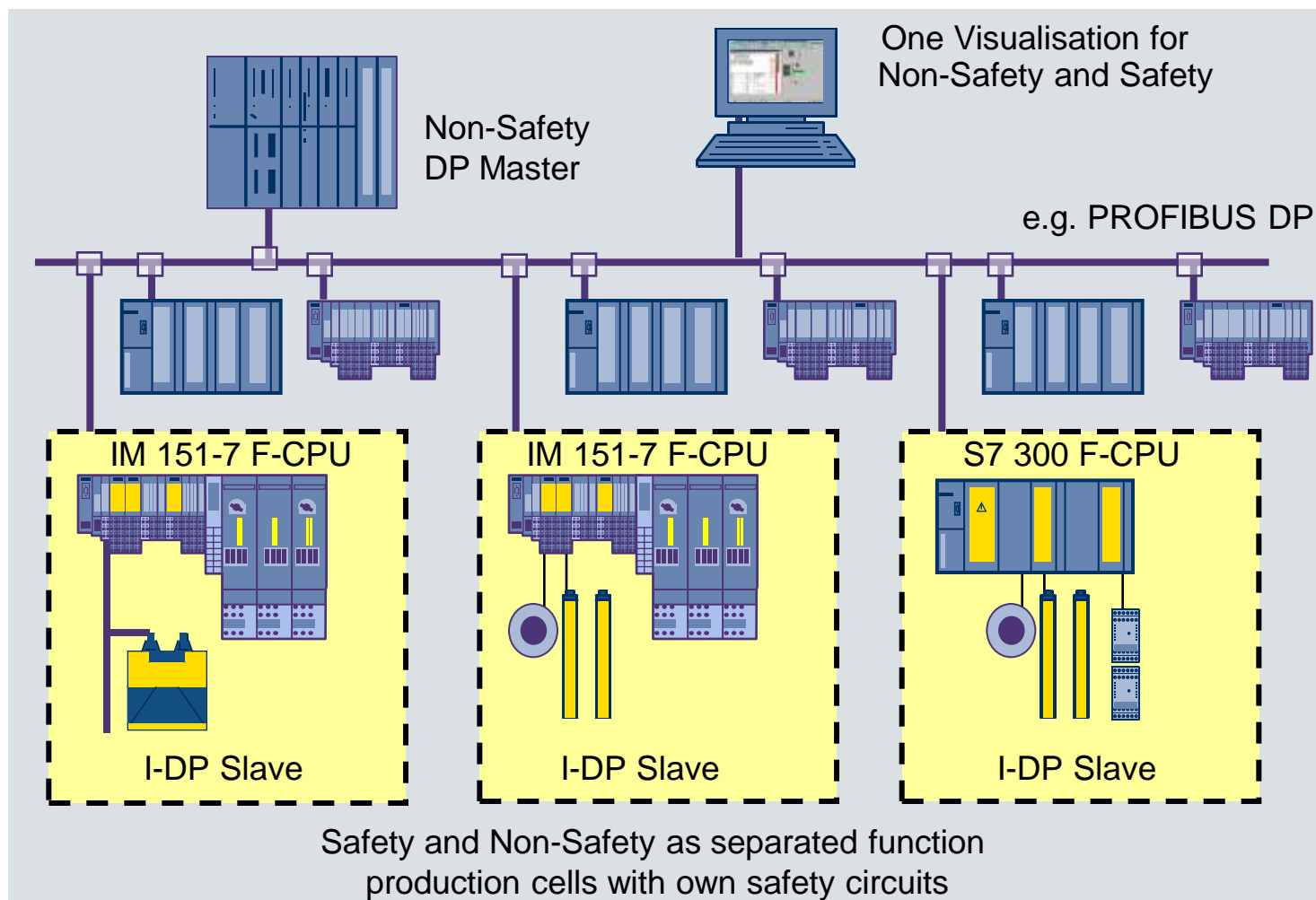
Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information



Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

# Product overview



# SIMATIC Safety Integrated Controller for Factory Automation

Introduction

Concept

PROFIsafe

Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information



# SIMATIC Safety Integrated controllers for Factory automation

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

Use of centralized and distributed ET 200S, ET 200M, ET 200pro and ET 200eco I/O with PROFIsafe

Programming with standard-STEP 7 in FBD and LAD

- Block library with examples certified by German Technical Inspectorate (TÜV) (S7 Distributed Safety)

Compliance with all essential safety standards

TÜV Certificate No.: Z2 02 03 20411 009

- EN 954 (to Category 4)
- IEC 61508 (to SIL 3)
- IEC 62061 (to SIL 3)
- UL 1998, UL 508 and UL 991
- NFPA 79-2002 (US) and NFPA 85 (US)



# SIMATIC Safety Integrated Controller For factory automation

Introduction

Concept

PROFIsafe

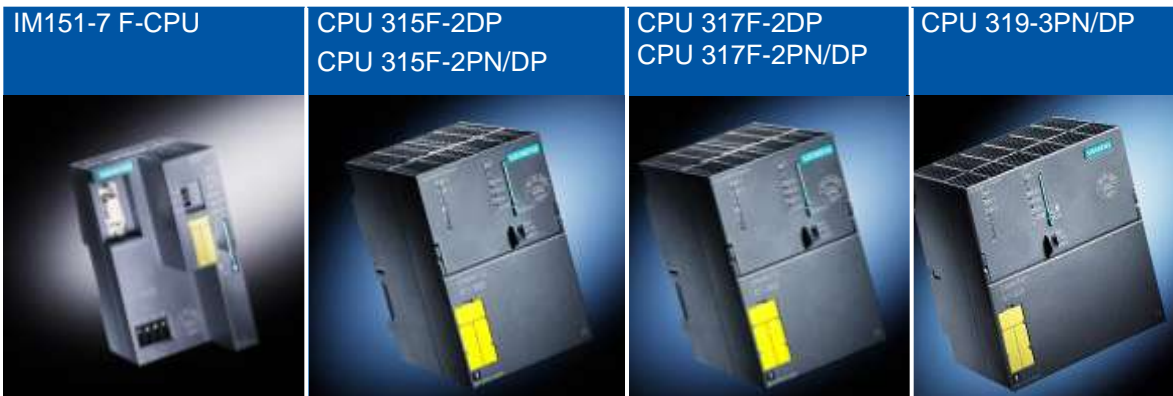
Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information



	IM151-7 F-CPU	CPU 315F-2DP CPU 315F-2PN/DP	CPU 317F-2DP CPU 317F-2PN/DP	CPU 319-3PN/DP
Work memory	128 kB	192 kB (2DP) 256 kB (2PN/DP)	1 MB	1,4 MB
Load memory (plug in)	64kB* – 8 MB	64kB* – 8 MB	64kB* – 8 MB	64kB* – 8 MB
Process image PII/PIO	128 Byte	384 Byte	2048 Byte	2048 Byte
FB/FC/DB	1024/1024/511	2048/2048/1023	2048/2048/ 2047	2048/2048/ 4095
Bit memories	2048 Bit	16 kBit	32 kBit	64 kBit

\* integrated

# SIMATIC Safety Integrated Controller For Factory Automation

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

CPU 416F-2



CPU 416F-3PN/DP



Work memory	5,6 MB	11,2 MB
Load memory (plug in)	1 MB*– 64 MB	1MB*– 64 MB
Process image PII/PIO	16 kB	16 kB
FB/FC/DB	5000/5000/ 10000	5000/5000/ 10000
* Bit memories	128 kBit	128 kBit

# Fail-safe ET 200S I/O

## The range at a glance

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information

### SIMATIC PROFIsafe-Modules

- Observing the discrepancy, short circuit/cross circuit and wire break observing on board
- Parameterization with STEP 7



Fail-safe periphery	DI	DO	DI / DO	AI	Relay/Switch	Motor starter	Frequency-converter	Properties
ET 200M	X	X		X	--	--	--	The modular I/O for multi-channel applications with up to 24 channels per module
ET 200S	X	X	X	--	X	X	X	The bit-modular I/O with up to eight channels per module
ET 200pro	X	--	X	--	X	(x)	X <sup>1)</sup>	The modular, multifunctional I/O in high degree of protection IP 65/67
ET 200eco	X	--	--	--	--	--	--	The low-cost block peripheral device in high degree of protection IP 65/67

X<sup>1)</sup> in preparation

(x) in conjunction with F-Switch PROFIsafe and Disconnecting Module ASM-400V

Industry Sector



# Fail-safe ET 200S I/O

## The range at a glance

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

- For centralized expansion of the ET 200S F-CPU
- For distributed expansion of ET 200S F-CPU, S7-300F, S7-400F, S7-400FH

→ Supported safety related busses

- PROFIBUS via IM151-1 HF
- PROFINET via
  - IM151-3 PN HF with integrated 2-port switch
  - IM 151-3 PN FO (Plastic optical fiber)



Digital inputs/outputs	For connecting digital sensors/encoders and/or loads/actuators
Power modules	For monitoring and short-circuit protection of the load and sensor supply voltages
Fail-safe motor starters	In the event of E-STOP the motor starters assigned switch off selective and supervised
Fail-safe frequency converters	For "Safe Standstill", "Safe Brake Ramp" and "Safely Reduced Speed"

# Fail-safe ET 200S I/O Input/output modules and power modules

- Introduction
- Concept
- PROFIsafe
- Configurations

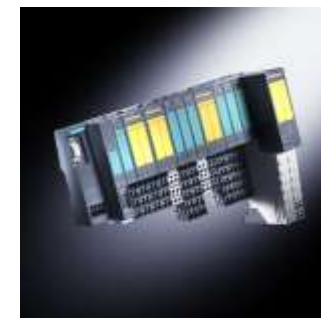
Product overview

Periphery connection

S7 Distributed Safety

Further Information

- F-DI and F-DO for connecting digital sensors/actuators and/or loads/actuators



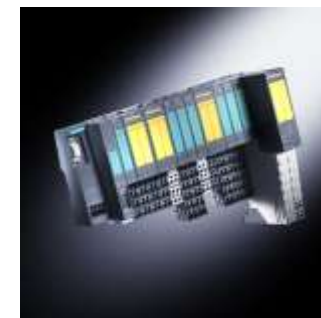
Module	Properties
4/8 F-DI DC 24V	<ul style="list-style-type: none"> <li>▪ 4 x 2-channel inputs, SIL 3/Cat. 4/PL e or 8 x 1-channel inputs, SIL 2/ PL d</li> </ul>
4 F-DO DC 24V/2A	<ul style="list-style-type: none"> <li>▪ 4 channels source/sink output, SIL 3/Cat. 4/ PL e</li> <li>▪ Access of muting-monitors</li> </ul>
1 F-RO DC 24V/5A AC24..230V/5A	<ul style="list-style-type: none"> <li>▪ Fail-safe relay module</li> <li>▪ 1 x relay output 5 A/ 230V for SIL 3/Cat.4/ PL e (requires FDO for controlling)</li> </ul>
EM 4 F-DI / 3 F-DO DC24V/2A	<ul style="list-style-type: none"> <li>▪ I/O-modul for SIL 2/Cat.3/PL d</li> <li>▪ 3 channel output; max. 4A; P-M-switching</li> <li>▪ 4 channel input; L+: 24 V</li> <li>▪ Flexible use up to SIL 2/Kat.3/PL d</li> </ul>

# Fail-safe ET 200S I/O

## Input/output modules and power modules

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview**
- Periphery connection
- S7 Distributed Safety
- Further Information

- Power modules for monitoring and securing the load and encoder supply voltages



Module	Properties
PM-E F DC24 V (P-M-switching)	<ul style="list-style-type: none"> <li>▪ 2 channels source/sink output, SIL 3/Cat. 4/ PL e</li> <li>▪ Safety relay 10A, SIL 3/Cat. 4/PL e</li> <li>▪ Safety-related shutdown of standard DO, Cat. 3/PL d</li> </ul>
PM-E F DC24 V (P-P-switching)	<ul style="list-style-type: none"> <li>▪ Safety relay 10A , SIL 3/Cat. 4/ PL d</li> <li>▪ Safety-related shutdown of standard DO up to Cat. 3/PL d</li> </ul>

# Fail-safe ET 200S I/O Motor starters

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information

- No external feeder contactor required
- Diagnostics (short-circuit, temperature)
- Parameterization functions for simple commissioning



Modules	Properties
PM-DF PROFIsafe	<ul style="list-style-type: none"> <li>▪ 6 fail-safe shutdown groups SIL 3/Cat. 4/ PL e</li> <li>▪ Status display per fail-safe shutdown group</li> <li>▪ Diagnostics (short-circuit, temperature)</li> </ul>
F CM	<ul style="list-style-type: none"> <li>▪ 4 x 2 safe contact multiplier, SIL 3/Cat. 4/PL e</li> <li>▪ Must be combined with PM-D F / PM-D FX1</li> </ul>
F direct starter	<ul style="list-style-type: none"> <li>▪ Switching capacity to 7.5 kW (16A)</li> <li>▪ Intrinsically safe to Cat. 4/ PL e</li> <li>▪ 1 direction of rotation</li> </ul>
F reversing starter	<ul style="list-style-type: none"> <li>▪ Switching capacity to 7.5 kW (16A)</li> <li>▪ Intrinsically safe to Cat. 4/PL e</li> <li>▪ 2 directions of rotation</li> </ul>

# Fail-safe ET 200S I/O Frequency converter

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

- Safe standstill
- Safe brake ramp
- Safely reduced speed

Certified by German Institute for Occupational Safety (BIA) and fulfill the requirements of Category 3 acc. to EN 954-1 and SIL 2 of IEC61508



Modules	Properties
PM-D F X1, PM-DF PROFIsafe	<ul style="list-style-type: none"> <li>▪ 6 fail-safe shutdown groups SIL 3/Cat. 4/PL e</li> <li>▪ Status display for each fail-safe shutdown group</li> <li>▪ Diagnostics: Short-circuit, over temperature, parameterization error</li> </ul>
ICU24F	<ul style="list-style-type: none"> <li>▪ Control unit of the ET 200S FC frequency converter with integrated safety functions</li> <li>▪ Closed-loop vector control</li> <li>▪ Evaluable speed encoder &amp; temperature sensors</li> <li>▪ Slot for an optional Micro Memory Card (MMC)</li> </ul>
IPM25	<ul style="list-style-type: none"> <li>▪ Available power ratings: 0.75 kW, 2.2 kW, 4.0 kW</li> <li>▪ Line-commutated regenerative feedback</li> </ul>

# Fail-safe ET 200M I/O

## The range at a glance

Introduction

Concept

PROFIsafe

Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further information

- For centralized expansion of the S7-300F
- For distributed expansion of S7-300F, S7-400F, S7-400FH
- Supported safety related busses
  - PROFIBUS via IM153-2 HF resp. IM153 FO HF



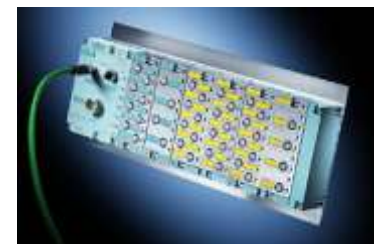
Module	Properties
SM 326 DI 24 24V DC	12 x 2-channel inputs, SIL 3/Cat./PL e 4 or 24 x 1-channel inputs, SIL 2/PL d
SM 326 DO 10 24V DC/2A	10 x channel outputs, SIL 3/Cat. 4/PL e, P-P switching
SM 326 D0 8 PM	8 x channel outputs, SIL 3/Cat. 4/PL e, P-M switching
SM 336 AI 6 13 bits	6 x 2-channel inputs, SIL 3/Cat. 4/PL e, 0-20mA
SM 326 DI 8NAMUR	4 x 2-channel inputs, SIL 3/Cat. 4/PL e or 8 x 1-channel inputs, SIL 2/PL d
Isolating module	Galvanic isolation between F and standard modules for SIL 3/Cat. 4/PL e

# Fail-safe ET 200pro I/O

## The range at a glance

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information

- For distributed expansion of ET 200S F-CPU, S7-300F und S7-400F
- Supported safety related busses
  - PROFIBUS via IM 154-2 DP HF
  - PROFINET via IM 154-4 PN HF
- Cabinet-free application due to high degree of protection IP65/67



Digital inputs/outputs	For connecting digital sensors/encoders and/or loads/actuators
Power modules	For monitoring and short-circuit protection of the load and sensor supply voltages
Motor starters	Motor starters up to 5,5 kW switching capacity in conjunction with F-Switch PROFIsafe and Disconnecting Module ASM-400V
Fail-safe frequency converters	For "Safe Standstill", "Safe Brake Ramp" and "Safely Reduced Speed" (in preparation)

# Fail-safe ET 200pro I/O Input/output modules

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information

- F-DI and F-DO for the connection of digital sensors/encoders



Module	Properties
EM 16/8 F-DI	<ul style="list-style-type: none"> <li>▪ 8x2-channel inputs, SIL 3/Cat.4/PL e or 16x1-channel inputs, SIL 2/Cat.3/PL d</li> <li>- <b>Rated input voltage 24V DC</b></li> <li>- <b>2 short circuit proof supply</b></li> </ul>
EM 8/4 F-DI/F-DO	<ul style="list-style-type: none"> <li>▪ 4x2-channel inputs, SIL 3/Cat.4/PL e or 8x1-channel inputs, SIL 2/Cat.3/PL d</li> <li>▪ 4xP-M-switching outputs, SIL 3/Cat.4/PL e</li> <li>- <b>Output current 2A</b></li> <li>- <b>Voltage 24V DC</b></li> </ul>



# Fail-safe ET 200pro I/O Motor starter and F-Switch 1(2)

- Introduction
- Concept
- PROFIsafe
- Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information

- No external feeder contactor required
- Diagnostics (short-circuit, temperature)
- Parameterization functions for simple commissioning



Module	Properties
Motor starter	<p>Motor starters up to 5,5 kW switching capacity</p> <ul style="list-style-type: none"> <li>▪ All settings can be parameterized by bus</li> <li>▪ Comprehensive diagnostics signals</li> <li>▪ Overload can be acknowledged by remote reset</li> <li>▪ Current unbalance monitoring</li> <li>▪ Stall protection</li> <li>▪ Emergency start function in the event of overload</li> <li>▪ Current value transmission by bus</li> <li>▪ Current limit monitoring</li> <li>▪ Direct-on-line or reversing starters</li> <li>▪ 25 A per segment</li> <li>▪ Supplied with 400 V AC brake contact as an option</li> </ul>

# Fail-safe ET 200pro I/O Motor starter and F-Switch 2 (2)



- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview**
- Periphery connection
- S7 Distributed Safety
- Further Information

Module	Properties
F-Switch PROFIsafe	<ul style="list-style-type: none"> <li>▪ 3 x P-P-switching source/sink output, SIL 3/Cat. 4/ PL e                             <ul style="list-style-type: none"> <li>▪ Permits safe disconnection of standard I/O modules, SIL 2/Cat.3/PL d</li> <li>▪ Safe controlling of ET200pro motor starters in conjunction with the ASM 400V module, SIL 3/Cat.4/PL e</li> <li>▪ Activation of parameterized safety functions of ET200pro frequency converters (in preparation)</li> </ul> </li> <li>▪ 2 x digital inputs, SIL 3/Cat.4/PL e</li> </ul>
400 V disconnecting module	<ul style="list-style-type: none"> <li>▪ Double disconnection of the main circuit supply SIL 3/Cat.4/PL e</li> <li>▪ Feedback of the module's functional state over bus</li> </ul>

# Fail-safe ET 200eco I/O

## The range at a glance

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

- For distributed expansion of ET 200S F-CPU, S7-300F und S7-400F for a cabinet-free distribution
  - Supported safety related busses
    - PROFIBUS
- F-DI for the connection of digital sensors/encoders



Module	Properties
4/8 F-DI DC 24V	<ul style="list-style-type: none"> <li>▪ 8 inputs, SIL2/Cat.3/PL d or 4 inputs, SIL3/Cat.4/PL e</li> <li>▪ Internal encoder supply</li> <li>▪ Dimensions like standard modules</li> <li>▪ Degree of protection IP 65/67</li> </ul>

# Failsafe periphery

## Hardware requirements for SIL3 / Cat.4

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

### S7 300:

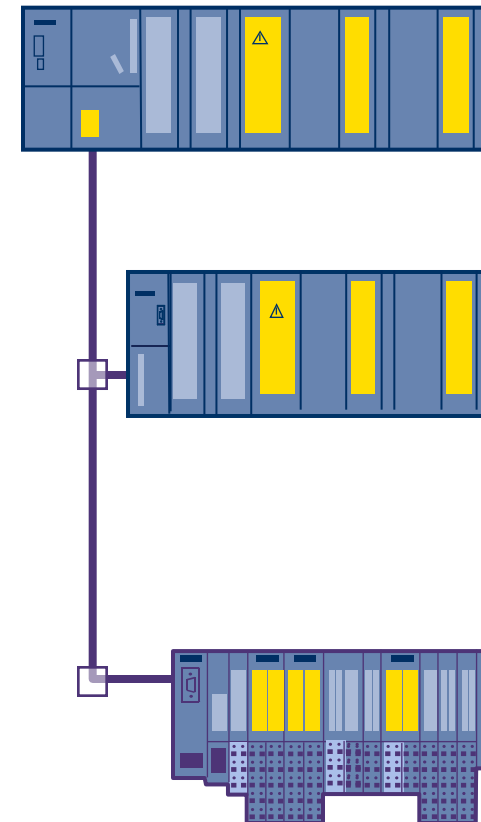
- Safety protector (rel. 03) required between standard modules (PLC, IM, SM, CP, FM, ...) and failsafe modules.

### ET 200M:

- Safety protector required between standard modules (like IM, SM, CP, FM, ...) and failsafe modules
  - beside IM153-2 FO without standard modules

### ET 200S:

- PM-E DC 24V AC120V/DC230V or PM-E DC24..48V
- Only failsafe I/O modules within one power group



# Failsafe periphery Required address area

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

Maximum amount of failsafe I/O modules for the F-CPU is depending on the process image

- e.g. CPU 315-2DP max. 384 byte PII/PIO

ET200M	DI24*	DO8*	DO10*	DI8 Namur*	AI6*
PII / PIO	10/4 Byte	5/5 Byte	6/8 Byte	6/4 Byte	16/4 Byte

\* only addresses divisible by 8

ET200S	4/8 F-DI	4 F-DO PM-E F
PII / PIO	6/4 Byte	5/5 Byte

ET200pro	8/16 F-DI	4/8 F-DI/ 4 F-DO
PII / PIO	8/4 Byte	7/5 Byte

ET200eco	4/8 F-DI
PII / PIO	6/4 Byte

# PROFIsafe communication via PROFINET and PROFIBUS

Introduction

Concept

PROFIsafe

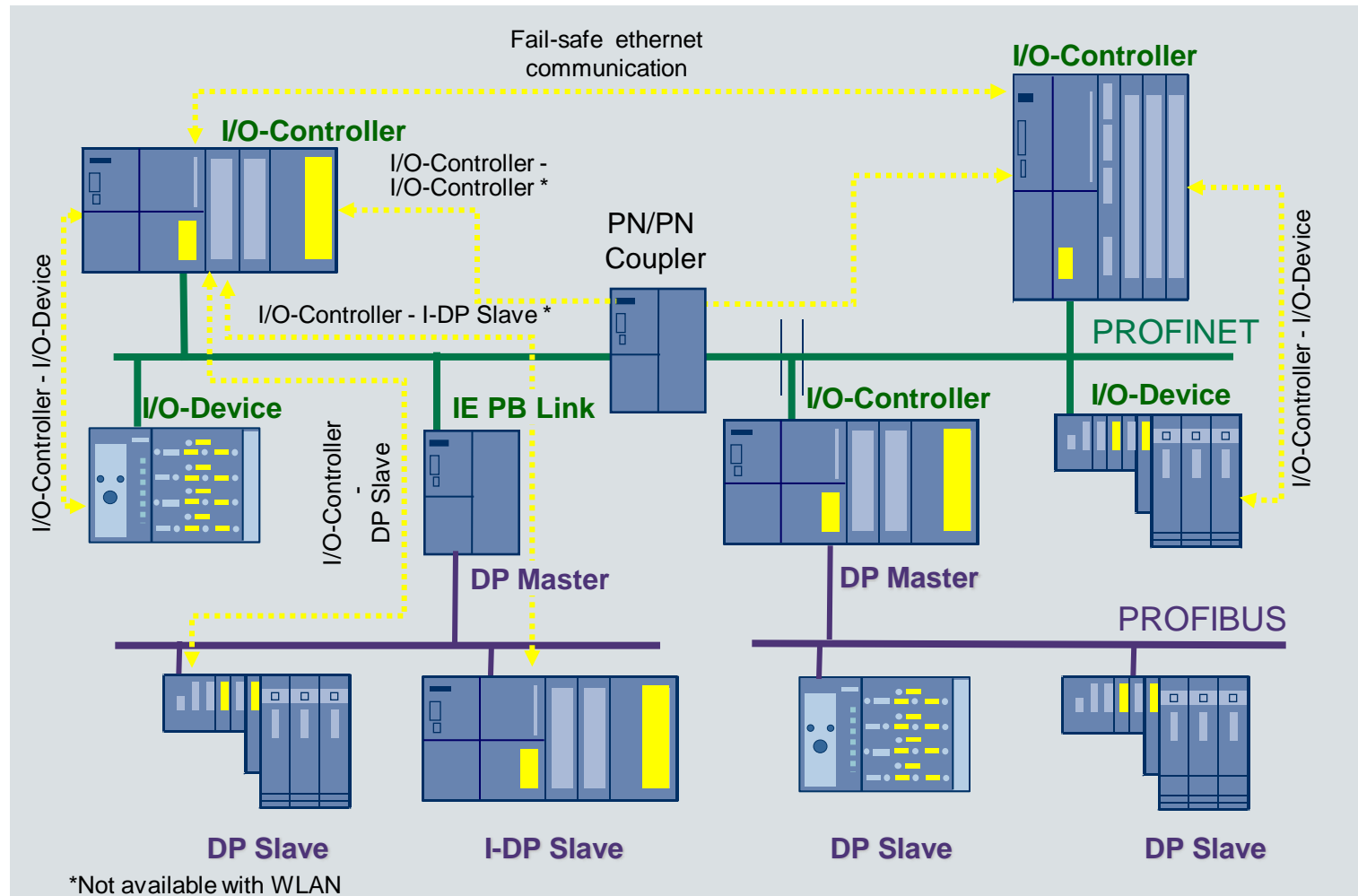
Configurations

Product overview

Periphery connection

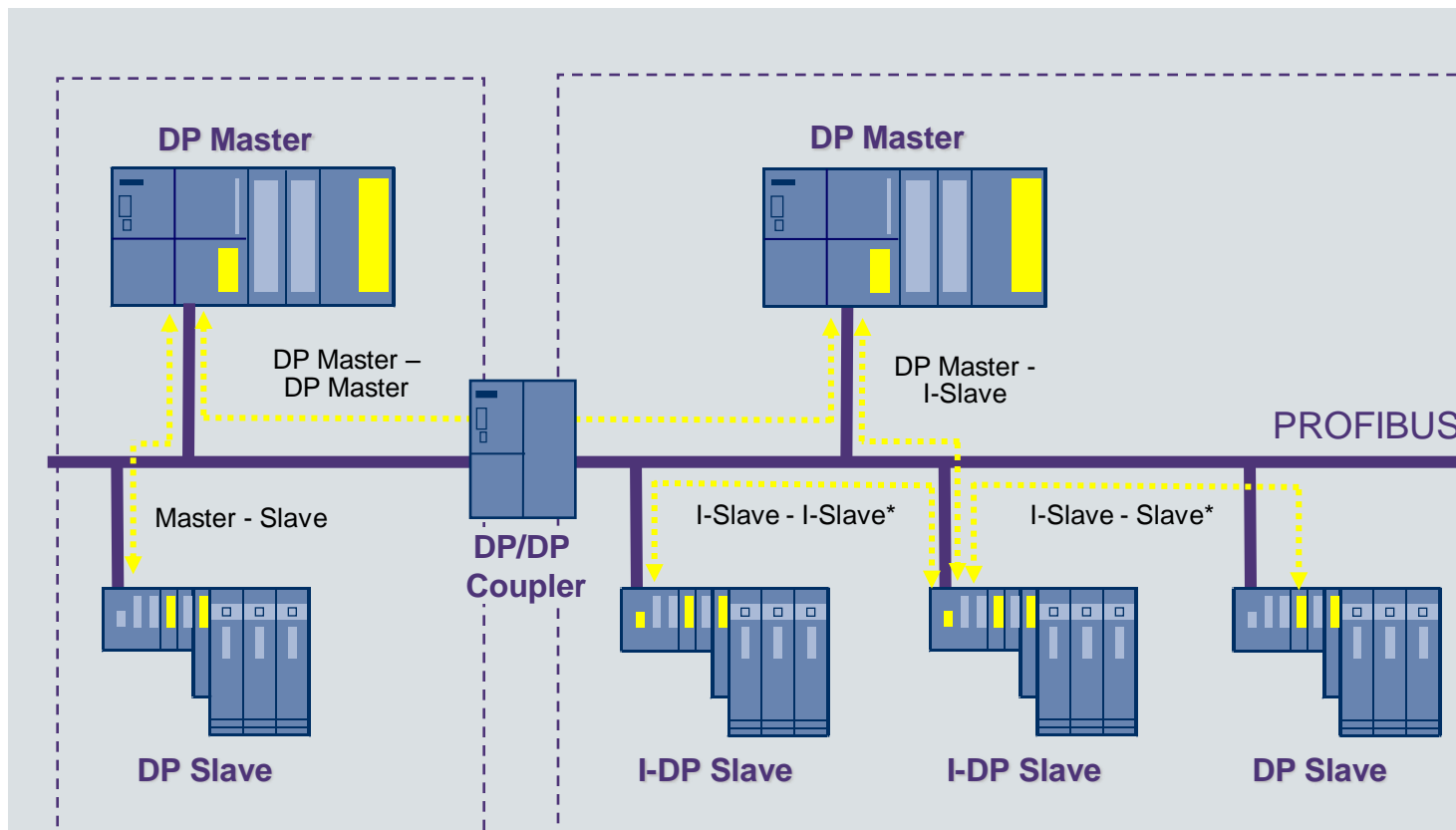
S7 Distributed Safety

Further Information



# PROFIsafe communication via PROFIBUS

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information



\* also available with standard DP Master

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

# Sensor/ actuator connection





# Sensor / actuator connection to failsafe modules

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

## Achievable safety category

- The achievable safety category is depending on the quality of the sensor (proof test interval, Mtbf time, probability of failures etc.) and the way of connecting to failsafe I/O modules.

## Selection of sensor:

- When connecting electronic sensors to the failsafe input modules, the testing of the short-circuit detection can interfere the sensor because of the pulsing of the internal sensor supply. Therefore the short circuit test has to be deactivated.

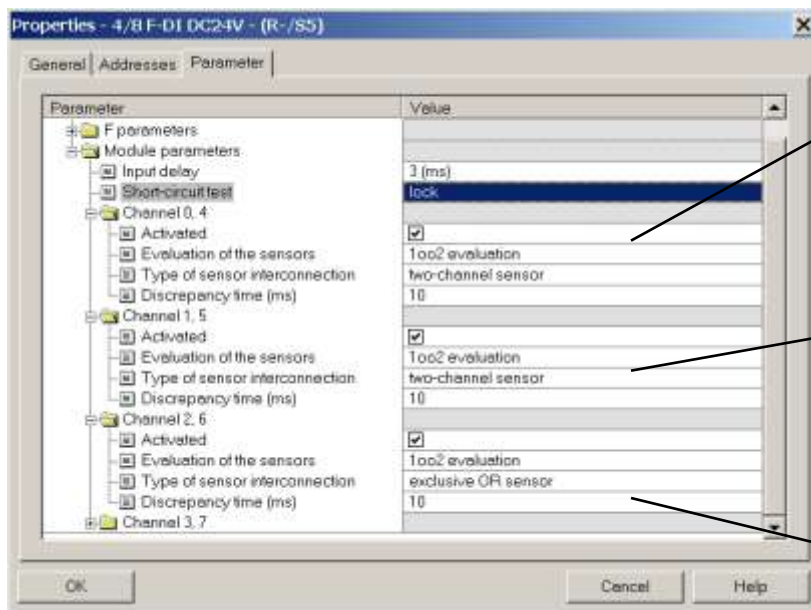
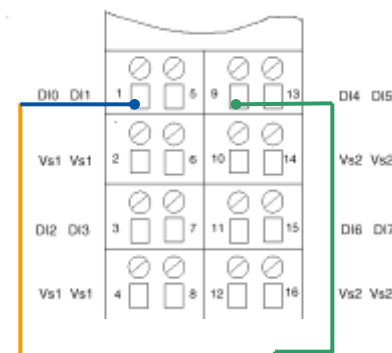
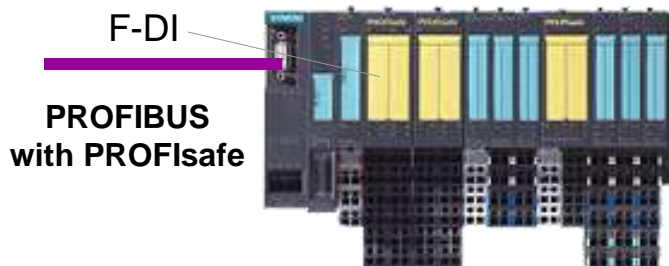
## Selection of actuators:

- Because of the internal testing (dark test/ bright test) of the output channels the actuators must be able to tolerate test pulses of 1ms

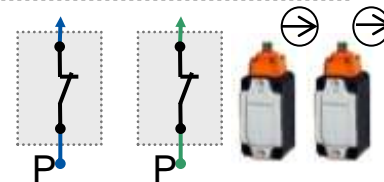
# Sensor connection with failsafe inputs

## Examples: Cat.3

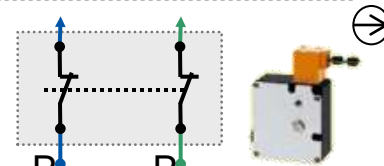
- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information



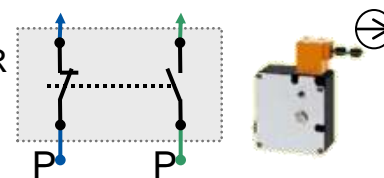
One channel sensors



Two channel sensor (according Cat.3)



Exclusive OR Sensor (according Cat.3)

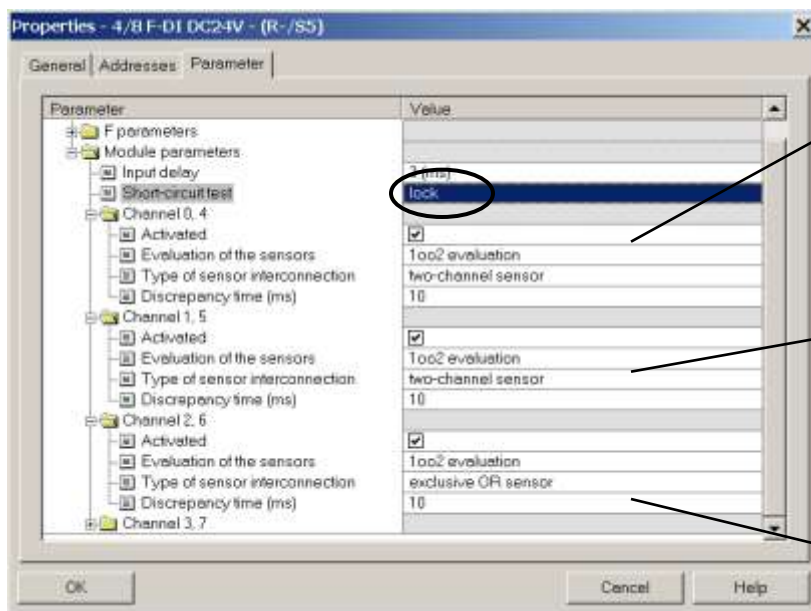
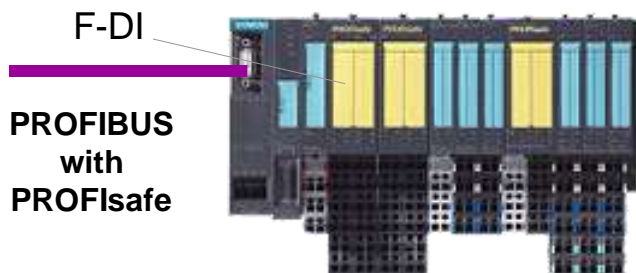


For shut down signals the first connector has to be NC

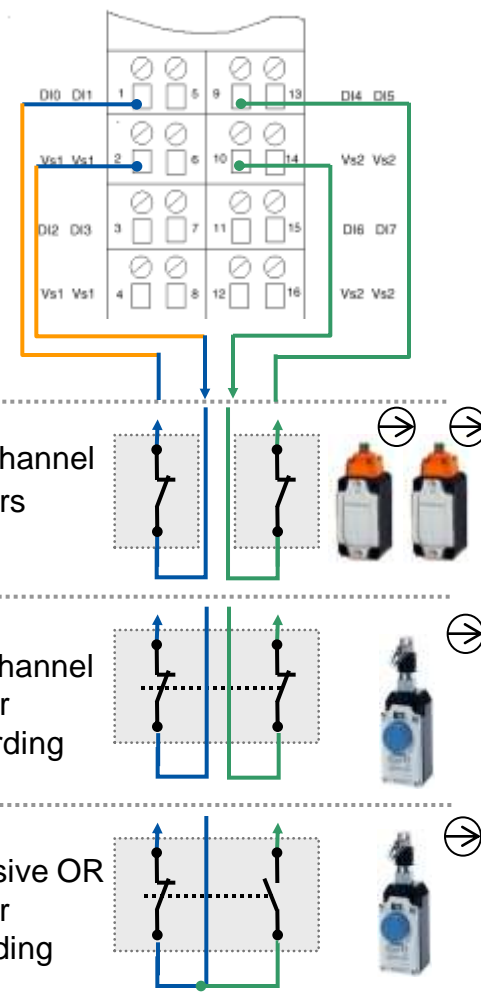
# Sensor connection with failsafe inputs

## Examples: Cat.4

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information



Internal power supply need not to be used  
 For shut down signals the first connector has to be NC



# Power circuit 24V - P/M-switched up to 2A and 10A

Introduction

Concept

PROFIsafe

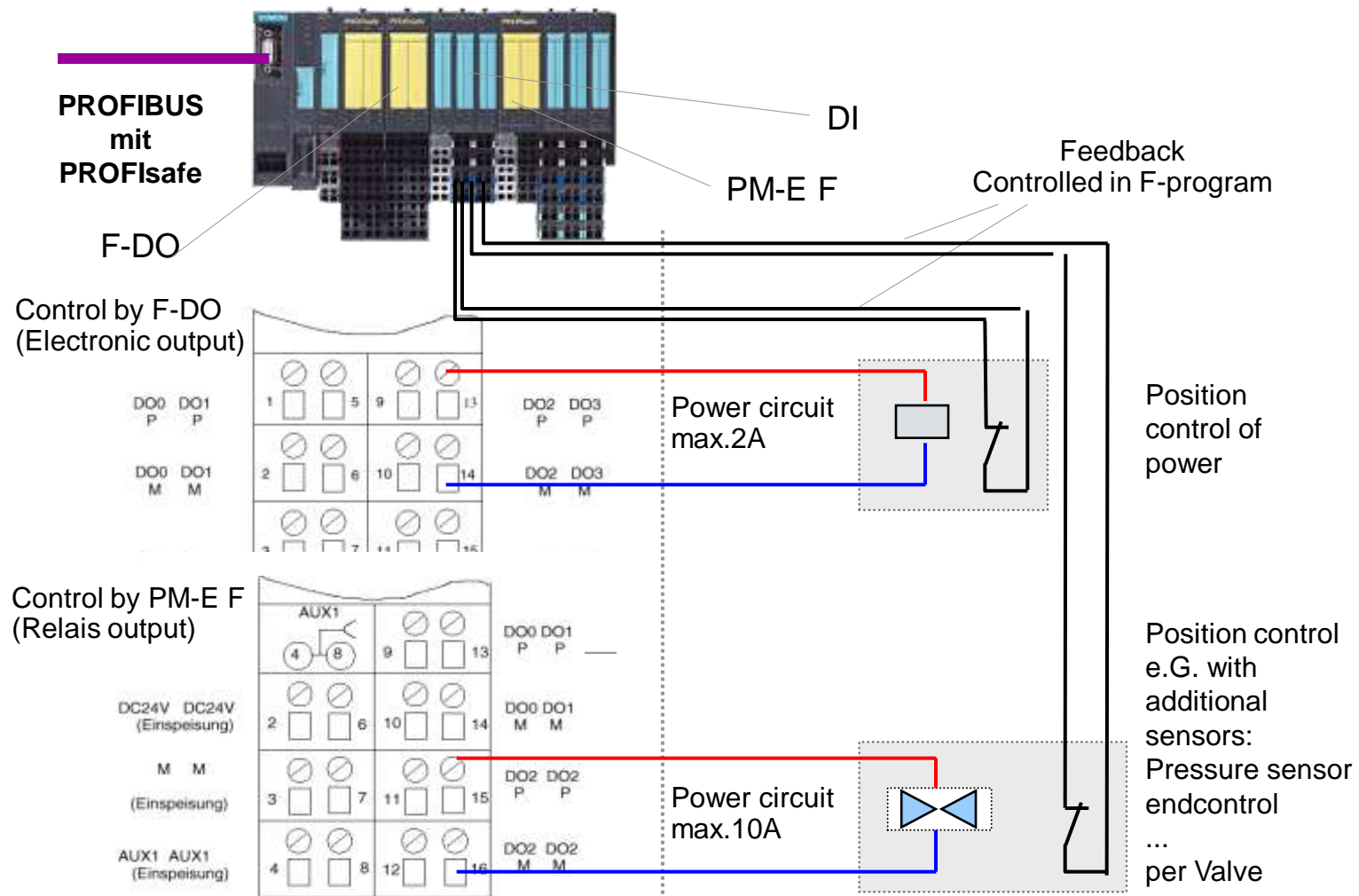
Configurations

Product overview

Periphery connection

S7 Distributed Safety

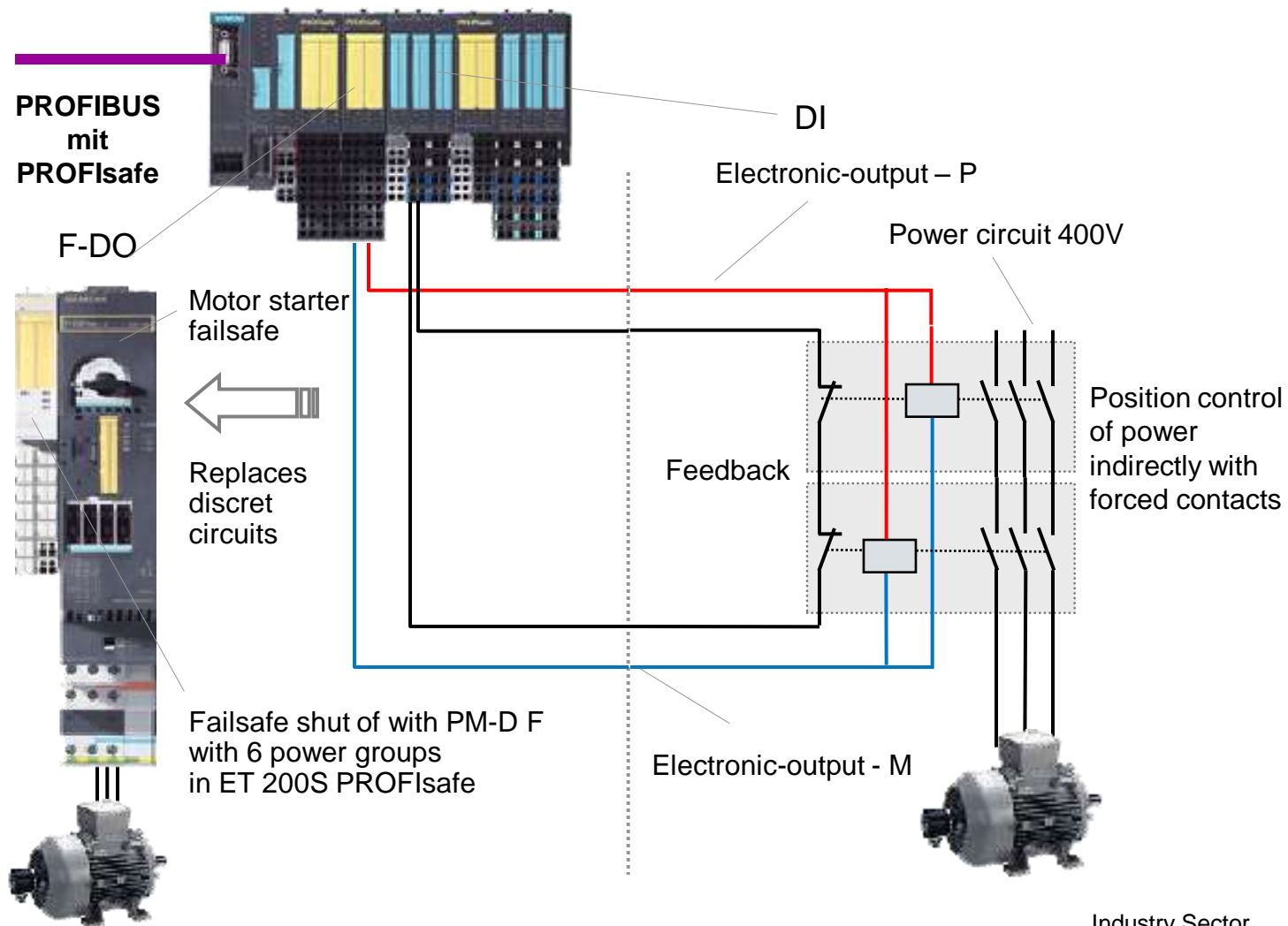
Further Information



# Power circuit >24V - P/M-switched

## Example: normal synchron drive - Cat.4

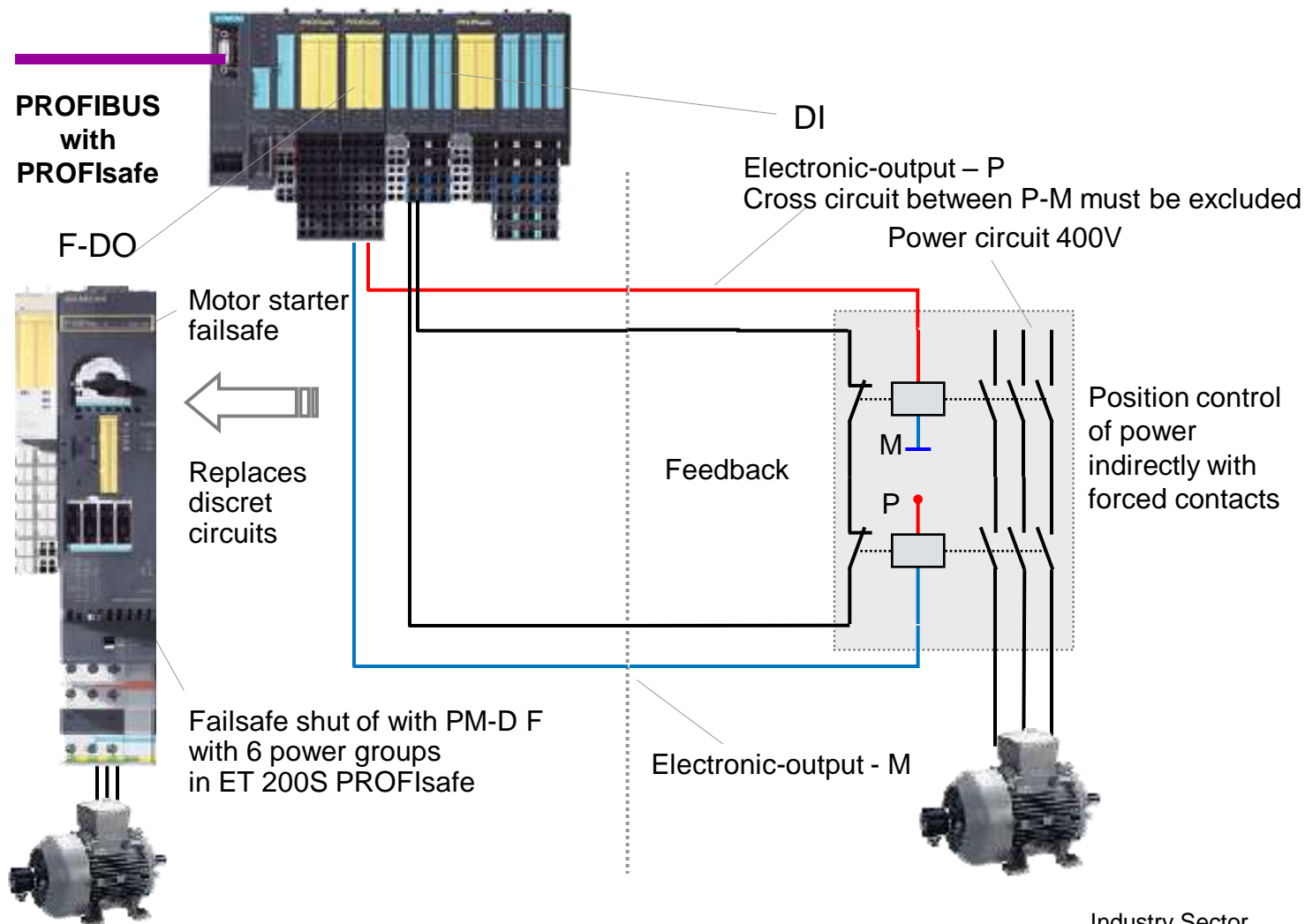
- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information



# Power circuit >24V - P/M-switched

## Example: normal synchron drive - Cat.4

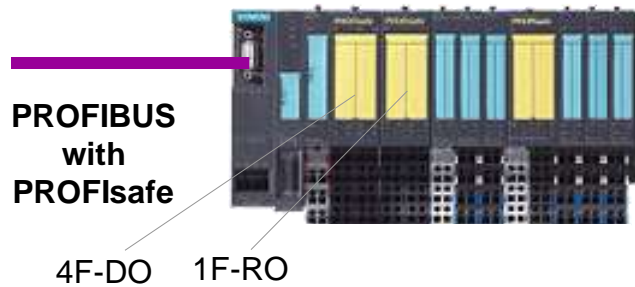
- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information



# Power circuit – switched by 1F-RO

## Example: DC24V/AC24-230V up to 5A - Cat.4

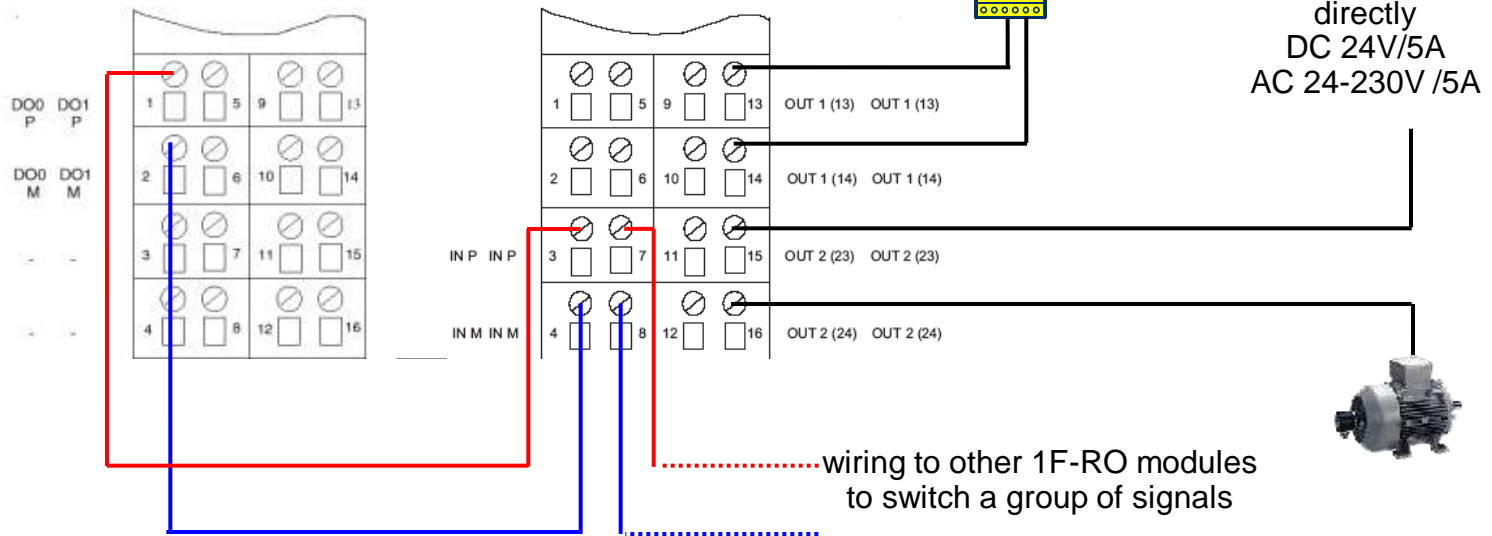
- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information



to control classical safety loops

Controlled by F-DO

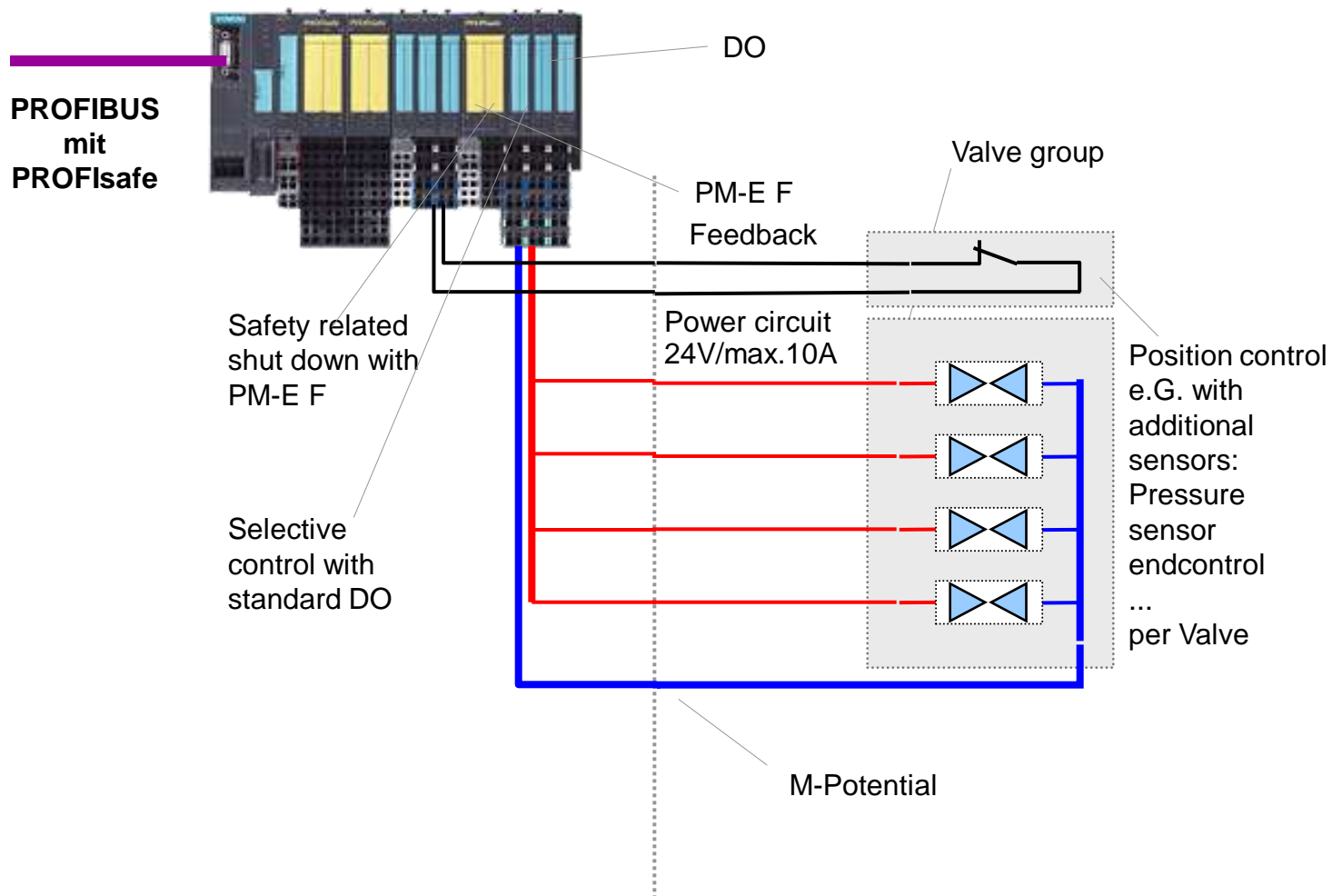
1F-RO



# Power circuits 24V with group shut down

## Example: valve block Cat.3

- Introduction
- Concept
- PROFIsafe
- Configurations
- Product overview
- Periphery connection
- S7 Distributed Safety
- Further Information





Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

# S7 Distributed Safety



# S7 Distributed Safety In general

Introduction

Concept

PROFIsafe

Configurations

Product overview

Periphery connection

S7 Distributed Safety

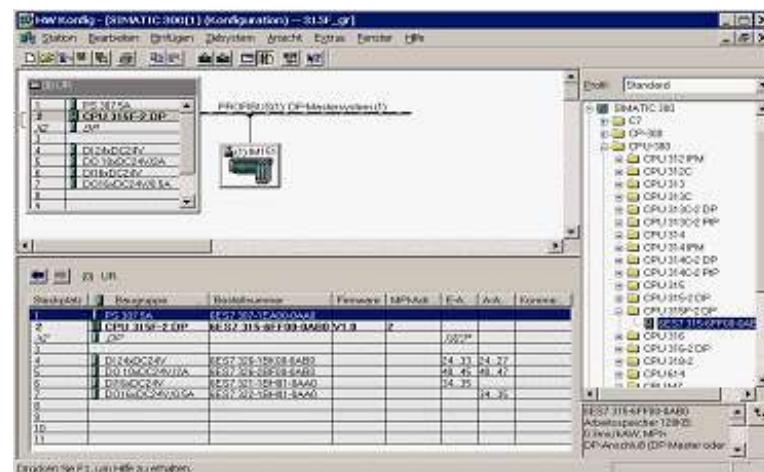
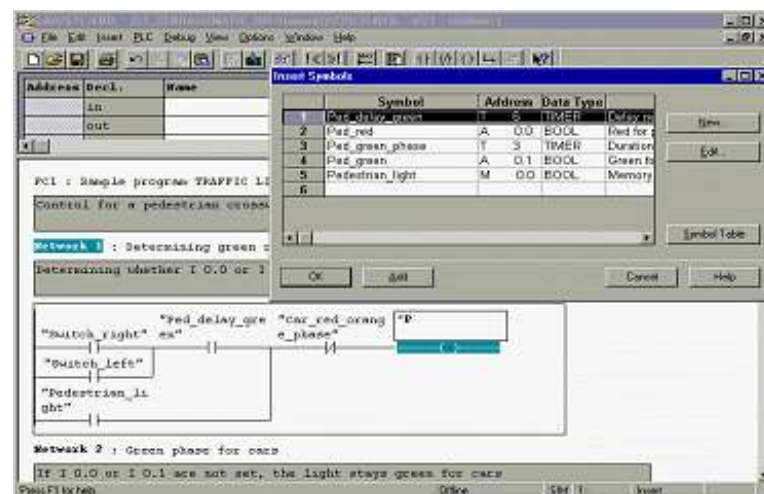
Further Information

## Distributed Safety

- for configuring the hardware and programming the safety-related application with FBD and LAD in the familiar STEP 7 environment (STEP 7 option package)

## The integral F library of commands

- with off-the-shelf TÜV-certified programming examples and function blocks – individually modifiable
  - EMERGENCY-OFF
  - Two-hand control
  - Muting
  - Gate monitoring
  - ....



# S7 Software Distributed Configuration of the PLC

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

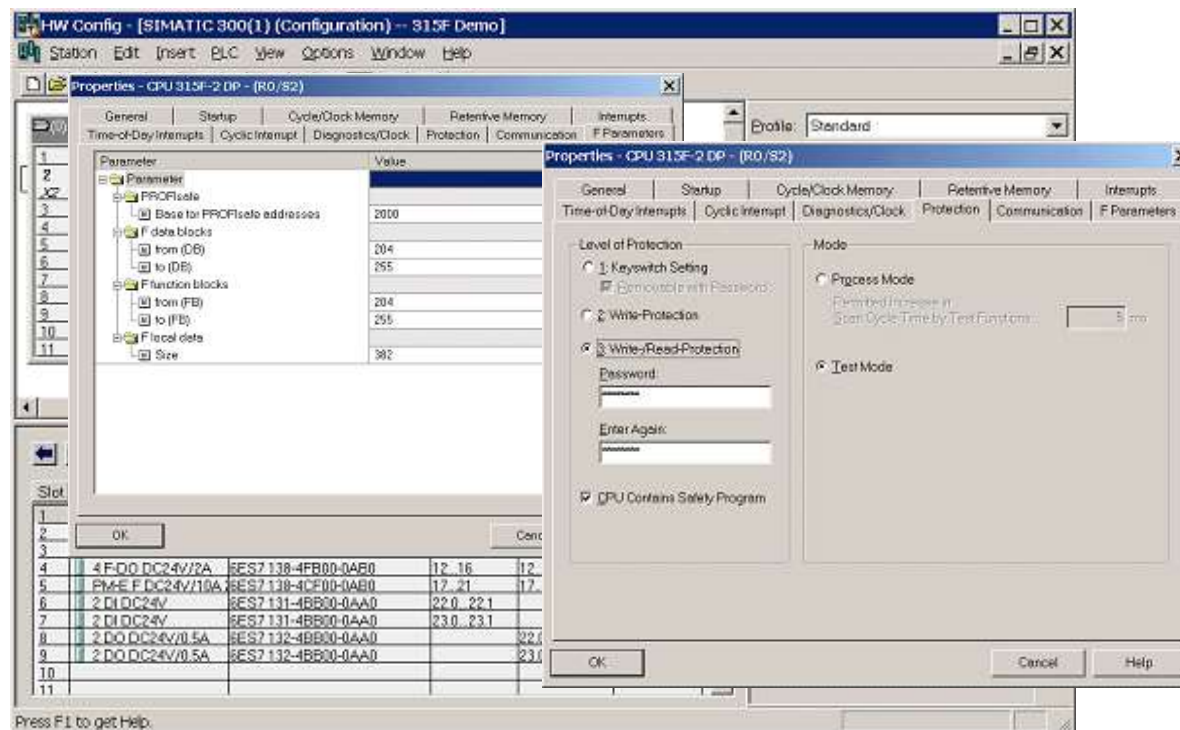
Periphery  
connection

S7 Distributed  
Safety

Further  
Information

## Configuration of F-PLC within STEP7 HW Config.

- Online password protection for PLC
- Enable PLC for safety mode
- Adjust reserved address areas for compiler blocks



# S7 Distributed Safety Configuration of the F-periphery

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

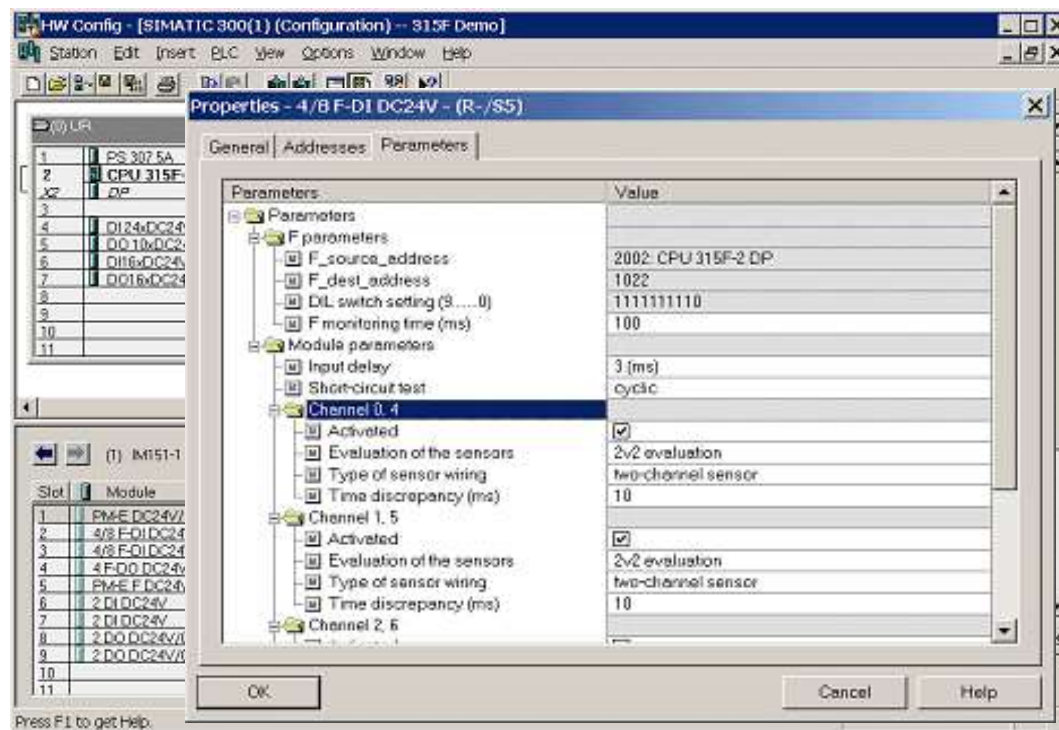
Periphery  
connection

S7 Distributed  
Safety

Further  
Information

Configuration of F-modules within STEP7 HW Config.

- Short- and cross circuit test on signal line
- Discrepancy control when for 2oo2 evaluation
- PROFIsafe parameters automatically adjusted



# Software Distributed Safety Handling of the F-program

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

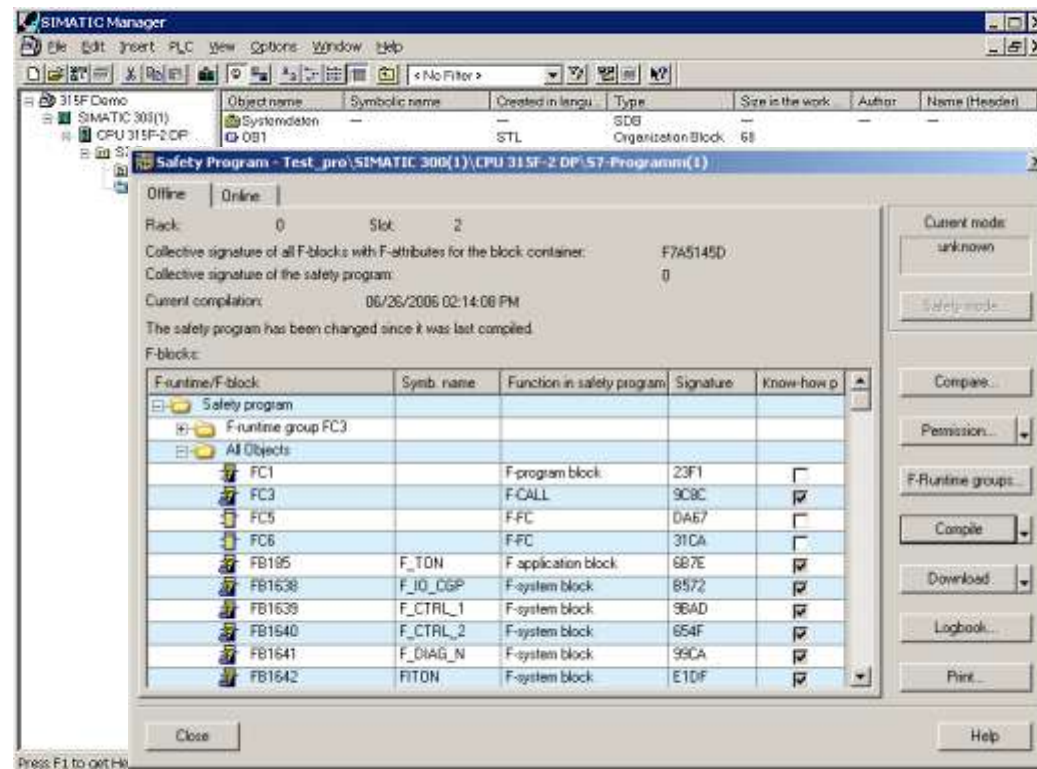
Periphery  
connection

S7 Distributed  
Safety

Further  
Information

Central handling and status of the failsafe application from SIMATIC Manager with the Safety program menu

- Status, protection, generating, loading, documentation ...



# S7 Distributed Safety $\geq$ V5.4

Introduction

Concept

PROFIsafe

Configurations

Product  
overview

Periphery  
connection

S7 Distributed  
Safety

Further  
Information

## New functions

- Channel granulate passivating for channel faults
  - With entry in the diagnostic buffer of the PLC
    - E.g. F-DI           discrepancy fault
    - E.g. F-DO           wire break
- Userbility
  - Extension and improvement of the password handling
  - Delta-Download of F-program
  - More Powerful Compilerchecks
    - Detection of Writing Accesses on F-Resources out of the Standard User-Programm
    - Detection, if there is a depassivation sequence in the F-programm for every used F-I/O
    - OV-Bit check
  - Logbook
- Support of PROFINET with PROFIsafe Profil
- Failsafe S7-communication between S7-31x-2PN/DP CPU's on Industrial Ethernet
- Profibus data exchange broadcast
  - Direct data exchange between I-DP Slaves und DP-Slaves

# Further Information

www.siemens.com/f-cpu

Introduction

Concept

PROFIsafe

Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information

The screenshot shows a web browser window displaying the Siemens website for SIMATIC Safety Integrated. The browser title is "Siemens - Sicherheitsgerichtete Steuerungen - SIMATIC Safety Integrated, SIMATIC S7, Distribute". The address bar shows the URL: "http://www.automation.siemens.com/cd/safety/html\_00/produkte/controller/produkte\_fehlersichsyst.htm".

The website layout includes a top navigation bar with the Siemens logo and "siemens.com" link. Below this is a secondary navigation bar with "International" and "English" options, and a search bar. The main content area features a large blue banner with the text "Sicherheitsgerichtete Steuerungen - SIMATIC Safety Integrated for Factory Automation".

On the left side, there is a "Produkte" (Products) menu with the following items:

- Safety Integrated - Überblick
- Sicherheitsgerichtete Kommunikation
- Sicherheitsgerichtete Schaltechnik
- Sicherheitsgerichtete, optische Sensoren
- Sicherheitsgerichtete Steuerungen - Factory Safety**
  - Übersicht
  - Vorteile
  - Controller
  - Peripherie
  - Engineering
  - Normen und Zertifikate
- Sichere, fehlertolerante Steuerungen - Process Safety
- Sicherheitsgerichtete Motion Control Systeme
- Sicherheitsgerichtete Antriebe
- Referenzen
- Partner

The main content area contains a photograph of a factory floor with a robotic arm. Below the image, there is a "Drucken" (Print) button and a footer with the text: "© Siemens AG 2001-2006 - Impressum - Datenschutz - Nutzungsbedingungen".

On the right side, there is a "Weitere Informationen" (Further Information) section with the following links:

- Infomaterial SIMATIC Safety Integrated
- Katalog & Online-Bestellsystem
- Techn. Dokumentation
- FAGs
- Tools & Downloads
- Systemhandbuch
- ARC White Paper Safety Integrated
- ARC White Paper PROFIsafe

Below this is a "Zertifikate für S7 Distributed Safety" (Certificates for S7 Distributed Safety) section with the following links:

- TÜV-Zertifikat
- TÜV-Report
- TÜV-Annex
- UL-Zertifikat
- UL Online Certification Directory

# Function examples

www.siemens.de/automation/csi\_de\_WW/appl&tools

Introduction

Concept

PROFIsafe

Configurations

Product overview

Periphery connection

S7 Distributed Safety

Further Information

The screenshot shows a web browser window displaying the Siemens Automation and Drives Service & Support website. The page is titled "SIEMENS" and "Automation and Drives". The main content area is titled "Applikationen & Tools" and "Dokumente filtern nach: [1]". Below this, there is a list of documents with columns for title, date, and ID. The documents are related to safety features like laser scanners, actuators, and emergency stop functions.

Document Title	Date	ID
Safety: Dezentrales Einsatz des Laserscanners LS4-4 in Kategorie 3 nach EN 954-1	20.04.2006	21330889
Safety: Einzel- und Gruppenabschaltung von Aktoren in Kategorie 4 nach EN 954-1	11.04.2006	21330890
Safety: Sichere Stillstandserfassung und sicher reduzierte Geschwindigkeit mit F-CPU und MASTERDRIVES in Kategorie 3 nach EN 954-1 bzw. SIL 2 nach IEC 62061	03.04.2006	22809859
Safety: Sicheres Abschalten in den Stopp-Kategorien 0 und 1 in Kategorie 4 nach EN 954-1	29.03.2006	21331097
Safety: Zweihand-Bedienpult mit integriertem Not-Halt in Kategorie 4 nach EN 954-1	24.03.2006	21331100
Safety: Einbindung des Rücklesesignals in eine Anwendung in Kategorie 4 nach EN 954-1	24.03.2006	21331098
Safety: Lichtvorhang in Kategorie 4 mit Mutingfunktion nach EN 954-1	22.03.2006	21331201
Safety: Passivierung und Wiedereingliederung von F-Peripherie	17.03.2006	22304119
Safety: Schutztür ohne Zuhaltung in Kategorie 4 nach EN 954-1	21.02.2006	21331363
Safety: Schutztür mit Zuhaltung durch Magnetkraftverriegelung in Kategorie 4 nach EN 954-1	03.02.2006	21064258



# **SIMATIC Safety Integrated**

for Factory Automation

# Thank you

Name: Martin Maier

Department: I IA AS FA PS 1

Address: D-Nuremberg

Gleiwitzerstrasse 555

Phone: +49 (911) 895-3828

Mail: [martinmaier@siemens.com](mailto:martinmaier@siemens.com)