

Safety Integrated Application Manual

ASIsafe circuits for safety technology
with AS-Interface safety monitor and DP/AS-i F-Link

Function Manual · 08/2012



Industrial Controls

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SIEMENS

AS-Interface

Safety Integrated Application Manual ASIsafe circuits for safety technology with AS-Interface safety monitor and DP/AS-i F-Link

Function Manual

About this documentation	1
Introduction	2
Typical circuit diagrams for IP20	3
Typical circuit diagrams for IP65 / IP67	4
Protective door monitoring with lock	5
Wiring the safety monitor and DP / AS-i F-Link	6
FAQ	7

Legal information

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WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

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Table of contents

1	About this documentation	9
1.1	Purpose of this documentation	9
1.2	Document structure	10
1.3	Target group	10
1.4	Required background	10
1.5	History	11
2	Introduction.....	13
2.1	AS-Interface basics	13
2.1.1	Reference	13
2.1.2	Network structure	13
2.1.3	Number of nodes.....	15
2.1.4	Creating an AS-Interface network.....	16
2.1.5	Network extension.....	17
2.1.6	ASIsafe	18
2.1.6.1	ASIsafe solution local	19
2.1.6.2	PROFIsafe ASIsafe solution	20
2.2	ASIsafe product overview	24
2.2.1	Images and features of the ASIsafe components	24
2.2.2	ASIsafe device variants (incl. accessories)	27
2.3	Function blocks of the safety monitor	29
2.3.1	Function blocks of type "forced"	30
2.3.2	Function blocks of type "dependent"	31
2.3.3	Function blocks of type "conditionally dependent"	32
2.3.4	Function blocks of type "independent"	33
2.3.5	Function block of type "Stop category 1 - two relay outputs"	34
2.3.6	Function block of type "Door lock by means of delay time"	35
2.3.7	Function block of type "Stop category 0"	36
2.3.8	Function block of type "External device monitoring circuit"	37
2.3.9	Function block of type "External device monitoring circuit for second, dependent OSSD"	38
2.4	Configuration of DP / AS-i F-Link	39
2.4.1	Configuring the PROFIBUS DP master system.....	39
2.4.2	Filling the AS-i address table	40
2.4.3	Calling the "Properties AS-i F Slave ..." dialog box.....	41
2.4.4	"ASIsafe" tab - parameterization, one-channel.....	41
2.4.5	"ASIsafe" tab - parameterization, two-channel	42
2.4.6	"ASIsafe" tab - parameterization of position switch with lock and ASIsafe	43

3	Typical circuit diagrams for IP20	45
3.1	AS-Interface F adapter	46
3.1.1	AS-Interface F adapter, 2F-DI (/ 1 DO); for EMERGENCY STOP command unit 3SB3; category 4	46
3.2	Safe SlimLine module S22,5F	48
3.2.1	S22,5 2F-DI; EMERGENCY STOP monitoring, category 2	48
3.2.2	S22,5 2F-DI; EMERGENCY STOP monitoring, category 4	49
3.2.3	S22,5 2F-DI; EMERGENCY STOP and protective door monitoring; category 2	50
3.2.4	S22,5 2F-DI; protective door monitoring, category 2	51
3.2.5	S22,5 2F-DI; protective door monitoring, two doors, category 2	52
3.2.6	S22,5 2F-DI; protective door monitoring, category 4	53
3.2.7	S22,5 2F-DI; magnetically-operated switch monitoring, category 4	54
3.2.8	S22,5 2F-DI / 2 DO; EMERGENCY STOP monitoring, category 2	55
3.2.9	S22,5 2F-DI / 2 DO; EMERGENCY STOP monitoring, category 4	56
3.2.10	S22,5 2F-DI / 2 DO; EMERGENCY STOP and protective door monitoring; category 2	57
3.2.11	S22,5 2F-DI / 2 DO; protective door monitoring, category 2	58
3.2.12	S22,5 2F-DI / 2 DO; protective door monitoring, two doors; category 2	59
3.2.13	S22,5 2F-DI / 2 DO; protective door monitoring, category 4	60
3.2.14	S22,5 2F-DI / 2 DO; magnetically-operated switch monitoring, category 4	61
3.2.15	S22,5 2F-DI / 2 DO, U_aux; EMERGENCY STOP monitoring; category 2	62
3.2.16	S22,5 2F-DI / 2 DO, U_aux; EMERGENCY STOP monitoring; category 4	63
3.2.17	S22,5 2F-DI / 2 DO, U_aux; EMERGENCY STOP and protective door monitoring; category 2	64
3.2.18	S22,5 2F-DI / 2 DO, U_aux; protective door monitoring, category 2	65
3.2.19	S22,5 2F-DI / 2 DO, U_aux; protective door monitoring, two doors; category 2	66
3.2.20	S22,5 2F-DI / 2 DO, U_aux; magnetically-operated switch monitoring, category 4	67
4	Typical circuit diagrams for IP65 / IP67	69
4.1	Safe compact module K20F	70
4.1.1	K20F 2F-DI; EMERGENCY STOP monitoring, category 2	70
4.1.2	K20F 2F-DI; EMERGENCY STOP monitoring, category 4	71
4.1.3	K20F 2F-DI; EMERGENCY STOP and protective door monitoring; category 2	72
4.1.4	K20F 2F-DI; protective door monitoring, category 2	73
4.1.5	K20F 2F-DI; protective door monitoring, two doors, category 2	74
4.1.6	K20F 2F-DI; protective door monitoring, category 4	75
4.1.7	K20F 2F-DI; magnetically-operated switch monitoring, category 4	76
4.2	Safe compact module K45F 2F-DI	77
4.2.1	K45F 2F-DI; EMERGENCY STOP monitoring, category 2	77
4.2.2	K45F 2F-DI; EMERGENCY STOP monitoring, category 4	78
4.2.3	K45F 2F-DI; EMERGENCY STOP and protective door monitoring; category 2	79
4.2.4	K45F 2F-DI; protective door monitoring, category 2	80
4.2.5	K45F 2F-DI; protective door monitoring, two doors, category 2	81
4.2.6	K45F 2F-DI; protective door monitoring, category 4	82
4.2.7	K45F 2F-DI; magnetically-operated switch monitoring, category 4	83

4.3	Safe compact module K45F 2F-DI / 2 DO	84
4.3.1	K45F 2F-DI / 2 DO, (U_aux); EMERGENCY STOP monitoring; category 2	84
4.3.2	K45F 2F-DI / 2 DO, (U_aux); EMERGENCY STOP monitoring; category 4	85
4.3.3	K45F 2F-DI / 2 DO, (U_aux); EMERGENCY STOP and protective door monitoring; category 2	86
4.3.4	K45F 2F-DI / 2 DO, (U_aux); protective door monitoring, category 2	87
4.3.5	K45F 2F-DI / 2 DO, (U_aux); protective door monitoring, two doors; category 2	88
4.3.6	K45F 2F-DI / 2 DO, (U_aux); protective door monitoring, category 4	89
4.3.7	K45F 2F-DI / 2 DO, (U_aux); magnetically-operated switch monitoring, category 4	90
4.4	Safe compact module K45F 4F-DI	91
4.4.1	K45F 4F-DI; EMERGENCY STOP monitoring, category 2	91
4.4.2	K45F 4F-DI; EMERGENCY STOP monitoring, category 4	92
4.4.3	K45F 4F-DI; EMERGENCY STOP and protective door monitoring; category 4	93
4.4.4	K45F 4F-DI; protective door monitoring, category 4	94
4.4.5	K45F 4F-DI; magnetically-operated switch monitoring, category 4	95
4.5	Safety compact module K45F LS	96
4.5.1	K45F LS; connection of a light curtain; category 2	96
4.5.2	K45F LS; connection of a light curtain; category 4	97
4.5.3	K45F LS; connection of a light curtain type 2; category 2	98
4.5.4	K45F LS; connection of a light curtain type 4; category 4	99
4.6	Sensors with direct connection to AS-Interface	100
4.6.1	EMERGENCY STOP with direct interface; category 4	100
4.6.2	Position switches with direct interface; category 2 / category 3 / category 4	101
4.6.3	ESPE with direct interface; category 3 / category 4	103
5	Protective door monitoring with lock.....	105
5.1	Spring-locked protective door lock	106
5.1.1	K45F, 2F-DI / 2 DO; safety monitor; monitoring: category 2 / category 3	106
5.1.2	K45F, 2F-DI / 2 DO; DP / AS-i F-Link; monitoring: category 2 / category 3	109
5.1.3	Direct interface; safety monitor; monitoring: category 3	112
5.1.4	Direct interface; DP / AS-i F-Link; monitoring: category 3	114
5.1.5	K45F, 2F-DI; safety monitor; monitoring: category 4; tumbler mechanism: category 3	116
5.1.6	K45F, 2F-DI; DP / AS-i F-Link; monitoring: category 4; tumbler mechanism: category 3	118
5.1.7	K45F, 2F-DI, safety monitor; monitoring: category 4; tumbler mechanism: category 4	120
5.1.8	K45F, 2F-DI, AS-i F-Link; monitoring: category 4; tumbler mechanism: category 4	123
5.2	Solenoid-locked protective door lock	126
5.2.1	K45F, 2F-DI / 2 DO; safety monitor; monitoring: category 2 / category 3	126
5.2.2	K45F, 2F-DI / 2 DO; DP / AS-i F-Link; Monitoring: category 2 / category 3	129
5.2.3	Direct interface; safety monitor; monitoring: category 2 / category 3	132
5.2.4	Direct interface; DP / AS-i F-Link; monitoring: category 2 / category 3	135
5.2.5	K45F, 2F-DI; safety monitor; monitoring: category 4; tumbler mechanism: category 3	138
5.2.6	K45F, 2F-DI; DP / AS-i F-Link; monitoring: category 4; tumbler mechanism: category 3	141
5.2.7	K45F, 2F-DI, safety monitor; monitoring: category 4; tumbler mechanism: category 4	144
5.2.8	K45F, 2F-DI, AS-i F-Link; monitoring: category 4; tumbler mechanism: category 4	147

6	Wiring the safety monitor and DP / AS-i F-Link	151
6.1	Safety monitor; one OSSD; category 2	152
6.2	Safety monitor; two OSSDs; category 2.....	153
6.3	Safety monitor; one OSSD; category 4	154
6.4	Safety monitor; two OSSDs; category 4.....	155
6.5	Safety monitor; two OSSDs; category 4 with frequency converter	156
6.6	DP / AS-i F-Link	157
7	FAQ	159
	Glossary of terms and abbreviations	165
	Index.....	167

About this documentation

You can download this documentation free-of-charge at
Internet (<http://support.automation.siemens.com/WW/view/en/24509484>)

1.1 Purpose of this documentation

This documentation contains a number of typical circuit diagrams for safety functions that can be implemented with the following ASIsafe modules:

- AS-Interface F adapter (IP20)
- Safe SlimLine module S22.5F (IP20)
- Safe compact module K20F (IP65 / IP67)
- Safe compact module K45F 2F-DI (IP65 / IP67)
- Safe compact module K45F 2F-DI / 2DO (IP65 / IP67)
- Safe compact module K45F 4F-DI (IP65 / IP67)
- Safe compact module K45F LS (IP65 / IP67)
- Position switch with integrated ASIsafe (IP65 / IP67)

The typical circuit diagrams contain:

- EMERGENCY STOP monitoring, category 2
- EMERGENCY STOP monitoring, category 4
- EMERGENCY STOP and protective door monitoring, category 2
- Protective door monitoring, category 2
- Protective door monitoring, category 2, with two doors
- Protective door monitoring, category 4
- Magnetically-operated switch monitoring, category 4
- Sensors with direct connection to AS-Interface (EMERGENCY STOP, light curtain)
- Protective door monitoring with tumbler (spring-locked and solenoid-locked)
- Wiring for the safety monitor
- Wiring for the DP / AS-i F-Link

This documentation does not contain typical circuit diagrams for safe output module S45F. You can find information on the topic of ASIsafe safe AS-i outputs/safe SlimLine module S45F in Internet (<http://support.automation.siemens.com/WW/view/en/55416968>) as well as in AS-i System Manual (<http://support.automation.siemens.com/WW/view/en/51579885>)

1.2 Document structure

This documentation is structured as follows:

Information type		Chapter	
I	Description	1	About this documentation
		2	Introduction: • AS-Interface basics • ASIsafe product overview • Function blocks of the safety monitor • Configuration of the DP / AS-i F-Link
II	Typical circuit diagrams	3	Typical circuit diagrams for IP20
		4	Typical circuit diagrams for IP65 / IP67
		5	Protective door monitoring with lock
		6	Wiring for the safety monitor and DP / AS-i F-Link
III	Further information	7	FAQ
			Glossary

1.3 Target group

This documentation contains information for the following target groups:

- Decision-makers
- Safety engineers
- Design engineers
- Commissioning engineers

1.4 Required background

A general knowledge of the following areas is needed in order to understand this documentation:

- Low-voltage switchgear
- Digital circuit logic
- Automation technology
- AS-Interface
- Safety systems
- STEP 7 (when the DP / AS-i F-Link is used)

1.5 History

The following versions of this documentation have been released to date. The changes apply to the previous version:

Edition	Comment / change	Language
08 / 2006	Initial release	De
04 / 2008	- IP65 / IP67 circuits, without: - K60F (discontinued product) - IP65 / IP67 circuits, supplemented by: - K45F 2F-DI / 2DO - K45F 4F-DI - K45F LS - Following chapter extended to include DP / AS-i F-Link: - Introduction - Protective door monitoring with tumbler - Wiring for the safety monitor and DP / AS-i F-Link - All circuit diagrams now include the DP / AS-i F-Link parameters	De, En, Fr, It, Es
05 / 2009	- Circuits supplemented by: - Updated information on safety standards - Revised graphics - Additional information on sensors with a direct connection to AS-Interface - FAQ: - Revised texts	De, En, Fr, It, Es
08 / 2011	- Text adjustment due to product discontinuation of SIMATIC light curtains, light arrays and laser scanners - Chapter "Protective door monitoring with tumbler" - Details regarding standards updated - Four new typical circuit diagrams added	De, En, Fr, It, Es
08 / 2012	- References to ASIsafe and AS-i System Manual information - AS-Interface and PROFINET in the typical circuit diagrams newly labeled - Alternative to AS-i Safety Monitor added - ASIsafe and components updated and supplemented - Error correction in sections 5.1.3 and 5.1.4: Order number of the position switch	De, En, Fr, It, Es

Introduction

2.1 AS-Interface basics

2.1.1 Reference

Note

Comprehensive basic information is available in the "AS-Interface / ASIsafe" system manual. It is available on the Internet in German and English at Service & support (<http://support.automation.siemens.com/WW/view/en/26250840>).

2.1.2 Network structure

Virtually no restrictions apply with respect to the AS-Interface topology, which includes linear, star, and tree structures. In addition, a new segment can be started at any point of the bus.

Linear structure

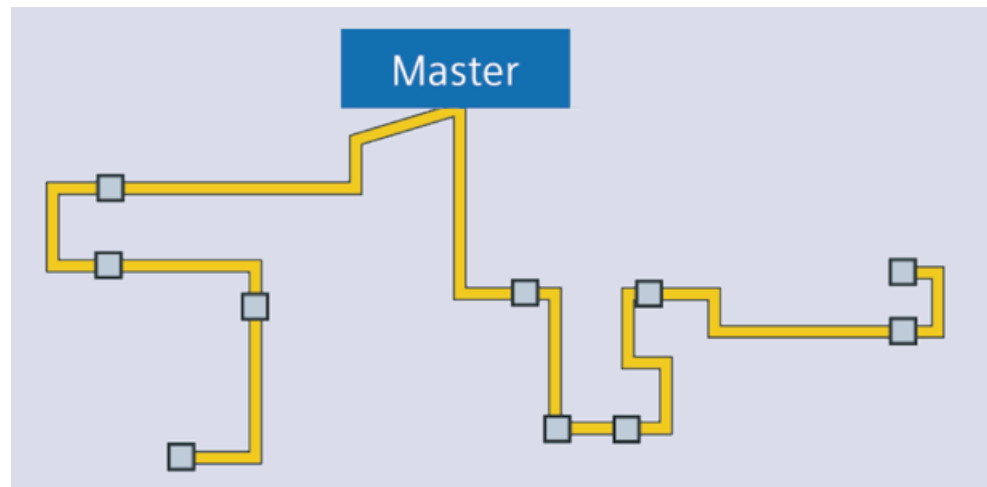


Figure 2-1 Linear structure

 Nodes

All devices are connected to a continuous cable.

Star structure

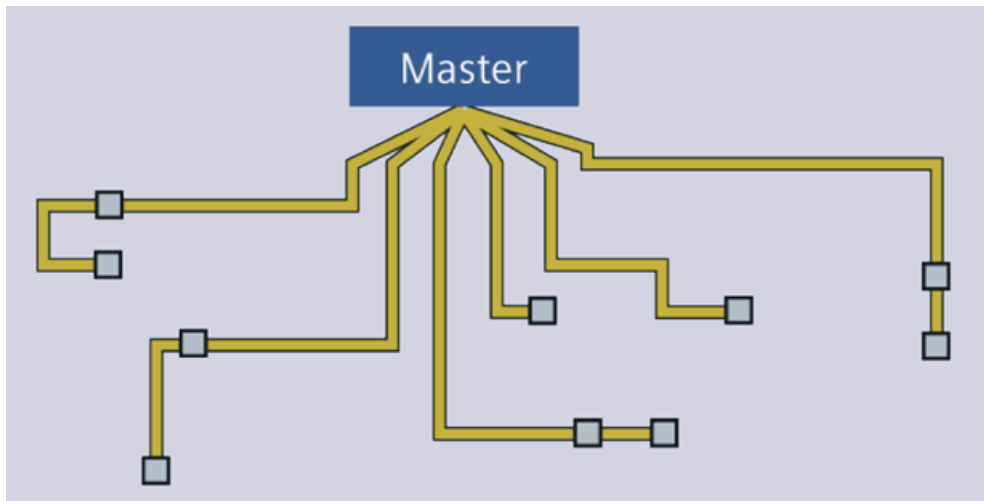


Figure 2-2 Star structure

■ Nodes

In the star structure, the master is connected to each field device by means of two-point connections. Several field devices can also be connected to one cable.

Tree structure

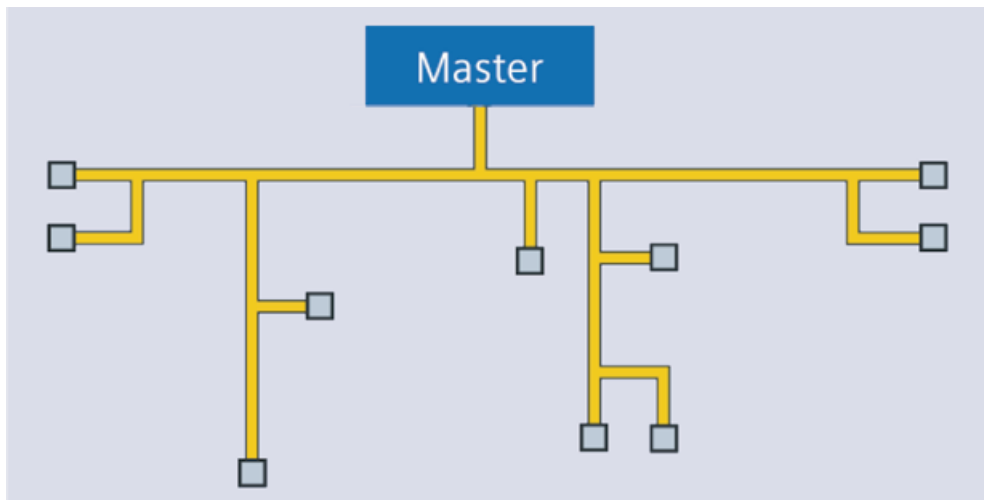


Figure 2-3 Tree structure

■ Nodes

The tree topology is an extension of the star topology, whereby a large number of branches extend from the root.

2.1.3 Number of nodes

An AS-Interface network can accommodate up to 31 nodes with standard addresses or 62 nodes with A/B addresses. Standard addresses and A/B addresses can also be combined.

In the maximum configuration, an additional 4 nodes without an address are possible (e.g. safety monitors, ground fault monitoring module).

When repeaters are used, the specified number of nodes without an address applies for each segment.

Note

For each unused standard address, an additional node without an address can be used.

In the same way, the use of more than 4 nodes **without** an address reduces the number of possible nodes **with** a standard address.

2.1.4 Creating an AS-Interface network

An AS-i network always comprises a master, an AS-i power supply unit, and the AS-i slaves.

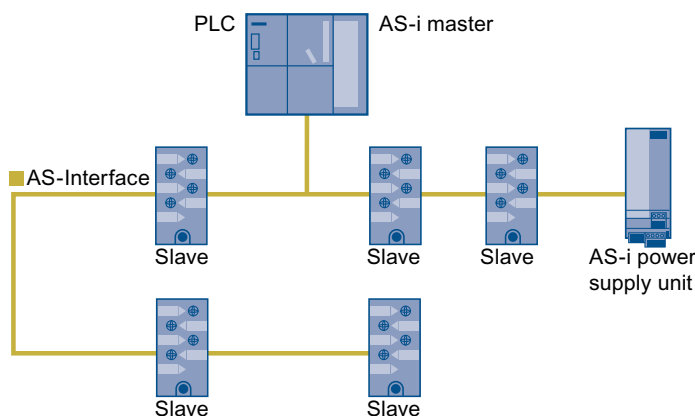
AS-Interface is designed as a single-master system with cyclic polling.

An AS-i network always contains one master, which queries the data of all the nodes at regularly defined intervals.

AS-Interface supports two types of interface to the next-highest level:

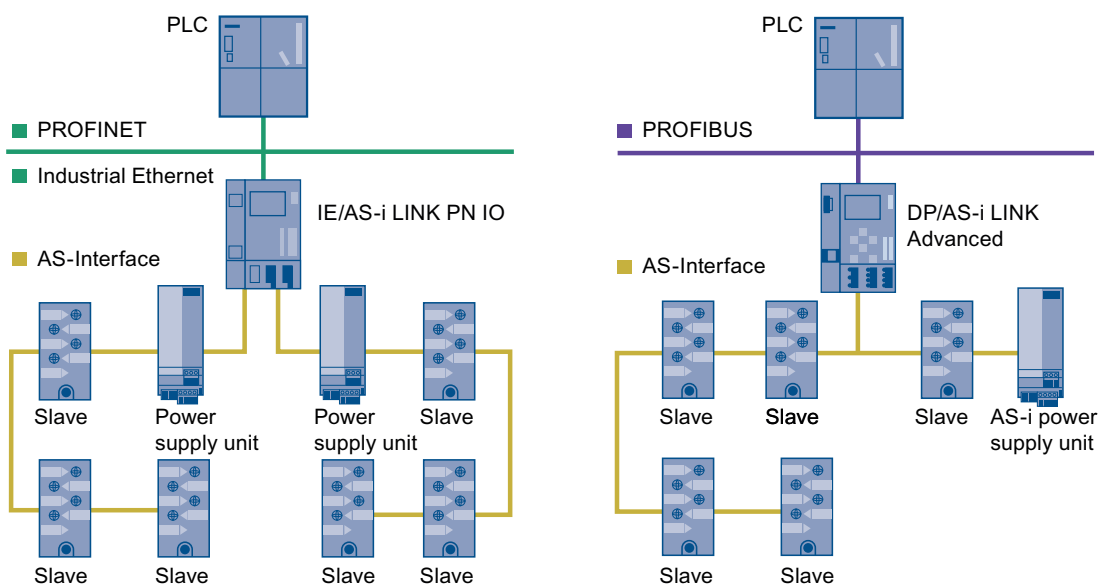
- Direct connection to the controller

The master may be an extension card (communications processor (CP)) of the controller and the slaves exchange data directly with the controller.



- AS-Interface as a subsystem

The entire AS-i network can be a subsystem of a higher-level field bus. With the connected network, the AS-i master becomes a node in the higher-level network and is, therefore, a gateway.



2.1.5 Network extension

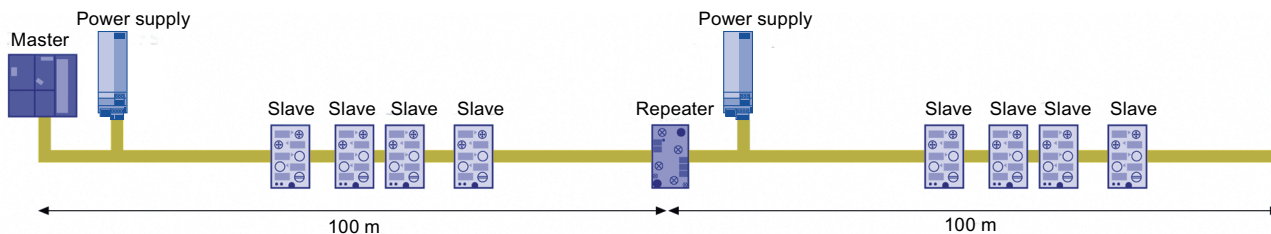


Figure 2-4 Network extension - so far max. 100 m per segment

An AS-i network can be up to 100 m long without additional components. Repeaters can be used, however, to increase the length of the network. Two repeaters can be connected in series, which can extend the network to 300 m (line structure). A separate AS-i power supply must be provided in each new segment.

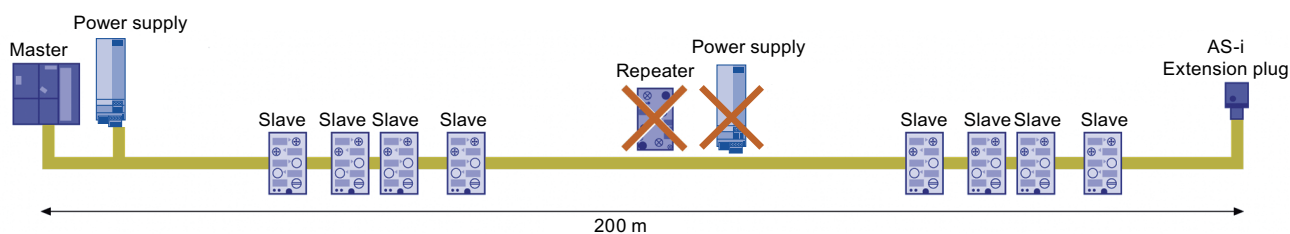


Figure 2-5 Network extension - now with AS-i extension plug, max. 200 m per segment

An extension plug can be used to double the length of an AS-i network to 200 m. Repeaters cannot be connected in series when they are used in conjunction with AS-i extension plugs. A maximum distance of 400 m between the master and slave and a maximum cable extension of 600 m (master in the middle of the network) can be achieved. Repeaters can be connected in parallel in a star configuration each with up to 200 m long segments.

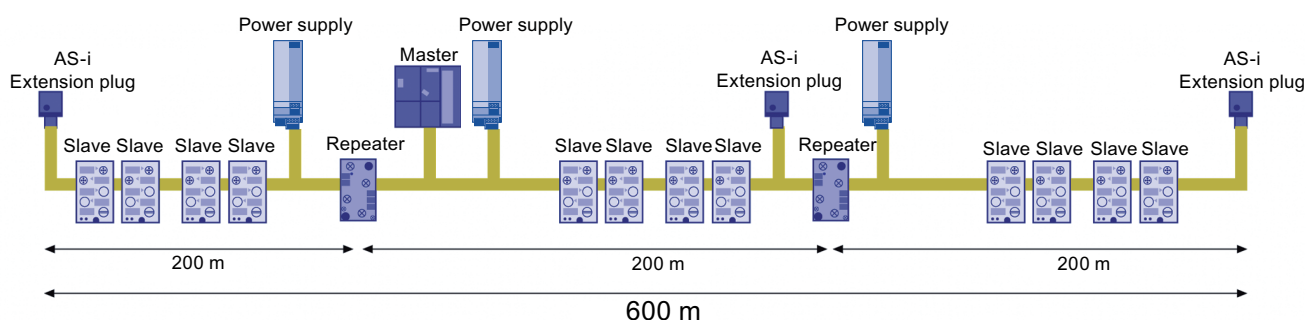


Figure 2-6 Network extension - now with AS-i extension plug, max. 200 m per segment, only one repeater connected in series

2.1.6 ASIsafe

To add safety to a standard AS-i network, two additional components are required:

- Safety monitor
- Safe slaves

Even existing applications can be extended quickly and easily by means of ASIsafe to include safety-relevant functions without the need for a fail-safe PLC or special master.

Note

Alternative to AS-i safety monitor

The SIRIUS 3RK3 modular safety system, or MSS for short, with connection to AS-Interface is offered as an alternative to the AS-i safety monitor. This system is not covered in this documentation. More information can be found on the Internet

(<http://www.siemens.com/sirius-mss>).

DP / AS-i F-Link is ideal for integrating your ASIsafe network in the Safety Integrated network technologies with PROFIBUS or PROFINET. DP / AS-i F-Link safely links the ASIsafe network to the fail-safe controller via PROFIsafe. This is effectively a unique combination of the AS-i master (gateway) and the safety monitor. For the AS-i network, you require:

- DP / AS-i F-Link
- Safe slaves

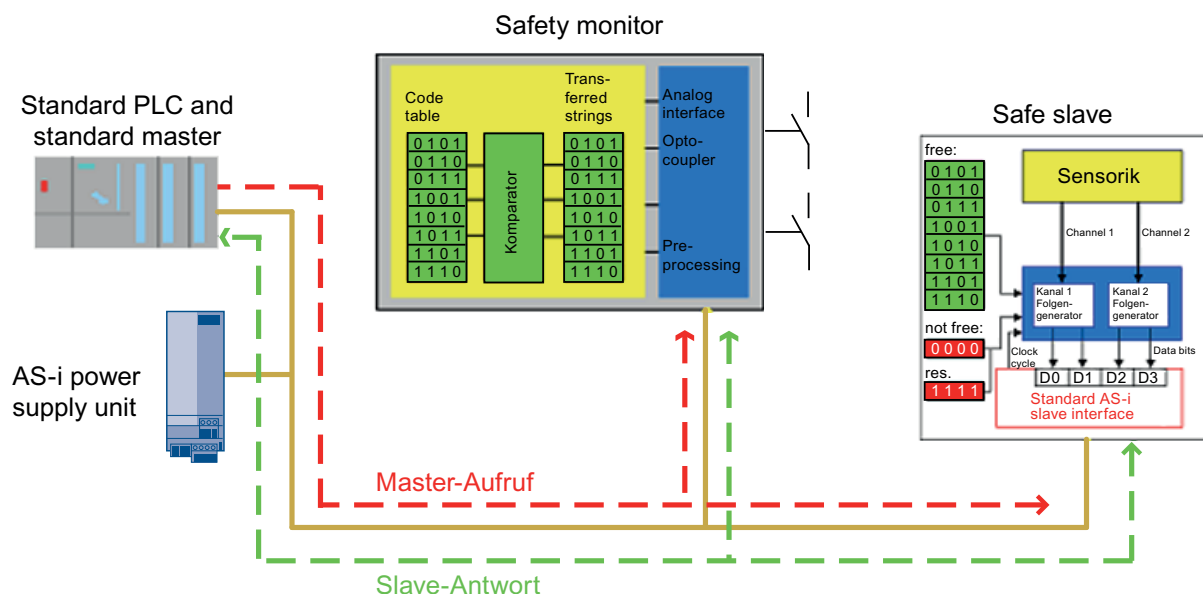
In safety-related applications, the following conditions apply for the extension of the AS-i network:

- When used without an extension plug, no more than two repeaters are permitted between the evaluation device (e.g. AS-i safety monitor) and the ASIsafe input slave.
- When used with an extension plug, no more than one repeater is are between the evaluation device (e.g. AS-i safety monitor) and the ASIsafe input slave.

2.1.6.1 ASIsafe solution local

Functional principle of the safety monitor

- The safety monitor monitors the safe inputs, links them by means of programmable logic, and ensures safe shutdown by means of a built-in safety relay. Configuration software is available to parameterize the shutdown logic of the safety monitor.
 - Safe slaves provide an easy, user-friendly means of monitoring fail-safe input devices, such as EMERGENCY STOP command devices, light arrays, and laser scanners up to category 4 according to EN 954-1 or SIL3 according to IEC 61508 / PL e according to EN ISO 13849-1.
 - Safe data transfer is ensured by means of a dynamic, secure transfer protocol between the safe slaves and the safety monitor. In each cycle, the safety monitor expects a specific telegram from each slave that changes continuously in accordance with a defined algorithm.
 - The maximum response time between the ASIsafe input and the safety monitor is 40 ms (for exceptions, see operating instructions of the device, e.g. input module K45F) for light curtains.
- The response time is measured from the point at which the signal switches at the safe input slave to the point at which the output switching element, i.e. the relay on the safety monitor, shuts down.

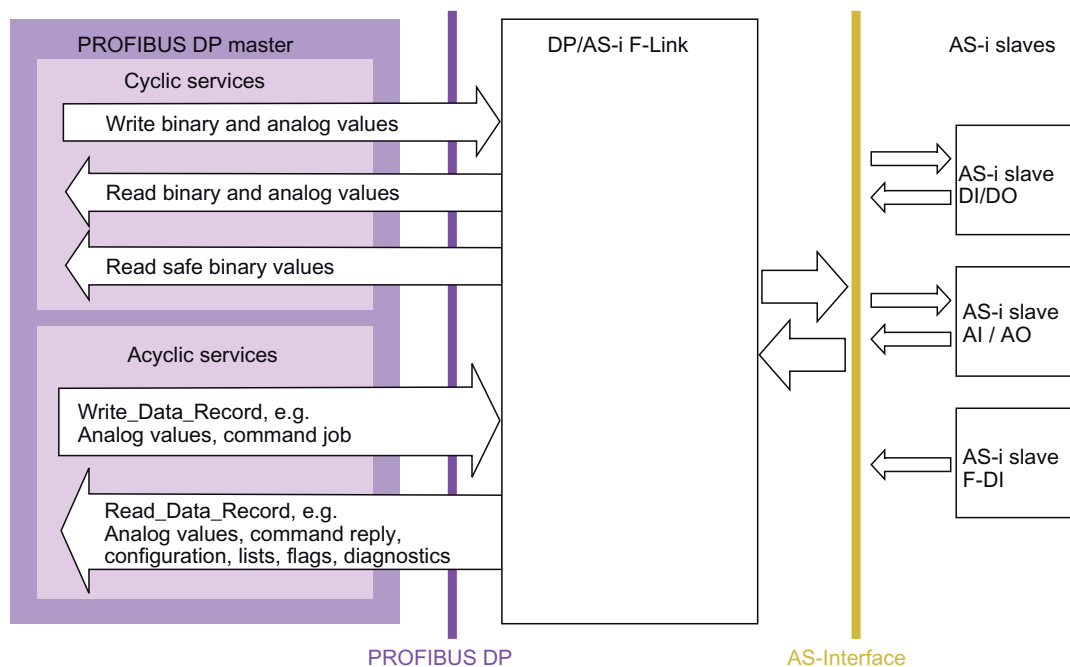


Alternative to AS-i safety monitor: Modular safety system
SIRIUS 3RK3, in Internet (<http://www.siemens.com/sirius-mss>)

2.1.6.2 PROFIsafe ASIsafe solution

Functional principle of DP / AS-i F-Link

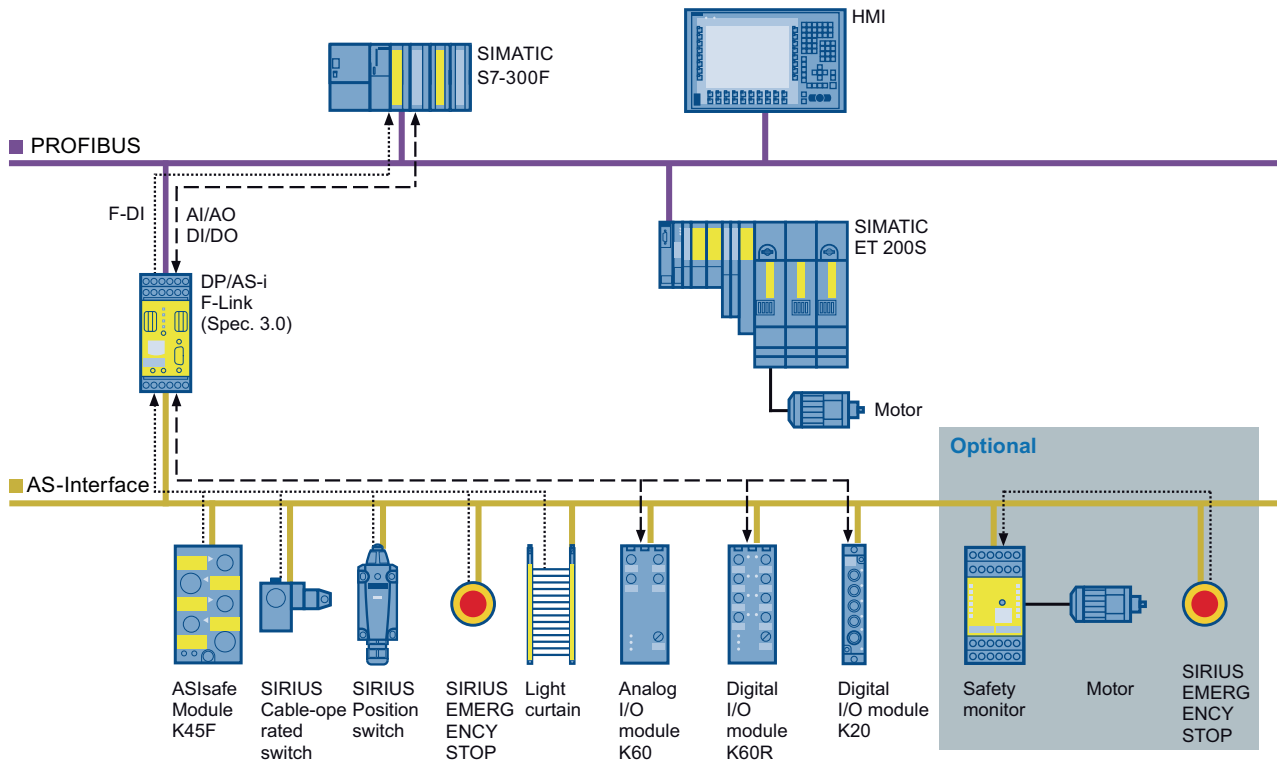
- The PROFIBUS DP master communicates with the AS-i slaves via DP / AS-i F-Link. The PROFIBUS DP master is the safe controller. The AS-i communication objects are mapped in contiguous data areas in the PROFIBUS DP master: one data area for non-safety-related input and output data, and another data area for PROFIsafe data. DP / AS-i F-Link is a PROFIBUS DP-V1 slave (according to EN 50170) and AS-i master (according to EN 50296 in accordance with AS-Interface Specification V3.0) and enables transparent data access to AS-Interface from PROFIBUS DP.
- DP / AS-i F-Link can be used to forward safety-related input data from ASIsafe slaves to a failsafe CPU with a PROFIBUS DP master using the PROFIsafe protocol. Additional safety-related cabling or monitoring is not required (in particular, no AS-Interface safety monitor is required).
- Binary or analog values can be transferred depending on the slave type. Safe slaves provide an easy, user-friendly means of monitoring fail-safe input devices, such as EMERGENCY STOP command devices, light arrays, and laser scanners up to category 4 according to EN 9541 / SIL 3 according to IEC 61508 / PL e according to EN ISO 13849-1.
- Safe data transfer is ensured by means of a dynamic, secure transfer protocol between the safe AS-i slaves and DP / AS-i F-Link. In each cycle, DP / AS-i F-Link expects a specific telegram from each slave that changes continuously in accordance with a defined algorithm.



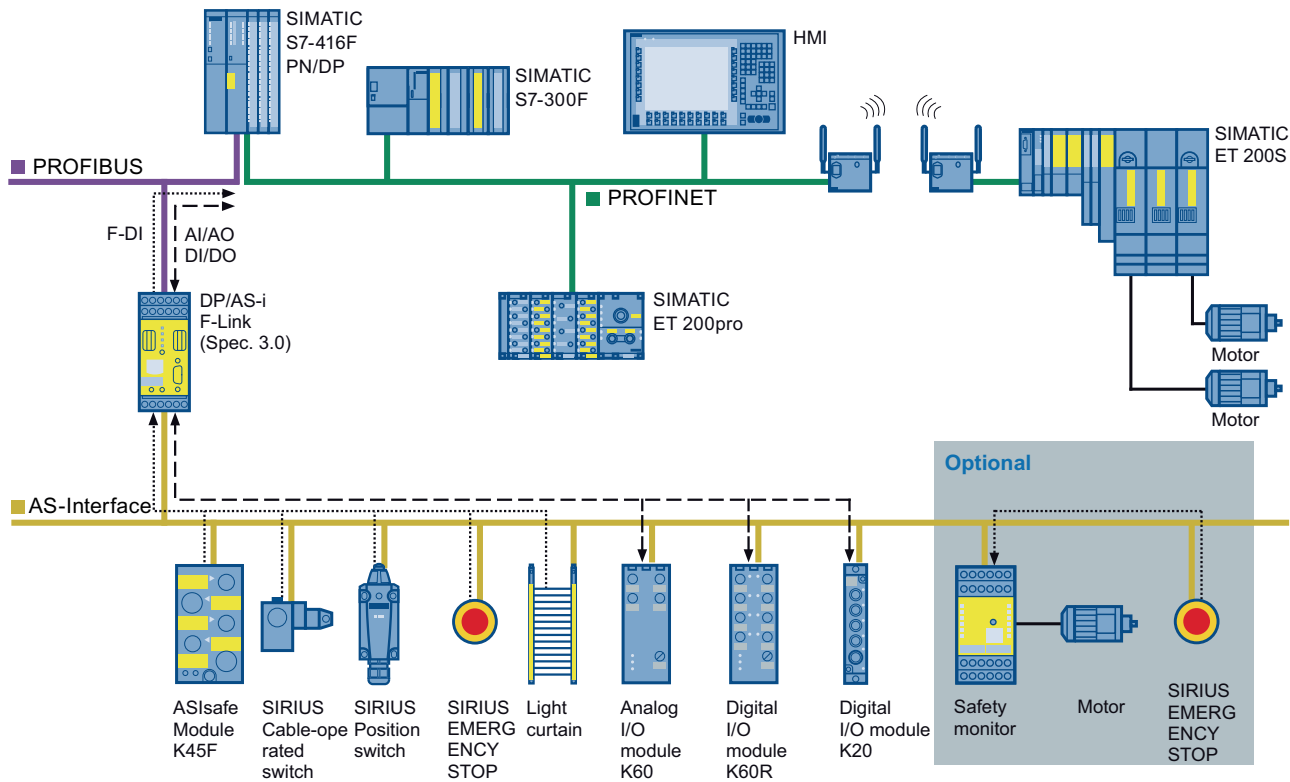
Network integration of DP / AS-i F-Link

DP/AS-i F-Link can be used in a number of different configurations:

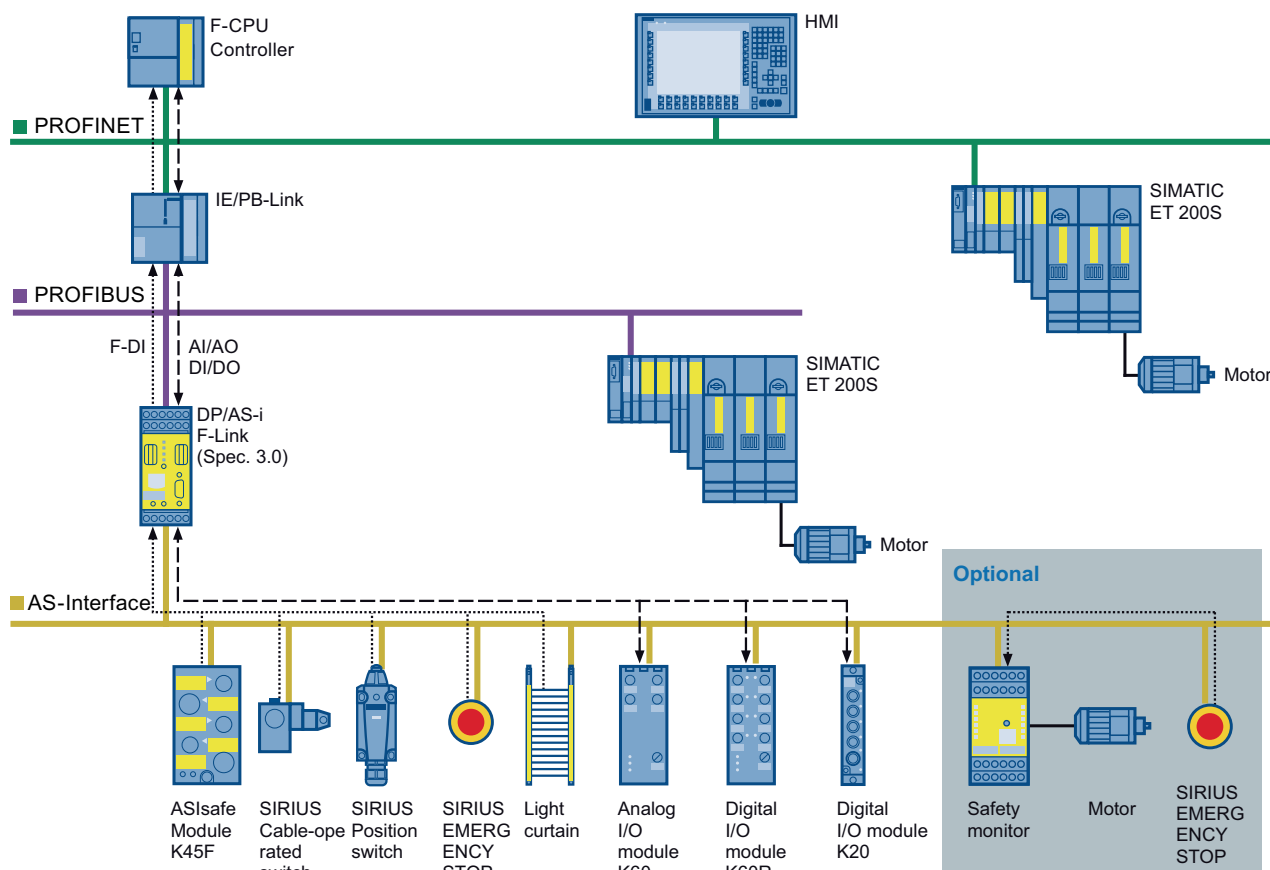
Configuration 1: Integration in PROFIBUS networks with the SIMATIC fail-safe controller



Configuration 2: Integration in PROFINET networks with the SIMATIC fail-safe controller (SIMATIC S7-315 F PN/DP, S7-317 F PN/DP, or S7-416F-3 PN/DP)



Configuration 3: Alternative integration in PROFINET networks with the SIMATIC fail-safe controller via IE / PB-Link



Additional options

Additional network integration options:

- Integration in SINUMERIK Power Line and Solution Line
- Integration under failsafe controllers from third-party vendors by means of the PROFIBUS GSD file

2.2 ASIsafe product overview

2.2.1 Images and features of the ASIsafe components

This section provides an overview of ASIsafe components as well as the accessories available to help you assemble, install, and use these components. The tables contain images of the products and their features.

Note

Alternative to safety monitor

The SIRIUS 3RK3 modular safety system, or MSS for short, with connection to AS-Interface is offered as an alternative to the AS-i safety monitor. This system is not covered in this documentation. You can find additional information in Internet (<http://www.siemens.com/sirius-mss>).

ASIsafe components

Product	Features
DP / AS-i F-Link 	Compact, safety-related gateway between PROFIBUS DP and AS-Interface; can be used up to category 4 according to EN 954-1 or SIL 3 according to IEC 61508 / PL e according to EN ISO 13849-1. • Core element of the ASIsafe solution PROFIsafe • Monitoring of the inputs of safety-related binary AS-i slaves and data forwarding via PROFIsafe. No need for additional safety-related components for the AS-Interface (e.g. additional cabling, safety monitor) • Direct integration in PROFIBUS networks. Can be integrated in PROFINET environments via the PROFINET / PROFIBUS gateway (IE / PB-Link) or via SIMATIC S7-315 F PN/DP, S7-317 F PN/DP, or S7-416F 3 PN/DP • Integration in SINUMERIK safety concepts under SINUMERIK 840 D pl/sl • Optimum TIA integration in STEP 7 via Object Manager, integration in engineering tools from third-party vendors via the PROFIBUS type file (GSD). • AS-i master in accordance with AS-Interface Specification V3.0, master profile M4, for connecting up to 62 AS-i slaves with integrated analog value transmission. • Local diagnosis via LEDs and display with operator input keys. • Module exchange without PG, as startup data is transferred via the PROFIBUS DP master.

Product	Features
Safety monitor/ expanded safety monitor 	Easy-to-configure safety functions up to category 4 according to EN 954-1 or SIL 3 according to IEC 61508 / PL e according to EN ISO 13849-1. • Core element of the ASIsafe solution local • Monitors safe nodes and connects their signals • Ensures safe shutdown • The terminal blocks can be removed and are protected against shock hazards and inversion • With one or two OSSDs • "Extended safety monitor" with extended main memory, integrated ON/OFF delay, and pulse functions Quick and easy configuration of the safety monitor via the PC software ASIMON
Safe modules  K45F K20F S22,5 F	Easy integration of safe signals both in the switching cabinet and in the field • Degrees of protection IP65/IP67 or IP20 • Compact dimensions as of a construction width of 20 mm • Inputs: – Two single-channel inputs / one two-channel input – Four single-channel inputs / two two-channel inputs – Input for electronic signals, e.g. light curtain • E.g: Standard position switch or magnetically-operated switch can be connected • Variants with two standard outputs also available
EMERGENCY STOP command devices 	Simple, direct connection of tried-and-tested command devices to ASIsafe • Enclosure with IP65/IP67 degree of protection • EMERGENCY STOP can be connected directly to AS-Interface via integrated modules • Metal or plastic design • Any combination of pushbuttons, indicator lights, knob-operated switches; can be actuated with just one cable • AS-i F adapter in IP20 degree of protection
Position switches / cable-operated switches Position switches  Cable-operated switches 	Standard wiring of safety functions no longer required • Degree of protection IP65 • Direct connection of position switches or cable-operated switches • Available with separate actuator or tumbler • Encased in plastic or metal

System components and accessories

Function / product		Properties
Addressing unit for commissioning 		Easy method for slave addressing and parameter assignment - Addressing of all nodes in the AS-Interface network (standard and A/B slaves) - Readout of the slave profile (IO, ID, ID2) and ID1 code - Setting of the slave parameters for commissioning - Measurement of the AS-Interface voltage - Enables direct setting of outputs and reading in of inputs of a slave - Readout of the code table of safe input slaves - Saving of complete plant configurations
Analyzer for maintenance and service 		Quality assessment of an AS-Interface network report printout, analysis for on-site and remote diagnostics - Check of quality and proper functioning of an AS-Interface installation - Transfer of data to a PC/PG via an RS232 interface - Software-based evaluation - Automatically-generated test reports - Advanced trigger functions enable precise analysis - Multiple error display enables preventive diagnostics - Process data (standard and Safety) can be viewed online
Cable 		Rapid exchange and connection to AS-Interface by means of piercing technique. - Reverse polarity protection as a result of trapezoidal profile - Cables for different applications made of suitably-optimized materials
Range extension		Reduced infrastructure costs, greater range of applications, and greater flexibility in plant design. - Extension of an AS-i segments to max. 200 m with extension plug (without additional power supply unit) - Extension by one bus segment with AS-i repeater Maximum extension increases (when combined) to 600 m or more
Extension plug 	Repeater 	

Function / product		Properties
Distributors / M12 feeders		Quick and easy distribution and branching to the AS-i trapezoidal cable • Simple distribution of the AS-i trapezoidal cable with a high degree of protection • Branching from AS-i and U_{aux} to round cable • Connection of slaves with M12 bus connection • Easy to use
Compact distributor 	M12 branch 	
Special modules		Ground fault detection and protection against overvoltages on AS-i • Advanced diagnostics function through detection, display (LED), and signaling (2 outputs) of ground faults. • Overvoltage protection
Overvoltage protection 	Ground fault detection 	

2.2.2 ASIsafe device variants (incl. accessories)

This section provides an overview of the variants of safety monitors, safe gateways, as well as switching cabinet and field modules that can be used with ASIsafe.

Safety monitors

Safety monitor	No. of OSSDs	Order number	
		With screw terminals	With spring-loaded terminals
Basic safety monitor	1	3RK1105-1AE04-0CA0	3RK1105-1AG04-0CA0
	2	3RK1105-1BE04-0CA0	3RK1105-1BG04-0CA0
Extended safety monitor	1	3RK1105-1AE04-2CA0	3RK1105-1AG04-2CA0
	2	3RK1105-1BE04-2CA0	3RK1105-1BG04-2CA0
Extended safety monitor with integrated safe slave	2	3RK1105-1BE04-4CA0	3RK1105-1BG04-4CA0

DP / AS-i F-Link

Device	Order number	
	With screw terminals	With spring-loaded terminals
DP/AS-i F-Link	3RK3141-1CD10	3RK3141-2CD10

Devices and modules for IP20

Device type	No. of OSSDs	Order number		
		With screw terminals	With spring-loaded terminals	With insulation displacement method
AS-Interface F adapter; front panel installation	2F-DI	3SF5402-1AA03	3SF5402-1AA04	3SF5402-1AA05
	2F-DI / 2 DO	3SF5402-1AB03	3SF5402-1AB04	3SF5402-1AB05
Safe SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2	3RK1205-0BG00-0AA2	
	2F-DI / 2 DO	3RK1405-0BE00-0AA2	3RK1405-0BG00-0AA2	
	2F-DI / 2 DO and U _{aux}	3RK1405-1BE00-0AA2	3RK1405-1BG00-0AA2	

Modules for IP65 / IP67

Device type	Inputs/outputs	Order number
Safe compact module K20F	2F-DI	3RK1205-0BQ30-0AA3
Safety compact module K45F ¹	2F-DI	3RK1205-0BQ00-0AA3
	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
	2F-DI / 2 DO and U _{aux}	3RK1405-1BQ20-0AA3
	4F-DI	3RK1205-0CQ00-0AA3
Safety compact module K45F LS ¹	2F-DI for light curtains type 2	3RK1205-0BQ21-0AA3
	2F-DI for light curtains type 4	3RK1205-0BQ24-0AA3

¹ Modules are shipped without mounting plate (see "Accessories for K20F and K45F")

General accessories

Accessories	Order number
ASIsafe CD: ASIMON V3 configuration software	3RK1802-2FB06-0GA1
Cable set for safety monitor consisting of - PC configuration cable - Download cable	3RK1901-5AA00

Accessories for K20F (M12 branches)

Type of M12 branch	Terminal connection diagram	Order number
M12 branch with internally-extruded cable		M12 branch: 3RK1 901-1NR11 (1 m) or 3RK1 901-1NR12 (2 m)
- M12 branch with socket - Separate M12 cable		M12 branch: 3RX9 801-0AA00 or 3RK1 901-1NR10 M12 cable 3RK1 902-4PB15-3AA0 (1.5 m)
4 x M12 branch - Separate M12 cable		M12 branch 3RK1 901-1NR04 M12 cable 3RK1 902-4PB15-3AA0 (1.5 m)

Accessories for K20F and K45F

Accessories		Order number
Mounting plate for K45F	For wall mounting	3RK1901-2EA00
	For DIN rail mounting	3RK1901-2DA00
Input jumper for K20F / K45F	Black version	3RK1901-1AA00
	Red version	3RK1901-1AA01

2.3 Function blocks of the safety monitor

Note

For information on how to handle the monitoring blocks, see the manual for the ASIMON V3 configuration software (<http://support.automation.siemens.com/WW/view/en/24434774>).

The following section describes the monitoring blocks required for a better understanding of the content of this manual.

2.3.1 Function blocks of type "forced"

Type symbol



Forced

Function block	Symbol	Meaning
		EMERGENCY STOP
		Protective door
		ESPE Electro-sensitive protective equipment
		Module For connecting safety switching elements via a safety-related AS-Interface module
		Enabling switch
		Key switch
		Coupling AS-Interface safety monitor of a coupled network which, as a safe input slave, communicates its enable information to another network. Local acknowledgement not possible.

With "Forced"-type monitoring blocks, the two input channels of the corresponding safe AS-Interface slave must be switched off and on synchronously.

A startup test and/or "local acknowledgement" is optionally possible. If the "Also acknowledge after startup" check box is activated, a "local acknowledgement" is also required after the AS-Interface safety monitor has been switched on or after a communications fault (warm restart of the AS-Interface safety monitor).

Note

If just one contact closes/opens, the block switches to error mode after a tolerated monitoring time of 100 ms.

2.3.2 Function blocks of type "dependent"

Type symbol



Dependent

Function block	Symbol	Meaning
		EMERGENCY STOP
		Protective door
		ESPE Electro-sensitive protective equipment
		Module For connecting safety switching elements via a safety-related AS-Interface module
		Enabling switch
		Key switch
		Two-hand operation (according to EN 574: max. synchronization time 500 ms)

With "dependent"-type monitoring blocks, the two input channels must be switched on within a specified synchronization time. They may only be switched on again if both input channels were switched off simultaneously beforehand.

In the "Synchronization time" input field, you can define the interval within which both switching signals must be received. If only one contact opens, the second contact must still open before the first contact is permitted to be closed again.

A startup test and/or "local acknowledgement" is optionally possible. If the "Also acknowledge after startup" check box is activated, a "local acknowledgement" is also required after the AS-Interface safety monitor has been switched on or after a communications fault (warm restart of the AS-Interface safety monitor).

Note

If the synchronization time defined by the user is exceeded, actuation must be repeated. If the synchronization time is set to infinite (∞), the AS-Interface safety monitor waits to communicate the enable information until the second switching signal arrives after the first switching signal (input signal).

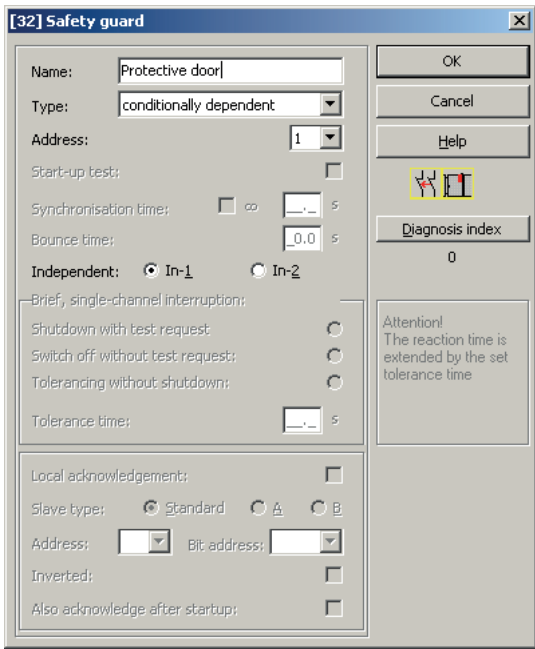
WARNING

Use as two-hand operation

If two-hand operation is used, note the relevant instructions in the documentation provided by the manufacturer.

2.3.3 Function blocks of type "conditionally dependent"

Type symbol  Conditionally dependent

Function block	Symbol	Meaning
	 	Protective door with tumbler Module For connecting standard safety elements via a safety-related AS-Interface module

With monitoring blocks of the "conditionally dependent" type, the time sequence of the two input channels are checked. With the appropriate sequence, restart is also possible even when both input channels were not switched off beforehand.

The presence of the first switching signal is a prerequisite for the acceptance of the second, dependent switching signal. The user can define which contacts are interdependent. If the second, dependent switching signal is received before the first one, this is an error.

Example: A door switch with interlock

The door switch operates one contact (independent contact). The interlock monitor operates the other contact (dependent contact). The interlock can only be opened and closed when the door is closed. If the door contact is open when the interlock is closed, this is an error.

 **CAUTION**

Limited safety with conditionally dependent monitoring blocks

Conditionally dependent monitoring blocks only offer limited safety because they are not checked with respect to simultaneity. You must ensure that the conditionally dependent monitoring blocks fulfill the requirements of the relevant category according to EN 954-1 or SIL according to IEC 61508 / PL according to EN ISO 13849-1.

2.3.4 Function blocks of type "independent"

Type symbol



Independent

Function block	Symbol	Meaning
		EMERGENCY STOP
		Protective door
		Module For connecting standard safety elements via a safety-related AS-Interface module
		Enabling switch
		Key switch

With "independent" monitoring blocks, the two input channels must be switched on. They are switched on again without additional conditions as soon as both input channels are switched on. The only requirement is that both switching signals have been received. A synchronization time is not defined.

A startup test and/or "local acknowledgement" is optionally possible. If the "Also acknowledge after startup" check box is activated, a "local acknowledgement" is also required after the AS-Interface safety monitor has been switched on or after a communications fault (warm restart of the AS-Interface safety monitor).

Note

If "Start-up test" is selected, both switches must always be open during the test.

A startup test must also be performed after an error condition is reset.

CAUTION

Limited safety with independent monitoring blocks

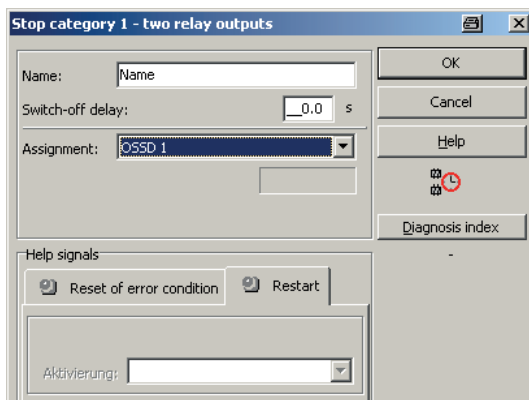
Independent monitoring blocks only offer limited safety because they are not checked with respect to simultaneity. You must ensure that the independent monitoring blocks fulfill the requirements of the relevant category according to EN 954-1 or SIL according to IEC 61508 / PL according to EN ISO 13849-1.

2.3.5 Function block of type "Stop category 1 - two relay outputs"

Block icon



Stop category 1 - two relay outputs



When the circuit is enabled (ON), the "Stop category 1 - two relay outputs" output block activates the output circuits (two relays each) of both OSSDs simultaneously. If a sensor input causes the circuit to shut down (OFF), the safety monitor shuts down the output circuit of OSSD 1 immediately. Once the set switch-off delay has elapsed, the safety monitor also shuts down the output circuit of the dependent OSSD. You can set the switch-off delay anywhere between 0 s and 300 s in increments of 100 ms. The circuit cannot be switched on again until the safety monitor has also shut down the dependent output circuit.

Note

If an internal AS-Interface safety monitor error occurs, all the output circuits are shut down immediately. With all other errors (e.g. communication interrupt), the set switch-off delay is retained.

2.3.6 Function block of type "Door lock by means of delay time"

Block icon



Door lock by means of delay time

When the safety monitor shuts down the first output circuit, it switches on the second output circuit after the set delay time has elapsed. This delay time can be set anywhere between 1 s and 300 s in increments of 1 s. To switch on the first output circuit, the safety monitor must have shut down the second output circuit beforehand.

If the sensors allow the circuit to be enabled (ON) again before the second output circuit has been switched on, the second output circuit remains OFF and the safety monitor switches on the first output circuit again.

Note

This output block is only available when two dependent OSSDs are used.

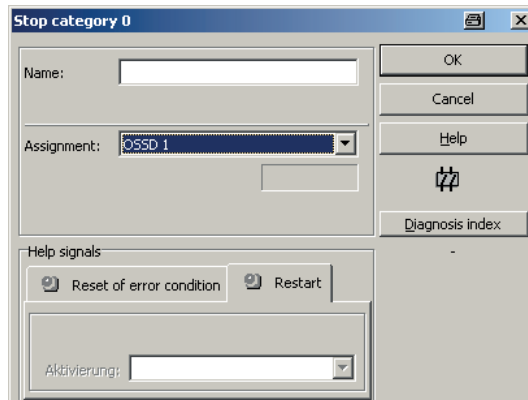
Once the AS-Interface safety monitor has been switched on, the second output circuit remains inactive for at least the set delay time.

2.3.7 Function block of type "Stop category 0"

Block icon



Stop category 0



Note

The "stop category 0" output block is only available when one or two independent OSSDs are used.

When the circuit is enabled (ON), the output block "stop category 0" activates the signaling output and output circuit simultaneously. When the circuit is shut down (OFF), the output block shuts down the signaling output and the output circuit immediately.

You can choose the assignment of the OSSD in the dropdown box.

Note

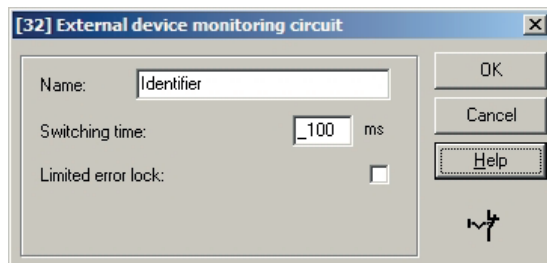
If an error occurs in the AS-Interface safety monitor, the status of the signaling output is undefined. The output circuit is shut down.

2.3.8 Function block of type "External device monitoring circuit"

Block icon



External device monitoring circuit



When the safety outputs have been shut down, the contactor monitor input on the AS-Interface safety monitor must be active (ON).

Once the safety outputs have been switched on (enable), the contactor monitor input is not relevant for the set switching time. The input must then be inactive (OFF). The status of the contactor monitor is active (ON).

Once the safety outputs have been shut down, the status of the contactor monitor switches to inactive (OFF) and the contactor monitor input is not queried for the set switching time.

The contactor monitor input must then be active again (ON).

Once the monitor has been shut down, the contactor monitor prevents the monitor from being reactivated during the set switching time. This aims to ensure that all downstream contactors have reached the idle state before the contactor monitor queries the input signal again to prevent an error lock.

Error lock

If the input is inactive (OFF) when the safety outputs have been shut down or active (ON) when the safety outputs have been switched on, the software switches to error mode and is locked.

Note

With a dynamic contactor monitor with error lock:

- The contactor control **cannot** be connected in series with operational switches.
 - The external device monitoring circuit **cannot** be connected in series with operational switches.
-

Limited error lock

If the input is inactive (OFF) when the safety outputs have been shut down, the software switches to error mode and is locked. If the input remains active (ON) once the safety outputs have been switched on, e.g. if the contactor does not pick up due to switched-off control voltage, the contactor monitor shuts down the safety outputs of the OSSD again and the safety monitor waits for the next start signal.

Note

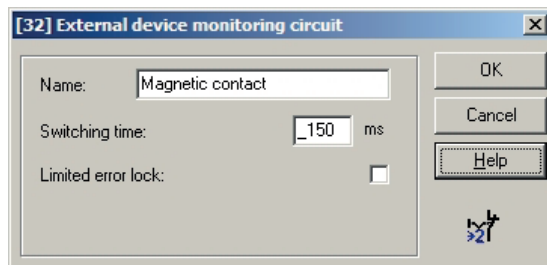
A dynamic contactor monitor with limited error lock cannot be used in conjunction with automatic startup because the safety outputs of the AS-Interface safety monitor may switch on and off continuously.

2.3.9**Function block of type "External device monitoring circuit for second, dependent OSSD"**

Block icon



External device monitoring circuit for second, dependent OSSD



The external device monitoring circuit for a second, dependent OSSD has the same function as a standard external device monitoring circuit. This external device monitoring circuit monitors the series-connected contactor on the second channel, but only acts on the enabling signal for channel 1.

Note

This external device monitoring circuit block can only be used in the first OSSD of a configuration with two dependent shutdown units.

2.4 Configuration of DP / AS-i F-Link

Note

A detailed guide to configuring DP / AS-i F-Link is available in Manual "DP / AS-i F-Link" in Section "Configuring"

(<http://support.automation.siemens.com/WW/view/en/24196041?Datakey=2860241>)

A guide to programming DP / AS-i F-Link is available in Manual "S7 Distributed Safety - Configuring and Programming"

(<http://support.automation.siemens.com/WW/view/en/22099875>)

The following section describes all the configurations required for a better understanding of the content of this manual.

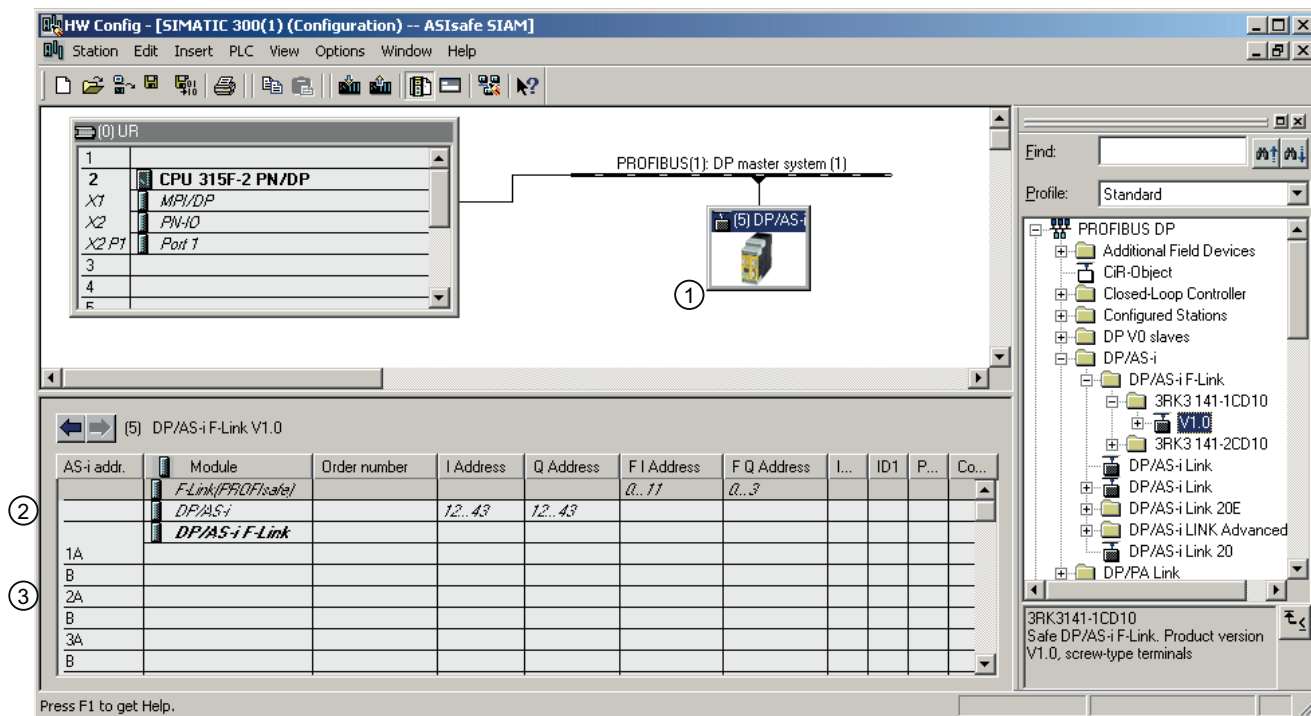
2.4.1 Configuring the PROFIBUS DP master system

Configure DP/AS-i F-Link as a modular PROFIBUS DP slave in HW Config of the PROFIBUS DP master.

Procedure

1. Open your STEP 7 project.
2. Generate OB 82, OB 85, and OB 86 additionally for the project.
3. Open the HW Config of the PROFIBUS DP master.
4. Select the DP / AS-i F-Link in the "Hardware Catalog" window.
Path: PROFIBUS-DP -> DP/AS-i -> DP/AS-i F-Link -> 3RK3141-xCD10 -> V1.0
5. Drag & drop the selected DP/AS-i F-Link to the DP master system.
The "Properties - PROFIBUS Interface..." dialog opens.
6. Set the properties of the PROFIBUS sub-network.
7. Select the PROFIBUS address for the DP / AS-i F-Link
8. Acknowledge the settings with "OK".

Result



- ① A symbol for the DP / AS-i F-Link is appended to the DP master system.
- ② In the lower section of the station window, a detailed view of the DP / AS-i F-Link appears with its possible slots or DP IDs.
- ③ This is followed by the lines for the AS-i address table, which has yet to be maintained.

Figure 2-7 Configuring DP / AS-i F-Link

2.4.2 Filling the AS-i address table

If the lines of the AS-i address table have not yet been populated using the "Load into PG" function, you can supplement the table with placeholder modules and specify them later. The Object Manager checks possible destination addresses and represents the relevant lines against a green background. You have the following options available to you:

- Drag & drop an AS-i slave from the Hardware Catalog (PROFIBUS-DP > DP/AS-i > DP/AS-i F-Link > 3RK3141-xCD10 > V1.0 > AS-i F slave or AS-i slave)
- Selection of an AS-i slave via the context menu "Insert Object..." (V1.0 > AS-i F slave or AS-i slave)
- Copying and inserting via the clipboard
- Moving the contents of the line while holding down the left mouse key. This changes the AS-i address provided for the slave in the configuration.

2.4.3 Calling the "Properties AS-i F Slave ..." dialog box

To specify the placeholder modules or for changing the AS-i slave parameters, open the "Properties - AS-i Slave - ..." or "Properties - AS-i F Slave - ..." dialog box in the following ways:

- Double-click on an assigned address line
- Click on the context menu "Object Properties..."

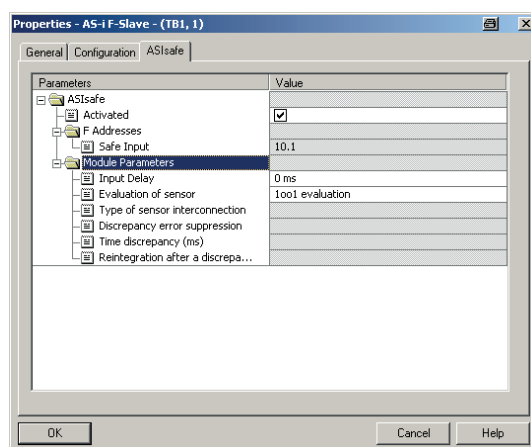
The following tabs are available:

- "General"
- "Configuration"
- "ASIsafe", when selecting an ASIsafe slave

Make the settings and acknowledge the inputs with "OK" to terminate the dialog.

2.4.4 "ASIsafe" tab - parameterization, one-channel

Parameterize the "ASIsafe" tab as follows:



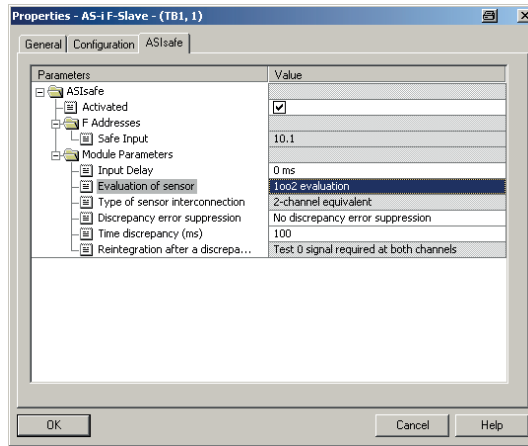
In the case of "1001 evaluation", the sensor is available once and has a single-channel connection to the first input of the ASIsafe slave. To do so, jumper the second input of the ASIsafe slave. Instead of the jumper, you can also connect a second single-channel sensor to the second input. Only if both inputs supply ONE signals does the DP / AS-i F-Link forward a resulting ONE signal to the PLC.

Note

ESPE (light barriers, light arrays, light curtains, laser scanners) must always be evaluated with "1002 evaluation".

2.4.5 "ASIsafe" tab - parameterization, two-channel

Parameterize the "ASIsafe" tab as follows:



In the case of "1oo2 evaluation" (default), both inputs of the ASIsafe slave are occupied by one two-channel sensor or by two single-channel sensors. Functionally, the two single-channel sensors belong together as a pair.

The value "0" is made available to the safety program in the F-CPU for each ASIsafe slave as soon as at least one input channel of the ASIsafe slave is switched off. If there is a discrepancy between the two input channels, the assigned discrepancy time starts and, after its expiration, a discrepancy error occurs and a diagnostic interrupt is output.

The value "1" is made available to the safety program in the F-CPU for each ASIsafe slave, when both input channels of the ASIsafe slave are switched on and there is not discrepancy error or other error pending.

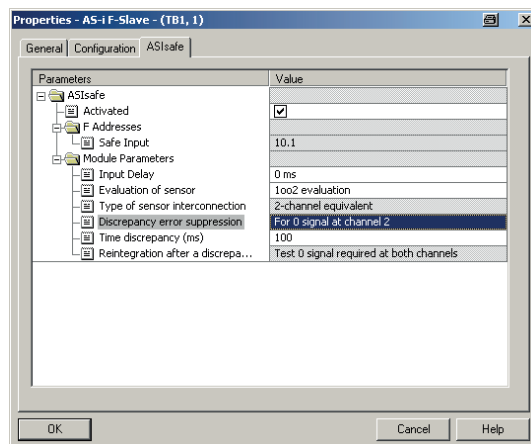
The discrepancy time can be set anywhere between 100 ms (default) and 2500 ms in increments of 10 ms.

Note

The message "Test 0 signal required at both channels" for module parameter "Reintegration after a discrepancy" means a discrepancy error is not considered to be rectified until a 0 signal is present again at both input channels.

2.4.6 "ASIsafe" tab - parameterization of position switch with lock and ASIsafe

Parameterize the "ASIsafe" tab as follows:



The value "0" is made available to the safety program in the F-CPU for each ASIsafe slave as soon as at least one input channel of the ASIsafe slave is switched off. If there is a discrepancy between the two input channels, the assigned discrepancy time starts under the following condition:

The discrepancy error is suppressed when the following signals are present:

- 0 signal at channel 2 (check-back signal from magnet)

And

- 1 signal at channel 1 (check-back signal from position switch)

The discrepancy analysis starts as soon as the following signals are present:

- 1 signal at channel 2 (check-back signal from magnet)

And

- 0 signal at channel 1 (check-back signal from position switch)

If the discrepancy is present within the configurable discrepancy time, a discrepancy error is present and results in a diagnostic interrupt.

Note

The message "Test 0 signal required at both channels" for module parameter "Reintegration after a discrepancy" means a discrepancy error is not considered to be rectified until a 0 signal is present again at both input channels.

Typical circuit diagrams for IP20

Protected installation of sensor cables

WARNING
Sensor cables for single-channel sensors must be installed in such a way that they are short-circuit and ground fault proof.

Note

Sensor cables must always be installed in such a way that they are protected, that is, according to EN 60204 (Electrical equipment of machines):

Cables and their terminals outside the housing of electrical equipment must be routed through suitable cable ducts (i.e. electric wiring conduits or ducting to be opened). Exceptions here include cables and wires that are properly protected and that can be installed without cable ducts as well as with or without open cable trays or fixings. If devices (e.g. position or proximity switch) are shipped with an integrated connection cable, the cables do not need to be installed in a cable duct provided that the cable is suitable for its intended purpose, is sufficiently short, and is positioned or protected in such a way that the risk of damage is minimized.

3.1 AS-Interface F adapter

3.1.1 AS-Interface F adapter, 2F-DI (/ 1 DO); for EMERGENCY STOP command unit 3SB3; category 4

AS-Interface F adapter	2F-DI, screw connection	3SF5402-1AA03
AS-Interface F adapter	2F-DI, spring-type connection	3SF5402-1AA04
AS-Interface F adapter	2F-DI, insulation displacement method	3SF5402-1AA05
AS-Interface F adapter	2F-DI / 1 DO, screw connection	3SF5402-1AB03
AS-Interface F adapter	2F-DI / 1 DO, spring-type connection	3SF5402-1AB04
AS-Interface F adapter	2F-DI / 1 DO, insulation displacement method	3SF5402-1AB05

- EMERGENCY STOP monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 61508 / PL e according to EN ISO 13849-1
- Dependent

Assembly

1. Position the device on the EMERGENCY STOP actuator
2. Engage the snap hook.

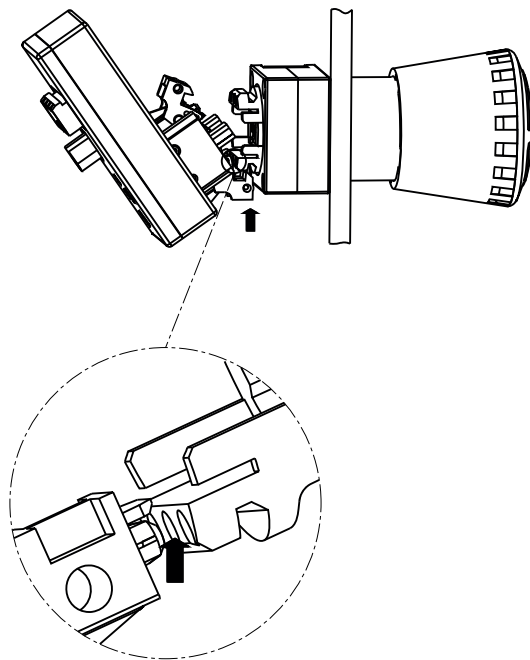


Figure 3-1 Installing the AS-i F adapter

Connecting

WARNING

Safety sensors with positive-opening contacts

Only safety sensors with positive-opening contacts are permitted to be used as sensors.

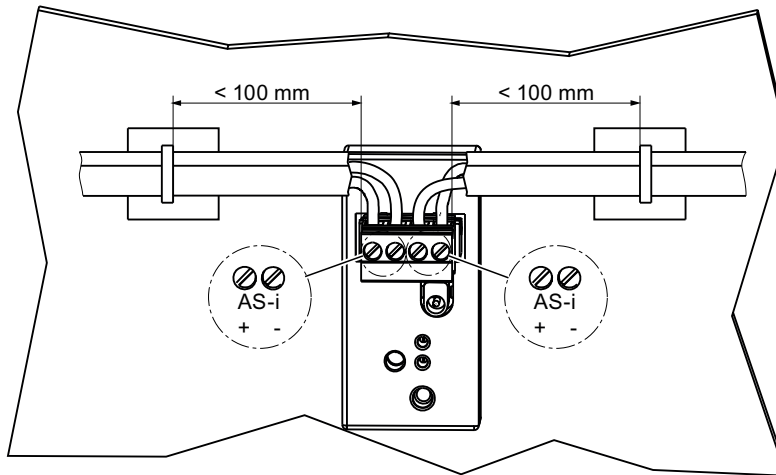
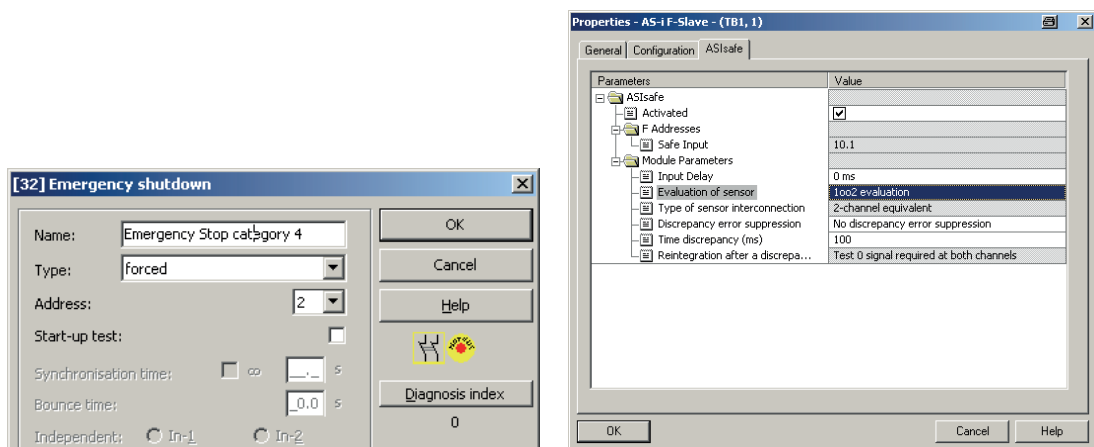


Figure 3-2 Connecting the AS-i F adapter (in this example: screw connection)

Characteristic data for the LED control output

Variable	Values
U_{out}	20 ... 25 V
I_{max}	20 mA
Max. cable length	100 mm

Configuring



3.2 Safe SlimLine module S22,5F

3.2.1 S22,5 2F-DI; EMERGENCY STOP monitoring, category 2

SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2
------------------------	-------	--------------------

- EMERGENCY STOP monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

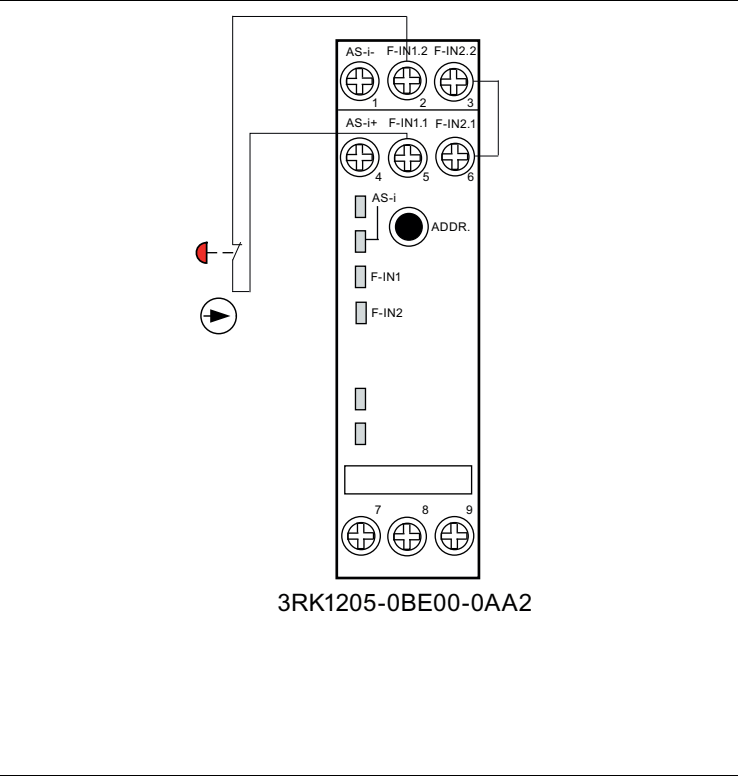
**WARNING**

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



Configuring

[32] Emergency shutdown

Name: Emergency Stop category 2

Type: independent

Address: 1

Start-up test: ☐

Synchronisation time: ☐

Bounce time: ☐

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Diagnosis index 0

Properties - AS-i F-Slave - (TB1, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1001 evaluation
Type of sensor interconnection	
Discrepancy error suppression	
Time discrepancy (ms)	
Reintegration after a discrepa...	

OK Cancel Help

3.2.2 S22,5 2F-DI; EMERGENCY STOP monitoring, category 4

SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2
------------------------	-------	--------------------

- EMERGENCY STOP monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

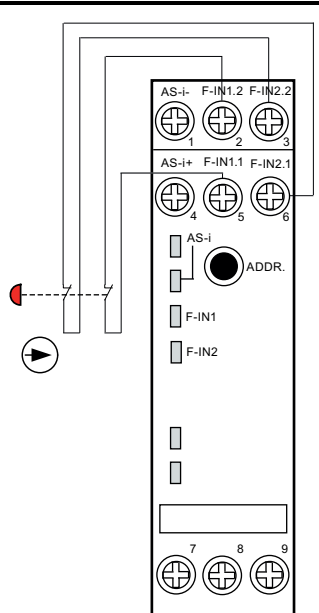
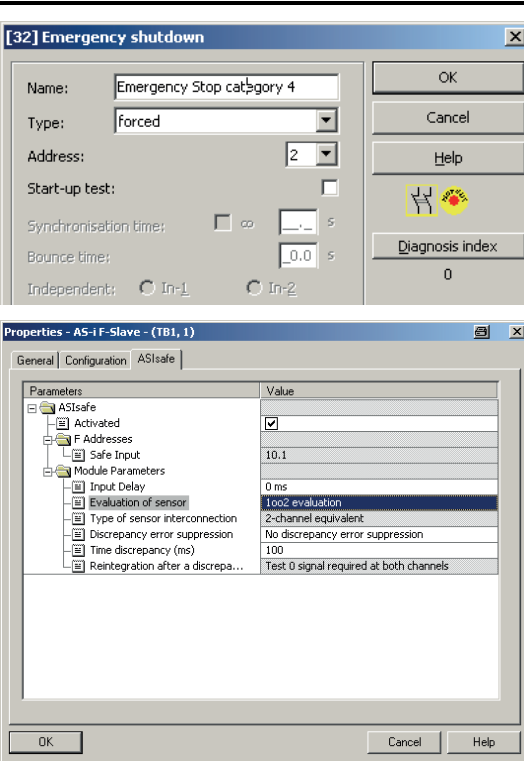
WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

Category 4 allows more than one EMERGENCY STOP command device to be connected in series.

Connecting	Configuring
 3RK1205-0BE00-0AA2	

3.2.3 S22,5 2F-DI; EMERGENCY STOP and protective door monitoring; category 2

SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2
------------------------	-------	--------------------

- EMERGENCY STOP and protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

! WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
3RK1205-0BE00-0AA2	

3.2.4 S22,5 2F-DI; protective door monitoring, category 2

SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2
------------------------	-------	--------------------

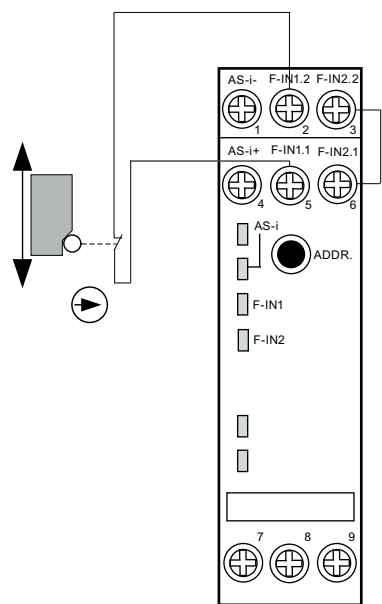
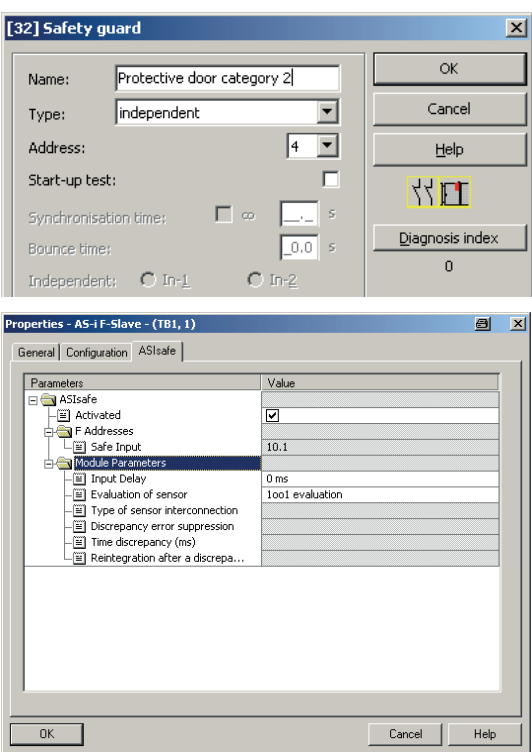
- Protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
 3RK1205-0BE00-0AA2	

3.2.5 S22,5 2F-DI; protective door monitoring, two doors, category 2

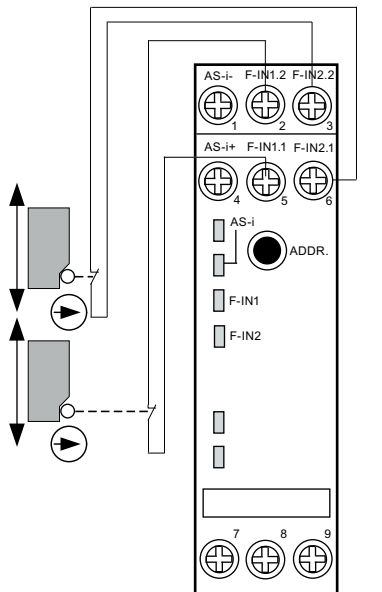
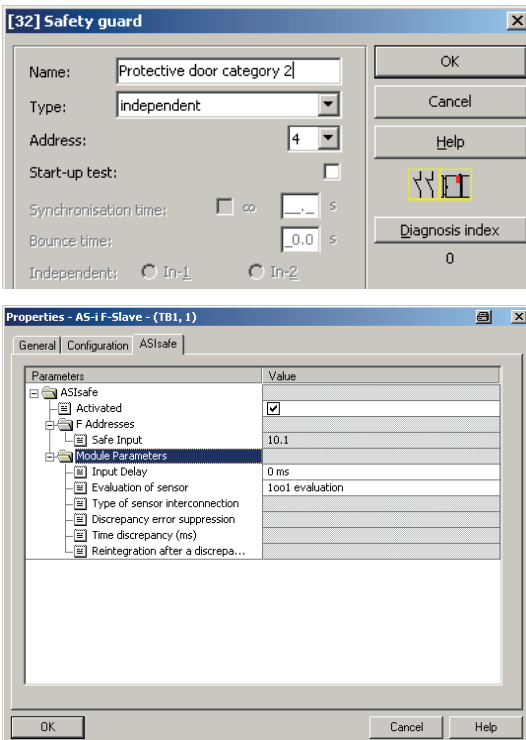
SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2
------------------------	-------	--------------------

- Protective door monitoring (two doors)
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
 3RK1205-0BE00-0AA2	

3.2.6 S22,5 2F-DI; protective door monitoring, category 4

SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2
------------------------	-------	--------------------

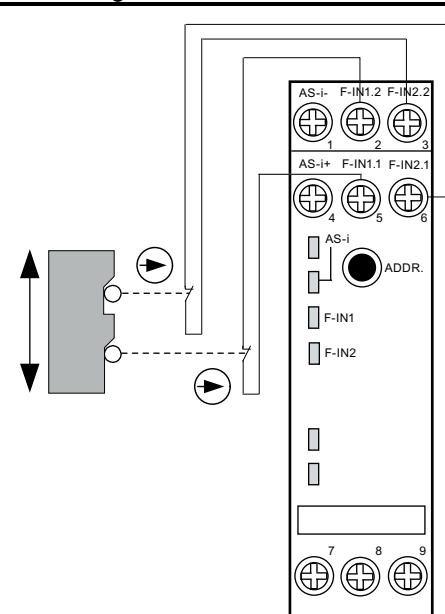
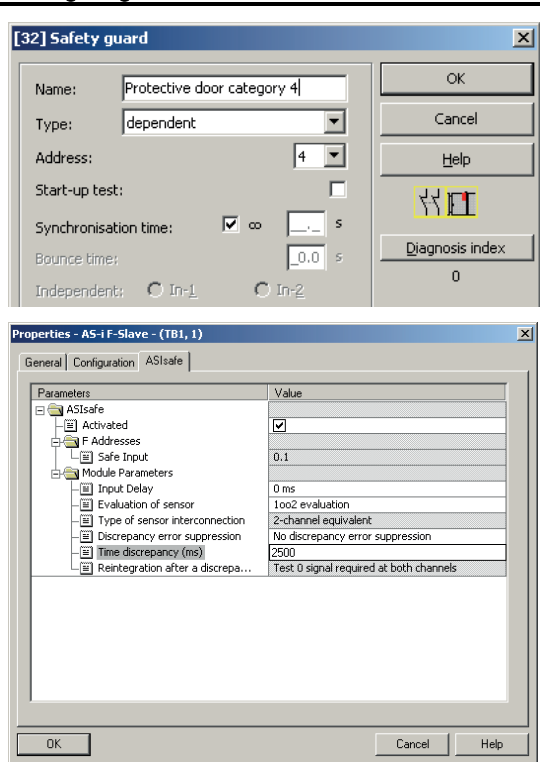
- Protective door monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

WARNING

Safety sensors with positive-opening contacts

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
 3RK1205-0BE00-0AA2	

3.2.7 S22,5 2F-DI; magnetically-operated switch monitoring, category 4

SlimLine module S22.5F	2F-DI	3RK1205-0BE00-0AA2
------------------------	-------	--------------------

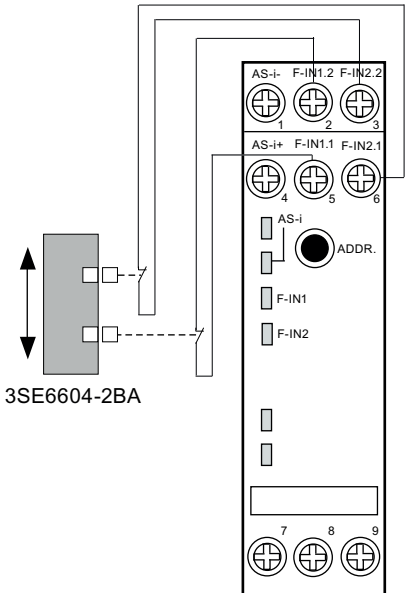
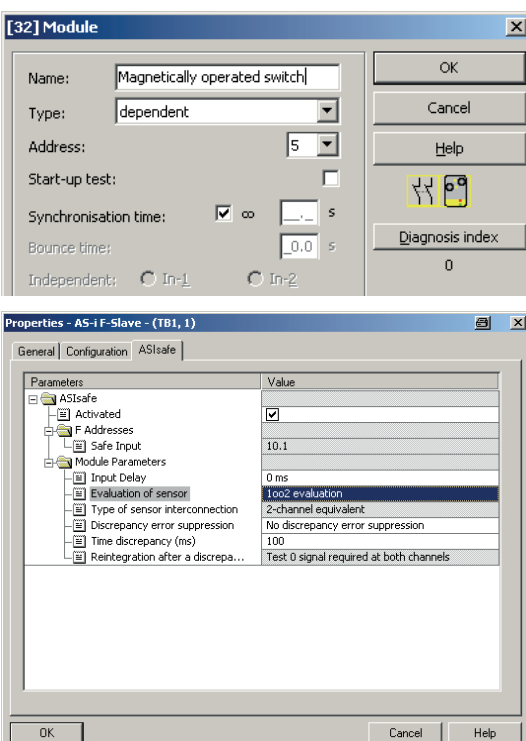
- Magnetically-operated switch monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

WARNING

Magnetically-operated switch for protective door monitoring

Category 4 does not allow several magnetically-operated switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected.

Connecting	Configuring
 3SE6604-2BA 3RK1205-0BE00-0AA2	

3.2.8 S22,5 2F-DI / 2 DO; EMERGENCY STOP monitoring, category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO	3RK1405-0BE00-0AA2
------------------------	--------------------	--------------------

- EMERGENCY STOP monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs		
Current at OUT1	Current at OUT2	Total current
≤ 150 mA	≤ 150 mA	≤ 150 mA

! WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
3RK1405-0BE00-0AA2	

3.2.9 S22,5 2F-DI / 2 DO; EMERGENCY STOP monitoring, category 4

SlimLine module S22.5F	S22.5 2F-DI / 2 DO	3RK1405-0BE00-0AA2
------------------------	--------------------	--------------------

- EMERGENCY STOP monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

Switching capacity of the outputs		
Current at OUT1	Current at OUT2	Total current
≤ 150 mA	≤ 150 mA	≤ 150 mA

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

Category 4 allows more than one EMERGENCY STOP command device to be connected in series.

Connecting	Configuring
3RK1405-0BE00-0AA2	

3.2.10 S22,5 2F-DI / 2 DO; EMERGENCY STOP and protective door monitoring; category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO	3RK1405-0BE00-0AA2
------------------------	--------------------	--------------------

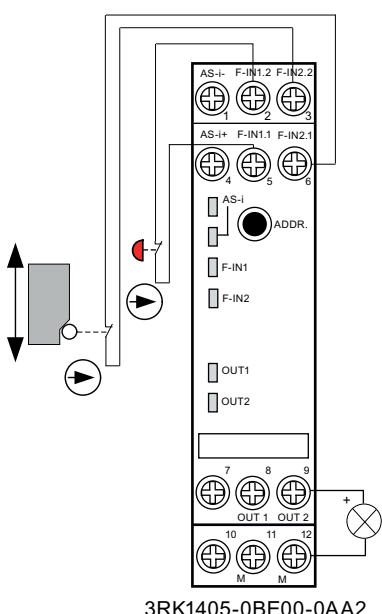
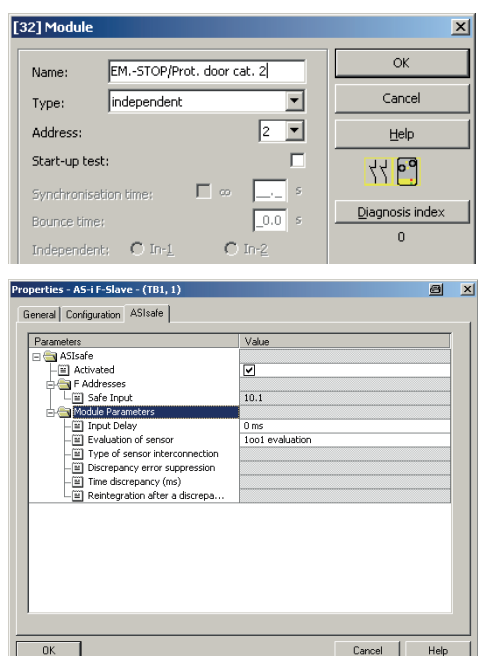
- EMERGENCY STOP and protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs		
Current at OUT1	Current at OUT2	Total current
≤ 150 mA	≤ 150 mA	≤ 150 mA

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
 3RK1405-0BE00-0AA2	

3.2.11 S22,5 2F-DI / 2 DO; protective door monitoring, category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO	3RK1405-0BE00-0AA2
------------------------	--------------------	--------------------

- Protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs		
Current at OUT1	Current at OUT2	Total current
≤ 150 mA	≤ 150 mA	≤ 150 mA

⚠ WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-0BE00-0AA2

Configuring

3.2.12 S22,5 2F-DI / 2 DO; protective door monitoring, two doors; category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO	3RK1405-0BE00-0AA2
------------------------	--------------------	--------------------

- Protective door monitoring (two doors)
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs		
Current at OUT1	Current at OUT2	Total current
≤ 150 mA	≤ 150 mA	≤ 150 mA

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
3RK1405-0BE00-0AA2	

3.2.13 S22,5 2F-DI / 2 DO; protective door monitoring, category 4

SlimLine module S22.5F	S22.5 2F-DI / 2 DO	3RK1405-0BE00-0AA2
------------------------	--------------------	--------------------

- Protective door monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

Switching capacity of the outputs		
Current at OUT1	Current at OUT2	Total current
≤ 150 mA	≤ 150 mA	≤ 150 mA

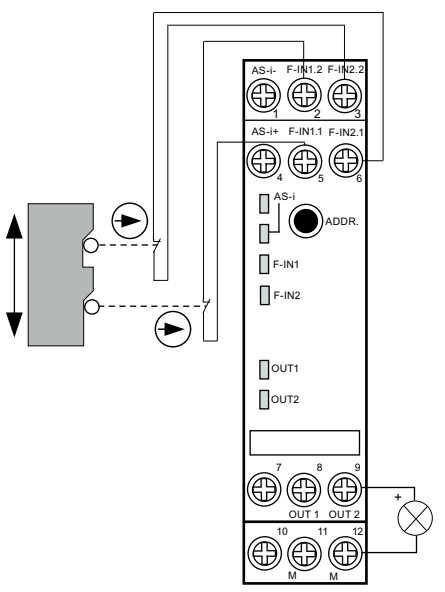
WARNING

Safety sensors with positive-opening contacts

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

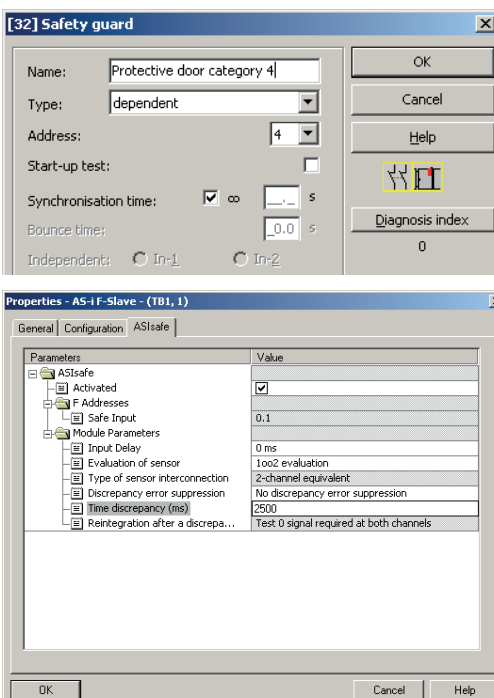
Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



3RK1405-0BE00-0AA2

Configuring



3.2.14 S22,5 2F-DI / 2 DO; magnetically-operated switch monitoring, category 4

SlimLine module S22.5F	S22.5 2F-DI / 2 DO	3RK1405-0BE00-0AA2
------------------------	--------------------	--------------------

- Magnetically-operated switch monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

Switching capacity of the outputs		
Current at OUT1	Current at OUT2	Total current
≤ 150 mA	≤ 150 mA	≤ 150 mA

! WARNING

Magnetically-operated switch for protective door monitoring

Category 4 does not allow several magnetically-operated switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected.

Connecting	Configuring
3SE6604-2BA 3RK1405-0BE00-0AA2	

3.2.15 S22,5 2F-DI / 2 DO, U_{aux}; EMERGENCY STOP monitoring; category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO, U _{aux}	3RK1405-1BE00-0AA2
------------------------	--------------------------------------	--------------------

- EMERGENCY STOP monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

 **WARNING**

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-1BE00-0AA2

Configuring

3.2.16 S22,5 2F-DI / 2 DO, U_{aux}; EMERGENCY STOP monitoring; category 4

SlimLine module S22.5F	S22.5 2F-DI / 2 DO, U _{aux}	3RK1405-1BE00-0AA2
------------------------	--------------------------------------	--------------------

- EMERGENCY STOP monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

Category 4 allows more than one EMERGENCY STOP command device to be connected in series.

Connecting	Configuring
3RK1405-1BE00-0AA2	

3.2.17 S22,5 2F-DI / 2 DO, U_{aux}; EMERGENCY STOP and protective door monitoring; category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO, U _{aux}	3RK1405-1BE00-0AA2
------------------------	--------------------------------------	--------------------

- EMERGENCY STOP and protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
3RK1405-1BE00-0AA2	

3.2.18 S22,5 2F-DI / 2 DO, U_{aux}; protective door monitoring, category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO, U _{aux}	3RK1405-1BE00-0AA2
------------------------	--------------------------------------	--------------------

- Protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-1BE00-0AA2

Configuring

[32] Safety guard

Name: Protective door category 2

Type: independent

Address: 4

Start-up test: ☐

Synchronisation timer: ☐ ∞ 5

Bounce timer: 0.0 5

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Properties - AS-i Slave - (I01, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	Tool evaluation
Type of sensor interconnection	
Discrepancy error suppression	
Time discrepancy (ms)	
Reintegration after a discrepa...	

OK Cancel Help

3.2.19 S22,5 2F-DI / 2 DO, U_{aux}; protective door monitoring, two doors; category 2

SlimLine module S22.5F	S22.5 2F-DI / 2 DO, U _{aux}	3RK1405-1BE00-0AA2
------------------------	--------------------------------------	--------------------

- Protective door monitoring (two doors)
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

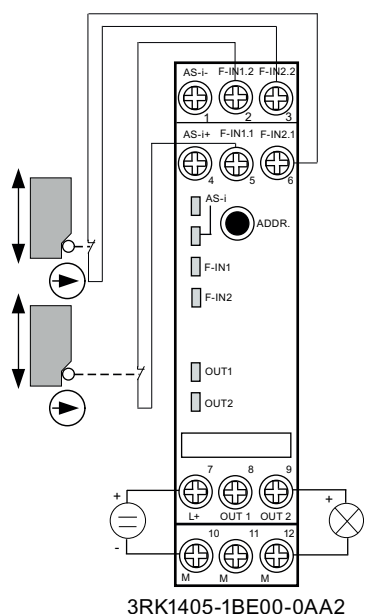
Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

 **WARNING**

Safety sensors with positive-opening contacts

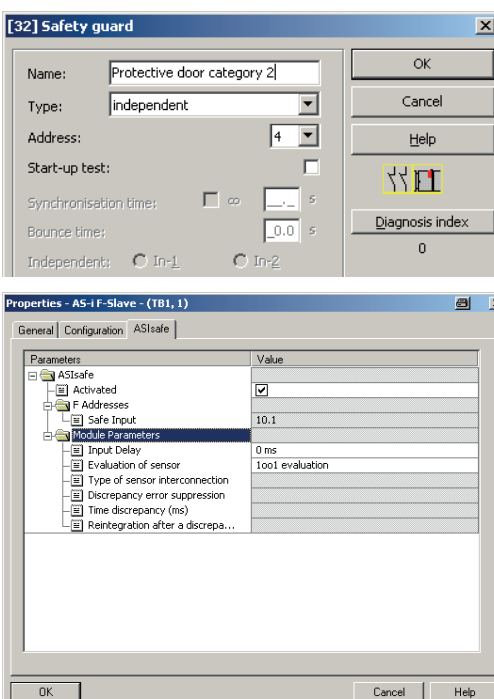
Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



3RK1405-1BE00-0AA2

Configuring



3.2.20 S22,5 2F-DI / 2 DO, U_{aux}; magnetically-operated switch monitoring, category 4

SlimLine module S22.5F	S22.5 2F-DI / 2 DO, U _{aux}	3RK1405-1BE00-0AA
------------------------	--------------------------------------	-------------------

- Magnetically-operated switch monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Magnetically-operated switch for protective door monitoring

Category 4 does not allow several magnetically-operated switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected.

Connecting	Configuring
3SE6604-2BA 3RK1405-1BE00-0AA2	

Typical circuit diagrams for IP65 / IP67

Protected installation of sensor cables

WARNING
Sensor cables for single-channel sensors must be installed in such a way that they are short-circuit and ground fault proof.

Note

Sensor cables must always be installed in such a way that they are protected, that is, according to EN 60204 (Electrical equipment of machines):

Cables and their terminals outside the housing of electrical equipment must be routed through suitable cable ducts (i.e. electric wiring conduits or ducting to be opened). Exceptions here include cables and wires that are properly protected and that can be installed without cable ducts as well as with or without open cable trays or fixings. If devices (e.g. position or proximity switch) are shipped with an integrated connection cable, the cables do not need to be installed in a cable duct provided that the cable is suitable for its intended purpose, is sufficiently short, and is positioned or protected in such a way that the risk of damage is minimized.

4.1 Safe compact module K20F

4.1.1 K20F 2F-DI; EMERGENCY STOP monitoring, category 2

K20F	2F-DI	3RK1205-0BQ30-0AA3
------	-------	--------------------

- EMERGENCY STOP monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

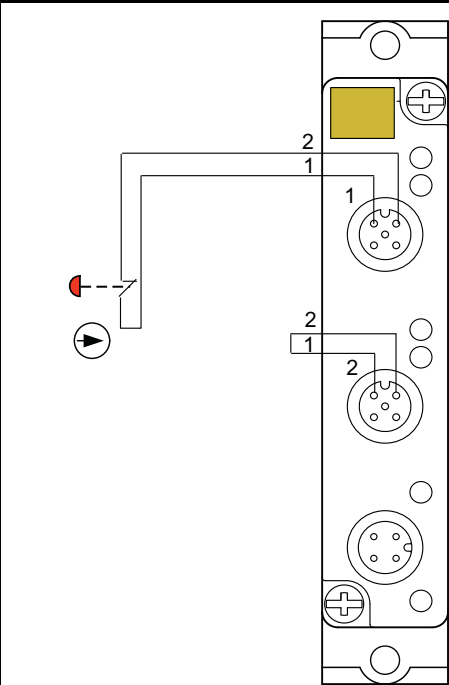
⚠ WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



3RK1205-0BQ30-0AA3

An input jumper is available as an accessory; see ASIsafe device variants (incl. accessories) (Page 27)

Configuring

[32] Emergency shutdown

Name: Emergency Stop category 2
Type: independent
Address: 1
Start-up test: ☐
Synchronisation timer: ☐ ∞ s
Bounce time: 0.0 s
Independent: ☐ In-1 ☐ In-2

Properties - AS-i F-Slave - (T81, 1)

General | Configuration | ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1001 evaluation
Type of sensor interconnection	
Discrepancy error suppression	
Time discrepancy (ms)	
Reintegration after a discrepa...	

4.1.2 K20F 2F-DI; EMERGENCY STOP monitoring, category 4

K20F	2F-DI	3RK1205-0BQ30-0AA3
------	-------	--------------------

- EMERGENCY STOP monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

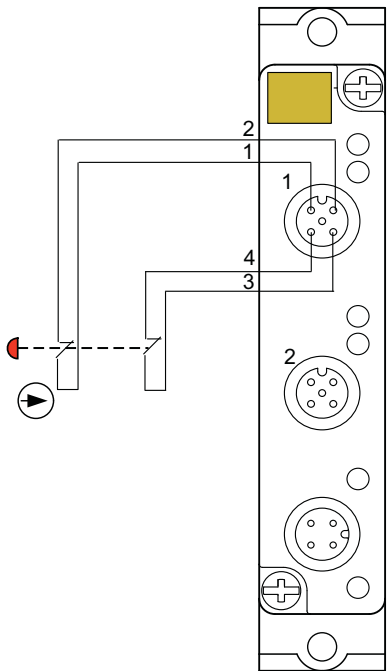
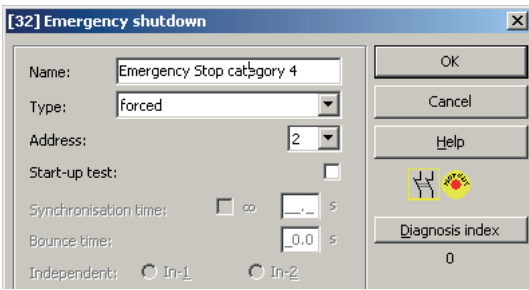
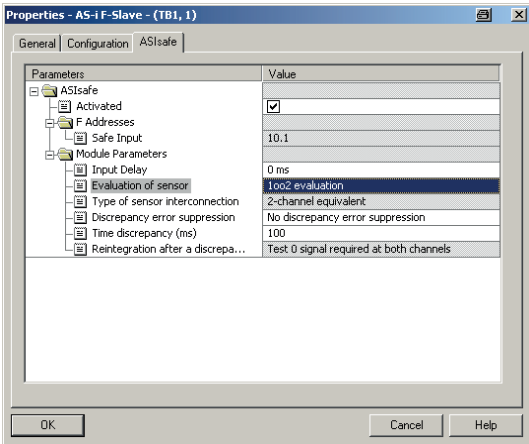
! WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

Category 4 allows more than one EMERGENCY STOP command device to be connected in series.

Connecting	Configuring
 3RK1205-0BQ30-0AA3	 

4.1.3 K20F 2F-DI; EMERGENCY STOP and protective door monitoring; category 2

K20F	2F-DI	3RK1205-0BQ30-0AA3
------	-------	--------------------

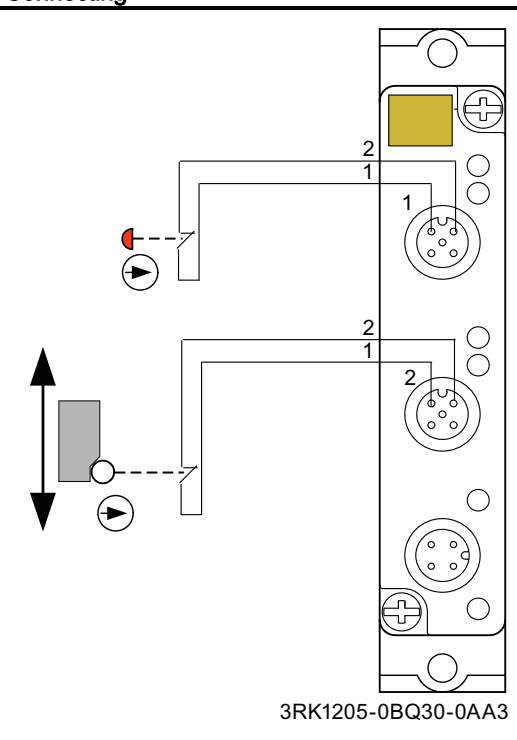
- EMERGENCY STOP and protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

! WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



3RK1205-0BQ30-0AA3

Configuring

[32] Module

Name: EM.-STOP/Prot. door cat. 2

Type: Independent

Address: 2

Start-up test: ☐

Synchronisation time: ☐ ∞ s

Bounce time: s

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Diagnosis index 0

Properties - AS-i F-Slave - (TB1, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1001 evaluation
Type of sensor interconnection	
Discrepancy error suppression	
Time discrepancy (ms)	
Reintegration after a discrepa...	

OK Cancel Help

4.1.4 K20F 2F-DI; protective door monitoring, category 2

K20F	2F-DI	3RK1205-0BQ30-0AA3
------	-------	--------------------

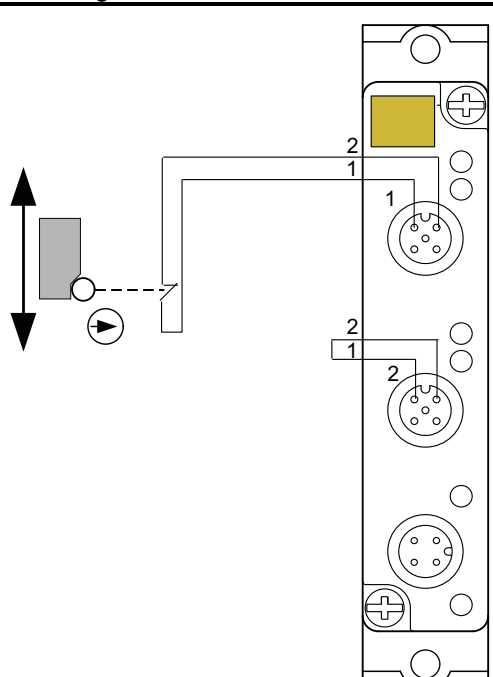
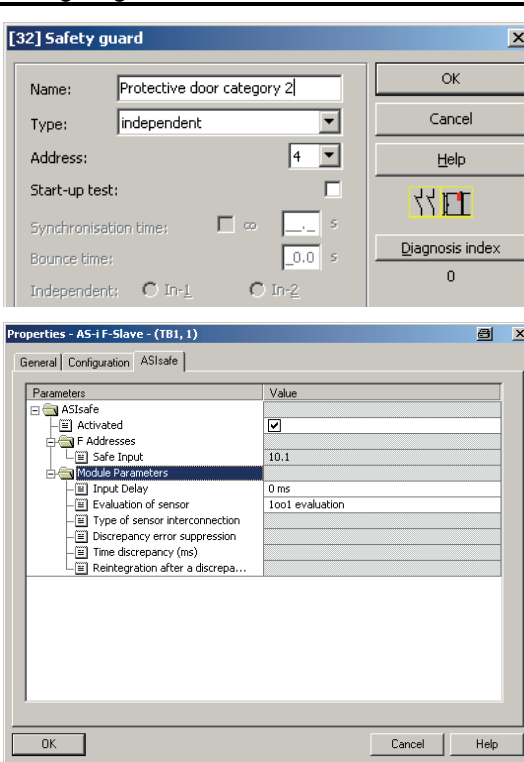
- Protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

WARNING

Safety sensors with positive-opening contacts

Both sensor inputs are always evaluated with ASIsafe. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
 3RK1205-0BQ30-0AA3 An input jumper is available as an accessory; see ASIsafe device variants (incl. accessories) (Page 27)	

4.1.5 K20F 2F-DI; protective door monitoring, two doors, category 2

K20F	2F-DI	3RK1205-0BQ30-0AA3
------	-------	--------------------

- Protective door monitoring (two doors)
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

! WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1205-0BQ30-0AA3

Configuring

4.1.6 K20F 2F-DI; protective door monitoring, category 4

K20F	2F-DI	3RK1205-0BQ30-0AA3
------	-------	--------------------

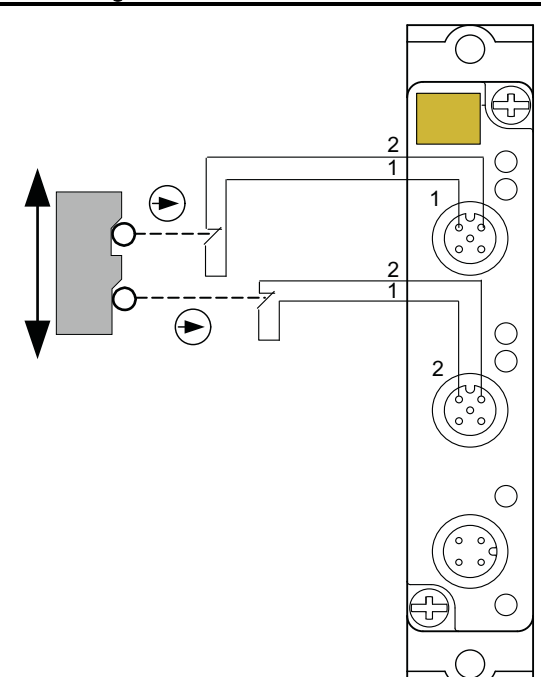
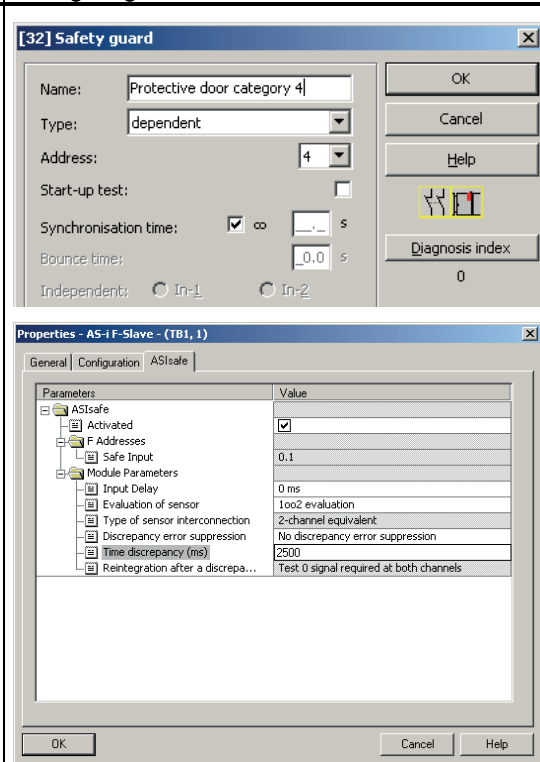
- Protective door monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

WARNING

Safety sensors with positive-opening contacts

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring																								
 3RK1205-0BQ30-0AA3	 [32] Safety guard Name: Protective door category 4 Type: dependent Address: 4 Start-up test: ☒ Synchronisation time: ∞ s Bounce time: 0.0 s Independent: ☒ In-1 ☐ In-2 Properties - AS-i F-Slave - (T81, 1) <table border="1"> <thead> <tr> <th>Parameters</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>ASIsafe</td> <td></td> </tr> <tr> <td> Activated</td> <td>☒</td> </tr> <tr> <td> F Addresses</td> <td></td> </tr> <tr> <td> Safe Input</td> <td>0.1</td> </tr> <tr> <td> Module Parameters</td> <td></td> </tr> <tr> <td> Input Delay</td> <td>0 ms</td> </tr> <tr> <td> Evaluation of sensor</td> <td>1002 evaluation</td> </tr> <tr> <td> Type of sensor interconnection</td> <td>2-channel equivalent</td> </tr> <tr> <td> Discrepancy error suppression</td> <td>No discrepancy error suppression</td> </tr> <tr> <td> Time discrepancy (ms)</td> <td>2500</td> </tr> <tr> <td> Reintegration after a discrepa...</td> <td>Test 0 signal required at both channels</td> </tr> </tbody> </table>	Parameters	Value	ASIsafe		Activated	☒	F Addresses		Safe Input	0.1	Module Parameters		Input Delay	0 ms	Evaluation of sensor	1002 evaluation	Type of sensor interconnection	2-channel equivalent	Discrepancy error suppression	No discrepancy error suppression	Time discrepancy (ms)	2500	Reintegration after a discrepa...	Test 0 signal required at both channels
Parameters	Value																								
ASIsafe																									
Activated	☒																								
F Addresses																									
Safe Input	0.1																								
Module Parameters																									
Input Delay	0 ms																								
Evaluation of sensor	1002 evaluation																								
Type of sensor interconnection	2-channel equivalent																								
Discrepancy error suppression	No discrepancy error suppression																								
Time discrepancy (ms)	2500																								
Reintegration after a discrepa...	Test 0 signal required at both channels																								

4.1.7 K20F 2F-DI; magnetically-operated switch monitoring, category 4

K20F	2F-DI	3RK1205-0BQ30-0AA3
------	-------	--------------------

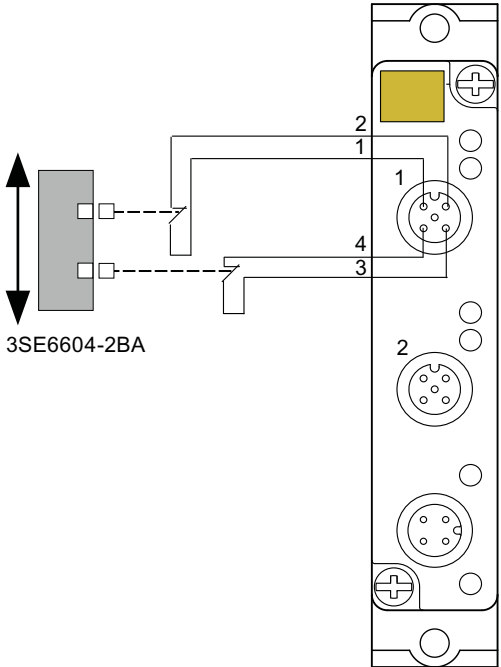
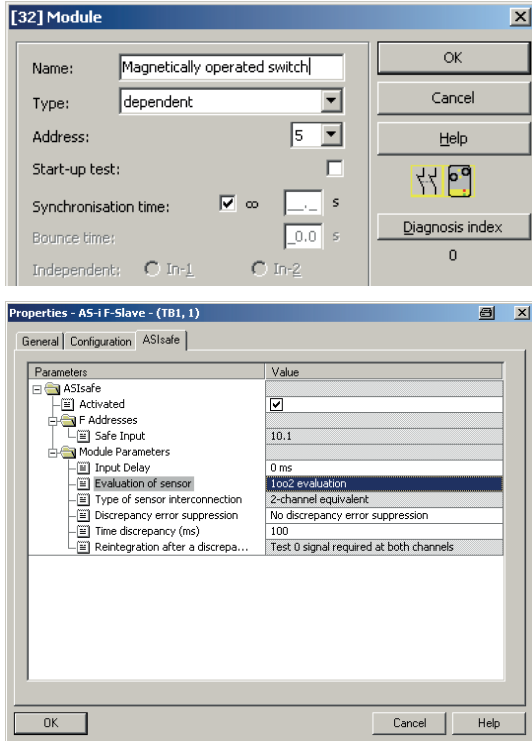
- Magnetically-operated switch monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

WARNING

Magnetically-operated switch for protective door monitoring

Category 4 does not allow several magnetically-operated switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected.

Connecting	Configuring
 3SE6604-2BA 3RK1205-0BQ30-0AA3	

4.2 Safe compact module K45F 2F-DI

4.2.1 K45F 2F-DI; EMERGENCY STOP monitoring, category 2

K45F	2F-DI	3RK1205-0BQ00-0AA3
------	-------	--------------------

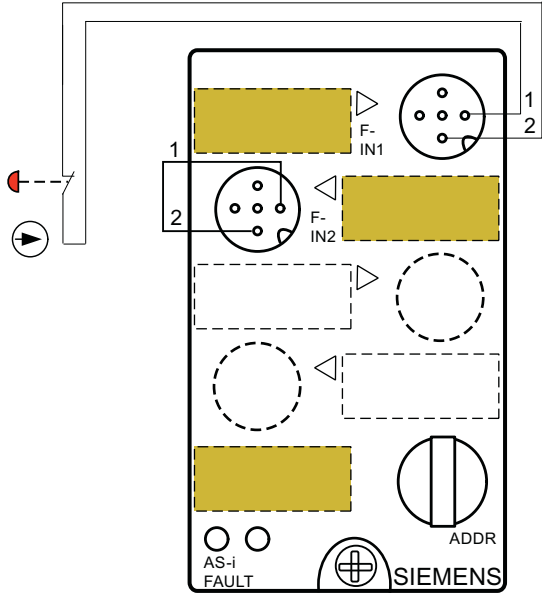
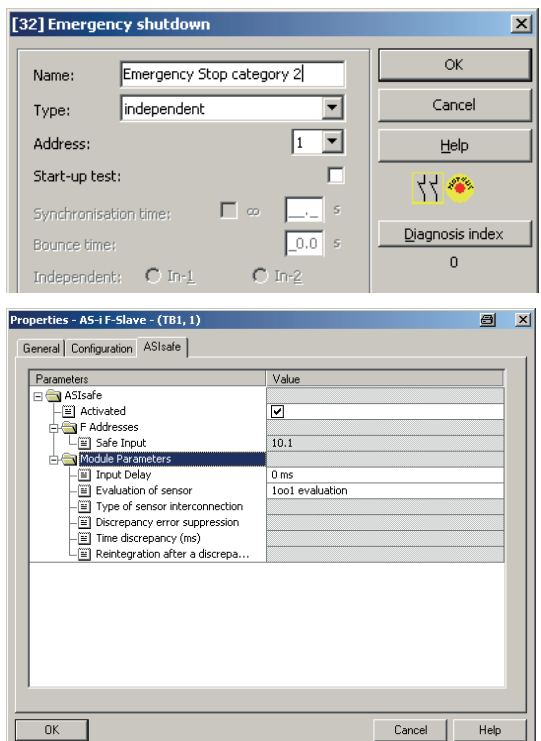
- EMERGENCY STOP monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting	Configuring
 3RK1205-0BQ00-0AA3 An input jumper is available as an accessory; see ASIsafe device variants (incl. accessories) (Page 27)	

4.2.2 K45F 2F-DI; EMERGENCY STOP monitoring, category 4

K45F	2F-DI	3RK1205-0BQ00-0AA3
------	-------	--------------------

- EMERGENCY STOP monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

Category 4 allows more than one EMERGENCY STOP command device to be connected in series.

Connecting

Configuring

4.2.3 K45F 2F-DI; EMERGENCY STOP and protective door monitoring; category 2

K45F	2F-DI	3RK1205-0BQ00-0AA3
------	-------	--------------------

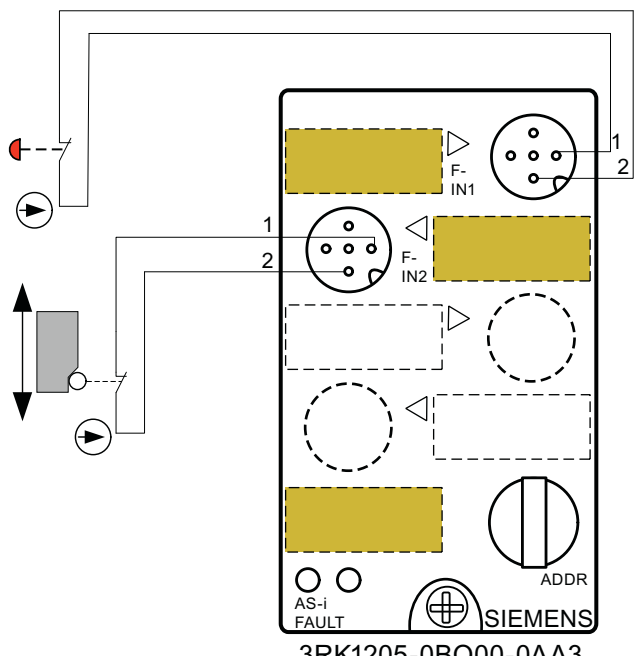
- EMERGENCY STOP and protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



Configuring

[32] Module

Name: EM.-STOP/Prot. door cat. 2

Type: independent

Address: 2

Start-up test: ☐

Synchronisation time: ☐ ∞ ☐ 5

Bounce time: ☐ 0.0 ☐ 5

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Properties - AS-i F-Slave - (T81, 1)

General Configuration ASISafe

Parameters	Value
ASISafe	
Activated	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1001 evaluation
Type of sensor interconnection	
Discrepancy error suppression	
Time discrepancy (ms)	
Reintegration after a discrepa...	

OK Cancel Help

4.2.4 K45F 2F-DI; protective door monitoring, category 2

K45F	2F-DI	3RK1205-0BQ00-0AA3
------	-------	--------------------

- Protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

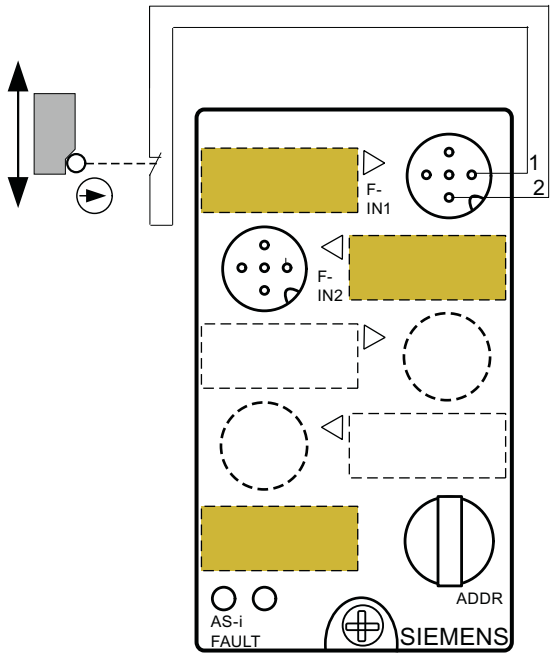
WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

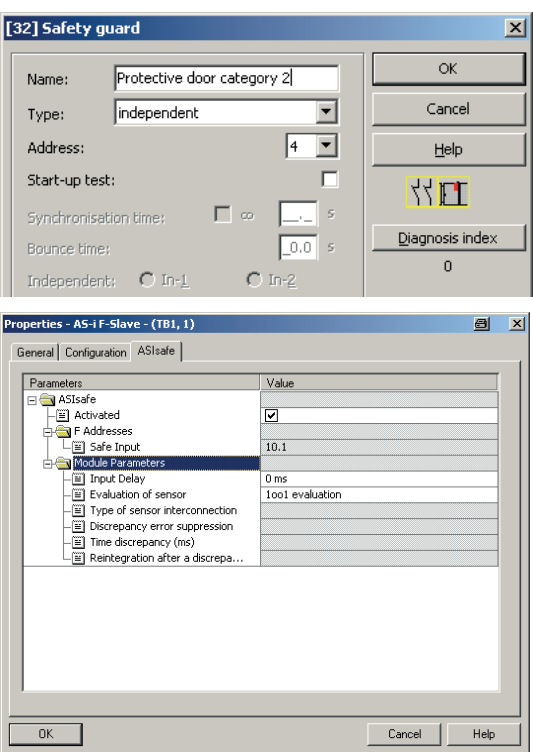
Connecting



3RK1205-0BQ00-0AA3

An input jumper is available as an accessory; see ASIsafe device variants (incl. accessories) (Page 27)

Configuring



4.2.5 K45F 2F-DI; protective door monitoring, two doors, category 2

K45F	2F-DI	3RK1205-0BQ00-0AA3
------	-------	--------------------

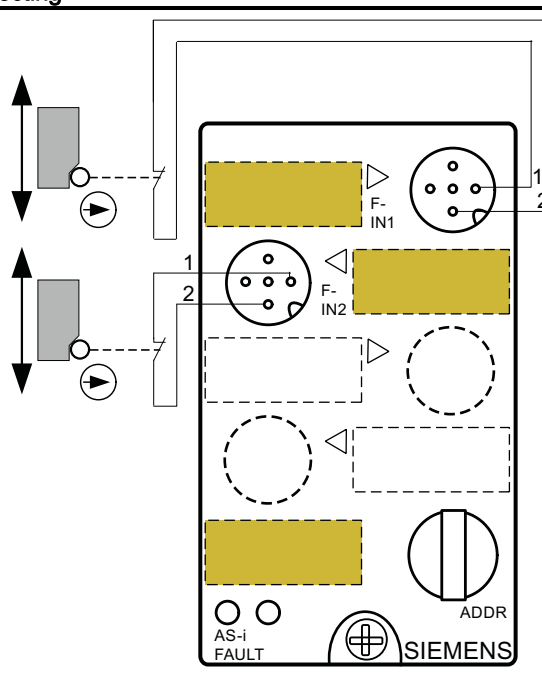
- Protective door monitoring (two doors)
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

WARNING

Safety sensors with positive-opening contacts

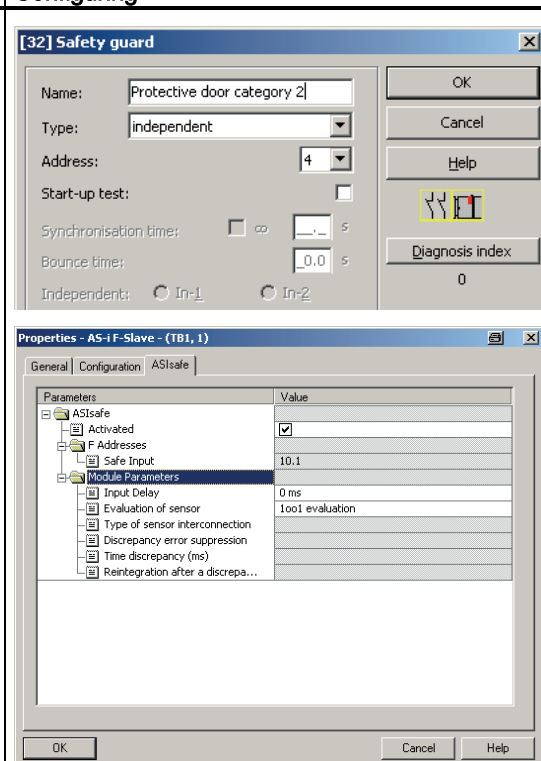
Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



3RK1205-0BQ00-0AA3

Configuring



4.2.6 K45F 2F-DI; protective door monitoring, category 4

K45F	2F-DI	3RK1205-0BQ00-0AA3
------	-------	--------------------

- Protective door monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

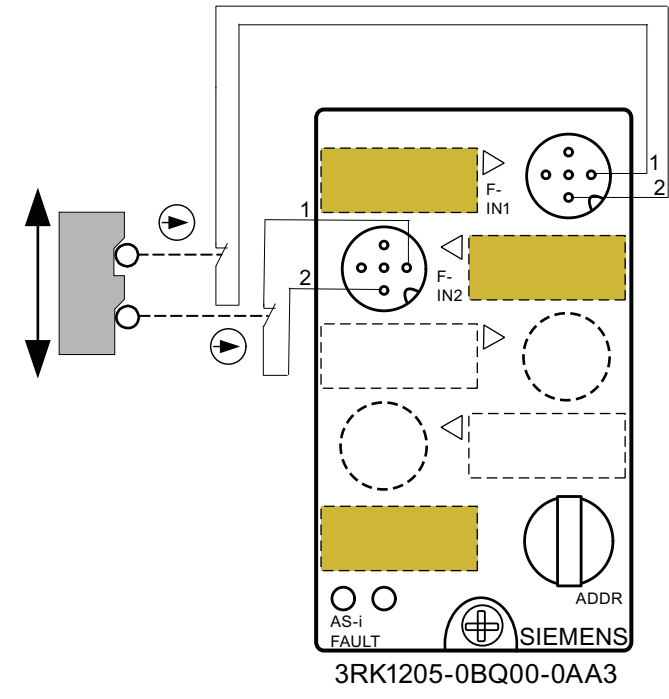
WARNING

Position switch for protective door monitoring

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting



Configuring

[32] Safety guard

Name: Protective door category 4

Type: dependent

Address: 4

Start-up test: ☐

Synchronisation time: ☒ ∞ s

Bounce time: s

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Diagnosis index 0

Properties - AS-i F-Slave - (TB1, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	0.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1002 evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	No discrepancy error suppression
Time discrepancy (ms)	2500
Reintegration after a discrepa...	Test 0 signal required at both channels

OK Cancel Help

4.2.7 K45F 2F-DI; magnetically-operated switch monitoring, category 4

K45F	2F-DI	3RK1205-0BQ00-0AA3
------	-------	--------------------

- Magnetically-operated switch monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

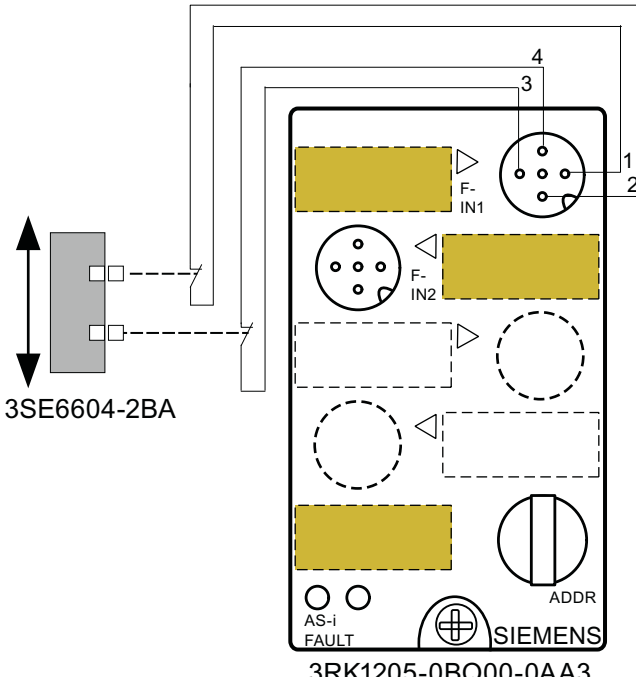
WARNING

Magnetically-operated switch for protective door monitoring

Category 4 does not allow several magnetically-operated switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected.

Connecting



3SE6604-2BA

3RK1205-0BQ00-0AA3

Configuring

[32] Module

Name:

Type:

Address:

Start-up test: ☐

Synchronisation time: ☒ s

Bounce time: s

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Diagnosis index: 0

Properties - AS-i Slave - (TB1, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1oo2 evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	No discrepancy error suppression
Time discrepancy (ms)	100
Reintegration after a discrepa...	Test 0 signal required at both channels

OK Cancel Help

4.3 Safe compact module K45F 2F-DI / 2 DO

4.3.1 K45F 2F-DI / 2 DO, (U_{aux}); EMERGENCY STOP monitoring; category 2

K45F	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
K45F	2F-DI / 2 DO, U _{aux}	3RK1405-1BQ20-0AA3

- EMERGENCY STOP monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-1BQ20-0AA3

An input jumper is available as an accessory; see ASIsafe device variants (incl. accessories) (Page 27)

Configuring

4.3.2 K45F 2F-DI / 2 DO, (U_{aux}); EMERGENCY STOP monitoring; category 4

K45F	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
K45F	2F-DI / 2 DO, U _{aux}	3RK1405-1BQ20-0AA3

- EMERGENCY STOP monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

Category 4 allows more than one EMERGENCY STOP command device to be connected in series.

Connecting

Configuring

4.3.3 K45F 2F-DI / 2 DO, (U_{aux}); EMERGENCY STOP and protective door monitoring; category 2

K45F	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
K45F	2F-DI / 2 DO, U _{aux}	3RK1405-1BQ20-0AA3

- EMERGENCY STOP and protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-1BQ20-0AA3

Configuring

4.3.4 K45F 2F-DI / 2 DO, (U_{aux}); protective door monitoring, category 2

K45F	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
K45F	2F-DI / 2 DO, U _{aux}	3RK1405-1BQ20-0AA3

- Protective door monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

! WARNING

Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-1BQ20-0AA3

An input jumper is available as an accessory; see ASIsafe device variants (incl. accessories) (Page 27)

Configuring

4.3.5 K45F 2F-DI / 2 DO, (U_{aux}); protective door monitoring, two doors; category 2

K45F	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
K45F	2F-DI / 2 DO, U _{aux}	3RK1405-1BQ20-0AA3

- Protective door monitoring (two doors)
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-1BQ20-0AA3

Configuring

4.3.6 K45F 2F-DI / 2 DO, (U_{aux}); protective door monitoring, category 4

K45F	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
K45F	2F-DI / 2 DO, U _{aux}	3RK1405-1BQ20-0AA3

- Protective door monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Safety sensors with positive-opening contacts

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Connecting

3RK1405-1BQ20-0AA3

Configuring

[32] Safety guard

Name: Protective door category 4

Type: dependent

Address: 4

Start-up test: ☐

Synchronisation time: ☒ ∞ s

Bounce time: 0.0 s

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Properties - AS-i F-Slave - (Tb1, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
P Addresses	0.1
Safe Input	
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1oo2 evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	No discrepancy error suppression
Time discrepancy (ms)	2500
Reintegration after a discrepa...	Test 0 signal required at both channels

OK Cancel Help

4.3.7 K45F 2F-DI / 2 DO, (U_{aux}); magnetically-operated switch monitoring, category 4

K45F	2F-DI / 2 DO	3RK1405-0BQ20-0AA3
K45F	2F-DI / 2 DO, U _{aux}	3RK1405-1BQ20-0AA3

- Magnetically-operated switch monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

Switching capacity of the outputs			
Auxiliary voltage	Current at OUT1	Current at OUT2	Total current
without U _{aux}	≤ 150 mA	≤ 150 mA	≤ 150 mA
with U _{aux}	≤ 0.7 A	≤ 0.7 A	≤ 1.4 A

⚠ WARNING

Magnetically-operated switch for protective door monitoring

Category 4 does not allow several magnetically-operated switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected.

Connecting

Configuring

4.4 Safe compact module K45F 4F-DI

4.4.1 K45F 4F-DI; EMERGENCY STOP monitoring, category 2

K45F	4F-DI	3RK1205-0CQ00-0AA3
------	-------	--------------------

- EMERGENCY STOP monitoring
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- Independent

WARNING

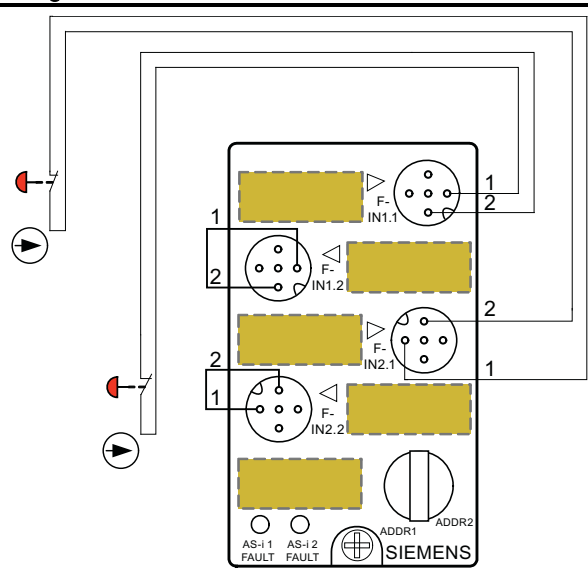
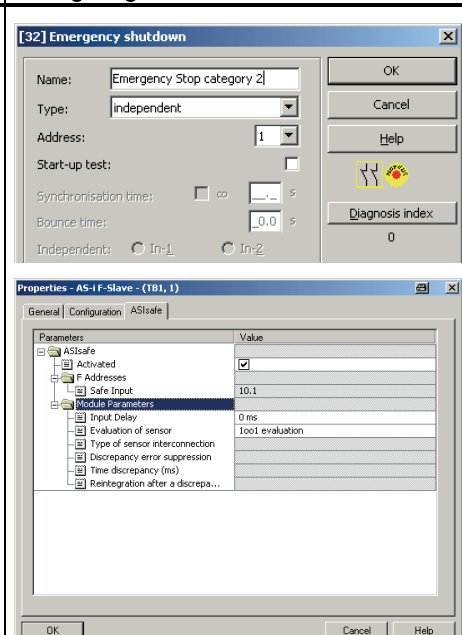
Safety sensors with positive-opening contacts

ASIsafe always evaluates both sensor inputs. This means that an unused input must be jumpered.

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

This module occupies two AS-i addresses, which must be assigned separately.

Connecting	Configuring
 3RK1205-0CQ00-0AA3 Input jumpers are available as accessories; see ASIsafe device variants (incl. accessories) (Page 27)	

4.4.2 K45F 4F-DI; EMERGENCY STOP monitoring, category 4

K45F	4F-DI	3RK1205-0CQ00-0AA3
------	-------	--------------------

- Monitoring two different EMERGENCY STOP signals
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

This module occupies two AS-i addresses, which must be assigned separately.

Note

Category 4 allows more than one EMERGENCY STOP command device to be connected in series.

Connecting

Configuring

4.4.3 K45F 4F-DI; EMERGENCY STOP and protective door monitoring; category 4

K45F	4F-DI	3RK1205-0CQ00-0AA3
------	-------	--------------------

- EMERGENCY STOP and protective door monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Forced

WARNING

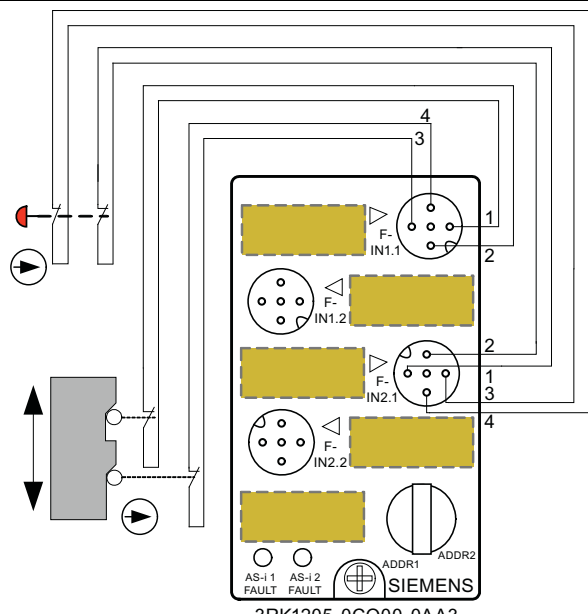
Position switch for protective door monitoring

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

This module occupies two AS-i addresses, which must be assigned separately and, in this case, differently too.

Connecting	Configuring
	Address 1: EMERGENCY STOP monitoring Configuration like K45F 2F-DI / 2 DO, (U_aux); EMERGENCY STOP monitoring; category 4 (Page 85) Address 2: Protective door monitoring Configuration like K45F 2F-DI / 2 DO, (U_aux); protective door monitoring, category 4 (Page 89)

4.4.4 K45F 4F-DI; protective door monitoring, category 4

K45F	4F-DI	3RK1205-0CQ00-0AA3
------	-------	--------------------

- Monitoring two different protective doors
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

! WARNING

Safety sensors with positive-opening contacts

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

Note

This module occupies two AS-i addresses, which must be assigned separately.

Connecting

Configuring

[32] Safety guard

Name: Protective door category 4

Type: dependent

Address: 4

Start-up test: ☐

Synchronisation time: ☒ ∞ s

Bounce time: s

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Diagnosis index: 0

Properties - AS-i F-Slave - (TB1, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	0.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1oo2 evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	No discrepancy error suppression
Time discrepancy (ms)	2500
Reintegration after a discrepa...	Test 0 signal required at both channels

OK Cancel Help

4.4.5 K45F 4F-DI; magnetically-operated switch monitoring, category 4

K45F	4F-DI	3RK1205-0CQ00-0AA3
------	-------	--------------------

- Magnetically-operated switch monitoring
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Dependent

WARNING

Magnetically-operated switch for protective door monitoring

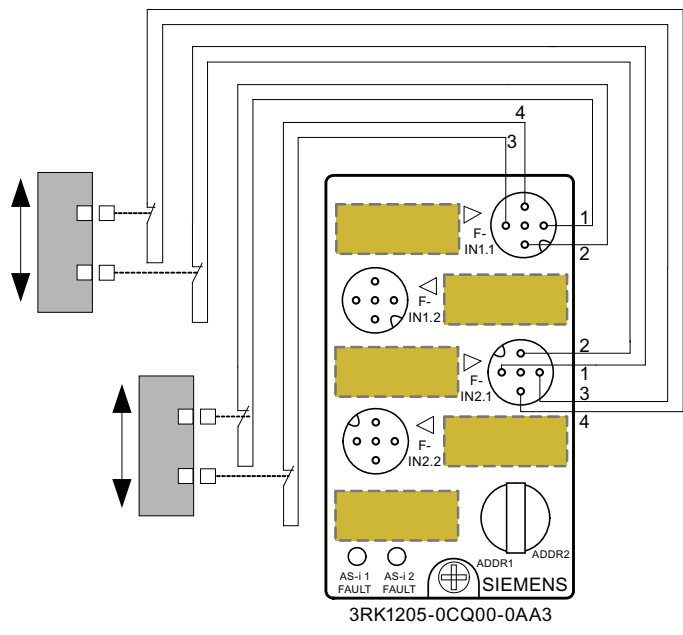
Category 4 does not allow several magnetically-operated switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected.

Note

This module occupies two AS-i addresses, which must be assigned separately.

Connecting



Configuring

[32] Module

Name: Magnetically operated switch

Type: dependent

Address: 5

Start-up test: ☐

Synchronisation time: ☒ ∞ s

Bounce time: 0.0 s

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Properties - AS-iF-Slave - (TB1, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	100% evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	No discrepancy error suppression
Time discrepancy (ms)	100
Reintegration after a discrepa...	Test 0 signal required at both channels

OK Cancel Help

4.5 Safety compact module K45F LS

4.5.1 K45F LS; connection of a light curtain; category 2

K45F	LS	3RK1205-0BQ21-0AA3
------	----	--------------------

- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- For connecting light curtains type 2 according to IEC/EN 61496-1

WARNING
Sensor cables, ESPE and outputs
Sensor cables must be laid in such a way that they are protected.
Only one ESPE can be connected to the module.
Untested outputs are not permitted!

Note
The module suppresses test pulses from testing outputs. As a result, the system extends the reaction time until shutdown of the safety monitor by 20 ms.

Connecting

3RK1205-0BQ21-0AA3

Configuring

[32] AOPD

Name: Light curtain
Type: forced
Address: 2
Start-up test: In-1, In-2
Synchronisation time: 0 s
Bounce time: 0.0 s
Independent: In-1, In-2

Properties - AS-i F-Slave - (TBI, 1)

Parameters	Value
ASIsafe	Activated
F Addresses	10.1
Safe Input	
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1002 evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	No discrepancy error suppression
Time discrepancy (ms)	100
Reintegration after a discrepa...	Test 0 signal required at both channels

4.5.2 K45F LS; connection of a light curtain; category 4

K45F	LS	3RK1205-0BQ24-0AA3
------	----	--------------------

- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- For connecting light curtains type 4 according to IEC/EN 61496-1

WARNING

Sensor cables, ESPE and outputs

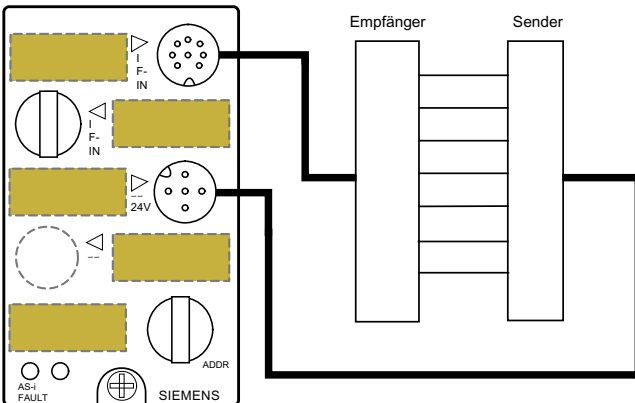
Sensor cables must be laid in such a way that they are protected. Only one ESPE can be connected to the module. Untested outputs are not permitted!

The module does not check two-channel sensors for correct two-channel shutdown. In the case of single-channel shutdown only, a two-channel shutdown is transferred to the safety monitor. This means that reactivation is possible without a test, that is, the connected safety sensor must check for two channels and prevent reactivation.

Note

The module suppresses test pulses from testing outputs. As a result, the system extends the reaction time until shutdown of the safety monitor by 20 ms.

Connecting



3RK1205-0BQ24-0AA3

Configuring

[32] AOPD

Name: Light curtain

Type: forced

Address: 2

Start-up test: ☐

Synchronisation time: ☐ ∞ s

Bounce time: 0.0 s

Independent: ☐ In-1 ☐ In-2

OK Cancel Help

Diagnosis index: 0

Properties - AS-iF-Slave - (TBI, 1)

General Configuration ASIsafe

Parameters	Value
ASIsafe	
Activated	☒
F Addresses	
Safe Input	10.1
Module Parameters	
Input Delay	0 ms
Evaluation of sensor	1002 evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	No discrepancy error suppression
Time discrepancy (ms)	100
Reintegration after a discrepa...	Test 0 signal required at both channels

OK Cancel Help

4.5.3 K45F LS; connection of a light curtain type 2; category 2

K45F	LS	3RK1205-0BQ21-0AA3
------	----	--------------------

- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
- For connecting light curtains type 2 according to IEC/EN 61496-1

! WARNING

Sensor cables, ESPE and outputs

Sensor cables must be laid in such a way that they are protected.

Only one ESPE can be connected to the module.

Untested outputs are not permitted!

Note

The module suppresses test pulses from testing outputs. As a result, the system extends the reaction time until shutdown of the safety monitor by 20 ms.

Connecting

3RK1205-0BQ21-0AA3

Configuring

4.5.4 K45F LS; connection of a light curtain type 4; category 4

K45F	LS	3RK1205-0BQ24-0AA3
------	----	--------------------

- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- For connecting light curtains type 4 according to IEC/EN 61496-1

WARNING

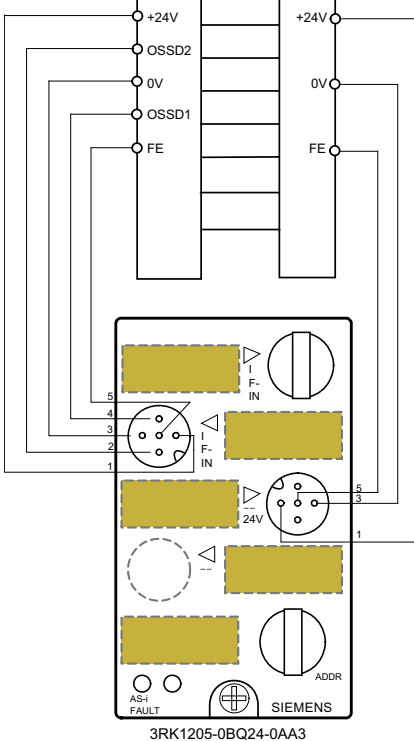
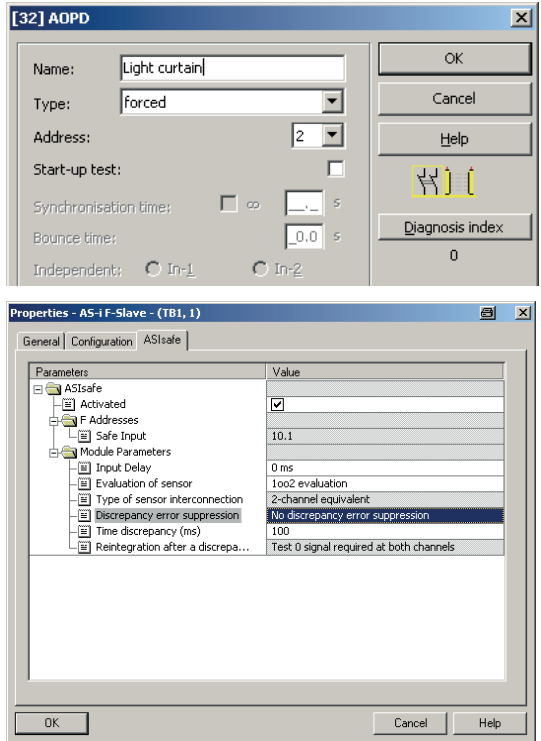
Sensor cables, ESPE and outputs

Sensor cables must be laid in such a way that they are protected. Only one ESPE can be connected to the module. Untested outputs are not permitted!

The module does not check two-channel sensors for correct two-channel shutdown. In the case of single-channel shutdown only, a two-channel shutdown is transferred to the safety monitor. This means that reactivation is possible without a test, that is, the connected safety sensor must check for two channels and prevent reactivation.

Note

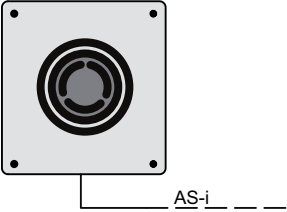
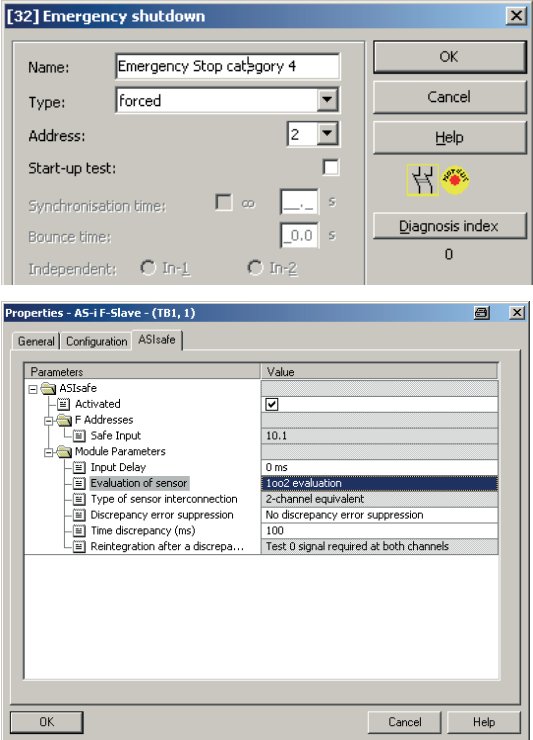
The module suppresses test pulses from testing outputs. As a result, the system extends the reaction time until shutdown of the safety monitor by 20 ms.

Connecting	Configuring
	

4.6 Sensors with direct connection to AS-Interface

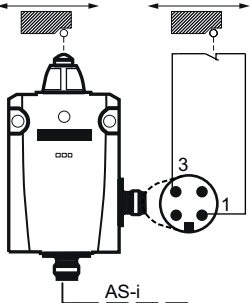
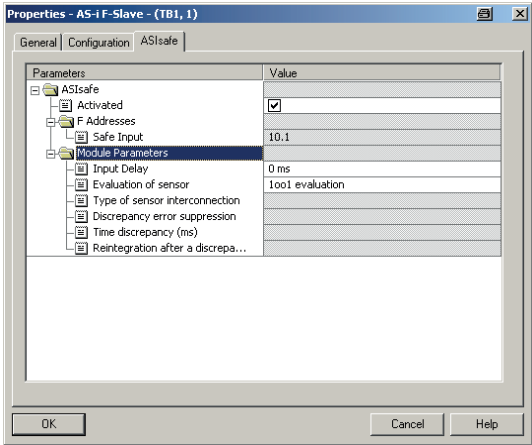
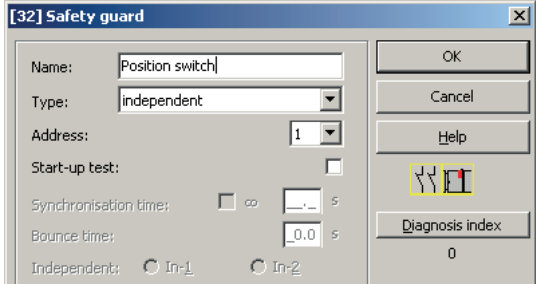
4.6.1 EMERGENCY STOP with direct interface; category 4

- EMERGENCY STOP, e.g. AS-Interface enclosure 3SF5811-0AA10
- Direct connection to AS-Interface
- Forced, see chapter 4.1.2 K20F 2F-DI for function; EMERGENCY STOP monitoring, category 4 (Page 71)

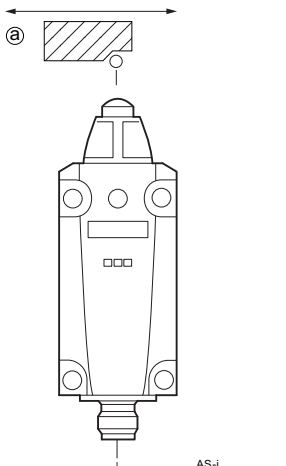
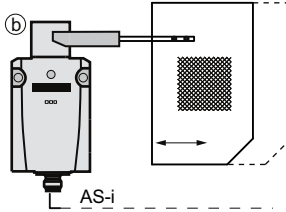
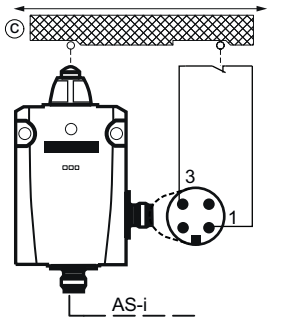
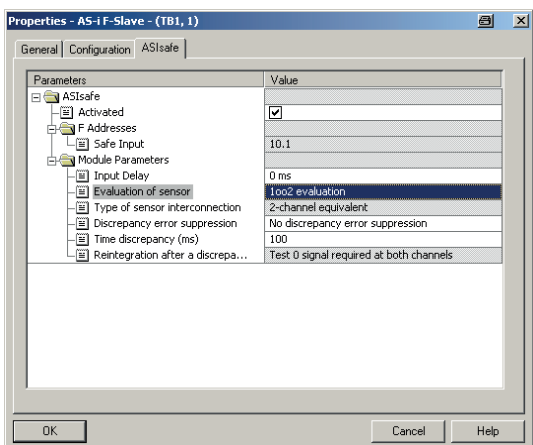
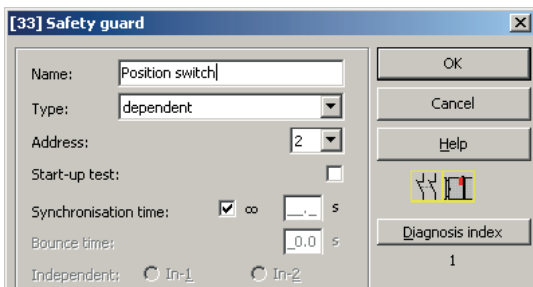
Connecting	Configuring
 The diagram shows a square AS-i sensor enclosure with a circular symbol in the center. A line connects the bottom of the enclosure to the label "AS-i".	 The 'Configuring' section contains two screenshots of software configuration windows. The first window is titled "[32] Emergency shutdown". It contains the following fields and options: - Name: Emergency Stop category 4 - Type: forced - Address: 2 - Start-up test: ☐ - Synchronisation time: ☐ ∞ s - Bounce time: 0.0 s - Independent: ☐ In-1 ☐ In-2 Buttons on the right include OK, Cancel, Help, a warning icon, and a "Diagnosis index" button showing the value 0. The second window is titled "Properties - AS-i F-Slave - (TB1, 1)". It has three tabs: General, Configuration, and ASIsafe. The ASIsafe tab is active, showing a tree view of parameters: - ASIsafe - Activated: ☒ - F Addresses - Safe Input: 10.1 - Module Parameters - Input Delay: 0 ms - Evaluation of sensor: 1002 evaluation - Type of sensor interconnection: 2-channel equivalent - Discrepancy error suppression: No discrepancy error suppression - Time discrepancy (ms): 100 - Reintegration after a discrepa...: Test 0 signal required at both channels Buttons at the bottom include OK, Cancel, and Help.

4.6.2 Position switches with direct interface; category 2 / category 3 / category 4

- ASIsafe position switches: two internal NC contacts on ASIsafe channel 1 and channel 2
- ASIsafe position switch with M12 socket:
one internal NC contact on ASIsafe channel 1,
one external NC contact (at pin 1 and pin 3 of the M12 socket) on ASIsafe channel 2
- Direct connection to AS-Interface
- Independent / dependent

Connecting	Configuring
	• Combination of ASIsafe position switch with M12 socket (for connecting an external NC contact) and additional standard position switch with NC contact • Parameterized as independent • Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1 • e.g. for protective door monitoring, two doors; category 2  

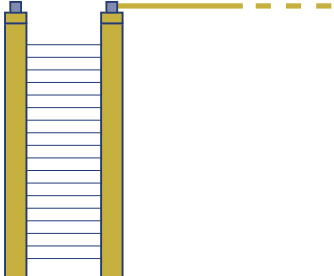
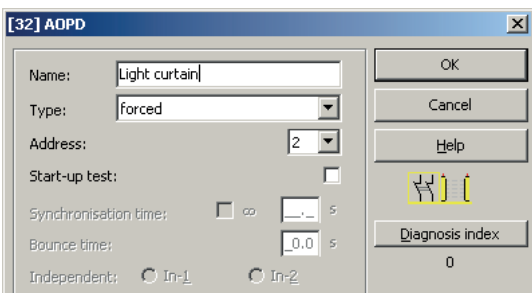
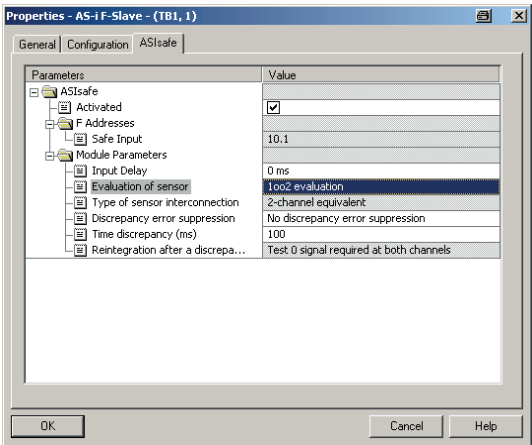
4.6 Sensors with direct connection to AS-Interface

Connecting	Configuring
  	Option a • ASIsafe position switch • Parameterized as dependent • Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1 • e.g. for position monitoring; category 2 Option b • ASIsafe position switch with separate actuator and mechanism to prevent actuator breakage • Parameterized as dependent • Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1 • e.g. for protective door monitoring; category 3 Option c • Combination of ASIsafe position switch with M12 socket (for connecting an external NC contact) and additional standard position switch with NC contact • Parameterized as dependent • Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1 • e.g. for protective door monitoring; category 4  

4.6.3 ESPE with direct interface; category 3 / category 4

- ESPE: Light curtain / light array; category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1 (depending on ESPE)
- ESPE: Laser scanner; category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1 (depending on ESPE)
- Direct interface
- Forced

The electro-sensitive protective equipment (ESPE) used in this example is a light curtain. A laser scanner could also be used here.

Connecting	Configuring
	 

Protective door monitoring with lock

Checking the safety category - AS-i safety monitor

WARNING

Conditionally dependent

Conditionally dependent monitoring blocks only offer limited safety because they are not checked for simultaneity. You must carefully check whether the requirements for your chosen safety category can be fulfilled by using a two-channel, conditionally dependent monitoring block.

Checking the safety category - DP / AS-i F-Link

WARNING

Discrepancy error suppression

Discrepancy error suppression for 0 signal at channel 1 or 2 only offers a limited level of safety because a simultaneity check is not performed. You must carefully check whether the requirements for your chosen safety category can be fulfilled by using discrepancy error suppression for 0 signal at channel 1 or 2.

Protected installation of sensor cables

Note

Sensor cables must always be installed in such a way that they are protected, that is, according to EN 60204 (Electrical equipment of machines):

Cables and their terminals outside the housing of electrical equipment must be routed through suitable cable ducts (i.e. electric wiring conduits or ducting to be opened). Exceptions here include cables and wires that are properly protected and that can be installed without cable ducts as well as with or without open cable trays or fixings. If devices (e.g. position or proximity switch) are shipped with an integrated connection cable, the cables do not need to be installed in a cable duct provided that the cable is suitable for its intended purpose, is sufficiently short, and is positioned or protected in such a way that the risk of damage is minimized.

5.1 Spring-locked protective door lock

5.1.1 K45F, 2F-DI / 2 DO; safety monitor; monitoring: category 2 / category 3

- Spring-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Depending on configuration
Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
OR:
Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via standard output of the K45F

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used to safeguard the production process.

Connecting

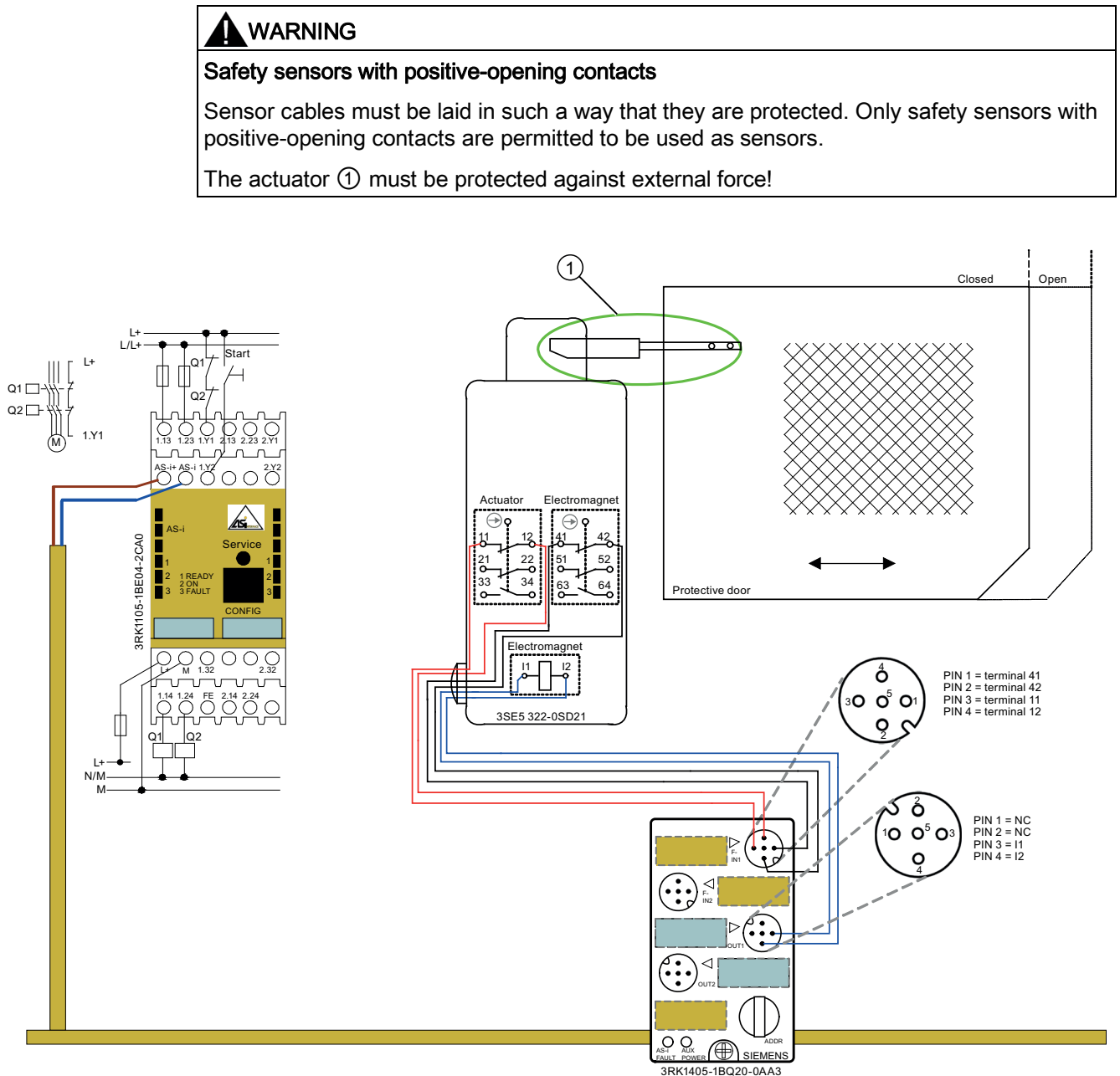


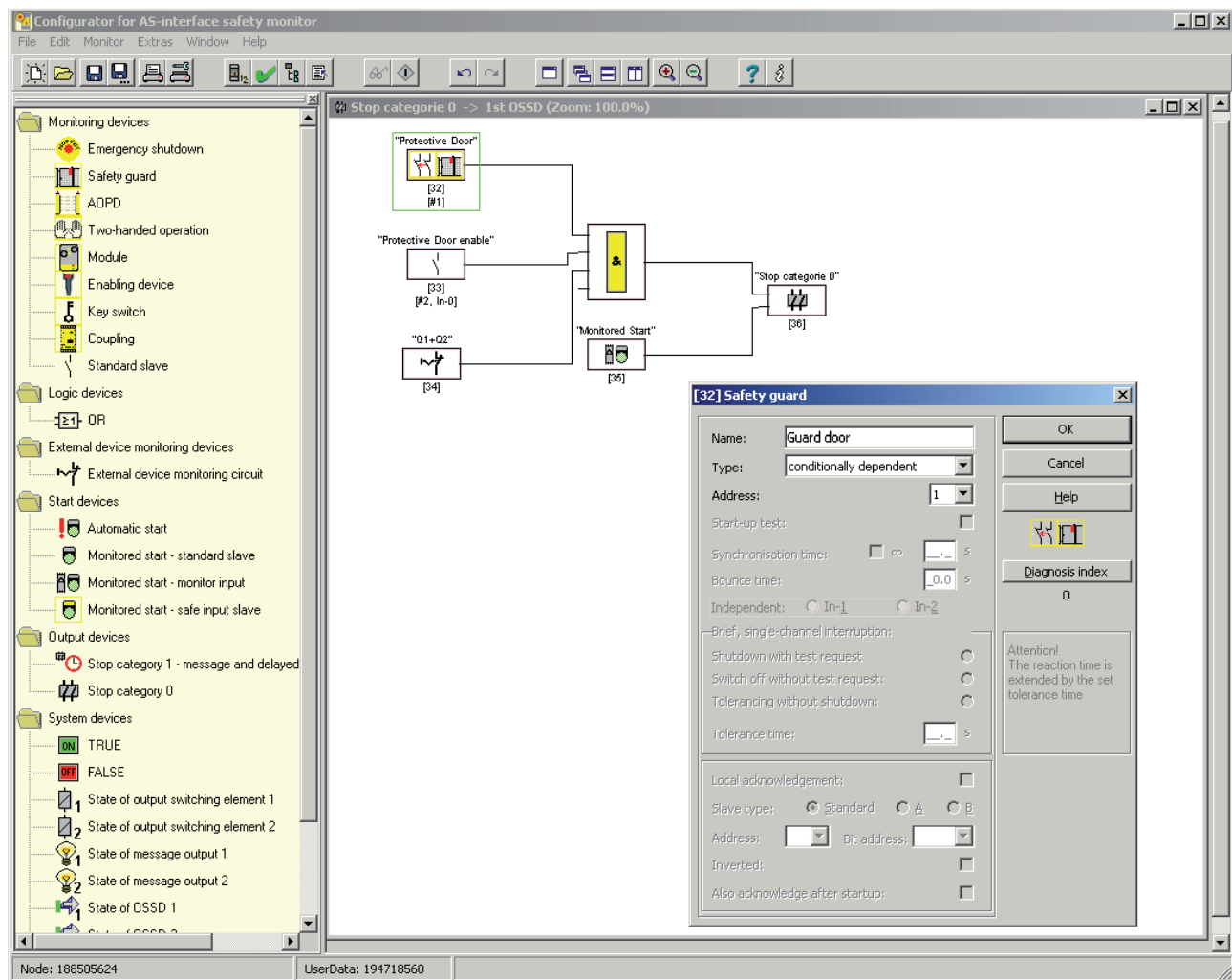
Figure 5-1 Protective door monitoring; spring-locked position switch; K45F, 2F-DI / 2 DO; safety monitor

If the solenoid is **not energized**, the protective door is locked.

The K45F module 3RK1405-1BQ20-0AA3 requires 24 V auxiliary voltage (black flat cable not shown in figure).

Configuring

- Protective door monitoring with ASIMON monitoring block, type "conditionally dependent": Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to ISO 13849-1
- Protective door monitoring with ASIMON monitoring block, type "dependent": Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1



- A standard output on the K45F module enables the protective door.
- ① The safety monitor monitors the actuator and the solenoid "conditionally dependent". Connect the solenoid to pins 1/2 and the actuator to pins 3/4. When you activate the "Independent In-1" parameter, you can unlock the protective door without having to open it afterwards.

5.1.2 K45F, 2F-DI / 2 DO; DP / AS-i F-Link; monitoring: category 2 / category 3

- Spring-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Depending on configuration
Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
OR:
Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via standard output of the K45F

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used to safeguard the production process.

Connecting

WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

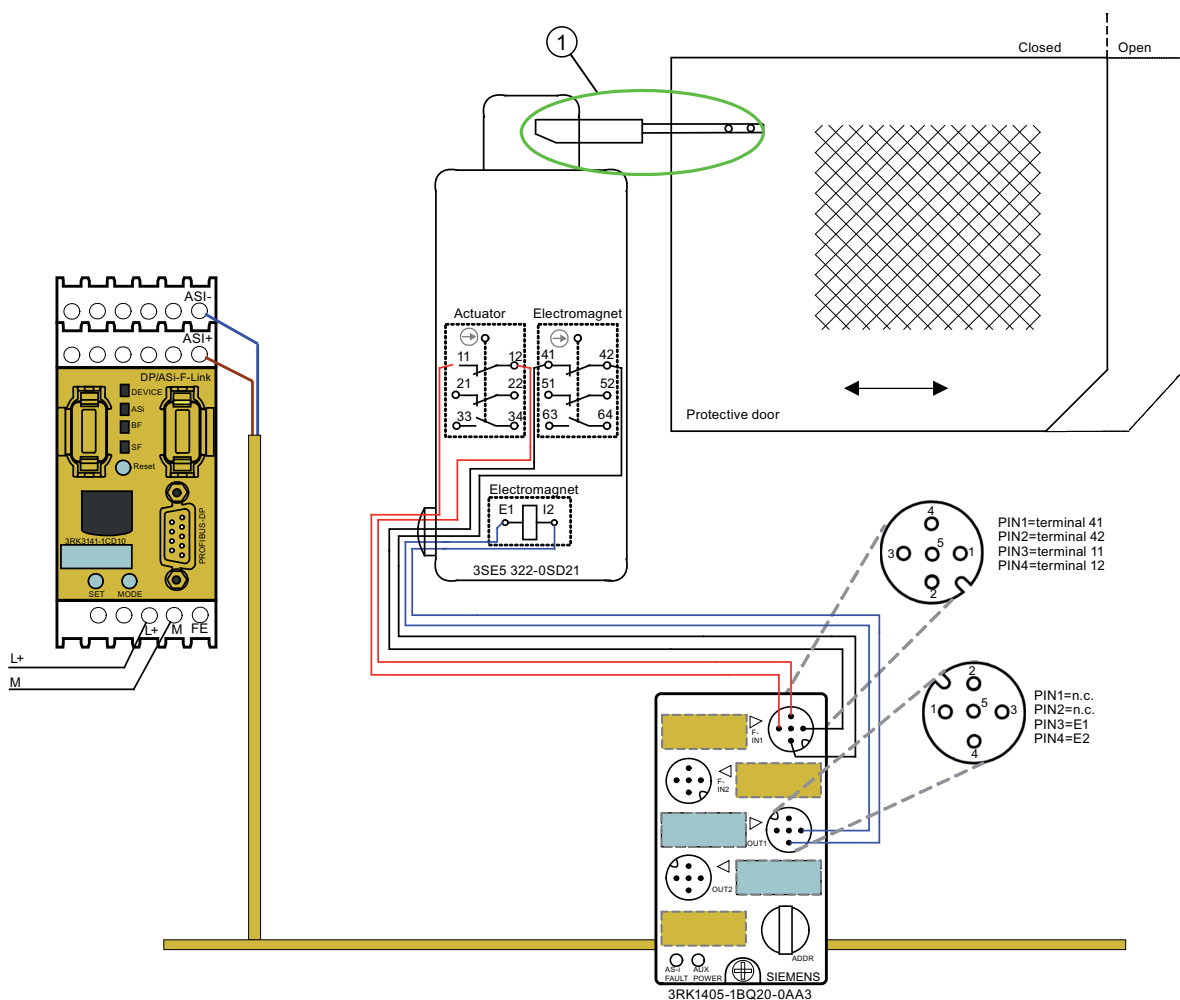


Figure 5-2 Protective door monitoring with tumbler; spring-locked position switch; K45F, 2F-DI / 2 DO; DP / AS-i F-Link

If the solenoid is **not energized**, the protective door is locked.

The K45F module 3RK1405-1BQ20-0AA3 requires 24 V auxiliary voltage (black flat cable not shown in figure).

Configuring

- 2oo2 evaluation of the sensors, with discrepancy error suppression: Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to ISO 13849-1
- 2oo2 evaluation of the sensors, no discrepancy error suppression (set discrepancy time to 2500. The door must be opened within the discrepancy time after it has been unlocked): Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1

Properties - AS-i F-Slave - (TB1, 1)

General Configuration ASIsafe

Parameters

Parameter	Value
ASIsafe	
Activated	☒
F Addresses	10.1
Safe Input	0 ms
Input Delay	0 ms
Evaluation of sensor	1oo2 evaluation
Type of sensor interconnection	2-channel equivalent
Discrepancy error suppression	For 0 signal on channel 1
Time discrepancy (ms)	100
Reintegration after a discrepancy	Test 0 signal required at both channels

OK Cancel Help

AS-i addr.	Module	Order number	I Address	Q Address	F I Address	F Q Address	IO I...	ID1	P...	C...
	F-Link (PROFIsafe)				10...21	10...13				
	DP/AS-i		22...53	22...53						
	DP/AS-i F-Link	3RK3 141-xCD10								
1A	ASIsafe K45F, 2F-DI/2DO	3RK1 405-1BQ20-0AA3	22.0...22.3	22.0...22.3	10.1		7.8.0	F	F	
B										
2A										
B										
3A										
B										
4A										

- A standard output on the K45F module enables the protective door.
- ① DP / AS-i F-Link monitors the actuator and the solenoid. Connect the solenoid to pins 1/2 and the actuator to pins 3/4. When you choose discrepancy error suppression "For 0 signal on channel 1", you can unlock the protective door without having to open it afterwards.

5.1.3 Direct interface; safety monitor; monitoring: category 3

- Spring-locked position switch with 3SF1324-1S.21-1BA4 tumbler
- Direct connection to AS-Interface
- Protective door monitoring: Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via integrated standard output of 3SF1324-1S.21-1BA4

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used to safeguard the production process.

Connecting

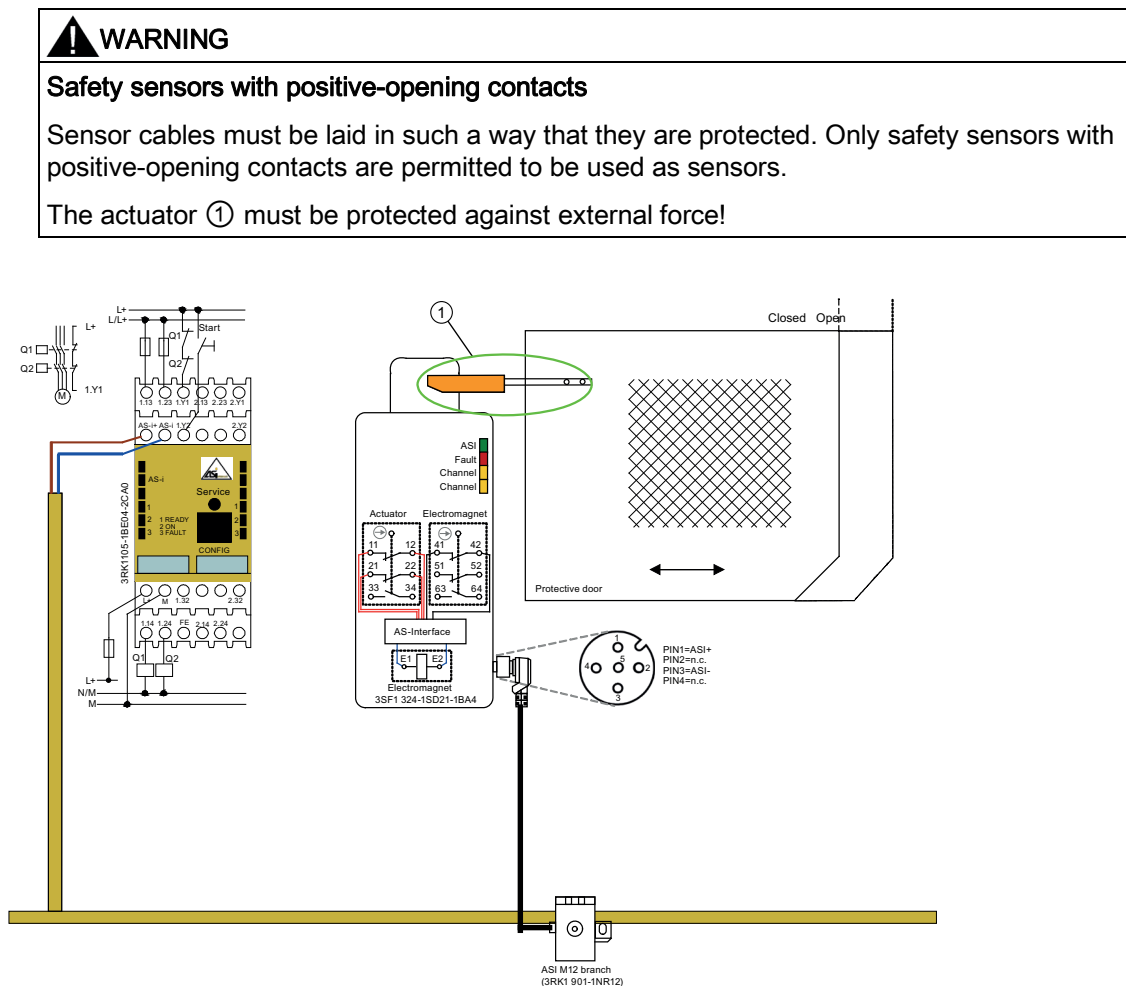
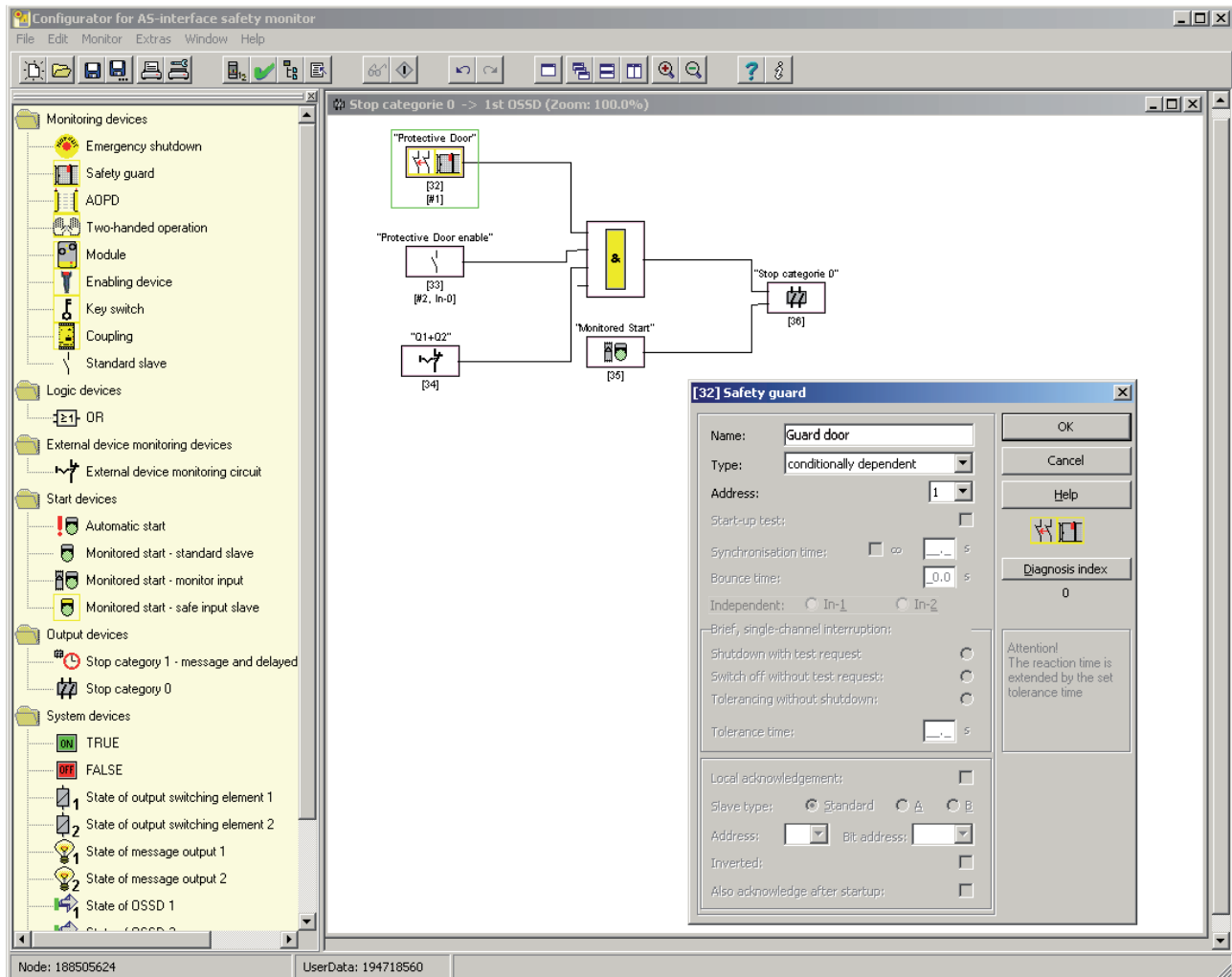


Figure 5-3 Protective door monitoring; spring-locked position switch; direct interface; safety monitor

If the solenoid is **not energized**, the protective door is locked.

Configuring

- Protective door monitoring with ASIMON monitoring block, type "independent":
Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1



- ① When using the 3SF1324-1S.21-1BA4 position switch, the follow applies:
The safety monitor monitors the type of the "independent" position switch. With this setting, the discrepancy evaluation in the safety monitor is disabled. A discrepancy between the two actuator contacts is independently recognized by the position switch with tumbler. The preprocessed signal of the actuator contacts and the signal of the solenoid are each read by the safety monitor via a signal channel. If one of these two channels opens, the safety monitor switches off the OSSD. If the contacts of the two channels are then closed again, switching on is possible. Therefore, you can unlock and lock the protective door without having to open it.
- The standard output integrated in the position switch is used to enable the protective door.

5.1.4 Direct interface; DP / AS-i F-Link; monitoring: category 3

- Spring-locked position switch with 3SF1324-1S.21-1BA4 tumbler
- Direct connection to AS-Interface
- Protective door monitoring: Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via integrated standard output of 3SF1324-1S.21-1BA4

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used to safeguard the production process.

Connecting

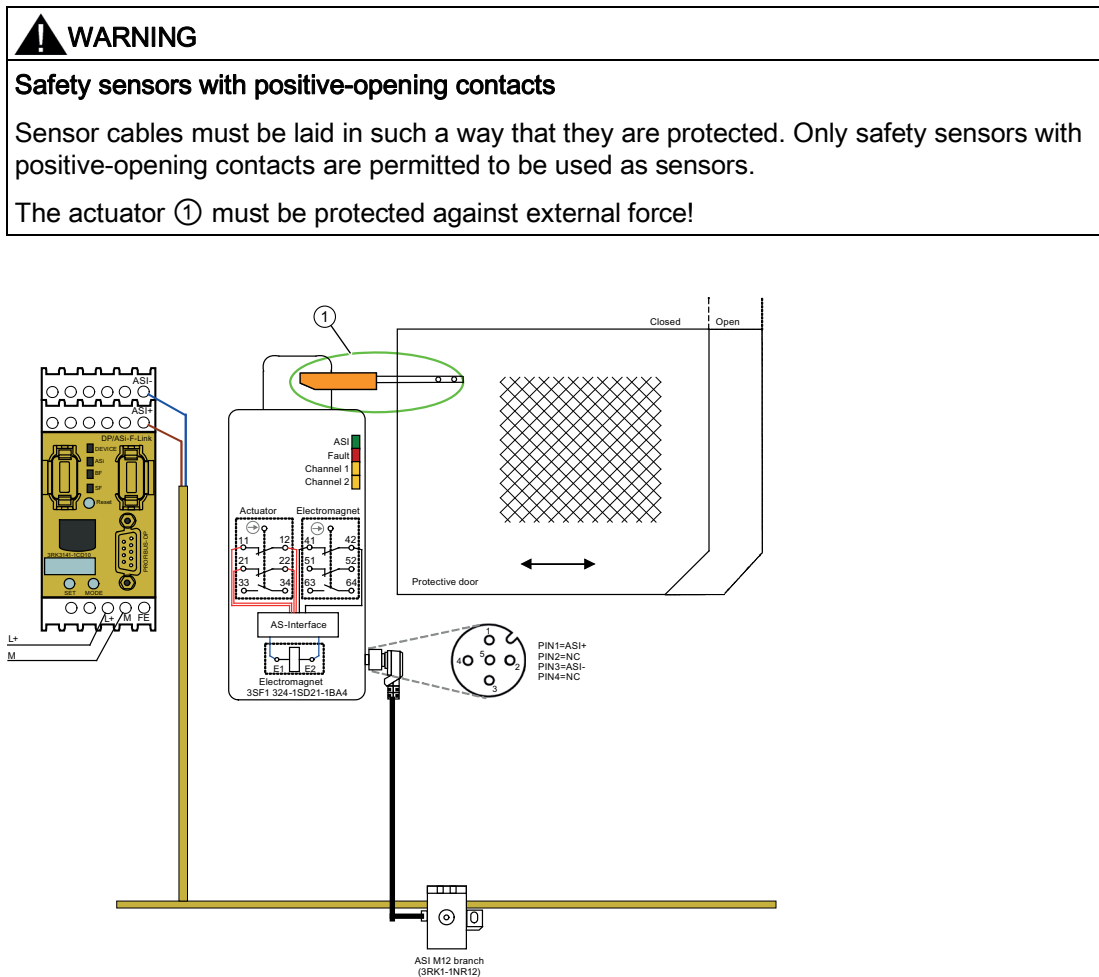
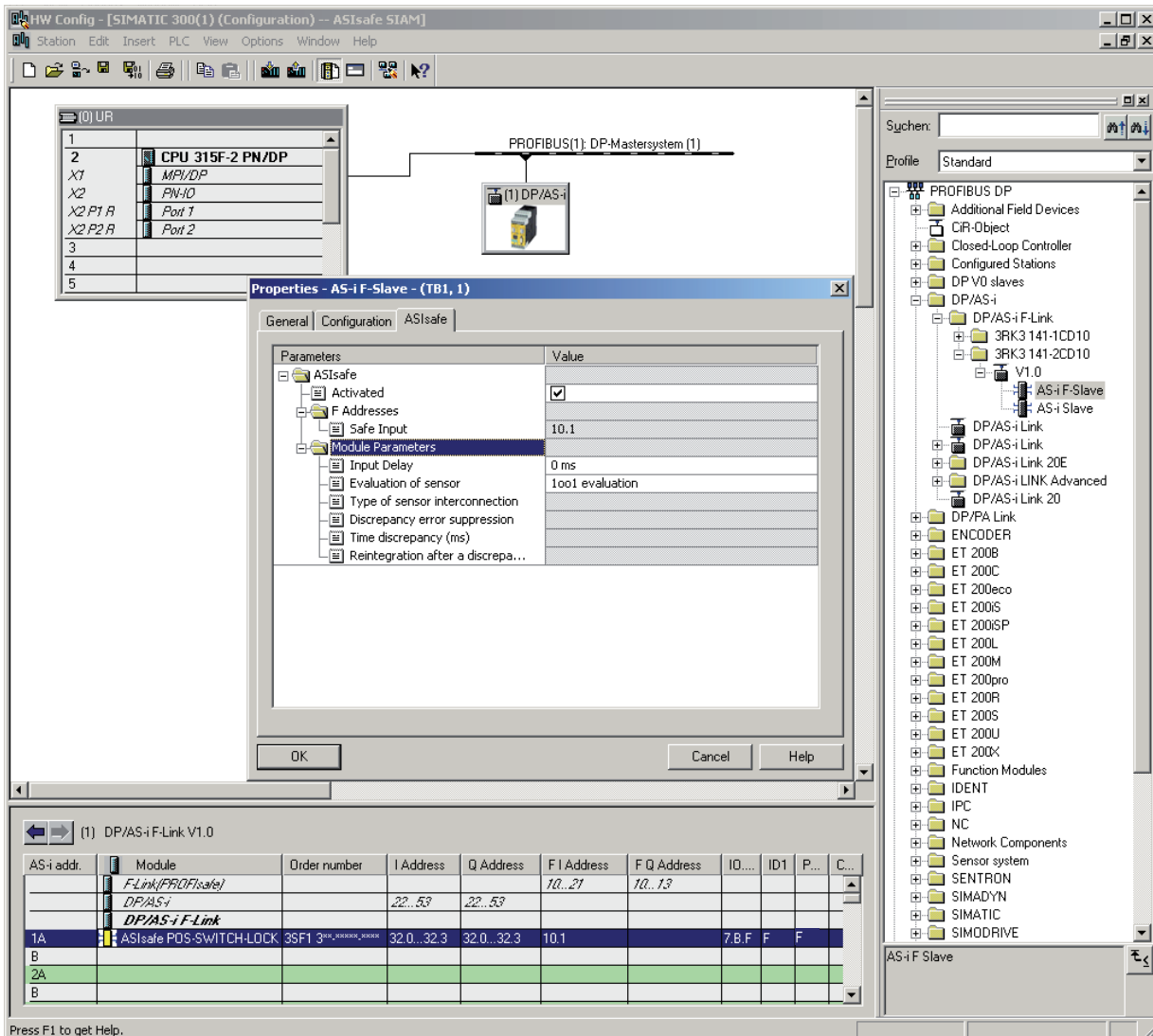


Figure 5-4 Protective door monitoring; spring-locked position switch; DP / AS-i F-Link

If the solenoid is **not energized**, the protective door is locked.

Configuring

- 1oo1 evaluation of the sensor: Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1



- ① When the 3SF1324-1S.21-1BA4 position switch is used, the following applies:
The DP / AS-i F-Link monitors the position switch with the "Sensor evaluation" set to "1oo1 evaluation". With this setting, the discrepancy evaluation in the DP/AS-i F-Link is disabled. A discrepancy between the two actuator contacts is independently recognized by the position switch with tumbler. The preprocessed signal of the actuator contacts and the signal of the solenoid are each read in by the DP/AS-i F-Link via a signal channel. If one of these two channels opens, no enable signal is sent by the DP/AS-i F-Link to the SIMATIC S7 fail-safe controller. If the contacts of the two channels are then closed again, switching on is possible.
Therefore, you can unlock and lock the protective door without having to open it.
- The standard output integrated in the position switch is used to enable the protective door.

- Spring-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Protective door tumbler: Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Safety-related tumbler via safety monitor

	WARNING
	Position switch for protective door monitoring Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection). Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors. The actuator ① must be protected against external force!

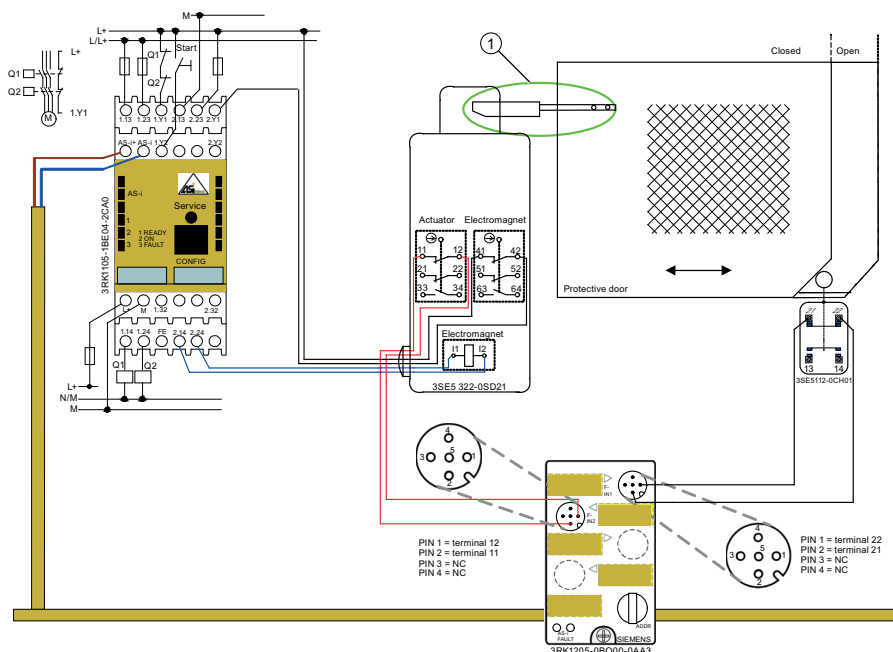
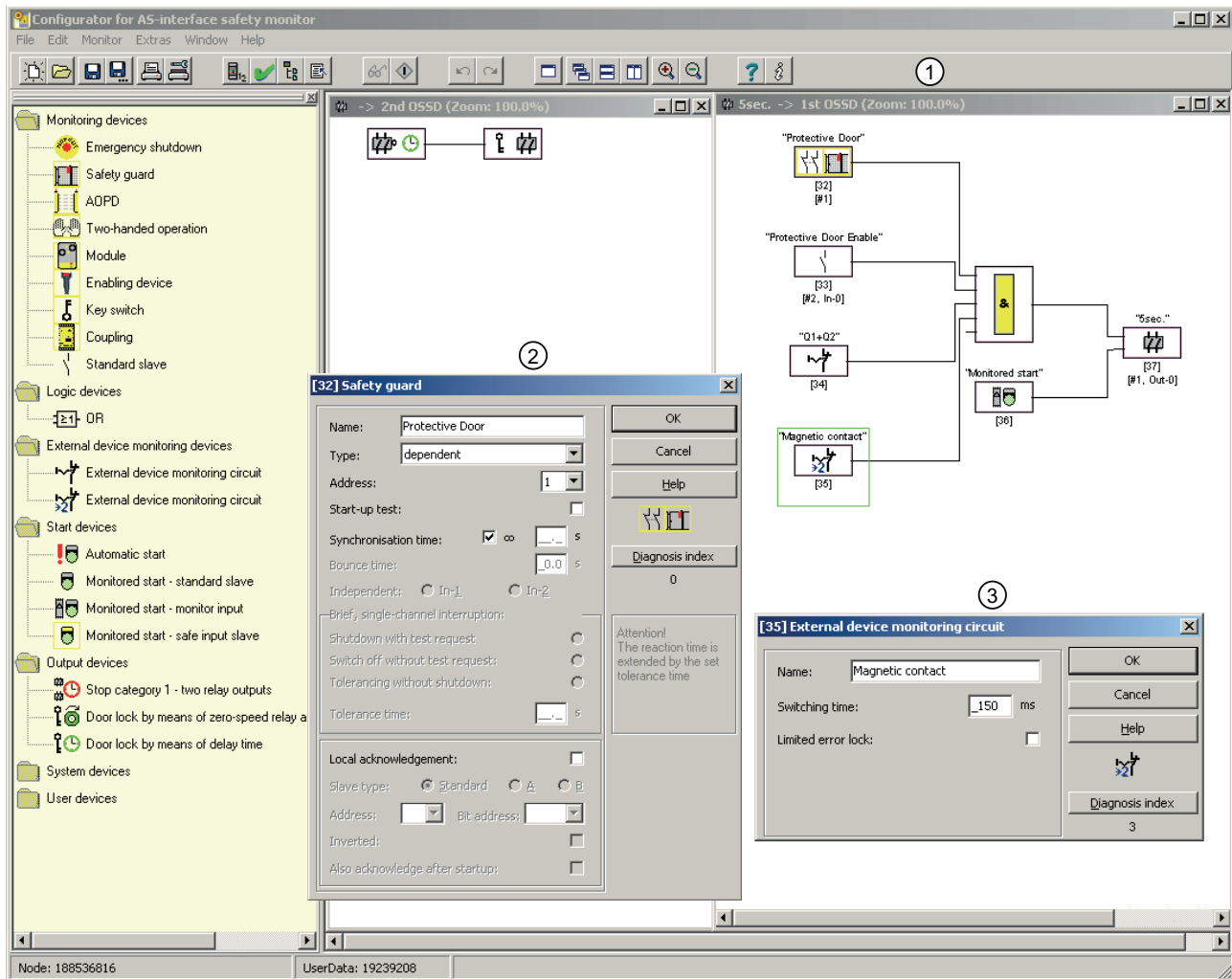


Figure 5-5 Protective door monitoring; spring-locked position switch; K45F, 2F-DI; category 4; safety monitor

If the solenoid is **not energized**, the protective door is locked.

Configuring



- ① Configure the operating mode of the safety monitor in the "Information about monitor and bus" screen as "two dependent OSSDs". A standard slave enables the protective door via OSSD 2 (time delayed). The "Door lock by means of delay time" output block energizes the solenoid (time delayed).
- ② The "Protective door" monitoring block monitors the actuators of the position switches.
- ③ The second external device monitoring circuit monitors the solenoid.

5.1.6 K45F, 2F-DI; DP / AS-i F-Link; monitoring: category 4; tumbler mechanism: category 3

- Spring-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Protective door tumbler: Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Safety-related tumbler via F-DO

Connecting

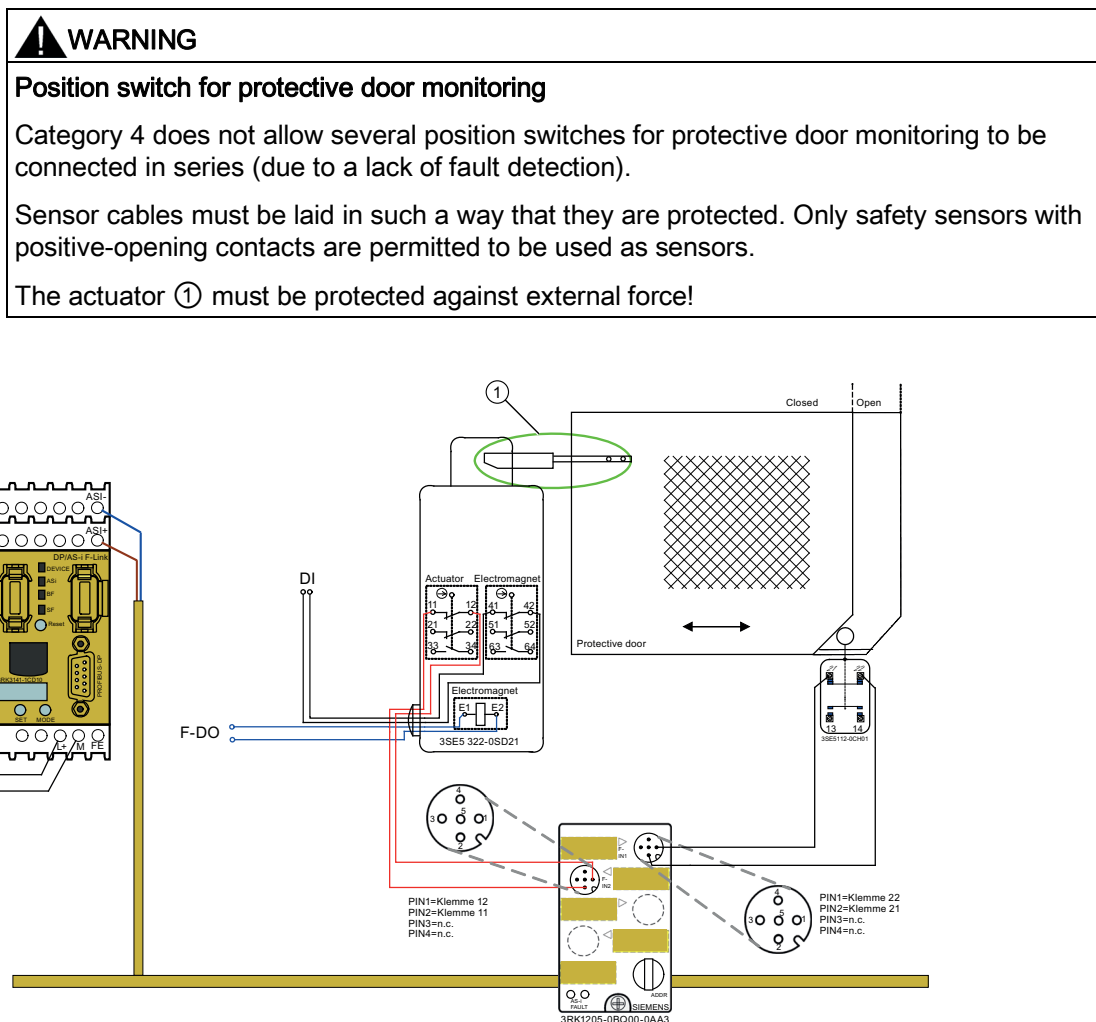
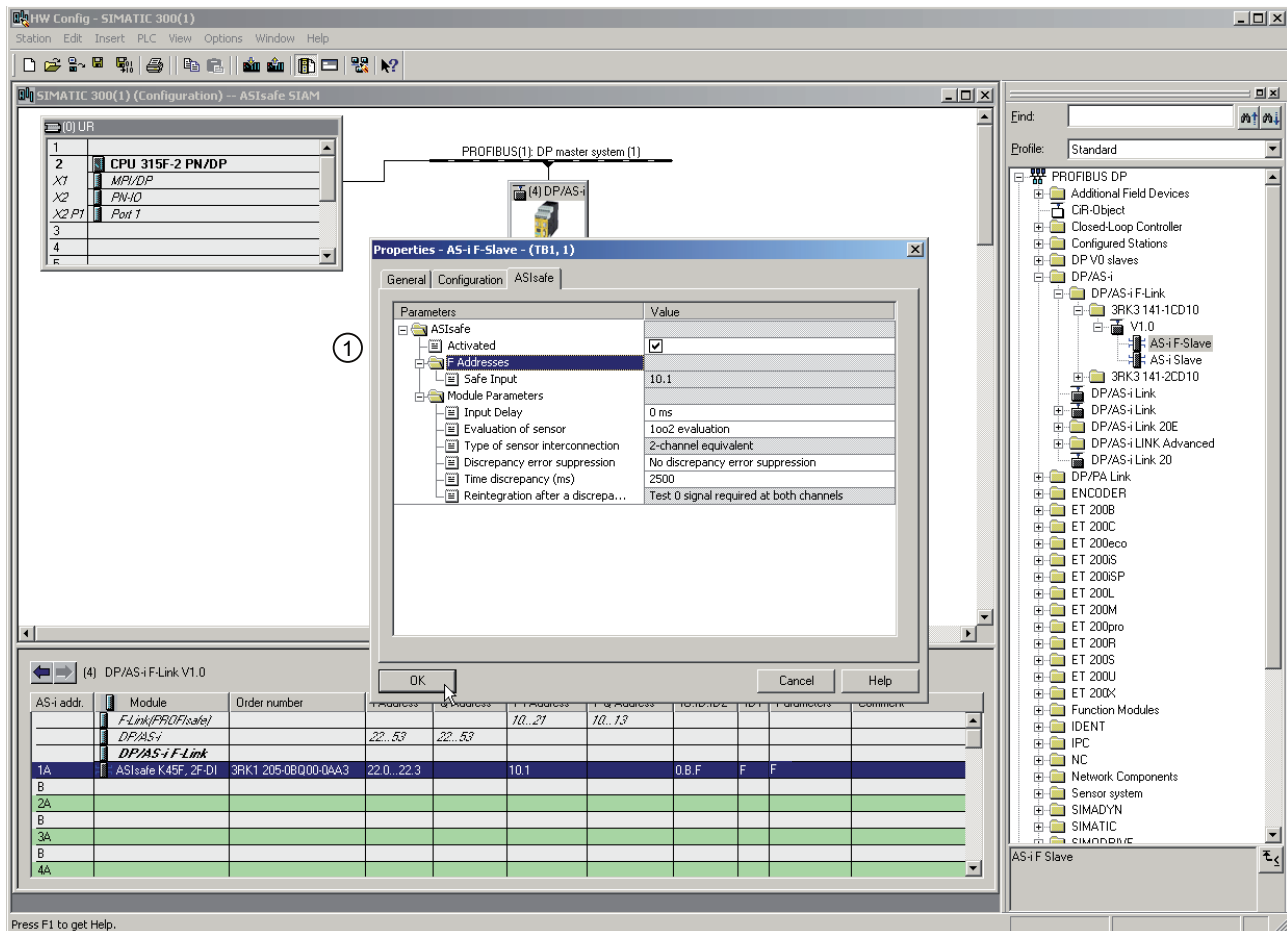


Figure 5-6 Protective door monitoring; spring-locked position switch; K45F, 2F-DI; category 4; DP / AS-i F-Link

If the solenoid is **not energized**, the protective door is locked.

Configuring



- ① F-Link monitors the actuators of the position switches. The protective door is enabled (time delayed) via a safety-related F-PLC output.
- The status of the solenoid is read in via a standard AS-i slave or a standard input of the PLC and evaluated in the F-program.

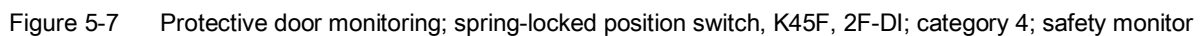
5.1.7 K45F, 2F-DI, safety monitor; monitoring: category 4; tumbler mechanism: category 4

- Spring-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Tumbler: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Safety-related tumbler via safety monitor

! WARNING

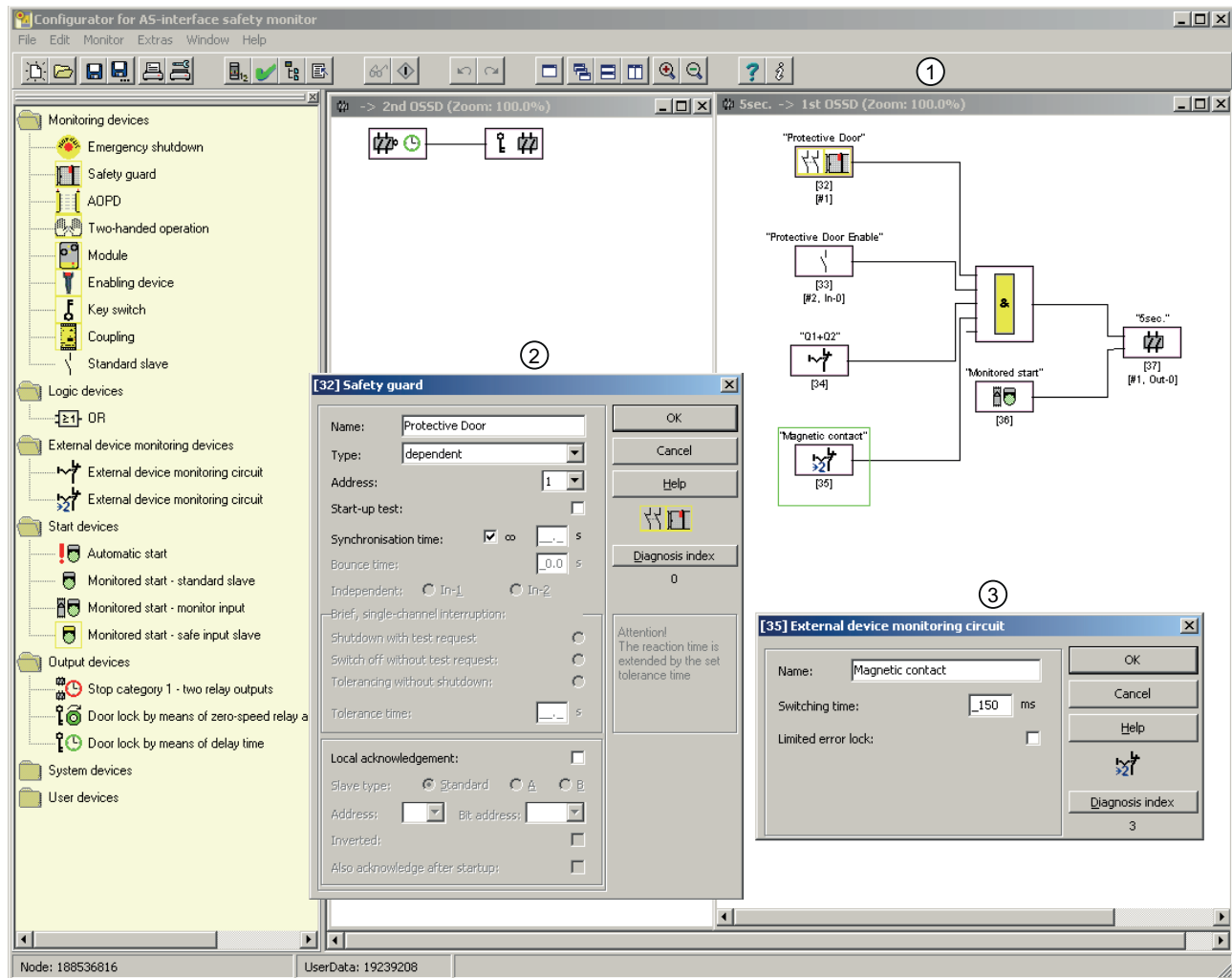
Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!



ASIsafe circuits for safety technology with AS-Interface safety monitor and DP/AS-i F-Link

Configuring



- ① Configure the operating mode of the safety monitor in the "Information about monitor and bus" screen as "two dependent OSSDs". A fail-safe slave enables the protective door via OSSD 2 (time delayed). The "Door lock by means of delay time" output block energizes the solenoid (time delayed).
- ② The "Protective door" monitoring block monitors the actuators of the position switches.
- ③ The second external device monitoring circuit monitors the solenoid.

5.1.8 K45F, 2F-DI, AS-i F-Link; monitoring: category 4; tumbler mechanism: category 4

- Spring-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Tumbler: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Safety-related tumbler via F-DO

Connecting

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

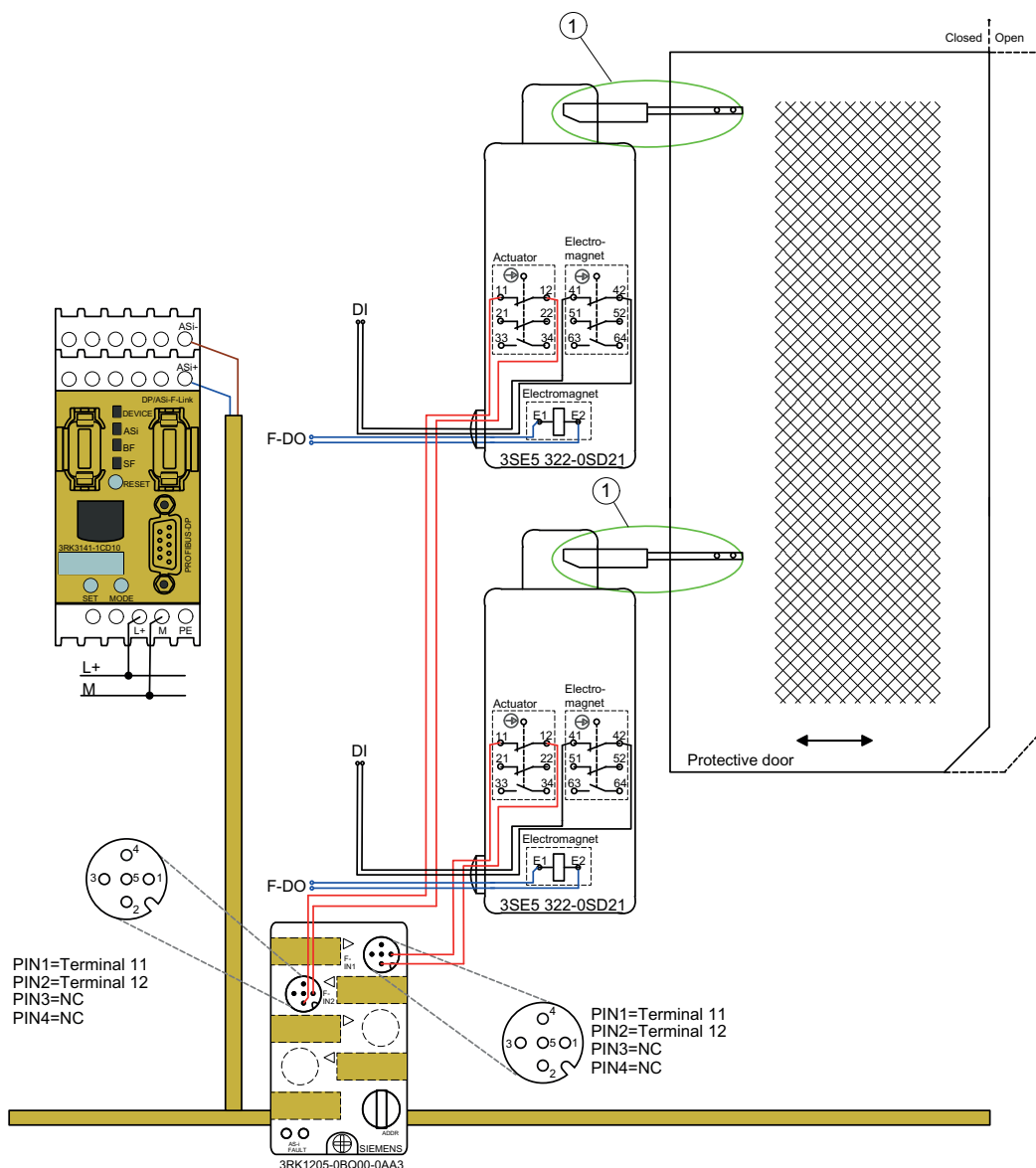
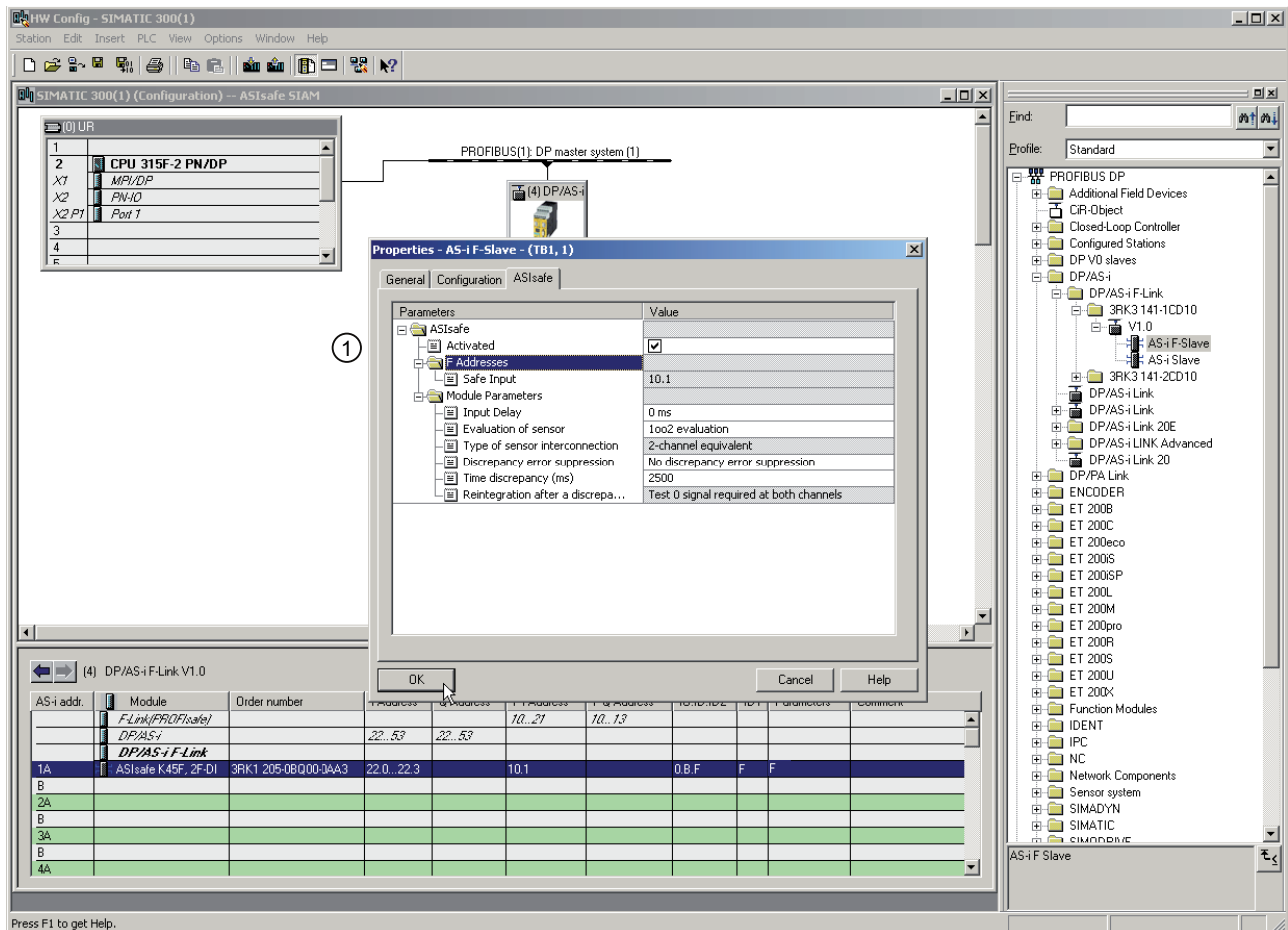


Figure 5-8 Protective door monitoring; spring-locked position switch, K45F, 2F-DI; category 4; DP / AS-i F-Link

If the solenoid is **not energized**, the protective door is locked.

Configuring



- ① F-Link monitors the actuators of the position switches. The protective door is enabled (time delayed) via a safety-related F-PLC output.
- The status of the magnet is read in via a standard AS-i slave or a standard input of the PLC and evaluated in the F-program.

5.2 Solenoid-locked protective door lock

5.2.1 K45F, 2F-DI / 2 DO; safety monitor; monitoring: category 2 / category 3

- Solenoid-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Depending on configuration
Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
OR:
Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via standard output of the K45F

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used to safeguard the production process.

Connecting

! WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

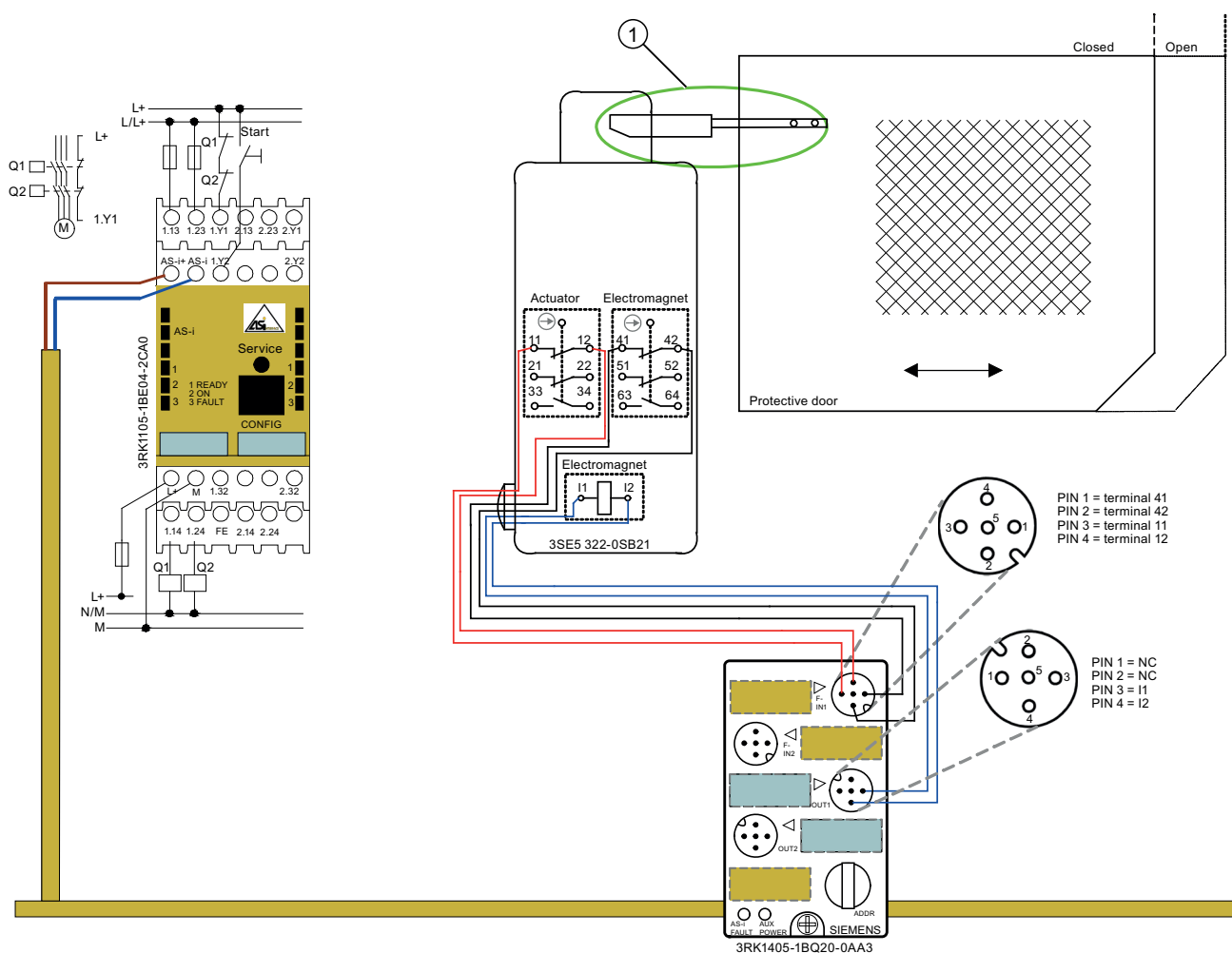


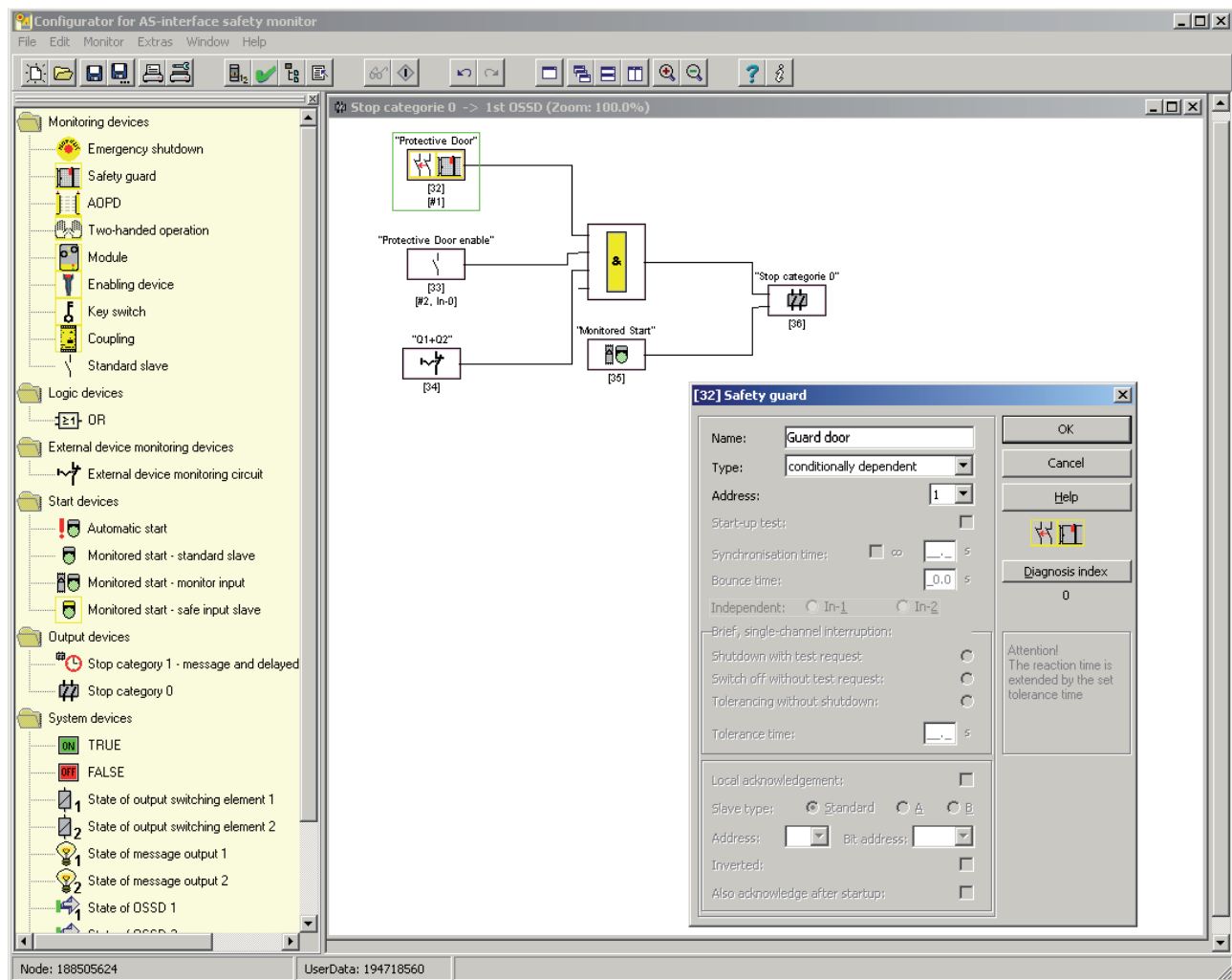
Figure 5-9 Protective door monitoring; solenoid-locked position switch; K45F, 2F-DI / 2 DO; safety monitor

If the solenoid is energized, the protective door is locked.

The K45F module 3RK1405-1BQ20-0AA3 requires 24 V auxiliary voltage (black flat cable not shown in figure).

Configuring

- Protective door monitoring with ASIMON monitoring block, type "conditionally dependent": Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to ISO 13849-1
- Protective door monitoring with ASIMON monitoring block, type "dependent": Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1



- A standard output on the K45F module enables the protective door.
- ① The safety monitor monitors the actuator and the solenoid "conditionally dependent". Connect the solenoid to pins 1/2 and the actuator to pins 3/4. When you activate the "Independent In 1" parameter, you can unlock the protective door without having to open it afterwards.

5.2.2 K45F, 2F-DI / 2 DO; DP / AS-i F-Link; Monitoring: category 2 / category 3

- Solenoid-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Depending on configuration
Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
OR:
Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via standard output of the K45F

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used to safeguard the production process.

Connecting

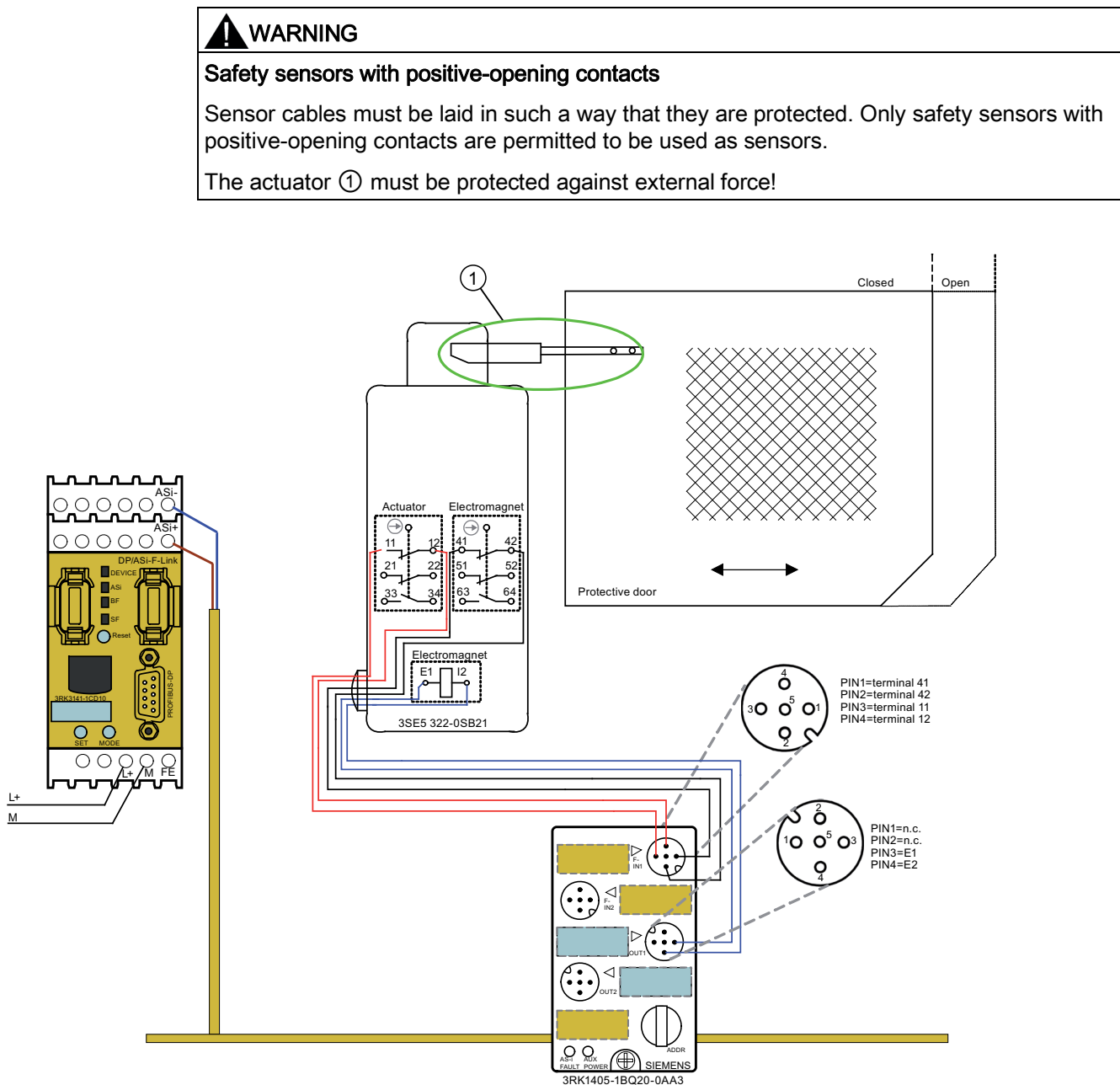


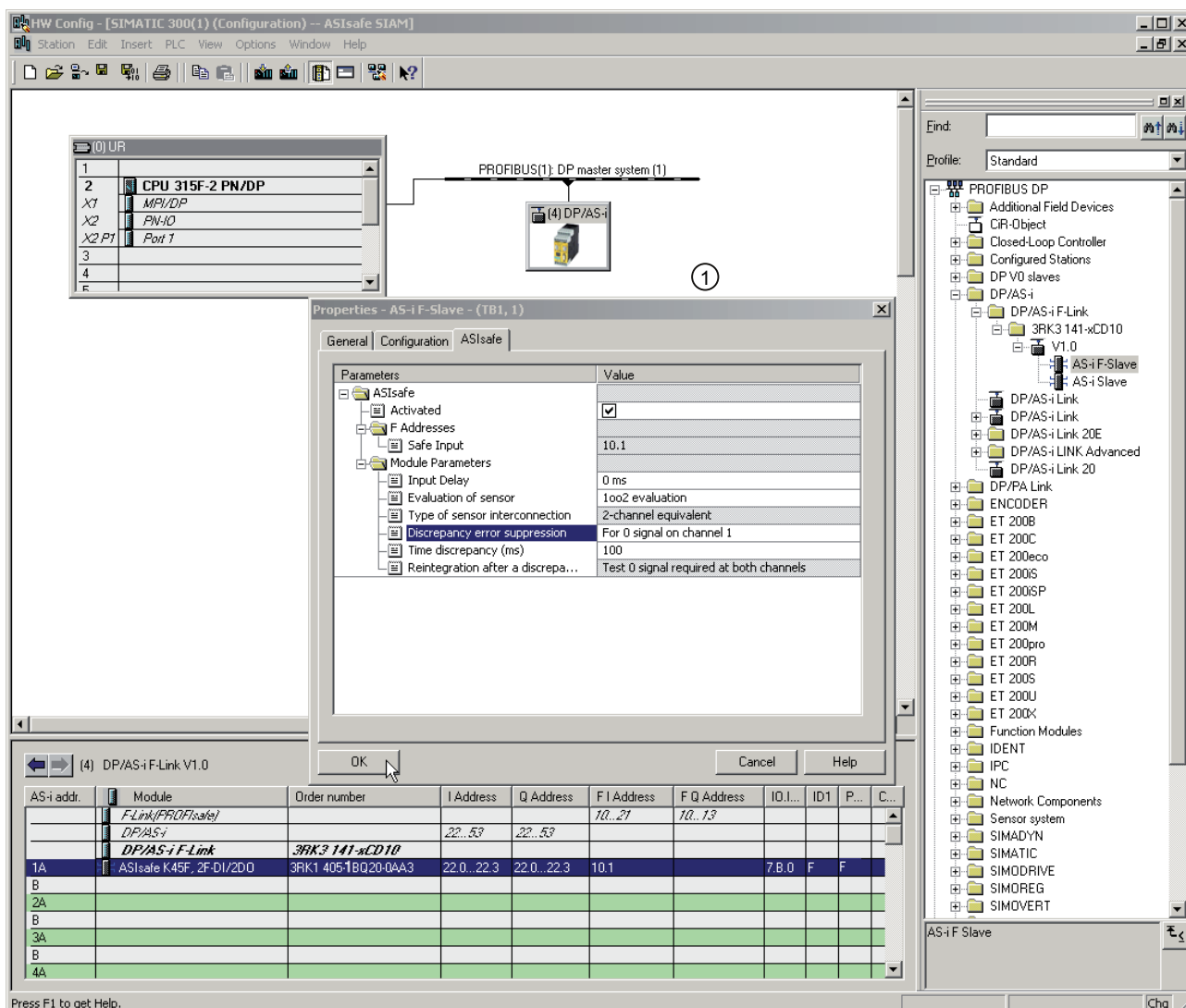
Figure 5-10 Protective door monitoring; solenoid-locked position switch; K45F, 2F-DI / 2 DO; DP / AS-i F-Link

If the solenoid is energized, the protective door is locked.

The K45F module 3RK1405-1BQ20-0AA3 requires 24 V auxiliary voltage (black flat cable not shown in figure).

Configuring

- 2oo2 evaluation of the sensors, with discrepancy error suppression: Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to ISO 13849-1
- 2oo2 evaluation of the sensors, no discrepancy error suppression (set discrepancy time to 2500. The door must be opened within the discrepancy time after it has been unlocked): Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1



- A standard output on the K45F module enables the protective door.
- ① DP / AS-i F-Link monitors the actuator and the solenoid. Connect the solenoid to pins 1/2 and the actuator to pins 3/4. When you choose discrepancy error suppression "For 0 signal on channel 1", you can unlock the protective door without having to open it afterwards.

5.2.3 Direct interface; safety monitor; monitoring: category 2 / category 3

- Solenoid-locked position switch with tumbler 3SF1
- Direct connection to AS-Interface
- Protective door monitoring: Depending on configuration
Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
OR:
Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via integrated standard output of the 3SF1

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used to safeguard the production process.

Connecting

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

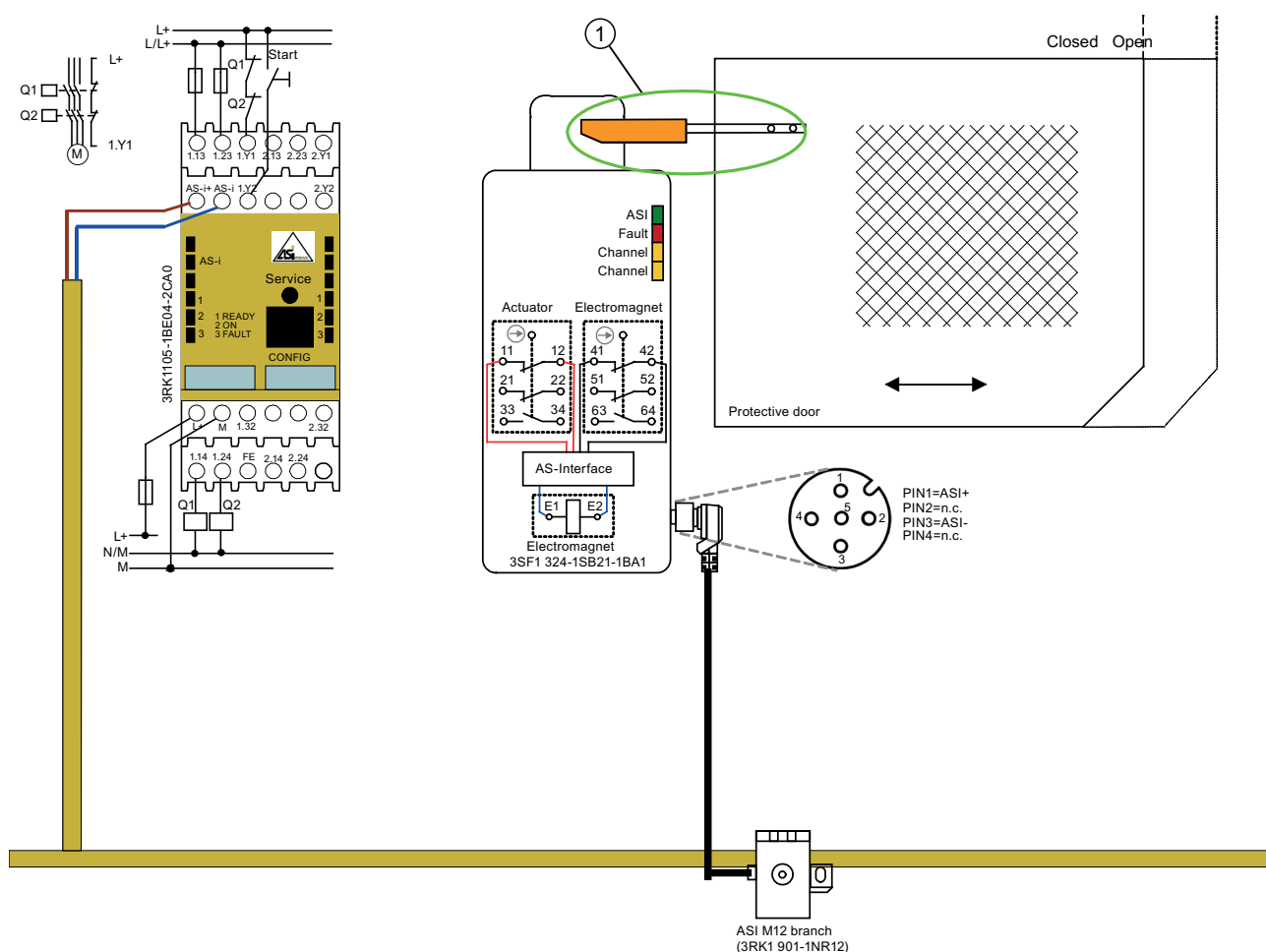
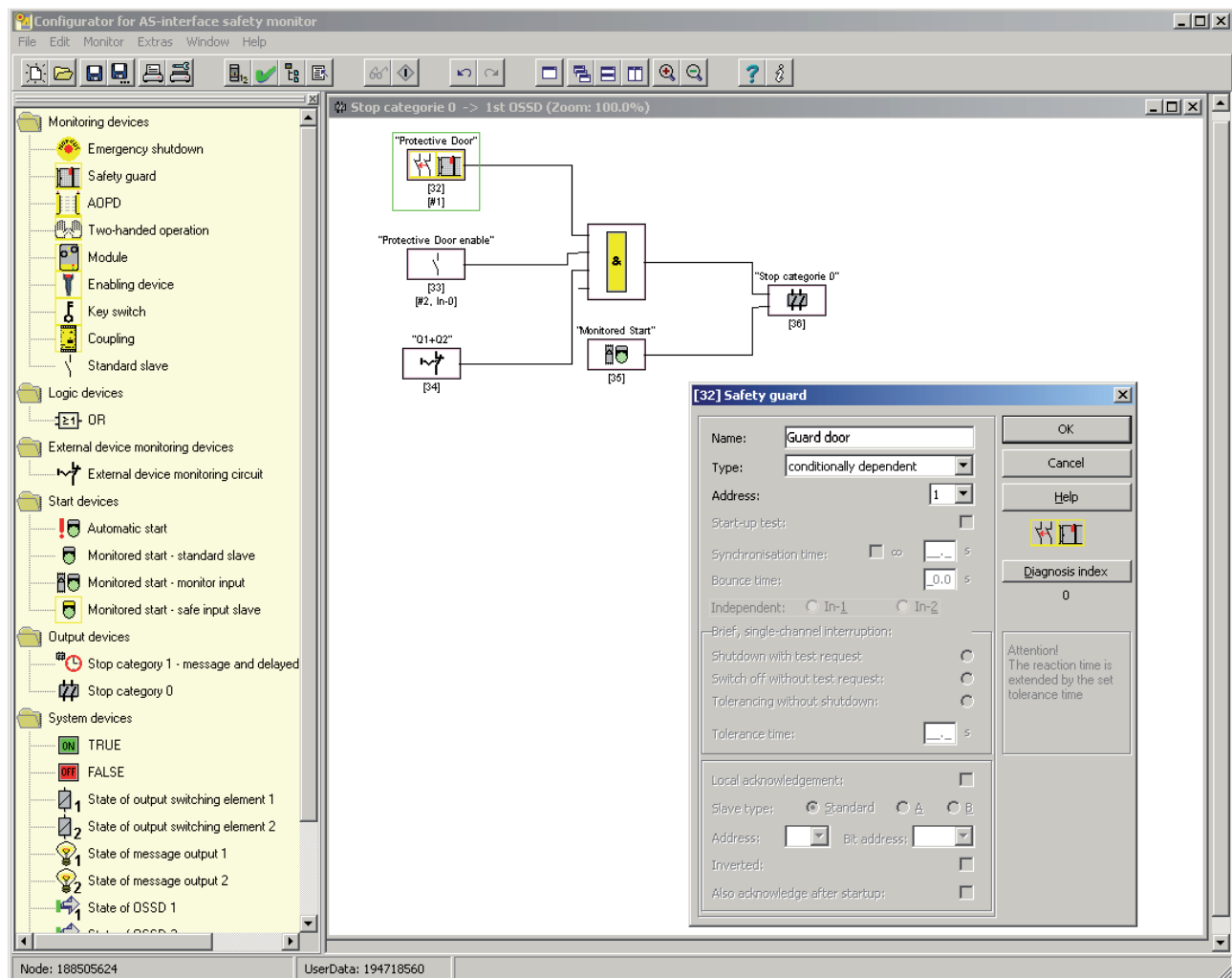


Figure 5-11 Protective door monitoring; solenoid-locked position switch; direct interface; safety monitor

If the solenoid is energized, the protective door is locked.

Configuring

- Protective door monitoring with ASIMON monitoring block, type "conditionally dependent": Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to ISO 13849-1
- Protective door monitoring with ASIMON monitoring block, type "dependent": Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1



- ① The safety monitor monitors the actuator and the solenoid "conditionally dependent". When you activate the "Independent In-1" parameter, you can unlock the protective door without having to open it afterwards.
- The standard output integrated in the position switch is used to enable the protective door.

5.2.4 Direct interface; DP / AS-i F-Link; monitoring: category 2 / category 3

- Solenoid-locked position switch with tumbler 3SF1
- Direct connection to AS-Interface
- Protective door monitoring: Depending on configuration
Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1
OR:
Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Non-safety-related tumbler via integrated standard output of the 3SF1

Note

The protective door tumbler is not a safety function (non-safety-related control of the solenoid). It can be used for safeguarding the production process.

Connecting

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

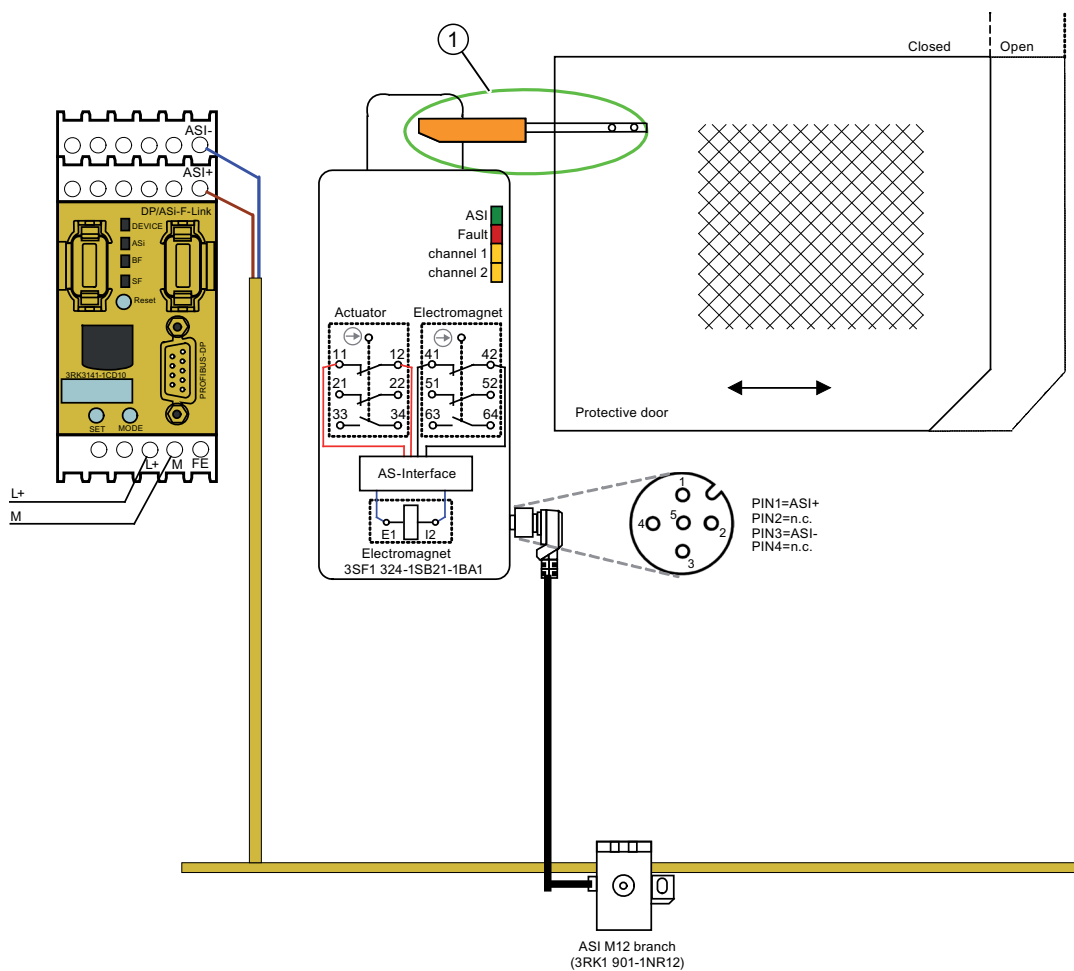
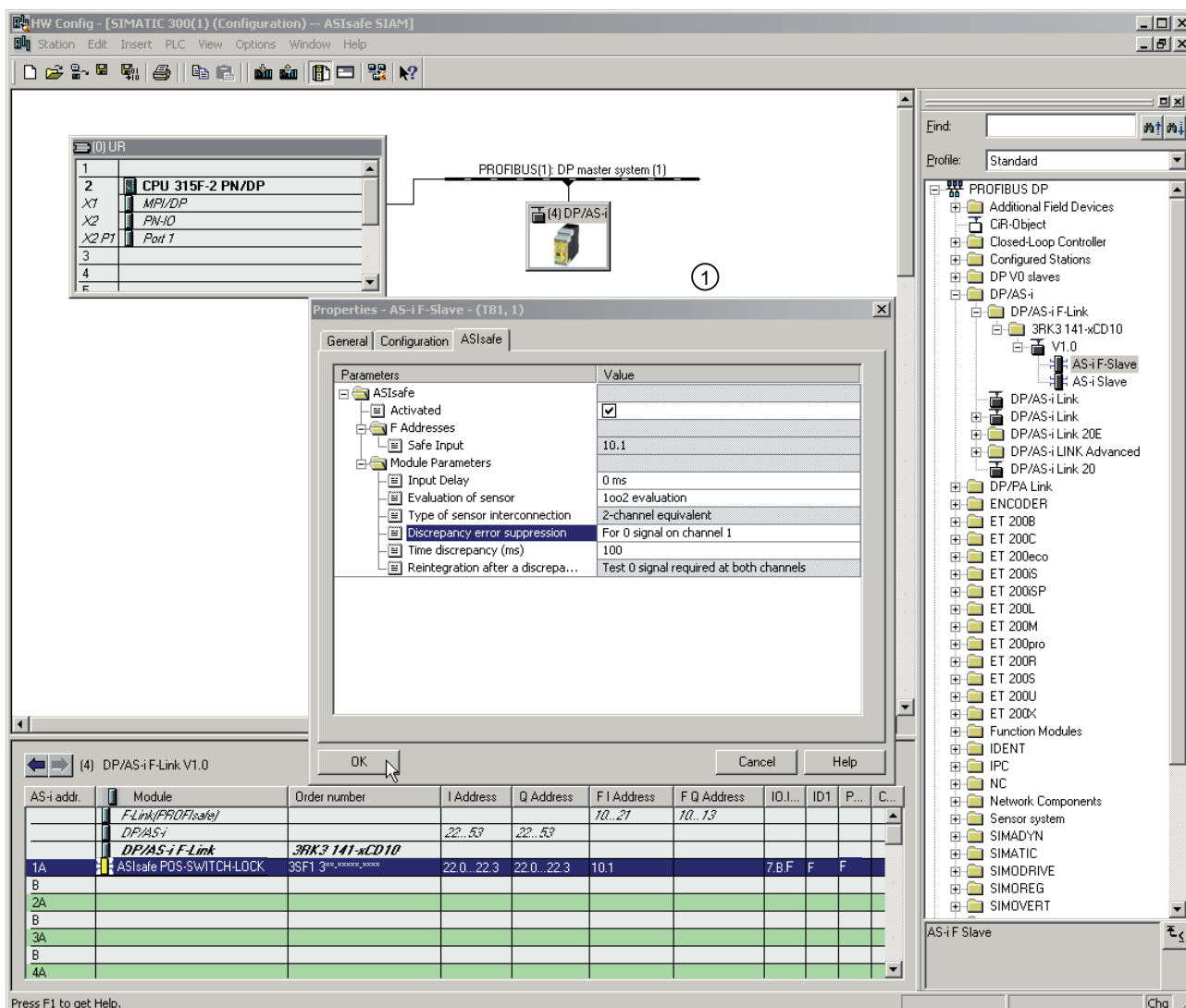


Figure 5-12 Protective door monitoring; solenoid-locked position switch; direct interface; DP AS-i F-Link

If the solenoid is energized, the protective door is locked.

Configuring

- 2oo2 evaluation of the sensors, with discrepancy error suppression: Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to ISO 13849-1
- 2oo2 evaluation of the sensors, no discrepancy error suppression (set discrepancy time to 2500. The door must be opened within the discrepancy time after it has been unlocked): Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to ISO 13849-1



- The standard output of the position switch with ASIsafe enables the protective door.
- ① DP AS-i F-Link monitors the actuator and the solenoid. When you choose discrepancy error suppression "For 0 signal on channel 2", you can unlock the protective door without having to open it afterwards.

5.2.5 K45F, 2F-DI; safety monitor; monitoring: category 4; tumbler mechanism: category 3

- Solenoid-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Protective door tumbler: Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Safety-related tumbler via safety monitor

Connecting

⚠ WARNING

Position switch for protective door monitoring

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

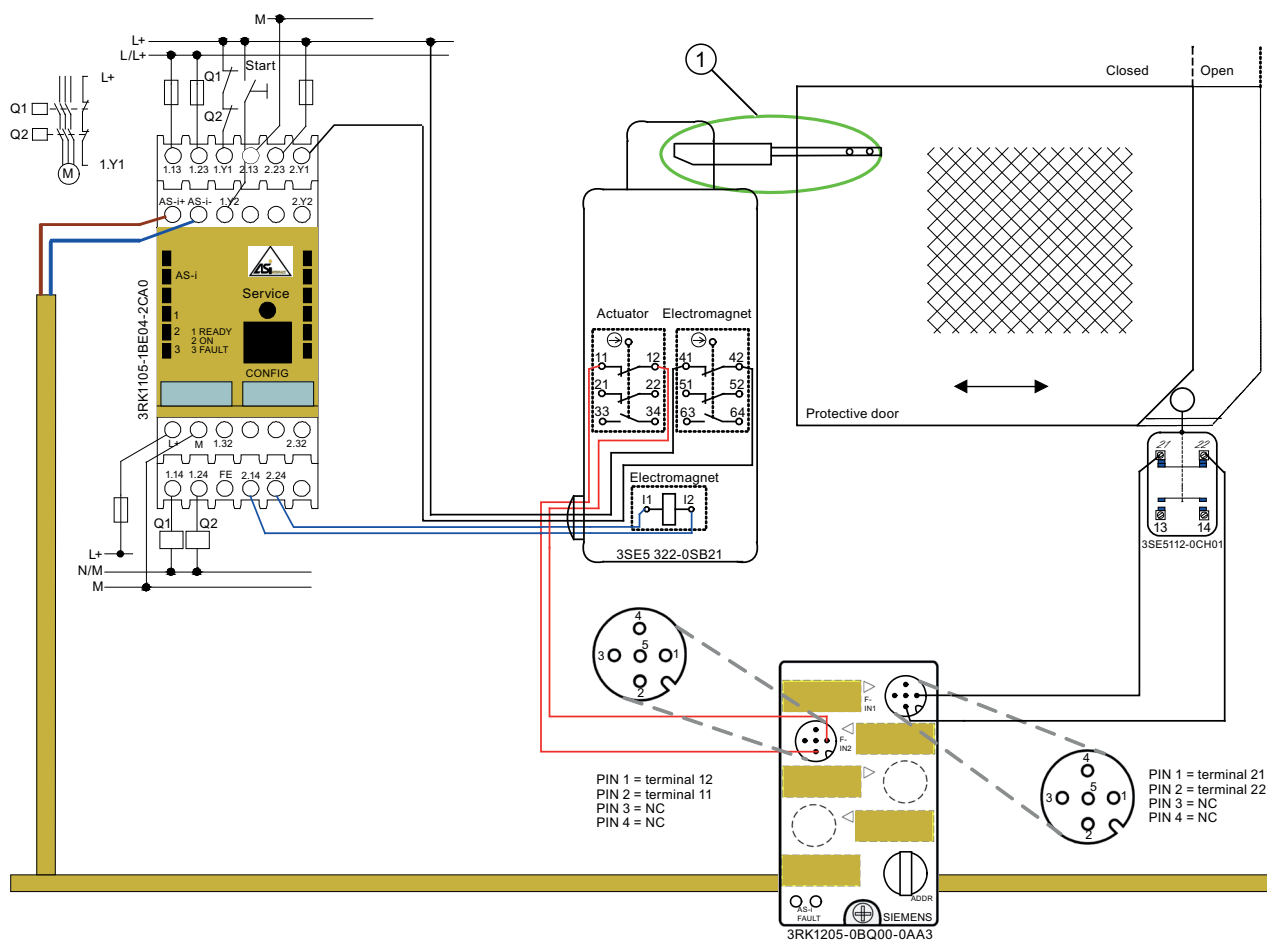
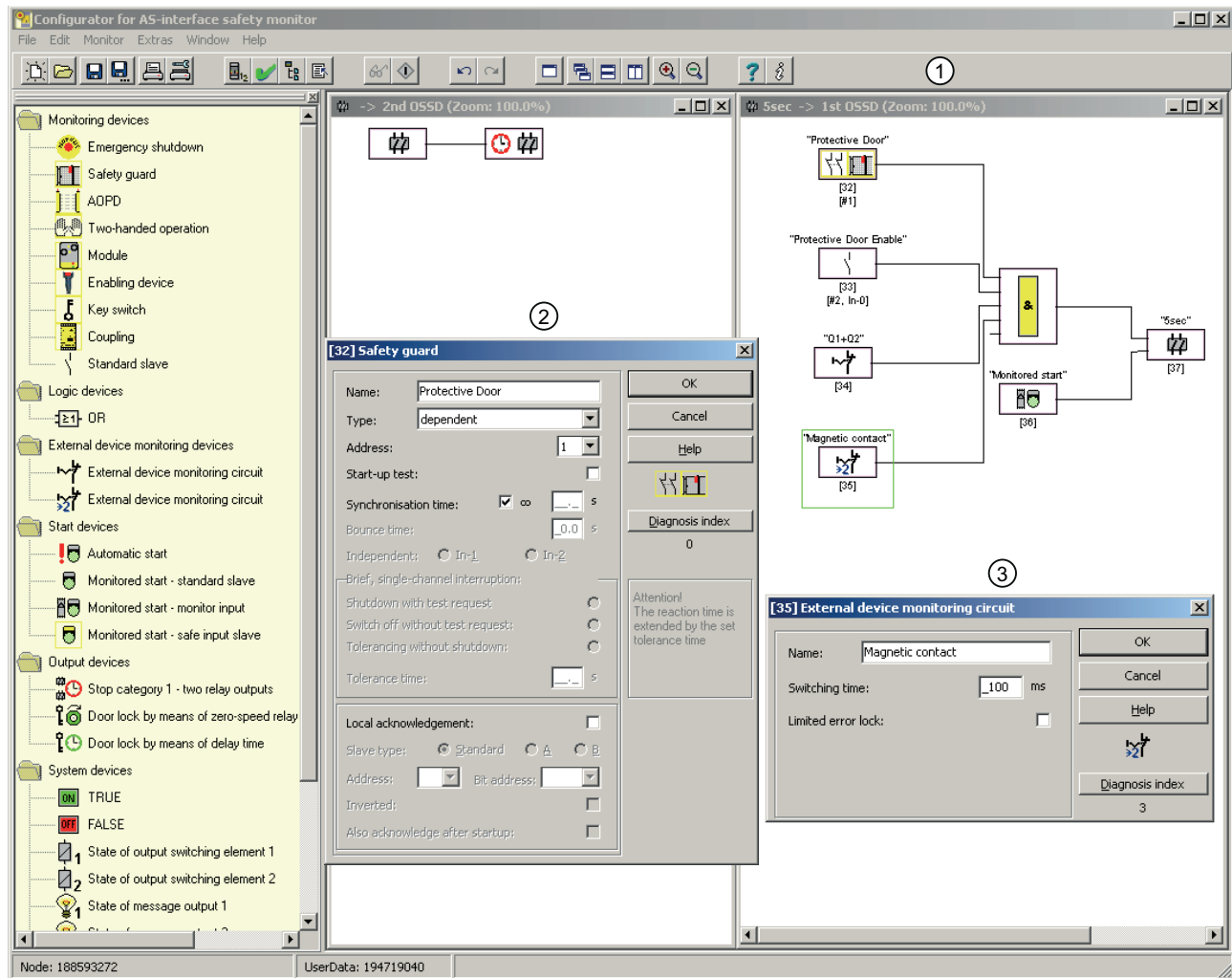


Figure 5-13 Protective door monitoring; solenoid-locked position switch; K45F, 2F-DI; category 4; safety monitor

If the solenoid is energized, the protective door is locked.

Configuring



- ① Configure the operating mode of the safety monitor in the "Information about monitor and bus" screen as "two dependent OSSDs". A standard slave enables the protective door via OSSD 2 (time delayed). The "Stop category 1 - two relay outputs" output block switches off the solenoid (time delayed).
- ② The "Protective door" monitoring block monitors the actuators of the position switches.
- ③ The second external device monitoring circuit monitors the solenoid.

5.2.6 K45F, 2F-DI; DP / AS-i F-Link; monitoring: category 4; tumbler mechanism: category 3

- Solenoid-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Protective door tumbler: Category 3 according to EN 954-1 or SIL2 according to IEC 62061 or PL d according to EN ISO 13849-1
- Safety-related tumbler via F-DO

Connecting

⚠ WARNING

Position switch for protective door monitoring

Category 4 does not allow several position switches for protective door monitoring to be connected in series (due to a lack of fault detection).

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

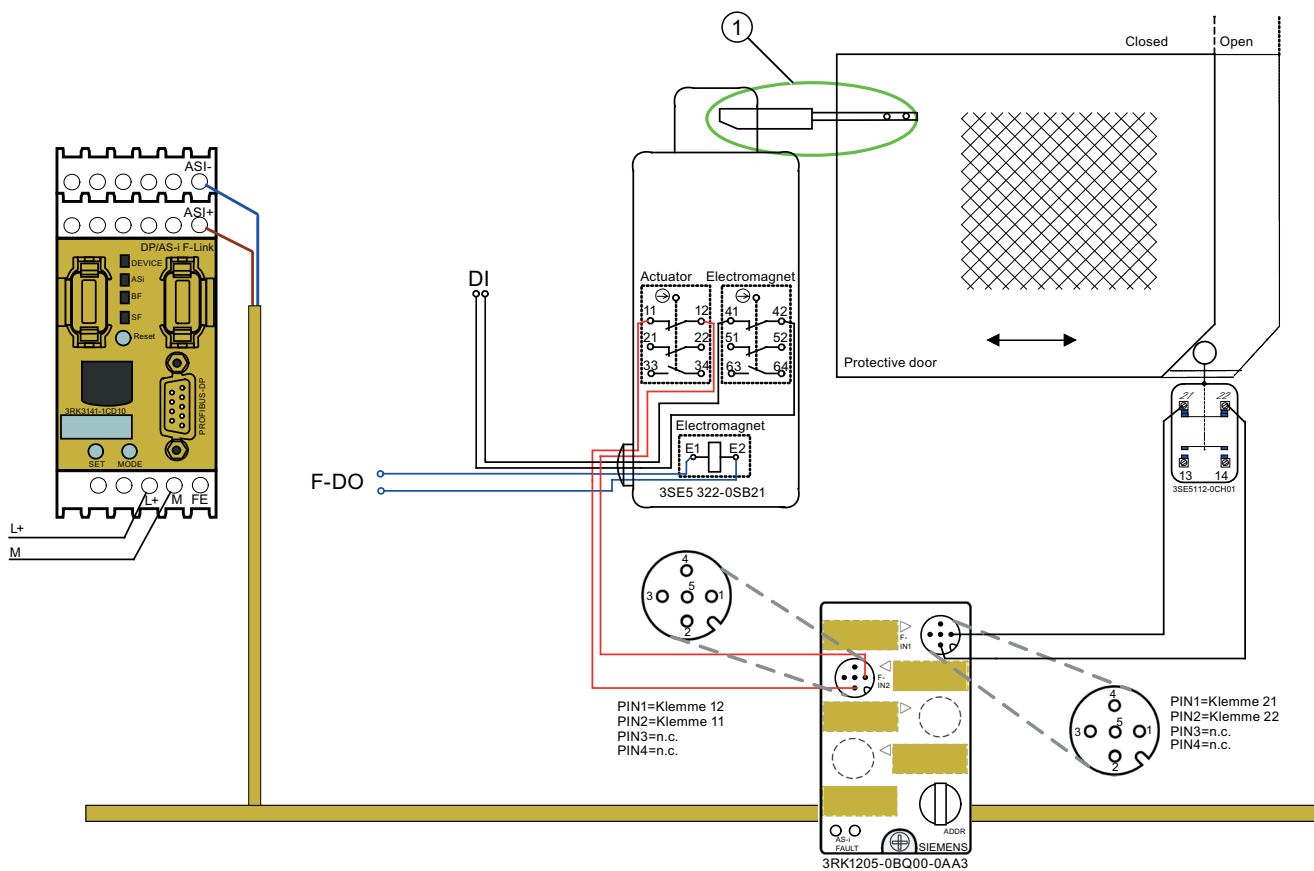
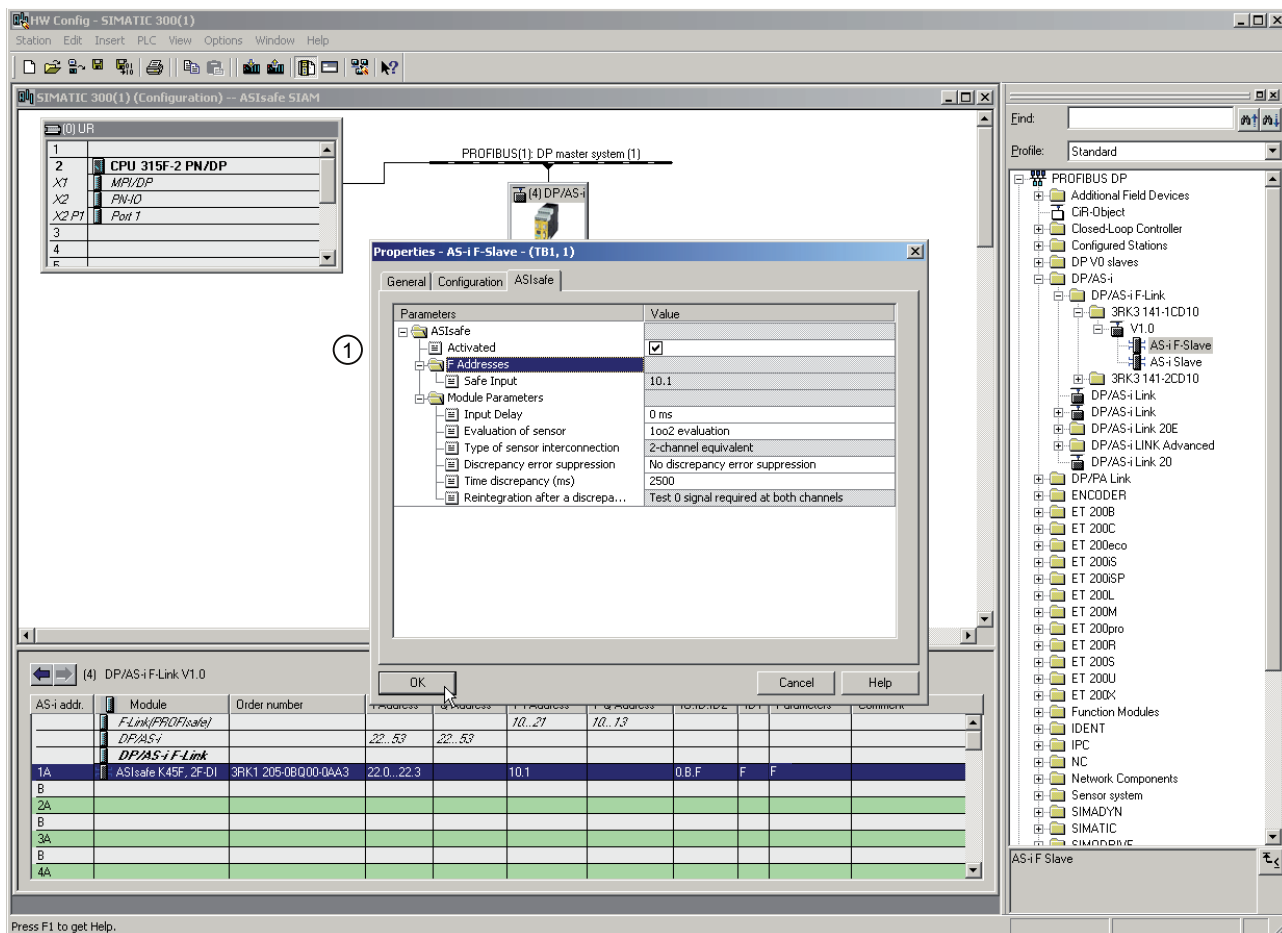


Figure 5-14 Protective door monitoring; solenoid-locked position switch; K45F, 2F-DI, category 4; DP / AS-i F-Link

If the solenoid is energized, the protective door is locked.

Configuring



- ① DP / AS-i F-Link monitors the actuators of the position switches. The protective door is enabled (time delayed) via a safety-related F-PLC output.
- The status of the solenoid is read in via a standard AS-i slave or a standard input of the PLC and evaluated in the F-program.

5.2.7 K45F, 2F-DI, safety monitor; monitoring: category 4; tumbler mechanism: category 4

- Solenoid-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Tumbler: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Safety-related tumbler via safety monitor

Connecting

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

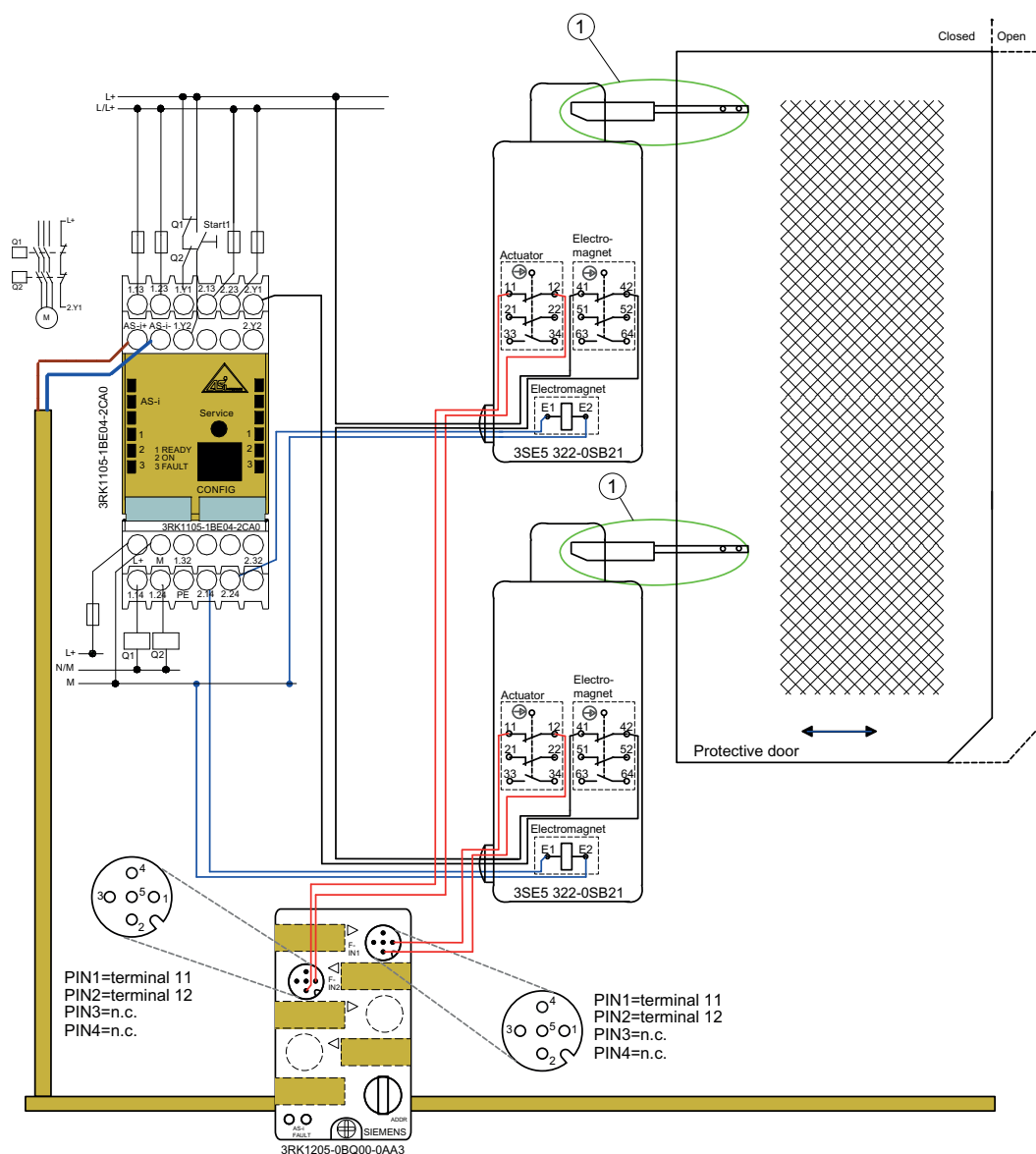
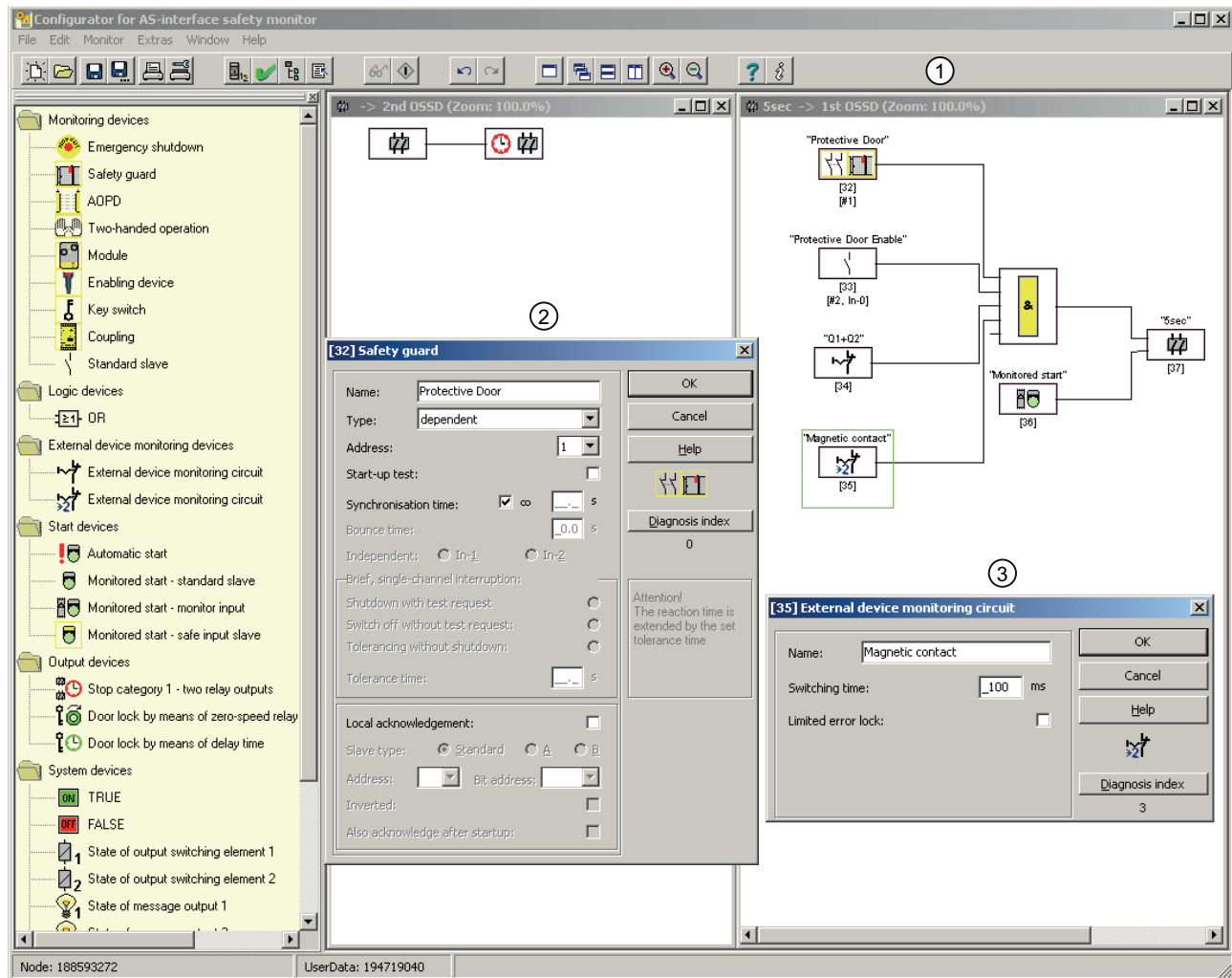


Figure 5-15 Protective door monitoring; solenoid-locked position switch; K45F, 2F-DI; category 4; safety monitor

If the solenoid is energized, the protective door is locked.

Configuring



- ① Configure the operating mode of the safety monitor in the "Information about monitor and bus" screen as "two dependent OSSDs". A fail-safe slave enables the protective door via OSSD 2 (time delayed). The "Stop category 1 - two relay outputs" output block switches off the solenoid (time delayed).
- ② The "Protective door" monitoring block monitors the actuators of the position switches.
- ③ The second external device monitoring circuit monitors the solenoid.

5.2.8 K45F, 2F-DI, AS-i F-Link; monitoring: category 4; tumbler mechanism: category 4

- Solenoid-locked position switch with tumbler 3SE5
- Safety compact module K45F
- Protective door monitoring: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Tumbler: Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1
- Safety-related tumbler via F-DO

Connecting

⚠ WARNING

Safety sensors with positive-opening contacts

Sensor cables must be laid in such a way that they are protected. Only safety sensors with positive-opening contacts are permitted to be used as sensors.

The actuator ① must be protected against external force!

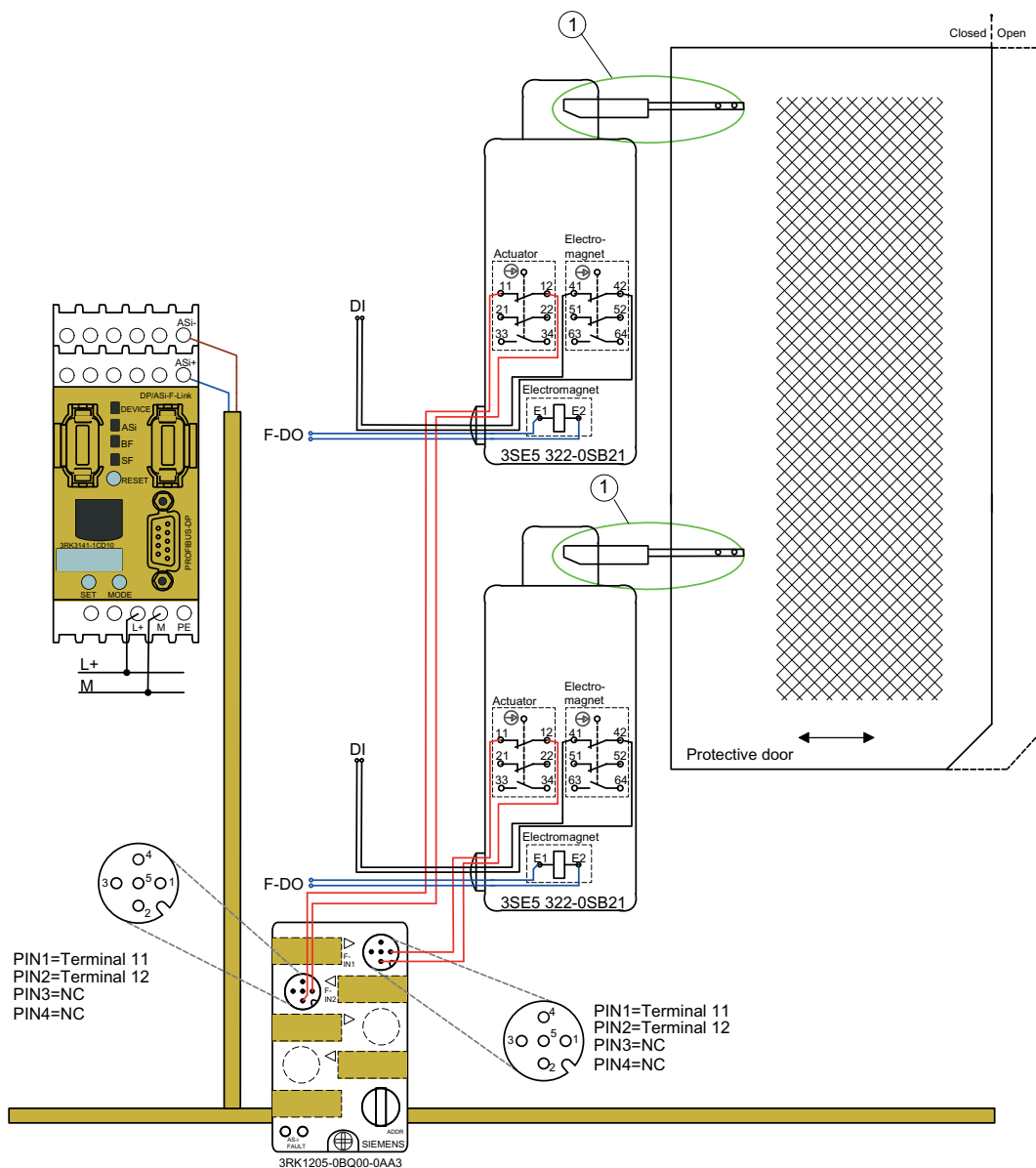
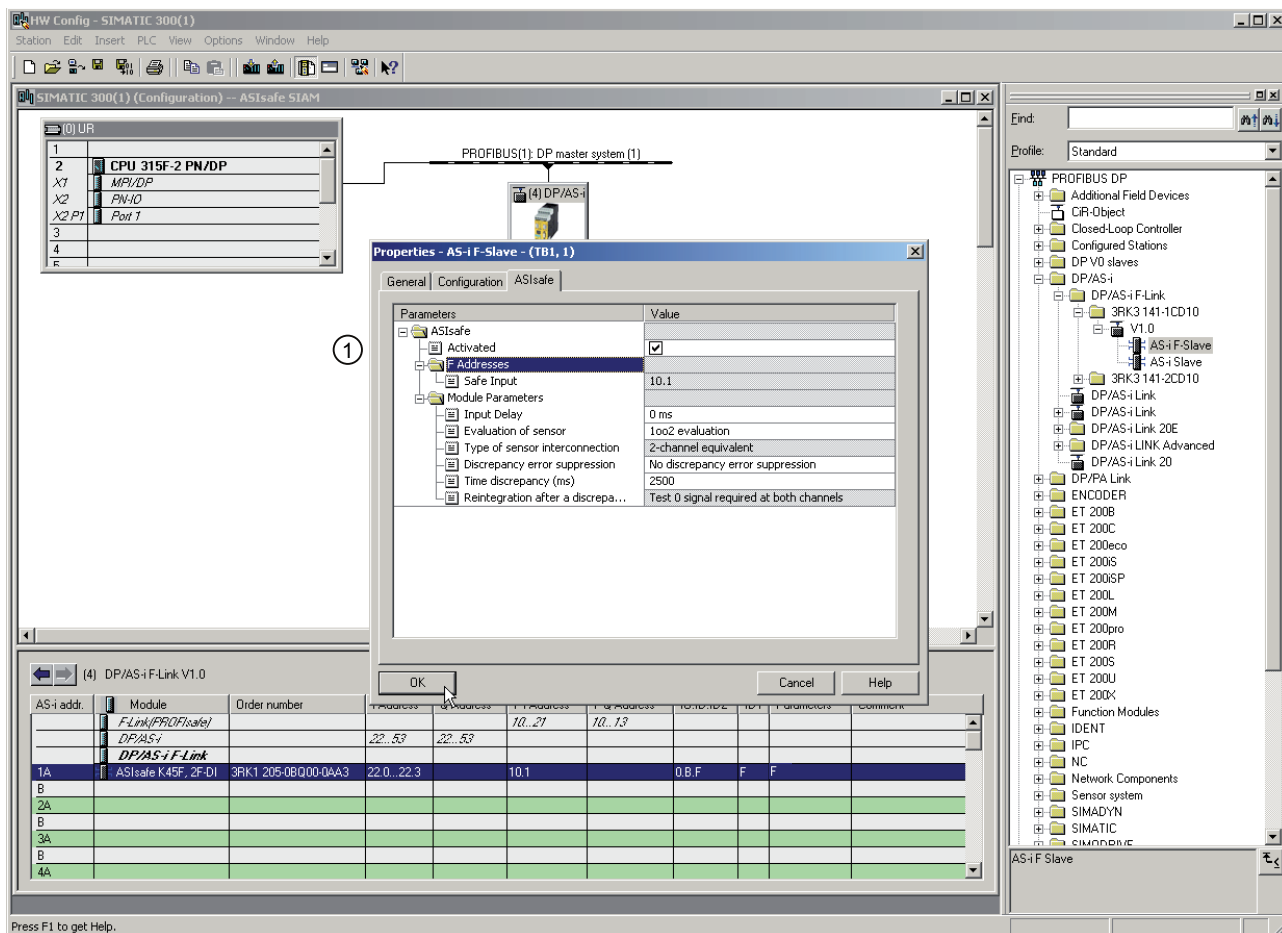


Figure 5-16 Protective door monitoring; magnet-locked position switch, K45F, 2F-DI; category 4; DP / AS-i F-Link

If the solenoid is energized, the protective door is locked.

Configuring



- ① F-Link monitors the actuators of the position switches. The protective door is enabled (time delayed) via a safety-related F-PLC output.
- The status of the solenoid is read in via a standard AS-i slave or a standard input of the PLC and evaluated in the F-program.

Wiring the safety monitor and DP / AS-i F-Link

General information about grounding the safety monitor

Note

Grounding the safety monitor

If terminal M is grounded in the immediate vicinity of the device, the grounding conductor does not need to be connected to the FE terminal.

WARNING

Output switching elements in the safety monitor

The output switching elements in the safety monitor are designed as a single switching contacts:

- 1 NO contact is located between terminals 1.13 and 1.14.
- 1 NO contact is located between terminals 1.23 and 1.24.
- 1 NO contact is located between terminals 2.13 and 2.14.
- 1 NO contact is located between terminals 2.23 and 2.24.

Note these technical properties when implementing your required safety function. If the safety function requires more shutdown paths, you must interconnect more NO contacts of the safety monitor for this.

See also Operating instructions of the safety monitor

(<http://support.automation.siemens.com/WW/view/en/24432172>)

6.1 Safety monitor; one OSSD; category 2

Basic safety monitor	1 OSSD	3RK1105-1AE04-0CA0
Expanded safety monitor	1 OSSD	3RK1105-1AE04-2CA0

- Single-channel connection with one OSSD
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1

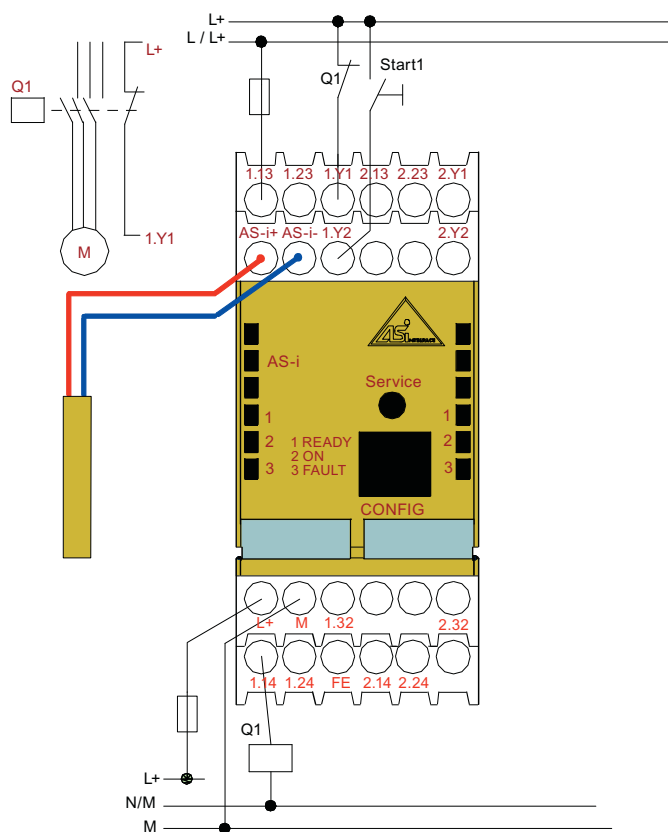
! WARNING

Failure of the actuator

With this typical circuit, category 2 according to EN 954-1 can only be fulfilled if warning is automatically given when the actuator fails or if the machine control system initiates a safe state.

Otherwise, a second shutdown path is necessary.

Connecting



6.2 Safety monitor; two OSSDs; category 2

Basic safety monitor	2 OSSDs	3RK1105-1BE04-0CA0
Expanded safety monitor	2 OSSDs	3RK1105-1BE04-2CA0

- Single-channel connection for each OSSD
- Category 2 according to EN 954-1 or SIL1 according to IEC 62061 or PL c according to EN ISO 13849-1

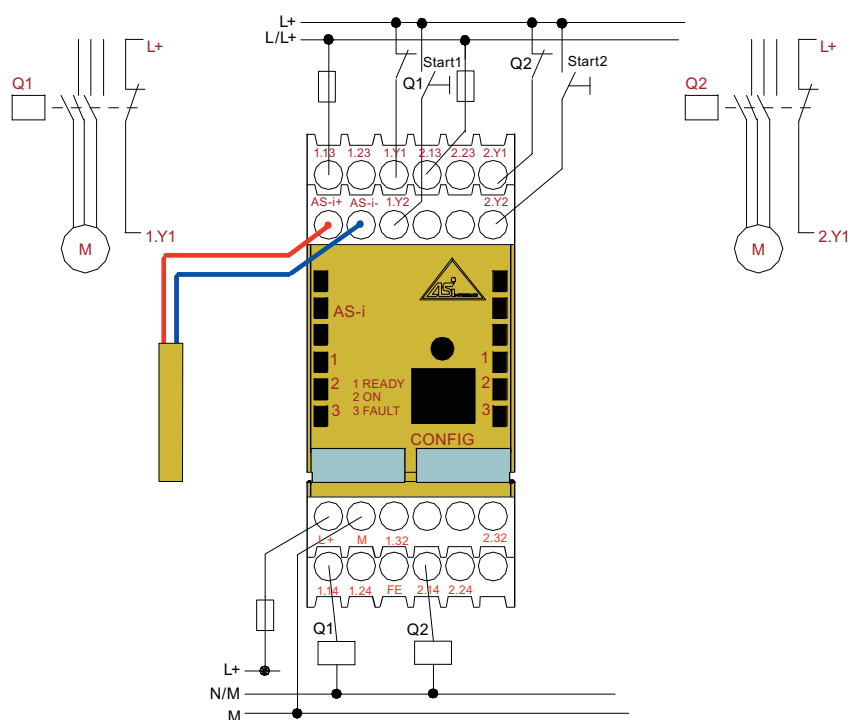
WARNING

Failure of the actuator

With this typical circuit, category 2 according to EN 954-1 can only be fulfilled if warning is automatically given when the actuator fails or if the machine control system initiates a safe state.

Otherwise, a second shutdown path is necessary.

Connecting

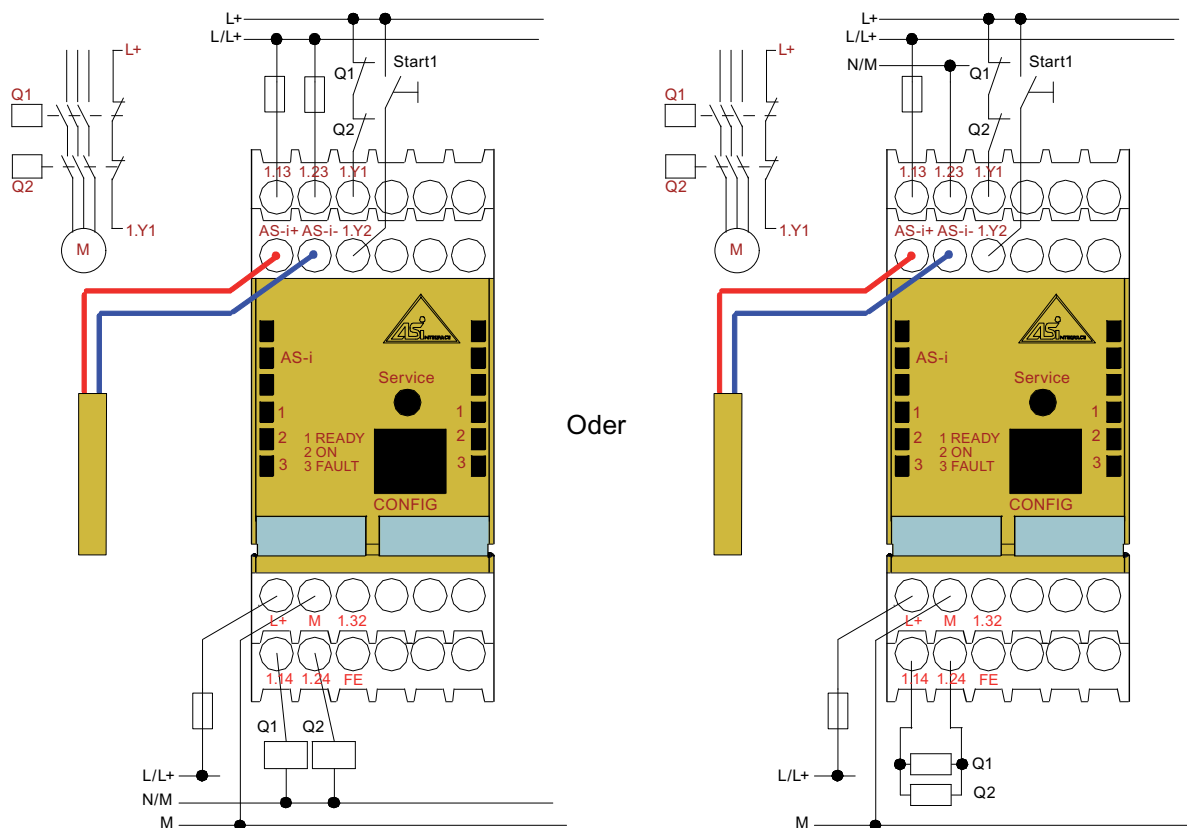


6.3 Safety monitor; one OSSD; category 4

Basic safety monitor	1 OSSD	3RK1105-1AE04-0CA0
Expanded safety monitor	1 OSSD	3RK1105-1AE04-2CA0

- Two-channel connection with one OSSD
- Category 4 according to EN 954-1 / SIL3 according to IEC 62061 / PL e according to EN ISO 13849-1

Connection

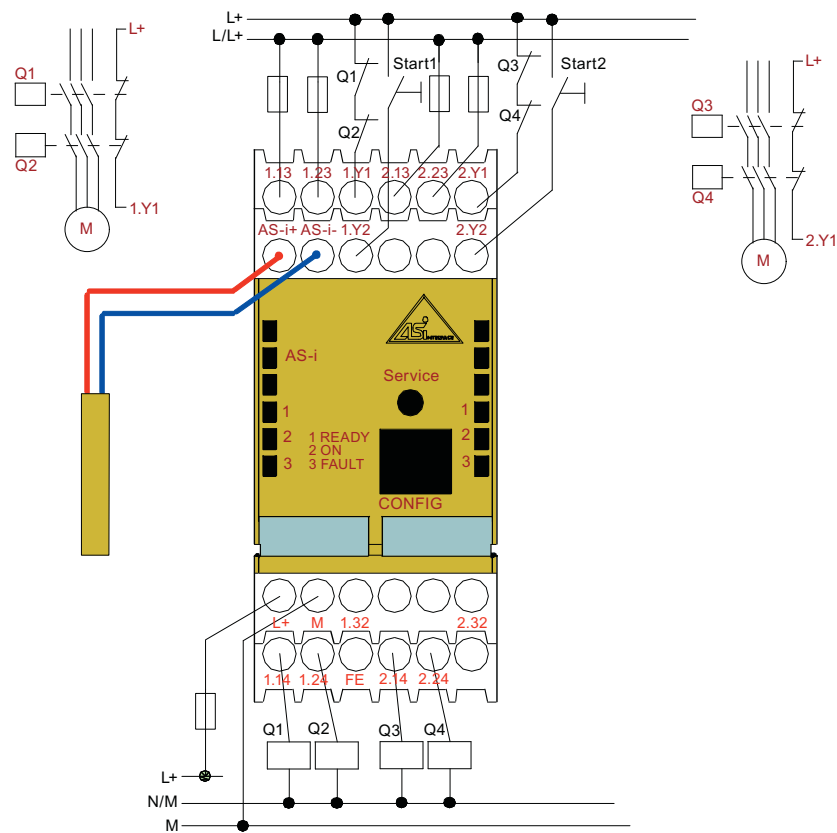


6.4 Safety monitor; two OSSDs; category 4

Basic safety monitor	2 OSSDs	3RK1105-1BE04-0CA0
Expanded safety monitor	2 OSSDs	3RK1105-1BE04-2CA0

- Two-channel connection for each OSSD
- Category 4 according to EN 954-1 / SIL3 according to IEC 62061 / PL e according to EN ISO 13849-1

Connection

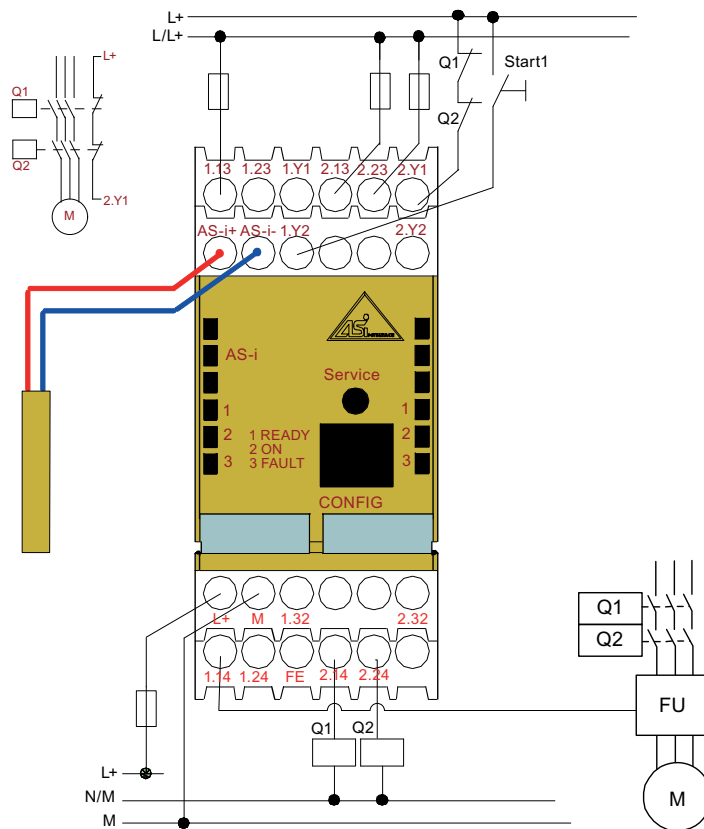


6.5 Safety monitor; two OSSDs; category 4 with frequency converter

Basic safety monitor	2 OSSDs	3RK1105-1BE04-0CA0
Expanded safety monitor	2 OSSDs	3RK1105-1BE04-2CA0

- 1. OSSD with single-channel connection
Second OSSD with two-channel connection
- Category 4 according to EN 954-1 or SIL3 according to IEC 62061 or PL e according to EN ISO 13849-1

Connecting



Note

The controller enable of the frequency converter is de-energized directly via the first OSSD and the power contactors are de-energized via the second OSSD (time delayed).

If the safety function requires it, connect the two NO contacts of the first OSSD in series for the controller enable (connect NO contacts 1.13-1.14 and 1.23-1.24 in series).

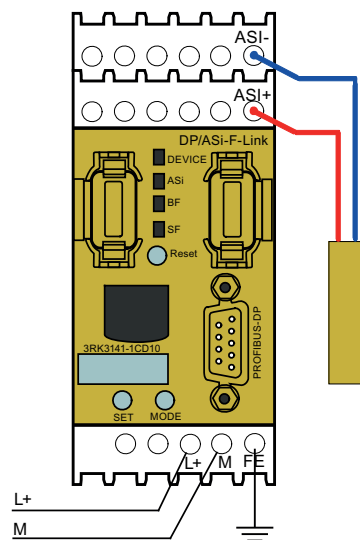
6.6 DP / AS-i F-Link

Device	Order number	
	With screw terminals	With spring-loaded terminals
DP/ AS-i F-Link	3RK3141-1CD10	3RK3141-2CD10

Note

Actuators are connected via failsafe CPU outputs.

Connection



How many safety monitors can be operated on an AS-i network?

In the maximum configuration of the AS-Interface network with 31 standard addresses being used, you can install up to four more safety monitors without addresses. Two A/B addresses correspond here to one standard address.

If fewer than 31 standard addresses are used, you can install one additional safety monitor for each unused standard address.

If you want to install additional nodes without an address (e.g. ground fault monitoring modules), this reduces the number of safety monitors that can be installed.

If you require more than three safety monitors, we recommend the use of a SIRIUS 3RK3 modular safety system with AS-Interface or a DP/AS-i F-Link.

What does it mean if the error message "Code not found" is output during teaching?

This error can be due to one of two problems:

- The sensor is damaged and the contacts are not closed, which means that the safety monitor cannot read the code table for the sensor.
- The slave has been wired incorrectly: PIN 1-2 (channel 1) and 3-4 (channel 2) are swapped.

Do all contactors connected to safety monitors require a protective circuit?

All contactors that are connected to an AS-i safety monitor must be equipped with a protective circuit (e.g. a varistor, RC element, or diode). This significantly increases the noise immunity and service life of the safety monitor based on the same switching frequency.

During a monitored startup, for how long must the start pulse be present in ASIsafe in order for the safety monitor to recognize and execute it as a start command?

The start pulse must be between 50 ms and 2 s.

If the start signal is shorter or longer, the system will not start.

What do the LEDs on the device indicate and how what is the remedy?

LED	Display	Description	Procedure
AS-i 1	OFF	No AS-i power supply	
	Green, permanent	AS-i power supply present	
AS-i 2	OFF	Normal operation	
	Red, permanent	Communication error	
1 READY (per channel)	OFF	No meaning	
	Permanent, yellow	During startup: restart inhibit active	Actuate Start pushbutton
	Flashing yellow	External text required	Actuate local acknowledgement or Carry out startup test (trip safety elements)
2 ON (per channel)	OFF	The contacts of the output switching elements are open.	
	Green, permanent	The contacts of the output switching elements are closed.	
	Flashing green	Delay time running for stop category 1	
3 OFF / FAULT (per channel)	OFF	The contacts of the output switching elements are closed.	
	Red, permanent	The contacts of the output switching elements are open.	
	Flashing red	Error at level of monitored AS-i components	Press Service key or Software STOP -> START or Power OFF -> ON

How should the safe slaves be configured in an AS-i network with more than one safety monitor?

All the safe slaves in an AS-i network must always be assigned to all safety monitors, even if not all safety monitors are to respond to all slaves.

If a slave is replaced, you must carry out the teach process to ensure that the new slave is recognized by all the safety monitors. Carry this out in the same way as during commissioning. The safety monitors learn the code table of the new slave.

What precautions must I follow before using a replacement safety monitor?

This is to replace a defective ASIsafe safety monitor. If you intend to transfer the data using a download cable, the replacement device must not be programmed.

If an ASIsafe safety monitor was programmed, you can "empty" it as follows:

1. Connect the safety monitor to the voltage supply.
2. Connect the safety monitor to the computer.
3. Launch the configuration software.
4. Choose "Open configuration".
5. In the path containing the configuration software, choose the "leer.asi" file.

The "leer.asi" file is shipped with the configuration software. The file contains a program for a single-channel safety monitor, although this file can also be transferred to a two-channel safety monitor to "empty" it.

6. In the "Monitor" menu, choose "Stop".
7. In the "Monitor - PC" menu, choose "Monitor" (ignore the error message).
8. In the "Monitor" menu, choose "Change password" and enter "SIMON".

How can the configuration of one ASIsafe safety monitor be transferred to another monitor?

This is to replace a defective ASIsafe safety monitor. To do so, you do not necessarily have to reconfigure the replacement device using the software. In most cases, you can transfer the configuration of the defective device to the replacement device using a download cable (optional accessory).

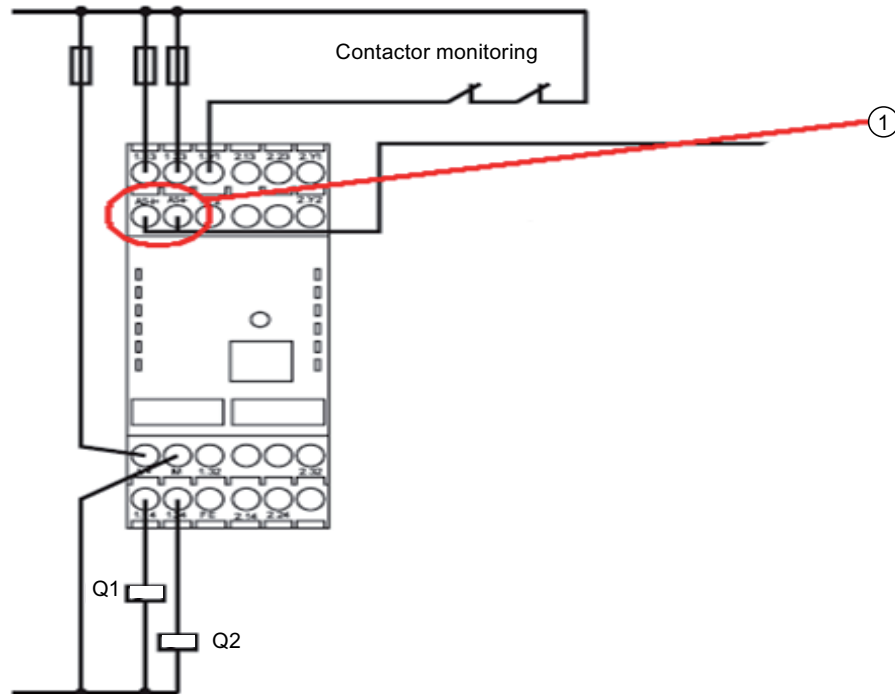
Procedure:

1. Disconnect the defective ASIsafe safety monitor from the power supply.
2. Connect the defective device to the replacement device using the download cable (RJ45/RJ45 crossover).
3. Connect the replacement device to the power supply.
 - The replacement device automatically transfers the configuration data from the defective device to its own configuration memory.
 - When the yellow LED READY is permanently illuminated, this indicates that the data is in the process of being transferred.
 - When the yellow LED READY remains illuminated and the green LED ON lights up, this indicates that the data has been successfully transferred.
4. Disconnect the replacement device from the power supply and disconnect the download cable from both devices.
 - The replacement device is now ready to use.

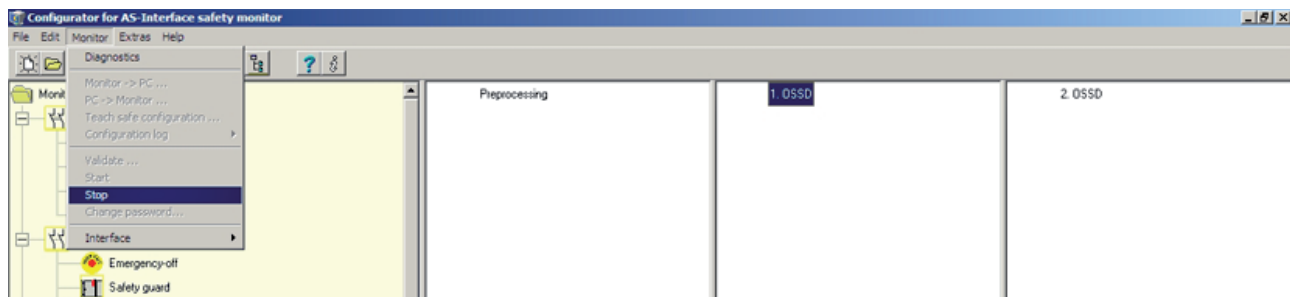
I have forgotten my password. What do I have to do to obtain a new one?

If you have forgotten your password, you can obtain a new one as follows (you only need to carry out steps 1 to 6 if the configuration log is no longer available):

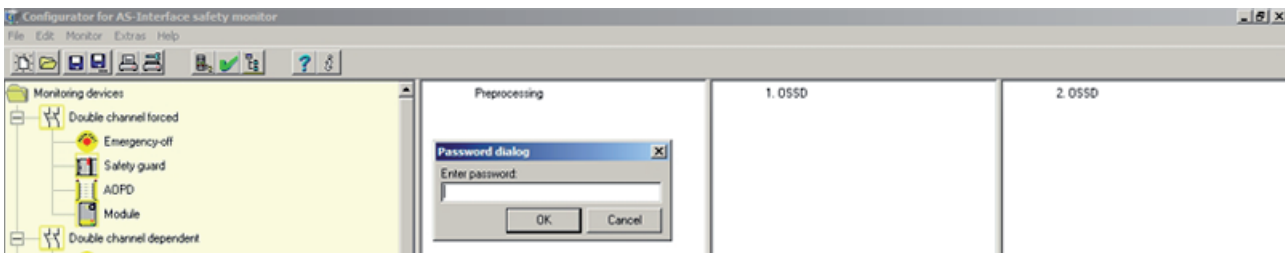
1. Disconnect the AS-i connection cable from the safety monitor. ①



2. In the ASIMON software for the safety monitor, choose "Monitor".
3. Click "Stop".



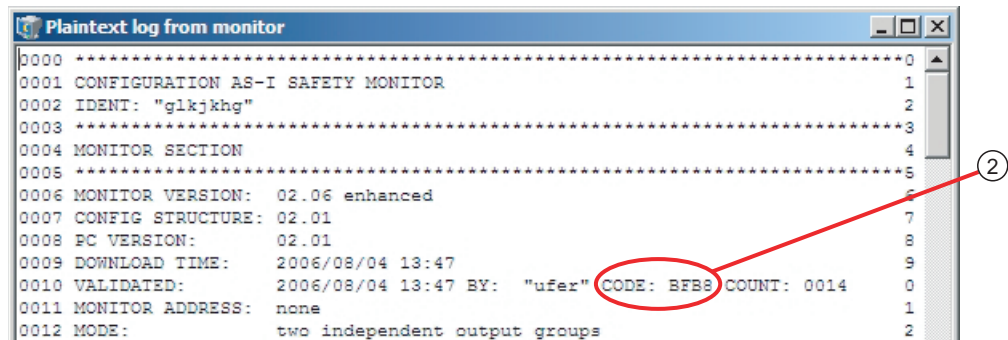
4. The "Password dialog" window is displayed.
Confirm this by choosing "OK".



5. Request the configuration log from the safety monitor.



6. The configuration log contains a special code ② under point 10.



7. Contact the
Technical Assistance
department, specifying this code (tel.: +49 911 895 5900
e-mail: technical-assistance@siemens.com)
8. The Technical Assistance department will guide you through the remaining steps.

Glossary of terms and abbreviations

AS-i

AS-Interface (actuator-sensor interface), field bus communication standard

ASIsafe

SIEMENS product line for AS-Interface modules and devices

DI

Digital input

DO

Digital output

ESPE

Electro-sensitive protective equipment (e.g. light barriers, light arrays, light curtains, laser scanners)

FAQ

Frequently asked questions

FC

Frequency converter

F-DI

Failsafe digital input

FE

Functional ground

IP20

Degree of protection IP20

IP65	IP65 degree of protection
IP67	IP67 degree of protection
PG	Programming device
PL	Performance level
SIL	Safety integrity level
TA	Technical Assistance

Index

A

- Accessories, 28
- ASIMON, 29
- ASIsafe accessories, 28
- ASIsafe components, 24
- ASIsafe modules
 - Overview, 28

C

- Components, 24
- conditionally dependent, 32

D

- dependent, 31
- Documentation
 - History, 11
 - Purpose, 9
 - Required background, 10
 - Structure, 10
 - Target group, 10
- Door lock by means of delay time, 35
- DP/AS-i F-Link
 - Configuration, 39
 - Functional principle, 20
 - Network integration, 21
 - Overview, 28

E

- External device monitoring circuit, 37
- External device monitoring circuit for second, dependent OSSD, 38

F

- F-Link
 - DP/AS-i F-Link, 20
 - Overview, 28
- Forced, 30
- Function blocks of the safety monitor, 29

H

- History, 11

I

- independent, 33

N

- Network integration
 - DP/AS-i F-Link, 21
- Network structures, 13

O

- Overview
 - ASIsafe accessories, 28
 - ASIsafe components, 24
 - ASIsafe modules, 28
 - DP/AS-i F-Link, 28
 - F-Link, 28
 - Safety monitors, 27

P

- Purpose of this documentation, 9

R

- Required background, 10

S

- Safety monitor, 19
 - Function blocks, 29
- Safety monitors
 - Overview, 27
- Stop category 0, 36
- Stop category 1 - two relay outputs, 34

T

- Target group, 10

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