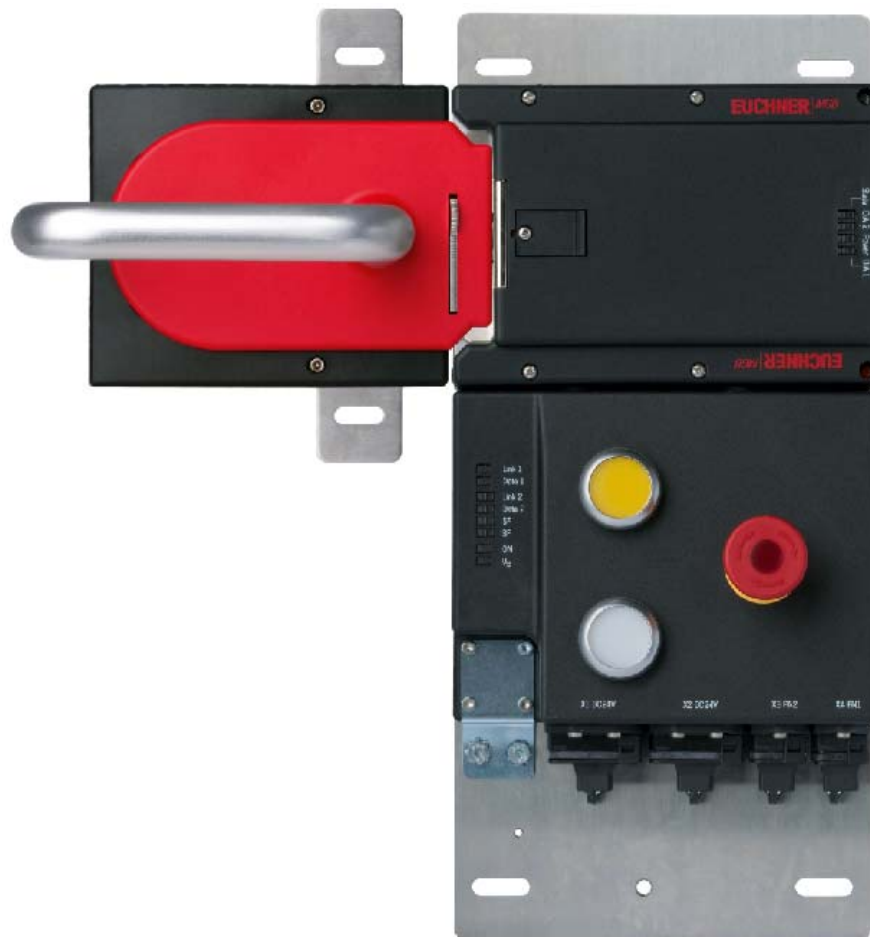


Connection of MGB-L2B-PN... to Siemens S7 315F



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Guard locking according to EN ISO 14119 power to lock – spring force to release (open-circuit current principle)

Safety function Guard locking according to EN ISO 14119

Reliability figures according to EN ISO 13849 Category 4, PL e

Components/modules used

EUCHNER

Description	Order no./item designation Set	Order no./item designation Evaluation unit
Safety system MGB with PROFINET interface, guard locking with guard lock monitoring	121841 / MGB-L2HB-PNA-R-121841	121840 / MGB-L2B-PNA-R-121840
	121845 / MGB-L2HB-PNA-L-121845	121844 / MGB-L2B-PNA-L-121844

Tip: More information and downloads about the aforementioned EUCHNER products can be found at [www. EUCHNER.com](http://www.EUCHNER.com). Simply enter the order number in the search box.

Others

Description	Item
SIMATIC S7 CPU315F-2 PN/DP	6ES7315-2FH13-0AB0
SIMATIC SM326 DO 8x24V/2A PM	6ES7326-2BF40-0AB0
8-port switch	-
Desktop PC	-

Software

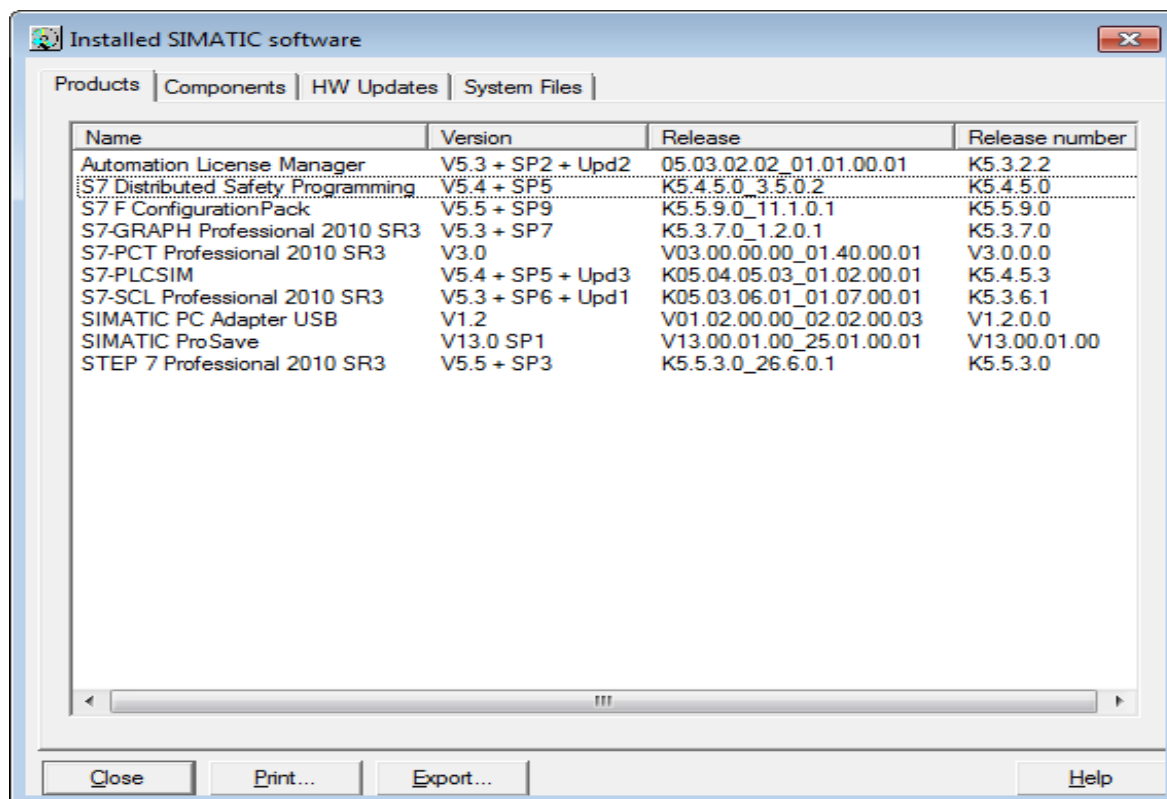


Figure 1

Functional description

General

The MGB-L2B-PN... is guard locking in accordance with EN ISO 14119 according to the open-circuit current principle. In this example all safety functions are processed via the PROFIsafe protocol. The MGB is connected to a Siemens 315F-2 PN/DP CPU.

PROFINET		Eingangsbereich / Input range:		Bit	7	6	5	4	3	2	1	0
<i>Datenbytes (Datenblöcke für nicht sichere Funktion)</i>	MGB	Slot 1	Byte 0	S8	-	-	-	-	-	-	-	-
			Byte 1	-	-	-	-	-	-	-	S9	
			Byte 2	L	-	-	-	-	E	E	E	
		Ausgangsbereich / Output range:		Bit	7	6	5	4	3	2	1	0
<i>Data bytes (data blocks for unsafe functions)</i>	MGB	Slot 1	Byte 0	H8	-	-	-	-	-	-	-	-
			Byte 1	S	-	-	-	-	H7	-	H9	
			Byte 2	-	-	-	-	-	-	Reset	Q	

PROFIsafe		Eingangsbereich / Input range:		Bit	7	6	5	4	3	2	1	0
<i>Datenbytes (Datenblöcke für sichere Funktion)</i>	SAFETY	Slot 5	Byte 0	-	-	-	Z	R	T	-	-	S7
			Byte 1	-	-	-	-	-	-	ÜK	SK	
			Byte 2	<i>PROFIsafe intern genutzt (Steuerbyte, CRC usw.) Used within Profisafe (control byte, CRC etc.)</i>								
		Ausgangsbereich / Output range:		Bit	7	6	5	4	3	2	1	0
<i>data bytes (data blocks for safe functions)</i>	SAFETY	Slot 5	Byte 0	-	-	-	-	-	-	-	-	S
			Byte 1	-	-	-	-	-	-	-	-	
			Byte 2-5	<i>PROFIsafe intern genutzt (Statusbyte, CRC usw.) Used within Profisafe (status byte, CRC etc.)</i>								

ÜK = T and R and Z	Z = Zuhaltung / guard locking	E = Gerätediagnose / Device diagnosis
SK = T and R	R = Riegelstellung / bolt position	Q = Quittierung / Acknowledgement
L = Lebensdauer / Life	T = Türstellung / door position	S = Zuhaltmagnet / Guard locking solenoid

Figure 2

Data structure

Input range slot 1: Standard

Input range slot 5: Safe

Output range slot 1: Standard

Output range slot 5: Safe

Information on the output range: for information on the control of the guard locking see the operating instructions.

Notice

This application is based on the operating instructions for the MGB-PN. The technical details are available in the operating instructions. If an MGB-L1...PN (guard locking in accordance with EN ISO 14119 according to the closed-circuit current principle) is used, attention is to be paid to the control of the guard locking.

Tip: The operating instructions are available at www.EUCHNER.com. Simply enter the order number for the device in the search box.

Mounting

Please ensure the device is mounted correctly as described in the operating instructions. Also make sure that the handle module is NOT in the operating distance during configuration

Installing the GSDML file

The latest MGB PROFINET GSDML file with related BMP image file (for the depiction of the MGB in the configuration software) can be downloaded from <http://www.euchner.com> in Service/ Downloads/ Software/ GSD data/ MGB.

To install the GSD file in SIMATIC Manager STEP7 proceed as follows:

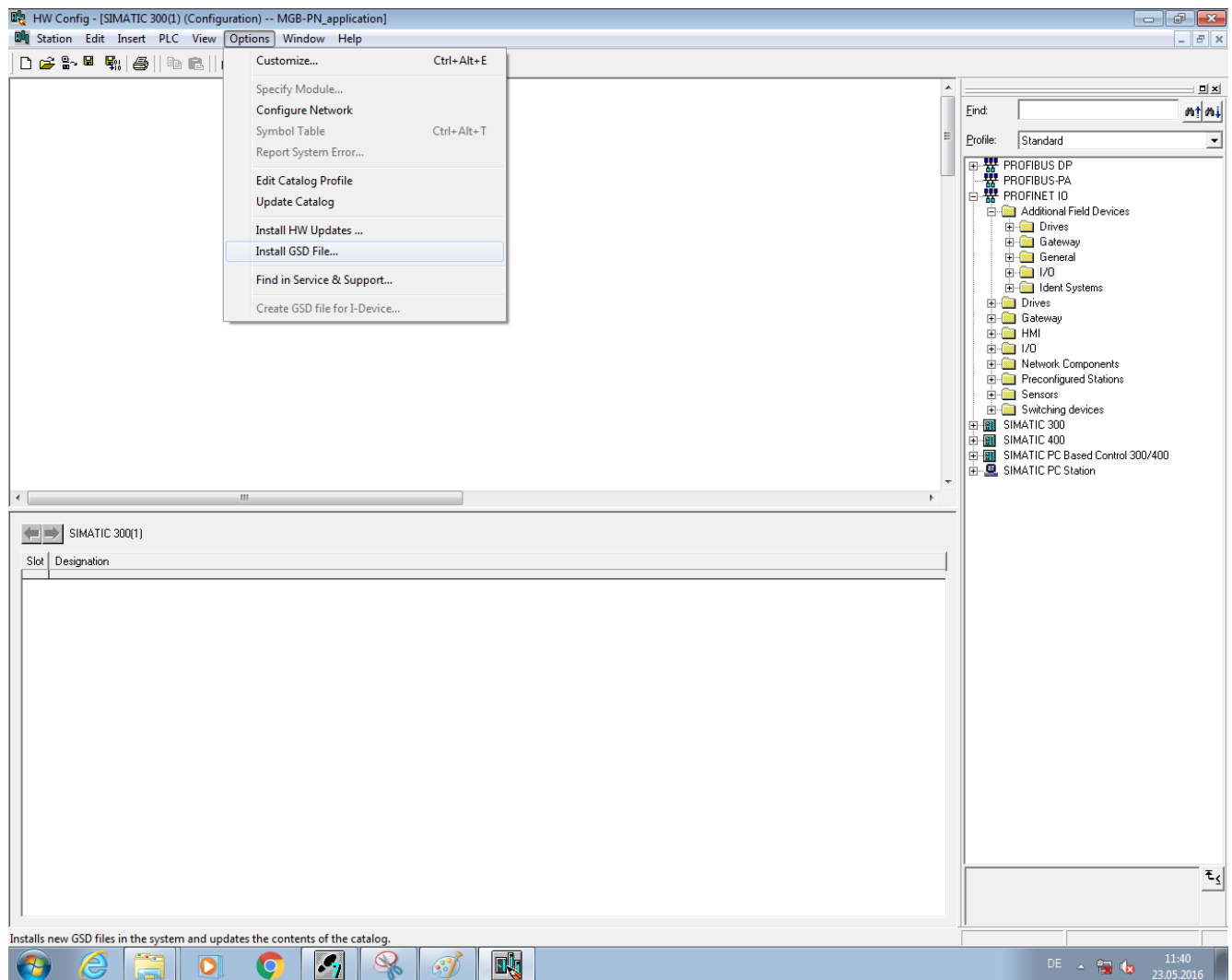


Figure 3

In HW Config click "Options" and select "Install GSD File".

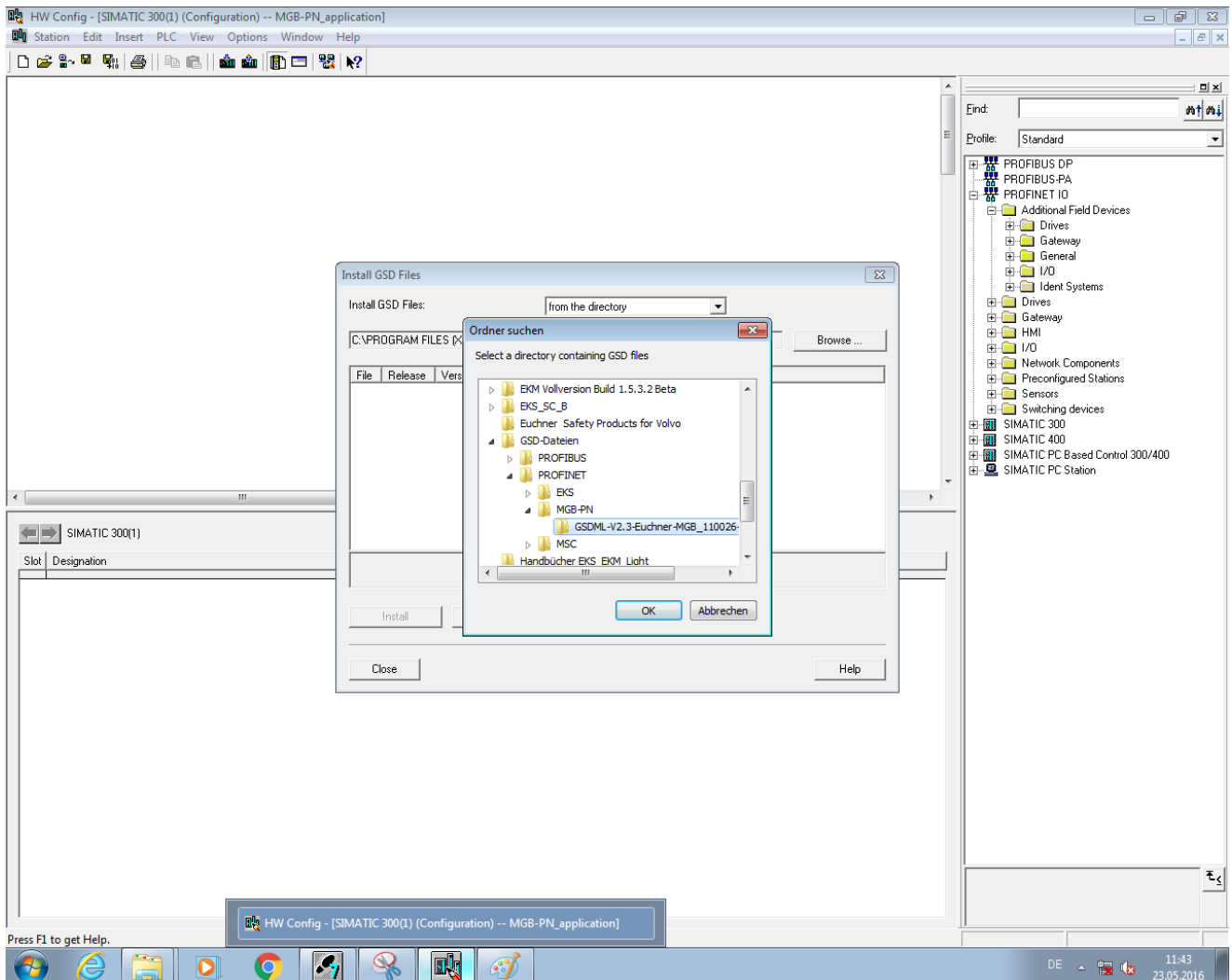


Figure 4

Select the folder where you saved the GSMDL file and click "OK".

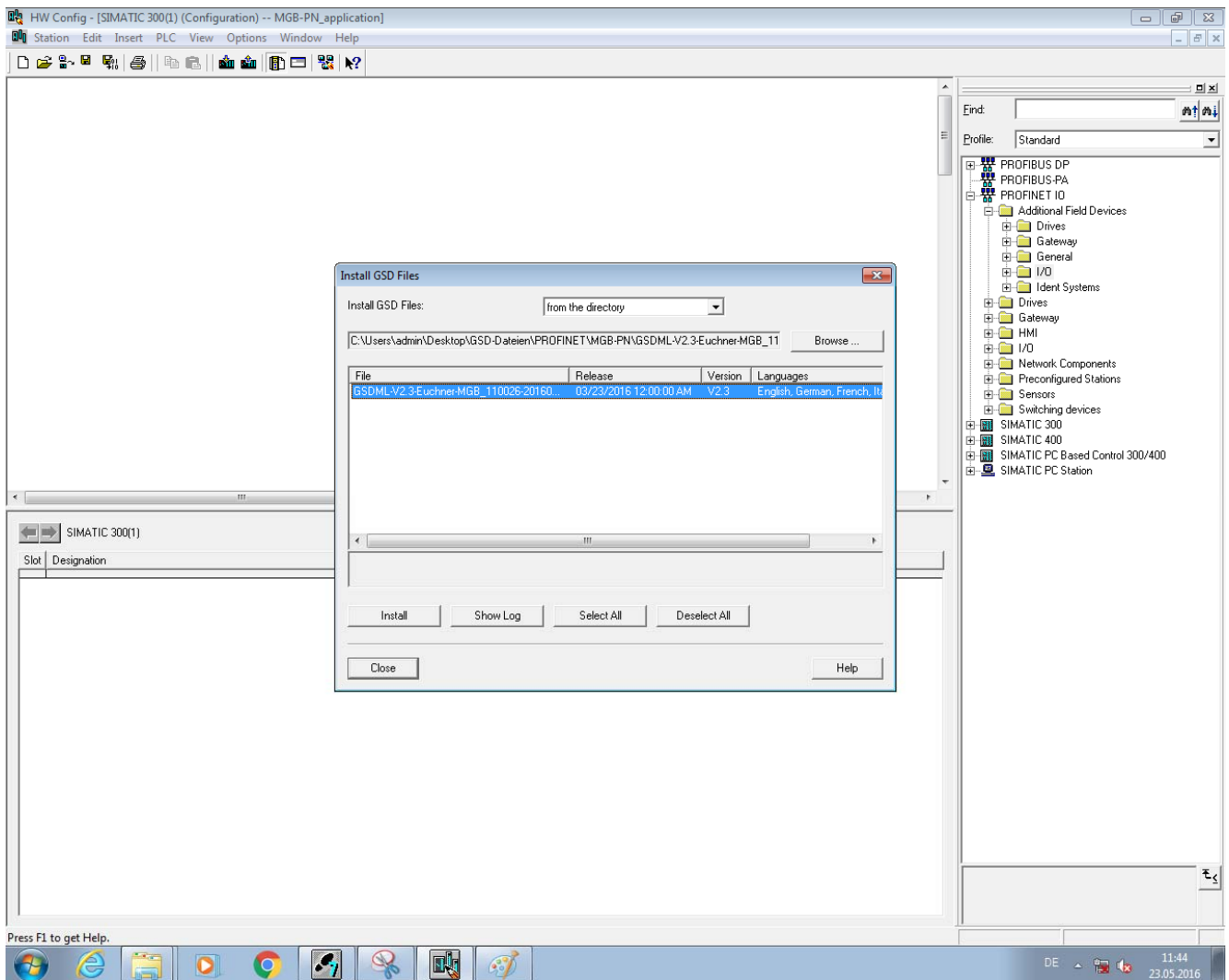


Figure 5

Select the appropriate GSDML file for the MGB from the list and click "Install".

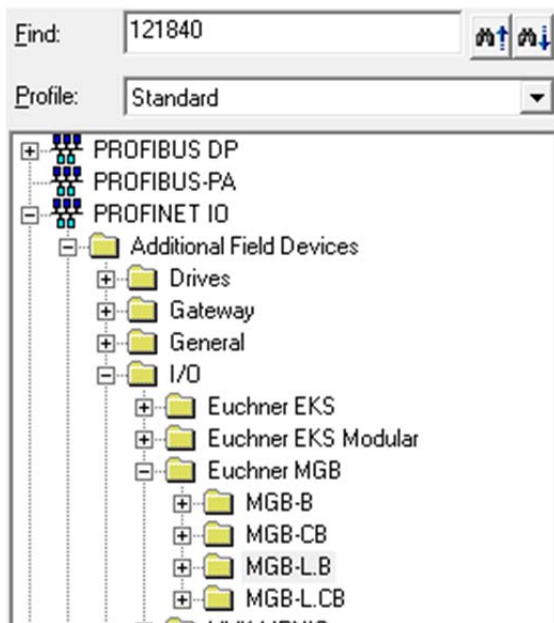


Figure 6

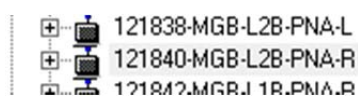


Figure 7

Now select the appropriate MGB on the right in "PROFINET IO" → "Additional Field Devices" → "I/O" → "Euchner MGB". Drag this to your PROFINET network.

Configuring hardware

Double-click the MGB in HW Config to open the properties of the MGB. There you can make the corresponding settings such as assign the device name, assign the IP address, and assign the addresses to the inputs and outputs.

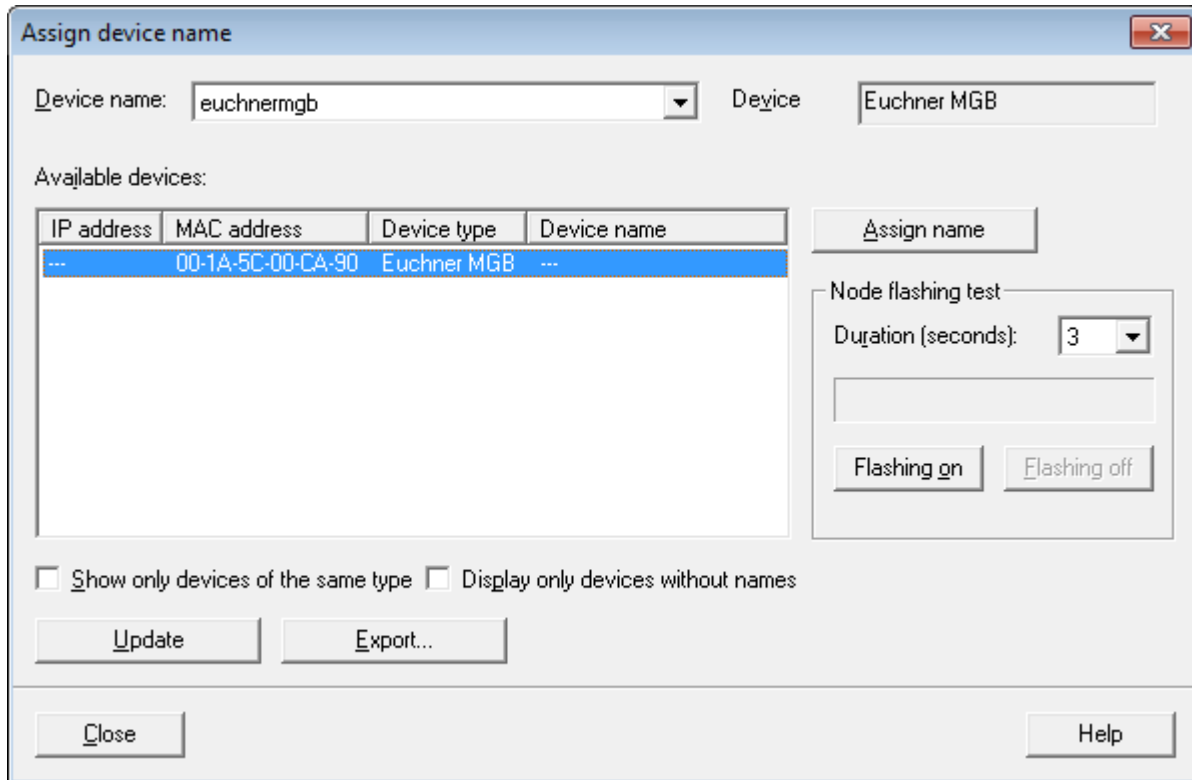


Figure 8

Click "PLC" → "Ethernet" → "Assign Device Name". Select the appropriate device name and click "Assign name". The device name here is "euchnermgb" (factory setting from GSD file). It is to be noted that the device name in the properties and the device name assigned must match.

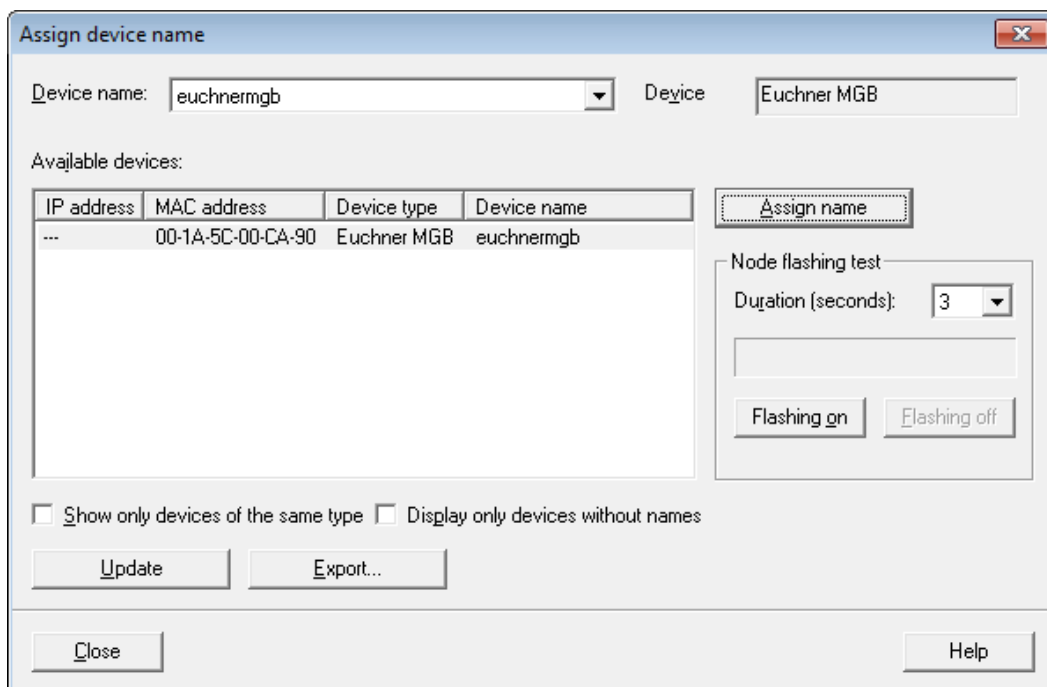
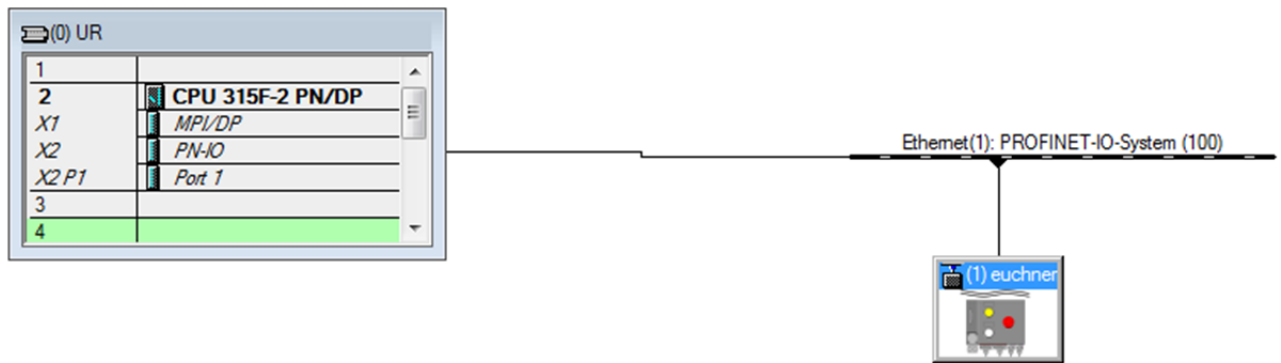


Figure 9



Slot	Module	Order number	I address	Q address	Diagnostic address:	Comment
0	euchnermgb	121840			2043*	
X1	Interface				2042*	
F1	Port 1				2041*	
F2	Port 2				2040*	
1	Keys/Leds 3 Byte IO sta...		0..2	0..2		
2	PROFIsafe 16 Bool IO st...		3..8	3..8		

Figure 10

The PROFIsafe assembly is in slot 2. Open the properties there.

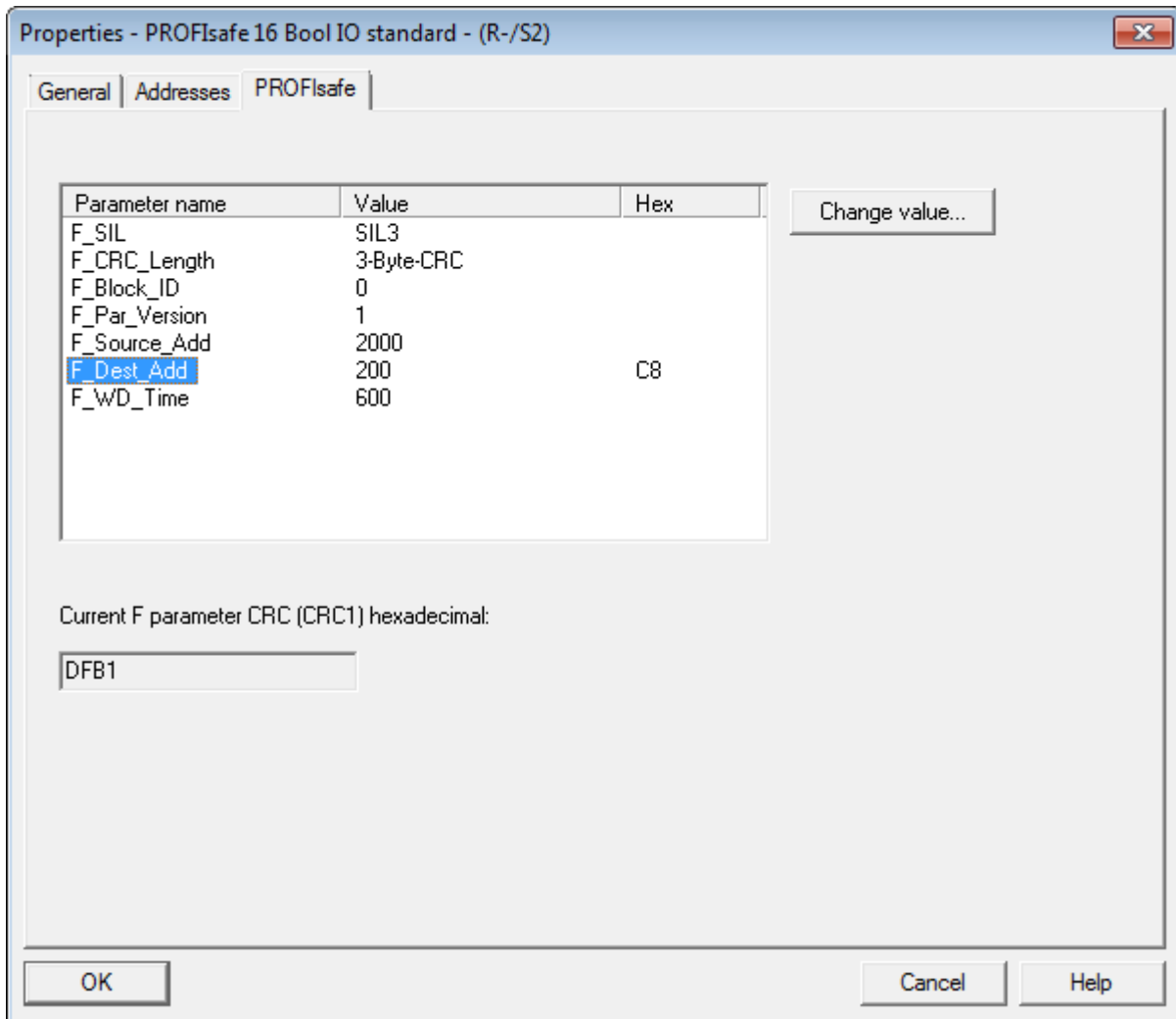


Figure 11

On the "PROFIsafe" tab, select "F_Dest_Add" and click "Change value".

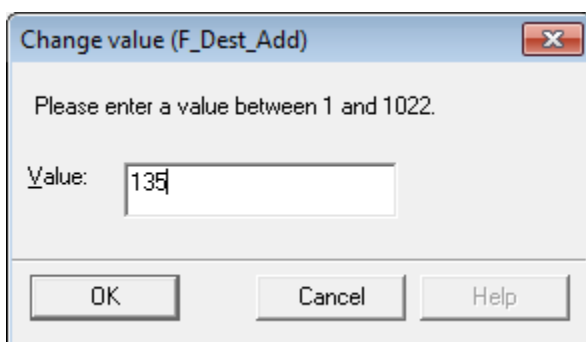


Figure 12

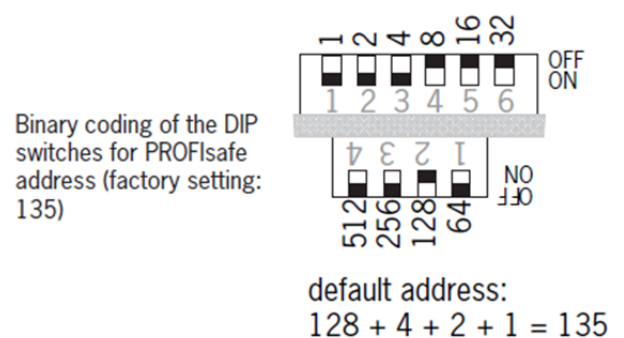


Figure 13

Enter the same PROFIsafe address as you set on the DIP switch on the MGB-PN. For information on how to set the PROFIsafe address on the MGB, please refer to the operating instructions.

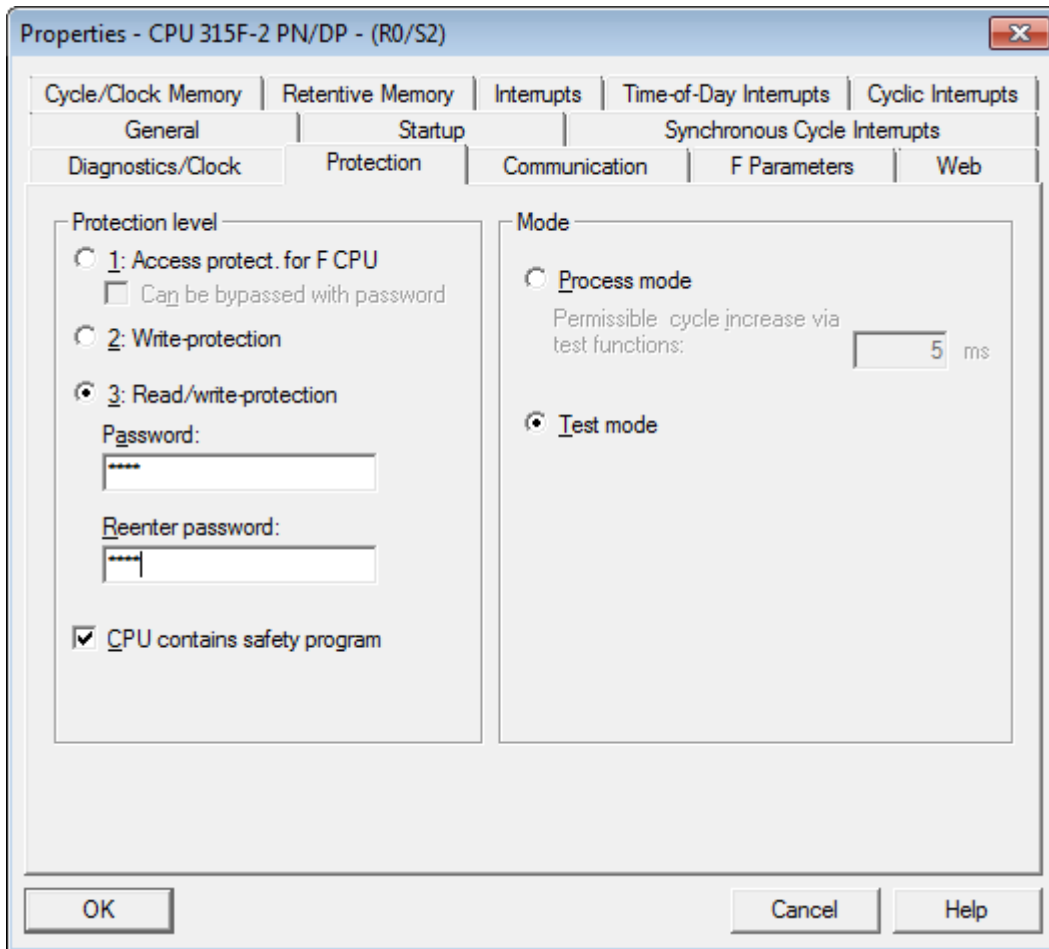


Figure 14

In the properties for the control system, open the "Protection" tab. In the Protection level group box, the "CPU contains safety program" check box must be selected, as shown in Figure 14.

After all settings have been made, save and compile the hardware configuration. Then load the configuration into your control system.

Preparing safety program

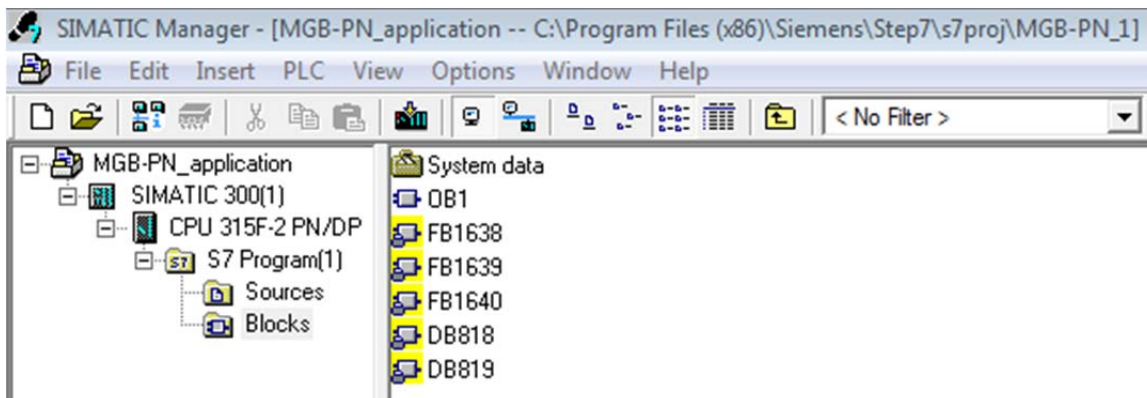


Figure 15

After you have saved and compiled the hardware configuration, the following function and data blocks are generated (see Figure 15). The MGB-PN is still passivated at this point. It is reintegrated by using a bit from the PROFIsafe area in the safety program. In the following you will find an example of how this action can be undertaken.

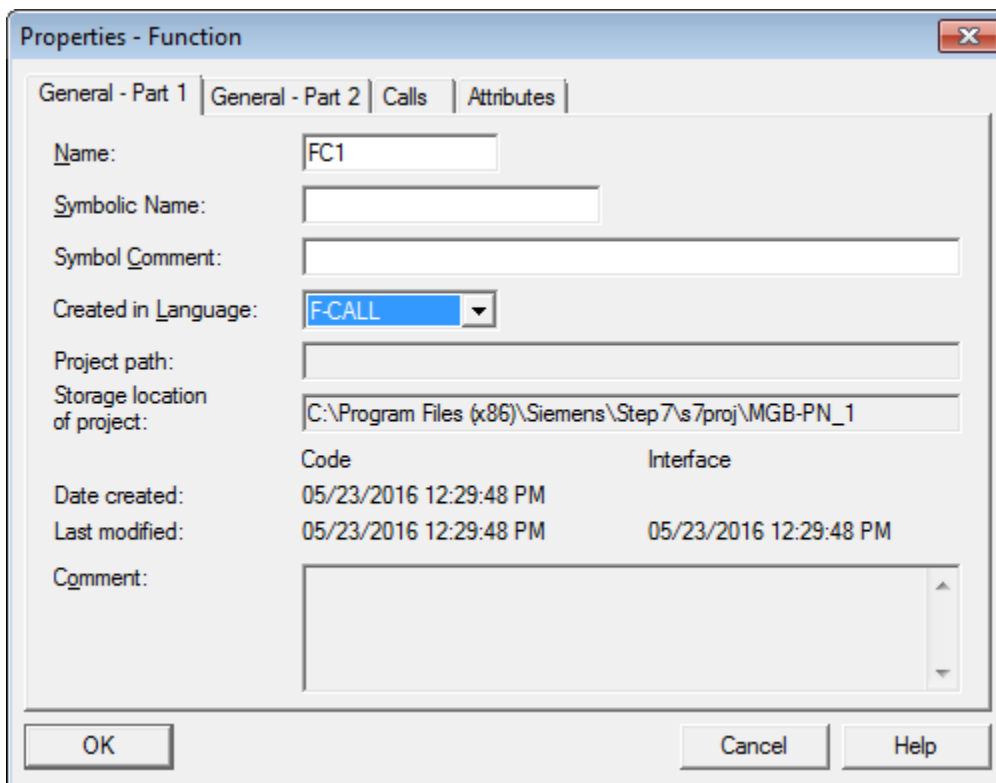


Figure 16

Prepare a function in the language "F-CALL".

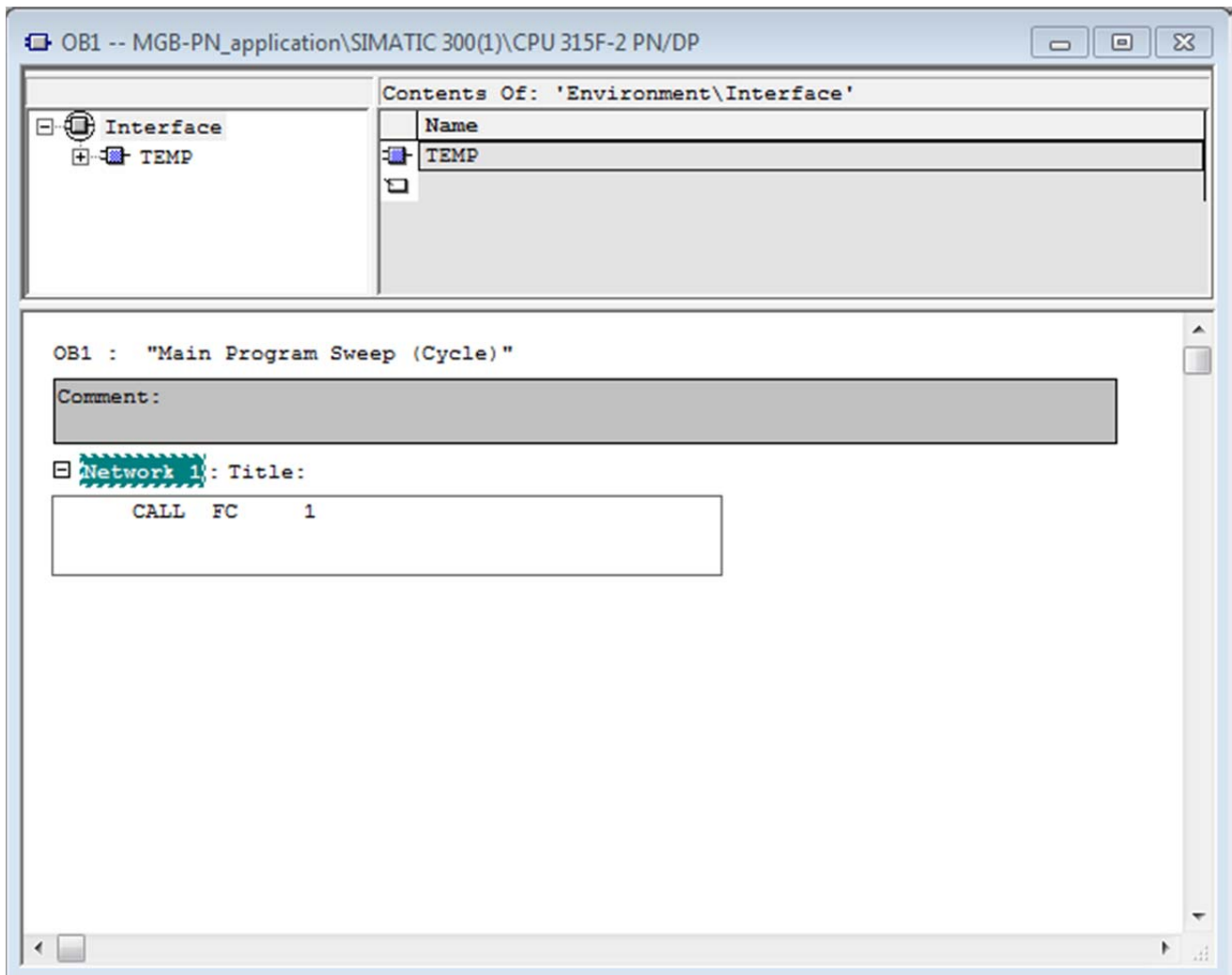


Figure 17

Call, e.g. in OB1, the FC1 you prepared. You can also call the function in an alarm OB (e.g. OB35). This method has the advantage that you interrupt the cyclic program execution of the standard user program in OB1 at fixed intervals. In this way an alarm OB will call and execute the safety program at fixed intervals.

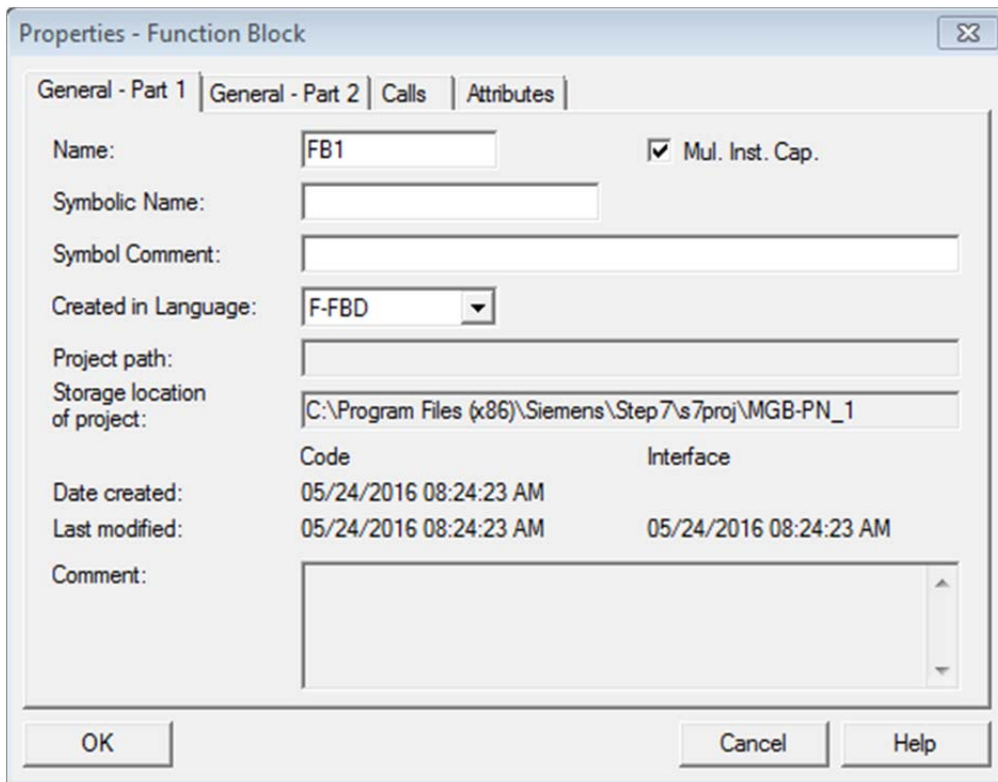


Figure 18

Prepare a function block in the language "F-FBD".

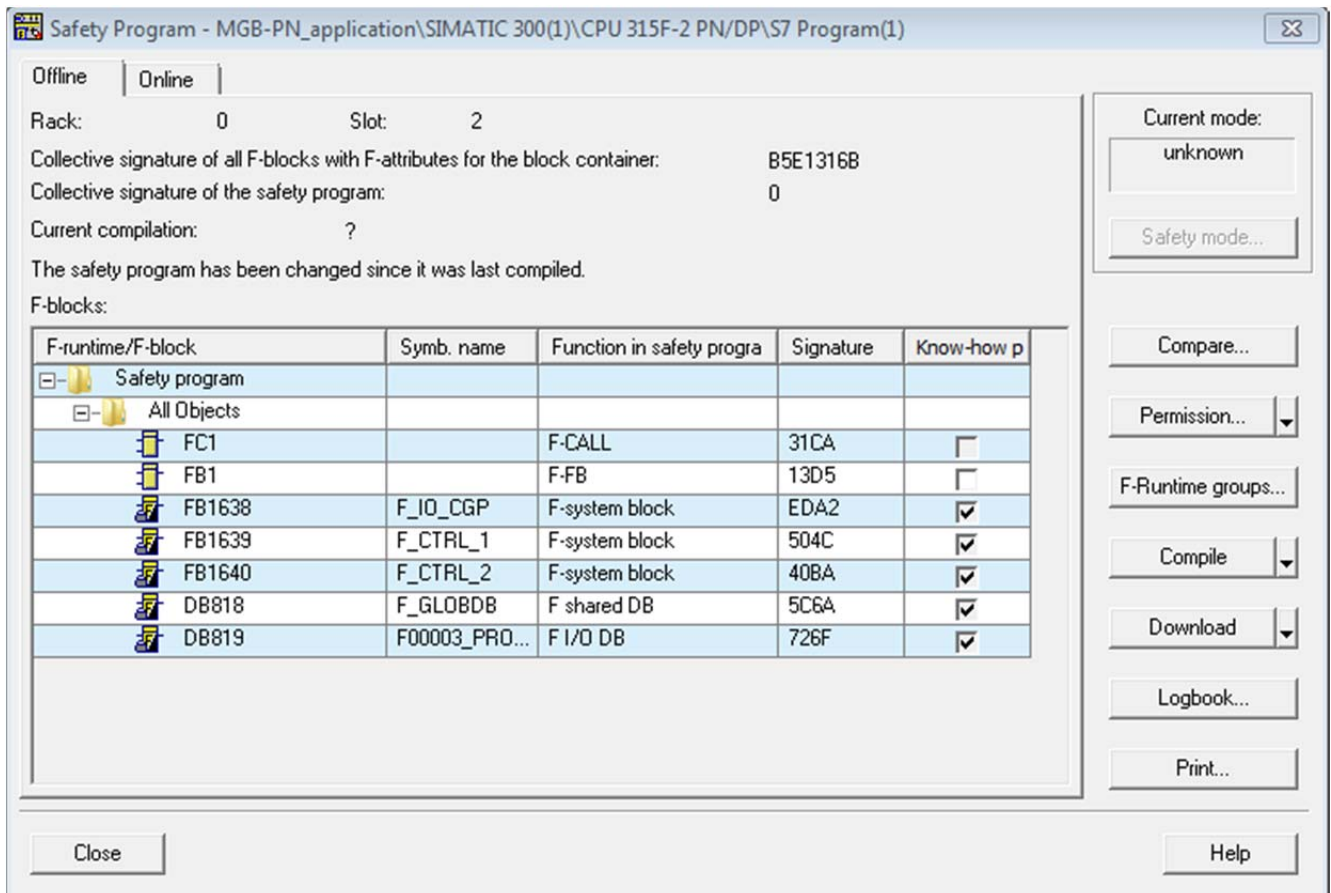


Figure 19

Click "Options" and select "Edit safety program". A window opens, as shown in Figure 19. Click here "F-Runtime groups".

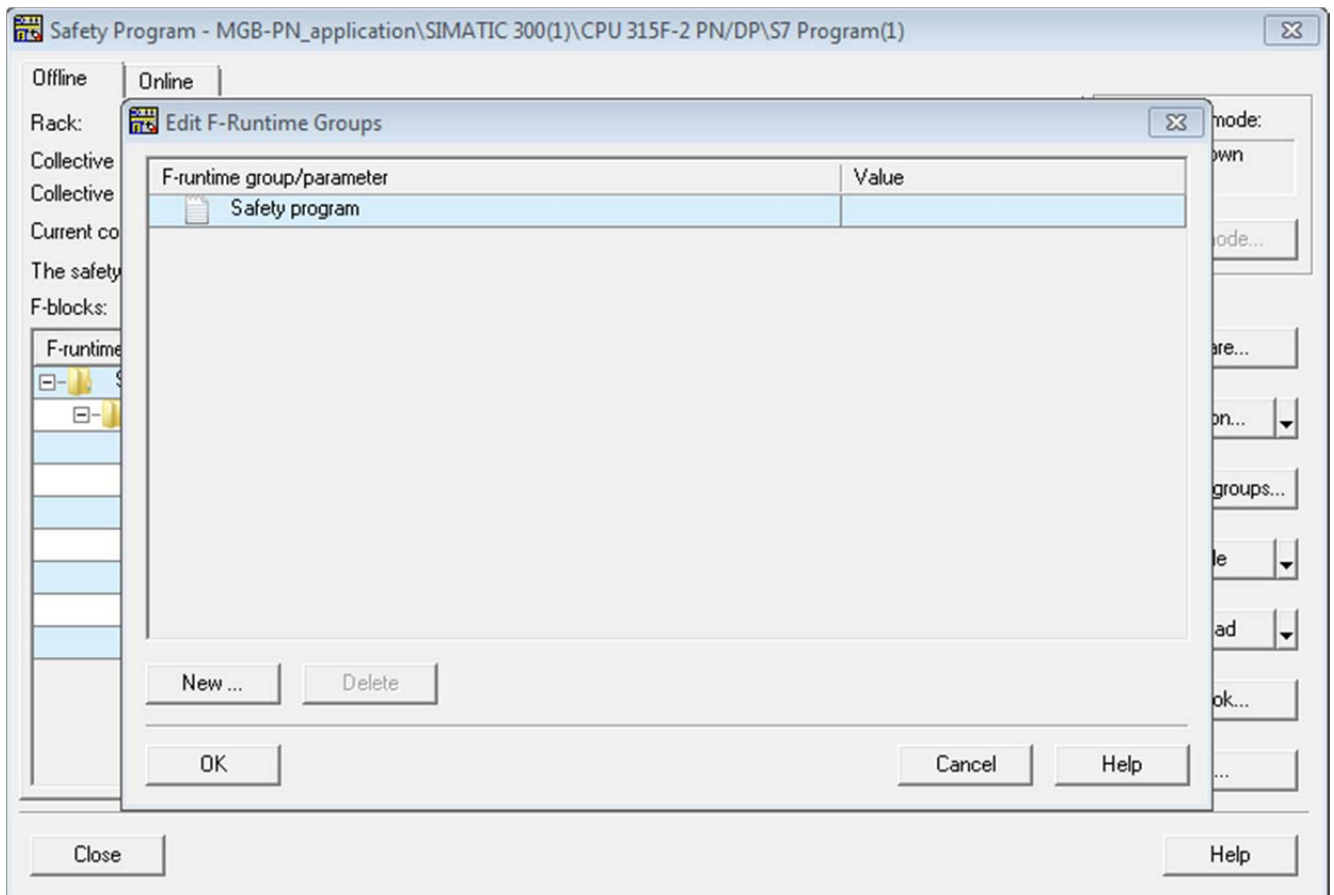


Figure 20

In this window, click "New".

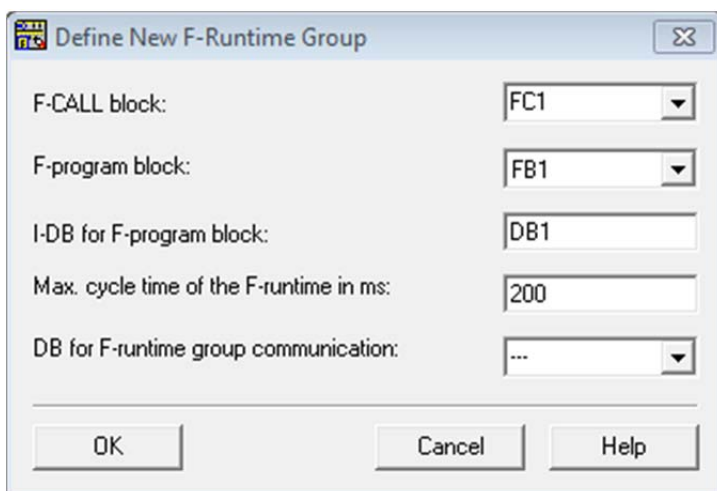


Figure 21

In this window in "I-DB for F-program block", enter a DB that does not yet exist (e.g. DB1).

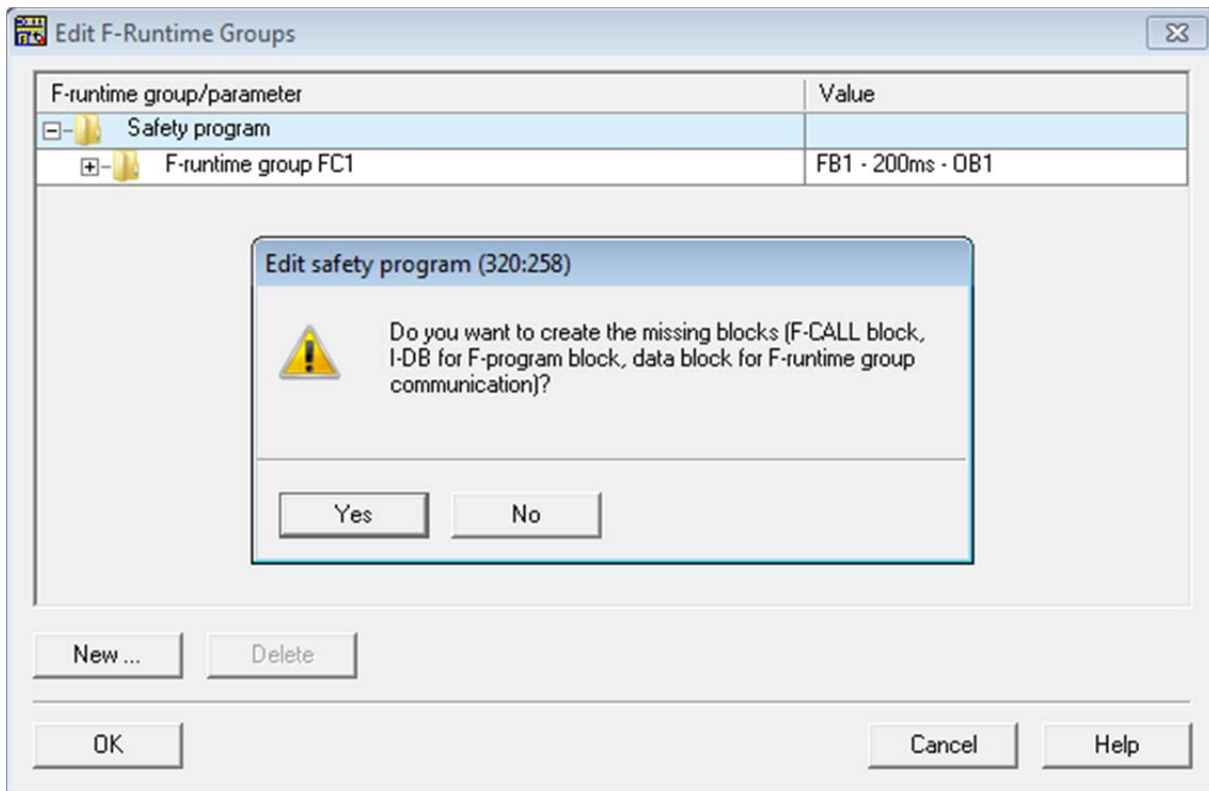


Figure 22

Accept your entry by clicking "Yes".

Example for reintegrating

PROFINET		Eingangsbereich / Input range:									
		Bit	7	6	5	4	3	2	1	0	
Datenbytes (Datenblöcke für nicht sichere Funktion)	MGB	Byte 0	S8	-	-	-	-	-	-	-	
		Slot 1 Byte 1	-	-	-	-	-	-	-	S9	
		Byte 2	L	-	-	-	-	E	E	E	
		Ausgangsbereich / Output range:									
		Bit	7	6	5	4	3	2	1	0	
Data bytes (data blocks for unsafe functions)	MGB	Byte 0	H8	-	-	-	-	-	-	-	
		Slot 1 Byte 1	S	-	-	-	-	H7	-	H9	
		Byte 2	-	-	-	-	-	-	Reset	Q	

PROFIsafe		Eingangsbereich / Input range:									
		Bit	7	6	5	4	3	2	1	0	
Datenbytes (Datenblöcke für sichere Funktion)	SAFETY	Byte 0	-	-	-	Z	R	T	-	S7	
		Slot 5 Byte 1	-	-	-	-	-	-	ÜK	SK	
		Byte 2	PROFIsafe intern genutzt (Steuerbyte, CRC usw.) Used within Profisafe (control byte, CRC etc.)								
		Ausgangsbereich / Output range:									
		Bit	7	6	5	4	3	2	1	0	
data bytes (data blocks for safe functions)	SAFETY	Byte 0	-	-	-	-	-	-	-	S	
		Slot 5 Byte 1	-	-	-	-	-	-	-	-	
		Byte 2-5	PROFIsafe intern genutzt (Statusbyte, CRC usw.) Used within Profisafe (status byte, CRC etc.)								

ÜK = T and R and Z	Z = Zuhaltung / guard locking	E = Gerätediagnose / Device diagnosis
SK = T and R	R = Riegelstellung / bolt position	Q = Quittierung / Acknowledgement
L = Lebensdauer / Life	T = Türstellung / door position	S = Zuhaltmagnet / Guard locking solenoid

Figure 23

There is now an example of how the MGB-PN can be reintegrated. The MGB-PN is to be consciously reintegrated using a push button on the MGB-PN. For this purpose the corresponding input address assigned to the push button is taken from the table (e.g. S9 = E 1.0). Please pay attention to the input and output range you have assigned to the MGB-PN in HW Config.

FB1 : Title:

Comment:

Network 1: Title:

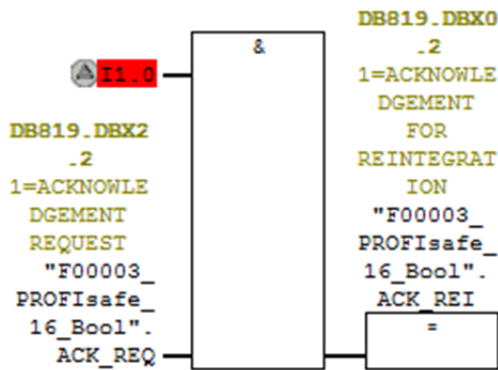


Figure 24

In FB1, prepare the operator shown in Figure 24. If the MGB-PN is passivated, the bit "ACKNOWLEDGEMENT REQUEST" from DB819 (Figure 25) is set. In this example user acknowledgment is required; this acknowledgment can be provided using a pushbutton on the MGB-PN. If the bit "ACKNOWLEDGEMENT REQUEST" and the bit E1.0 are set, the bit "ACKNOWLEDGEMENT FOR REINTEGRATION" is set and the MGB-PN is reintegrated.

Now click "Options" again and again select "Edit safety program". Compile the safety program by clicking "Compile". Then load the safety program into your PLC and click "Download". The MGB-PN can now be reintegrated at any time by pressing the push button. Teach-in the handle module as described in the operating instructions.

In this example only this one MGB-PN is reintegrated. In the S7 Distributed Safety Programming V5.4 + SP5 there is a FB that reintegrates all bus users. For this purpose use FB219 prepared by Siemens.

Adresse	Deklaration	Name	Typ	Anfangswert	Kommentar
0.0	in	PASS_ON	BOOL	FALSE	1=ACTIVATE PASSIVATION
0.1	in	ACK_NEC	BOOL	TRUE	1=ACKNOWLEDGEMENT NECESSARY
0.2	in	ACK_REI	BOOL	FALSE	1=ACKNOWLEDGEMENT FOR REINTEGRATION
0.3	in	IPAR_EN	BOOL	FALSE	1=ENABLE I-PARAMETER ASSIGNMENT
2.0	out	PASS_OUT	BOOL	TRUE	1=PASSIVATION OUTPUT
2.1	out	QBAD	BOOL	TRUE	1=FAIL-SAFE VALUES ARE OUTPUT
2.2	out	ACK_REQ	BOOL	FALSE	1=ACKNOWLEDGEMENT REQUEST
2.3	out	IPAR_OK	BOOL	FALSE	1=NEW I-PARAMETER VALUES ASSIGNED

Figure 25 (DB819)

There must be at least one call for the MGB in the safe program routine so that the device is not passivated. The bit I4.1 (ÜK) from the PROFIsafe range in the MGB is then used. The bit ÜK is set if the following conditions are met: door closed / bolt tongue inserted in the locking module / guard locking active.

□ Network 3: Use of bit ÜK



Figure 26

In this example an output on the Siemens output card is switched using the bit I4.1 (ÜK).

Explanation:

<p>ACK_REI (IN 0.2) (BOOL)</p>	<p>User acknowledgment on manual reintegration</p>	<p>"ACK_REI = 0->1" (positive edge): Reintegration occurs after positive edge.</p> <p>Comment: User acknowledgment is only possible if the error that caused the passivation has been rectified. User acknowledgment is always required for "F-communication errors", independent of ACK_NEC.</p>
<p>ACK_REQ (OUT 2.2) (BOOL)</p>	<p>The user only has read access to this variable in the F-peripheral data block.</p>	<p>"ACK_REQ = 1": The error that caused the passivation has been rectified. User acknowledgment for manual reintegration (ACK_REI) is now possible. Cause of the passivation: "F-communication error", "Assembly error", "Channel error"</p> <p>Comment: If the error that caused the passivation has been rectified, and the F-system has detected this situation, the F-system sets "ACK_REQ = 1". After user acknowledgment, the F-operating system sets "ACK_REQ = 0".</p>

List of references

Preparation of S7 Distributed Safety Project Presentation Technikerschule Hannover (Technical College, Hanover)

SIMATIC Safety Integrated "Passivation and Reintegration of F-I/O considering as example the ET 200S"

Important note – please observe carefully!

This document is intended for a design engineer who possesses the requisite knowledge in safety engineering and knows the applicable standards, e.g. through training for qualification as a safety engineer. Only with the appropriate qualification is it possible to integrate the introduced example into a complete safety chain.

The example represents only part of a complete safety chain and does not fulfill any safety function on its own. In order to fulfill a safety function, the energy switch-off function for the hazard location and the software within the safety evaluation must also be considered, for example.

The introduced applications are only examples for solving certain safety tasks for protecting safety doors. The examples cannot be comprehensive due to the application-dependent and individual protection goals within a machine/installation.

If questions concerning this example remain open, please contact us directly.

In accordance with Machinery Directive 2006/42/EC, the design engineer of a machine or installation is obligated to perform a risk assessment and take measures to reduce the risk. When doing this, the engineer must comply with the applicable national and international standards. Standards generally represent the current state of the art. Therefore, the design engineer should continuously inform himself about changes in the standards and adapt his considerations to them. Relevant standards include EN ISO 13849 and EN 62061. This application must be regarded only as assistance for the considerations about safety measures.

The design engineer of a machine/installation has the obligation to assess the safety technology him/herself. The examples must not be used for assessment, because only a small excerpt of a complete safety function was considered in terms of safety engineering here.

In order to be able to use the safety switch applications correctly on safety doors, it is indispensable to observe the standards EN ISO 13849-1, EN ISO 14119 and all relevant C-standards for the respective machine type. Under no circumstances does this document replace the engineer's own risk assessment, and it cannot serve as the basis for a fault assessment.

Particularly in case of fault exclusion, it must be noted that this can be performed only by the design engineer of a machine or installation and requires a reason. General fault exclusion is not possible. More information about fault exclusion can be found in EN ISO 13849-2.

Changes to products or within assemblies from third-party suppliers used in this example can lead to the function no longer being ensured or the safety assessment having to be adapted. In any event, the information in the operating instructions on the part of EUCHNER, as well as on the part of third-party suppliers, must be used as the basis before this application is integrated into an overall safety function. If contradictions should arise between the operating instructions and this document, please contact us directly.

Use of brand names and company names

All brand names and company names stated are the property of the related manufacturer. They are used only for the clear identification of compatible peripheral devices and operating environments in relation to our products.