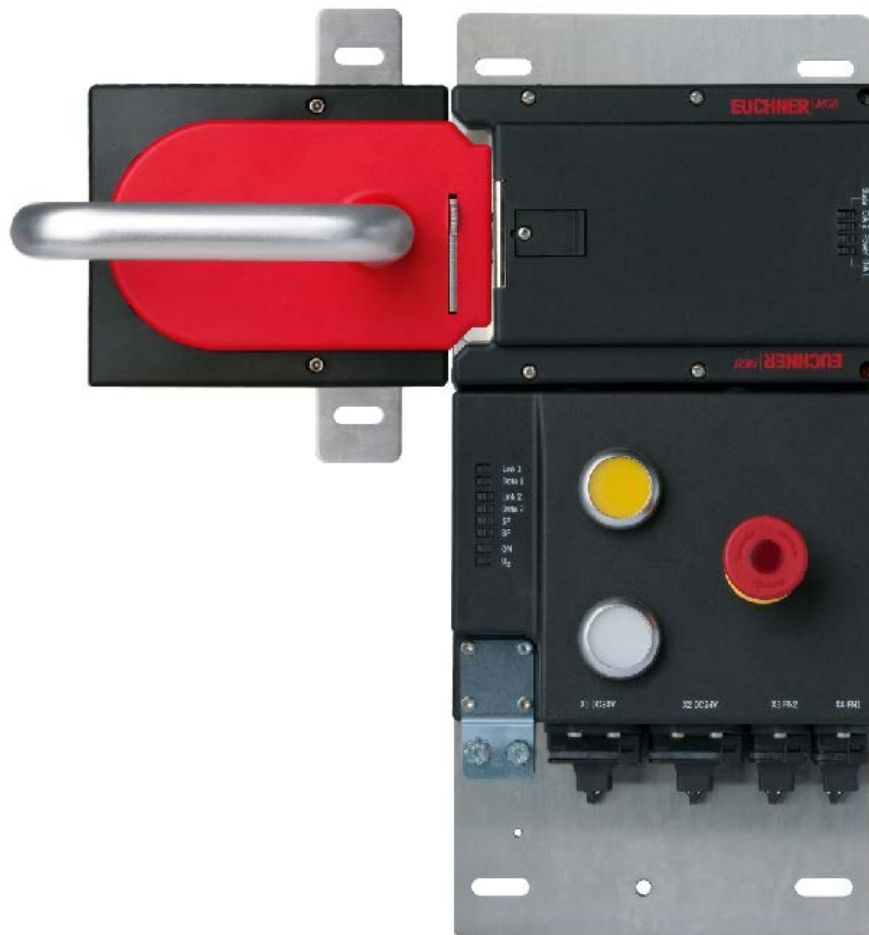# EUCHNER
More than safety.

Connecting MGB-L1B-PN… to Siemens S7 315F (TIA Portal V13)

Contents

Guard locking acc. to EN ISO 14119 actuated by spring force applied – power-ON released (closed-circuit current principle)

Safety function	Guard locking acc. 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	117102 / MGB-L1HB-PNC-R-117102 117103 / MGB-L1HB-PNC-L-117103	117098 / MGB-L1B-PNC-R-117098 117099 / MGB-L1B-PNC-L-117099

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

Others

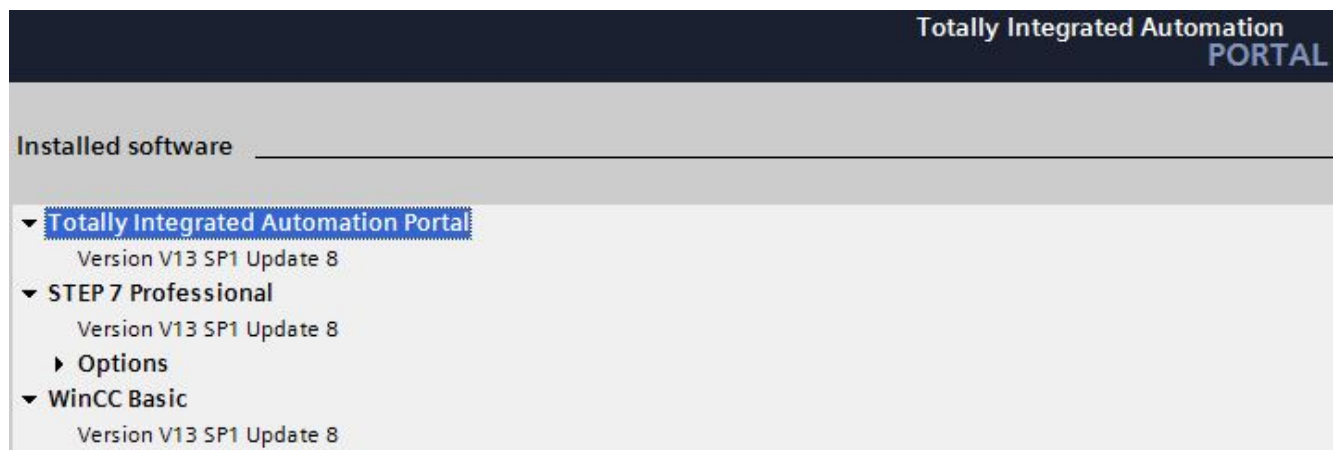| Description	Item
SIMATIC S7 CPU315F-2 PN/DP	6ES7315-2FH13-0AB0
SIMATIC SM326 DO 8x24V/2A PM	6ES7326-2BF40-0AB0
8-port switch	-
Desktop PC	-

Software

Figure 1

Functional description

General

The MGB-L1B-PN… is guard locking in accordance with EN ISO 14119 according to the closed-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

Datenbytes (Datenblöcke für nicht sichere Funktion)

Data bytes (data blocks for unsafe functions)

Eingangsbereich / Input range:			Bit	7	6	5	4	3	2	1	0
MGB-B	Slot 1	Byte 0		-	-	S95	-	-	S92	-	S90
		Byte 1		-	-	-	-	-	-	-	-
Emergency stop	Slot 2	Byte 0		-	-	-	-	-	-	-	S93
MGB-L	Slot 3	Byte 0		ÜK	SK	-	-	-	Z	R	T
Diagnostics	Slot 4	Byte 0		L	-	-	-	-	E	E	E

Ausgangsbereich / Output range:			Bit	7	6	5	4	3	2	1	0
MGB-B	Slot 1	Byte 0		-	-	H95	-	-	H92	-	H90
Emergency stop	Slot 2	Byte 0		-	-	-	-	-	-	-	H93
MGB-L	Slot 3	Byte 0		-	-	-	-	-	-	-	S
Diagnostics	Slot 4	Byte 0		-	-	-	-	-	-	Reset	Q

PROFIsafe

Datenbytes (Datenblöcke für sichere Funktion)

data bytes (data blocks for safe functions)

Eingangsbereich / Input range:			Bit	7	6	5	4	3	2	1	0
SAFETY	Slot 5	Byte 0		-	-	-	Z	R	T	-	S93
		Byte 1		-	-	-	-	-	-	ÜK	SK
		Byte 2-5		*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
SAFETY	Slot 5	Byte 0		-	-	-	-	-	-	-	S
		Byte 1		-	-	-	-	-	-	-	-
		Byte 2-5		*PROFIsafe intern genutzt (Statusbyte, CRC usw.)* Used within Profisafe (status byte, CRC etc.)							

ÜK = T and R and Z
SK = T and R
L = Lebensdauer / Life

Z = Zuhaltung / guard locking
R = Riegelstellung / bolt position
T = Türstellung / door position

E = Gerätediagnose / Device diagnosis
Q = Quittierung / Acknowledgement
S = Zuhaltemagnet / Guard locking solenoid

Figure 2

Data structure

Input range, slot 1 - 4: Standard

Input range, slot 5: Safe

Output range, slot 1 - 4: Standard

Output range, slot 5: Safe

Information about the output range: Refer to the operating instructions for information about activation of guard locking.

Notice

This application is based on the MGB-PN operating instructions. Please refer to the operating instructions for the technical details. Pay attention to activation of guard locking when using an MGB-L2..-PN (guard locking according to EN ISO 14119 in accordance with the open-circuit current principle).

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 ensure that the handle module is NOT in the operating distance during configuration.

Installing the GSDML file

The latest MGB PROFINET GSDML file and the associated BMP image file (to depict the MGB in the configuration software) are available in the Service/Downloads/Software/GSD-data/MGB area at http://www.euchner.com.

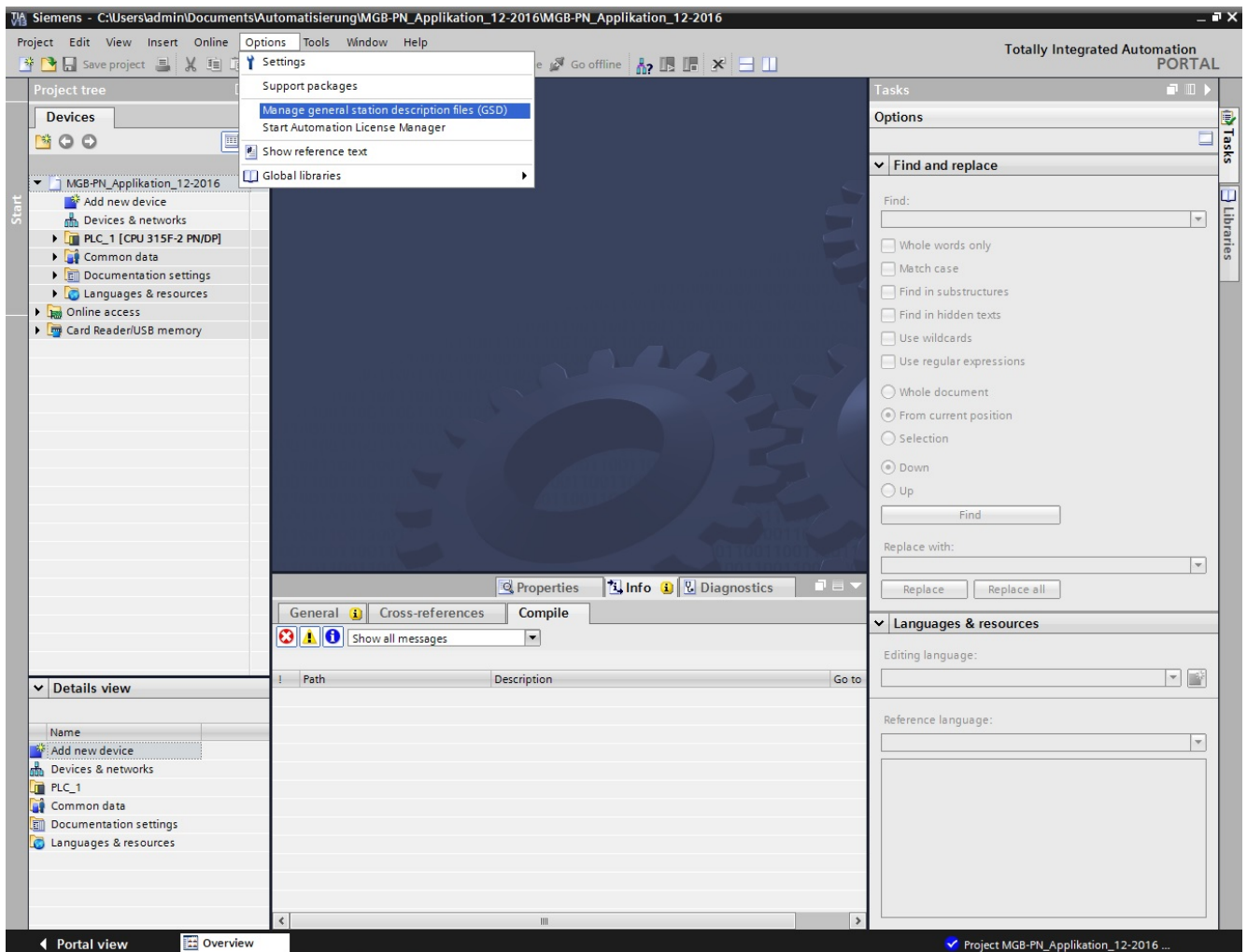Please proceed as follows to install the GSD file in TIA Portal V13:

Figure 3

Click "Options" and select "Manage general station description files (GSD)."
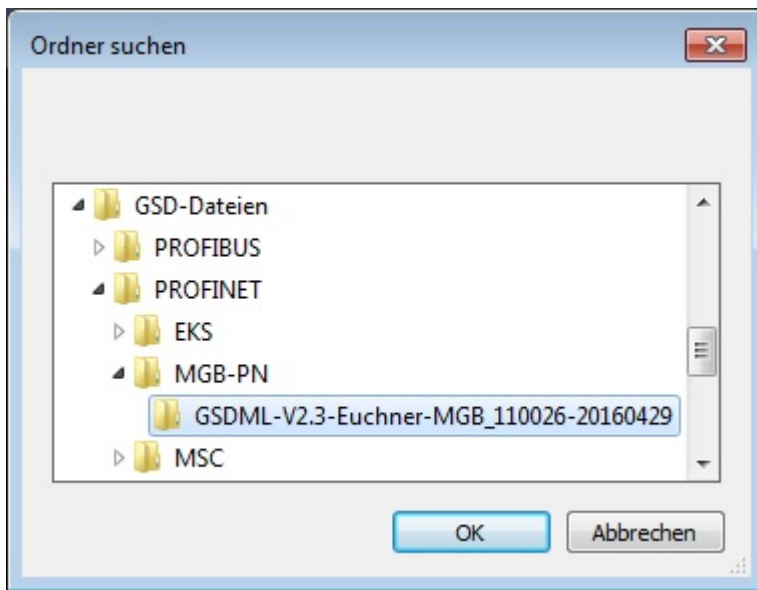
Figure 4

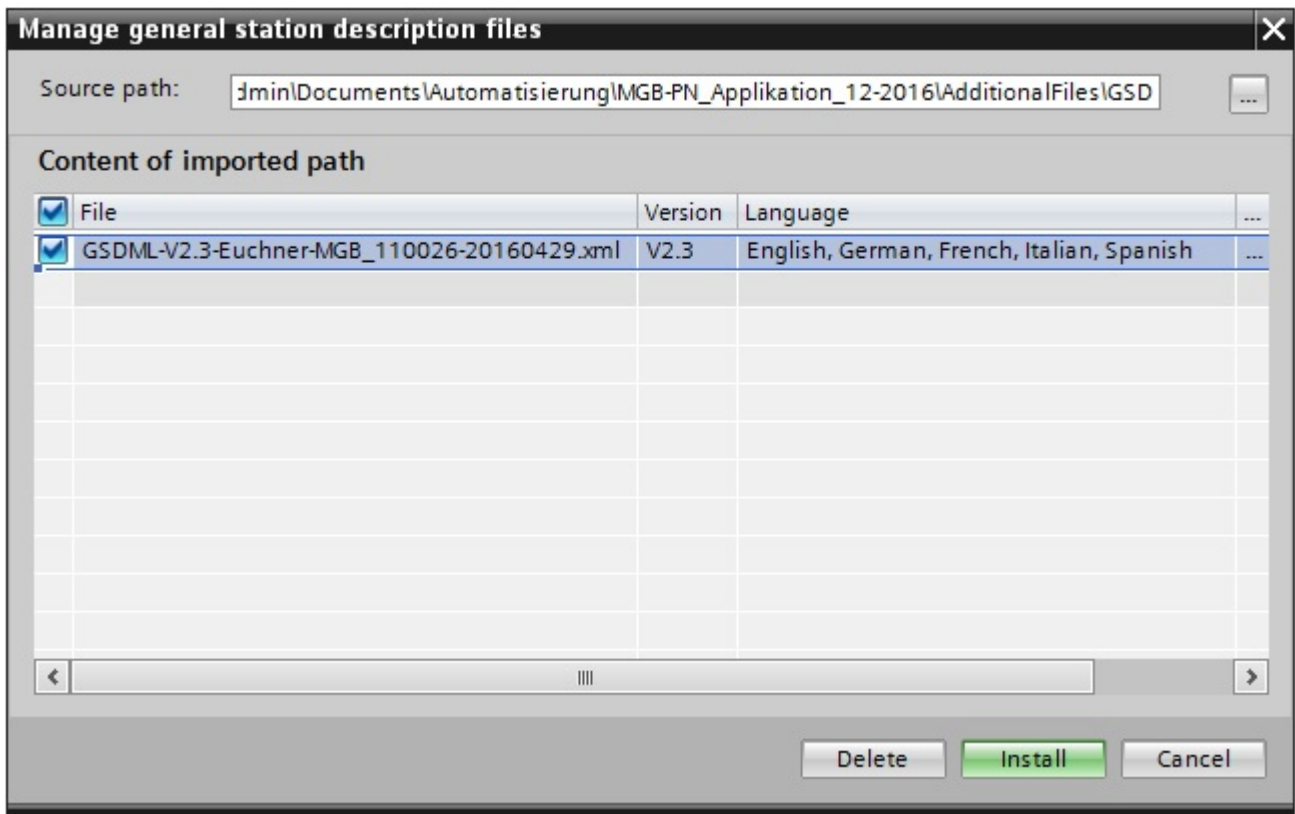Select the folder where you saved the GSMDL file and click "OK."

Figure 5

Select the GSDML file suitable for the MGB from the list and click "Install."
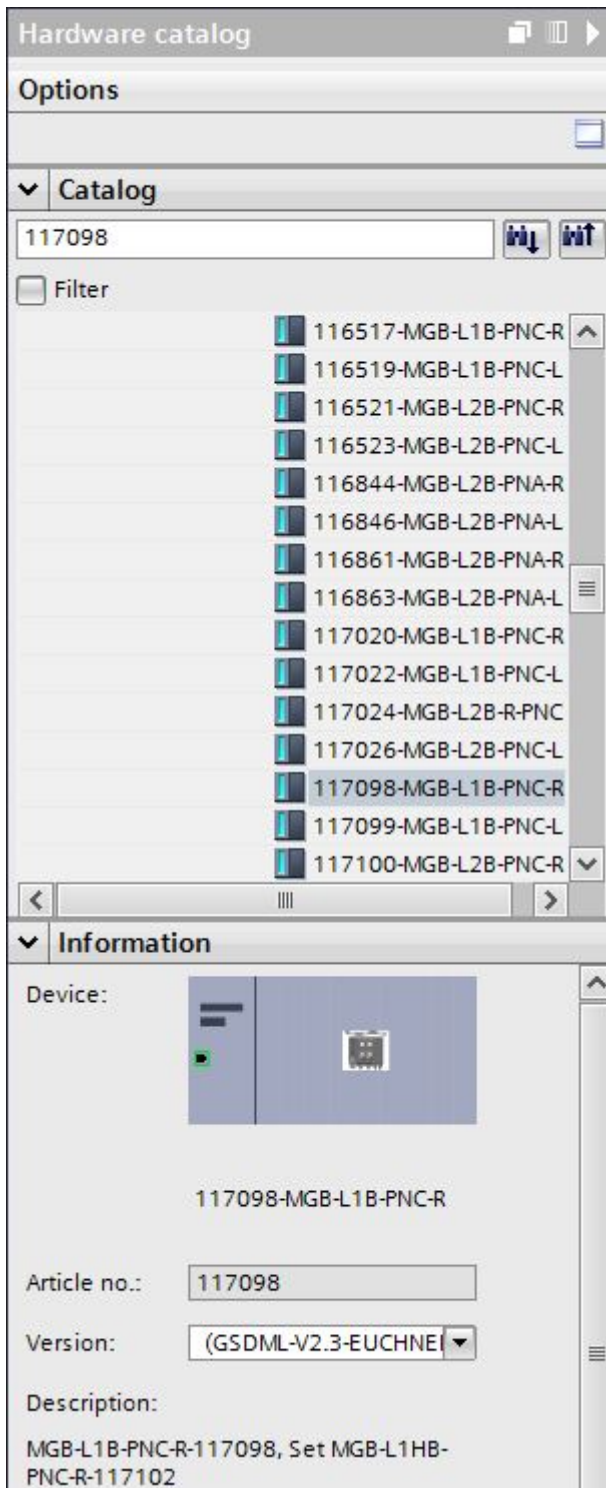
Figure 6

Enter the corresponding order no. of the bus and guard locking module in the search box for the hardware catalog. The appropriate device will be displayed there. Check the information area to determine the GSDML file version. If an older GSDML file has already been installed, you can select the required GSDML file. Drag the selected MGB into your PROFINET network.
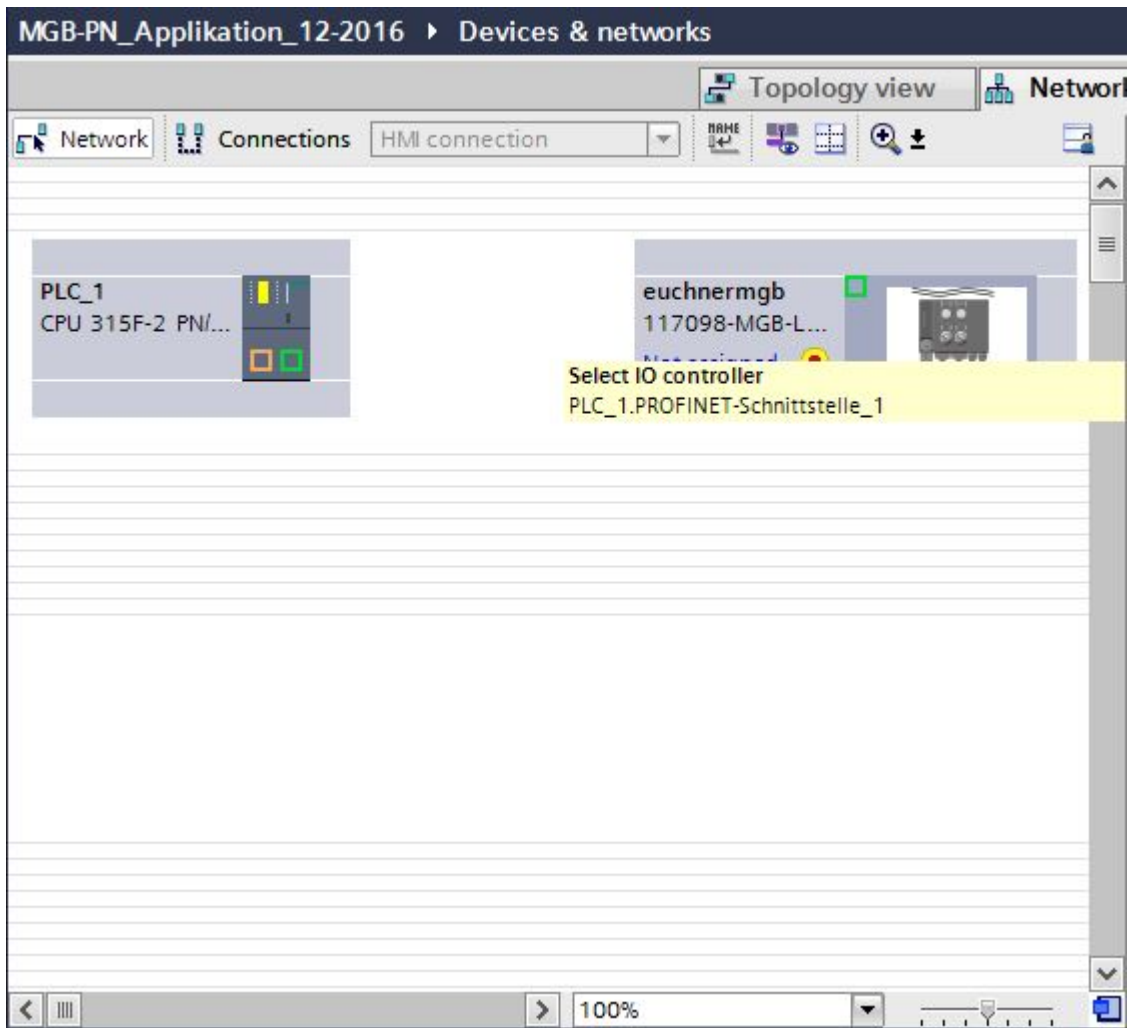
Figure 7

Now assign the appropriate IO controller to the MGB by clicking "Not assigned" and then selecting the IO controller.

Hardware configuration

Open the MGB device view. Double-clicking the displayed MGB will show the general settings of the MGB in the bottom window. You can make the corresponding settings there, e.g. assigning the IP address and the diagnostic addresses. The device name and the input and output addresses can be changed in the device overview.
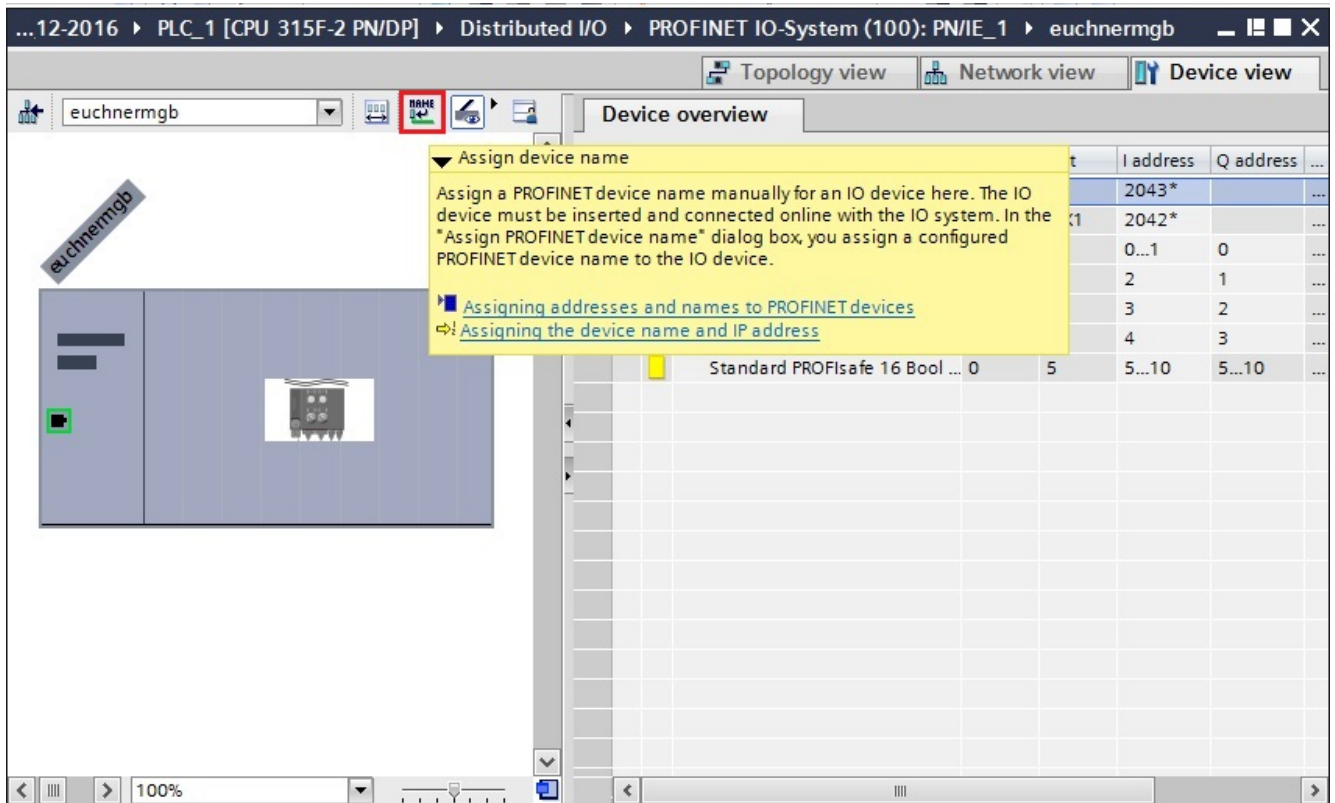

Figure 8

Click the "assign device name" icon marked in red here.

Figure 9

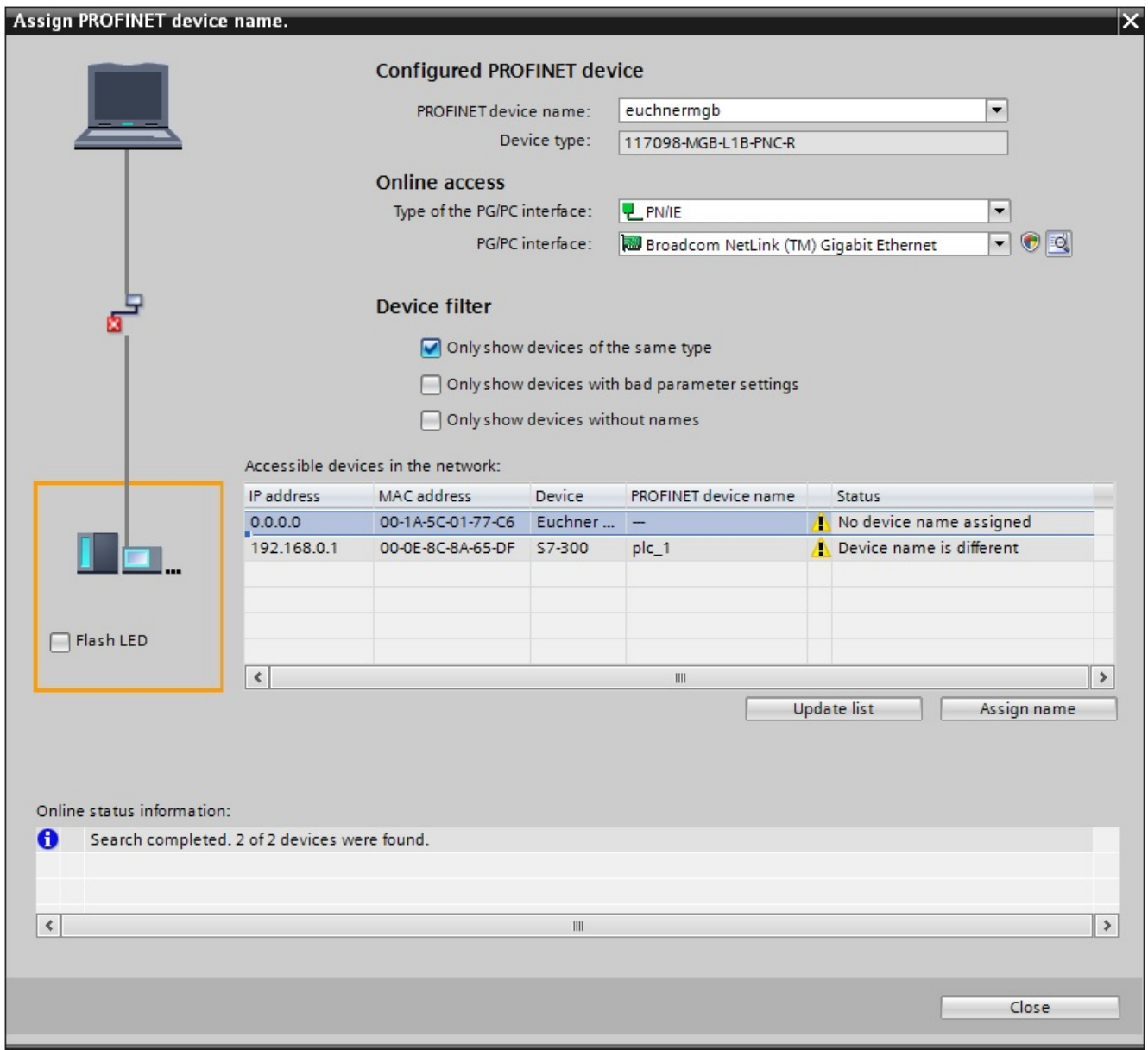Select the suitable device name and the corresponding available devices, and then click "Assign name." The device name in this application is
"euchnermgb" (factory setting from GSD file). Please note that the device name in the device overview must match the assigned device name.
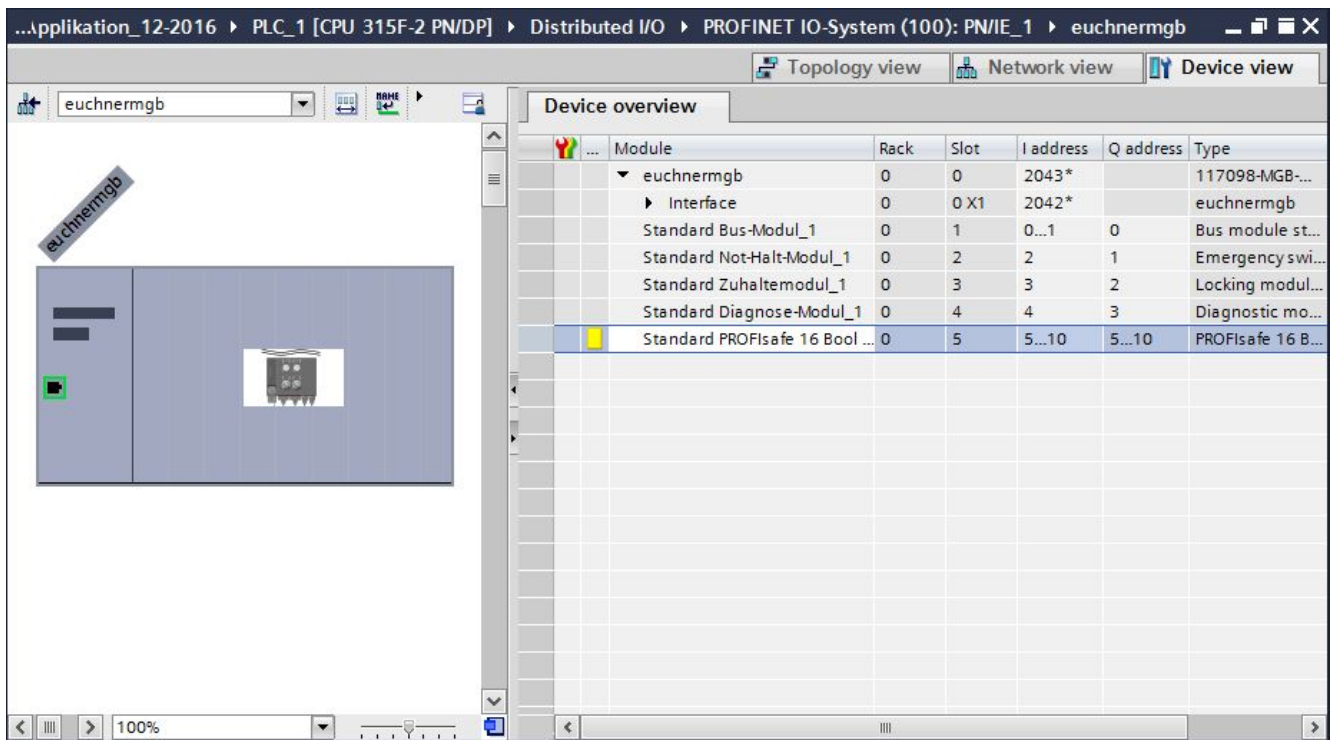
Figure 10

The PROFIsafe assembly is located in slot 5. Go to the general properties there. They are displayed in the bottom window.
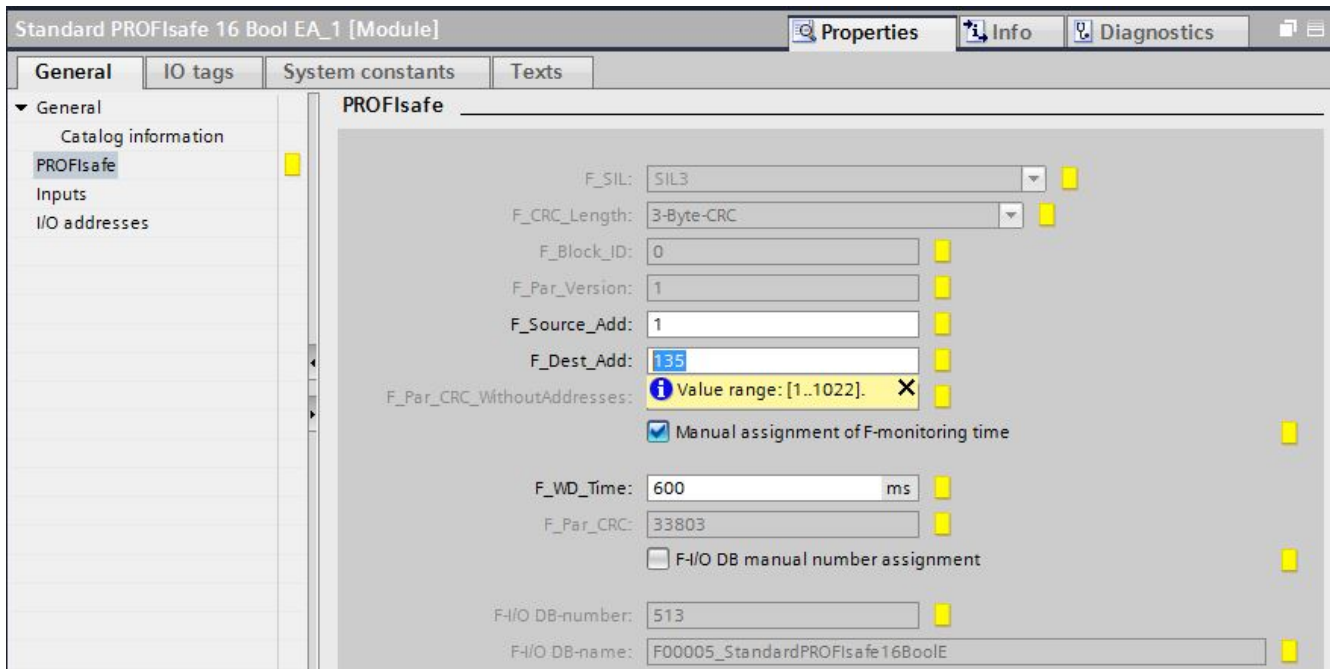
Figure 11

Enter the same PROFIsafe address you set on the DIP switch (*Figure 12*) on the MGB-PN in the "F_Dest_Add" field. Refer to the operating instructions for information about setting the PROFIsafe address on the MGB.

Binary coding of the DIP switches for PROFIsafe address (factory setting: 135)

default address:
$128 + 4 + 2 + 1 = 135$

Figure 12

Figure 13

Go to "Safety Administration" and open the "Protection" item. Set up a password there. If the
F-CPU must be protected by a password as well, please note the "F-CPU access protection" item.

Creating the safety program

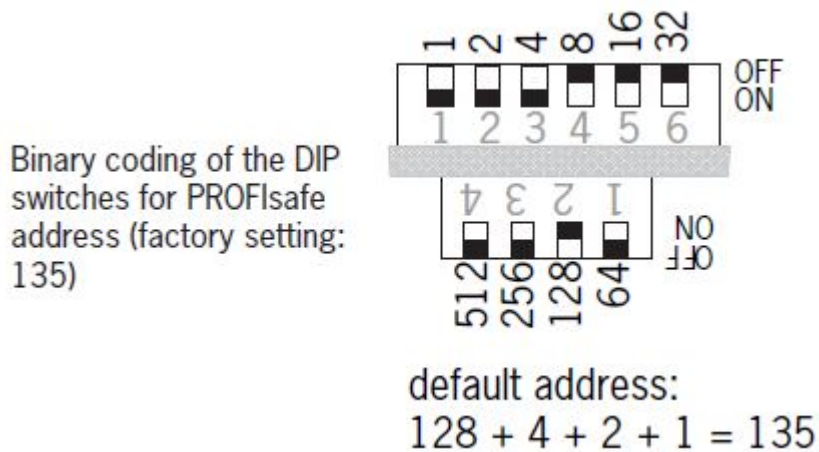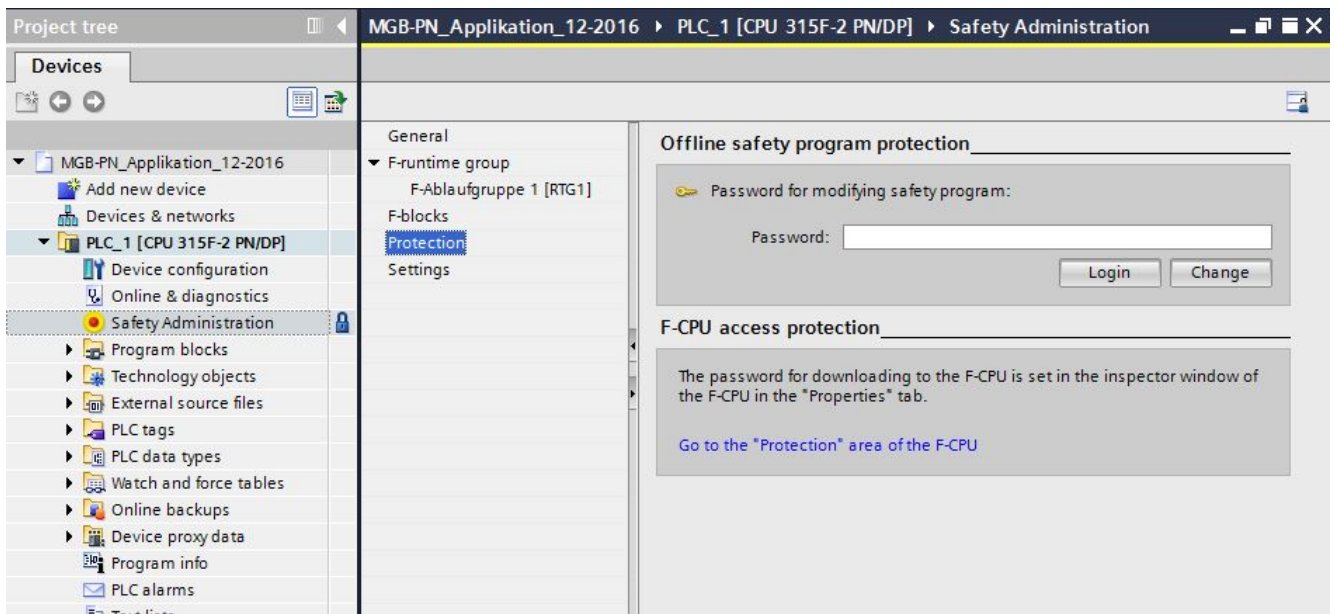The F sequence group, the FB and the associated DB are generated automatically in TIA Portal V13. As soon as the program is compiled, a safety program consistency check is performed.

Example of depassivation

PROFINET

			Bit	7	6	5	4	3	2	1	0
			Eingangsbereich / Input range:								
MGB-B	Slot 1	Byte 0		–	–	S95	–	–	S92	–	S90
		Byte 1		–	–	–	–	–	–	–	–
Emergency stop	Slot 2	Byte 0		–	–	–	–	–	–	–	S93
MGB-L	Slot 3	Byte 0		ÜK	SK	–	–	–	Z	R	T
Diagnostics	Slot 4	Byte 0		L	–	–	–	–	E	E	E

Datenbytes (Datenblöcke für nicht sichere Funktion)

Data bytes (data blocks for unsafe functions)

			Bit	7	6	5	4	3	2	1	0
			Ausgangsbereich / Output range:								
MGB-B	Slot 1	Byte 0		–	–	H95	–	–	H92	–	H90
Emergency stop	Slot 2	Byte 0		–	–	–	–	–	–	–	H93
MGB-L	Slot 3	Byte 0		–	–	–	–	–	–	–	S
Diagnostics	Slot 4	Byte 0		–	–	–	–	–	–	Reset	Q

PROFIsafe

			Bit	7	6	5	4	3	2	1	0
			Eingangsbereich / Input range:								
SAFETY	Slot 5	Byte 0		–	–	–	Z	R	T	–	S93
		Byte 1		–	–	–	–	–	–	ÜK	SK
		Byte 2-5		PROFIsafe intern genutzt (Steuerbyte, CRC usw.) Used within Profisafe (control byte, CRC etc.)							

Datenbytes (Datenblöcke für sichere Funktion)

data bytes (data blocks for safe functions)

			Bit	7	6	5	4	3	2	1	0
			Ausgangsbereich / Output range:								
SAFETY	Slot 5	Byte 0		–	–	–	–	–	–	–	S
		Byte 1		–	–	–	–	–	–	–	–
		Byte 2-5		PROFIsafe intern genutzt (Statusbyte, CRC usw.) Used within Profisafe (status byte, CRC etc.)							

ÜK = T and R and Z
SK = T and R
L = Lebensdauer / Life

Z = Zuhaltung / guard locking
R = Riegelstellung / bolt position
T = Türstellung / door position

E = Gerätediagnose / Device diagnosis
Q = Quittierung / Acknowledgement
S = Zuhaltemagnet / Guard locking solenoid

Figure 14

Below is an example of how depassivation of the MGB-PN can be performed. The MGB-PN is to be depassivated intentionally using a button on MGB-PN. Refer to the table for the corresponding input address assigned to the button (e.g. S90 = I 0.0). Please consider the input and output ranges you assigned to the MGB-PN in the HW configuration.
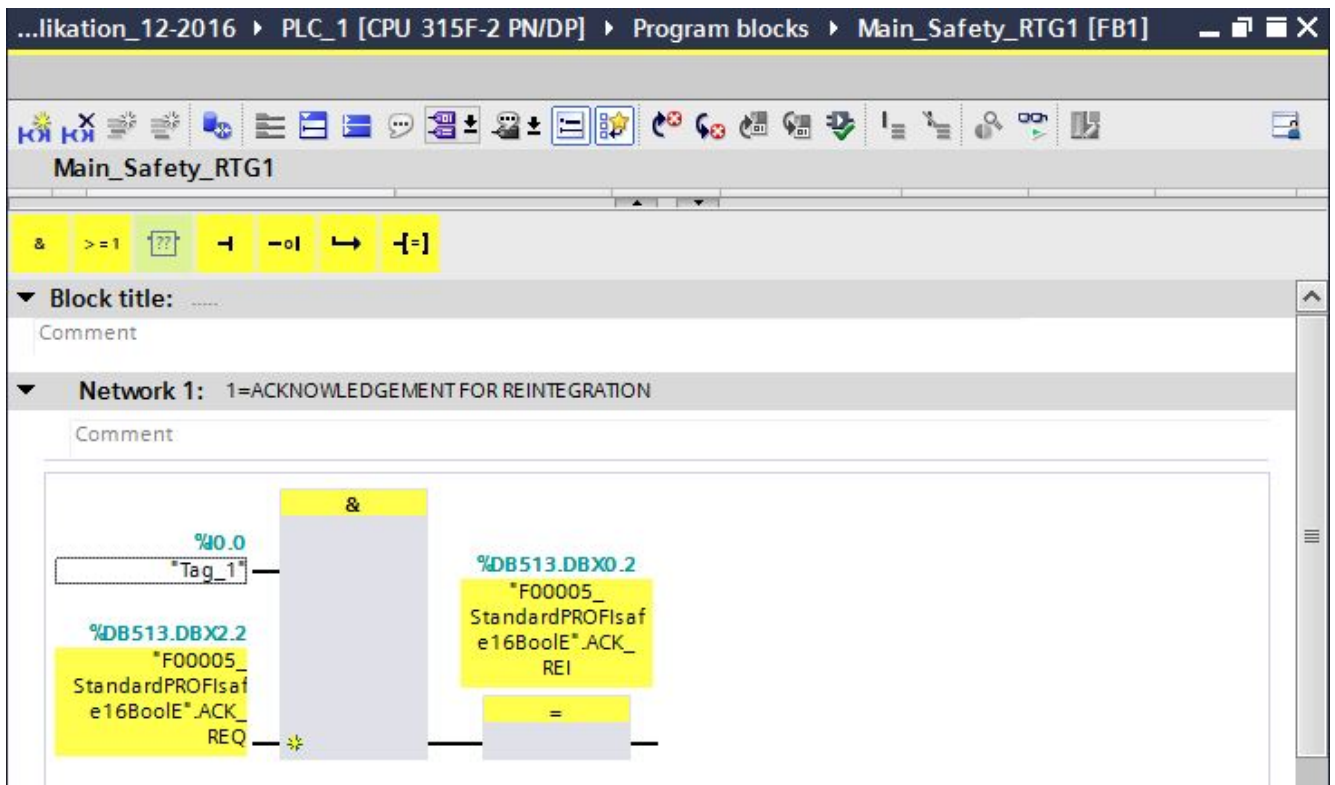
Figure 15

The designation of the modules named here can vary, because they are generated automatically. Create the link shown in Figure 15 in FB1. The "ACKNOWLEDGEMENT REQUEST" bit from DB513 (Figure 16) set when the MGB-PN is passivated. User acknowledgment using an MGB-PN button must be performed in this example. If the "ACKNOWLEDGEMENT REQUEST" bit and bit I0.0 are set, the "ACKNOWLEDGEMENT FOR REINTEGRATION" bit is set and the MGB-PN is re-integrated.

Click "Compile." This automatically performs a safety program consistency check. Then load the safety program into your PLC by clicking "Load into Device." The MGB-PN can now be depassivated at any time by pressing the button. Teach the handle module as described in the operating instructions.

Figure 16 (DB513)

There must be at least one MGB call in the safe program section to prevent the device from being passivated. Bit I6.1 (ÜK) from the PROFIsafe area of the MGB is then used. Bit ÜK is set when the following conditions are met: door closed/bolt tongue inserted into the locking module/guard locking active.
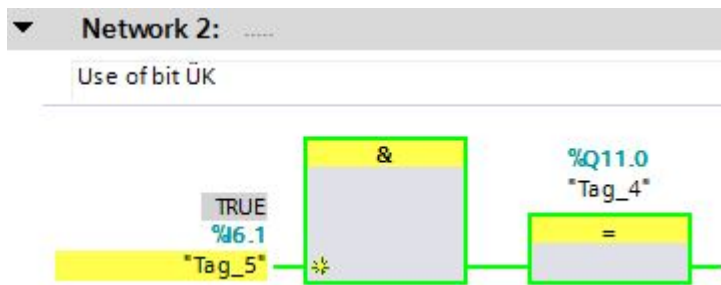

Figure 17

One output of the Siemens output card is connected with bit I6.1 (ÜK) in this example.

Explanation:

ACK_REI (IN 0.2) (BOOL)	User acknowledgment on manual reintegration	**"ACK_REI = 0->1" (positive edge):** Reintegration takes place after a positive edge.
		Comment: User acknowledgment is possible only after the fault causing passivation has been remedied. User acknowledgment is always required for an "F communication error," independently of ACK_NEC.
ACK_REQ (OUT 2.2) (BOOL)	The user can only read this variable in the P periphery data module.	**"ACK_REQ = 1":** The fault leading to passivation has been remedied. User acknowledgment for manual reintegration (ACK_REI) is now possible. Cause for passivation: "F communication error," "assembly error," "channel error"
		Comment: Once the fault leading to passivation has been remedied and the F system has recognized this, the F system sets "ACK_REQ = 1." After user acknowledgment, the F operating system sets "ACK_REQ = 0."

Sources

Elaboration of S7 Distributed Safety project presentation at Technikerschule Hannover

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.