

# EUCHNER

## Application



Integration of MGB2 Modular into TIA Portal V13/V14/V15

EN

From V1.5.6

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## 1. About this document

### 1.1. Version

Version	Date	Change/addition	Chapter
01-06/18	19.06.2018	Prepared	All

### 1.2. Scope





The purpose of this document is the integration and configuration of the MGB2 *Modular* into SIEMENS TIA Portal version V13, version V14 and version V15.

### 1.3. Target group

Design engineers and installation planners for safety systems on machines, as well as setup and servicing staff possessing special expertise in handling safety components as well as expertise in the installation, setup, programming and diagnostics of programmable logic controllers (PLC) and bus systems.

### 1.4. Supplementary documents

The overall documentation for this application consists of the following documents:

Document title (document number)	Contents	
Operating Instructions (2500235)	System and configuration manual for the modular bus module	
Safety Information and Maintenance (2500232)	Information sheet with important safety information	
Operating instructions for the modules connected and their submodules	Device-specific information for the related module and the submodules installed.	
Possibly enclosed data sheets	Item-specific information about deviations or additions	

### 1.5. Notice

This application is based on the MGB2 *Modular* operating instructions. Please refer to the operating instructions for the technical details and other information.

## 2. Components/modules used

### 2.1. EUCHNER

Description	Order number / item number
Safety system MGB2 Modular with modular bus module MBM (PROFINET interface), guard locking with guard locking monitoring	156386 / MGB2-L1HB-PN-U-S4-D-R-156386
	156387 / MGB2-L1HB-PN-U-S4-D-L-156387
	156388 / MGB2-L1HB-PN-U-S3-D-R-156388
	156389 / MGB2-L1HB-PN-U-S3-D-L-156389
	156390 / MGB2-L2HB-PN-U-S3-D-R-156390
	156391 / MGB2-L2HB-PN-U-S3-D-L-156391

#### 2.1.1. Items included in the MGB2 Modular set

Description	Order number/item number	MGB2 set					
		156386	156387	156388	156389	156390	156391
Modular bus module MBM	156310 / MBM-PN-S3-MLI-3B-156310	-	-	●	●	●	●
	156312 / MBM-PN-S4-MLI-3B-156312	●	●	-	-	-	-
Locking module MGB2-L	136776 / MGB2-L1-MLI-U-Y0000-BJ-136776	●	●	●	●	-	-
	156392 / MGB2-L2-MLI-U-Y0000-BJ-156392	-	-	-	-	●	●
Submodule: emergency stop + two pushbuttons	136687 / MSM-1-P-CA-BPP-A1-136687	●	●	●	●	●	●
Submodule: three slide-in labels	137610 / MSM-1-N-AA-QQQ-B1-137610	●	●	●	●	●	●
Handle module	136691 / MGB2-H-BA1A3-R-136691	●	-	●	-	●	-
	156394 / MGB2-H-BA1A3-L-156394	-	●	-	●	-	●
Module connector MLI	157024 / AC-MC-SB-M-A-157024	●	●	●	●	●	●
Blanking cover MLI	156718 / AC-MC-00-0-B-156718	●	●	●	●	●	●

Key to symbols	●	Included in the MGB2 set
		-

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.

### 2.2. Others

Description	Order number / item number
SIMATIC S7-1215 FC DC/DC/DC	6ES7 215-1AF40-0XB0
SIMATIC Scalance XC208	6GK5 208-0BA00-2AC2
SIMATIC ET200 SP, interface module	6ES7 155-6AU00-0BNO
SIMATIC ET200 SP, F-DQ electronics module	6ES7 136-6DB00-0CA0
SIMATIC ET200 SP, DI electronics module	6ES7 131-6BF00-0BA0

## 2.3. Software

Description	Version
Totally Integrated Automation Portal	Version V14 SP1 update 6
STEP 7 Professional	Version V14 SP1 update 6
STEP 7 Safety	Version V14 SP1 update 6

## 3. Functional description

The MGB2-L1HB-PN.. is a guard locking device in accordance with EN ISO 14119 according to the closed-circuit current principle, the MGB2-L2HB-PN.. is a guard locking device 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 MGB2 *Modular* is connected to a SIMATIC S7-1215 FC PLC from Siemens via the bus module.

## 4. Overview of the communication data

### 4.1. Input

PROFINET	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	BM.E_G	-	BM.E_SYS	-	-	BM.E_ML2	BM.E_ML1	BM.D_RUN
2nd byte	Diagnostics byte (pluggable)							

PROFINET	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	LM.E_G	LM.E_ER	LM.ESM1	LM.E_SMO	-	LM.I_UK	LM.I_SK	LM.D_RUN
2nd byte	-	-	-	-	-	LM.I_OL	LM.I_OT	LM.I_OD
3rd byte	Diagnostics byte (pluggable)							

PROFINET	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	-	-	SM.E_S1	-	-	SM.I_S3	SM.I_S2	SM.I_S1
2nd byte	Diagnostics byte (pluggable)							

PROFIsafe	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	-	-	-	-	-	SM.FI_ES	LM.FI_UK	LM.FI_SK
2nd byte	-	-	-	-	-	-	-	-
Byte 3-6	Used within PROFIsafe (control byte, CRC, etc.)							

### 4.2. Output

PROFINET	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	BM.ACK_G	-	-	-	-	-	-	-

PROFINET	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	LM.ACK_G	LM.ACK_ER	-	-	-	-	-	LM.O_CL

PROFINET	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	-	-	SM.O_H3_B	SM.O_H2_B	SM.O_H1_B	SM.O_H3	SM.O_H2	SM.O_H1

PROFIsafe	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	-	-	-	-	-	-	-	LM.FO_CL
2nd byte	-	-	-	-	-	-	-	-
Byte 3-6	Used within PROFIsafe (status byte, CRC, etc.)							

Tip: The individual abbreviations are explained in the operating instructions



#### NOTE!

While PROFINET data are always incorporated by bytes, for PROFIsafe the data are always incorporated by individual bits. For this reason, the module PROFIsafe 2 Bytes was used for this application example and offers a sufficiently large safe memory area for the bits: LM.FI\_SK, LM.FI\_UK and SM.FI\_ES.

## 5. Installing the GSD file

You will require the corresponding GSD file in the GSDML format to integrate the MGB2 *Modular* into TIA Portal, depending on the version of TIA Portal:

- TIA Portal V14/V15: GSDML-V2.33-EUCHNER-MBM\_2512512\_T14-YYYYMMDD.xml
- TIA Portal V13: GSDML-V2.33-EUCHNER-MBM\_2512512\_T13-YYYYMMDD.xml

You will find the GSD files in the download area at [www.euchner.com](http://www.euchner.com). Always use the latest GSD file.

Please proceed as follows to install the GSD file in TIA Portal V14:

1. Click *Options* and select *Manage general station description files (GSD)*.

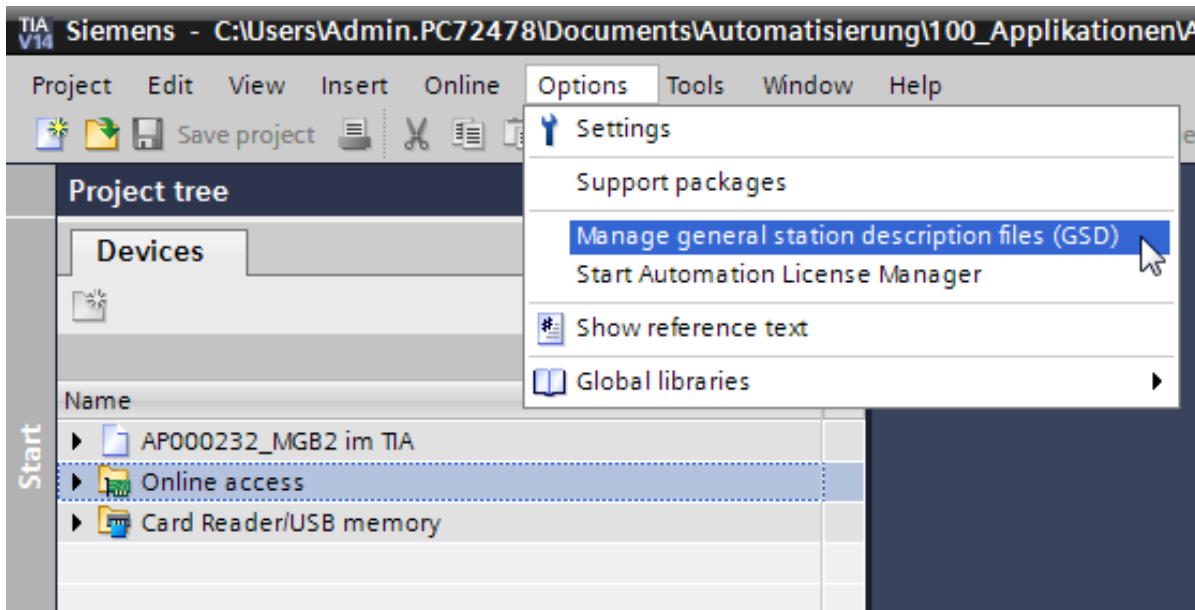


Figure 1: GSD file selection

2. Select the source path for the GSD file and install it.

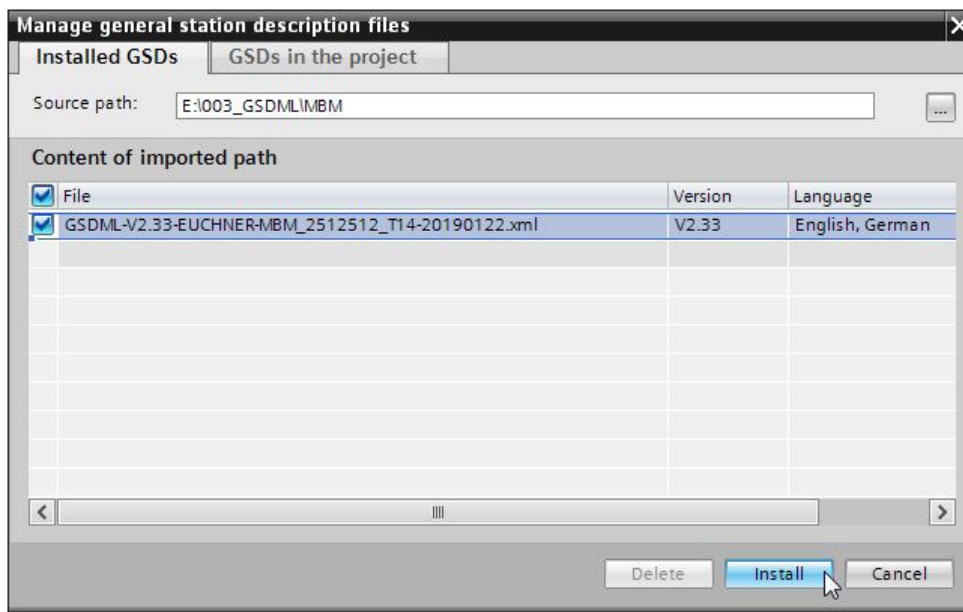


Figure 2: GSD file installation

## 6. Configuring the bus module MBM

Select the bus module MBM from the hardware catalog and add to the network view using drag & drop. Then assign the PLC. For this purpose, click *Not assigned* and select the corresponding IO controller.

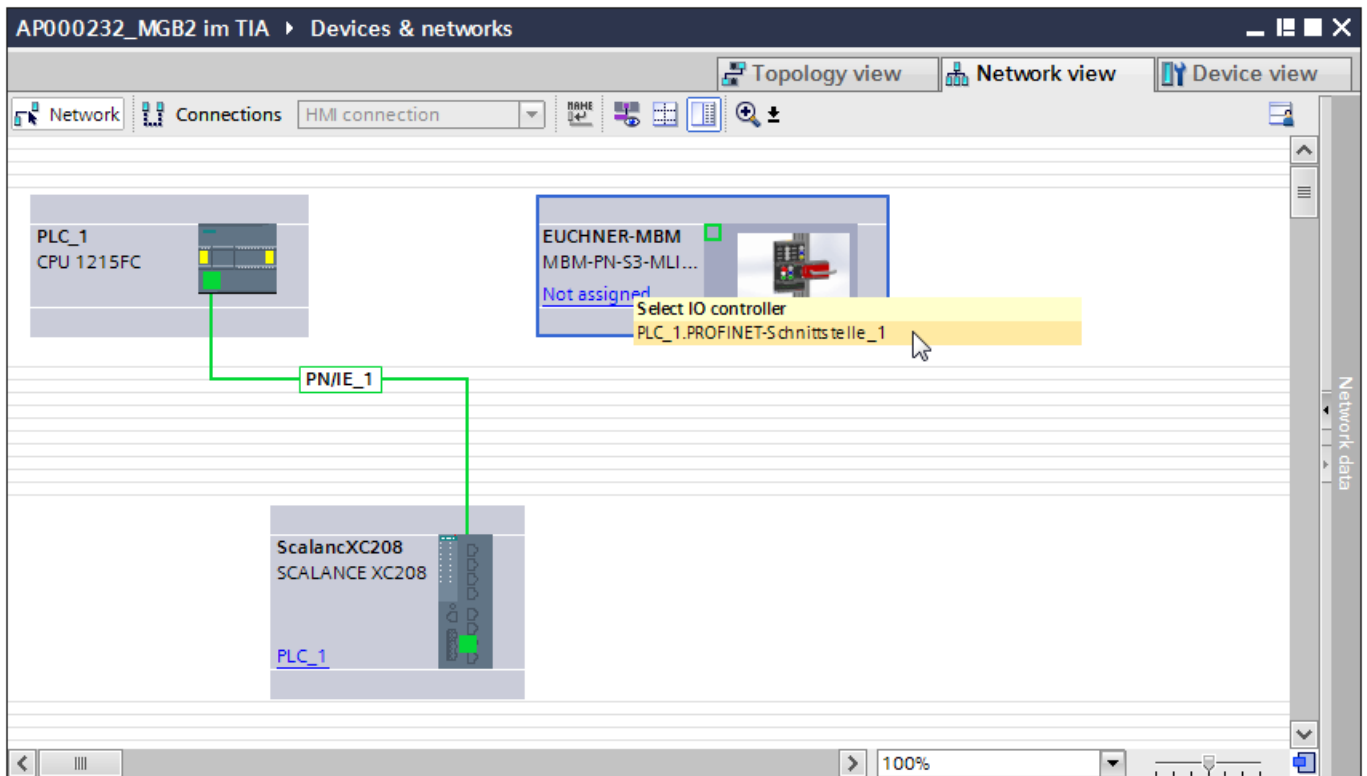


Figure 3: Network view for the MBM

The following PROFINET parameters must be set:

- › Device name (factory setting from GSD file): [euchner-mbm].
- › IP address: optionally fixed or dynamic

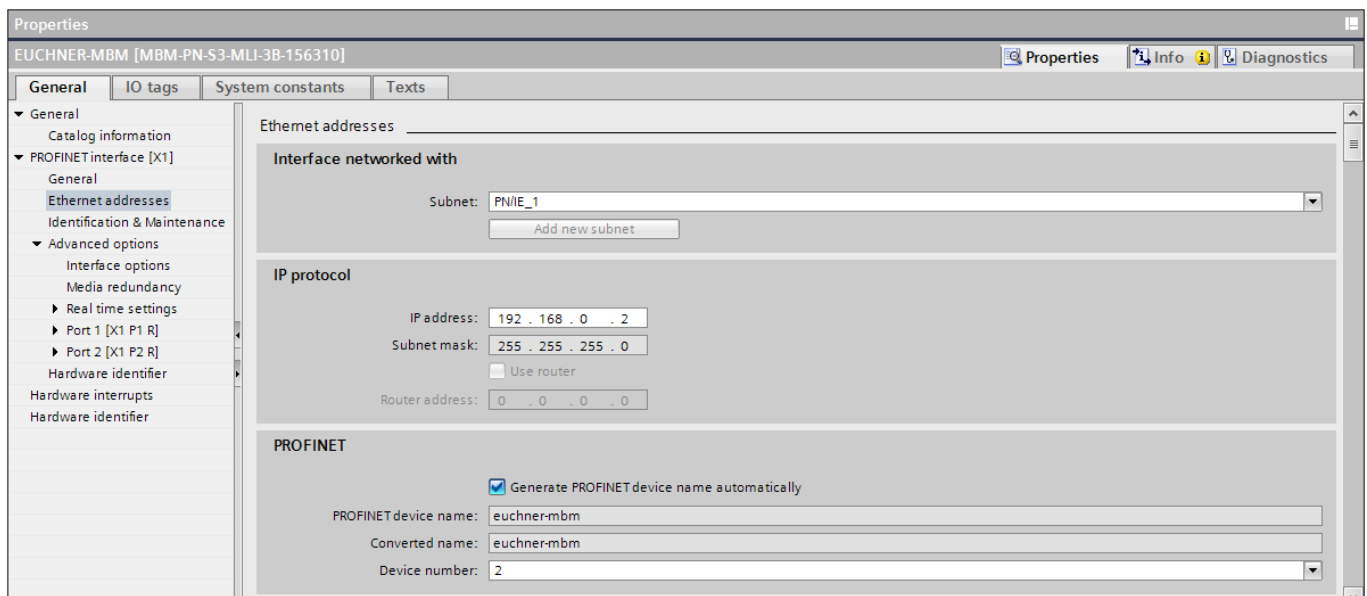


Figure 4: PROFINET parameters



▸ Real time settings, IO cycle

Update Time: Calculate update time automatically (recommended)

Watchdog time: Number of accepted update cycles without missing IO data: 3 (recommended)

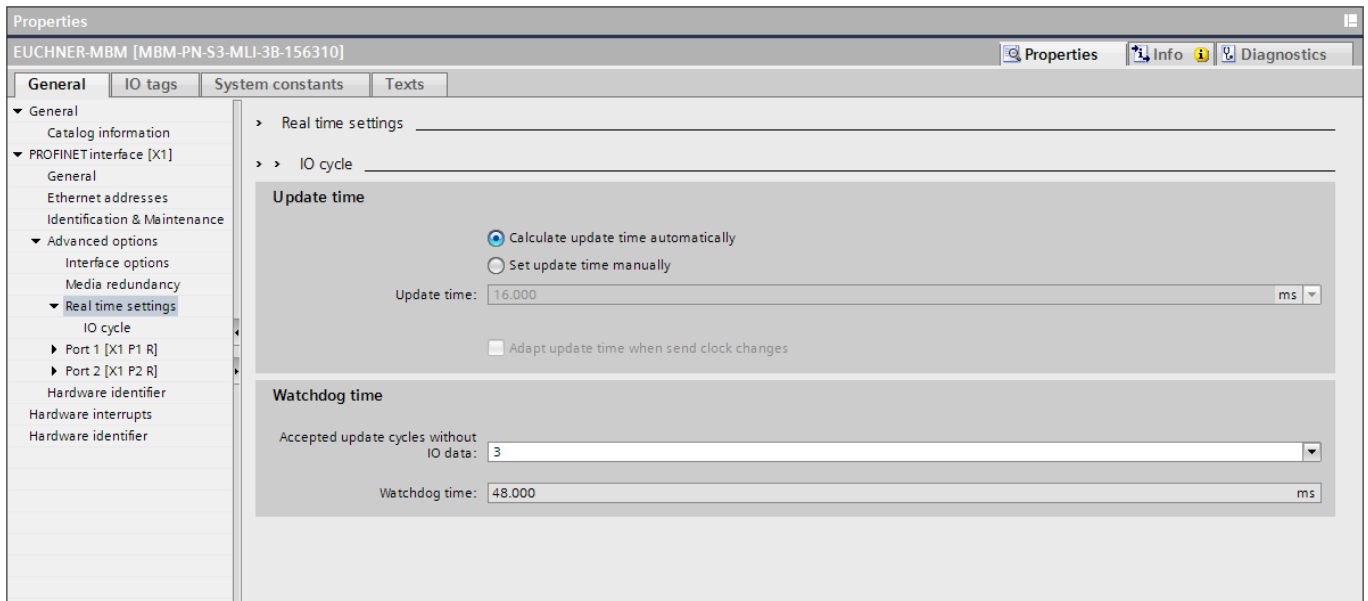


Figure 5: PROFINET real time settings

## 7. Configuration of the PROFIsafe communication

Open the bus module MBM in the device view and, in the hardware catalog, select the module *PROFIsafe 2 Bytes*, *PROFIsafe 4 Bytes* or *PROFIsafe 8 Bytes*. You will find further information on the PROFIsafe modules in the operating instructions for the bus module MBM. Using drag & drop, drag the module to MBM slot 1. The PROFIsafe modules can only be placed in slot 1 on the MBM.

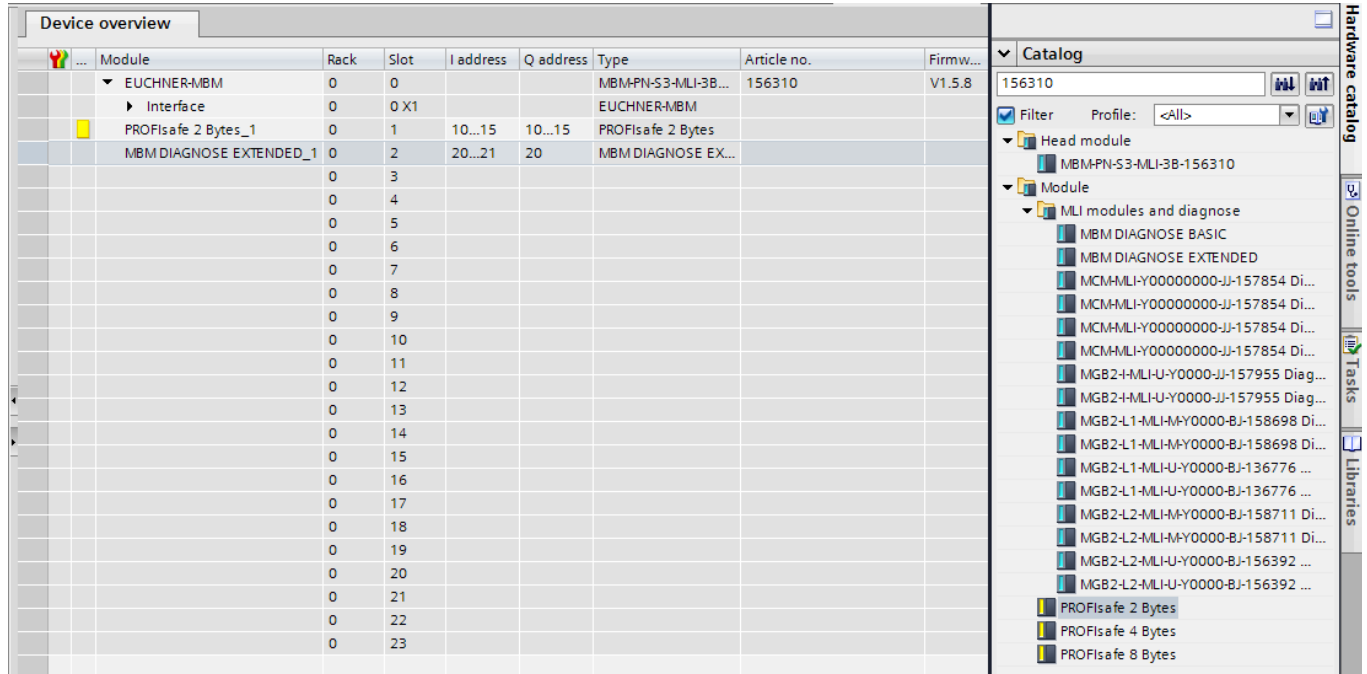


Figure 6: Adding module *PROFIsafe 2 Bytes*

The following PROFIsafe parameters must be set:

- F\_Dest\_Add (PROFIsafe address): 12 (The PROFIsafe default address is assigned by TIA Portal, the addressing can be changed manually).
- F\_WD\_Time (Time during which the control system expects a response from the PROFIsafe device): 600 ms. Factory setting from GSD file: [600 ms].
- Input and output address range for the PROFIsafe data (if the sequential addressing from TIA portal is not required).

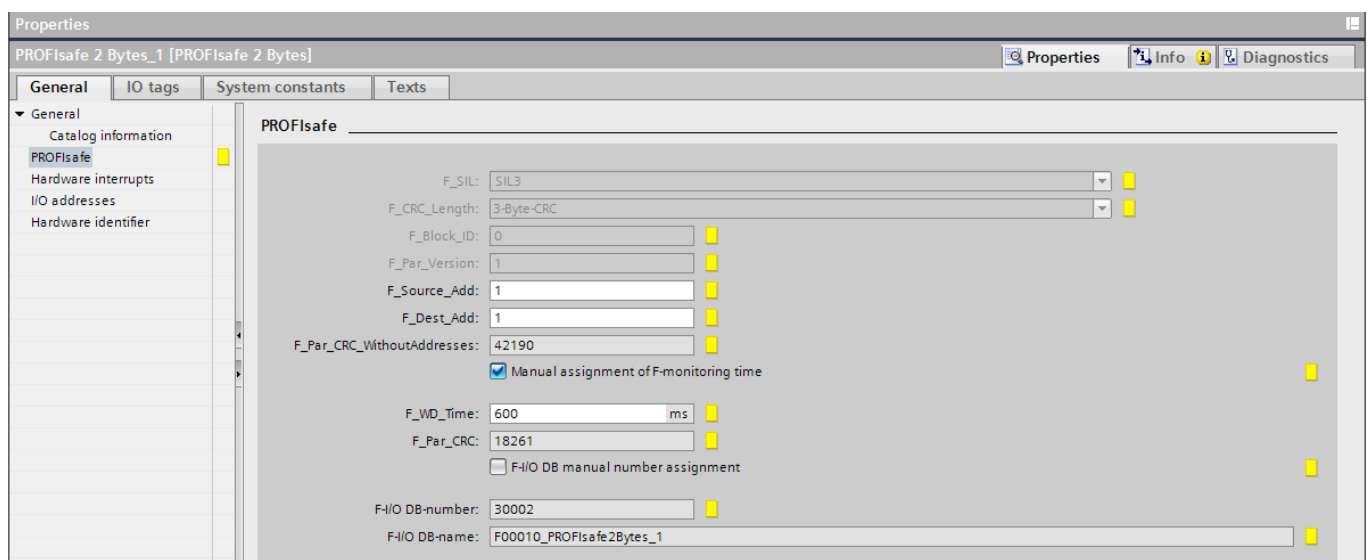
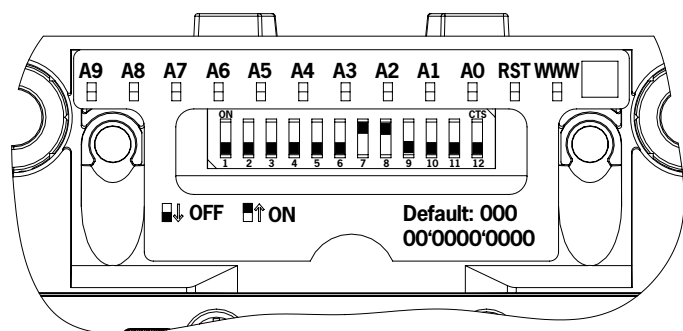


Figure 7: Properties of the PROFIsafe module

2. Set the PROFIsafe address (F\_Dest\_Add) on the bus module MBM using the DIP switches. The PROFIsafe address must be set to the value configured.



Switch	Description
A0 ... A9	Address switch, bit zero to nine For setting the PROFIsafe address in binary (factory setting: 0000000000)
RST	Factory reset (factory setting: off)
WWW	Activate device web interface with extended diagnostic options. (factory setting: off)

The DIP switch setting is as follows for F\_Dest\_Add 12 configured in TIA Portal:

Switch	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
DIP switch position MBM	off	off	off	off	off	off	on	on	off	off
Significance	2 <sup>9</sup>	2 <sup>8</sup>	2 <sup>7</sup>	2 <sup>6</sup>	2 <sup>5</sup>	2 <sup>4</sup>	2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>
Decimal value	512	256	128	64	32	16	8	4	2	1

Table 1: DIP switch settings



### ATTENTION!

- › The PROFIsafe address set on the MBM and the address configured in TIA Portal must match.
- › The PROFIsafe address set using the DIP switches is only applied after restarting the MBM.

## 8. Configuration of the locking module and the submodule

Add the locking module MGB2 from the folder *Modules and Diagnose* in the hardware catalog to slot 3 on the modular bus module using drag & drop. Use the submodule (MSM-1-P-CA-BPP-A1-136687) from the folder *Submodules* and drag the submodule to slot 3.3. . Set the parameters for the locking module and the submodule in the parameters for the related module.

AP000232\_MGB2 im TIA ▶ Ungrouped devices ▶ EUCHNER-MBM [MBM-PN-S3-MLI-3B-156310]

Device overview							
Module	Rack	Slot	I address	Q address	Type	Article no.	
▼ EUCHNER-MBM	0	0			MBM-PN-S3-MLI-3B...	156310	
▶ Interface	0	0 X1			EUCHNER-MBM		
PROFIsafe 2 Bytes_1	0	1	10...15	10...15	PROFIsafe 2 Bytes		
MBM DIAGNOSE EXTENDED_1	0	2	20...21	20	MBM DIAGNOSE EX...		
▼ MGB2-L1-MLI-U-Y0000-BJ-1...	0	3			MGB2-L1-MLI-U-YO...	136776	
MGB2-L1-MLI-U-Y0000-...	0	3 1	22...24	21	MGB2-L1-MLI-U-YO...		
	0	3 2					
MSM-1-P-CA-BPP-A1-13...	0	3 3	25...26	22	MSM-1-P-CA-BPP-A...	136687	
	0	4					
	0	5					
	0	6					
	0	7					
	0	8					

Hardware catalog

Options

▼ Catalog

Filter Profile: <All>

- Head module
  - MBM-PN-S3-MLI-3B-156310
- Module
  - MLI modules and diagnose
    - MBM DIAGNOSE BASIC
    - MBM DIAGNOSE EXTENDED
    - MCM-MLI-Y00000000-JJ-157854 Diagnose Basic
    - MCM-MLI-Y00000000-JJ-157854 Diagnose Basic with Stacklight
    - MCM-MLI-Y00000000-JJ-157854 Diagnose Extended
    - MCM-MLI-Y00000000-JJ-157854 Diagnose Extended with Stacklight
    - MGB2-HMLI-U-Y0000-JJ-157955 Diagnose Basic
    - MGB2-HMLI-U-Y0000-JJ-157955 Diagnose Extended
    - MGB2-L1-MLH-M-Y0000-BJ-158698 Diagnose Basic
    - MGB2-L1-MLH-M-Y0000-BJ-158698 Diagnose Extended
    - MGB2-L1-MLI-U-Y0000-BJ-136776 Diagnose Basic
    - MGB2-L1-MLI-U-Y0000-BJ-136776 Diagnose Extended
    - MGB2-L2-MLH-M-Y0000-BJ-158711 Diagnose Basic
    - MGB2-L2-MLH-M-Y0000-BJ-158711 Diagnose Extended
    - MGB2-L2-MLI-U-Y0000-BJ-156392 Diagnose Basic
    - MGB2-L2-MLI-U-Y0000-BJ-156392 Diagnose Extended
  - PROFIsafe 2 Bytes
  - PROFIsafe 4 Bytes
  - PROFIsafe 8 Bytes
- Submodules
  - Submodules
    - MSM-1-P-CA-0LD-A3-126062
    - MSM-1-P-CA-OP0-BB-137744
    - MSM-1-P-CA-B00-C8-159480 Diagnose Basic
    - MSM-1-P-CA-B00-C8-159480 Diagnose Extended
    - MSM-1-P-CA-B0P-B5-137738 Diagnose Basic
    - MSM-1-P-CA-B0P-B5-137738 Diagnose Extended
    - MSM-1-P-CA-BPP-A1-136687 Diagnose Basic
    - MSM-1-P-CA-BPP-A1-136687 Diagnose Extended

Figure 8: Adding locking module/submodule



**NOTE!**

- ▶ Only modules with extended diagnostics are configured in the application example. It is possible to configure the modules and submodules with basic diagnostics.
- ▶ You will find the list of parameters that can be set for modules and submodules in the operating instructions for the bus module.
- ▶ The module MBM DIAGNOSE EXTENDED is automatically inserted in slot 2. It can be replaced with the module MBM DIAGNOSE BASIC.

## 9. Assigning PROFINET device names to the bus module MBM

1. Open the device view and select the bus module MBM. Use *Assign device name*.

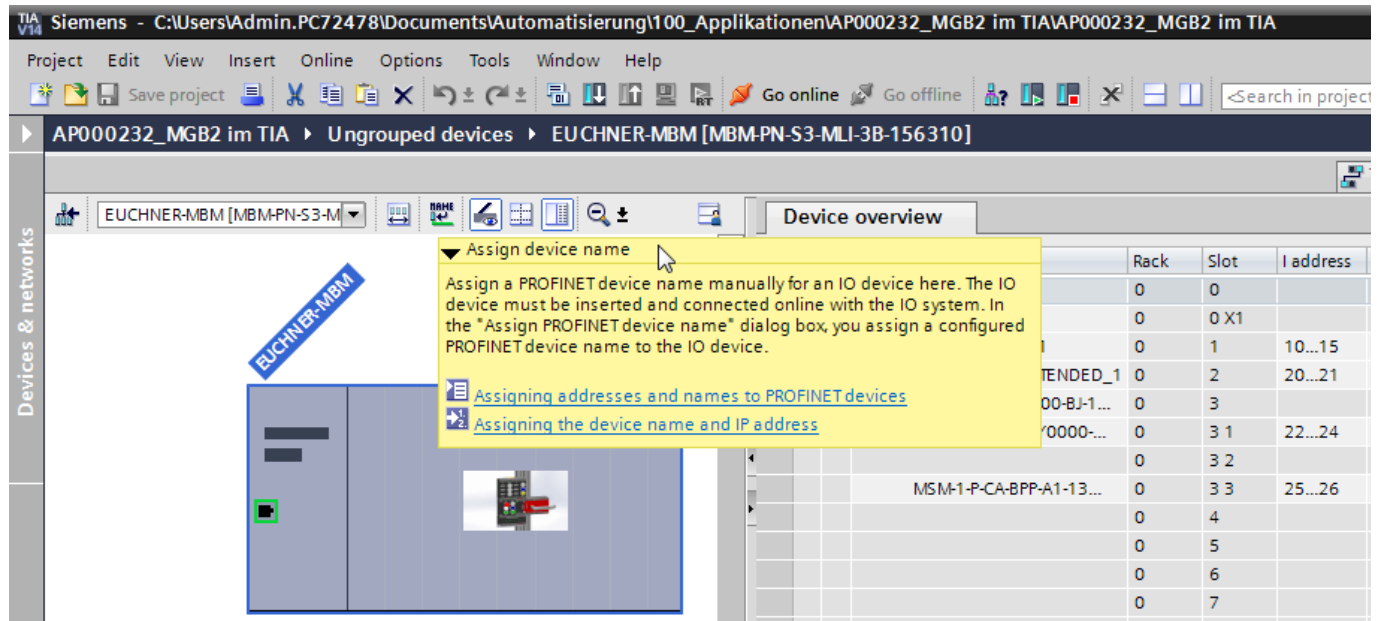


Figure 9: Device view

2. Use *Update list* to display all devices of the same type. Compare the MAC address on the type label with the MAC address of the subscriber available in the network and assign the PROFINET name to the MAC address using *Assign name*.

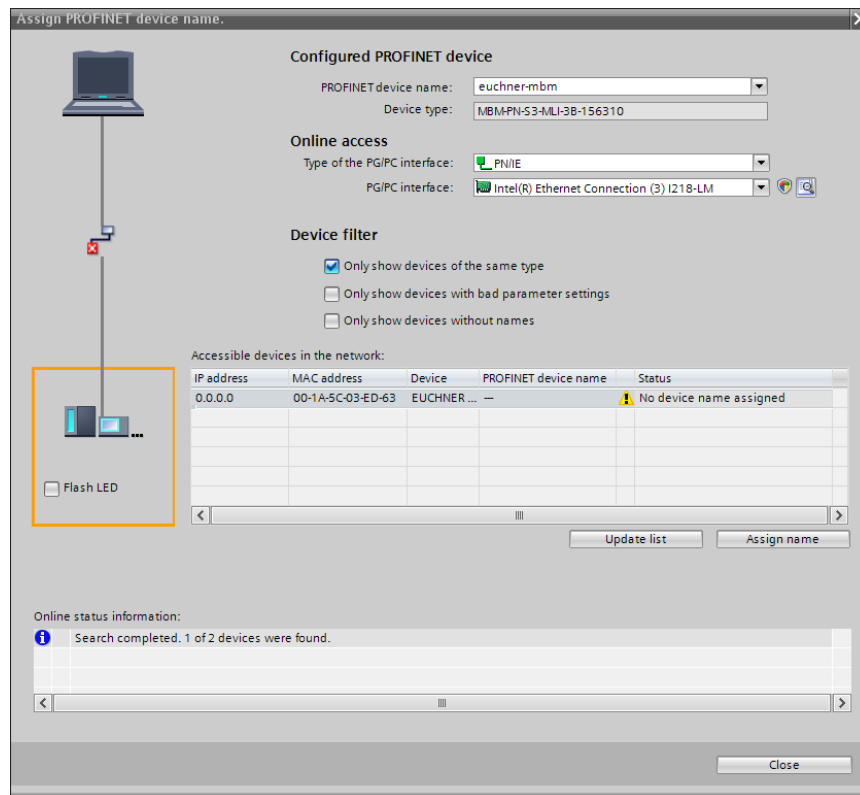


Figure 10: Assigning device name

TIP: As an alternative to the MAC address comparison, you can see from the *Flash LED* whether you have selected the correct subscriber.

## 10. Using the TIA Portal library (from TIA V14 SP1)

In the library you will find the templates for the hardware configuration of MGB2 Modular sets as well as UDTs (PLC data types) to make the configuration of the MGB easier.

Open the page with the MGB2 applications in the download area at [www.euchner.com](http://www.euchner.com) and download the library for the MGB2 Modular.

### 10.1. Retrieving the library

1. Change to the Task Card view (shortcut: *Ctrl+3*) and select *Libraries*.
2. Open the context menu with a right click on the *Global libraries* area and select *Retrieve library...*. Select the folder with the library downloaded and retrieve it to the required destination folder. On retrieving the library using TIA Portal V15, the library is updated because it was prepared using TIA Portal V14 SP1.

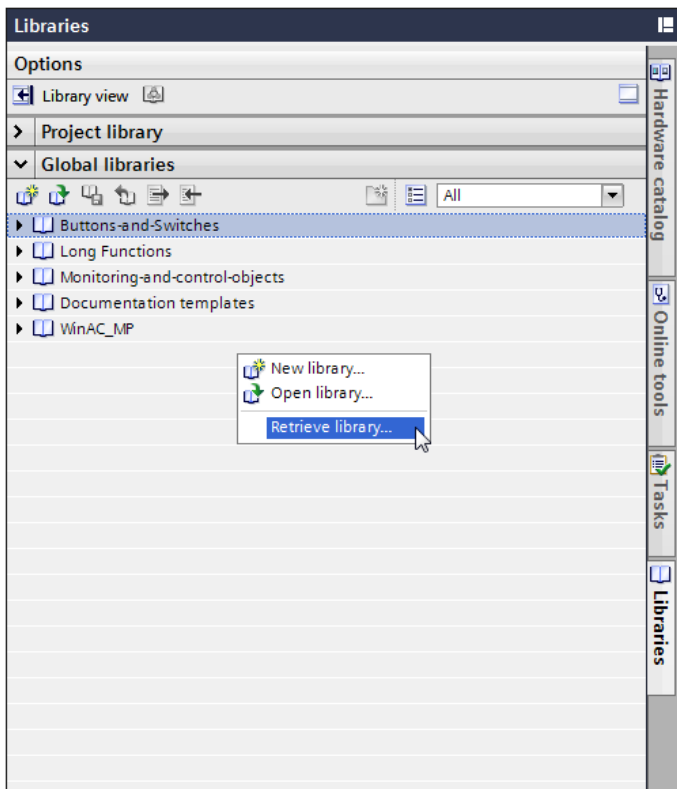


Figure 11: Retrieving library

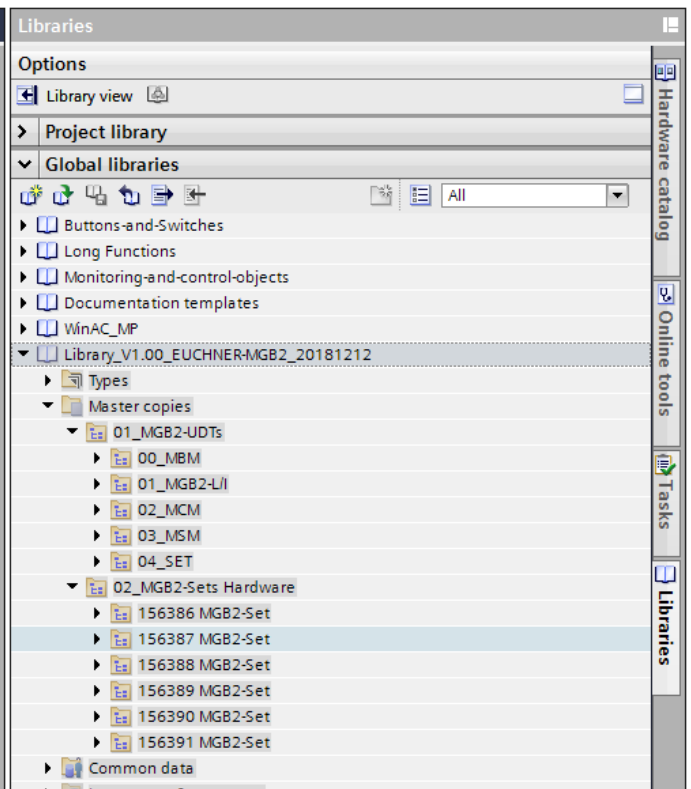


Figure 12: Opened library

TIP: If the library has already been retrieved, select *Open library...* to add the library to the project.

## 10.2. Using the UDTs for the MGB2 Modular

The UDTs are data structures defined by the user that can be used more than once in the program. The UDTs in the library are used as a template for preparing structured PLC tags (source: SIEMENS TIA Portal information system)

1. Open the library and copy the required UDTs to the folder *PLC data types* in the project navigation.

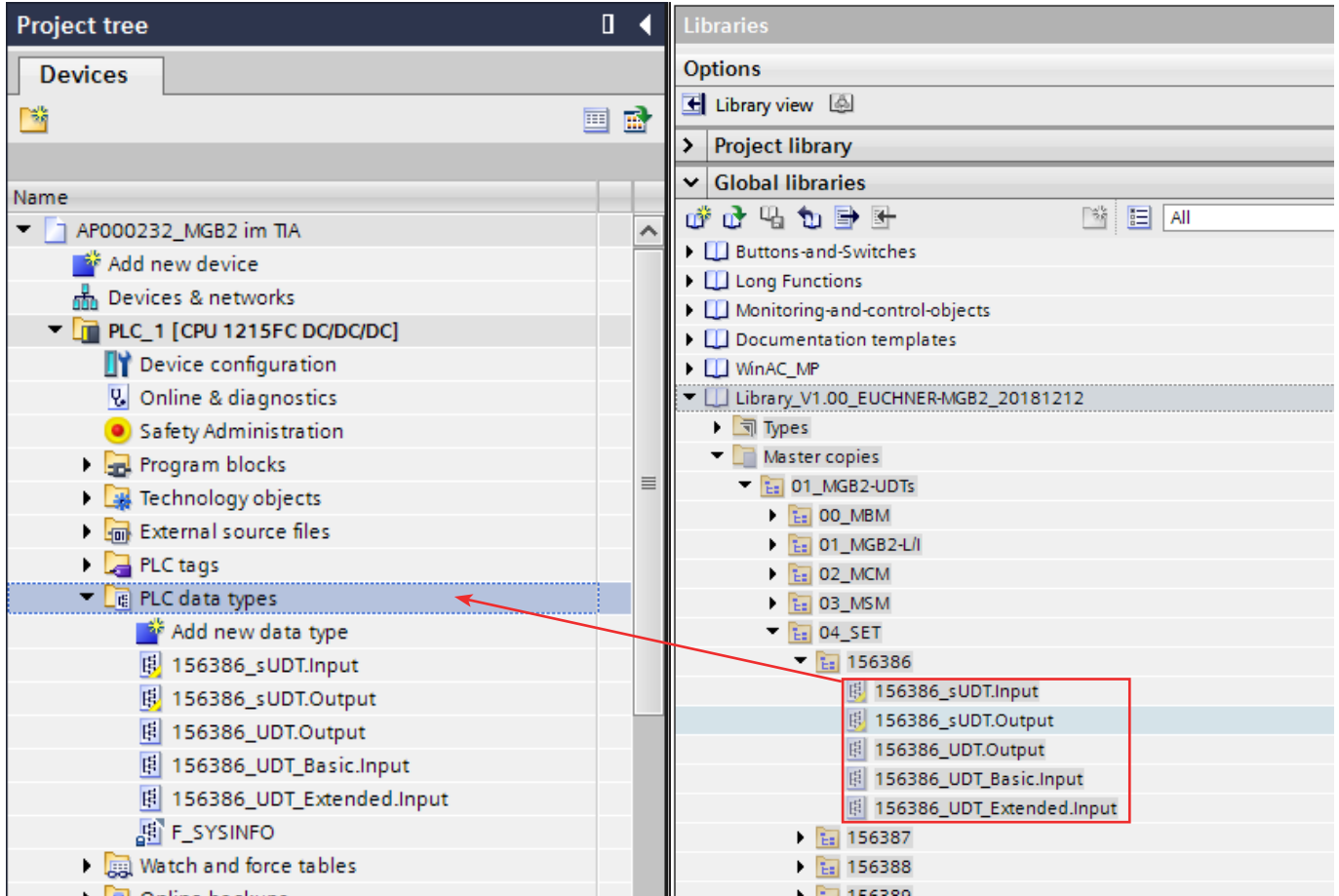


Figure 13: Copying UDTs to PLC-Datentypen (PLC data types)

2. Then the UDTs are assigned to the input and output areas in a PLC tag table.

Example tag declaration:

- › Assign tag names
- › Select UDT as data type
- › Select addressing for the hardware configuration

Name	Data type	Address
MGB2.Safety.Input	156386_sUDT.Input	I10.0
MGB2.Safety.Output	156386_sUDT.Output	Q10.0
MGB2.Input	156386_UDT_Extended.Input	I20.0
MGB2.Output	156386_UDT.Output	Q20.0

Table 2: Assigning I/O addresses

AP000232\_MGB2 im TIA ▶ PLC\_1 [CPU 1215FC DC/DC/DC] ▶ PLC tags ▶ Standard-Variablen-tabelle [58]

Standard-Variablen-tabelle								
	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...	Comment
1	▶ MGB2.Safety.Input	*156386_sUDT.Input*	%I10.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	▶ MGB2.Safety.Output	*156386_sUDT.Output*	%Q10.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	▼ MGB2.Input	*156386_UDT_Extended.Input*	%I20.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	BM.D.RUN	Bool	%I20.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Bus module: Diagnostic runmode
5	BME_ML1	Bool	%I20.1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Bus module: Error MLI1
6	BME_ML2	Bool	%I20.2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Bus module: Error MLI2
7	NC3	Bool	%I20.3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
8	NC4	Bool	%I20.4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
9	BME_SYS	Bool	%I20.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Bus module: Error system
10	NC6	Bool	%I20.6		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
11	BME_G	Bool	%I20.7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Bus module: Error generally
12	BM.Diagnostic_Byte	Byte	%IB21		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Bus module: Diagnose Byte
13	LM.D.RUN	Bool	%I22.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Diagnostic runmode
14	LMI_SK	Bool	%I22.1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Input SK
15	LMI_UK	Bool	%I22.2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Input UK
16	NC12	Bool	%I22.3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
17	LME_SM0	Bool	%I22.4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Error Sub module 0
18	LME_SM1	Bool	%I22.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Error Sub module 1
19	LME_ER	Bool	%I22.6		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Error escape release
20	LME_G	Bool	%I22.7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Error generally
21	LMI_OD	Bool	%I23.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Door position
22	LMI_OT	Bool	%I23.1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Tongue position
23	LMI_OL	Bool	%I23.2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Locking position
24	NC20	Bool	%I23.3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
25	NC21	Bool	%I23.4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
26	NC22	Bool	%I23.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
27	NC23	Bool	%I23.6		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
28	NC24	Bool	%I23.7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
29	LM.Diagnostic_Byte	Byte	%IB24		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Locking module: Diagnose Byte
30	SML_S1	Bool	%I25.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sub modul: Input S1
31	SML_S2	Bool	%I25.1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sub modul: Input S2
32	SML_S3	Bool	%I25.2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sub modul: Input S3
33	NC29	Bool	%I25.3		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
34	NC30	Bool	%I25.4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
35	SME_S1	Bool	%I25.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sub modul: Error S1
36	NC32	Bool	%I25.6		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
37	NC33	Bool	%I25.7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
38	SM.Diagnostic_Byte	Byte	%IB26		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sub modul: Diagnose Byte
39	▶ MGB2.Output	*156386_UDT.Output*	%Q20.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Figure 14: Assigning I/O addresses in the tag table



**IMPORTANT!**

For the UDTs in the MGB2 Modular set, the addressing of the input and output areas for the modules/submodules must be contiguous (e.g. IB20...26, QB20...22) because otherwise the structural assignment will not match the input/output signals. If the addressing is not contiguous, you can also use the UDTs for the modules and submodules separately. Simply copy them from the folder *01\_MGB2-UDTs* in the library to the folder *PLC data types* and assign the corresponding module I/O area in the tag table.



## 11. Creating the safety program

The F-runtime group, the FB and the associated DB are generated automatically in TIA Portal V14 SP1. As soon as the program is compiled, a safety program consistency check is performed



### NOTICE

There must be at least one call for an MBM safety bit in the safe part of the program to prevent the device from being passivated!

### 11.1. Example safety program

In the following example the safe output (F-DO/Q406.0) on the ET200SP is controlled by the bit LM.FI\_UK. The conditions for the bit LM.FI\_UK are met if the door is closed, the bolt tongue is in the locking module and the guard locking is active.

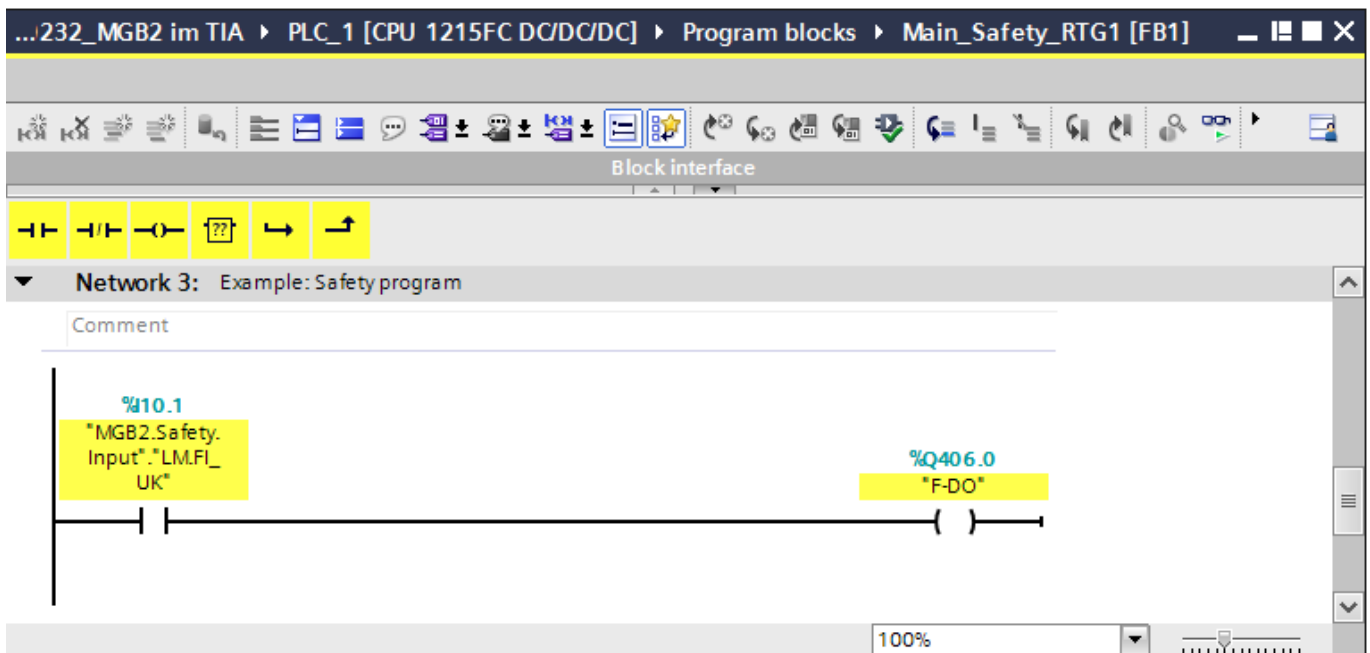


Figure 15: Safety program

## 11.2. Example for the reintegration of the MBM F-I/O:

In the following example two ways are shown using which the MBM can be consciously reintegrated as an F-I/O if there is a fault.

### 11.2.1. Reintegration of the MBM F-I/O channel:

A related F-I/O DB is created automatically on using the MBM PROFIsafe modules. The name of the DB can vary between configurations because it is generated by TIA Portal depending on the I/Q byte used. If the MBM is passivated, the bit "ACK\_REQ" (Acknowledgment Request) of the DB generated is set (=TRUE). For reintegration the bit "ACK\_REI" (Acknowledgment for Reintegration) must be set (=TRUE).

	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Comment
1	Input								
2	PASS_ON	Bool	false	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1=Enable passivation
3	ACK_NEC	Bool	true	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1=Acknowledgment for reintegration re
4	ACK_REI	Bool	false	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1=Acknowledgment for reintegration
5	IPAR_EN	Bool	false	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Tag for parameter reassignment of fail-s
6	Output								
7	PASS_OUT	Bool	true	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Passivation output
8	QBAD	Bool	true	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1=Fail-safe values are output
9	ACK_REQ	Bool	false	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1=Acknowledgment requirement for rei
10	IPAR_OK	Bool	false	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Tag for parameter reassignment of fail-s
11	DIAG	Byte	16#0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Non-fail-safe service information
12	InOut								
13	Static								

Figure 16: Declaration table, F-I/O DB

In the following figure, on the occurrence of passivation the MBM is consciously reintegrated using the Start\_reintegration input. Sequence: if, e.g. a communication error has occurred between the PLC and the MBM, the MBM is passivated. As soon as the error has been rectified, the passivation of the MBM is indicated using the POWER/FC LED (flashes) and the bit ACK\_REQ is set (=TRUE). When the non-safe input "Start\_reintegration (I411.0)" = TRUE on the ET200SP, the condition becomes valid and the MBM is reintegrated using the output ACK\_REI.

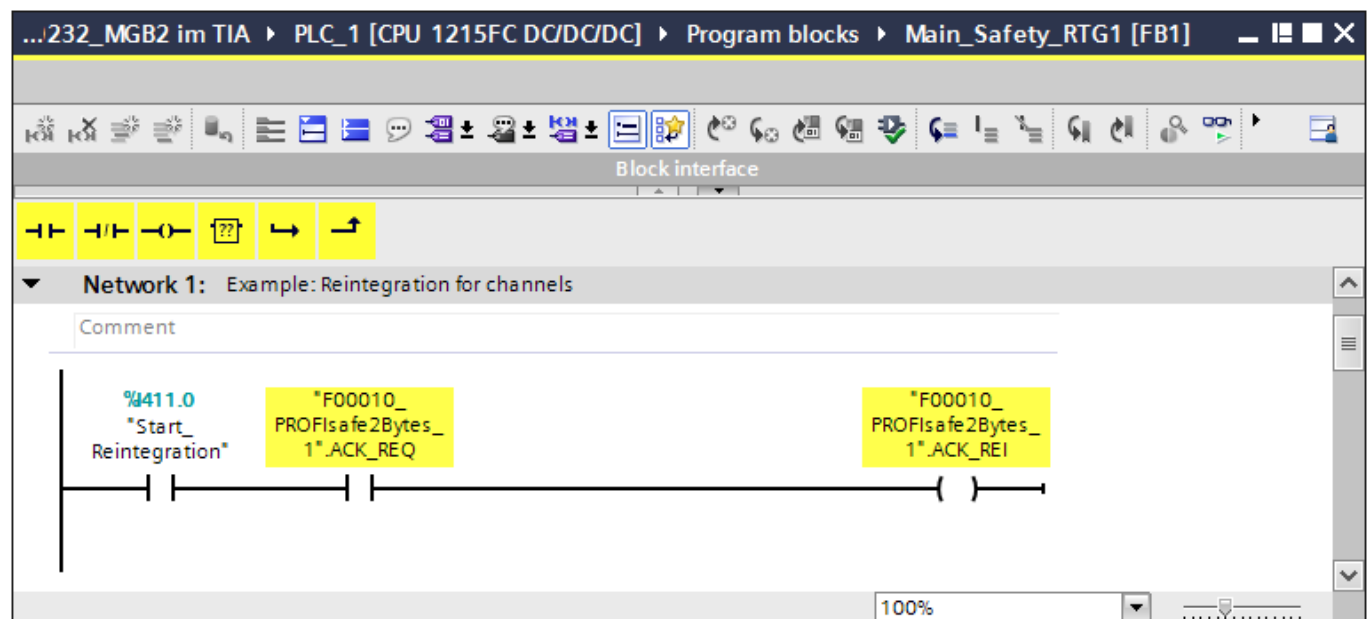


Figure 17: Reintegration for channels

## 11.2.2. Explanations ACK\_REQ and ACK\_REI

### ACK\_REQ:

When the F-system detects a communication error or an F-I/O fault or channel fault for an F-I/O, the relevant F-I/O or individual channels of the F-I/O are passivated. ACK\_REQ = 1 signals that user acknowledgment is required for reintegration of the relevant F-I/O or channels of the F-I/O. The F-system sets ACK\_REQ = 1 as soon as the fault has been eliminated and user acknowledgment is possible. For channel-granular passivation, the F-system sets ACK\_REQ = 1 as soon as the channel fault is corrected. User acknowledgment is possible for this fault. Once acknowledgment has occurred, the F-system resets ACK\_REQ to 0.

#### Notice:

For F-I/O with outputs, acknowledgment after F-I/O or channel faults may only be possible some minutes after the fault has been eliminated, until the necessary test signal is applied (see F-I/O manuals).

### ACK\_REI:

When the F-system detects a communication error or an F-I/O fault for an F-I/O, the relevant F-I/O is passivated. If channel faults are detected and channel-granular passivation is configured, the relevant channels are passivated. If passivation of the entire F-I/O is configured, all channels of the relevant F-I/O are passivated. Reintegration of the F-I/O/channels of the F-I/O after elimination of faults requires a user acknowledgment with a positive edge at the ACK\_REI tag of the F-I/O DB:

- After every communication error
- After F-I/O or channel faults only with parameter assignment "Channel failure acknowledge = Manually" or ACK\_NEC = 1

Reintegration after channel faults reintegrates all channels whose faults were eliminated.

Acknowledgment is not possible until tag ACK\_REQ = 1.

In your safety program, you must provide a user acknowledgment by means of the ACK\_REI tag for each F-I/O.

### ⚠ WARNING:

For the user acknowledgment, you must interconnect the ACK\_REI tag of the F-I/O DB with a signal generated by an operator input. An interconnection with an automatically generated signal is not permitted. (S011)

Table 3: Source: SIEMENS TIA Portal information system

## 11.2.3. Global reintegration of all F-I/Os using the SIEMENS instruction "ACK\_GL":

If you use the instruction ACK\_GL, you do not have to provide a user acknowledgment for each F-I/O of the F-runtime group via the ACK\_REI tag of the F-I/O DB. In the following example the global reintegration is consciously undertaken using the input *Start\_reintegration* (I411.0).

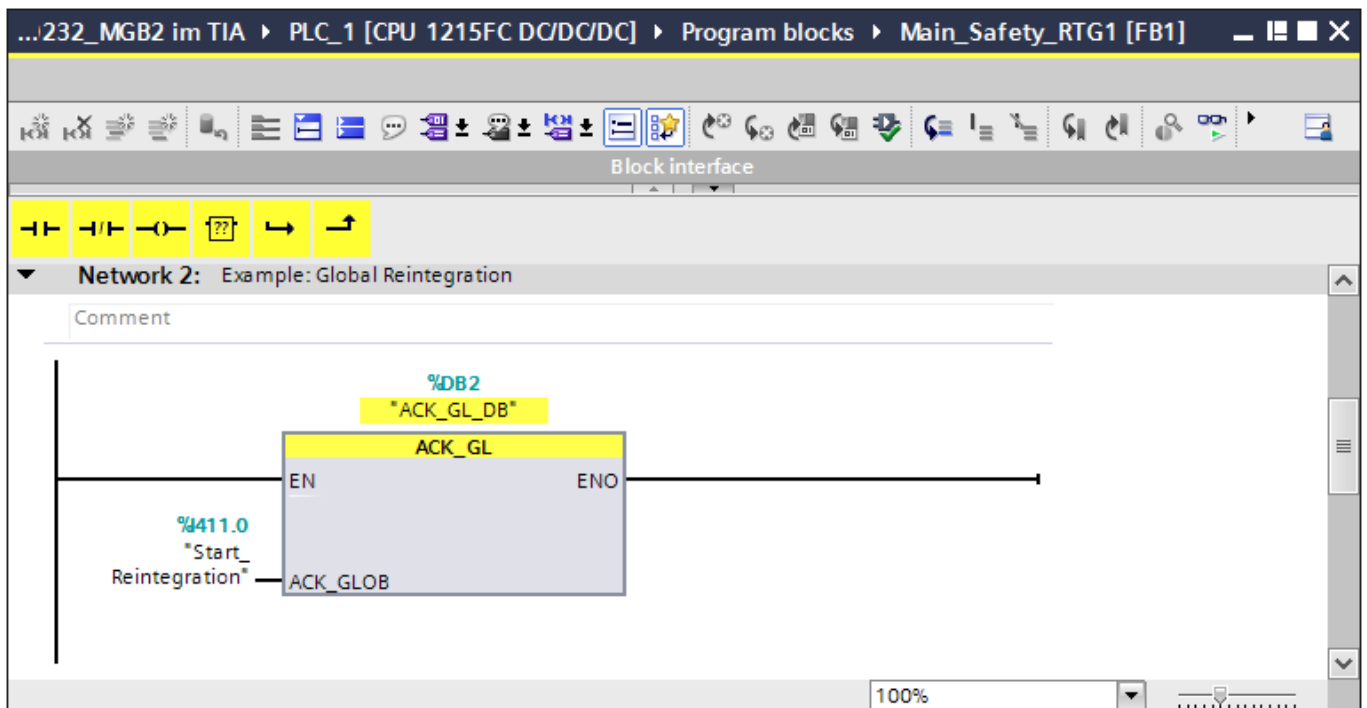


Figure 18: Global reintegration

### 11.2.4. Explanation ACK\_GL

#### ACK\_GL:

This instruction creates an acknowledgment for the simultaneous reintegration of all F-I/O or channels of the F-I/O of an F-runtime group after communication errors, F-I/O errors, or channel faults.

A user acknowledgment with a positive edge at input ACK\_GLOB is required for reintegration. The acknowledgment occurs analogously to the user acknowledgment via the ACK\_REI tag of the F-I/O DB, but it acts simultaneously on all F-I/O of the F-runtime group in which the instruction is called.

If you use the instruction ACK\_GL, you do not have to provide a user acknowledgment for each F-I/O of the F-runtime group via the ACK\_REI tag of the F-I/O DB.

Every call of the "Global acknowledgment of all F-I/O of a runtime group" instruction must be assigned a data area in which the instruction data are stored. The "Call options" dialog is automatically opened when the instruction is inserted in the program for this reason. There you can create a data block (single instance) (e.g., ACK\_GL\_DB\_1) or a multi-instance (e.g., ACK\_GL\_Instance\_1) for the "Global acknowledgment of all F-I/O of a runtime group" instruction. Once it is created, you can find the new data block in the project tree in the "STEP 7 Safety" folder under "Program blocks > System blocks" or the multi-instance as a local tag in the "Static" section of the block interface. For more information, refer to the help on STEP 7.

Enable input "EN" and enable output "ENO" cannot be connected. The instruction is therefore always executed (regardless of the signal state at enable input "EN").



#### NOTICE

An acknowledgment via the ACK\_GL instruction is only possible if the tag ACK\_REI of the F-I/O DB = 0. Accordingly, an acknowledgment via the tag ACK\_REI of the F-I/O DB is only possible if the input ACK\_GLOB of the instruction = 0.

The instruction is only allowed to be called once per F-runtime group.

Table 4: Source: SIEMENS TIA Portal information system

## 12. 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 example provided 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 danger zone and the software within the safety evaluation must also be considered, for example.

The applications provided 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.**

According to the Machinery Directive 2006/42/EC, the design engineer of a machine or installation has the obligation to perform a risk assessment and take measures to reduce the risk. While doing this, the engineer must comply with the applicable national and international safety 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 an 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.

In particular in relation to a fault exclusion, it must be noted that a fault can only be excluded by the machine's or installation's design engineer and this action requires justification. A 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.

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Edition:  
AP000232-01-06/18  
Title:  
Application MGB2  
Integration of MGB2 into TIA Portal V13/V14/V15

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