EUCHNER

Application

Connection of ESM-CB-AZ-FI2-BR-IO-158875 to SIEMENS I/O-Link master

EN

From V1.02

Contents

1. About this document

1.1. Version

Version	Date	Change/addition	Chapter
01-07/19	7/4/2019	Prepared	All

1.2. Scope

The purpose of this document is the integration and configuration of the ESM-CB-AZ-FI2-BR-IO-158875 in a SIEMENS I/O-Link master using 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 (2510145)	Operating instructions for non-contact safety switch CES-I-BR-.-C07-... (Unicode/Multicode)	www
Safety Information and Maintenance Safety Switch CES-AP/CES-AR/CES-BR (2500232)	Basic information for safe setup and service	
Operating Instructions (2522722)	Operating instructions for safety module ESM-CB-AZ-FI2-BR-IO-158875	www
Safety Information and Maintenance Safety Module ESM-CB-AZ (2522723)	Basic information for safe setup and service	
Possibly enclosed data sheets	Item-specific information about deviations or additions	

1.5. Notice

This application is based on the operating instructions for the safety module ESM-CB-AZ-FI2-BR-IO-158875. Please refer to the operating instructions for technical details and other information.

EN

2. Components/modules used

2.1. EUCHNER

Description	Order number / item number
Safety module	158875 / ESM-CB-AZ-FI2-BR-IO-158875
Emergency stop	105017 / ES-FB1W-XW1E-BV412MFR-YO
	105018 / ES-FB1W-XW1E-LV412Q4MFR-YO
Safety switch with transponder technology	157920 / CES-I-BR-U-C07-SA-157920
	156233 / CES-I-BR-M-C07-SA-156233

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.

2.2. Others

Description	Order number / item number
SIMATIC S7-1215 FC DC/DC/DC	6ES7 215-1AF40-0XB0
SIMATIC S7-1200, SM1278 IO-Link	6ES7 278-4BD32-0XB0

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
SIMATIC S7-PCT	Version 3.5 release 305.1.110.1

3. Functional description

In this application, the ESM-CB-AZ-FI2-BR-IO-158875 is used to transfer the process data and asynchronous data from the switches connected to a control system. The data are transferred via an IO-Link master to the control system and processed. The asynchronous communication data are processed with the aid of the Siemens IO-Link block library with the entry ID: 82981502 that can be downloaded from https://support.industry.siemens.com.

4. Overview of the connections

4.1. ESM-CB-AZ-..

Designation	Function	Use in this example
A1/A2	Power supply	A1: connection to DC 24 V; A2: connection to ground, DC 0 V
C/Q	IO-Link switching and communication line	Communication connection to IO-Link Master C/Q1
L+/L-	IO-Link supply	Power supply connection from the IO-Link MASTER. L+: IO-Link Master L1 connection; L-: IO-Link Master M1 connection
ID/C	Safety switch diagnostic input	Input for the communication data from the switch or the BR switch chain.
OM	Digital monitoring output	Not used in this example
S10	Supply input for S14	Connection, emergency stop channel 2
S14	Sensor circuit S1 input (channel 2)	
S11	Supply output for S12 and S21	Connection, emergency stop channel 1
S12	Sensor circuit S1 input (channel 1)	
S32	OSSD sensor circuit S2 input (channel 1), input for FO1A from BR series connection	Connection of the safety outputs from the switch or the BR switch chain.
S34	OSSD sensor circuit S2 input (channel 2), input for FO1B from BR series connection	
S21	Input for start circuit	Connection to S12 for automatic start function
13-14	Safety contact	Enable path Not used in this example.
23-24	Safety contact	

EN

5. Basic circuit diagram

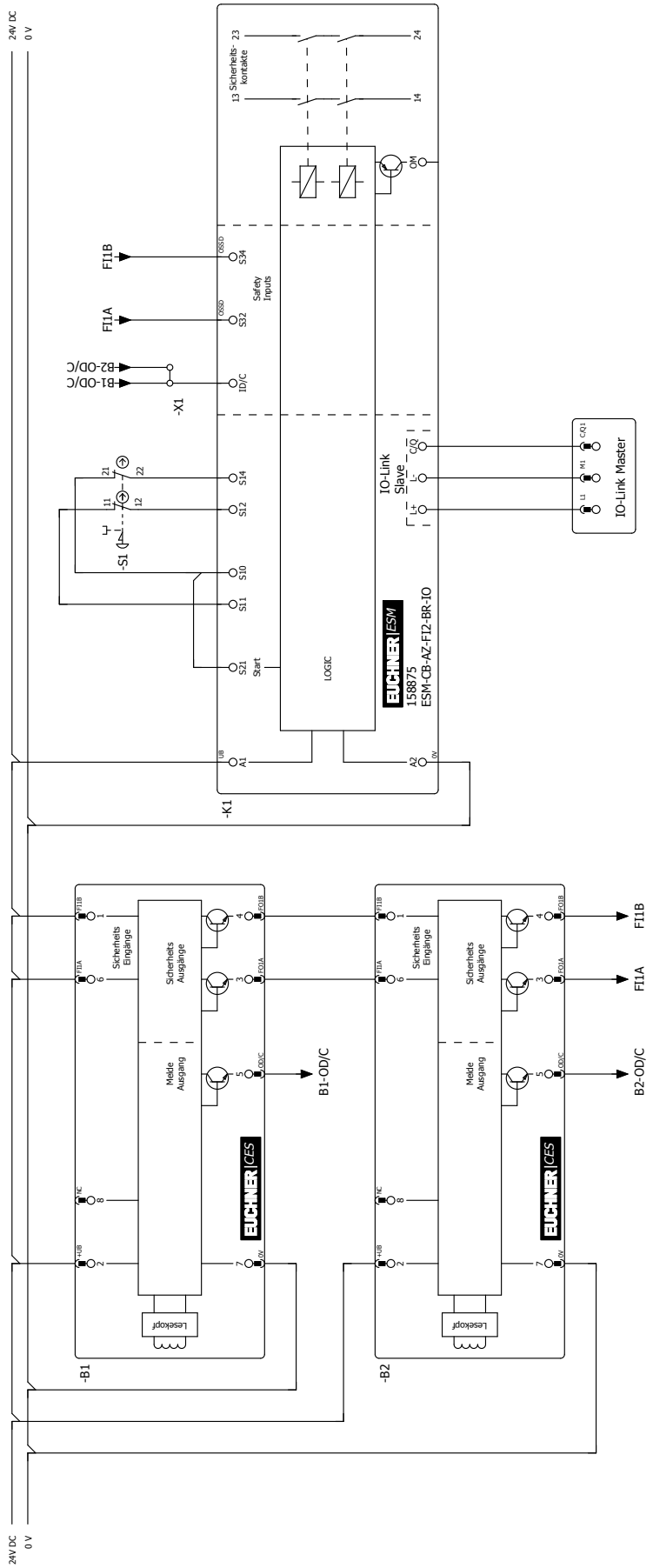


Figure 1: Connection of safety module ESM-CB-AZ-.. to SIEMENS I/O-Link master

6. Configuration of the ESM-CB-AZ-. in the SIEMENS PCT tool

6.1. Installing the IODD file

Depending on the number and type of safety switches used, you need the related device description file in IODD format to integrate the ESM-CB-AZ-FI2-BR-IO-158875 into the SIEMENS I/O-Link master:

IODD	Quantity of input process data (bytes)	Quantity of output process data (bytes)
Euchner-ESM_CB_158857_6x1-20181116-IODD1.1.xml	6	1
Euchner-ESM_CB_158857_11x1-20181116-IODD1.1.xml	11	1
Euchner-ESM_CB_158857_11x6-20181116-IODD1.1.xml	11	6
Euchner-ESM_CB_158857_21x1-20181116-IODD1.1.xml	21	1
Euchner-ESM_CB_158857_21x11-20181116-IODD1.1.xml	21	11
Euchner-ESM_CB_158857_31x16-20181116-IODD1.1.xml	31	16

You will find the IODD files in the download area at www.euchner.com. Always use the latest IODD file.

Proceed as follows to install the IODD file:

1. Start the PCT Device Tool in the Device view in TIA Portal by right-clicking the IO-Link master.

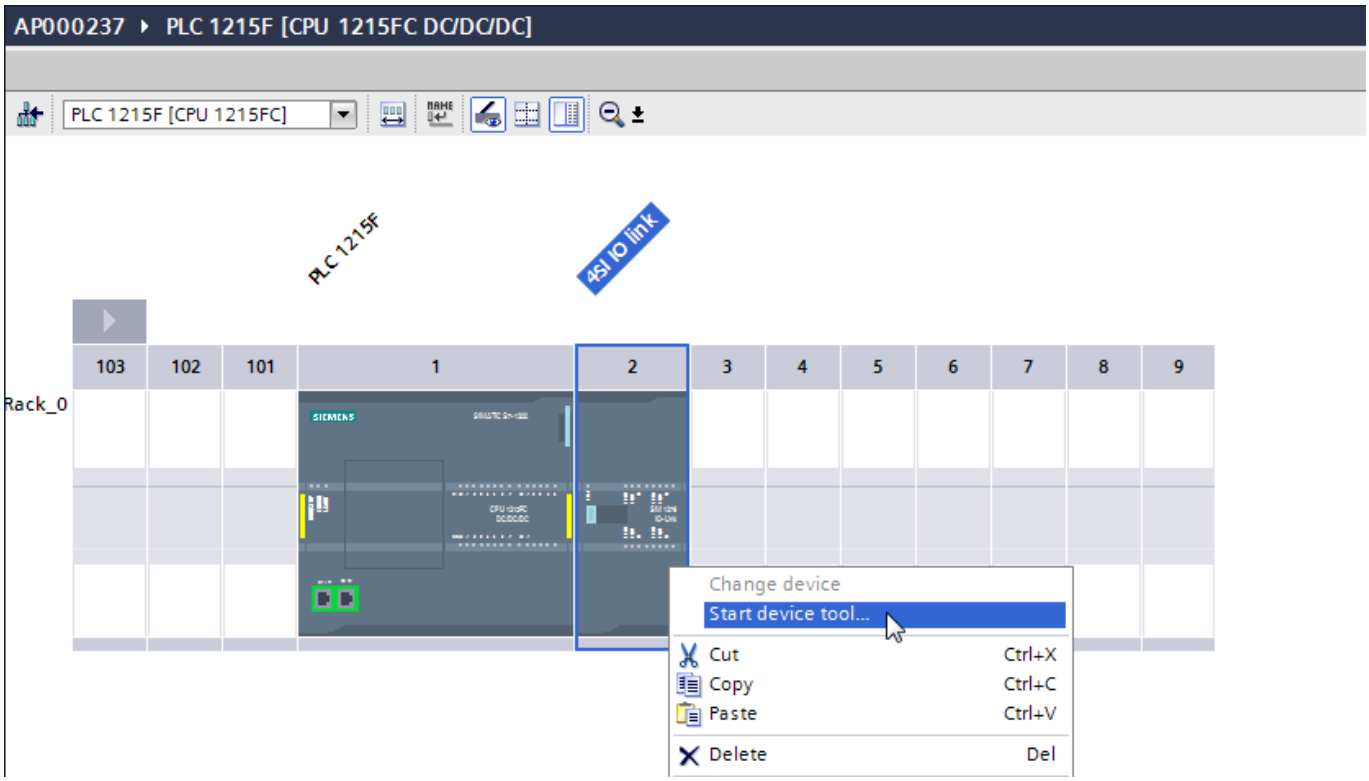


Figure 2: Starting PCT Device Tool

EN

2. Click *Tools* (Extras) and select *Import IODD...* .

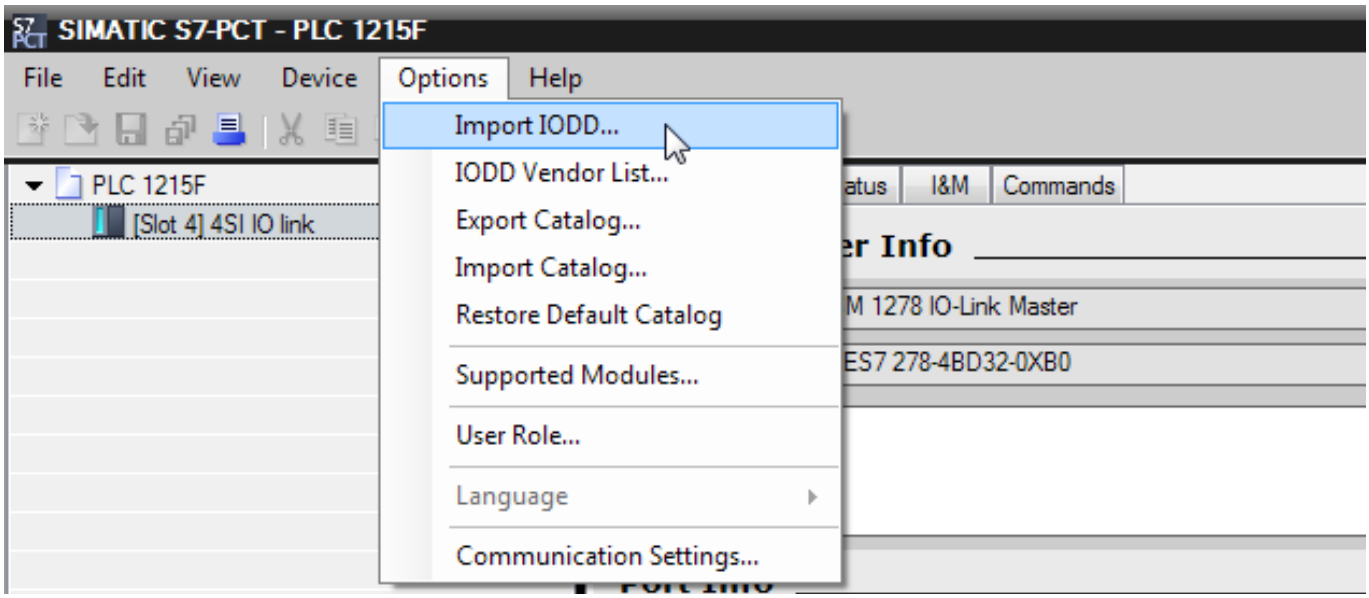


Figure 3: Importing PCT Tool IODD

3. Select the IODD source folder and import the IODD.

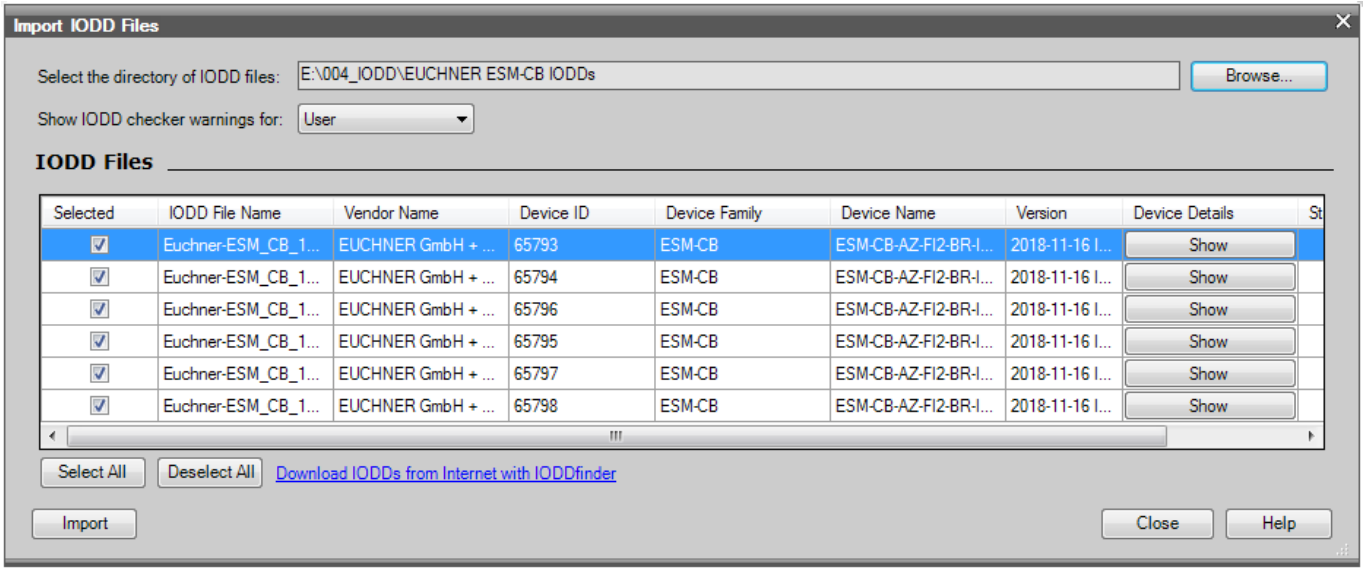


Figure 4: IODD import

6.2. Integration of ESM-CB-AZ-.

Select the ESM-CB-AZ-FI2-BR-IO-158875 from the IO-Link catalog and, using drag & drop, add to the corresponding port to suit the wiring. Then configure the Test severity and Backup level parameters.

Parameter: Test severity (Prüfschärfe)	
No check (Keine Prüfung)	There is no check as to whether the device connected corresponds to the device configured.
Type compatible (Typkompatibel) [factory setting]	The IO-Link master checks whether the device connected can provide the functionality of the device configured. If not, the device connected is marked as an incorrect device.

Parameter: Backup Level	
None (Keine)	The data backup mechanism is deactivated and the parameter record saved for this port is deleted.
Backup & Restore [factory setting]	The data backup mechanism can write data to the device connected and read data from the device connected.
Restore	The data backup mechanism can write data to the device connected.

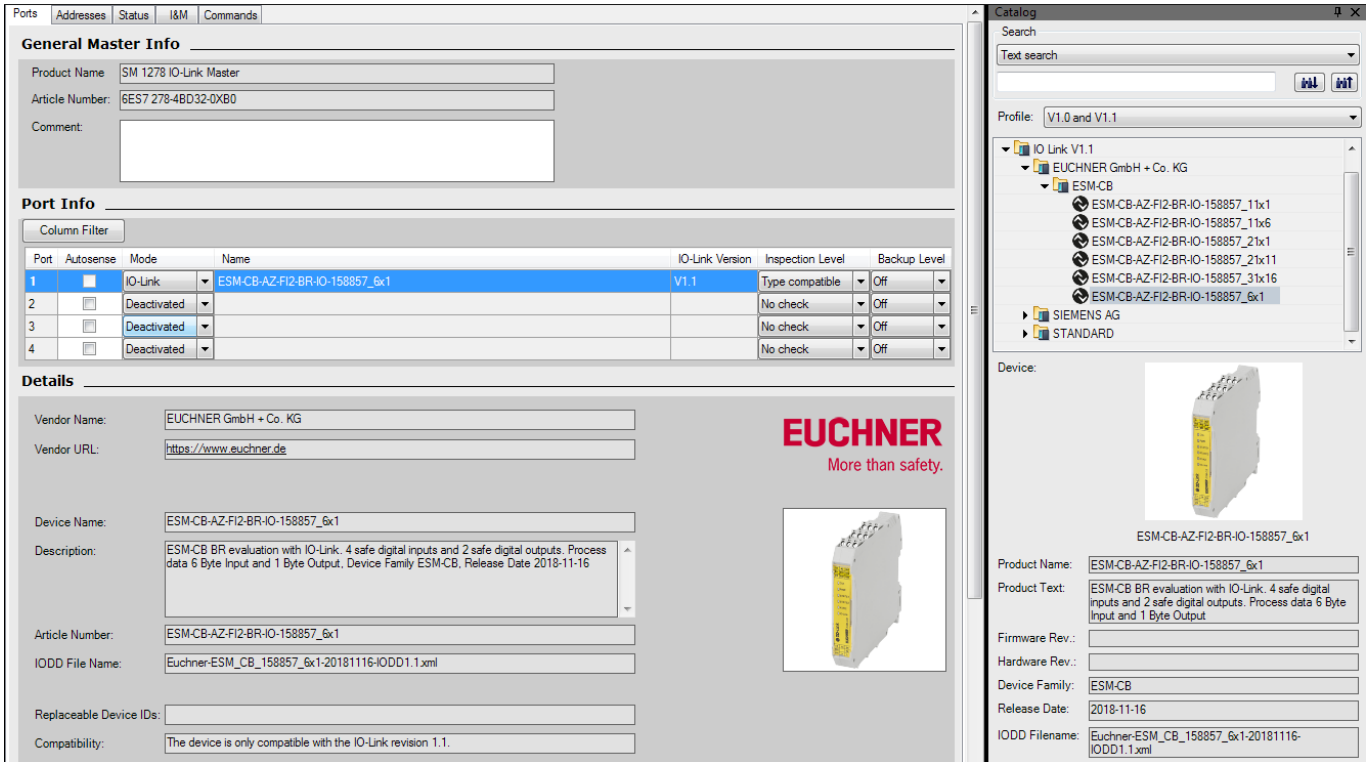


Figure 5: PCT port information

6.3. Loading configuration into the IO-Link master

Once configuration is complete, the data record must be written to the IO-Link master. For this purpose click *Load with devices* in the target system.

EN

7. Reading the cyclic process data

The process data for the ESM-CB-AZ-FI2-BR-IO-158875 and the switch connected are written directly to the control system input area configured.

‣ Example process data for the ESM and two safety switches CES-I-BR-.-C07-.. connected in series

Input byte	Device	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100	ESM-BA	DIA3	DIA2	DIA1	DIA0	OQ	OM	S2	S1
101	Switch #1	OI	-	-	OR	OM	-	OW	OD
102	Switch #2	OI	-	-	OR	OM	-	OW	OD

Output byte	Device	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100	ESM-BA	-	-	-	-	-	-	Chain reset	Enable signal

TIP

The abbreviations used are explained in the operating instructions for the products used.

AP000237 ‣ PLC_1 [CPU 1215FC DC/DC/DC] ‣ Watch and force tables ‣ AP000237

		Name	Address	Display format	Monitor value
1		"ESM-CB.IN".xS1	%I100.0	Bool	TRUE
2		"ESM-CB.IN".xS2	%I100.1	Bool	TRUE
3		"ESM-CB.IN".xOM	%I100.2	Bool	TRUE
4		"ESM-CB.IN".xOQ	%I100.3	Bool	FALSE
5		"ESM-CB.IN".xDIA0	%I100.4	Bool	FALSE
6		"ESM-CB.IN".xDIA1	%I100.5	Bool	FALSE
7		"ESM-CB.IN".xDIA2	%I100.6	Bool	FALSE
8		"ESM-CB.IN".xDIA3	%I100.7	Bool	FALSE
9	// ESM-CB Output				
10		"ESM-CB.OUT".xEnable	%Q100.0	Bool	TRUE
11		"ESM-CB.OUT"."xChain-reset"	%Q100.1	Bool	FALSE
12	// Sensor 1 Input				
13		"Sensor1.IN".xOD	%I101.0	Bool	TRUE
14		"Sensor1.IN".xOW	%I101.1	Bool	FALSE
15		"Sensor1.IN".xOM	%I101.3	Bool	TRUE
16		"Sensor1.IN".xOR	%I101.4	Bool	TRUE
17		"Sensor1.IN".xOI	%I101.7	Bool	FALSE
18	// Sensor 2 Input				
19		"Sensor2.IN".xOD	%I102.0	Bool	TRUE
20		"Sensor2.IN".xOW	%I102.1	Bool	FALSE
21		"Sensor2.IN".xOM	%I102.3	Bool	TRUE
22		"Sensor2.IN".xOR	%I102.4	Bool	TRUE
23		"Sensor2.IN".xOI	%I102.7	Bool	FALSE

Figure 6: Watch and force table , cyclic process data ESM-CB-.-158875/CES-C07

8. Reading the acyclic data

In addition to the cyclic process data, the acyclic data from the ESM-CB-AZ-FI2-BR-IO-158875 and the switches or switch chain connected can also be read via the IO-Link master. The acyclic data are requested by writing corresponding command bytes and then read from the ESM-CB-AZ-FI2-BR-IO-158875 with the aid of the Siemens IO-Link library "Acyclic read and write" .

8.1. Indexing of the switches (devices) for acyclic data communication

Acyclic data, such as device parameters or events, are exchanged via a defined index and subindex range. The control system accesses the data via system mechanisms (e.g. for online functions such as reading the status). Using the index and subindex range it is possible to access specific device data (e.g. for changing the device or master parameter configuration in operation). (Source: IO-Link_Systembeschreibung_d_2013)

8.1.1. Reading service, index 16 ... 23

The manufacturer-specific data in the ESM-CB-AZ-FI2-BR-IO-158875 (e.g. manufacturer, product ID) are saved in indices 16...23. The data you can obtain from the ESM-CB-AZ-FI2-BR-IO-158875 are listed in the table below.

Index dec (hex)	Subindex dec (hex)	Type	Description	Example from the data read
16 (10)	0 (0)	String	Manufacturer	'EUCHNER GmbH+Co.KG'
17 (11)	0 (0)	String	Manufacturer's text	'EUCHNER - More than safety'
18 (12)	0 (0)	String	Product name	'ESM-CB-AZ-FI2-BR-IO-158875'
19 (13)	0 (0)	String	Product ID	'ESM-CB-AZ-FI2-BR-IO-158875'
20 (14)	0 (0)	String	Product text	'ESM-CB BR eval. unit, IO-Link, 2 safe inputs, 2 safe outputs'
21 (15)	0 (0)	String	Serial number	'1359541790'
22 (16)	0 (0)	String	Hardware version	'1.00'
23 (17)	0 (0)	String	Firmware version	'1.02'

8.1.2. Reading service, index 100

Three bytes are reserved in index 100 for all switches in the switch chain. These bytes contain the manufacturer's code, the size of the input process data and the size of the output process data.

Index dec (hex)	Subindex dec (hex)	Switch no.	Byte no.	Type	Description	Example from the data read
100 (64)	0 (0)	1	1	Byte	Manufacturer's code safety switch 1	01
			2	Byte	Size of input process data safety switch 1	01
			3	Byte	Size of output process data safety switch 1	00
		2	4	Byte	Manufacturer's code safety switch 2	01
			5	Byte	Size of input process data safety switch 2	01
			6	Byte	Size of output process data safety switch 2	00
		...		...	...	
		30	88	Byte	Manufacturer's code safety switch 30	00
			89	Byte	Size of input process data safety switch 30	00
			90	Byte	Size of output process data safety switch 30	00
		-	91	Byte	Number of safety switches	02

8.1.3. Reading service, index 101

The manufacturer's codes for the devices are saved in index 101

Index dec (hex)	Subindex dec (hex)	Switch no.	Byte no.	Type	Description	Example from the data read
101 (65)	0 (0)	1	1	Byte	Manufacturer's code safety switch 1	01
		2	2	Byte	Manufacturer's code safety switch 2	01
		...		...	...	
		30	30	Byte	Manufacturer's code safety switch 30	00
		-	31	Byte	Number of safety switches	02

8.1.4. Reading service, index 102

The size of the input process data for the devices is saved in index 102.

Index dec (hex)	Subindex dec (hex)	Switch no.	Byte no.	Type	Description	Example from the data read
102 (66)	0 (0)	1	1	Byte	Size of input process data safety switch 1	01
		2	2	Byte	Size of input process data safety switch 2	01
		...		...	...	
		30	30	Byte	Size of input process data safety switch 30	00
		-	31	Byte	Number of safety switches	02

8.1.5. Reading service, index 103

The size of the output process data for the devices is saved in index 103.

Index dec (hex)	Subindex dec (hex)	Switch no.	Byte no.	Type	Description	Example from the data read
103 (67)	0 (0)	1	1	Byte	Size of output process data safety switch 1	00
		2	2	Byte	Size of output process data safety switch 2	00
		...		...	...	
		30	30	Byte	Size of output process data safety switch 30	00
		-	31	Byte	Number of safety switches	02

8.1.6. Write/read service, index 201 ... 231

Using the indices 201 ... 231, information on the devices in the switch chain can be requested and read by sending a request command to the ESM-CB-AZ-FI2-BR-IO-158875.

Index dec (hex)	Subindex dec (hex)	Switch no.	Byte no.	Type	Description
201 (C9)	0 (0)	1	1	Byte	User data length for the telegram for safety switch 1
			2...8	Byte	User data for the telegram for safety switch 1
202 (CA)	0 (0)	2	1	Byte	User data length for the telegram for safety switch 2
			2...8	Byte	User data for the telegram for safety switch 2
...	...	...	...	...	...
231 (E7)	0 (0)	30	1	Byte	User data length for the telegram for safety switch 30
			2...8	Byte	User data for the telegram for safety switch 30

The user data to be written contain the data for the request command to the safety switch.

The telegram to be written/read consists of 8 bytes. The user data in the telegram must therefore be padded with 00.

NOTICE

You will find a description of the possible request commands in chapter 8.2.

Example:

Request telegram for order number/serial number (user data)

Request telegram: 01 02 00 00 00 00 00 00

Byte number	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Request telegram in hex	01	02	00	00	00	00	00	00
Description	User data length in bytes	Request command to the ESM-CB (order number/serial number)	Filled with zeros	Filled with zeros	Filled with zeros	Filled with zeros	Filled with zeros	Filled with zeros

Result obtained for the requested telegram

Result: 06 E0 68 02 17 01 00 00

Byte number	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Reply in hex	06	E0	68	02	17	01	00	00
Description	User data length in bytes	Order number LSB	Order number	Order number MSB	Serial number LSB	Serial number	Serial number MSB	Filled with zeros
Result	6 bytes	157920			279			-

8.2. Request commands ESM-CB-AZ-.

By sending a request command, the required data, e.g. the actual temperature (0x1A) of the required switch are requested and made available in the ESM-CB-AZ-. for reading. The reply data made available can vary in length (1-6 bytes).

Request command		Switch no.	Reply	
Dec	**Hex**	**Command**	**Number of bytes**	**Number of bytes**
2	2	Send order no. and serial no.	3 bytes for order no.	3 bytes for serial no.
3	3	Send device version	1 byte for letter V	4 bytes for version number, e.g. 1.0.1.0 (the periods are not sent)
18	12	Send current error code	1 byte for error code	
19	13	Send saved error code (history)	1 byte for error code. This error is no longer present.	
20	14	Send size of log file	1 byte for length of the current log file	
21	15	Send entry from log file with index. The required index must be sent in the second byte.	1 byte for error code	
22	16	Send current actuator code	5 bytes for code of the currently read actuator	
23	17	Send taught-in actuator code	For unicode evaluation: 5 bytes for code of the taught-in actuator in the switch For multicode evaluation: replies with 5x 0xFF	
24	18	Send disabled actuator code	For unicode evaluation: 5 bytes for code of the currently disabled actuator For multicode evaluation: replies with 5x 0xFF	
25	19	Send applied voltage	2 bytes for voltage value in mV	
26	1A	Send current temperature	1 byte for temperature value in °C	
27	1B	Send number of switching cycles	3 bytes for counter value	
29	1D	Reset device	1 byte for acknowledgment, value hex 1D	
30	1E	Factory-reset device	1 byte for acknowledgment, value hex 1E	

EN

9. Reading the acyclic communication data

TIP

You will find the IO-Link library *82981502_IO_LINK_Library_V5.1.zip* with entry ID: 82981502 at https://support.industry.siemens.com

9.1. Using the TIA Portal library

After you have downloaded the block library from Siemens, it is necessary to add this library to your project.

9.1.1. 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.

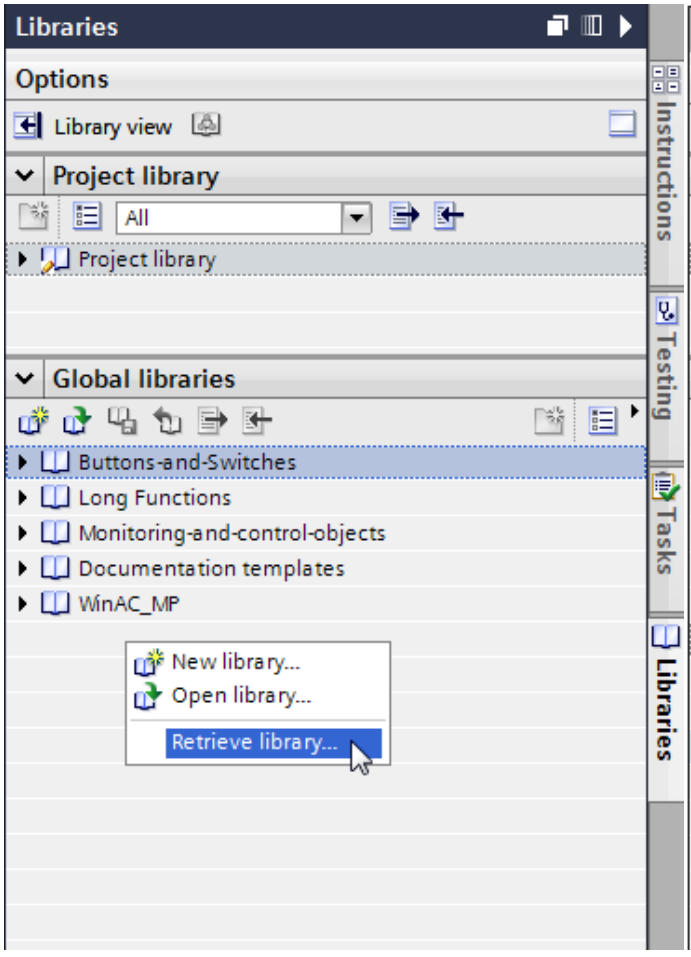


Figure 7: Retrieving library

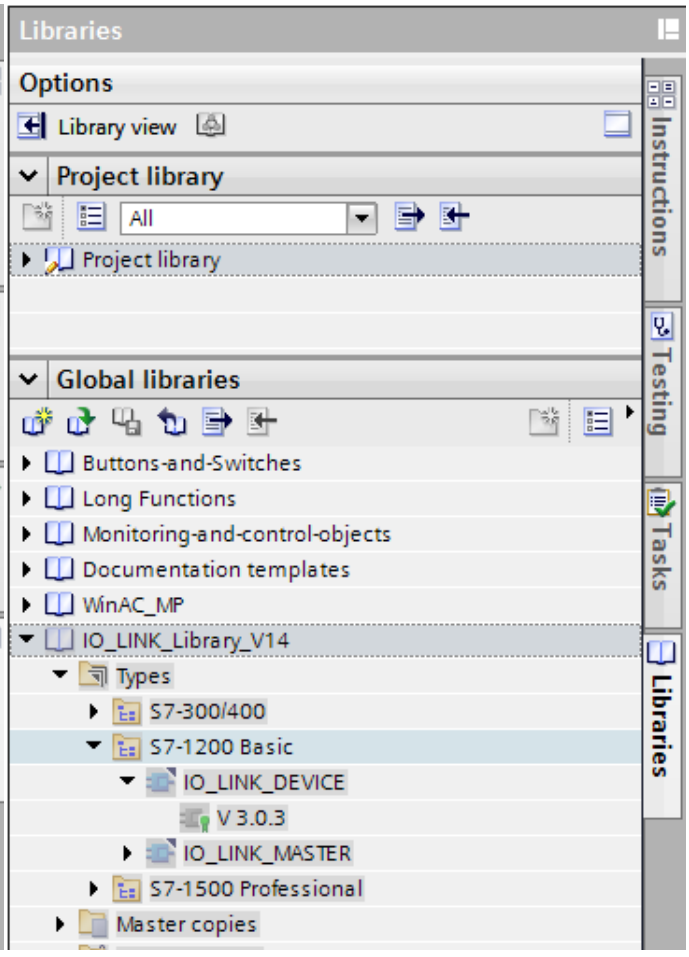
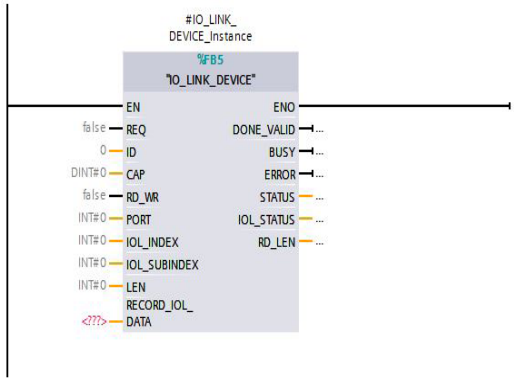


Figure 8: Opened library

3. Add the block for your control system from the library to the program block using drag & drop.

9.2. Explanations on the IOL block used

SIEMENS IO-Link block



Parameter	Data type	Description
Input parameters		
REQ	BOOL	Positive edge: triggers data transfer
ID	HW_IO	For S7-1200/1500 Hardware identifier for the IO-Link communication module
CAP	DINT	Access point of the IO_LINK_DEVICE function (Siemens AG = 227 decimal)
RD_WR	BOOL	Read or write access 0: Read 1: Write
PORT	INT	Port number at which the IO-Link device is operated. Possible values: 0..63
IOL_INDEX	INT	Parameter index Possible values: 0..32767
IOL_SUBIN-DEX	INT	Parameter subindex 0: Complete record 1..255: Parameter from record
LEN	INT	Length of the data to be written (net data) Read: 0..232 (not relevant) Write: 1..232
Output parameters		
DONE_VALID	BOOL	Validity: 0: Data not valid 1: Data valid
BUSY	BOOL	Job in progress: 0: Job completed (valid or error) 1: Job in progress
ERROR	BOOL	Error status: 0: No error 1: Abort with error
STATUS	DWORD	Status output: ERROR flag set = Function error Error flag reset = Status of the function DW#16#000x0000 (x: Process step 0..3)
IOL_STATUS	DWORD	IO-Link error status: ERROR flag set and IO-Link error: See error information ERROR flag set and communication error: Specification to which SFB the status belongs Error flag reset: DW#16#00000000
RD_LEN	INT	Length of the data read (net data)
Input/output parameters		
RECORD_IOL_ DATA	ARRAY [0..231] of BYTE	Source/target area for the data to be read / written

Table 1: SIEMENS IO-Link block (source: SIEMENS IO-Link library)

EN

10. Example using SIEMENS IOL block

In the following example the request command 0x02 (order number/serial number) is run for switch 1 using the SIEMENS IO-Link block.

1. Generate the send telegram (01 02 00 00 00 00 00 00) in the array *#Write.RECORD_IOL_DATA*. When the flag *Global-Flags.xSetRequestCommand* is set (=TRUE), the constants for the send telegram are copied to the input/output array for the IO-Link block using the copy commands (MOVE).

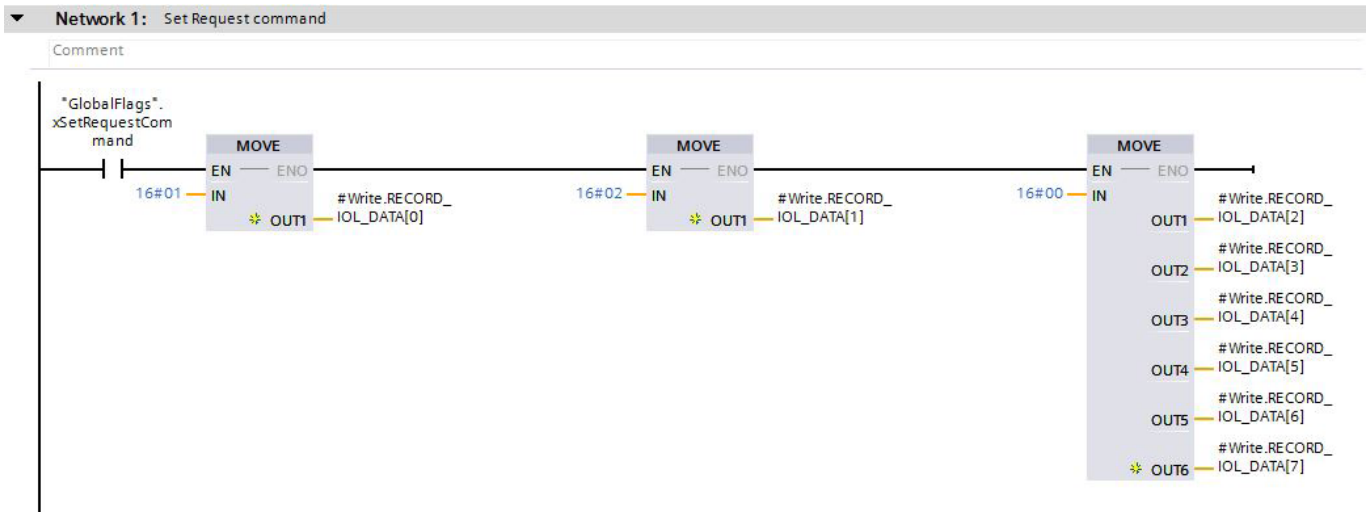


Figure 9: Preparing send telegram

2. To send the telegram to the ESM-CB, write/read access must be set (=TRUE) on input *RD_WR* on the IO_LINK_DEVICE FB (FB5). Start to send the message with a positive edge on the variable *#Write.TriggerDataTransfer*. If the transfer is successful, it is acknowledged using a TRUE signal on the variable *#Write.DoneValid*.

Variable table:

Name	Data type	Use
Input		
#Write.TriggerDataTransfer	BOOL	Trigger for starting the communication on input *REQ*
Output		
#Write.DoneValid	BOOL	Data transfer successful/not successful on output *BUSY*
#Write.JobInProgress	BOOL	Job in progress on output *BUSY*
#Write.ErrorStatus	BOOL	Error status on output *ERROR*
#Write.StatusOutput	DWORD	Status output on output *STATUS*
#Write.IOLErrorStatus	DWORD	IO-Link error status on output *IOL_STATUS*
#Write.ReadLength	INT	Length of the data read on the output *RD_LEN*
InOut		
#Write.RECORD_IOL_DATA	ARRAY [0..231] of byte	The request telegram is written to this array
Static		
#instIOLinkDeviceWrite	IO_LINK_DEVICE	Instance for the IO_LINK_DEVICE function block FB5

Input values used:

Input for the FB IO_LINK_DEVICE	Input values	
ID	"Local~4SI_IO_link" (269)	Hardware identifier for the IO-Link communication module
CAP	227	Access point of the IO_LINK_DEVICE function
RD_WR	true	Send write access for request telegram
Port	1	The ESM-CB is connected to port 1 on the IO-Link master
IOL_INDEX	201	201 = Safety switch 1 in the switch chain
IOL-SUBINDEX	0	The parameter subindex is not used
LEN	8	Request telegrams of 8 bytes are sent to the ESM-CB

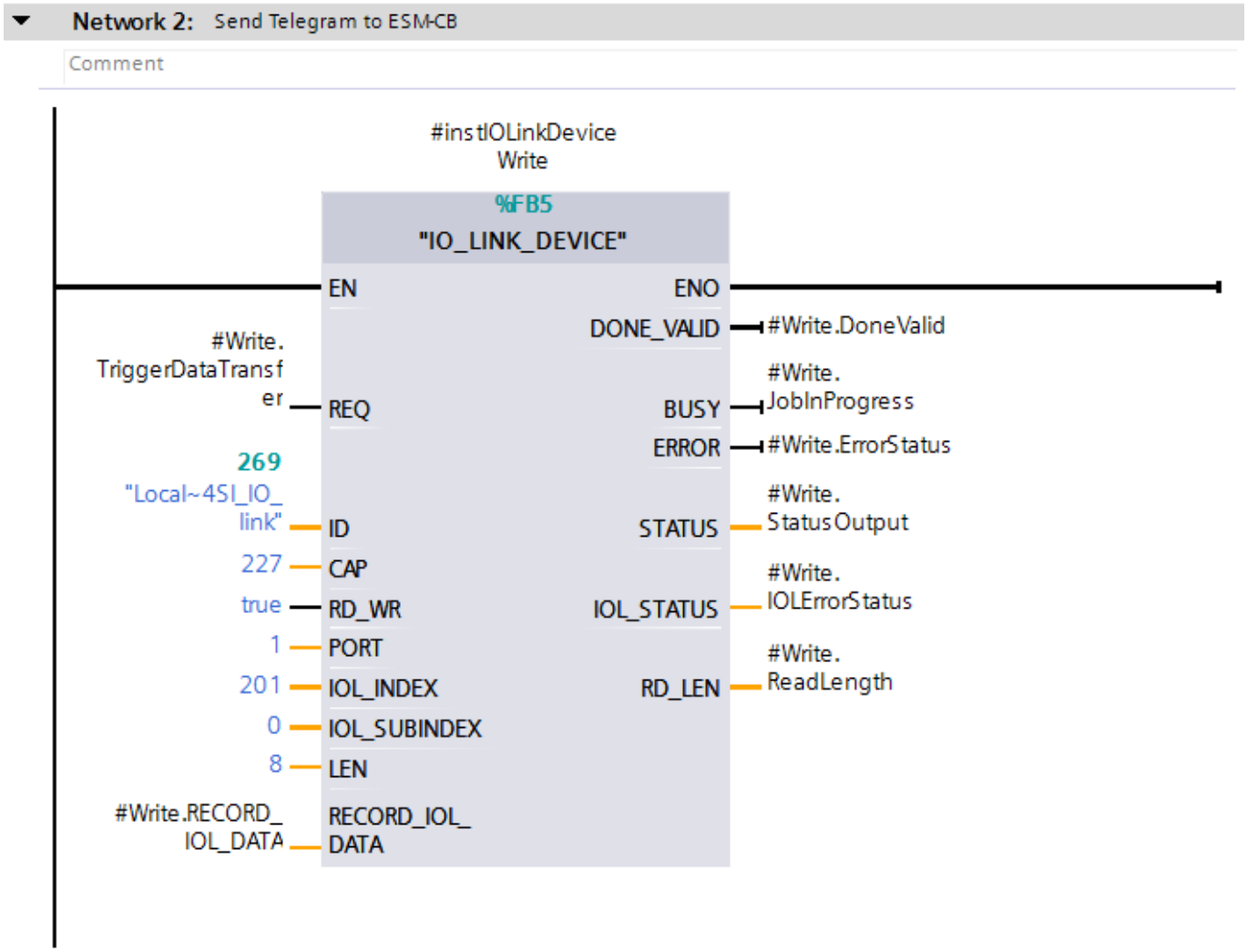


Figure 10: Sending telegram

3. To read the order number/serial number, the input *RD_WR* on the *IO_LINK_DEVICE FB (FB5)* must not be active (=FALSE). The data can be read with a positive edge on the variable *#Read.TriggerDataTransfer*. A successful transfer is then acknowledged on the variable *#Read.DoneValid*. In addition, the number of bytes transferred is indicated in the variable *#Read.ReadLength*.

Variable table:

Name	Data type	Use
Input		
#instIOLinkDeviceRead	IO_LINK_DEVICE	Instance for the IO_LINK_DEVICE function block FB5
#Read.TriggerDataTransfer	BOOL	Trigger for starting the communication on input *REQ*
Output		
#Read.DoneValid	BOOL	Data transfer successful/not successful on output *BUSY*
#Read.JobInProgress	BOOL	Job in progress on output *BUSY*
#Read.ErrorStatus	BOOL	Error status on output *ERROR*
#Read.StatusOutput	DWORD	Status output on output *STATUS*
#Read.IOLErrorStatus	DWORD	IO-Link error status on output *IOL_STATUS*
#Read.ReadLength	INT	Length of the data read on the output *RD_LEN*
InOut		
#Read.RECORD_IOL_DATA	ARRAY [0..231] of byte	The reply read is saved in this array.

EN

Input values used:

Input for the FB IO_LINK_DEVICE	Input values	
ID	"Local~4SI_IO_link" (269)	Hardware identifier for the IO-Link communication module
CAP	227	Access point of the IO_LINK_DEVICE function
RD_WR	false	Send write access for request telegram
Port	1	The ESM-CB is connected to port 1 on the IO-Link master
IOL_INDEX	201	201 = Safety switch 1 in the switch chain
IOL-SUBINDEX	0	The parameter subindex is not used
LEN	8	Request telegrams of 8 bytes are sent to the ESM-CB

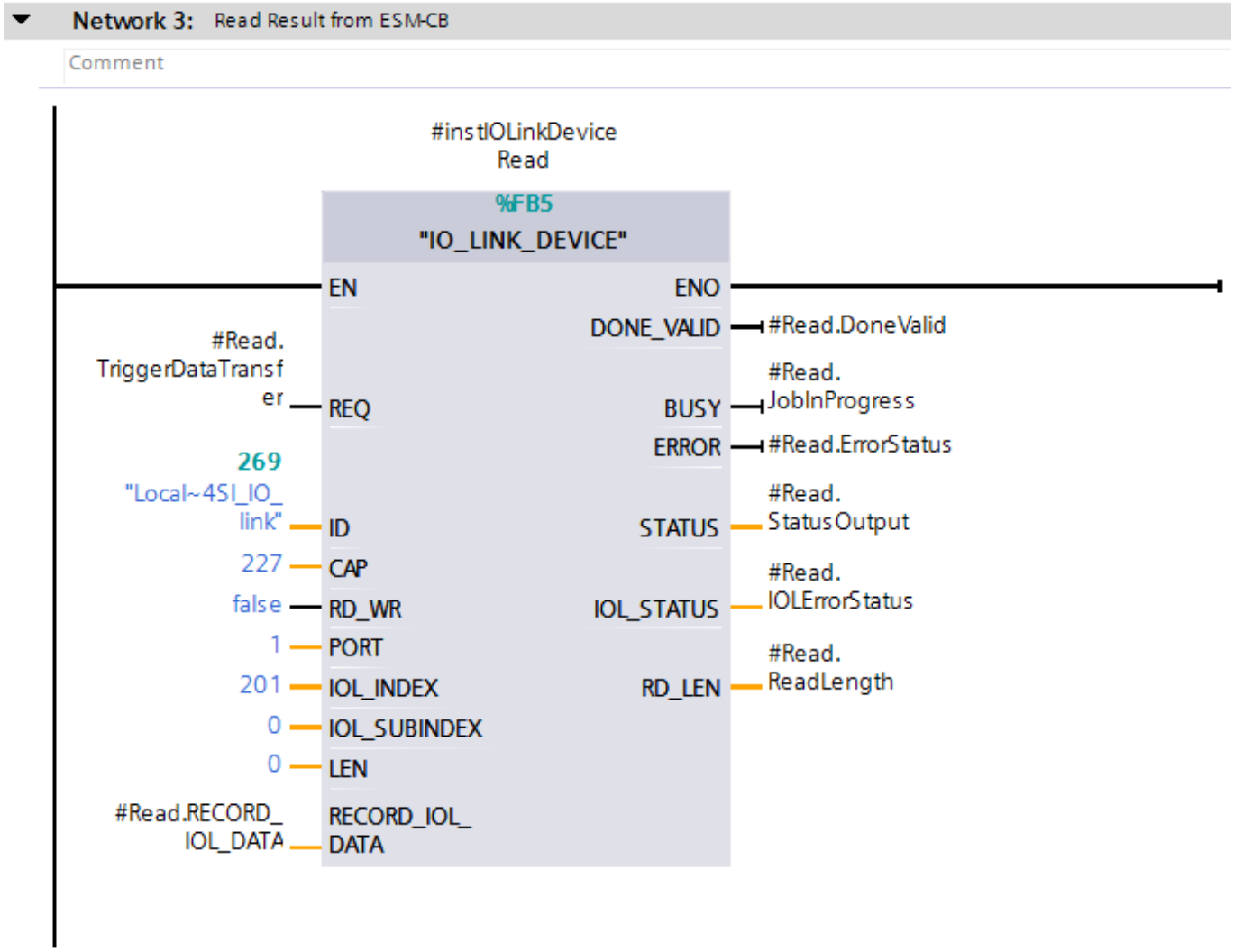


Figure 11: Reading order number/serial number

4. The result is written to the array *#Read.RECORD_IOL_DATA* and can be further processed. The values are shown below in the watch and force table.

31	// IOL Communication Data			
32	"GlobalFlags".Read.RECORD_IOL_DATA[0]		Hex	16#06
33	"GlobalFlags".Read.RECORD_IOL_DATA[1]		Hex	16#3F
34	"GlobalFlags".Read.RECORD_IOL_DATA[2]		Hex	16#42
35	"GlobalFlags".Read.RECORD_IOL_DATA[3]		Hex	16#0F
36	"GlobalFlags".Read.RECORD_IOL_DATA[4]		Hex	16#3F
37	"GlobalFlags".Read.RECORD_IOL_DATA[5]		Hex	16#42
38	"GlobalFlags".Read.RECORD_IOL_DATA[6]		Hex	16#0F
39	"GlobalFlags".Read.RECORD_IOL_DATA[7]		Hex	16#00

Figure 12: Watch and force table RECORD_IOL_DATA

5. Evaluation of the result

Name	Value	Description	Result
"GlobalFlags".Read.RECORD_IOL_DATA[0]	16#06	User data length	6 bytes
"GlobalFlags".Read.RECORD_IOL_DATA[1]	16#E0	Order number LSB	157920
"GlobalFlags".Read.RECORD_IOL_DATA[2]	16#68	Order number	
"GlobalFlags".Read.RECORD_IOL_DATA[3]	16#02	Order number MSB	
"GlobalFlags".Read.RECORD_IOL_DATA[4]	16#17	Serial number LSB	279
"GlobalFlags".Read.RECORD_IOL_DATA[5]	16#01	Serial number	
"GlobalFlags".Read.RECORD_IOL_DATA[6]	16#00	Serial number MSB	
"GlobalFlags".Read.RECORD_IOL_DATA[7]	16#00	Filled with 16#00 to total of 8 bytes	0

EN

11. Example EUCHNER block library

Using the example program described in the following it is possible to read acyclic data straightforwardly by sending a request telegram.

You will find the blocks required in Library_ESM-CB-TIAV14SP1-YYYYMMDD at www.euchner.com for download.

TIP

The configuration of the hardware is described in chapter 6.

1. Open the library as described in chapter 9.1.1. and copy the blocks *DB_GlobalFlags*, *FB_AcyclicalData_ESM-CB* and *IO_LINK_DEVICE* to the folder Program Blocks for the control system configured.

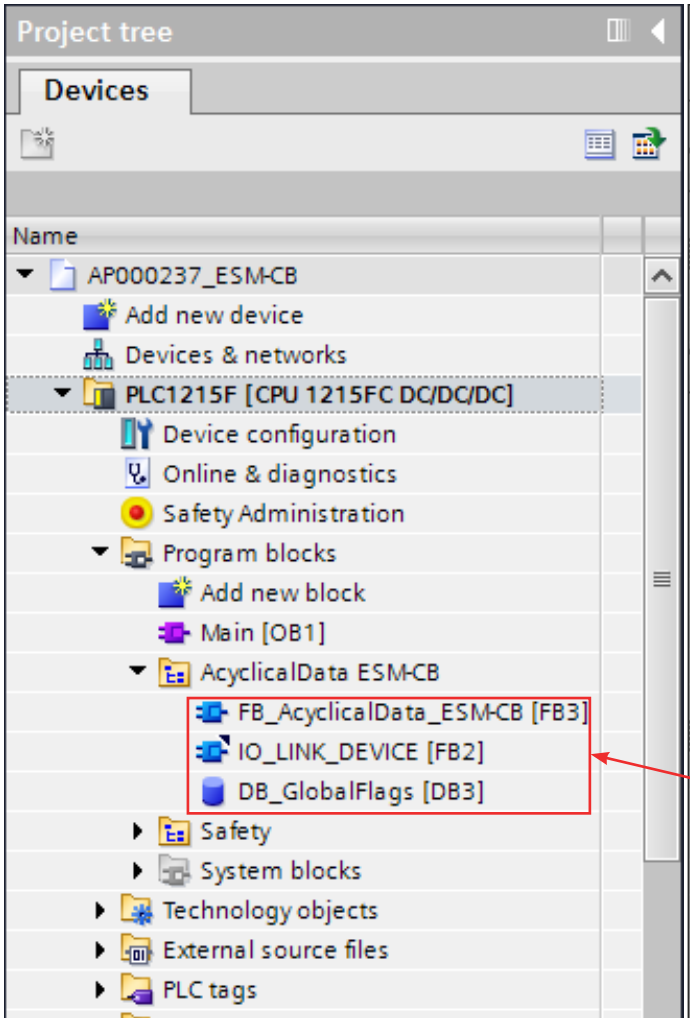


Figure 13: Blocks added

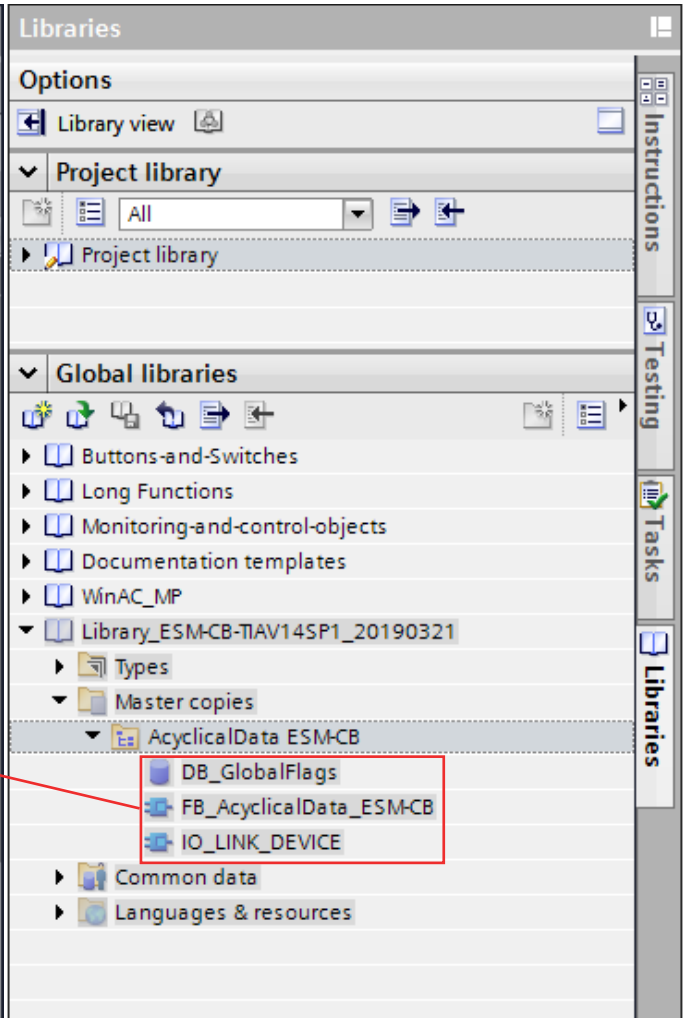


Figure 14: Block library

2. Call the block *FB_AcyclicalData_ESM-CB* for example in the Main (OB1) program. Create the related instance by calling the FB.

3. Assign the variables and constants from the variable table below to the block.

Variable table:

Name	Data type	Use
Input		
"DB_GlobalFlags".strRequest-Command	BOOL	Trigger for reading the acyclic data
"DB_GlobalFlags".xReset	BOOL	Reset the process if there is an error
"Local~4SI_IO_link_1"(269)	HW_SUBMODULE	Hardware identifier for the IO-Link communication module
227	DInt	Access point of the IO_LINK_DEVICE function
1	INT	The ESM-CB is connected to port 1 on the IO-Link master
201	INT	201 = Safety switch 1 in the switch chain
0	INT	The parameter subindex is not used
"DB_GlobalFlags".strRequest-Command	String	Entry for the request telegram in String format. Example: 01 1B 00 00 00 00 00 00
Output		
"DB_GlobalFlags".xDone	BOOL	TRUE if data have been read and step sequence run through
"DB_GlobalFlags".arrResult	Array [0..7] of byte	Output of the result for the requested telegram
"DB_GlobalFlags".xErrorWRRD	BOOL	If an error occurs during writing or reading using the SIEMENS IO Link_FB, the bit is set (=TRUE)
"DB_GlobalFlags".xErrorCom-mandLength	BOOL	TRUE if the request command has an incorrect length.
"DB_GlobalFlags".dwStatus	DWORD	Status output on the Siemens IO-Link block if there is an error
"DB_GlobalFlags".dwIOL_Status	DWORD	Status output on the IO-Link communication if there is an error

EN

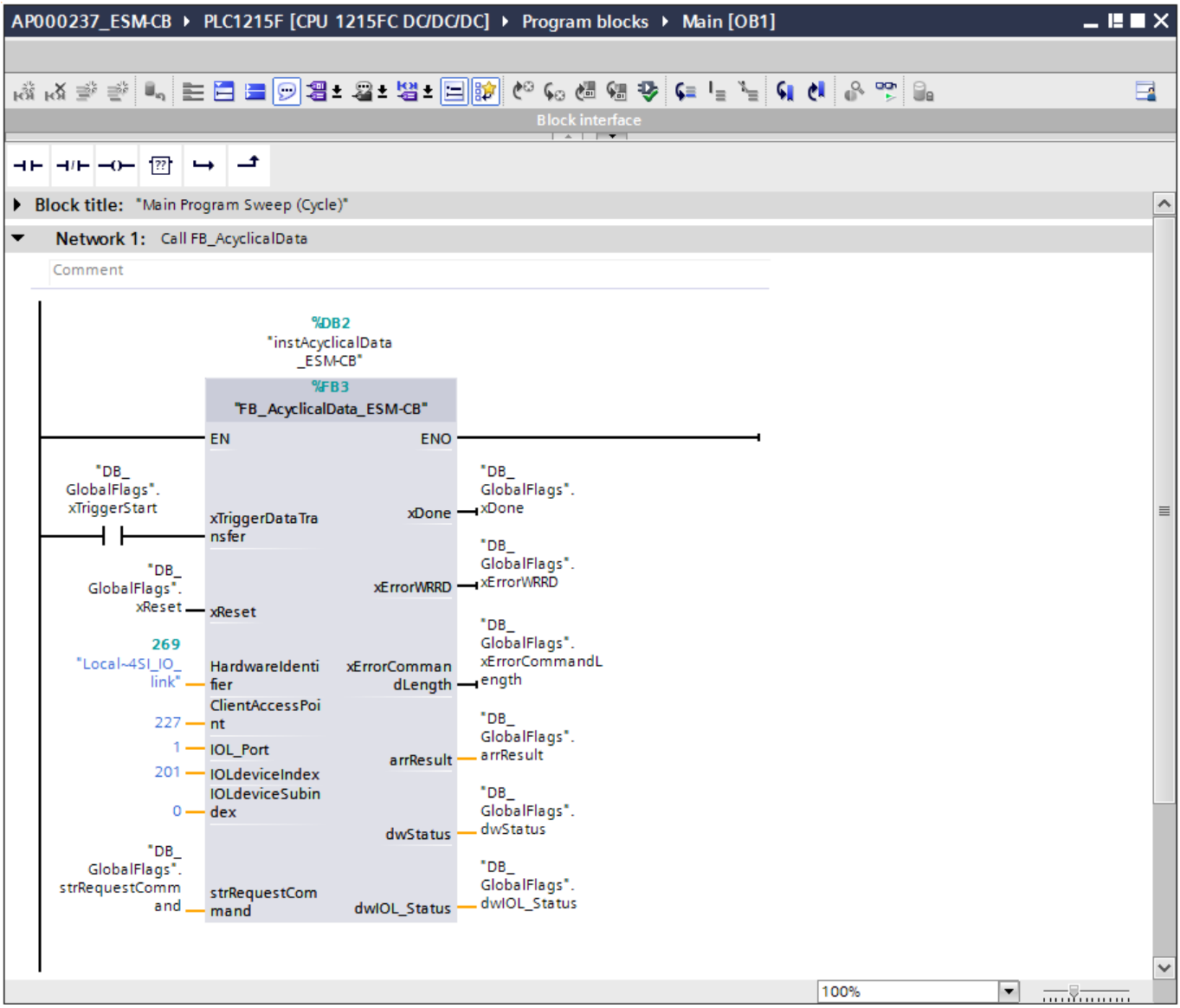


Figure 15: Calling the FB in OB1

4. Enter the request telegram: the request telegram is assigned to the variable *"DB_GlobalFlags".strRequestCommand* in the format String. This action can be undertaken using the watch and force table or directly in the variables. For this example, the number of switching cycles is read. The request telegram for the number of switching cycles is written as follows: 01 1B 00 00 00 00 00 00.

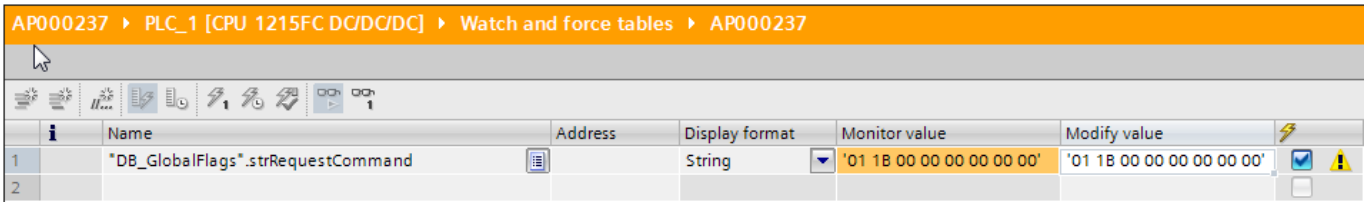


Figure 16: Assigning value using watch and force table

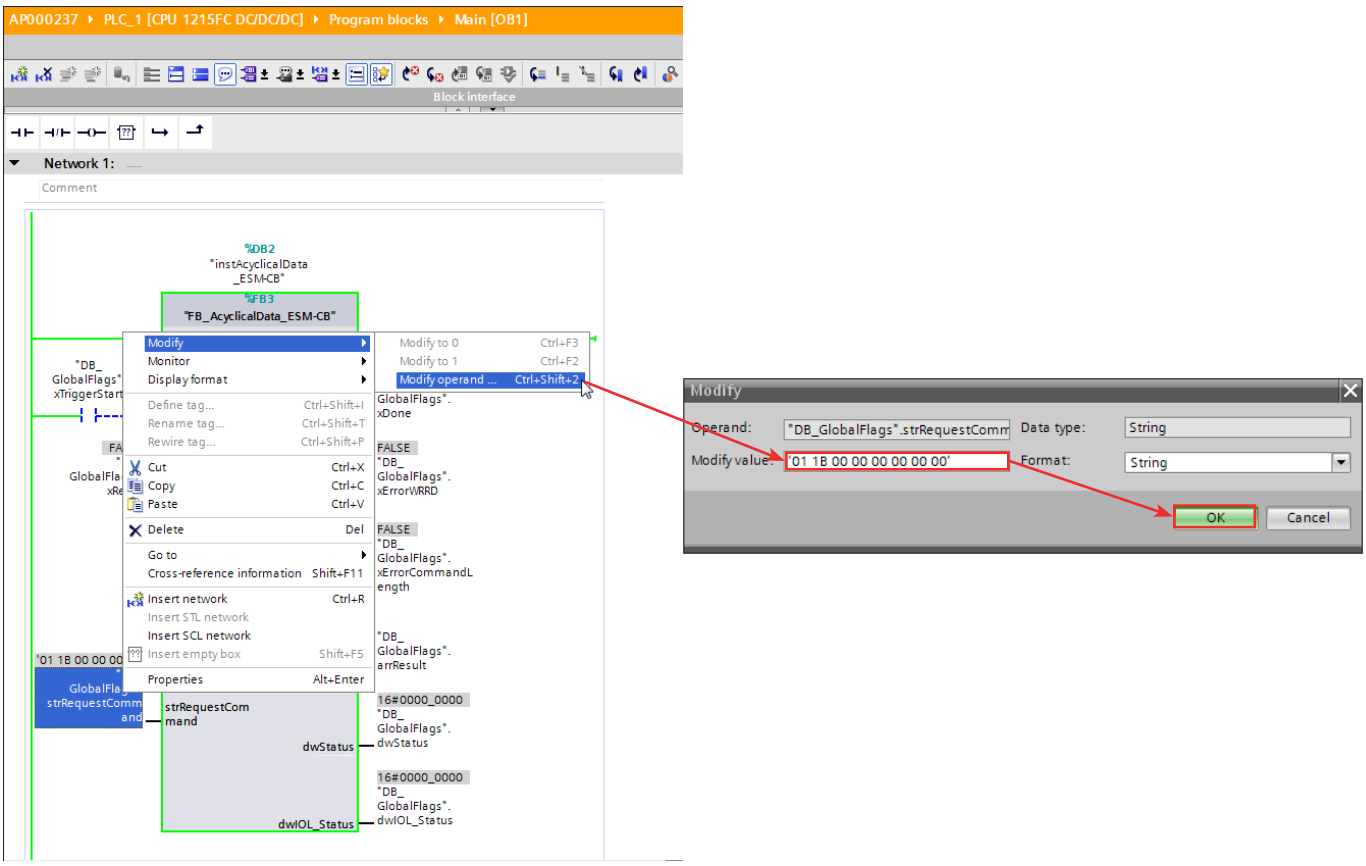


Figure 17: Assigning value to the variable

5. Start the step sequence in the FB by setting the bit *"DB_GlobalFlags".xTriggerStart.* (=TRUE). If there is an error (*"DB_GlobalFlags".xErrorWRRD = TRUE)* the sequence chain can be reset using a TRUE signal on the variable *"DB_GlobalFlags".xReset.*
6. The result can be viewed in the array *"DB_GlobalFlags".arrResult* using a watch and force table and then further processed.

AP000237_ESM-CB ▸ PLC_1 [CPU 1215FC DC/DC/DC] ▸ Watch and force tables ▸ ESM_CB

	i	Name	Address	Display format	Monitor value	Modify value
1		"DB_GlobalFlags".arrResult[0]		Hex	16#03	
2		"DB_GlobalFlags".arrResult[1]		Hex	16#3E	
3		"DB_GlobalFlags".arrResult[2]		Hex	16#00	
4		"DB_GlobalFlags".arrResult[3]		Hex	16#00	
5		"DB_GlobalFlags".arrResult[4]		Hex	16#00	
6		"DB_GlobalFlags".arrResult[5]		Hex	16#00	
7		"DB_GlobalFlags".arrResult[6]		Hex	16#00	
8		"DB_GlobalFlags".arrResult[7]		Hex	16#00	

Figure 18: Result

EN

7. Evaluation of the result

Name	Value	Description	Result
"DB_GlobalFlags".arrResult[0]	16#03	User data length	3 bytes
"DB_GlobalFlags".arrResult[1]	16#3E	Number of switching cycles LSB	62
"DB_GlobalFlags".arrResult[2]	16#00	Number of switching cycles	
"DB_GlobalFlags".arrResult[3]	16#00	Number of switching cycles MSB	
"DB_GlobalFlags".arrResult[4]	16#00	Filled with 16#00 to total of 8 bytes	0
"DB_GlobalFlags".arrResult[5]	16#00	Filled with 16#00 to total of 8 bytes	
"DB_GlobalFlags".arrResult[6]	16#00	Filled with 16#00 to total of 8 bytes	
"DB_GlobalFlags".arrResult[7]	16#00	Filled with 16#00 to total of 8 bytes	

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.

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.

EN

EN

Euchner GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
info@euchner.de
www.euchner.com

Edition:
AP000237-01-07/19
Title:
Application ESM-CB
ConnectionofESM-CB-AZ-FI2-BR-IO-158875toSIEMENSI/O-Linkmaster