## Application



## Integration of MGB2 *Modular* EtherCAT in Beckhoff TwinCAT 3

from V1.0.0

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### 1. About this document

#### 1.1. Version

Version	Date	Change/addition	Chapter
02-01/24	11/11/2021	Prepared	All
02-01/24	01/22/2024	Revision of chapter 8. Parameterizing the MGB2 Modular EtherCAT via startup configuration on page 14	8

### 1.2. Scope

This document is used for integration and configuration of the MGB2 *Modular* EtherCAT with BECKHOFF TwinCAT 3.

#### 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 (PLCs) 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 (2540772)	Operating instructions for bus module MBM-ECMLI (EtherCAT)	www
Safety information (2525460)	Basic safety information	$\square$
Operating instructions for the connected modules and their submodules	Device-specific information for the related module and the installed submodules.	www
Possibly enclosed data sheets	Item-specific information about deviations or additions	

#### 1.5. Notice

This application is based on the MGB2 *Modular* EtherCAT operating instructions and the operating instructions for the BECK-HOFF components used. Please refer to the operating instructions for technical details and other information.

## 2. Components/modules used

### 2.1. EUCHNER

Description	Order number / item number
Safety system MGB2 <i>Modular</i> with modular bus module	169251 / MGB2-L1HEB-EC-U-S4-DA-R-169251
lock monitoring	169252 / MGB2-L1HEB-EC-U-S4-DA-L-169252
	169253 / MGB2-L2HEB-EC-U-S4-DA-R-169253
	169254 / MGB2-L2HEB-EC-U-S4-DA-L-169254
	163293 / MBM-EC-S7-MLI-3B-163293

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

		MGB2 Modular set				
Description	Order number/item number	169251	169252	169253	169254	
Modular bus module MBM	163291 / MBM-EC-S4-MLI-3B-163291		•	•		
	163293 / MBM-EC-S7-MLI-3B-163293	-	-	-	-	
Locking module MGB2-L	136776 / MGB2-L1-MLHJ-Y0000-BJ-136776	•	•	-	-	
	156392 / MGB2-L2-MLHJ-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		•			



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

### 2.2. Others

Description	Order number / item number
Basic BECKHOFF CPU module with PROFINET RT controller	CX9020-0115-M930
BECKHOFF TwinSAFE Logic	EL6910
BECKHOFF EtherCAT extension	EK1110
BECKHOFF 2-port EtherCAT P branch with feed-in	EK1322

#### 2.3. Software

Description	Version
TwinCAT 3	3.1.4024.22
TwinCAT 3 Safety Editor	1.3.0

## 3. Functional description

The MGB2-L1HB-EC-... is a guard locking device in accordance with EN ISO 14119 according to the closed-circuit current principle, the MGB2-L2HB-EC-... 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 FSoE protocol. The MGB2 *Modular* is connected to a CX9020-0115-M930 from BECKHOFF via the bus module.

EN

### 4. Overview of the communication data

#### 4.1. Input

EtherCAT	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 b	yte (pluggable)			
EtherCAT	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_E_SM1	LM_E_SM0	-	LM_I_UK	LM_I_SK	LM_D_RUN
2nd byte	-	-	-	-	-	LM_I_OL	LM_I_OT	LM_I_OD
3rd byte				Diagnostics by	yte (pluggable)			
EtherCAT	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 b	yte (pluggable)			
50 5	D: 7	5.0	D'1 5	D': 4	D'' 0	5. 0	D'1 1	511.0
FSOE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit U
1st byte	-	-	-	-	-	SM_FI_ES	LM_FI_UK	LM_FI_SK
2nd byte	-	-	-	-	-	-	-	-
4.2 Oi	itnut							
T.C. V(	rput							
EtherCAT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit O
1st byte	BM_ACK_G	-	-	-	-	-	-	-
FtherCAT	Rit 7	Rit 6	Rit 5	Rit 4	Rit 3	Rit 2	Rit 1	Rit 0
1st byte			Dito	DR 4	Ditto	DRE	DRI	
15t byte	LIVI_ACI\_G			-	_	_		
EtherCAT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	-	-	SM_O_H3_B	SM_0_H2_B	SM_O_H1_B	SM_0_H3	SM_0_H2	SM_0_H1
FSoE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1st byte	-	-	-	-	-	-	-	LM_FO_CL
2nd byte	-	-	-	-	-	-	-	-

Tip: The individual abbreviations are explained in the operating instructions



#### NOTICE!

While EtherCAT data are always incorporated by bytes, the data for FSoE are always incorporated by individual bits. The *FSoE 2 Bytes module* was therefore used for this application example. It offers a sufficiently large safe memory area for the bits: *LM\_FI\_SK*, *LM\_FI\_UK* and *SM\_FI\_ES*.

## 5. Installing the ESI file

You will require the corresponding ESI files in XML format to integrate the MGB2 *Modular* EtherCAT into the TwinCAT 3 hardware configuration:

• EUCHNER\_MBM\_ESI.xml (contains all information about the MBM modules and data transfer)

#### Both ESI files must always be used!

You will find the ESI files in the download area at <u>www.euchner.com</u>. Always use the latest ESI files.

Unzip the content of the ESI file into the following directory:

Name	Änderungsdatum	Тур	Größe
EUCHNER_MBM_ESI	14.10.2021 10:49	XML-Dokument	570 KB
EUCHNER_MBM_Modules	14.10.2021 10:49	XML-Dokument	338 KB

Fig. 1: ESI files to be added

→ Dieser PC → Lokaler Datenträger (C:) → TwinCAT → 3.1 → Config → Io → EtherCAT →

Fig. 2: Path of the ESI files for TwinCAT 3

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### 6. TwinSAFE hardware addressing

 $\underline{\mathbb{A}}$ 

#### WARNING

Each TwinSAFE address set must occur only once within a network/configuration!
 Address 0 is not a valid TwinSAFE address!

#### 6.1. BECKHOFF EL6910

The TwinSAFE address must be set for TwinSAFE logic terminal EL6910. It is set using the DIP switches on the left side of the TwinSAFE terminals.

TwinSAFE device	TwinSAFE address in the example		
EL6910	1		

#### 6.2. MBM-EC-..-MLI-...

The TwinSAFE address must be set for the bus module MBM-EC-..-MLI-.... It is set on the bus module MBM using the DIP switches.



The DIP switch setting is as follows for the TwinSAFE address 12 selected in the application:

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	29	2 <sup>8</sup>	27	26	2 <sup>5</sup>	24	2 <sup>3</sup>	2 <sup>2</sup>	21	20
Decimal value	512	256	128	64	32	16	8	4	2	1

Table 1: DIP switch settings



#### ATTENTION!

• The set TwinSAFE address of the bus module and the address configured in *Alias Device* must match.

> The TwinSAFE address set using the DIP switches is adopted only after the MBM is restarted.

## 7. Configuring the MGB2 Modular EtherCAT

### 7.1. Manually adding the MBM-EC-..-MLI-..-..

#### 7.1.1. MBM-EC-S4-MLI-3B-163291

The EtherCAT master and terminals EL6910, EK1322 and EK1110 have already been created for this section.

1. Right-click the EtherCAT master to open the context-sensitive menu. Click Add New Item....



Fig. 3: Adding a new device

2. Select the bus module MBM-EC-S4-MLI-3B-163291 under EUCHNER GmbH + Co. KG >> Euchner Modular bus module.

Insert EtherCAT Device	×
Search: Name: Box 1 Multiple: 1 🜩	ОК
Type: Type: Beckhoff Automation GmbH & Co. KG EUCHNER GmbH + Co. KG Euchner Modular bus module MBM-EC-S4-MLI-3B (EtherCAT)	Cancel  Port A D B (Ethernet) C

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#### 7.1.2. MBM-EC-S7-MLI-3B-163293

The EtherCAT master and the terminals EL6910, EK1322 and EK1110 have already been created for this section.

1. Right-click the EtherCAT P terminal to open the context-sensitive menu. Click Add New Item....



Fig. 5: Adding a new device

2. Select the bus module MBM-EC-S7-MLI-3B-163293 under EUCHNER GmbH + Co. KG >> Euchner Modular bus module. Please note that an EtherCAT P port must be selected. In our example, the bus module is connected to port D 'X1'.

Add Ether	CAT device at port D (Ethernet) of Term 4 (EK1322)		×
Search:	Name: Box 1 I System Couplers EK1300 EtherCAT P Coupler (2A E-Bus) EtherCAT P Fieldbus Boxes (EPPxxxx) EtherCAT P fieldbus Boxes (FB1XXX) EUCHNER GmbH + Co. KG MBM-EC-S7-MLI-3B (EtherCAT P)	Multiple: 1 主	OK Cancel
			C (E-Bus)

Fig. 6: Selecting the MBM bus module.

### 7.2. Adding the modules and submodules

Open the bus module in the IO tree and go to the Slots tab.

1. Add the FSoE 2 Bytes module to the Safety Slot.



Fig. 7: Adding FSoE module to the slot configuration

2. Add the MBM DIAGNOSE BASIC module to the Diagnosis Slot.

neral EtherCAT DC Pro	ocess Data Plc Slots Startu	CoE - Online	Diag History	Online			
Slot	Module	ModuleIdent	^		Module	ModuleIdent	Description
🔸 Safety Slot	FSoE 2 Bytes	0x00000130		<	Q Diagnosis Modules		
🔍 Diagnosis Slot	MBM DIAGNOSE BASIC	0x00000010			MBM DIAGNOSE BASIC	0x00000010	Basic diagnose information with single bits
Slot 3				X	Q MBM DIAGNOSE EXTENDED	0x00000011	Basic diagnose information, additional fault co
Subslot 3.1							
Subslot 3.2							
Subslot 3.3							
Subslot 3.4							
Slot 4							
Subslot 4.1							
Subslot 4.2							
Subslot 4.3							
Subslot 4.4							
Slot 5							
Subslot 5.1							
Subslot 5.2							
Subslot 5.3							
Subslot 5.4							
Slot 6			~		<		:

#### Fig. 8: Adding MBM diagnostic module to the slot configuration

3. Add the MGB2-L1-MLI-U-Y0000-BJ-136776 Diagnose Basic locking module to Slot 3.

lot	Module	ModuleIdent	^		Module	ModuleIdent	Desc '
🔸 Safety Slot	FSoE 2 Bytes	0x00000130		<	MGB2 Modular locking module		
Q Diagnosis Slot	MBM DIAGNOSE BASIC	0x00000010			MGB2-I-MLI-U-Y0000-JJ-157955 Diagnose Basic	0x02690300	MGB
Slot 3	MGB2-L1-MLI-U-Y0000-BJ	0x02164800		X	MGB2-I-MLI-U-Y0000-JJ-157955 Diagnose Extended	0x02690301	MGB
Subslot 3.1					MGB2-L1-MLI-U-Y0000-BJ-136776 Diagnose Basic	0x02164800	MGB
Subslot 3.2					MGB2-L1-MLI-U-Y0000-BJ-136776 Diagnose Extended	0x02164801	MGB
Subslot 3.3					MGB2-L2-MLI-U-Y0000-BJ-156392 Diagnose Basic	0x0262E800	MGB
Subslot 3.4					MGB2-L2-MLI-U-Y0000-BJ-156392 Diagnose Extended	0x0262E801	MGB
Slot 4					MGB2-L1-MLI-M-Y0000-BJ-158698 Diagnose Basic	0x026BEA00	MGB
Subslot 4.1					MGB2-L1-MLI-M-Y0000-BJ-158698 Diagnose Extended	0x026BEA01	MGB
Subslot 4.2					MGB2-L2-MLI-M-Y0000-BJ-158711 Diagnose Basic	0x026BF700	MGB
Subslot 4.3					MGB2-L2-MLI-M-Y0000-BJ-158711 Diagnose Extended	0x026BF701	MGB
Subslot 4.4					MCM Modular control module		
Slot 5					MCM-MLI-Y00000000-JJ-157854 Diagnose Basic	0x02689E00	MCM
Subslot 5.1					MCM-MLI-Y00000000-JJ-157854 Diagnose Extended	0x02689E01	MCM
Subslot 5.2					MCM-MLI-Y00000000-JJ-157854 Diagnose Basic with Stacklight	0x02689E02	MCM
Subslot 5.3					MCM-MLI-Y0000000-JJ-157854 Diagnose Extended with Stacklight	0x02689E03	MCM
Subslot 5.4					MCM-MLI-Y0000-JJ-164241 Diagnose Basic	0x02819100	MCM N
Slot 6			~		<		>



4. Add the MSM-1-P-CA-BPP-A1-136687 Diagnose Basic submodule to Subslot 3.2.

eral EtherCAT DC Pro	cess Data Plc Slots Startup	CoE - Online Diag H	listory (	Unline			
ilot	Module	ModuleIdent	^		Module	ModuleIdent	Description /
🔸 Safety Slot	FSoE 2 Bytes	0x00000130		< .	MSM Submodul		
Q Diagnosis Slot	MBM DIAGNOSE BASIC	0x00000010		1	MSM-1-P-CA-BPP-A1-136687 Diagnose Basic	0x0215EF00	1 e-stop illum
INC Slot 3	MGB2-L1-MLI-U-Y0000-BJ	0x02164800		x	MSM-1-P-CA-BPP-A1-136687 Diagnose Extended	0x0215EF01	1 e-stop illum
Subslot 3.1				~	MSM-1-P-CS-B0P-A2-137020 Diagnose Basic	0x02173C00	1 e-stop illum
Subslot 3.2	MSM-1-P-CA-BPP-A1-1366	0x0215EF00			MSM-1-P-CS-B0P-A2-137020 Diagnose Extended	0x02173C01	1 e-stop illum
Subslot 3.3					MSM-1-P-CA-0L0-A3-126062	0x01EC6E00	1 indicator lig
Subslot 3.4					MSM-1-P-CS-BPP-A5-126381 Diagnose Basic	0x01EDAD00	1 e-stop illum
Slot 4					MSM-1-P-CS-BPP-A5-126381 Diagnose Extended	0x01EDAD01	1 e-stop illum
Subslot 4.1					MSM-1-R-DA-M00-A6-137596 Diagnose Basic	0x02197C00	1 M12 plug c
Subslot 4.2					MSM-1-R-DA-M00-A6-137596 Diagnose Extended	0x02197C01	1 M12 plug c
Subslot 4.3					MSM-1-R-DA-00N-A7-137597 Diagnose Basic	0x02197D00	1 M23 - 12-p
Subslot 4.4					MSM-1-R-DA-00N-A7-137597 Diagnose Extended	0x02197D01	1 M23 - 12-p
Slot 5					MSM-1-P-CA-PPP-A9-127040	0x01F04000	3 push buttor
Subslot 5.1					MSM-1-P-CA-B0P-B5-137738 Diagnose Basic	0x021A0A00	1 e-stop illum
Subslot 5.2					MSM-1-P-CA-B0P-B5-137738 Diagnose Extended	0x021A0A01	1 e-stop illum
Subslot 5.3					MSM-1-P-CA-P0P-B6-137740	0x021A0C00	2 push buttor
Subslot 5.4					MSM-1-P-CA-PP0-B7-137742	0x021A0E00	2 push buttor N
Slot 6			$\sim$		<		>

- Fig. 10: Adding submodule to the slot configuration
- 7.2.1. Complete bus structure of MGB2:



Fig. 11: Completely configured EtherCAT

Fig. 12: Completely configured EtherCAT P

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## 8. Parameterizing the MGB2 Modular EtherCAT via startup configuration

The MGB2 *Modular* EtherCAT can be parametrized to suit requirements. This includes control of the solenoid in the locking module, activation or deactivation of the escape release error and parametrization of any LEDs on the submodule, for example. The escape release error is activated and the LED of the emergency stop on the submodule in slot 2 is parametrized in this application. The modules and submodules are parametrized via the startup configuration.

#### 8.1. Example: activating the escape release error

#### 8.1.1. Locking module L1



#### NOTICE!

The solenoid is controlled via the SAFE bit and the NON-SAFE bit (default setting). If you do not want to change the slot parametrization of the locking module, you do not have to create any startup values. If you want to activate the escape release error in the slot parametrization, solenoid control must also be parametrized correspondingly.

The decimal values 0, 2, 4 and 6 are not allowed with an L1 locking module and will lead to a parametrization error.

Parametrization of locking module L1	Bit 2	Bit 1	Bit 0	Decimal value	Comment
Control guard locking from SAFE area	FALSE	FALSE	TRUE	1	Guard locking is controlled exclusively from the SAFE area
Control guard locking from SAFE and NON-SAFE area	FALSE	TRUE	TRUE	3	Guard locking is controlled from the SAFE and NON-SAFE area
Control guard locking from SAFE area + activate escape release error	TRUE	FALSE	TRUE	5	Guard locking is controlled exclusively from the SAFE area. The locking module enters into an error state when the escape release is actuated.
Control guard locking from SAFE and NON-SAFE area + activate escape release error	TRUE	TRUE	TRUE	7	Guard locking is controlled from the SAFE and NON-SAFE area. The locking module enters into an error state when the escape release is actuated.

 Table 2:
 Parameters of locking module L1

NOTICE!

#### 8.1.2. Locking module L2



The solenoid is controlled via the SAFE bit (default setting). If you do not want to change the slot parametrization of the locking module, you do not have to create any startup values. If you want to activate the escape release error in the slot parametrization, solenoid control must also be parametrized correspondingly.

 The decimal value 4 is not allowed with an L2 locking module and will lead to a parametrization error.

Parametrization of locking module L2	Bit 2	Bit 1	Bit 0	Decimal value	Comment
Deactivate guard locking	FALSE	FALSE	FALSE	0	Behaves like IO box (applies only to L2)
Control guard locking from SAFE area	FALSE	FALSE	TRUE	1	Guard locking is controlled exclusively from the SAFE area
Control guard locking from NON- SAFE area	FALSE	TRUE	FALSE	2	Guard locking is controlled exclusively from the NON-SAFE area
Control guard locking from SAFE and NON-SAFE area	FALSE	TRUE	TRUE	3	Guard locking is controlled from the SAFE and NON-SAFE area
Control guard locking from SAFE area + activate escape release error	TRUE	FALSE	TRUE	5	Guard locking is controlled exclusively from the SAFE area. The locking module enters into an error state when the escape release is actuated.
Control guard locking from NON- SAFE area + activate escape release error	TRUE	TRUE	FALSE	6	Guard locking is controlled exclusively from the NON-SAFE area. The locking module enters into an error state when the escape release is actuated.
Control guard locking from SAFE and NON-SAFE area + activate escape release error	TRUE	TRUE	TRUE	7	Guard locking is controlled from the SAFE and NON-SAFE area. The locking module enters into an error state when the escape release is actuated.

Table 3: Parameters of locking module L2

#### 8.1.3. Adding Startup value

 $1. \ \mbox{Open the settings of the MBM module and click the Startup tab.}$ 

	202	11111_AP	)00270 H	• ×							
	G	eneral Eth	erCAT D	C Proces	s Data Plc	EtherCA	TP Slots	Startup	CoE - Online	Diag History	Online
	h	Tropoiti	Protocol	Index	Dete		Commont				
L				Index	01.00.00.00.00.00	00	Comment				
L		C <ps></ps>	COE	0X1B00 C	01000800000	00	download				
L		C <ps></ps>	CoE	0x1C12 C	04 00 00 16 01	16 02 1	download	pdo 0x1C1			
L		C <ps></ps>	CoE	0x1C13 C	05 00 00 1A 01	1A 02	download	pdo 0x1C1			
		C <ps></ps>	CoE	0xF030 C 0	05 00 30 00 00 0	00 10 0	download	slot cfg			
		E <ip,< th=""><th>EoE</th><th></th><th>01 00 00 00 02 0</th><th>01 05 2</th><th>eoe init</th><th></th><th></th><th></th><th></th></ip,<>	EoE		01 00 00 00 02 0	01 05 2	eoe init				
L											
L											
L											

#### Fig. 13: Startup values

2. Right-click the empty field and select Add New Item ....

202	11111_AP	000270 +	• ×									
G	eneral Eth	nerCAT D	C Proces	s Data	Plc	EtherCA	ΤP	Slots	Startup	CoE - Online	Diag History	Online
	Transiti	Protocol	Index	Data			Cor	nment				
	C <ps></ps>	CoE	0x1B00 C	01 00 0	00 00 80	00	dov	vnload p	do 0x1B0			
	C <ps></ps>	CoE	0x1C12 C	04 00 0	00 16 01	16 02 1	dov	vnload p	do 0x1C1			
	C <ps></ps>	CoE	0x1C13 C	05 00 0	)0 1A 01	1A 02	dov	vnload p	do 0x1C1			
	C <ps></ps>	CoE	0xF030 C 0	05 00 3	30 00 00	00 10 0	dov	vnload s	lot cfg			
	E <ip,< td=""><td>EoE</td><td></td><td>01 00 0</td><td>00 00 02</td><td>01 05 2</td><td>eoe</td><td>e init</td><td></td><td></td><td></td><td></td></ip,<>	EoE		01 00 0	00 00 02	01 05 2	eoe	e init				
			_									
				ት Ad	dd Ne <u>w</u>	Item			Ctrl+	Shift+A		
				× <u>D</u> e	elete				Del			
				Ec								
				Ex	port XN	/L Descri	iptic	)n				



3. Select the slot where the locking module is to be found (here: Slot 3 Configuration) and then double-click SubIndex 001.

Edit CANopen	Startup Entry				×
Transition □I->P ☑P->S □S->0	S->P O->S	Index (hex): Sub-Index (dec):	8029 1 Complete Acces	8	OK Cancel
D <b>ata (hexbin)</b> : Validate Mask:	00				Hex Edit
Comment:	SubIndex 0	01			Edit Entry
Index	Name	Flags	Value	Unit	^
Ė 8029:0	Slot 3 Configuratio	n	>4<		
8029	SubIndex 001	RW	0x00 (0)		
8029	SubIndex 002	RW	0x00 (0)		
8029	SubIndex 003	RW	0×00 (0)		
8029	SubIndex 004	RW	0×00 (0)		
	Subslot 3.1 Config	uration	> 4 <		
<u>+</u> 8049:0	Subslot 3.2 Config	uration	>4<		
÷ 8059:0	Subslot 3.3 Config	uration	>4<		
<u>+</u> 8069:0	Subslot 3.4 Config	uration	>4<		

Fig. 15: Selecting the slot



#### NOTICE!

You can then refer to the settings of the MBM bus module under the *Slots* tab for the corresponding slot configuration.

4. As described above, the escape release error is to be activated in this application. Bit 3 (decimal value 4) must be set to TRUE for this purpose. Solenoid control must additionally be parametrized as described in the notice above. In this application, control of guard locking must be controlled from the SAFE and NON-SAFE area. As shown in *Table 3*, the resulting decimal value is 7.

	Set Value Dialo	g	×
	Dec:	7	OK
	Hex	0x07	Cancel
	Float:		
	Bool:	<u>0</u> <u>1</u>	Hex Edit
	Binary:	07	1
	Bit Size:	○1 ●8 ○16 ○32 ○64	<b>○</b> ?
Т			

Fig. 16: Activating the escape release error and parameterizing solenoid control (SAFE and NON-SAFE)

20	)21	1111_AF	P000270 H	⊨ ×										
	Ge	neral E	therCAT D	C Proces	s Data	Plc	EtherCA	TP	Slots	Startup	CoE -	Online	Diag History	Online
		Transiti	Protocol	Index	Data			Cor	nment					
		C <ps></ps>	CoE	0x1B00 C	01 00 0	00 00 80	00	dov	vnload p	odo 0x1B0				
		C <ps></ps>	CoE	0x1C12 C	04 00 0	00 16 01	16 02 1	dov	vnload p	odo 0x1C1				
		C <ps></ps>	CoE	0x1C13 C	05 00 0	00 1A 01	1A 02	dov	vnload p	odo 0x1C1				
		C <ps></ps>	CoE	0xF030 C 0	05 00 3	30 00 00	00 10 0	dov	vnload s	slot cfg				
		E <ip,< th=""><th>EoE</th><th></th><th>01 00 0</th><th>00 00 02</th><th>01 05 2</th><th>eoe</th><th>e init</th><th></th><th></th><th></th><th></th><th></th></ip,<>	EoE		01 00 0	00 00 02	01 05 2	eoe	e init					
		C PS	CoE	0x8029:01	0x07 (7	7)		Sub	olndex 0	01				
						·								



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### 8.2. Example: parameterizing the LEDs in the submodule

Submodule parameterization	Value range	Flashing frequen- cy	Default value	Comment
SubIndex 001	1 - 255	0.1 - 25.5 Hz	1 Hz	Flashing frequency $H1 = emergency stop LED$
SubIndex 002	1 - 255	0.1 - 25.5 Hz	1 Hz	Flashing frequency $H2 = pushbutton LED$
SubIndex 003	1 - 255	0.1 - 25.5 Hz	1 Hz	Flashing frequency H3 = pushbutton LED

Table 4: Values for parameterizing the submodule

#### $1. \ \mbox{Open the settings of the MBM bus module and click the Startup tab.}$

20211111_AP000270 + ×													
G	eneral E	EtherCAT	DC	Proces	s Data	Plc	EtherCA	TP	Slots	Startup	CoE - Online	Diag History	Online
	Transiti.	Protoc	ol Ind	dex	Data			Cor	nment				
	C <ps< th=""><th>&gt; CoE</th><th>0x</th><th>1B00 C</th><th>01 00 0</th><th>00 00 8</th><th>00</th><th colspan="2">download pdo 0x1B0</th><th></th><th></th><th></th></ps<>	> CoE	0x	1B00 C	01 00 0	00 00 8	00	download pdo 0x1B0					
	C <ps< th=""><th>&gt; CoE</th><th>0x</th><th>1C12 C</th><th>04 00 0</th><th>0 16 01</th><th>16 02 1</th><th>dov</th><th>vnload p</th><th>do 0x1C1</th><th></th><th></th><th></th></ps<>	> CoE	0x	1C12 C	04 00 0	0 16 01	16 02 1	dov	vnload p	do 0x1C1			
	C <ps< th=""><th>&gt; CoE</th><th>0x</th><th>1C13 C</th><th>05 00 0</th><th>0 1A 01</th><th>1A 02</th><th>dov</th><th>vnload p</th><th>do 0x1C1</th><th></th><th></th><th></th></ps<>	> CoE	0x	1C13 C	05 00 0	0 1A 01	1A 02	dov	vnload p	do 0x1C1			
	C <ps< th=""><th>&gt; CoE</th><th>0x</th><th>F030 C 0</th><th>05 00 3</th><th>00 00 00</th><th>00 10 0</th><th>dov</th><th>vnload s</th><th>lot cfg</th><th></th><th></th><th></th></ps<>	> CoE	0x	F030 C 0	05 00 3	00 00 00	00 10 0	dov	vnload s	lot cfg			
	E <ip,< th=""><th> EoE</th><th></th><th></th><th>01 00 0</th><th>0 00 02</th><th>01 05 2</th><th>eoe</th><th>init</th><th></th><th></th><th></th><th></th></ip,<>	EoE			01 00 0	0 00 02	01 05 2	eoe	init				
	C PS	CoE	0x	8029:01	0x07(7	)		Sub	Index 0	01			
	L PS	C0E	UX	0029:01	UXU7 (7	)		Sub	index 0	01			

- Fig. 18: Startup values
- 2. Right-click the empty field and select Add New Item....

20211111_AP000270 + ×											
General	EtherCAT	T DC	Process Da	ta Plc	EtherCAT P	Slots	Startup	CoE - Online	Diag	History	Online
Transi	tion Pr	otocol	Index	Data			Comment				
<b>C</b> <p< td=""><td colspan="2">C <ps> CoE</ps></td><td>0x1C12C0</td><td>04 00</td><td colspan="2">04 00 00 16 01 16 02 16 0</td><td colspan="3">download pdo 0x1C12 index</td><td></td><td></td></p<>	C <ps> CoE</ps>		0x1C12C0	04 00	04 00 00 16 01 16 02 16 0		download pdo 0x1C12 index				
<b>C</b> <p< th=""><th colspan="2">C <ps> CoE</ps></th><th>0x1C13C0</th><th>04 00</th><th colspan="2">04 00 00 1A 01 1A 02 1A</th><th colspan="3">download pdo 0x1C13 index</th><th></th><th></th></p<>	C <ps> CoE</ps>		0x1C13C0	04 00	04 00 00 1A 01 1A 02 1A		download pdo 0x1C13 index				
C <p< th=""><th colspan="2">C <ps> CoE</ps></th><th>0xF030 C 0</th><th>05 00 3</th><th colspan="2">05 00 30 01 00 00 11 00 0</th><th colspan="2">download slot cfg</th><th></th><th></th><th></th></p<>	C <ps> CoE</ps>		0xF030 C 0	05 00 3	05 00 30 01 00 00 11 00 0		download slot cfg				
E <if< th=""><th colspan="2">E <ip, ps=""> EoE</ip,></th><th></th><th>01 00</th><th>00 00 02 01 05</th><th>20 0</th><th>eoe init</th><th></th><th></th><th></th><th></th></if<>	E <ip, ps=""> EoE</ip,>			01 00	00 00 02 01 05	20 0	eoe init				
C PS	C PS CoE		0x8029:01	0x07 (	7)		SubIndex	001			
			*כ	Add New	ltem		Ctrl+Sh	ift+A			
			$\times$	Delete			Del				
				Edit							
		<u>.</u>									



3. Select Subslot 3.2 Configuration and double-click SubIndex 001 to parameterize the flashing frequency of the LED in the emergency stop.

E	Edit CANopen Startup Entry ×								
	Transition □I->P ☑P->S	_ S → P	Index (hex): Sub-Index (dec):	8049		OK Cancel			
$\Box S \rightarrow O$ $\Box O \rightarrow S$			Validate	Complete	e Access				
Data (hexbin): 00 Validate Mask:						Hex Edit			
Comment: SubIndex 00			1			Edit Entry			
ſ	Index	Name		Flags	Value	^			
		It parameters	RO	>1<					
	主 10F1:0	Error Settings			> 2 <				
	⊞ ~ 10F3:0	Diagnosis His	tory		>5<				
	10F8	Timestamp Ob	oject	RW P	0x0				
	∃ 1C32:0	SM output pa	rameter		> 32 <				
. E 1C33:0 SM input param			meter		> 32 <				
😟 8029:0 Slot 3 Configu		ration		> 4 <					
			onfiguration		> 4 <				
	⊡ ~ 8049:0	3:0 Subslot 3.2 Configuration			> 4 <				
	8049:01	SubIndex 001		RW	0x00 (0)				
	8049:02	Subindex 002		RW	UxUU (U)				
	8049:03	Subindex 003		RW	UxUU (U)				
	····· 8049:04	Subindex UU4		HW	UXUU [U]				

Fig. 20: Selecting the slot

4. Enter the required value for the flashing frequency according to *Table 4* (here: dec.: 50 = 5 Hz). If the bit for controlling the LED and the bit for controlling the flashing command are set, the LED will flash at 5 Hz. Refer to chapter 4 or the data sheet of the submodule for the respective bits.



Fig. 21: Flashing frequency of emergency stop LED 5 Hz

## 9. Linking the FSoE module of the MGB2 Modular EtherCAT

In order to be able to use the MGB2 in the safety program, the FSoE module from the hardware configuration must be linked with an *Alias Device* in the safety program.

1. Right-click Alias Devices in your safety program and select Add -> New Item...

Solution Explorer	🕈 🗸					
○ ○ 🏠 🛱 - <sup>™</sup> ⊙ - ₱ 📕						
Search Solution Explorer (Ctrl+ü)	-م					
Image: Solution '20211111_AP000270' (1 project)         Image: Solution '20211111_AP000270         Image: Solution '20211111_AP00270         Image: Solution '20211111_AP00270         Image: Solution '20211111_AP00270         Image: Solution '202111111_AP00270         Image: Solution '202111111_AP00270         Ima	Î					
Alias Devices FrorAcknowledgem	Add				· * *	► * New Item
Run.sds	Scope to This				*	🊈 New Folder
Constance 32 TwinSafeGroup 1.sal	New Solution Expl	(	orer View	prer View	prer View	orer View

Fig. 22: Adding an Alias Device

2. In the *Installed* tree, open the *Safety* structure and *EtherCAT* and then click *EUCHNER GmbH* + *Co*. Select the Safety *Alias Device* configured in accordance with the hardware (here: 2 Bytes).

Add New Item - SAFETY_PROG			?	$\times$
Installed	Sort by:	Default • 🔢 📃 Search (Ctrl+E)		- م
Standard ∡ Safety		0x00000130 - Assigns 2 Byte as FSoE area. Obtain number oSafety 0x00000130 - Assigns 2 Byte as FSoE area. Obtain number oSafety		193
✓ EtherCAT Beckhoff Automation GmbH & Co		0x00000131 - Assigns 4 Byte as FSoE area. Obtain number oSafety must not exceed 16 Bit (FSoE	l safety bits whi (FSoE 2 Bytes)	ich
EUCHNER GmbH + Co KBus		0x00000132 - Assigns 8 Byte as FSoE area. Obtain number oSafety		
PROFIsafe				

Fig. 23: Selecting the corresponding safety module

3. The Alias Device must now be linked with the configured hardware module so that the safety data of the MGB2 can be used in the safety project. Double-click to go to the properties of the added Alias Device and open the Linking tab. Select the physical module.



#### Fig. 24: FSoE module linking

Fig. 25: Selecting FSoE module

4. The FSoE address of the physical device (DIP switch) must then be adopted for the Alias Device by clicking the green arrow.

(	0x00000130 - AssignFSoE 2 Bytes)_1.sds* 🗢 🗙								
ſ	Linkin	g Connecti	on Safety Parameters Process Image						
FSoE Address:		ddress:	0 External Safe Address:						
l	Linking Mode:		Automatic Y						
	Physical Device:		TIID^Device 2 (EtherCAT)^Box 6 (EPP1322-0001)^Box 7 (MBM-E						
l	Dip Switch:		12 💞						
l	Input: Full Name:		TIID^Device 2 (EtherCAT)^Term 1 (EK1200)^Term 2 (EL6910)^Co						
l		Linked to:	TIID^Device 2 (EtherCAT)^Box 6 (EPP1322-0001)^Box 7 (MBM-E						
l	Output: Full Name:		TIID^Device 2 (EtherCAT)^Term 1 (EK1200)^Term 2 (EL6910)^Co						
		Linked to:	TIID^Device 2 (EtherCAT)^Box 6 (EPP1322-0001)^Box 7 (MBM-E						
	Name:		Message_6						

Fig. 26: Adopting FSoE address

The safety program must then be created. This is not part of this application and is the responsibility of the programmer. At least one safe bit of the MGB2 must be used.

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### 10. 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 must also be considered in the safety evaluation, 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 for functional safety 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 engineering himself. 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 be excluded only 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.

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

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