

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



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

Safety function Guard locking according to EN ISO 14119

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

Components/modules used

EUCHNER

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

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

Others

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

Software

Installed SIMATIC software	nstalled SIMATIC software					
Products Components HW Updates	s System Files					
Name	Version	Release	Release number			
Automation License Manager S7 Distributed Safety Programming S7 F ConfigurationPack S7-GRAPH Professional 2010 SR3 S7-PCT Professional 2010 SR3 S7-PLCSIM S7-SCL Professional 2010 SR3 SIMATIC PC Adapter USB SIMATIC Pro Save STEP 7 Professional 2010 SR3	V5.3 + SP2 + Upd2 V5.4 + SP5 V5.5 + SP9 V5.3 + SP7 V3.0 V5.4 + SP5 + Upd3 V5.3 + SP6 + Upd1 V1.2 V13.0 SP1 V5.5 + SP3	05.03.02.02_01.01.00.01 K5.4.5.0_3.5.0.2 K5.5.9.0_11.1.0.1 K5.3.7.0_1.2.0.1 V03.00.00.00_01.40.00.01 K05.04.05.03_01.02.00.01 K05.03.06.01_01.07.00.01 V01.02.00.00_02.02.00.03 V13.00.01.00_25.01.00.01 K5.5.3.0_26.6.0.1	K5.3.2.2 K5.4.5.0 K5.5.9.0 K5.3.7.0 V3.0.0 K5.4.5.3 K5.3.6.1 V1.2.0.0 V13.00.01.00 K5.5.3.0			
•			4			
<u>Close</u> <u>P</u> rint	oport		<u>H</u> elp			





Functional description

General

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

PROFINET	Eingangsbereich / Input	range:	Bit	7	6	5	4	3	2	1	0
			Byte 0	S8	-	-	-	-	-	-	-
	MGB	Slot 1	Byte 1	-	-	-	-	-	-	-	S9
Datenbytes			Byte 2	L	-	-	-	-	E	E	Е
(Datenblöcke für nicht sichere	Ausgangsbereich / Outp	out range:	Bit	7	6	5	4	3	2	1	0
Funktion)			Byte 0	H8	-	-	-	-	-	-	-
Data bytes (data blocks for	MGB	Slot 1	Byte 1	s	-	-	-	-	H7	-	H9
unsafe functions)			Byte 2	-	-	-	-	-	-	Reset	Q
PROFIsafe	Eingangsbereich / Input	range:	Bit	7	6	5	4	3	2	1	0
			Byte 0	-	-	-	Z	R	Т	-	S7
Datarbutas	SAFETY	Slot 5	Byte 1	-	-	-	-	-	-	ÜK	SK
(Datenblöcke für sichere Funktion)			Byte 2			PROFIsafe intern genutzt (Steuerbyte, CRC usw.) Used within Profisafe (control byte, CRC etc.)					
dete hutee	Ausgangsbereich / Outp	out range:	Bit	7	6	5	4	3	2	1	0
data blocks for			Byte 0	-	-	-	-	-	-	-	S
safe functions)	SAFETY	Slot 5	Byte 1	-	-	-	-	-	-	-	-
			Byte 2-5		PROF Use	PROFIsale intern genutzt (Statusbyte, CRC usw.) Used within Profisale (status byte, CRC etc.)					
	ŪK = T and R and Z SK = T and R L = Lebensdauer / Life	Z = Zuha R = Riege T = Türst	itung / guard eisteilung / bo eilung / door	l locking alt position position	E=Ge Q=Qu S=Zu	rātediagnos ittierung / A haltemagne	se / Device I.cknow ledg t / Guard lo	diagnosis Jement cking solen	oid		

Figure 2

Data structure

Input range slot 1: Standard

Input range slot 5: Safe

Output range slot 1: Standard

Output range slot 5: Safe

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

Notice

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

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



Mounting

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

Installing the GSDML file

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

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



Figure 3

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



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

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

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Now select the appropriate MGB on the right in the tree in "PROFINET IO" \rightarrow "Addition Field Devices" \rightarrow "I/O" \rightarrow "Euchner MGB". Drag this to your PROFINET network.



Configuring hardware

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

Assign device name
Device name: euchnermgb Device Euchner MGB
Avajlable devices:
IP address MAC address Device type Device name Assign name
Node flashing test Duration (seconds): 3 Flashing on Elashing off
Show only devices of the same type 🔲 Display only devices without names
<u>Update</u> <u>Export</u>
Close

Figure 8

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

Assign device name				×
Device name: euchne	ermgb	•	De <u>v</u> ice	Euchner MGB
Avajlable devices:				
IP address MAC add 00-1A-5C	ess Device type 00-CA-90 Euchner MGB	Device name euchnermgb		Assign name
				Node flashing test Duration (seconds): 3 Flashing on
, □ <u>S</u> how only devices o <u>U</u> pdate	f the same type 🗖 Disgla	y only devices withou	ut names	
				Help

Figure 9

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(0) UR	CPU 315F-2 PN/DP MPL/DP		
X2 X2P1 3 4	PN-IO Port 1		Ethemet(1): PROFINET-IO-System (100)
			(1) euchner

(1) euchnermgb					
Slot 🚺 Module	Order number	I address	Q address	Diagnostic address:	Comment
0 🚡 euchnermgb	121840	1		2043*	
X1 Interlace				2042**	
Ft Fort 1				2041*	
F2 Rot 2				2040*	
1 Keys/Leds 3 Byte 10 sta~		a2	a2		
2 PROFIsale 16 Bool ID st~		38	38		
		-	-	•	

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

				More than safe
operties - PROFIsafe 16	Bool IO standard - (R-/S2)		—
General Addresses PR	OFIsafe			
Parameter name	Value	Hex	Change value	
F_SIL F_CRC_Length F_Block_ID F_Par_Version F_Source_Add F_Dest_Add	SIL3 3-Byte-CRC 0 1 2000 2000	C8		
F_WD_Time	600			
Current F parameter CRC	(CRC1) hexadecimal:			
			Court 1	
OK			Cancei	неір

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Figure 11

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

	3210 8 4 0 1
Binary coding of the DIP switches for PROFIsafe address (factory setting: 135)	00 01 02 01 02 03 04 03 04 03 04 04 04 04 04 04 04 04 04 04
	default address: 128 + 4 + 2 + 1 =
	135)

Figure 13

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

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roperties - CPU 315F-2 PN/DP - (R0/S2)			×
Cycle/Clock Memory Retentive Memory	Interrupts Time-of	-Day Interrupts Cy	clic Interrupts
General Startup	Sy	nchronous Cycle Inter	rupts
Protection level ○ 1: Access protect. for F CPU □ Can be bypassed with password ○ 2: Write-protection ● 3: Read/write-protection Password: ■ <th>Mode C <u>Process mode</u> Permissible cy test functions: (• <u>Test mode</u></th> <th>rcle increase via</th> <th>5 ms</th>	Mode C <u>Process mode</u> Permissible cy test functions: (• <u>Test mode</u>	rcle increase via	5 ms
ОК		Cancel	Help

Figure 14

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

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



Preparing safety program



Figure 15

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

Properties - Function		—
General - Part 1 General	- Part 2 Calls Attributes	
<u>N</u> ame:	FC1	
Symbolic Name:		
Symbol Comment:		
Created in Language:	F-CALL 🗸	
Project path:		
Storage location of project:	C:\Program Files (x86)\Siemens\Step7\s7proj\MGB-PN_1	
	Code Interface	
Date created:	05/23/2016 12:29:48 PM	
Last modified:	05/23/2016 12:29:48 PM 05/23/2016 12:29:48 PM	vi
Comment:		*
		Ŧ
ОК	Cancel	Help

Figure 16

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

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OB1 MGB-PN_application\Sl	MATIC 300(1)\CPU 315F-2 PN/DP	• 🕱
⊡-⊕ Interface ⊕-⊕ TEMP	Contents Of: 'Environment\Interface' Name TEMP	
OB1 : "Main Program Swe Comment: Network 1: Title: CALL FC 1	ep (Cycle)"	
Image: A state of the state		► ai

Figure 17

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

eneral - Part 1 Genera	al - Part 2 Calls Attributes	
Name:	FB1	Mul. Inst. Cap.
Symbolic Name:		
Symbol Comment:		
Created in Language:	F-FBD	
Project path:		
Storage location of project:	C:\Program Files (x86)\Siemen	s\Step7\s7proj\MGB-PN_1
	Code	Interface
Date created:	05/24/2016 08:24:23 AM	
.ast modified:	05/24/2016 08:24:23 AM	05/24/2016 08:24:23 AM
Comment:		*
		-

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

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📆 Safety Program - MGB-PN_applicat	tion\SIMATIC 30	0(1)\CPU 315F-2 PN/DP\	S7 Program(1)	83
Offline Online					
Rack: 0 Slot	: 2				Current mode:
Collective signature of all F-blocks with F-	attributes for the bl	lock container:	B5E1316B		unknown
Collective signature of the safety program	1		D		
Current compilation: ?					Safety mode
The safety program has been changed si	nce it was last con	npiled.			
F-blocks:					
F-runtime/F-block	Symb. name	Function in safety progra	Signature	Know-how p	Compare
E- Safety program					
E-					Permission 🗸
1 FC1		F-CALL	31CA	Г	
1 FB1		F-FB	13D5	Г	F-Runtime groups
🖅 FB1638	F_IO_CGP	F-system block	EDA2	V	
🖅 FB1639	F_CTRL_1	F-system block	504C	v	Compile
🖅 FB1640	F_CTRL_2	F-system block	40BA	V	
🖅 DB818	F_GLOBDB	F shared DB	5C6A	V	
	F00003_PR0	FI/O DB	726F	V	Download
					Logbook
					Print
Close					Help

Figure 19

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

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Safety Program - MGB-PN_application\SIMATIC 300(1)\CPU 315F-2 PN/DP\S7 Program(1)						
Offline	Online					
Rack:	📆 Edit	F-Runtime Groups		node:		
Collective Collective	F-run	time group/parameter	Value	þwn		
Current co		Safety program	_	ode		
The safety						
F-blocks:						
F-runtime				are		
E-)				pn 🖵		
				groups		
				le 🚽		
				ad 👻		
	Ne	ew Delete		ok		
		ок	Cancel Hel	P		
Close				Help		

Figure 20

In this window, click "New".

Define New F-Runtime Group		83
F-CALL block:	FC1	•
F-program block:	FB1	-
I-DB for F-program block:	DB1	
Max. cycle time of the F-runtime in ms:	200	
DB for F-runtime group communication:		-
ОК	Cancel	Help

Figure 21

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



Edit F-Runtime Groups	×
F-runtime group/parameter	Value
□- Bafety program	
⊕-) F-runtime group FC1	FB1 - 200ms - OB1
Edit safety program (320:258) Image: Do you want to create the missing blocks (F-I-DB for F-program block, data block for F-run communication)? Yes No	CALL block, ntime group
New Delete	
ОК	Cancel Help

Accept your entry by clicking "Yes".



Example for reintegrating

PROFINET	Eingangsbereich / Input	range:	Bit	7	6	5	4	3	2	1	0
			Byte 0	S8	-	-	-	-	-	-	-
	MGB	Slot 1	Byte 1	-	-	-	-	-	-	-	S9
Datenbytes			Byte 2	L	-	-	-	-	E	E	Е
(Datenblöcke für nicht sichere	Ausgangsbereich / Outp	ut range:	Bit	7	6	5	4	3	2	1	0
Funktion)			Byte 0	H8	-	-	-	-	-	-	-
Data bytes (data blocks for	MGB	Slot 1	Byte 1	s	-	-	-	-	H7	-	H9
unsafe functions)			Byte 2	-	-	-	-	-	-	Reset	Q
PROFIsafe	Eingangsbereich / Input	range:	Bit	7	6	5	4	3	2	1	0
	SAFETY	Slot 5	Byte 0	-	-	-	z	R	Т	-	S7
Datanhutas			Byte 1	-	-	-	-	-	-	ÜK	SK
(Datenblöcke für sichere Funktion)			Byte 2	PROFIsafe intern genutzt (Steuerbyte, CRC usw.) Used within Profisafe (control byte, CRC etc.)							
data hitan	Ausgangsbereich / Outp	ut range:	Bit	7	6	5	4	3	2	1	0
(data blocks for			Byte 0	-	-	-	-	-	-	-	s
safe functions)	SAFETY	Slot 5	Byte 1	-	-	-	-	-	-	-	-
			Byte 2-5		PROF Use	PROFIsafe intern genutzt (Statusbyte, CRC usw.) Used within Profisafe (status byte, CRC etc.)					
	ŪK = T and R and Z SK = T and R L = Lebensdauer / Life	Z = Zuhaltung / guard locking R = Riegelstellung / bolt position T = Türstellung / door position		E = Gerätediagnose / Device diagnosis Q = Quittierung / Acknow ledgement S = Zuhaltemagnet / Guard locking solenoid							

Figure 23

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



FB1 : Title:				
Comment:				
Network 1: Tit:	le:			
		DB819_DBX0		
Г	&	_2		
II.0		1=ACKNOWLE		
		DGEMENT		
DB819_DBX2		FOR		
-2		REINTEGRAT		
1=ACKNOWLE		ION		
DGEMENT		"F00003_		
REQUEST		PROFIsafe_		
"F00003_		16_Bool".		
PROFIsafe_		ACK_REI		
16_Bool".		=		
ACK REO				

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

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

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

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

Figure 25 (DB819)



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



Figure 26

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

Explanation:

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



List of references

Preparation of S7 Distributed Safety Project Presentation Technikerschule Hannover (Technical College, Hanover) SIMATIC Safety Integrated "Passivation and Reintegration of F-I/O considering as example the ET 200S"

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Important note – please observe carefully!

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

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

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

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

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

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

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

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

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

Use of brand names and company names

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