

AOI for MGB-L1B-EI... on Allen Bradley ControlLogix



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

Guard locking for personnel protection according to EN ISO 14119 Safety function 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 Ethernet/IP interface, guard locking with guard lock	126636 / MGB-L1HB-EIA-R-126636	126635 / MGB-L1B-EIA-R-126635 126637 / MGBJ 1B-EIAJ-126637
monitoring	1200307 Mad EIND EINE 120030	120037 / MGD EID EINE 120037

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
Allen Bradley ControlLogix 4 Slots Chassis	Mat No PN-240518
Allen Bradley Logix 5576S Automation Controller 8M/4M	Mat No PN-98688
Allen Bradley Logix L7SP SIL3 PLe Safety Partner	Mat No PN-98690
Allen Bradley 2-PORT CLX HI-CAP ENET/IP MODULE – TP	Mat No. 184724

Notice: The device can be operated on control systems of the type RSLogix5000 from version 20. (Firmware 20.011).

Software





Functional description

General

The MGB-L1B-EL...is guard locking in accordance with EN ISO 14119 according to the closed-circuit current principle. In this example all safety functions are processed via the CIP Safety protocol. The MGB is connected to an Allen Bradley ControlLogix CPU.

luce de					Bit			
Inputs	7	6	5	4	3	2	1	0
Byte 0 = Connection Header	-	-	-	-	-	Diagnostic Active	Connection Faulted	RunMode
Byte 1 = Connection Header				Diagnost:	icSequenceC	ount		
Byte 2 = Connection Header	-	-	-	-	-	-	-	-
Byte 3 = Connection Header	-	-	-	-	-	-	-	-
Byte 4 = Failsafe Inputs 0	FI.MS2	FI.MS1	FI.MS0	-	-	-	FI.EN	FI.ES
Byte 5 = Failsafe Inputs 1	FI.UK	FI.SK	-	-	-	FI.L	FI.B	FI.D
Byte 6 = Inputs 0	-	-	S92.2	S92.1	S91.2	S91.1	S90.2	S90.1
Byte 7 = Inputs 1	-	-	\$95.2	S95.1	S94.2	S94.1	S93.2	S93.1
Byte 8 = Inputs 2	S4.2	S4.1	S3.2	S3.1	s2.2	S2.1	S1.2	S1.1
Byte 9 = Diagnostics	D.LT	-	D.OL	D.MS	D.EN	D.ES	D.PF	-
Bytes 10,11				F	aultCode			

Outroute		Bit								
Outputs	7	6	5	4	3	2	1	0		
Byte 0 = Failsafe Outputs 0	-	-	-	-	-	-	-	FO.L		
Byte 1 = Outputs 0	-	-	Н95	Н94	Н93	H92	H91	H90		
Byte 2 = Outputs 1	-	-	-	-	Н4	HЗ	Н2	Н1		
Byte 3 = Control X6 and Ack	Q.FP	Q.G	-	-	-	-	-	-		

Figure 2

Data structure

Figure 2 shows the general data structure. For the respective MGB selected, only the bits described in the related data sheet are used. For example, on an MGB without connection for an enabling switch, bit FI.EN is always 0.

A description of the individual bits of the data structure is given in the operating instructions.

Important: In the MGB Ethernet/IP all data are only transmitted via CIP Safety in the safety area. This does not mean the data all have a PL or SIL in safety-related terms. Only the data that start with FI or FO are subject to safety-related assessment.

This application is based on the operating instructions for the MGB-L..B-EI- (Ethernet/IP) with data structure type A. The technical details are available in the operating instructions.

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.

Installing the EDS file

The EDS file is saved in the MGB and can be downloaded. The EDS file does not contain any information on the operation of the MGB.

Setting up the EUCHNER MGB with Ethernet/IP

Setup via a "Generic Safety Device" is described in application 000223. Use this application before you install the AOI.

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Using the EUCHNER AOI

An Add-On-Instruction (AOI) is available from Euchner in the internet at "Service \rightarrow Downloads \rightarrow Software". Prior to use, download the file AOI_MGB_Vx.xx.L5X (x.xx stands for the version of the AOI).

On the usage of the new command AOI_MGB, the safe information is separated from the standard information and the identifiers for the individual bits from the related MGB assigned. The command must be used for each MGB that is used in the system.

1. Importing the AOI

Go offline with Studio5000. Right-click the Add-On Instructions folder in the Controller Organizer window to obtain the following screen.





Now import the new AOI from the folder in which you have saved the downloaded file. Studio5000 now imports all the necessary information and displays it. Please accept using OK.

Import Configuration - AOI_MGB_1_00	.L5X	10.5.5 mm	x
Find:	- A A	Eind/Replace	
Import Content:			
Add-On Instructions	Configure Add-Or	Instruction Properties	
AOI_MGB	Import Name:	AOI_MGB	
Routines	Operation:	Create 🔹	
Contraction References		(i) References will be imported as configured in the References folders	
	Final <u>N</u> ame:	AOI_MGB Properties	s
	Description:	Defines datastructure for all MGB- Ethernet/IP. Copying data from MGB into different UDTs describing MGB like in manual Usage described in application	
	Class:	Safety	
	Revision:	v1.0 Basic Version	
	Revision Note:	Initial version of this AOI	
	Vendor:	EUCHNER GmbH + Co. KG	
			DK Cancel Help
Ready			H.

Figure 4

No responsibility is accepted for the accuracy of this information. Subject to technical modifications. © EUCHNER 2016 AP000224-01-07/16 Page 4 of 14



After the import you will see the new AOI_MGB command in the Add-On Instructions folder as well as the new data types for the MGB in the Data Types folder, User-Defined sub-folder



Figure 5

2. Adding the AOI_MGB command in the safety program



Now prepare a new rung on the ladder diagram in the safety task

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Figure 7



Figure 8

3. Creating the control tag for the AOI_MGB command

The tag for the command must be created (for example using right mouse button and "New Tag").



AOI_MGB			
Defines datastructure for all MGB-Et AOI_MGB		New Tag	
FaultCode MGB_Device_Input_Data MGB_Device_Output_Data MGB_Safety_Tage	<u>ж</u> В	Cu <u>t</u> Instruction <u>C</u> opy Instruction	Ctrl+X Ctrl+C
MGB_Standard_Input_Tags MGB_Standard_Output_Tags	ß	<u>P</u> aste	Ctrl+V
		Delete Instruction	Del
		Add Ladder Element	Alt+Ins
		Edit Main Operand Description	Ctrl+D
		Save Instruction Defaults	
		Clear Instruction Defaults	
		R <u>e</u> move Force	
		<u>G</u> o To	Ctrl+G
		Instruction <u>H</u> elp	F1
		Remove Parameter	
	œ	Remove All Unknown Parameters	
		Open Instruction Logic	
		Open Instruction Definition	
		Properties	Alt+Enter

New Tag		×
Name:	AOI_MGB_Tag	Create 🛛 🔻
Description:	*	Cancel
	-	
Usage:	Local Tag 🔹	
Туре:	Base Connection	
Alias For:		
Data Type:	AOI_MGB	
Parameter Connection:		
Scope:	SafetyProgram 🗸 🗸	
Class:	Safety 👻	
External Access:	Read/Write 🔹	
Style:	~	
Constant		
Sequencin	g	
Open Conf	iguration	
Open Para	meter Connections	





4. Linking the AOI_MGB command to the MGB

Once the tag has been created, the inputs and outputs on the MGB used must be linked in the MGB_Device_Input_Data field and in the MGB_Device_Output_Data field. For this purpose select the identifier for the MGB to which the command is to be linked (here the identifier from the application AP000223.)

7.	Enter Name Filter	Defines AOL_MG FaultCod MGB_De MGB_De	datastru B le wice_In wice_O Show:	AOL_MGB ucture for all MG AOL_MG put_Data AB:ETHERNET	B-Ethernet/ BB_Tag □ - < 0 ← ▼ - < SAFETYMODU	RunMode)	
	Name		-8	Data Type	Usage	Description	1
				AB:ETHERNET.	. <controller></controller>		=
	Show controller tags					Show standard tag	s
Sho	Show SafetyProgram tags w parameters from other program: one>					✓ Show safety tags	

Figure 11

[7.	A0I_MGB Defines datastructure for all MGB-Ethernet/IP. Cop A0I_MGB AOI_MGB_Tag (ConnectionFaulted) MGB_Device_Input_Data MGB_EI_AP000223: MGB_Device_Output_Data ? MGB_Sifeku_Tane Enter Name Riter Show: AB:ETHERNET_SAFETYMODULE_4Bytes:0:0	-
		Name <u>I Data Type</u> Usage Description	1
	<u> </u>	GB_EL_AP000223:0 AB:ETHERNET <controller></controller>	
-			Ξ
			-
[v 9	now controller tags Show standard tags	
-	V 5	now SafetyProgram tags ☑ Show safety tags	
	Sho	parameters from other program:	
(<no< th=""><th>ie> ▼</th><th></th></no<>	ie> ▼	



5. Creating the tags for the safety task

Create a new tag for the standard program as well as a new tag for the safety program.



New Paramete	er or Tag		×
Name:	S_MGB_Safety_Tags		Create 🗸 🔻
Description:		*	Cancel Help
		Ŧ	
Usage:	<controller></controller>	Ψ	
Туре:	Base Conne	ction	
Alias For:		-	
Data Type:	MGB_Safety_Tags_Type		
Parameter Connection:		-	
Scope:	AP000223	-	
Class:	AP000223		
External	SafetyProgram		
Style:		-	
Constant			
Sequencin	g		
Open Conf	iguration		
Open Para	meter Connections		





tion of outo the oftandard tage for input and output	Now	/ create	the	standard	tags	for	input	and	output.
--	-----	----------	-----	----------	------	-----	-------	-----	---------

New Tag		×
Name:	S_MGB_Standard_Input_Tags	Create 🛛 🔻
Description:	*	Cancel
		Help
	-	
Usage:	<controller></controller>	
Туре:	Base Connection	
Alias For:		
Data Type:	MGB_Std_In_Data_Type	
Parameter Connection:		
Scope:	AP000223 🗸	1
Class:	Safety 🔻	
External Access:	Read/Write 👻	
Style:	·	
Constant		
Sequencin	g	
Open Conf	iguration	
Open Para	meter Connections	

Name:	S_MGB_Standard_Output_Ta	gs	Create 🗸 🔻
Description:		*	Cancel
		Ŧ	пар
Usage:	<controller></controller>	-	
Type:	Base Conne	ection	
Alias For:		Ŧ	
Data Type:	MGB_Std_Out_Data		
Parameter Connection:		Ŧ	
Scope:	AP000223	-	
Class:	Safety	•	
External Access:	Read/Write	•	
Style:		-	
Constant			
Sequencin	g		
0 C	·		





Then check whether the command has been added correctly to the rung. If an error has occurred, please correct it.



Figure 17

6. Creating the output tag for the standard task

In the global controller tags create a new standard tag; this tag will contain the output bits that are to be used in the standard task.

ATTENTION: The new variable must be created in the class Standard!

s	Scope: 12AP000223 V Show: All Tags V Z. Enter Name Filter								
	Name			그림 스	Alias For	Base Tag	Data Type	Class	
	+ MG	B_EI_AP000223:1					AB:ETHERNET_SAFETYMODU	Safety	Γ
	+ MG	B_EI_AP000223:0					AB:ETHERNET_SAFETYMODU	Safety	Г
	+-S_	MGB_Safety_Tags					MGB_Safety_Tags_Type	Safety	T
	+-S_	MGB_Standard_Inpu	.t_Tags				MGB_Std_In_Data_Type	Safety	Т
	+-S	MGB Standard Outr	out Taos				MGB Std Out Data	Safety	Т
Ι	+-MG	B_Standard_Output	_Tags				MGB_Std_Out_Data	Standard	T
									1

Figure 18

During processing in the safety task, the AOI_MGB command copies the necessary bits from the MGB input area to the variables created earlier. The outputs from the standard task are copied to the MGB structure.

To separate safe bits and standard bits, the standard bits for the outputs still need to be made available on the standard tasks. For this purpose the corresponding part of the safety bits is mapped to the new variable just created. The safe inputs can be read directly from the safe data in the standard task.

🦻 File Edit View Search	.ogic Communic	ations Tools Window
1 🖻 🖬 🎒 🕹 🖬 🕇	<u>O</u> pen	•
Offline 🛛 🗸 🗐 RUN	<u>M</u> onitor Tags	ETHIP-1\192
No Forces	<u>E</u> dit Tags	
No Edits	Produced Tags	
Safety Unlocked	Map P <u>L</u> C/SLC	Messages
Controller Organizer	Map Safety Tag	js
Controller Organizer	Verify Build I/O Eorcing SFC Forcing Online Edits	hiner_MGB_1 hiner_MGB_1 hiner_MGB_1 MGB_Safety_ MGB_Standar iB_Standard_
Barameter	and Local Tags	





	Standard Tag Name	∧ ←	Safety Tag Name	<u>C</u> lose
ļ	MGB_Standard_Output_Tags		S_MGB_Standard_Output_Tags	
*				Help
				Delete Row
				Delete How

Figure 20

7. Data structures produced due to the AOI

The following bits are now available in the safe task.

-S_MGB_Safety_Tags		MGB_Safety_Tags_Type	Safety
-S_MGB_Safety_Tags.InputData		MGB_Safety_In_Data_Type	Safety
-S_MGB_Safety_Tags.InputData.FI_ES		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_EN		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_MS0		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_MS1		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_MS2		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_D		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_B		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_L		BOOL	Safety
-S_MGB_Safety_Tags.InputData.FI_SK		BOOL	Safety
S_MGB_Safety_Tags.InputData.FI_UK		BOOL	Safety
-S_MGB_Safety_Tags.OutputData		MGB_Safety_Out_Data_Type	Safety
S_MGB_Safety_Tags.OutputData.FO_CL		BOOL	Safety



The following bits are available as read-only data in the standard task.

S_MGB_Standard_Input_Tags	MGB_Std_In_Data_Type	Safety
-S_MGB_Standard_Input_Tags.RunMode	BOOL	Safety
-S_MGB_Standard_Input_Tags.ConnectionFaulted	BOOL	Safety
-S_MGB_Standard_Input_Tags.DiagnosticActive	BOOL	Safety
+ S_MGB_Standard_Input_Tags.DiagnosticSequen	SINT	Safety
-S_MGB_Standard_Input_Tags.S90_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S91_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S92_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S93_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S94_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S95_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S1_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S2_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S3_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S4_1	BOOL	Safety
-S_MGB_Standard_Input_Tags.S90_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S91_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S92_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S93_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S94_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S95_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S1_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S2_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S3_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.S4_2	BOOL	Safety
-S_MGB_Standard_Input_Tags.D_PF	BOOL	Safety
-S_MGB_Standard_Input_Tags.D_ES	BOOL	Safety
-S_MGB_Standard_Input_Tags.D_EN	BOOL	Safety
-S_MGB_Standard_Input_Tags.D_MS	BOOL	Safety
-S_MGB_Standard_Input_Tags.D_OL	BOOL	Safety
-S_MGB_Standard_Input_Tags.D_LT	BOOL	Safety
E S_MGB_Standard_Input_Tags.FaultCode1	SINT	Safety
+ S_MGB_Standard_Input_Tags.FaultCode2	SINT	Safety
S_MGB_Standard_Input_Tags.FaultCode	INT	Safety
-S_MGB_Standard_Output_Tags	MGB_Std_Out_Data	Safety

Figure 22

The following bits are available as data that can be written in the standard task.

-MGB_Standard_Output_Tags	MGB_Std_Out_Data	Standard
-MGB_Standard_Output_Tags.H90	BOOL	Standard
-MGB_Standard_Output_Tags.H91	BOOL	Standard
-MGB_Standard_Output_Tags.H92	BOOL	Standard
-MGB_Standard_Output_Tags.H93	BOOL	Standard
-MGB_Standard_Output_Tags.H94	BOOL	Standard
-MGB_Standard_Output_Tags.H95	BOOL	Standard
-MGB_Standard_Output_Tags.H1	BOOL	Standard
-MGB_Standard_Output_Tags.H2	BOOL	Standard
-MGB_Standard_Output_Tags.H3	BOOL	Standard
-MGB_Standard_Output_Tags.H4	BOOL	Standard
-MGB_Standard_Output_Tags.Q_G	BOOL	Standard
MGB_Standard_Output_Tags.Q_PF	BOOL	Standard



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 is obligated to assess the safety technology itself. The examples must not be used for assessment, because only a small excerpt of a complete safety function was considered in terms of safety engineering here.

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

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

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

Use of brand names and company names

All brand names and company names stated are the property of the related manufacturer. They are used only for the clear identification of compatible peripheral devices and operating environments in relation to our products.

EUCHNER GmbH + Co. KG · Kohlhammerstraße 16 · 70771 Leinfelden-Echterdingen Telephone: +49 711 75 97 -0 · Fax: +49 711 75 97 -303 · info@euchner.de · <u>www.euchner.de</u>

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