

## 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)

**Safety function** Guard locking for personnel protection 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 Ethernet/IP interface, guard locking with guard lock monitoring	126636 / MGB-L1HB-EIA-R-126636 126638 / MGB-L1HB-EIA-L-126638	126635 / MGB-L1B-EIA-R-126635 126637 / MGB-L1B-EIA-L-126637

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

#### Others

Description	Item
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



Figure 1

## 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.

Inputs	Bit							
	7	6	5	4	3	2	1	0
Byte 0 = Connection Header	-	-	-	-	-	Diagnostic Active	Connection Faulted	RunMode
Byte 1 = Connection Header	DiagnosticSequenceCount							
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	-	-	S95.2	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	FaultCode							

Outputs	Bit							
	7	6	5	4	3	2	1	0
Byte 0 = Failsafe Outputs 0	-	-	-	-	-	-	-	FO.L
Byte 1 = Outputs 0	-	-	H95	H94	H93	H92	H91	H90
Byte 2 = Outputs 1	-	-	-	-	H4	H3	H2	H1
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-El- (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](http://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.

## Using the EUCHNER AOI

An Add-On-Instruction (AOI) is available from Euchner in the internet at "Service →Downloads→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.

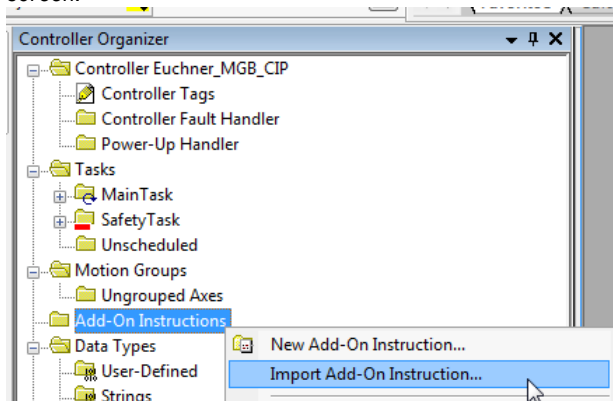


Figure 3

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.

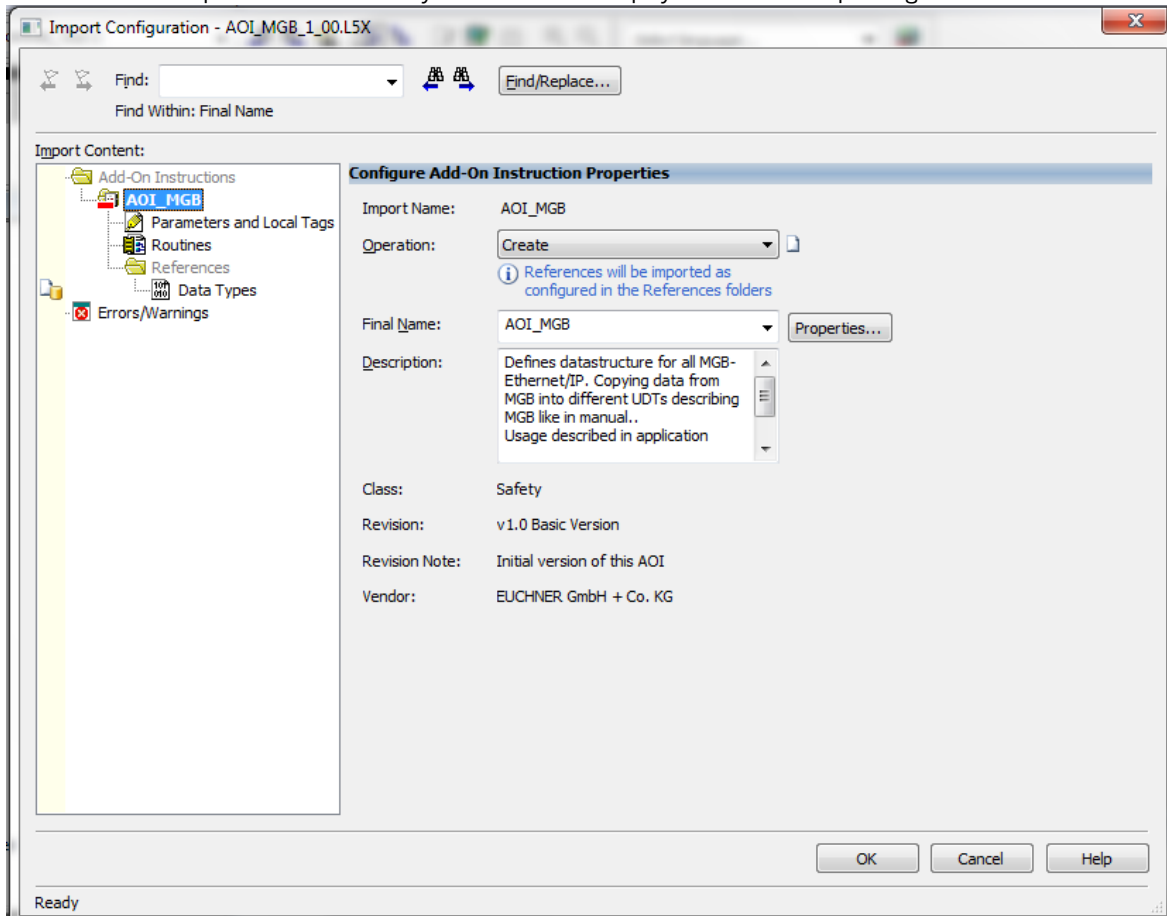


Figure 4

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

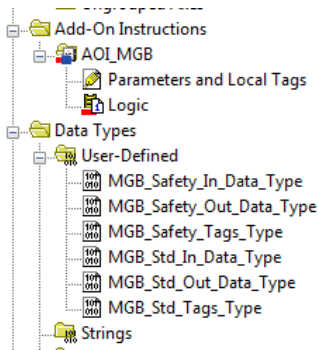


Figure 5

## 2. Adding the AOI\_MGB command in the safety program

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

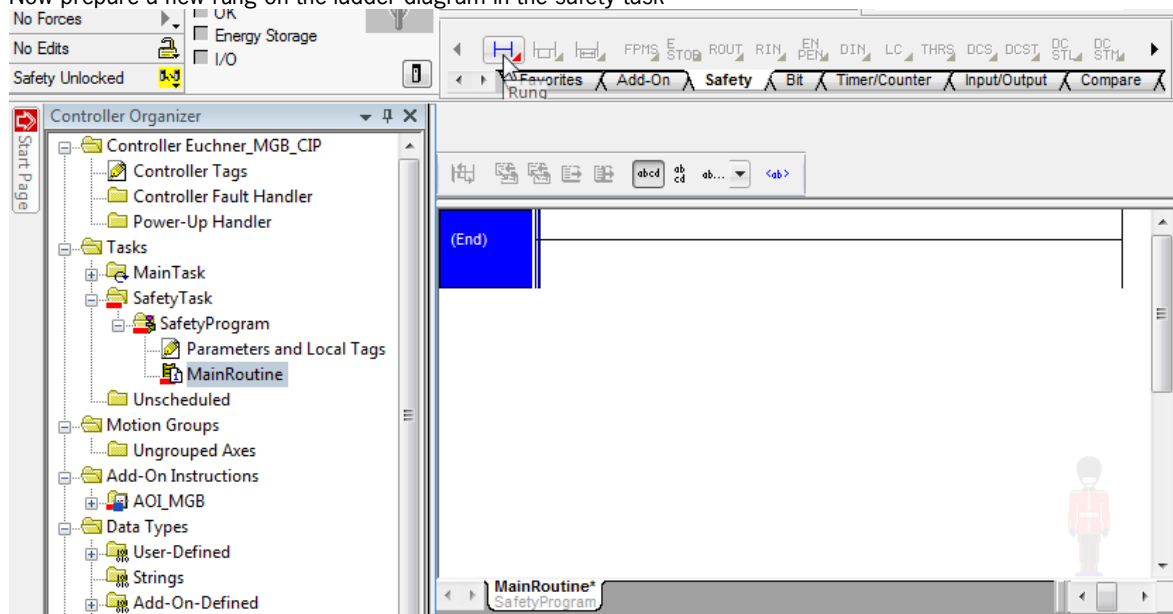


Figure 6

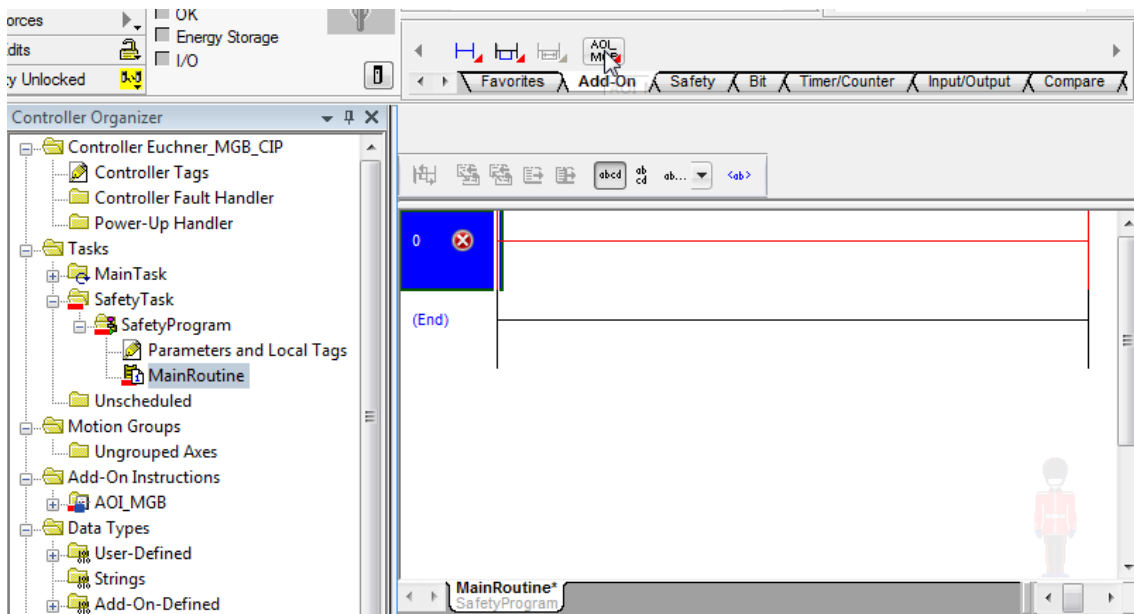


Figure 7

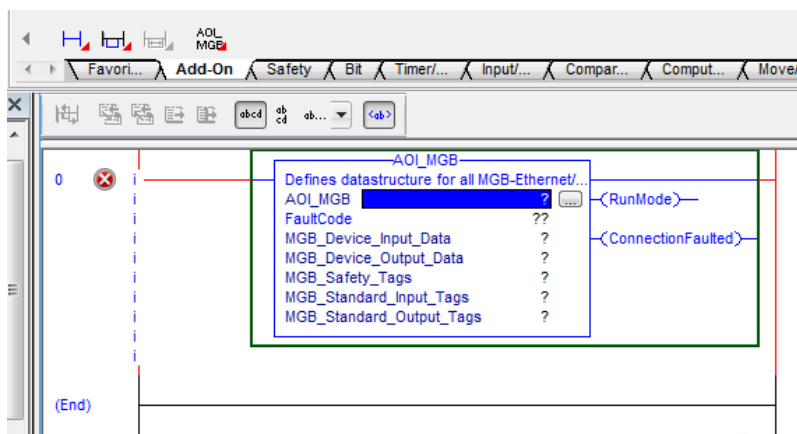


Figure 8

### 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").

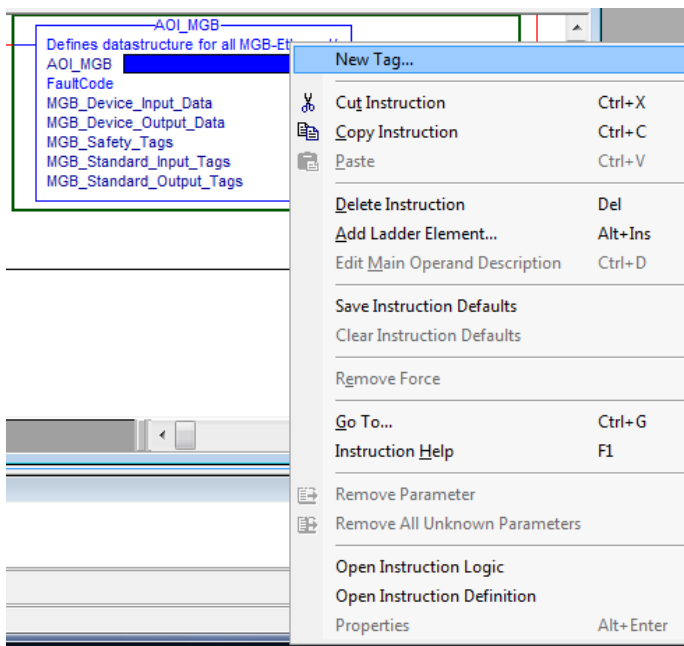


Figure 9

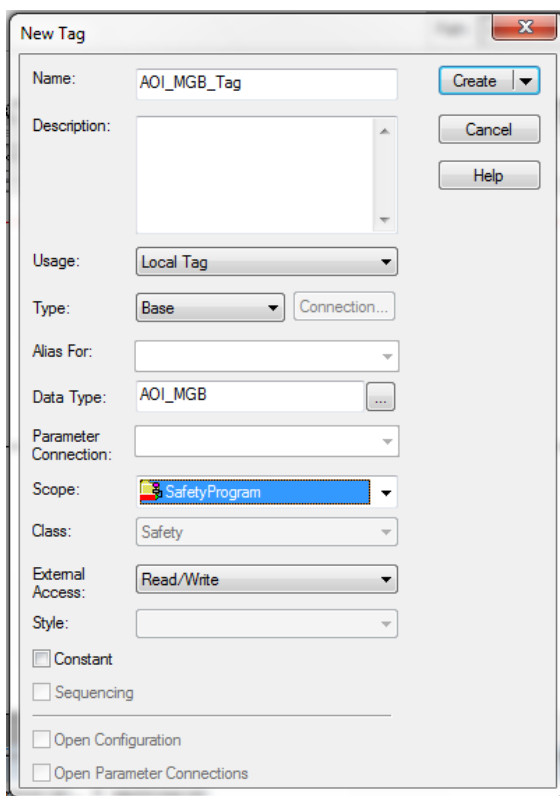


Figure 10

#### 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.)

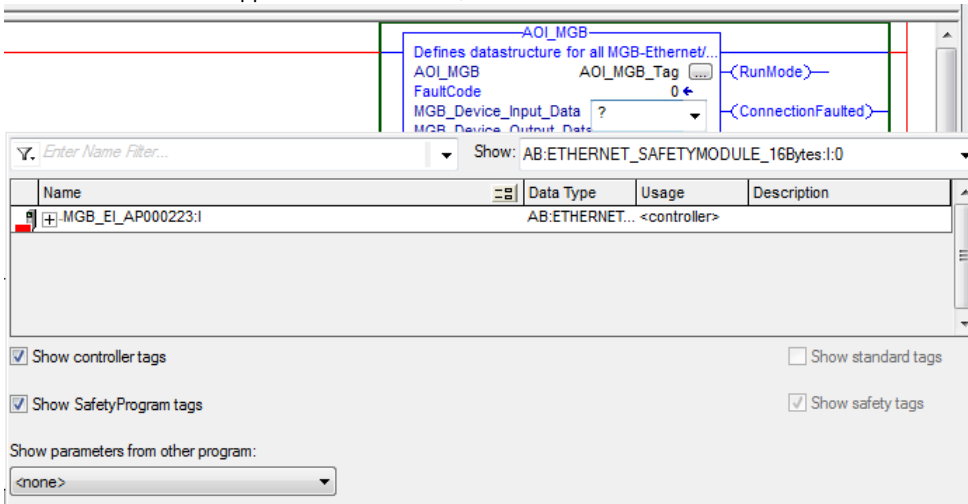


Figure 11

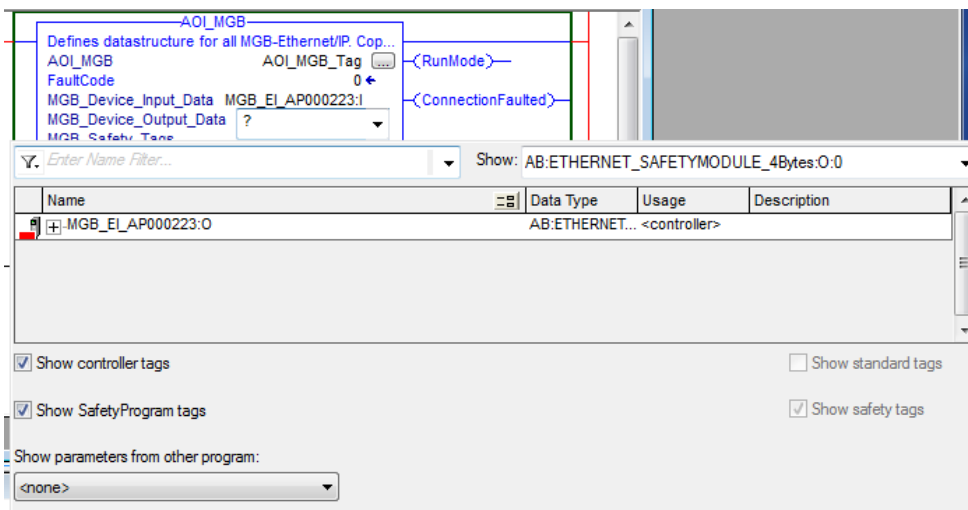


Figure 12



## 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.

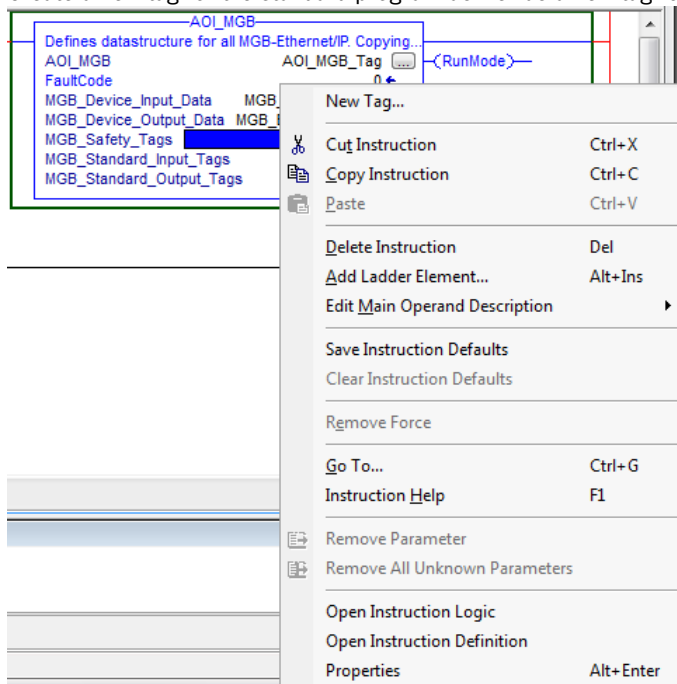


Figure 13

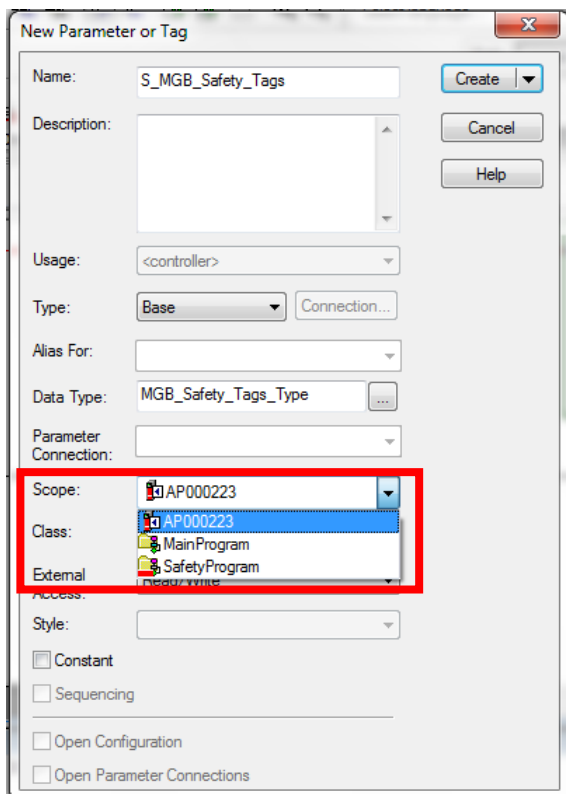


Figure 14

Now create the standard tags for input and output.

The 'New Tag' dialog box is shown with the following configuration:

- Name: S\_MGB\_Standard\_Input\_Tags
- Description: (empty)
- Usage: <controller>
- Type: Base
- Alias For: (empty)
- Data Type: MGB\_Std\_In\_Data\_Type
- Parameter Connection: (empty)
- Scope: AP000223 (highlighted with a red box)
- Class: Safety
- External Access: Read/Write
- Style: (empty)
- Constant:
- Sequencing:
- Open Configuration:
- Open Parameter Connections:

Figure 15

The 'New Tag' dialog box is shown with the following configuration:

- Name: S\_MGB\_Standard\_Output\_Tags
- Description: (empty)
- Usage: <controller>
- Type: Base
- Alias For: (empty)
- Data Type: MGB\_Std\_Out\_Data
- Parameter Connection: (empty)
- Scope: AP000223 (highlighted with a red box)
- Class: Safety
- External Access: Read/Write
- Style: (empty)
- Constant:
- Sequencing:
- Open Configuration:
- Open Parameter Connections:

Figure 16

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

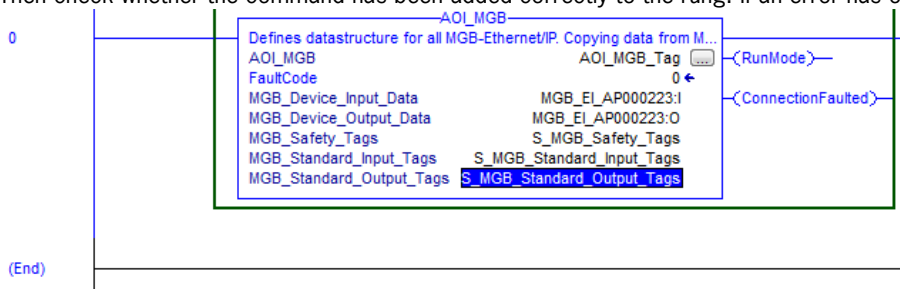


Figure 17

## 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!

Name	Alias For	Base Tag	Data Type	Class
MGB_EI_AP000223-1			AB:ETHERNET_SAFETYMODU...	Safety
MGB_EI_AP000223-0			AB:ETHERNET_SAFETYMODU...	Safety
S_MGB_Safety_Tags			MGB_Safety_Tags_Type	Safety
S_MGB_Standard_Input_Tags			MGB_Std_In_Data_Type	Safety
S_MGB_Standard_Output_Tags			MGB_Std_Out_Data	Safety
MGB_Standard_Output_Tags			MGB_Std_Out_Data	Standard

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.



Figure 19

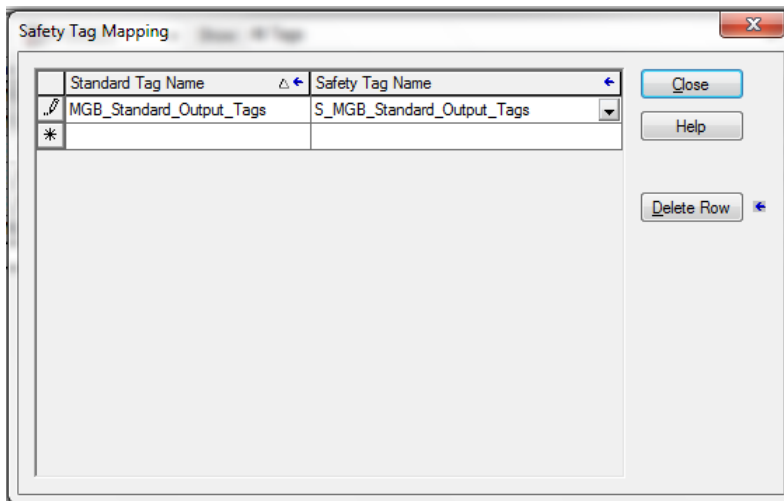


Figure 20

### 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

Figure 21

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
+	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

Figure 23

## **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.