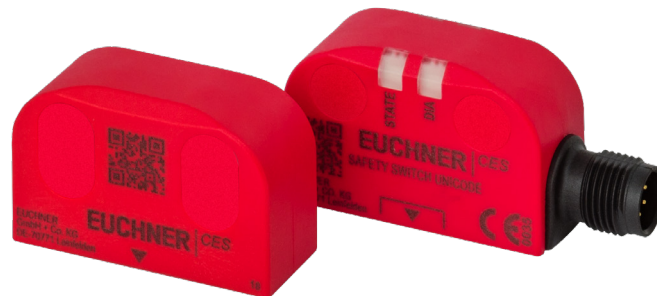
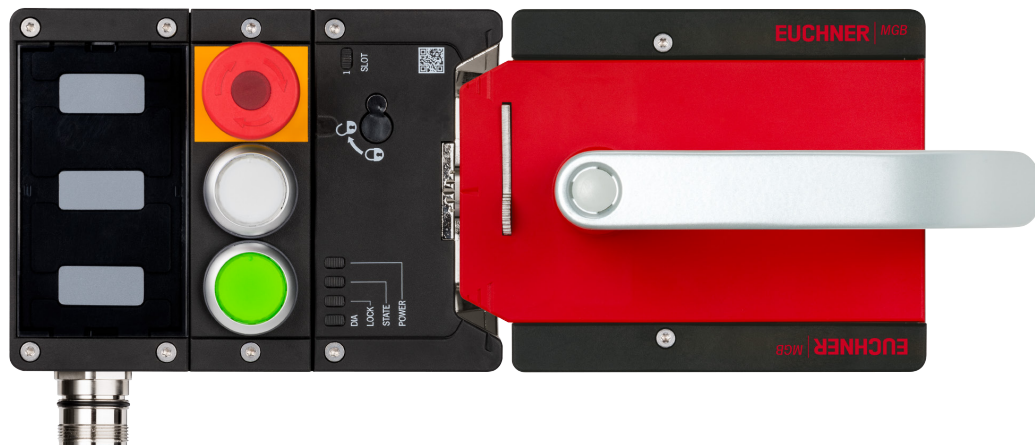


# EUCHNER

## Application



Connection of MGB2 Classic and CES-C07 in Series to Safety Relay  
ESM-BA..1

EN

from V1.0.0

**Contents**

<b>1.</b>	<b>About this document</b> .....	<b>3</b>
1.1.	Version .....	3
1.2.	Scope.....	3
1.3.	Target group .....	3
1.4.	Supplementary documents .....	3
1.5.	Notice.....	3
<b>2.</b>	<b>Components/modules used</b> .....	<b>4</b>
2.1.	EUCHNER .....	4
<b>3.</b>	<b>Functional description</b> .....	<b>5</b>
3.1.	MGB2-L1-...-BR-.....	5
3.2.	MGB2-L2-...-BR-.....	5
3.3.	CES-I-BR-...-C07.....	5
<b>4.</b>	<b>Safety assessment</b> .....	<b>6</b>
<b>5.</b>	<b>Overview of the connections</b> .....	<b>7</b>
5.1.	Connection of MGB2-L1-...-BR-... and MGB2-L2-...-BR-.....	7
5.2.	Connection of CES-I-BR-...-C07.....	8
<b>6.</b>	<b>Basic circuit diagram</b> .....	<b>9</b>
<b>7.</b>	<b>Wiring of the starting behavior on the ESM-BA..1</b> .....	<b>10</b>
<b>8.</b>	<b>Device configuration MGB2 Classic</b> .....	<b>10</b>
8.1.	Activating/deactivating guard locking monitoring.....	10
<b>9.</b>	<b>Important note – please observe carefully!</b> .....	<b>11</b>

## 1. About this document

### 1.1. Version

Version	Date	Change/addition	Chapter
01-08/19	8/1/2019	Prepared	All

### 1.2. Scope









This document describes the connection of the MGB2 *Classic* and CES-IBR.-C07-... in series to the safety relays in the series ESM-BA..1.

### 1.3. Target group

Design engineers and installation planners for safety devices on machines, as well as setup and servicing staff possessing special expertise in handling safety components.

### 1.4. Supplementary documents

The overall documentation for this application consists of the following documents:

Document title (document number)	Contents	
Operating Instructions (2500233)	Operating instructions safety systems MGB2-L1-...-BR-... / MGB2-L2-...-BR-... and MGB2-L1-...-BP-... / MGB2-L2-...-BP-...	
Safety Information and Maintenance Safety System MGB2-BR/MGB2-BP from V1.0.0 (2500232)	Information sheet with important safety information	
Operating instructions for the modules connected and their submodules	Device-specific information for the related module and the submodules installed.	
Operating Instructions (2510145)	Operating instructions non-contact safety switch CES-IBR.-C07-... (unicode/multicode)	
Operating Instructions (2090071)	Operating instructions safety relay ESM-BA2..	
Operating Instructions (2090073)	Operating instructions safety relay ESM-BA3..	
Operating Instructions (2090093)	Operating instructions safety relay ESM-BA7..	
Possibly enclosed data sheets	Item-specific information about deviations or additions	

### 1.5. Notice

This application is based on the MGB2 *Modular* operating instructions, the operating instructions for the CES-IBR.-C07-... and the operating instructions for the safety relay ESM-BA..1. Please refer to the related operating instructions for technical details and other information.

## 2. Components/modules used

### 2.1. EUCHNER

Description	Order number / item number
Safety system MGB2 Classic, guard locking with guard locking monitoring, without submodule	136774 / MGB2-L1-BR-U-X0000-BX-136774
	158166 / MGB2-L1-BR-U-X0000-BJ-158166
	161762 / MGB2-L1-BR-U-XA4S0-OB-R-161762
	161764 / MGB2-L1-BR-U-XA4S0-OB-L-161764
	138012 / MGB2-L2-BR-U-X0000-BX-138012
	158168 / MGB2-L2-BR-U-X0000-BJ-158168
	161766 / MGB2-L2-BR-U-XA4S0-OB-R-161766
	161768 / MGB2-L2-BR-U-XA4S0-OB-L-161768
	161021 / MGB2-L1-BR-M-X0000-BX-161021
	161027 / MGB2-L1-BR-M-X0000-BJ-161027
	161023 / MGB2-L2-BR-M-X0000-BX-161023
	161029 / MGB2-L2-BR-M-X0000-BJ-161029
	Safety system MGB2 Classic, guard locking with guard locking monitoring, with submodule MSM-1-K-CA-CPP-B2-137732
160748 / MGB2-L1-BR-U-XB2S1-DY-R-160748	
161770 / MGB2-L1-BR-U-XB2S0-DB-L-161770	
161774 / MGB2-L1H-BR-U-S0-DB-R-161774	
161775 / MGB2-L1H-BR-U-S0-DB-L-161775	
161778 / MGB2-L1-BR-U-XB2S1-DY-L-161778	
161786 / MGB2-L1H-BR-U-S1-DY-R-161786	
161787 / MGB2-L1H-BR-U-S1-DY-L-161787	
158396 / MGB2-L2-BR-U-XB2S0-DB-R-158396	
161772 / MGB2-L2-BR-U-XB2S0-DB-L-161772	
161776 / MGB2-L2H-BR-U-S0-DB-R-161776	
161777 / MGB2-L2H-BR-U-S0-DB-L-161777	
161781 / MGB2-L2-BR-U-XB2S1-DY-R-161781	
161783 / MGB2-L2-BR-U-XB2S1-DY-L-161783	
161788 / MGB2-L2H-BR-U-S1-DY-R-161788	
161789 / MGB2-L2H-BR-U-S1-DY-L-161789	
Safety switch CES-I-BR-.C07... with transponder technology	156233 / CES-I-BR-M-C07-SA-156233
	157920 / CES-I-BR-U-C07-SA-157920
Safety relay	085610 / ESM-BA201
	097226 / ESM-BA201P
	085613 / ESM-BA301
	097230 / ESM-BA301P
	097224 / ESM-BA701
	097225 / ESM-BA701P

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

## 3. Functional description

### 3.1. MGB2-L1-...-BR-...

The MGB2-L1-...-BR-... is a guard locking device in accordance with EN ISO 14119 according to the closed-circuit current principle. Provided the guard locking monitoring on the MGB2 Classic is activated using the DIP switches (factory setting), the safety outputs are switched off if the guard locking is released (monitoring of the locking element).

The activation and deactivation of the guard locking monitoring is described in chapter 8.

Guard locking according to EN ISO 14119 actuated by spring force – released by power-ON (closed-circuit current principle)	
Safety function	Guard locking for personnel protection acc. to EN ISO 14119
Reliability values according to EN ISO 13849	Category 4, PL e

With guard locking monitoring inactive, the MGB2-L1-...-BR-... is to be treated as a guard locking device for process protection. On this aspect, see chapter 3.2.

### 3.2. MGB2-L2-...-BR-...

The MGB2-L2-...-BR-... is a guard locking device in accordance with EN ISO 14119 according to the open-circuit current principle. Provided the guard locking monitoring on the MGB2 Classic is activated using the DIP switches (factory setting), the safety outputs are switched off if the guard locking is released (monitoring of the locking element). If guard locking monitoring is inactive, the guard locking position does not influence the safety outputs. The safety outputs are switched off as soon as the device is unlocked using the handle module.

The activation and deactivation of the guard locking monitoring is described in chapter 8.

Guard locking according to EN ISO 14119 actuated by power-ON and released by spring force (open-circuit current principle)	
Safety function	Guard locking for process protection with locking according to EN ISO 14119
Reliability values according to EN ISO 13849	Category 4, PL e

### 3.3. CES-I-BR-.-C07...

The CES-I-BR-.-C07-... is part of an interlocking device according to EN ISO 14119. The safety outputs are switched off when the guard is open. In this example the two safe outputs on the CES-I-BR-.-C07-... are connected to a safety relay ESM-BA..1.

Interlocking device according to EN ISO 14119	
Safety function	Interlocking device according to EN ISO 14119
Reliability values according to EN ISO 13849	Category 4, PL e

## 4. Safety assessment

In this example the MGB2-L1-...-BR-... and MGB2-L2-...-BR-... and CES-I-BR-.-C07-... are connected in series. The devices MGB-L1/L2-...-BR and CES-I-BR-.-C07 feature complete monitoring for faults in the safety-relevant parts and in the cables connected (short circuit monitoring by means of pulsed signals on the outputs FO1A and FO1B).

The safety relay ESM-BA..1 achieves PL e, depending on the number of annual switching cycles and the load on the enable paths (see the device's operating instructions for this purpose). The wiring corresponds to the circuit "Dual-channel emergency stop circuit with pnp semiconductor outputs/OSSD outputs with short circuit detection" in the operating instructions for the ESM-BA..1. In combination with safety sensors that detect a short circuit on the cables connected (here MGB2 Classic and CES-C07), the wiring corresponds to PL e. For the monitoring of the position of the locking element of the guard locking in the MGB2-L1-...-BR-... and MGB2-L2-...-BR-... it is therefore possible to achieve PL e according to EN ISO 13849-1. The series connection of MGB2-L1-...-BR-... and MGB2-L2-...-BR-... and CES-I-BR-.-C07-... does not reduce the achievable PL.

The safety assessment on safety functions in an optional submodule, e.g. emergency stop or acknowledgment button, connection of an enabling switch to plug connector X5/X6 as well as the control of guard locking are not part of this example and must be added for the respective machine by the design engineer in accordance with the risk assessment.



### Important!

Shutdown of the energy and any necessary monitoring of the shutdown of the energy (feedback loop) causing the hazard are not part of this document and must be added in accordance with the risk assessment for the machine. In this example, the safety evaluation unit without feedback loop and without start button is used. Please refer to the operating instructions of the safety evaluation unit used for more information.

## 5. Overview of the connections

### 5.1. Connection of MGB2-L1-...-BR-.... and MGB2-L2-...-BR-....

Terminal	Designation	Function	Use in this example
X1.1	UB	Operating voltage of BR/BP electronics, 24 V DC	Connection to power supply 24 V DC
X1.2	F11A	Enable input for channel A If operated separately (BP), set DIP switch as per operating instructions.	Connection to power supply 24 V DC, first station in the series connection
X1.3	F11B	Enable input for channel B If operated separately (BP), set DIP switch as per operating instructions.	Connection to power supply 24 V DC, first station in the series connection
X1.4	OT/C	Bolt tongue monitoring output ON when the door is closed and the bolt tongue is inserted into the locking module. Optional: BR diagnostic output	Function is not used
X1.5	OD	Door monitoring output ON when the door is closed.	
X1.6	OL	Guard locking monitoring output ON when the door is closed and locked.	
X1.7	OI	Monitoring output DIA ON when the device is in the fault state	
X1.8	FO1A	Safety output channel A ON when door is closed and locked/interlocked. Attention: Pay attention to the DIP switch position. See chapter 8.	Switching off this safety output will result in the direct shutdown of the enable paths (13 – 14, 23 – 24, ...) in the safety relay ESM-BA..1. Important: The actual shutdown of the energy causing a hazard in a machine is not shown in the example and must be supplemented.
X2.1	0V UB	Operating voltage of BR/BP electronics, 0 V	Connection to power supply 0 V DC
X2.2 - X2.6	-	Function dependent on the submodule used	Function is not used
X2.7	RST	Reset input; device is reset if DC 24 V is applied to RST for min. 3 s.	Function is not used
X2.8	FO1B	Safety output channel B ON when door is closed and locked/interlocked. Attention: Pay attention to the DIP switch position. See chapter 8	Switching off this safety output will result in the direct shutdown of the enable paths (13 – 14, 23 – 24, ...) in the safety relay ESM-BA..1. Important: The actual shutdown of the energy causing a hazard in a machine is not shown in the example and must be supplemented.
X3.1	IMP	Operating voltage of guard locking solenoid, 24 V DC	Activation of the guard locking by switch S1. Important: According to EN ISO 14119, it must be ensured that the hazard posed by a machine is no longer present before the guard locking can be opened.
X3.2	IMM	Operating voltage of guard locking solenoid, 0 V	Connection to power supply 0V. Dual-channel control of the guard locking is not used in this example.
X3.3 - X3.8	-	Function dependent on the submodule used	Function is not used
X4.1 - X4.8	-	Function dependent on the submodule used or plug connector X5/X6	

Table 1: Terminal assignment and contact description MGB2 Classic

**5.2. Connection of CES-I-BR-...-C07...**

Terminal	Designation	Function	Use in this example
X1.1	F11B	Enable input for channel B	Connection of the safety output F01B from the previous MGB2 Classic
X1.2	UB	Operating voltage 24 V DC	Connection to power supply 24 V DC
X1.3	F01A	Safety output channel A ON if actuator in the operating distance.	Switching off this safety output will result in the direct shutdown of the enable paths (13 – 14, 23 – 24, ...) in the safety relay ESM-BA..1. Important: The actual shutdown of the energy causing a hazard in a machine is not shown in the example and must be supplemented.
X1.4	F01B	Safety output channel B ON if actuator in the operating distance.	Switching off this safety output will result in the direct shutdown of the enable paths (13 – 14, 23 – 24, ...) in the safety relay ESM-BA..1. Important: The actual shutdown of the energy causing a hazard in a machine is not shown in the example and must be supplemented.
X1.5	OD/C	Door monitoring output ON if actuator in the operating distance. Optional: BR diagnostic output	Function is not used
X1.6	F11A	Enable input for channel A	Connection of the safety output F01A from the previous MGB2 Classic
X1.7	0V	Operating voltage 0 V	Connection to power supply 0 V DC
X1.8	-	n.c.	-

Table 2: Terminal assignment and contact description CES-I-BR-.C07-...



## 6. Basic circuit diagram

In the example, the automatic start in the ESM-BA301 is used.

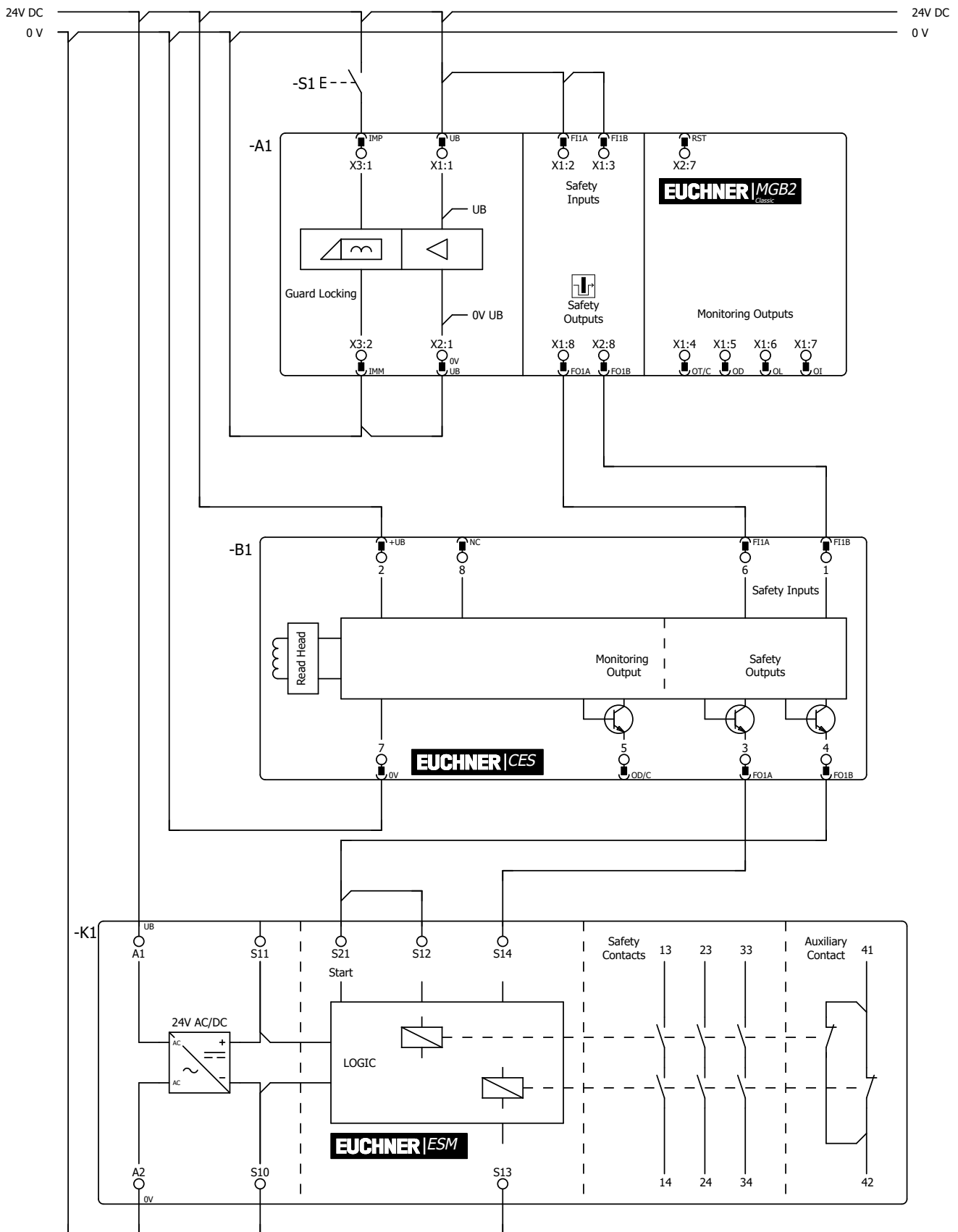


Figure 1: Basic circuit diagram (shown with the ESM-BA301)

## 7. Wiring of the starting behavior on the ESM-BA..1

With the following settings, the safety relay ESM-BA..1 operates correctly in combination with the MGB2 Classic.

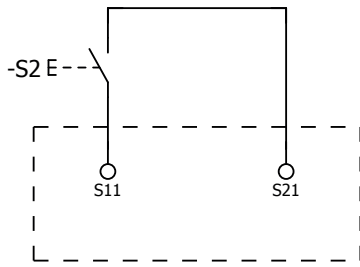


Figure 2: Manual start

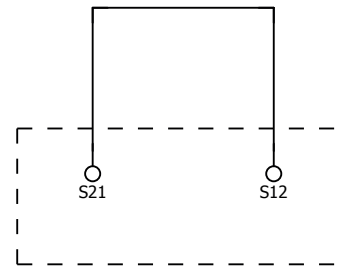


Figure 3: Automatic start

## 8. Device configuration MGB2 Classic

### 8.1. Activating/deactivating guard locking monitoring

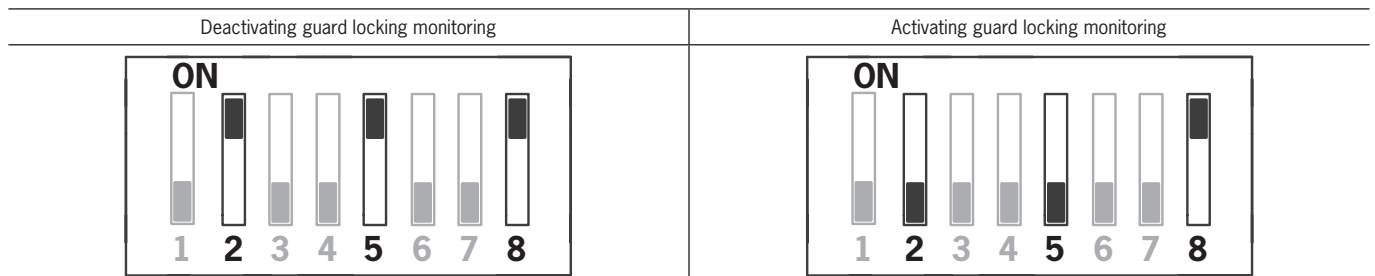


**WARNING**

Risk of injury due to inactive guard locking monitoring.

► If guard locking monitoring is inactive, the guard locking position does not influence the safety outputs. The guard can be opened immediately. This setting is not allowed to be used in applications in which, e.g., there is a hazard due to overrunning machinery movement. With inactive guard locking monitoring, guard locking must be used only for process protection.

1. Switch off power supply.
2. Set DIP switches 2, 5 and 8 as shown



3. Switch on power supply for 5 s.
  - ➔ The change is confirmed by the illumination of the Power LED. All other LEDs are off.
4. Switch off power supply and set DIP switch 8 to OFF.
  - ➔ The next time the device is started, it operates in the operating mode set.

## 9. 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 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 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.

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

Edition:  
AP000243-01-08/19  
Title:  
Application MGB2  
Connection of MGB2-BR Classic and CES-C07 in Series to  
Safety Relay ESM-BA..1

Copyright:  
© EUCHNER GmbH + Co. KG, 08/2019

Subject to technical modifications; no responsibility is accepted for the accuracy of this information.