

## Connection of MGB-L1..-AR to Safety Relay ESM-BA..1



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**Guard locking spring applied – power on released according to EN ISO 14119  
(closed-circuit current principle)****Safety function**

Guard locking for personal protection according to EN ISO 14119

**Reliability figures according to EN ISO 13849** Category 4, PL e**Components/modules used****EUCHNER**

<b>Description</b>	<b>Order no./item designation Set</b>	<b>Order no./item designation Evaluation Units</b>
Safety system MGB, Guard locking with guard locking monitoring	105783 / MGB-L1H-AR-R-105783	105328 / MGB-L1-AR-AA2A1-M-105328
	105785 / MGB-L1HE-AR-R-105785	110219 / MGB-L1-ARA-AB8A1-M-110219
	110220 / MGB-L1HE-ARA-R-110220	110702 / MGB-L1-ARA-AC8A1-M-110702
	110703 / MGB-L1HE-ARA-R-110703	110772 / MGB-L1-ARA-AD1A1-M-110772
	110774 / MGB-L1HE-ARA-R-110774	111360 / MGB-L1-ARA-AG2A1-M-111360
	111364 / MGB-L1HE-ARA-R-111364	111361 / MGB-L1-ARA-AG4A1-M-111361
	111365 / MGB-L1HE-ARA-L-111365	111426 / MGB-L1-ARA-AE1A1-M-111426
	111427 / MGB-L1H-ARA-R-111427	111428 / MGB-L1-ARA-AE2A1-M-111428
	111429 / MGB-L1H-ARA-L-111429	116666 / MGB-L1-ARA-AG6A1-M-116666
	113381 / MGB-L1HE-ARA-R-113381	113380 / MGB-L1-ARA-AC3A1-M-113380
	114785 / MGB-L1H-ARA-R-114785	114784 / MGB-L1-ARA-AG2A1-M-114784
	116667 / MGB-L1H-ARA-L-116667	121234 / MGB-L1-ARA-AM3A1-M-R-121234
	116668 / MGB-L1HE-ARA-L-116668	121241 / MGB-L1-ARA-AM3A1-M-L-121241
	121235 / MGB-L1H-ARA-R-121235	121255 / MGB-L1-ARA-AM3A1-M-R-121255
	121236 / MGB-L1HE-ARA-R-121236	121261 / MGB-L1-ARA-AM3A1-M-L-121261
	121242 / MGB-L1H-ARA-L-121242	
	121243 / MGB-L1HE-ARA-L-121243	
	121256 / MGB-L1H-ARA-R-121256	
	121262 / MGB-L1H-ARA-L-121262	
	121509 / MGB-L1H-ARA-R-121509	
Safety relay (base module)	085610 / ESM-BA201	
	085613 / ESM-BA301	
	097224 / ESM-BA701	
	097225 / ESM-BA701P	
	097226 / ESM-BA201P	
	097230 / ESM-BA301P	

Tip: More information and downloads about the above mentioned EUCHNER products can be found at [www.EUCHNER.de](http://www.EUCHNER.de). Simply enter the order number into the search field.

## Functional description

### General

The MGB-L1 is a guard locking device according to EN ISO 14119 using the closed-circuit current principle. The two safe outputs of the MGB-L1 are connected to an ESM-BA..1 safety relay.

In this example, an MGB with the version 2.0.0 or newer is used in the configuration “system family AR”. Please note that the circuit must be changed if older MGB versions are used.

### Connections

Designation	Function	Use in this example
F01A, F01B	Safety outputs. HIGH when the safety guard is closed and locked.	Switch-off of at least one of the outputs leads to a direct switch-off of the safety contacts (13 – 14, 23 – 24, ...) of the safety relay ESM-BA..1. Important: The actual shutdown of the energy which is causing a hazard in a machine is not shown in the example and must be supplemented.
FI1A, FI1B	Inputs for series connection of AR devices from EUCHNER.	Connected to 24 V DC; function is not used. Important: DIP switches 1 and 2 in the MGB must be set to OFF position. It is essential to observe the MGB operating instructions for this purpose.
IMP (up to V2.2.2) IMP1 (from V3.0.0)	Control input for guard locking solenoid. Connect guard locking to 24 V DC to open.	Activated by switch S1. Important: According to EN ISO 14119, it shall be ensured that the hazard caused by a machine has disappeared before the guard locking can be released.
IMP2 (from V3.0.0)	Control input for guard locking solenoid, when dual channel control of the solenoid is used. Connect guard locking to 24 V DC to open.	Function is not used. Important: IMP1 and IMP2 are connected with a jumper. In this example has to remain plugged.
OD	Door monitoring output, HIGH, when the door is closed.	Function is not used.
OT	Bolt tongue monitoring output, HIGH when the door is closed and the bolt tongue is inserted in the locking module.	Function is not used.
OL	Guard locking monitoring output, HIGH when the door is closed and locked.	Function is not used.
OI	Diagnostics monitoring output, HIGH when the device is in the fault state.	Function is not used.
RST	Input for resetting the switch	Connected to ground; function is not used.
X2:1, X2:2, X2:3, X2:4	Potential-free contacts of the installed emergency stop command device, with or without monitoring contact (X2:6).	Not used in this example. Important: The emergency stop function must be integrated into the emergency stop chain of the safety control system in accordance with the risk analysis.
X3:1, X3:3	Control inputs for the LEDs in buttons S2 and S3	Not used in this example.
X2:7, X3:2	Monitoring outputs for the installed buttons S2 and S3	Not used in this example.

## Safety assessment

The MGB-L1 features complete monitoring for faults in the safety-relevant parts and in the connected cables (clock pulses at outputs FO1A and FO1B). The safety relay ESM-BA..1 achieve PL e, depending on the number of annual switching cycles and the load of the enable paths (see the device's operating instructions for this purpose). The wiring corresponds to the circuit "Two-channel emergency stop with pnp-outputs/OSSD-outputs with short circuit monitoring" in the operating instructions of the ESM-BA..1. In combination with a safety sensor that detects a short circuit for the connected cables (here MGB), the wiring corresponds to PL e. Therefore, PL e in accordance with EN ISO 13849-1 can be achieved for locking mechanism position monitoring of guard locking of the MGB-L1.

A safety assessment for control of guard locking is not part of this example and must be supplemented for the respective machine by the design engineer in accordance with the risk assessment.

Important: Switch-off of the energy and any necessary monitoring energy switch-off (feedback loop) of 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.

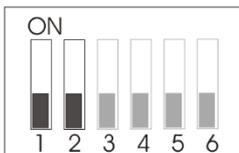
## Device configuration for MGB

The device can be configured using DIP switches. To change the device settings, please refer to the operating instructions for the MGB.

Tip: The operation manual can be found at [www.EUCHNER.de](http://www.EUCHNER.de). Simply enter the order number into the search field.

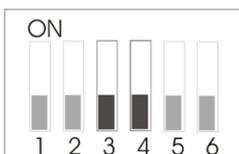
### **DIP switches – Setting system family AR**

Switches 1 and 2 must be set to OFF position (normally the factory setting).



### **DIP switches – Setting guard lock monitoring activated**

Switches 3 and 4 must be set to OFF position (normally the factory setting).



**Principle circuit diagram (shown with ESM-BA301)**

In the example Automatic Start of the ESM-BA301 is used

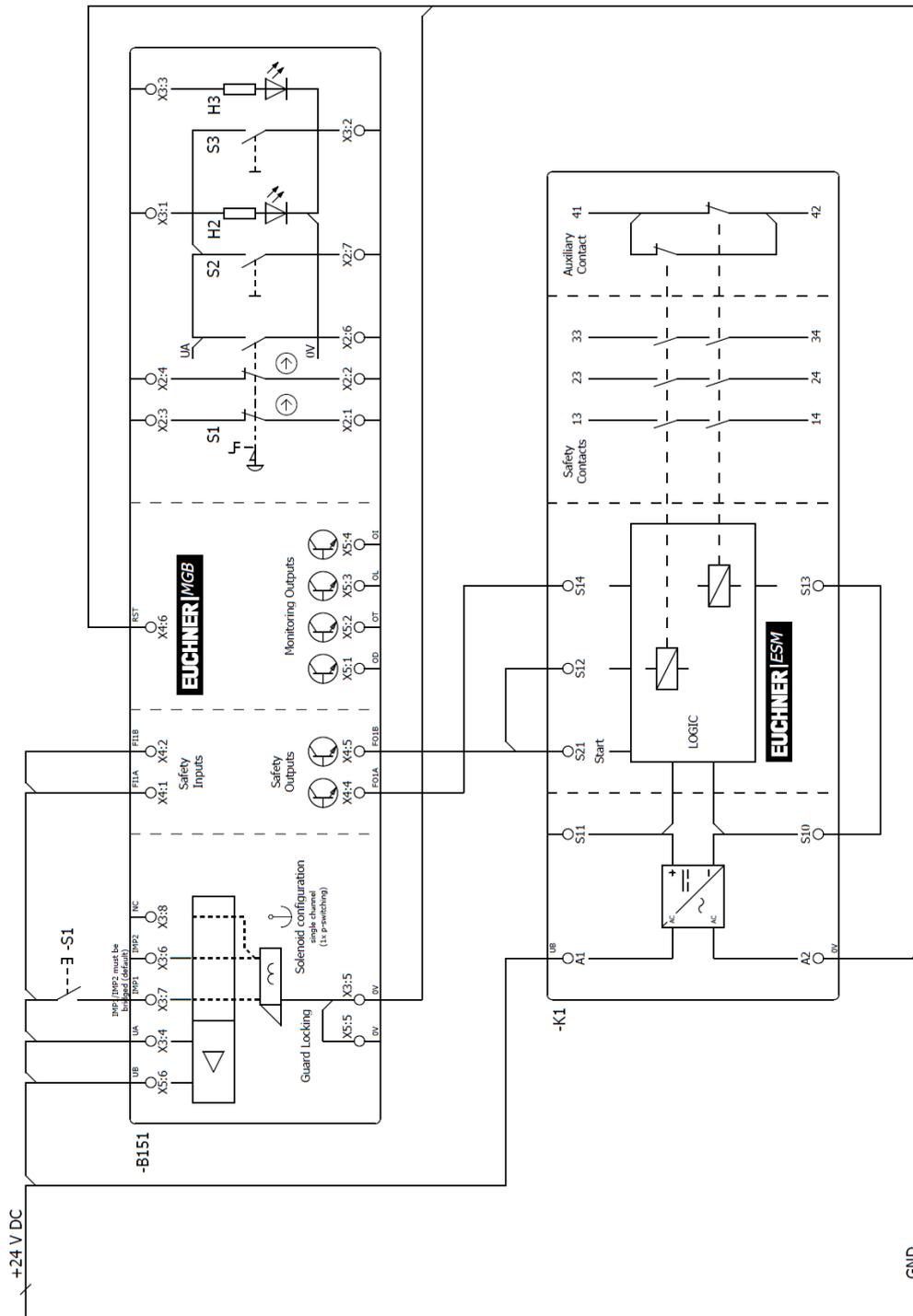
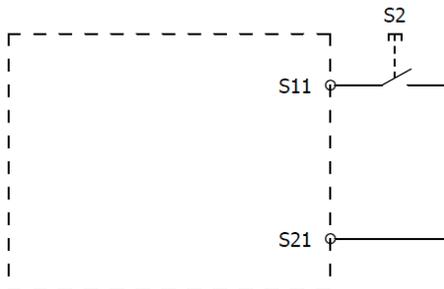


Figure 1

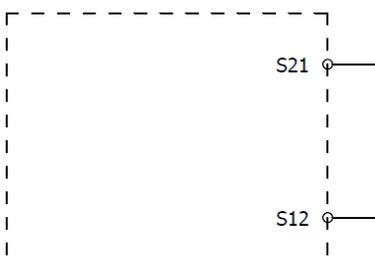
## Setting of the Start behavior for ESM-BA..1

Only with the following settings does the safety relay ESM-BA..1 operates correctly with a MGB-L1-AR.

### Manual Start



### Automatic Start



## **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 a 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 guards. The examples cannot be comprehensive due to the application-dependent and individual protection goals within a machine/installation.

### **If questions pertaining to 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 himself. 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 guards, 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 a 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. A general fault exclusion is not possible. More information about fault exclusion can be found in EN ISO 13849-2.

Changes at 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 taken 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.

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All mentioned brand and company names are property of the respective manufacturers. The use is only for clear identification of compatible peripheral devices and environment of operation in combination with our products.