EUCHNER
More than safety.

Connection of serial wired MGB-L1..-AR to Safety Relay MSR127TP

Content

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

Description	Order no./item designation Set	Order no./item designation Evaluation Units
Safety system MGB, Guard locking with guard locking monitoring	105782 / MGB-L1H-AR-R-105782 105784 / MGB-L1HE-AR-R-105784 116232 / MGB-L1HE-ARA-R-116232 116233 / MGB-L1HE-ARA-L-116233	104302 / MGB-L1-AR-AA1A1-M-104302

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

Other

Description	Items
Safety relay	MSR127TP / 440R-N23132

Functional description

General

The MGB-L1 is a guard locking device according to EN ISO 14119 using the closed-circuit current principle. In this example 3 MGB-L1 are connected in series. The two safe outputs of the last MGB-L1 are connected to a MSR127TP safety relay.

In this example, MGBs with version 2.0.0 or newer are 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
FO1A, FO1B	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 MSR127TP. 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.	At B3 connected to 24V DC. At B2 and B1 connected to FO1A and FO1B of the previous device. 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 switches S1, S3 and S4. 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	Activated via switch S5. All MGB-L1 connected in series must be reset simultaneously. Refer to the section “AR safety switches connected in series”.

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 MSR127TP achieve up to PL e according to the manufacturer's information (see the device's operating instructions for this purpose). The wiring is similar to the circuit "Light Curtain, Monitored Manual Reset, Monitored Output" in the operating instructions of the MSR127TP. As found in the operation manual of the MSR127TP, when connected to light curtains, the light curtain must perform cross fault detection (here MGB-L1), then, 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. Series connection of three MGB devices does not reduce the achievable PL.

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 with start button is used. Please refer to the operating instructions of the safety evaluation unit used for more information.

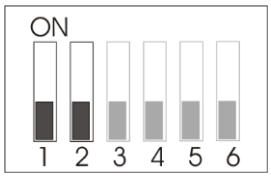
Device configuration for MGB

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. Simply enter the order number into the search field.

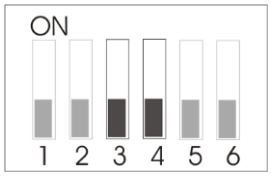
DIP switches – Setting system family AR

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

In the example Manual Reset of the MSR127TP is used.

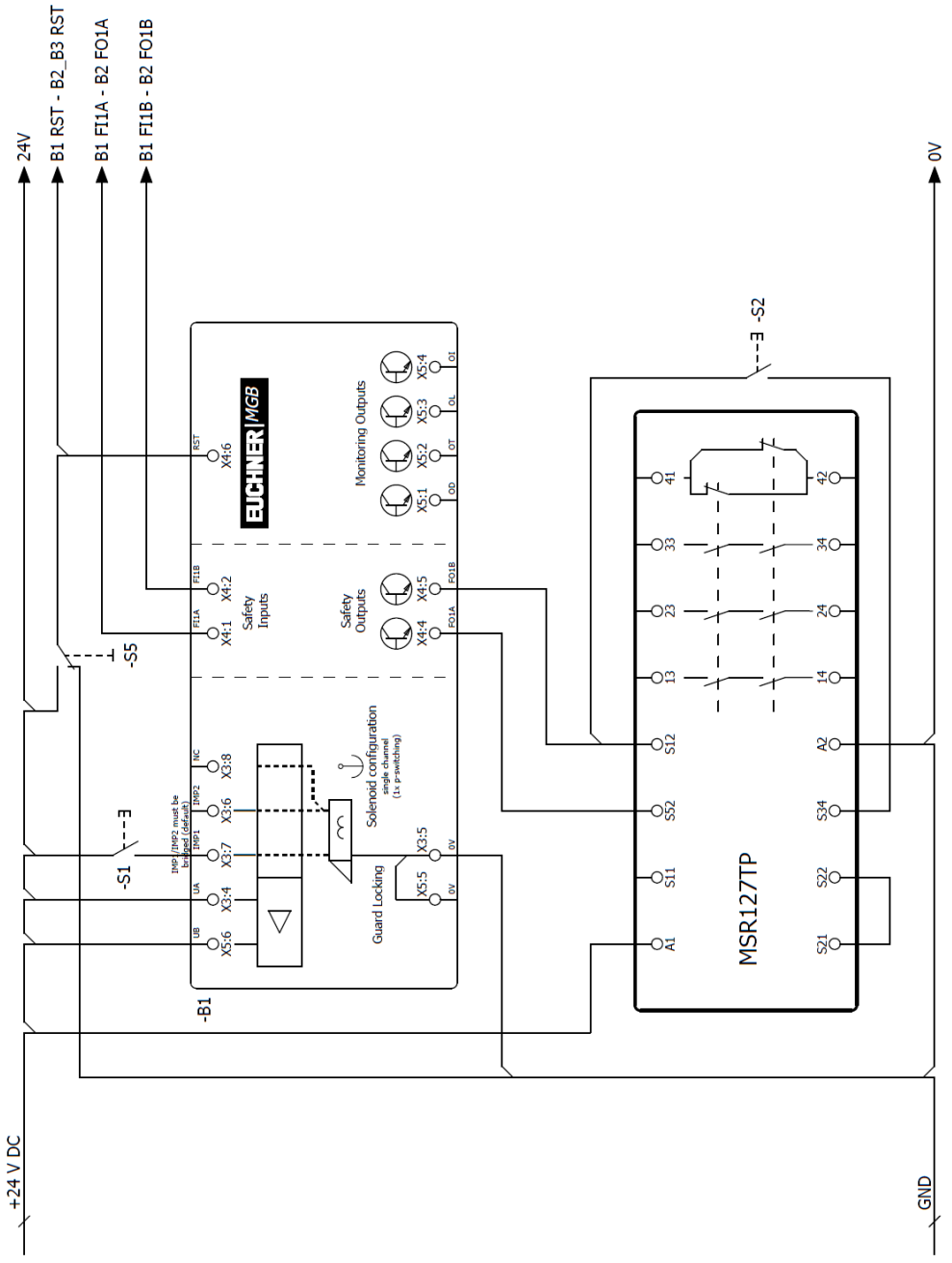


Figure 1

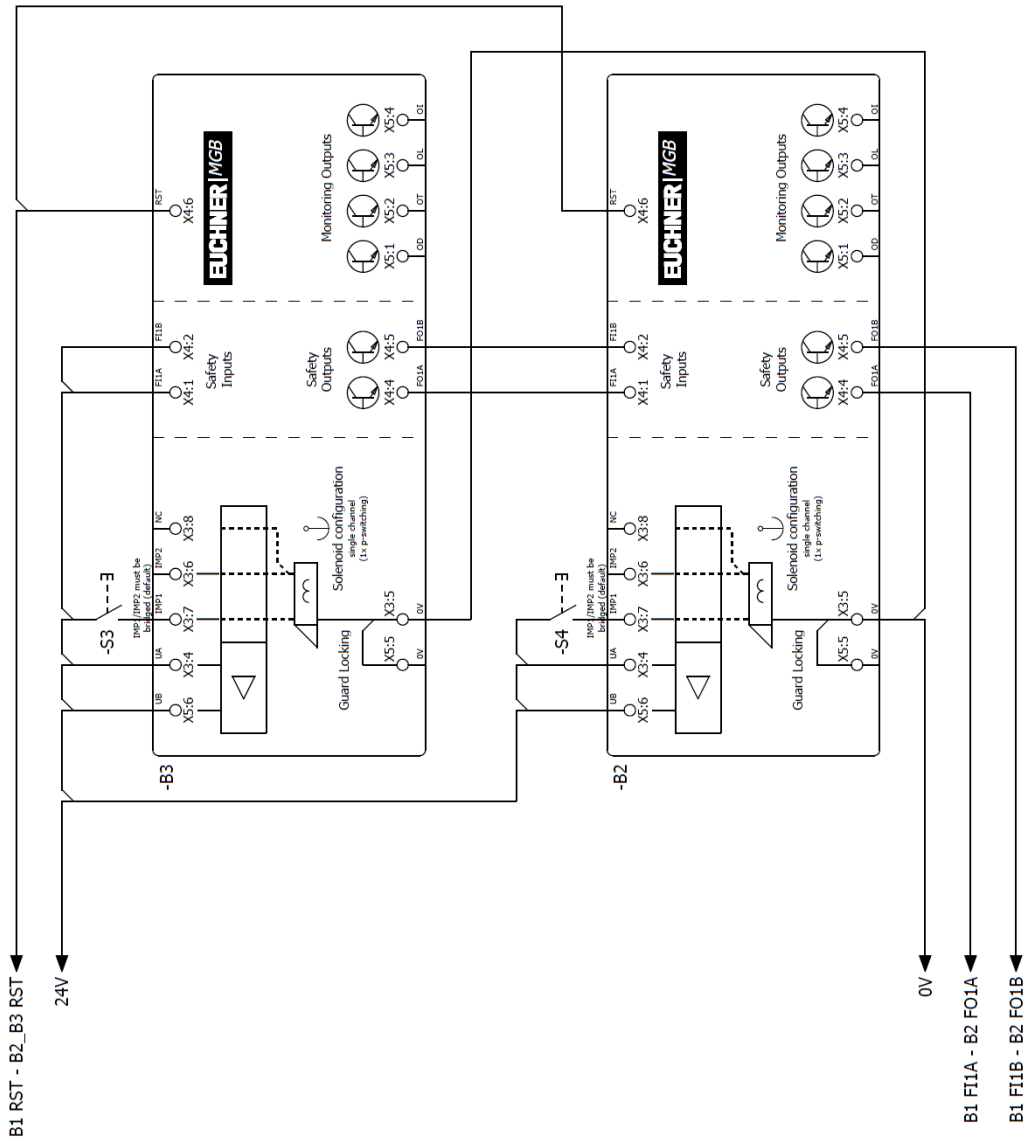

B1 RST - B2_B3 RST
24V
0V
B1 FI1A - B2 FO1A
B1 FI1B - B2 FO1B
-B3
-B2
-S3
-S4
EUCHNER MGB
Safety Inputs
Safety Outputs
Monitoring Outputs
Solenoid configuration
Guard Locking

Figure 2

AR safety switches connected in series

Usage of the Reset input

In a series connection the reset must always be connected to all switches. A common signal must be used for all switches in the chain. This can be a changeover switch or the output of a control system. A button is not suitable because Reset must always be connected to GND during operation.

The reset is used to synchronize the switches connected in series. This action is necessary if synchronization is lost due to external effects. This situation may be caused by switching off one of the switches in the series. All switches in the chain must always be reset together, as otherwise the synchronization will fail and as a result the safety outputs will not switch.

Teaching in actuators

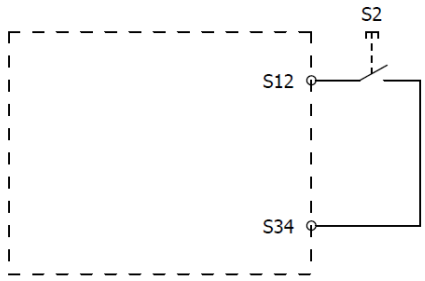
It is recommended not to teach-in the actuators in the series circuit, but to teach them in one by one instead.
It is often only possible to teach-in actuators in an installed chain with limitations. Work on the wiring (e.g. during device replacement) should in general be performed in a de-energized state. On certain systems, it is nevertheless necessary to perform this work and subsequent teach-in during ongoing operation.
To make this action possible, the input RST must be connected as shown in Figures 1 and 2.
Proceed as follows:

1. Open the safety door on which the switch or actuator is to be replaced.
2. Mount the new switch or actuator and close all safety doors in the chain.
3. Actuate the reset for at least 3 s (24 V on RST).
4. On the safety switch that is positioned at a new actuator, the green State LED flashes at approx. 1 Hz and the actuator is taught-in. This happens for approx. 1 minute - do not switch off during this time and do not actuate reset!
   The teach-in operation has ended when the green State LED on the device is off.
5. Actuate the reset for at least 3 s (24 V on RST).
   The system re-starts and then operates normally again.

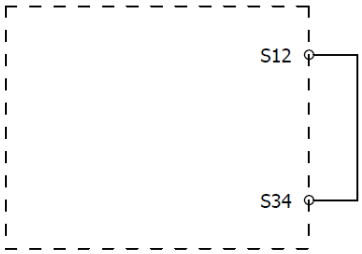
Possible settings of the Reset for MSR127TP

Only with the following settings does the Safety Relay MSR127TP operate correctly with a MGB-L1-AR.

Manual Reset



Automatic Reset



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.

Use of brand and company names

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.