EUCHNER
More than safety.

Examples for Use of the MGB Inputs and Outputs

Contents

Components/modules used

EUCHNER

Description	Order no./item designation Set	Order no./item designation Evaluation unit
Safety system MGB, guard locking with guard lock monitoring	105783 / MGB-L1H-AR-R-105783 105785 / MGB-L1HE-AR-R-105785 110774 / MGB-L1HE-ARA-R-110774 116667 / MGB-L1H-ARA-L-116667 116668 / MGB-L1HE-ARA-L-116668 113381 / MGB-L1HE-ARA-R-113381	105328 / MGB-L1-AR-AA2A1-M-105328 110772 / MGB-L1-ARA-AD1A1-M-110772 116666 / MGB-L1-ARA-AG6A1-M-116666 113380 / MGB-L1-ARA-AC3A1-M-113380

Tip: More information and downloads about the aforementioned EUCHNER products can be found at www.EUCHNER.de. Simply enter the order number in the search box.

Others

Description	Item
Any control systems	

Functional description

General

The aim of this document is to provide examples of how the various functions of the MGB can be used. This collection is intended merely to provide suggestions and is not complete. Other applications can be realized and must be implemented in a control system, just like the applications described here. The safety aspects of the MGB and built-in emergency stop, as well as the various safety functions, are not explained in this application. Information about this can be found in the respective applications in combination with a suitable evaluation unit.

In general, the MGB can be used to realize two different types of door monitoring: the interlocking monitoring system and guard lock monitoring.
If the interlocking monitoring system is selected, the safe outputs FO1A and FO1B are set when the safety guard is in the “safety guard closed and bolt inserted” position.
Note: This is designated “Position monitoring of the locked safety guard” in the EN 1088 standard or its successor, EN ISO 14119.

If guard lock monitoring is selected, the safe outputs FO1A and FO1B are set when the MGB is in the “safety guard closed and bolt inserted” position.
Note: This is designated “Position monitoring of the locking mechanism” in the EN 1088 standard or its successor, EN ISO 14119.
Note: The descriptions of the inputs and outputs and the sequences in the pictures are applicable to all MGBs. All signals are not always fed out.

Connections

Designation	Function	Use in this example
FO1A, FO1B	Safety outputs. HIGH when the safety guard is closed and locked.	Not used in this example.
FI1A, FI1B	Inputs for series connection of AR devices from EUCHNER.	Not used in this example.
IMP, IMM	Control input for guard locking solenoid. Connect to 24 V DC to open guard locking.	Not used in this example.
OD	Door monitoring output, HIGH when the door is closed.	Connected to a standard input of the control system.
OT	Bolt tongue monitoring output, HIGH when the door is closed and the bolt tongue is inserted in the locking module.	Connected to a standard input of the control system.
OL	Guard locking monitoring output, HIGH when the door is closed and locked.	Connected to a standard input of the control system.
OI	Diagnostics monitoring output, HIGH when the device is in the fault state.	Connected to a standard input of the control system.
RST	Input for resetting the switch.	Connected to a standard output of the control system.
X2:1, X2:2, X2:3, X2:4	Floating contacts of the installed emergency stop command device.	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.	Connected to a standard output of the control system.
X2:7, X3:2	Monitoring outputs for the installed buttons S2 and S3.	Connected to a standard input of the control system.

HIGH at an output means that the output is set and 24 DC is present.
LOW at an output means that the output is reset and 0 DC is present.

HIGH at an input means that the input is set and 24 DC is present.
LOW at an input means that the input is reset and 0 DC is present.

MBG inputs and outputs

Monitoring output OD

OD is set by the MGB when the safety door is closed but the bolt has not been inserted yet (door handle in “open” position). A LOW or HIGH signal level is statically present at monitoring output OD. The safe outputs F01A and F01B are always reset.

OD can be used to reset non-latching faults in the MGB. Non-latching faults are reset by completely opening the safety door once and then closing it again. The safety guard is fully open when OD is reset. In the flow chart in Figure 1, OI is polled first to determine whether there is a fault on the MGB. OD is then polled to determine for control purposes whether it was attempted to reset a non-latching fault.

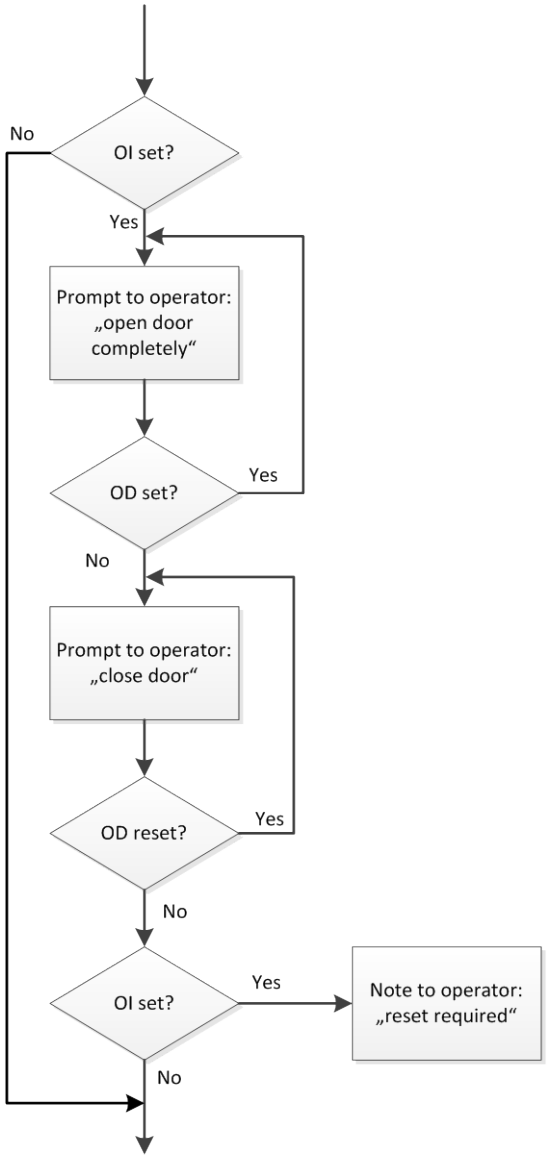

Figure 1

Note: Further information about resetting and acknowledging faults can be found in the sections about monitoring output OI and reset input RST.

Monitoring output OT

OT is set by the MGB as soon as the bolt is inserted at the safety door, i.e. the door handle is moved to the position in which the guard locking can engage. A LOW or HIGH signal level is statically present at monitoring output OT. The safe outputs FO1A and FO1B are set in this status if the interlocking monitoring system is selected.

The signal should be used so that guard locking is not controlled until the bolt has been inserted into the MGB. Figure 2 shows the possible sequence.

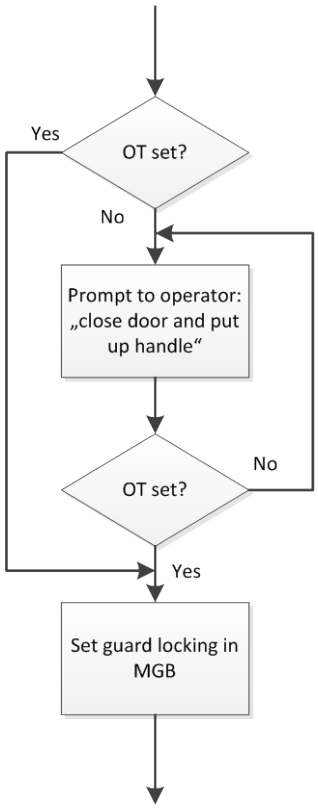

Figure 2

Monitoring output OL

OL is set by the MGB when the safety guard is locked. The signal can be set only if the safety door is closed (failsafe locking mechanism; OD and OT are permanently set in this case). A LOW or HIGH signal level is statically present at monitoring output OL. The safe outputs FO1A and FO1B are always set in this state, irrespective of the state of guard lock monitoring or the interlocking monitoring system.

For example, OL can be used to indicate to the control system that the safety door is in the locked position. This allows a process requiring a locked safety guard to be started.
ATTENTION: The signal must not be used for safe detection of the locking position! FO1A and FO1B must be used for this purpose.

Monitoring output OI

OI is set when a fault has occurred in the MGB. A LOW or HIGH signal level is statically present at monitoring output OI.

OI can be used to detect a possible malfunction of the MGB in the control system. The MGB can indicate latching or non-latching faults via OI; it is not possible to make a distinction between them. The MGB offers the possibility of resetting the fault. If only non-latching faults are to be reset, this can be done as described in the section about monitoring output OD. If all faults are to be reset, reset input RST can be used. An example of how this can be initiated by the operator is shown in Figure 3.

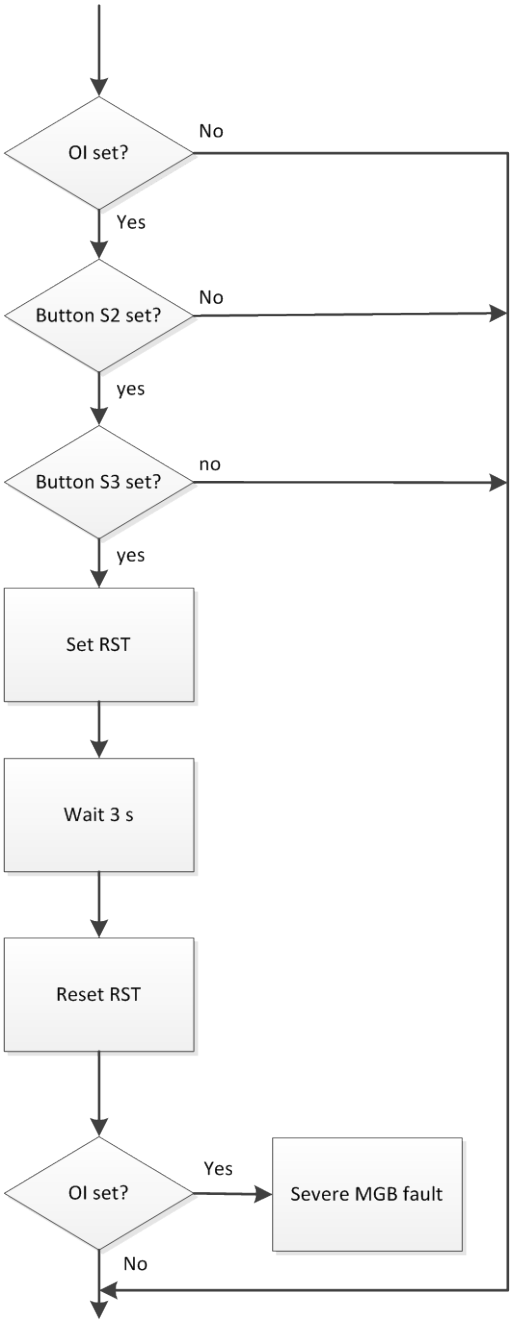

Figure 3

Monitoring inputs S2 and S3

S2 or S3 is set when the corresponding button on the MGB is pressed. The signals are independent of the MGB state.

One of the two signals is often used to put a machine or installation into the “Stop after Cycle End” status (request) so that the installation can be entered. Guard locking is opened as soon as the cycle end is reached.
The second signal can be used to confirm that the accessible space of the installation is free again (acknowledgement) and the machine can start again when the start signal is issued. Pressing the second button closes guard locking again.

The two buttons also can be used to generate a RST signal, for example, as shown in Figure 3. Here, a RST is triggered if both buttons are pressed simultaneously in the event of a fault. To prevent a reset from being performed at an arbitrary time, this shortcut becomes active only for the MGB that indicates a fault. This is realized by polling input OI.

Note: More information is available in the section about monitoring output OI and reset input RST.

Reset input RST

This input can be used to restart the MGB. The input is always effective, irrespective of the MGB state. Therefore, it is important to set this input only when the machine has already been shut down. After the RST input has been set, outputs FO1A and FO1B always switch off. RST does not affect the state of emergency stop S1. Outputs FO1A and FO1B switch again after run-up if all safety prerequisites (door and locking position, series-connection signal, …) have been met and no internal fault was detected.

The input can be used to reset the MGB from a fault state. Resetting is generally permissible, independently of the type of fault. If a permanent fault has occurred in the MGB, this fault cannot be deleted with RST. It will recur immediately after run-up. Sporadic faults can be acknowledged with this input.
Note: Latching faults are more serious than non-latching faults, so it must be considered whether or not to release this function for all users. In many cases, it can be anticipated that a serious fault will not be discovered if a fault can be acknowledged as desired.

This input also can be used to teach-in a new handle module. Instead of switching off the 24 V input voltage, the RST also can be used to initiate a teach-in process. The required restart can be triggered in the second step after teach-in. Figure 4 shows the sequence for a single MGB.
Tip: Observe the section about teaching in a handle module in the operating instructions of the MGB, which you can find at www.euchner.de. Simply enter the order number in the search box.

Note: If you connected several MGB-AR devices in series, the RST signal must always be applied simultaneously at all MGB devices in the series connection. Otherwise, the chain will not start up properly and outputs FO1A and FO1B will not switch. Always use the reset input RST for series connections.

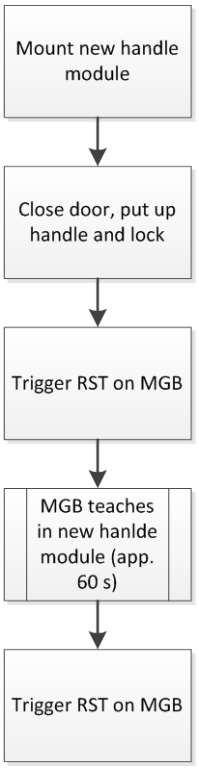

Figure 4

LED inputs H2 and H3

Inputs H2 and H3 illuminate the corresponding buttons S2 and S3. This lighting does not affect the state of the MGB. The MGB itself does not indicate anything via H2 and H3.

The lights are typically switched to provide the operator with feedback or instructions. For example, a stop after cycle end and opening of guard locking can be prompted with S2 in an application. S3 re-activates guard locking.
In this example, button S2 is continuously illuminated during machine operation to signal that this button is functional and can be pressed. H2 flashes after S2 has been pressed to provide feedback to the operator confirming that the button press was detected and that the installation will stop after the next cycle end.
Once the installation has stopped, guard locking is opened, H2 is switched off and H3 is switched on. This signals to the operator that S3 now must be pressed to re-start the machine. After S3 has been pressed, guard locking closes again, H3 goes out and H2 is switched on again.

Principle circuit diagram

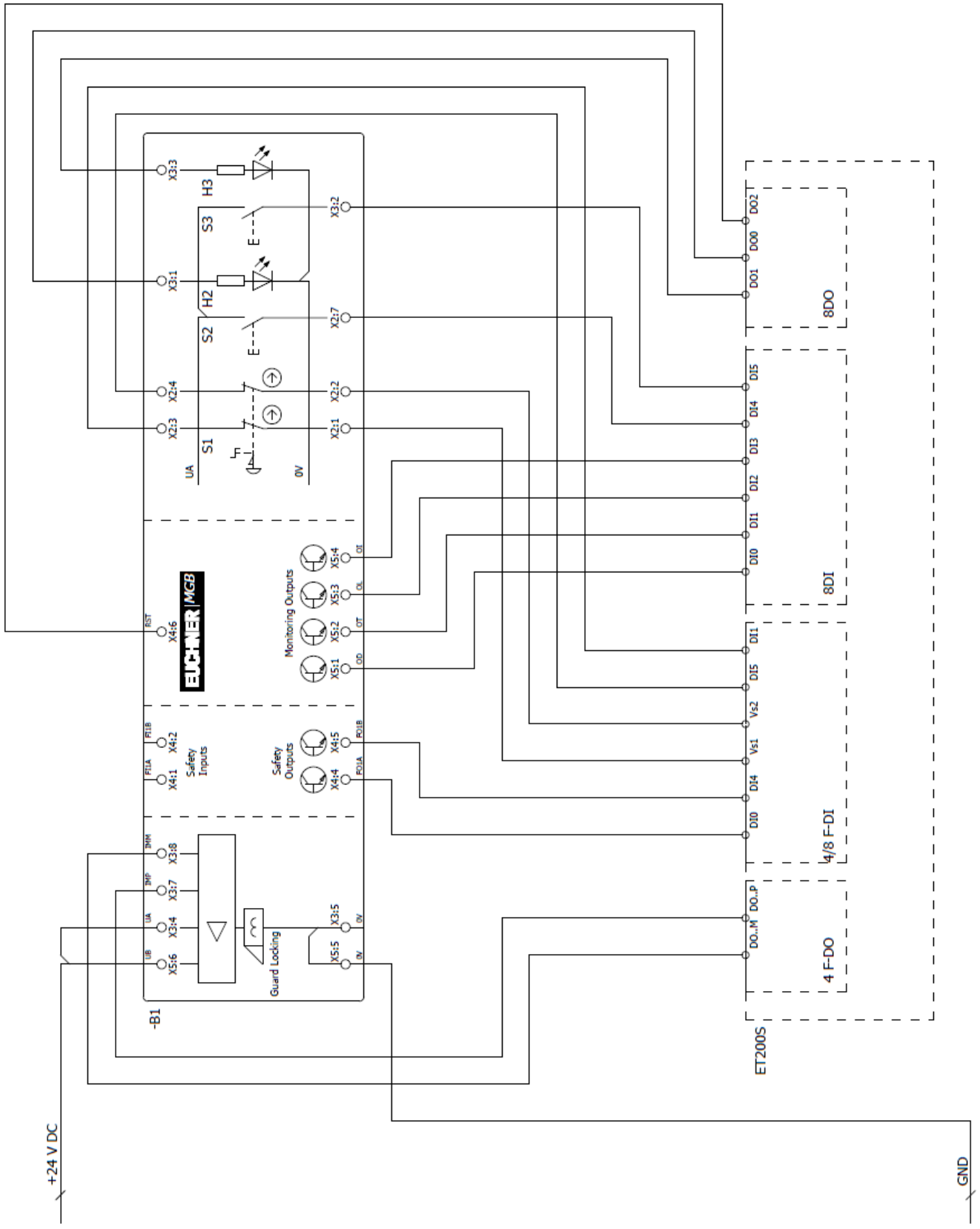

Figure 5

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.