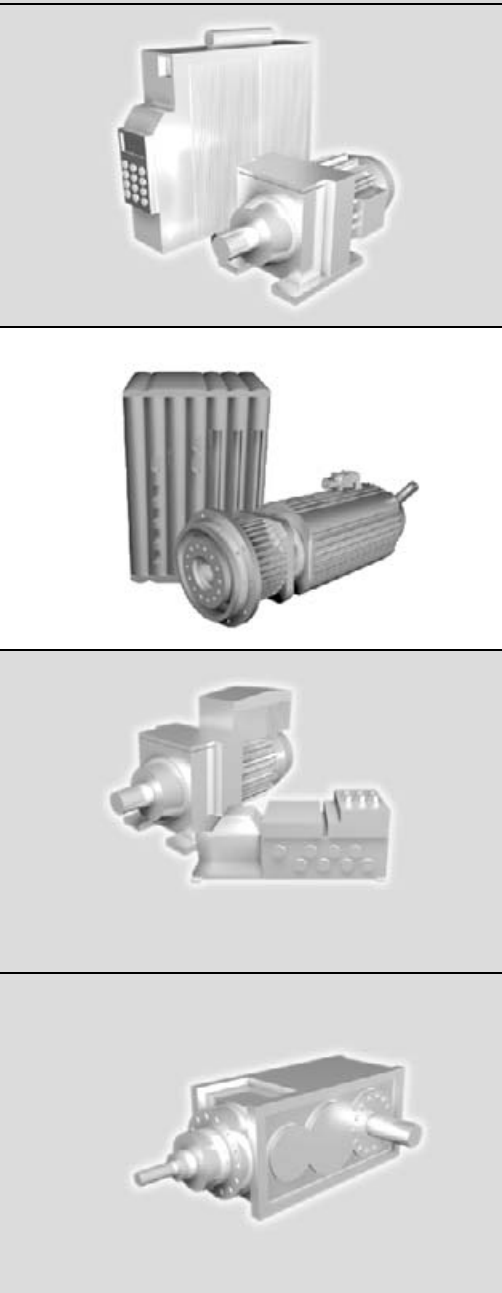




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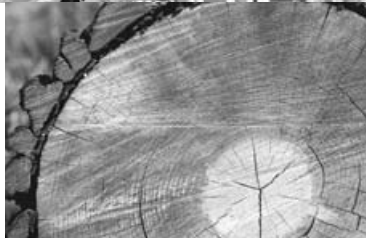


Safe Disconnection for MOVIAxis[®] Applications

Edition 10/2006

11399414 / EN

Manual





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1 Important Notes

Generally, all the connection variants listed in this documentation are permitted for safety-relevant applications as long as the basic safety concept is fulfilled. This means that the 24 V safety inputs must always be disconnected using an external emergency stop relay or a safety control to EN 954-1 category 3 or EN 201 to prevent automatic restart.

All safety-relevant conditions mentioned in the documentation Safe Disconnection for MOVIAXIS® MX- Conditions must be met for the basic selection, installation, and application of the safety components, such as emergency stop relay, emergency off switch, etc., and the approved connection variants.

The safety-relevant conditions are included in the "Checklist" section in this document.

MOVIAXIS® axis system

The following figures show examples of a MOVIAXIS® axis system (Figure 1) as well as the positioning of the safety relays at the bottom of an axis module size 3 (Figure 2).

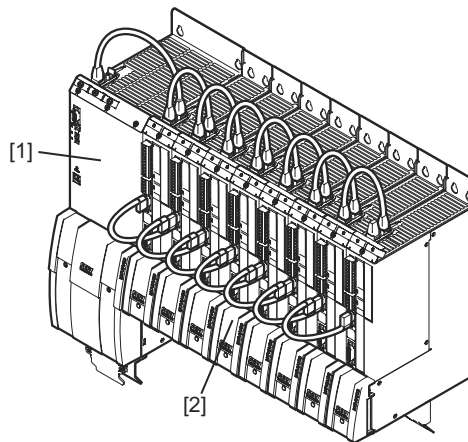


Figure 1: Example of a MOVIAXIS® axis system

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[1] Power supply module

[2] Axis modules



Connections of the safety relays

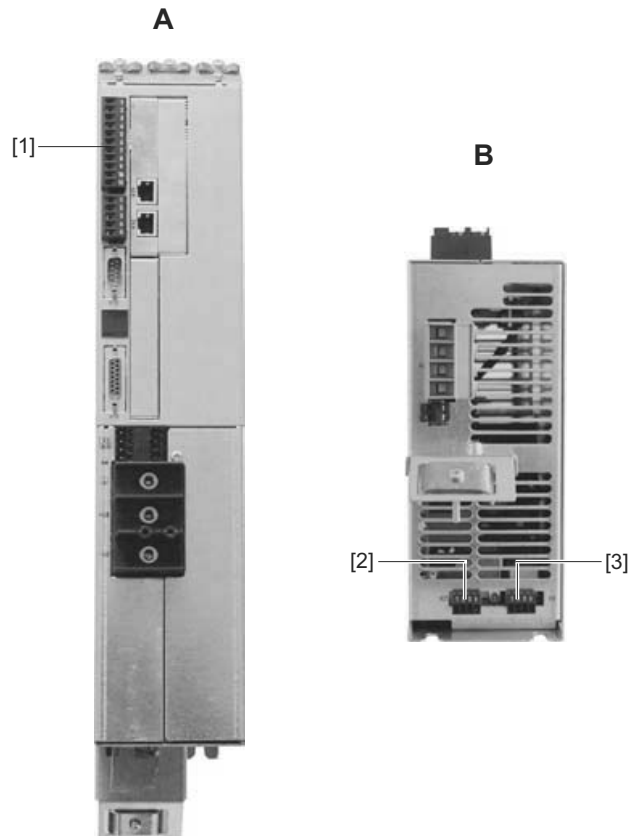


Figure 2: Connections of the safety relays at the bottom of an axis module size 3

59146axx

View from front

[1] X10 binary inputs

View from bottom

[2] Connections of the safety relay X7

[3] Connections of the safety relay X8



2 Disconnection of Single Drives

This chapter describes how an axis module is brought to a safe stop.

2.1 *Definition of stop variants according to EN 60204-1*

Stop 1

A controlled stop, in which the drive elements of the machine are kept energized in order to ensure a standstill. The power is only disconnected when standstill has been reached.

Stop 0

Stopping by instantly disconnecting the power supply to the drive elements of the machine, i.e. an uncontrolled stop.

2.2 *Requirements*

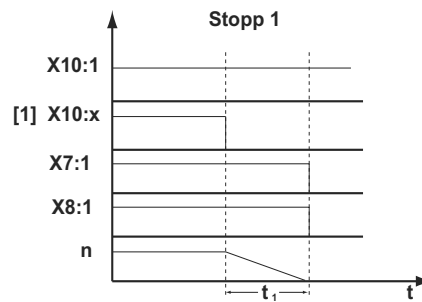
The requirements of the manufacturers of emergency stop relays (such as protecting the output contacts against welding) or other safety components must be strictly observed. For cable routing, the basic requirements described in the manual "Safe Disconnection for MOVIAXIS® – Conditions" apply.

Please note the installation requirements described in the manual "Safe Disconnection for MOVIAXIS® – Conditions" for a connection of MOVIAXIS® with emergency stop relays.

Other instructions by the manufacturer on the use of emergency stop relays for specific applications must also be observed.



2.3 Connection variant "Stop 1 (EN 60204-1) and protection type III to EN 201"



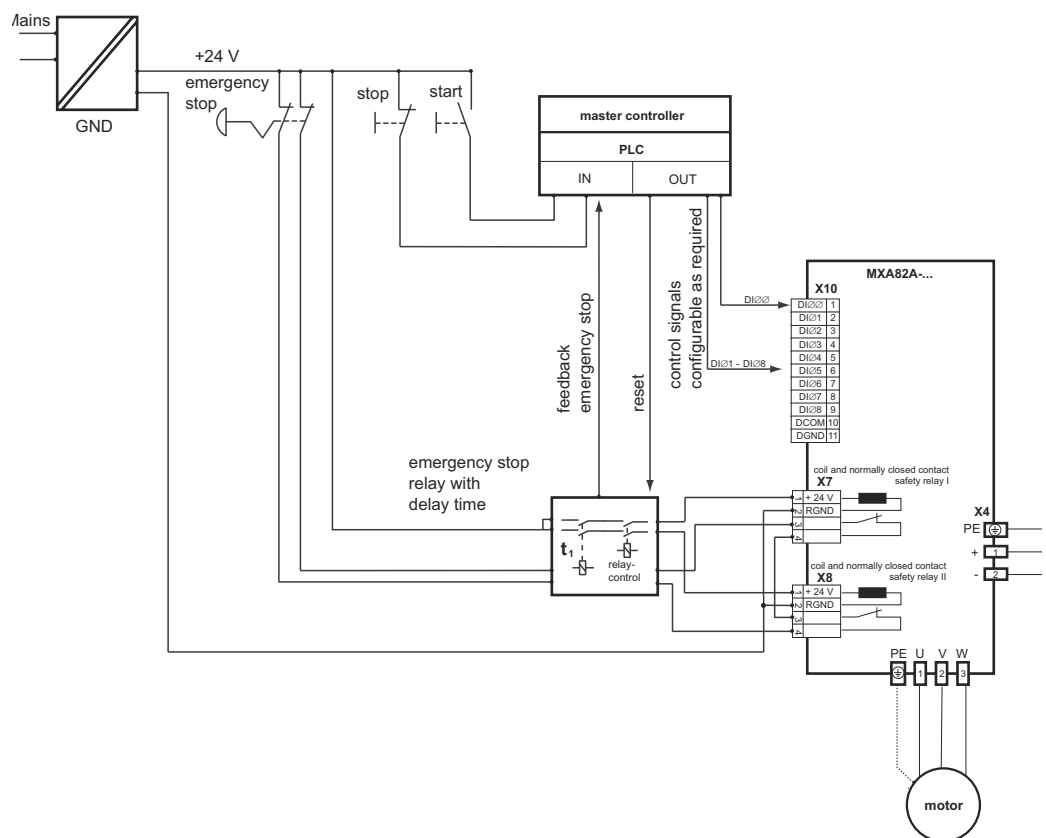
59277axx

Figure 3: Temporal signal pattern for stop 1 (EN 60204-1) and protection type III according to EN 201

[1] Example: X10:x requests an FCB

The procedure is as follows:

- X10:1 must not be disconnected.
- X10:x is disconnected, e. g. in case of an emergency stop.
- Within the safety period t_1 , the motor reduces its speed along the ramp to a standstill.
- After t_1 has elapsed, the safety inputs X7 and X8 are disconnected. The safety period t_1 must be set so that the motor comes to a standstill within this period.



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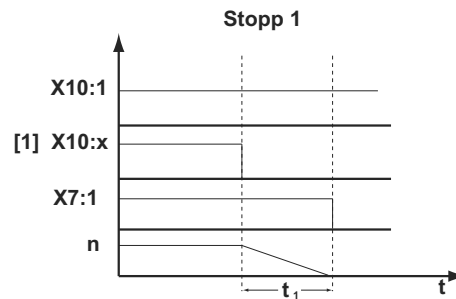
Figure 4: Connection variant "Stop 1 (EN 60204-1) and protection type III according to EN 201"



Disconnection of Single Drives

Connection variant "Stop 1 (EN 60204-1) and category 3 to EN 954-1"

2.4 Connection variant "Stop 1 (EN 60204-1) and category 3 to EN 954-1"



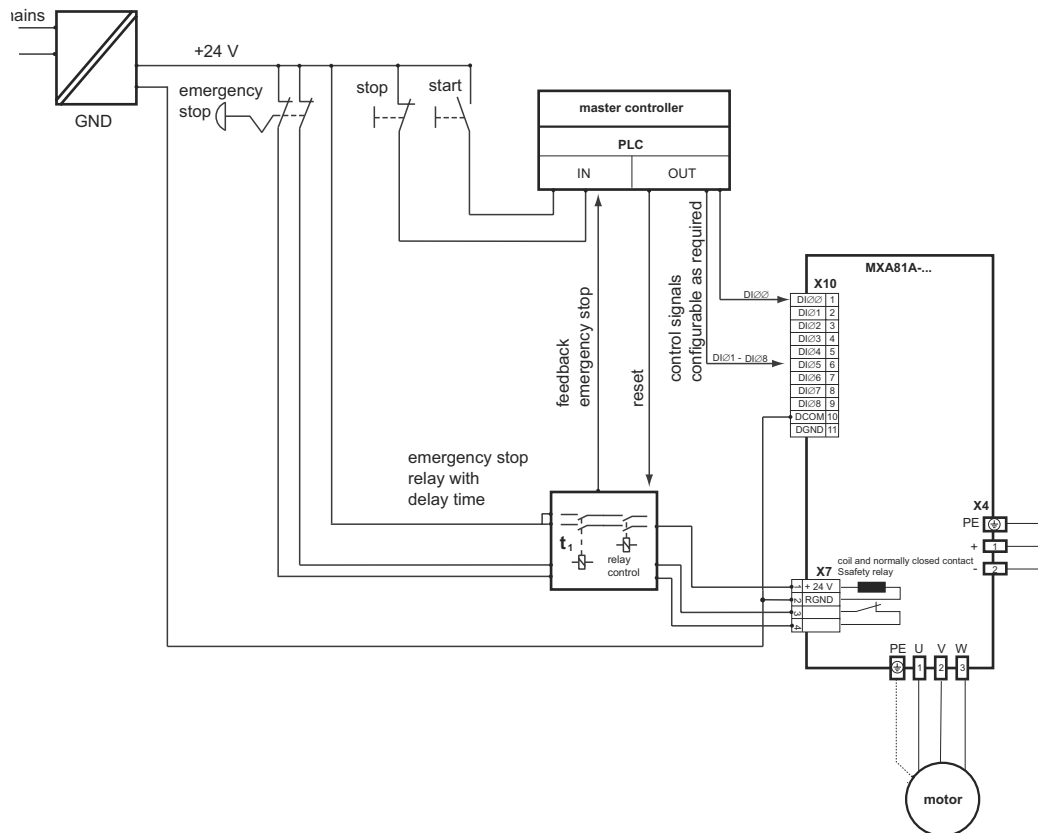
59279axx

Figure 5: Temporal signal pattern for stop 1 (EN 60204-1) and category 3 according to EN 954-1

[1] Example: X10:x requests an FCB

The procedure is as follows:

- X10:1 must not be disconnected.
- X10:x is disconnected, e. g. in case of an emergency stop.
- Within the safety period t_1 , the motor reduces its speed along the ramp to a standstill.
- After t_1 has elapsed, the safety inputs X7 is disconnected. The safety period t_1 must be set so that the motor comes to a standstill within this period.

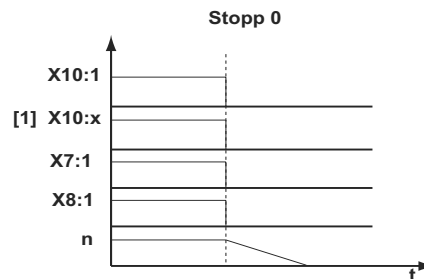


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Figure 6: Connection variant "Stop 1 and category 3 according to EN 954-1"



2.5 Connection variant "Stop 0 (EN 60204-1) and protection type III to EN 201"



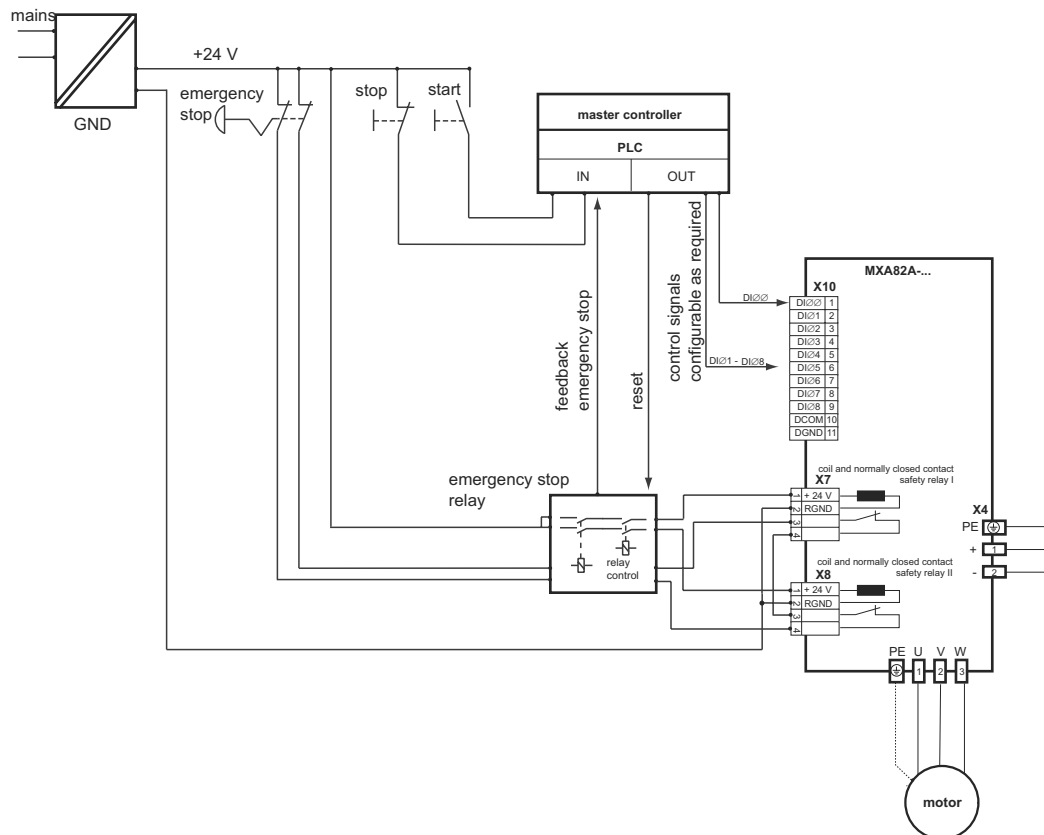
59284axx

Figure 7: Temporal signal pattern for stop 0 (EN 60204-1) and protection type III according to EN 201

[1] Example: X10:x requests an FCB

The procedure is as follows:

- Recommendation: X10:1 and X10:x are disconnected **at the same time**, e. g. in case of an emergency stop.
- The 24 V safety inputs X7 and X8 are disconnected.
- The motor coasts to a halt, if no brake is activated.



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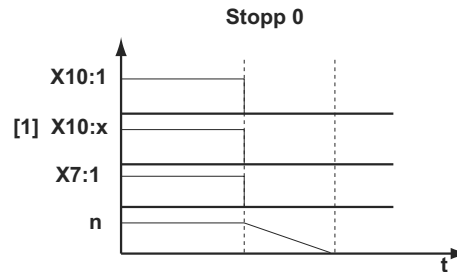
Figure 8: Connection variant "Stop 0 (EN 60204-1) and protection type III according to EN 201"



Disconnection of Single Drives

Connection variant "Stop 0 (EN 60204-1) and category 3 to EN 954-1"

2.6 Connection variant "Stop 0 (EN 60204-1) and category 3 to EN 954-1"



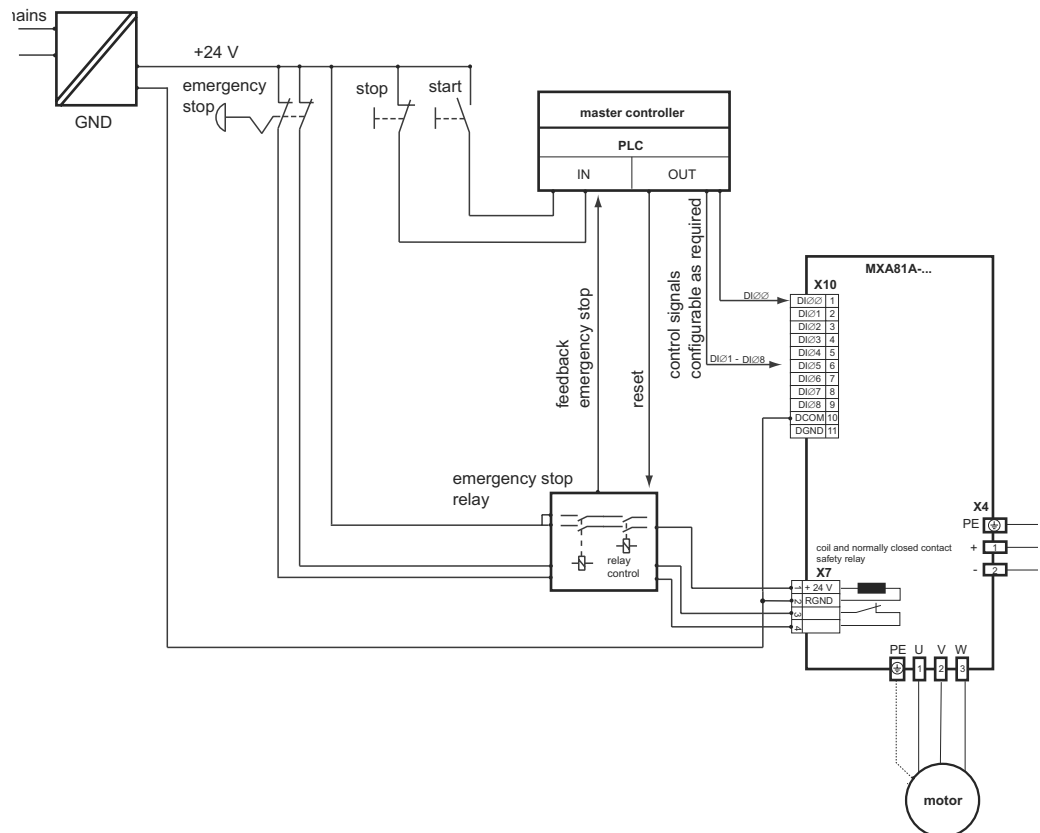
59285axx

Figure 9: Temporal signal pattern for stop 0 (EN 60204-1) and category 3 according to EN 954-1

[1] Example: X10:x requests an FCB

The procedure is as follows:

- Recommendation: X10:1 and X10:x are disconnected **at the same time**, e. g. in case of an emergency stop.
- The 24 V safety input X7 is disconnected.
- The motor coasts to a halt, if no brake is activated.



58564aen

Figure 10: Connection variant "Stop 0 and category 3 according to EN 954-1"



3 Disconnection of Group Drives

This chapter describes how several axis modules are brought to a safe stop.

3.1 Requirements

For group drives, the 24 V safety inputs of several MOVIAXIS[®] axis modules can be made available by a single emergency stop relay. The maximum number of axis modules results from the maximum permitted contact load of the emergency stop relay or the safety control.

Other requirements of the manufacturers of emergency stop relays (such as protecting the output contacts against welding) or other safety components must be strictly observed. For cable routing, the basic requirements described in the manual "Safe Disconnection for MOVIAXIS[®] – Conditions" apply.

Please note the installation requirements described in the manual "Safe Disconnection for MOVIAXIS[®] – Conditions" for a connection of MOVIAXIS[®] with emergency stop relays.

Other instructions by the manufacturer on the use of emergency stop relays for specific applications must also be observed.

Determining the maximum number of MOVIAXIS[®] axis modules for disconnection of group drives

The number (n units) of MOVIAXIS[®] axis modules that can be connected to a group drive with safe disconnection is limited by the following points:

1. Switching capacity of the emergency stop relay.

A fuse must be connected in front of the safety contacts according to the specifications of the emergency stop relay manufacturer to prevent contact welding.

The project planner is responsible for ensuring that the specifications for the switching capacity to EN 60947-4-1, 02/1 and EN 60947-5-1, 11/97 as well as on contact fuse protection given in the operating instructions of the emergency stop relay manufacturer are strictly observed.

2. Maximum permitted voltage drop in the 24 V power supply cable.

Values concerning cable lengths and permitted voltage drops must be observed during project planning for axis systems.

3. Maximum line cross section of 1 x 1.5 mm² or 2 x 0.75 mm².



Disconnection of Group Drives

Connection variant "Stop 1 (EN 60204-1) and category 3 to EN 954-1"

3.2 Connection variant "Stop 1 (EN 60204-1) and category 3 to EN 954-1"

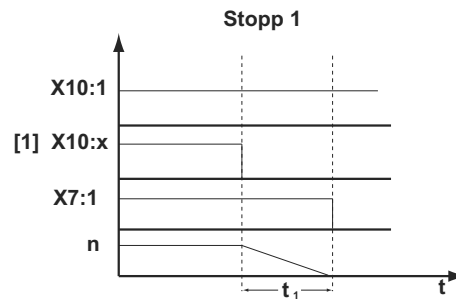


Figure 11: Temporal signal pattern for stop 1 (EN 60204-1) and category 3 according to EN 954-1 59279axx

[1] Example: X10:x requests an FCB

The procedure is as follows:

- X10:1 must not be disconnected.
- X10:x is disconnected, e. g. in case of an emergency stop.
- Within the safety period t_1 , the motor reduces its speed along the ramp to a standstill.
- After t_1 has elapsed, the safety inputs X7 is disconnected. The safety period t_1 must be set so that the motor comes to a standstill within this period.

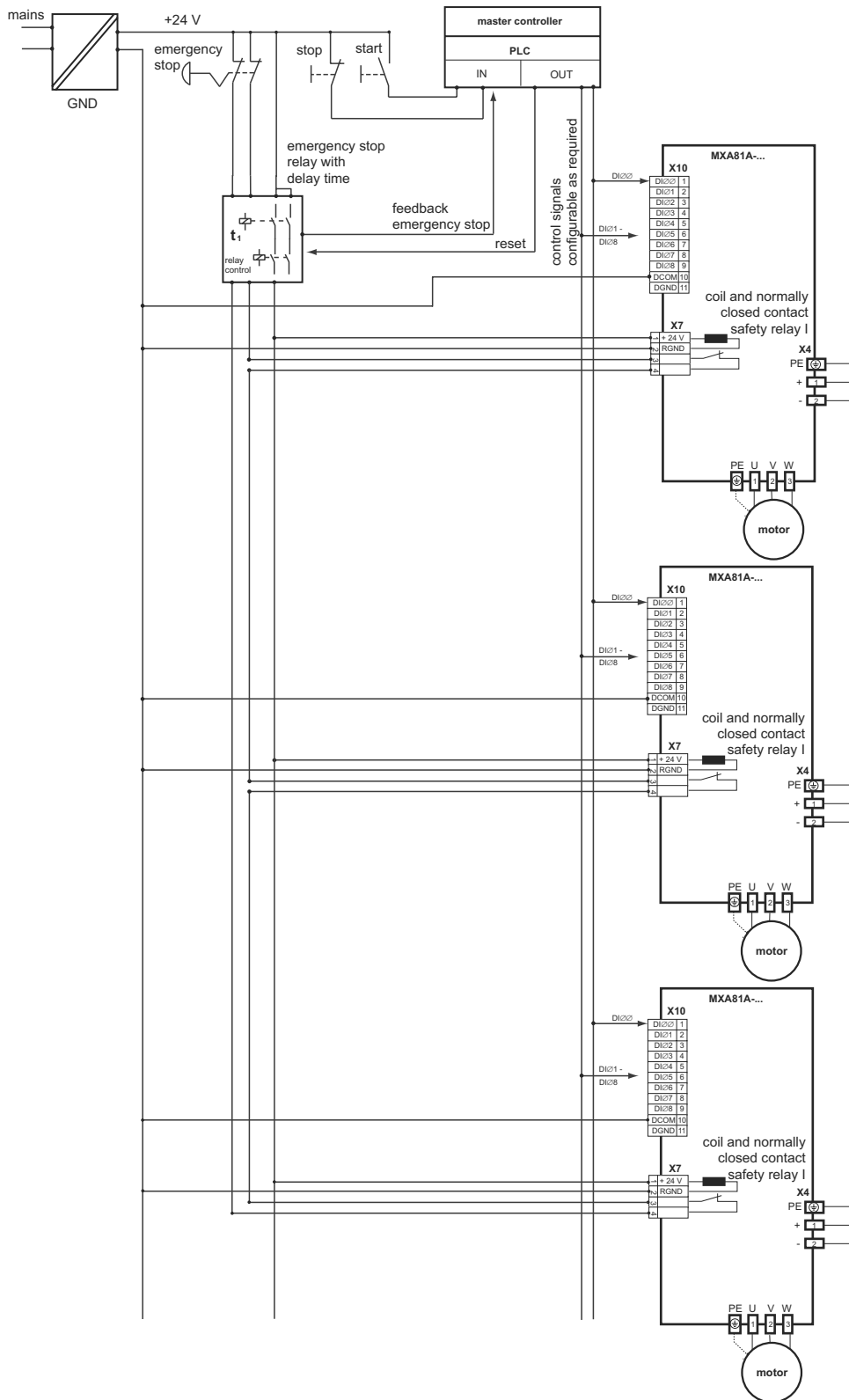


Figure 12: Example: Group disconnection of 3 axis modules

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Disconnection of Group Drives

Group disconnection with one emergency stop relay

3.3 Group disconnection with one emergency stop relay

With one emergency stop relay, the safety inputs of all axis modules of the axis system can be controlled and monitored.

The axes can be equipped with one or two safety relays.

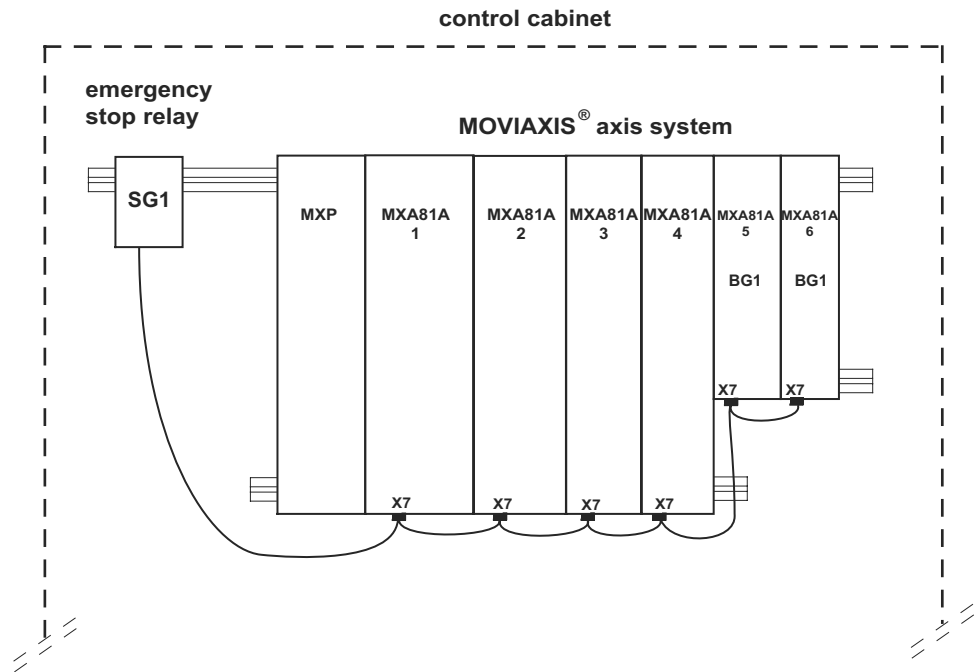


Figure 13: Group disconnection with one emergency stop relay

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For group disconnection, please refer to the wiring diagram for disconnection of singles drives in chapter 2.4.



3.4 Group disconnection with two emergency stop relays

With several emergency stop relays, the safety inputs of the respective axis modules can be controlled and monitored. In the example in Figure 14, the axis modules 1 - 4 and 5 - 6 are grouped together and monitored by one emergency stop relay per group. The axes can be equipped with one or two safety relays.

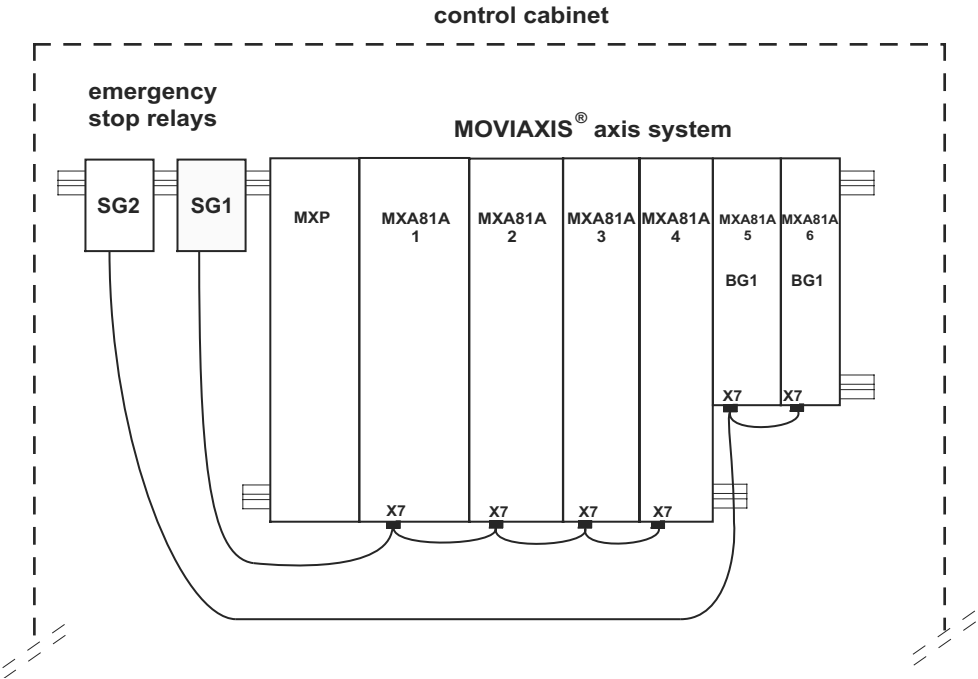


Figure 14: Group disconnection with two emergency stop relays

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For group disconnection, please refer to the wiring diagram for disconnection of singles drives in chapter 2.4.



Checklist

Using the checklist

4 Checklist

4.1 Using the checklist

The checklist helps you perform project planning, installation and startup for the connection variants described above.

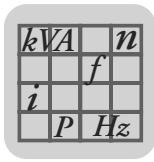


- **Correct use of the checklist and the connection-specific addendums does not replace complete and documented startup and proof of the efficacy of the safety functions.**
- **Additional requirements may become necessary depending on the system/machinery.**
- **The checklist is not exhaustive.**

No.	Requirement	Met		Comment
		Yes	No	
1	General requirements			
1.1	Has a risk analysis according to EN 1050/ EN 954-1 been performed that shows: <ul style="list-style-type: none"> • That safety category 3 can be realized? • Which stop category (0 or 1) must be realized to EN 60204-1? • Whether a mechanical brake is necessary or not? 			
2.	General requirements on units and installation			
2.1	Are only DC 24 V power supplies / power supply units used that meet the requirements of EN 60950?			
2.2	Has the maximum permitted total cable length for the 24 V DC supply cable been calculated? Has the maximum number of MOV-IAXIS® axis modules for the disconnection of group drives been determined, taking the contact rating of the emergency stop relay into account? Please refer to the project planning manual for project planning notes on taking the maximum contact rating into account. For technical data, please refer to the "Safe Disconnection - Conditions" manual.			
2.3	Have you adhered to the instructions for EMC-compliant cabling in accordance with the MOVIAXIS®MX operating instructions?			
2.4	Has the DC24 V supply cable for safe stop been installed as follows: <ul style="list-style-type: none"> • EMC compliant cabling (i.e. routed separately from motor cables and other cables carrying switched-mode signals). • Or using shielded cables. • Either in cable ducts or conduits. • Using suitable terminal strips for the distribution. 			
3.	Requirements for external emergency stop relays			
3.1	Does the emergency stop relay have at least certification to category 3 in accordance with EN 954-1?			
3.2	Have the values specified for the emergency stop relay been strictly observed in the circuit design?			
3.3	Has the switching capacity of the emergency stop relay been taken into account and corresponding fusing been carried out?			
3.4	Have suitable control devices to EN 418 been used for safe disconnection of the drive according to stop category 0 or 1?			
3.5	Have the emergency stop relays been designed in such a way that resetting the control device (emergency off switch) itself will not lead to a restart?			



No.	Requirement	Met		Comment
		Yes	No	
4.	Startup requirements			
4.1	Have you checked the connection for the signals displayed in the connection variants?			
4.2	Has a commissioning test of the disconnecting device been carried out and the correct wiring been checked and recorded in writing?			
4.3	Was the display (7-segment display "C2" flashes) for the safety input included in the functional check during startup?			
4.4	Have you taken into account that if the drive does not have a mechanical brake or if the brake is faulty, the drive may coast to a halt. Have you adhered to the relevant requirements (including the coasting time, access time, closure, safety clearance ...)?			
5.	Operation requirements			
5.1	Have you ensured that the units / components in the safety area are operated within the limits specified in the data sheets?			
5.2	Is the safety function checked at regular intervals?			



Technical Data

Technical data of control section axis module, safety technology

5 Technical Data

5.1 *Technical data of control section axis module, safety technology*

For technical data, please refer to chapter 7 of the publication "Safe Disconnection for MOVIAXIS® – Conditions", publication no. 11523026.



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How we're driving the world

With people who think fast and develop the future with you.



With a worldwide service network that is always close at hand.

With drives and controls that automatically improve your productivity.



With comprehensive knowledge in virtually every branch of industry today.



With uncompromising quality that reduces the cost and complexity of daily operations.



SEW-EURODRIVE
Driving the world

With a global presence that offers responsive and reliable solutions. Anywhere.

With innovative technology that solves tomorrow's problems today.

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