



SEW
EURODRIVE

Manual



MOVIDRIVE® MDX60B/61B Functional Safety



Contents

1	General information.....	5
1.1	About this documentation	5
1.2	Underlying standards	5
1.3	Structure of the safety notes	5
1.3.1	Meaning of signal words	5
1.3.2	Structure of section-related safety notes.....	6
1.3.3	Structure of embedded safety notes	6
1.4	Rights to claim under limited warranty	6
1.5	Decimal separator in numerical values	6
1.6	Copyright notice	7
1.7	Document content.....	7
1.8	Other applicable documentation	7
2	Integrated safety technology.....	8
2.1	General	8
2.2	Safe condition	8
2.3	Safety concept	8
2.4	Schematic representation "Safety concept for MOVIDRIVE® B"	9
2.5	Safety subfunctions.....	10
2.6	Restrictions	11
3	Safety requirements	12
3.1	Requirements.....	12
3.2	Approved devices	12
3.2.1	MOVIDRIVE® MDX60B/61B for a connection voltage of 3 × AC 380 – 500 V ... 12	
3.2.2	MOVIDRIVE® MDX61B for a connection voltage of AC 230 V	13
3.3	Requirements on the installation.....	14
3.4	Requirements on the external safety controller	16
3.5	Requirements on startup.....	17
3.6	Requirements on operation.....	17
4	Connection variants	18
4.1	General information	18
4.1.1	Terminal X17 on the MOVIDRIVE® MDX60B/61B	18
4.2	Requirements.....	19
4.2.1	Use of safety relays.....	19
4.2.2	Using safety controllers	19
4.3	Disconnection of a single drive	20
4.3.1	STO according to PL d (EN ISO 13849-1)	20
4.3.2	SS1-t in accordance with PL d (EN ISO 13849-1)	22
4.4	Disconnection of group drives.....	25
4.4.1	Requirements.....	25
4.4.2	Implementing group disconnection with a safety relay	26
4.4.3	STO according to PL d (EN ISO 13849-1)	27
5	Technical data.....	29

5.1 Safety characteristics..... 29

5.2 Electronics data X17: Signal terminal block for STO safety contact..... 29

Index 31

27778037/EN – 01/2022

1 General information

1.1 About this documentation

The documentation at hand is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, contact SEW-EURODRIVE.

1.2 Underlying standards

The safety assessment of the device is based on the following standards and safety classes:

Underlying standards	
Safety class/underlying standards	Performance Level (PL) in accordance with EN ISO 13849-1

Observe the versions of the applicable standards as specified on the declaration of conformity or on the TÜV certificate.

1.3 Structure of the safety notes

1.3.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
▲ DANGER	Imminent hazard	Severe or fatal injuries
▲ WARNING	Possible dangerous situation	Severe or fatal injuries
▲ CAUTION	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.3.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:



SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage

1.3.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ SIGNAL WORD! Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

1.4 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

1.5 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

1.6 Copyright notice

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1.7 Document content

This documentation contains conditions and amendments for MOVIDRIVE® MDX60B/61B in safety-related applications.

The system comprises a drive inverter with AC motor and safety-tested external disconnecting device.

1.8 Other applicable documentation

This documentation supplements the operating instructions of MOVIDRIVE® MDX60B/61B and limits the application notes in accordance with the following information. It may only be used in conjunction with the MOVIDRIVE® MDX60B/61B operating instructions.

2 Integrated safety technology

2.1 General

The safety technology of MOVIDRIVE® MDX60B/61B described below has been developed and tested in accordance with the following safety requirements:

- PL d according to EN ISO 13849-1

This was certified by TÜV Nord. Copies of the TÜV certificate can be obtained from SEW-EURODRIVE.

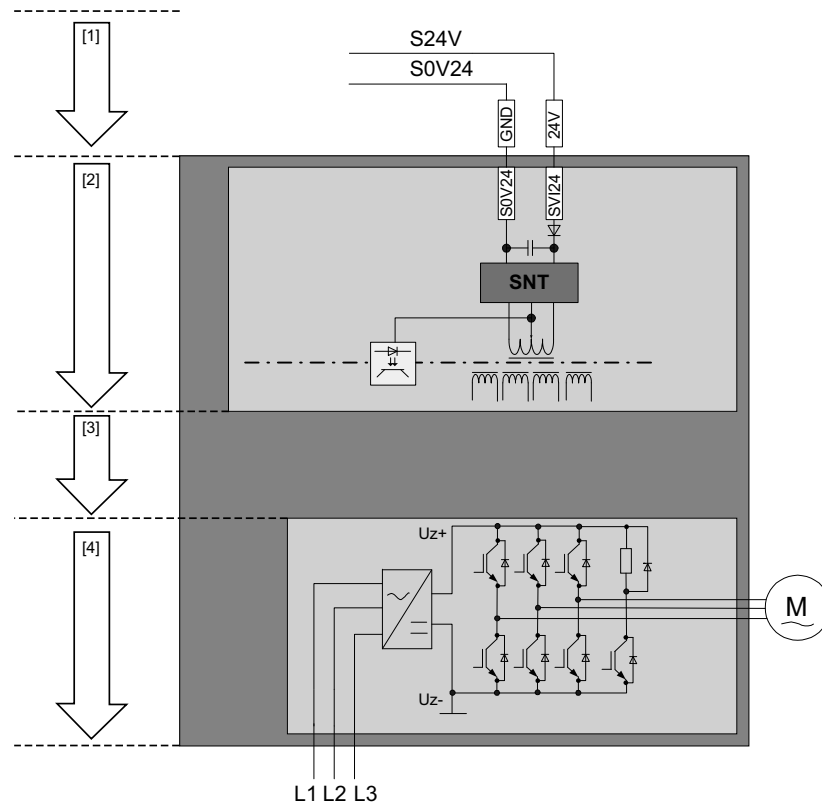
2.2 Safe condition

For safety-related operation of MOVIDRIVE® MDX60B/61B, safe torque off is defined as a safe state (see STO safety function). The safety concept is based on this definition.

2.3 Safety concept

- In the event of danger, any potential risk related to a machine must be eliminated as quickly as possible. Idle state with restart prevention is generally the safe state for preventing dangerous movements.
- The MOVIDRIVE® MDX60B/61B drive inverter is characterized by the option to connect an external safety relay. The safety relay disconnects all active elements (disconnection of the safety-related 24 V power supply of the output stage control) that generate the pulse trains to the power output stage (IGBT) when a connected command device (e.g. an emergency stop button with latching function) is activated.
- Disconnecting the safety-related 24 V supply voltage ensures that the supply voltages required for operating the inverter and consequently for generating a rotating field of pulse patterns (which allow the generation of a rotating field) are safely interrupted, preventing automatic restart.
- Instead of galvanic separation of the drive from the power supply by means of relays or switches, the disconnection of the 24 V supply described here safely prevents the control of the power semiconductors in the drive inverter. This process disconnects the rotating field generation for the respective motor. The individual motor cannot develop any torque in this state even though the line voltage is still present.

2.4 Schematic representation "Safety concept for MOVIDRIVE® B"



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- [1] Safety-related DC 24 V voltage supply
- [2] Electrical isolation
- [3] Voltage supply for controlling the power transistors
- [4] Pulse width modulated signals for the output stage

2.5 Safety subfunctions

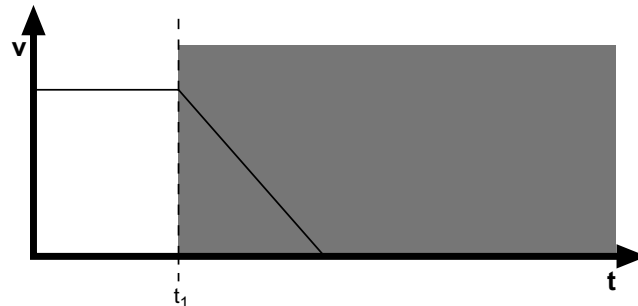
The following drive-related safety functions can be used:

- **STO** (Safe Torque Off according to EN 61800-5-2) by disconnecting the STO input.

If the STO function is activated, the frequency inverter no longer supplies power to the motor for generating torque. This safety subfunction corresponds to a non-controlled stop according to EN 60204-1, stop category 0.

The STO input must be disconnected by a suitable external safety controller/safety relay.

The following figure shows the STO function:



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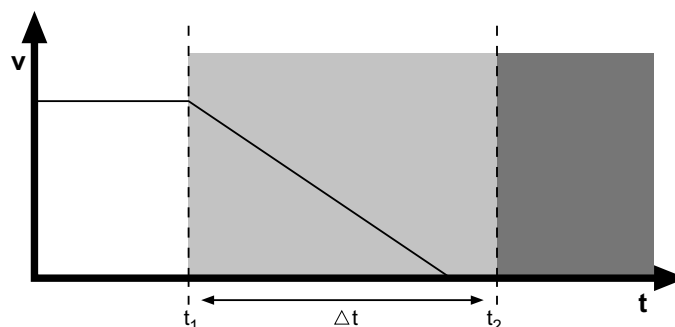
- **SS1-t** (Safe stop 1 with time control by means of suitable external control, e.g. safety relay with delayed disconnection).

The following sequence is mandatory:

- Decelerate the drive using an appropriate brake ramp specified via the setpoint input.
- Disconnect the STO input (= triggering the STO function) after a specified safety-related time delay.

This safety subfunction corresponds to a controlled stop in accordance with EN 60204-1, stop category 1. The SS1-t function corresponds to the former presentation of the SS1(c) function.

The following figure illustrates the SS1-t function:



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v	Velocity
t	Time
t_1	Point of time when brake ramp is initiated
t_2	Point of time when STO is triggered
Δt	Delay time until STO is triggered
	Safe time delay range
	Disconnection range

2.6 Restrictions

- Note that if the drive does not have a mechanical brake, or if the brake is defective, the drive may coast to a halt (depending on the friction and mass moment of inertia of the system). In case of regenerative loads, the drive can even accelerate. This must be taken into account in a risk assessment of the system/machine. Additional safety measures might have to be implemented (e.g. safety brake system).

MOVIDRIVE® MDX60B/61B cannot be used without an additional brake system for application-specific safety functions that require active deceleration (braking) of the dangerous movement.

- When using the SS1-t function as described in chapter "Safety subfunctions", the brake ramp of the drive is not monitored with respect to safety. In the case of an error, the drive might not be decelerated during the delay time, or it might even be accelerated in the worst case. In this case, the safety-related disconnection via the STO function is only activated after the set time delay has elapsed (see chapter "Safety subfunctions"). The resulting hazard must be taken into account in the risk assessment of the system/machine, and additional safety measures have to be implemented.

⚠ WARNING



The safety concept is only suitable for performing mechanical work on driven system/machine components.

If the STO signal is disconnected, the line voltage is still present at the DC link of MOVIDRIVE® MDX60B/61B.

- Before working on the electric part of the drive system, disconnect it from the supply voltage using an appropriate external disconnecting device, and secure it against unintentional reconnection to the voltage supply.

ℹ INFORMATION



In case of safety-related disconnection of the DC 24 V supply voltage at X17 (STO activated), the brake is **always** applied. The brake control in MOVIDRIVE® MDX60B/61B is not safety-related.

3 Safety requirements

3.1 Requirements

The requirement for safe operation is that the safety functions of MOVIDRIVE® MDX60B/61B are properly integrated into an application-specific, higher-level safety function. In any case, a system/machine-specific risk assessment must be carried out by the system/machine manufacturer and taken into consideration for using the drive system with MOVIDRIVE® MDX60B/61B.

The system/machine manufacturer and the user are responsible for the compliance of the system/machine with the applicable safety regulations.

The following requirements are mandatory when installing and operating MOVIDRIVE® MDX60B/61B in safety-related applications.

The requirements are divided into:

- Approved devices
- Installation requirements
- Requirements for external safety controllers and safety relays
- Startup requirements
- Operational requirements

3.2 Approved devices

The following device variants of MOVIDRIVE® MDX60B/61B are permitted for safety-related applications:

3.2.1 MOVIDRIVE® MDX60B/61B for a connection voltage of 3 × AC 380 – 500 V

Power rating kW	Size	Type
0.55	0S	MDX60B0005-5A3-4-XX
0.75	0S	MDX60B0008-5A3-4-XX
1.1	0M	MDX60B0011-5A3-4-XX
1.5	0M	MDX60B0014-5A3-4-XX
0.55	0S	MDX61B0005-5A3-4-XX
0.75	0S	MDX61B0008-5A3-4-XX
1.1	0M	MDX61B0011-5A3-4-XX
1.5	0M	MDX61B0014-5A3-4-XX
1.5	1	MDX61B0015-5A3-4-XX
2.2	1	MDX61B0022-5A3-4-XX
3	1	MDX61B0030-5A3-4-XX
4	1	MDX61B0040-5A3-4-XX
5.5	2S	MDX61B0055-5A3-4-XX
7.5	2S	MDX61B0075-5A3-4-XX

Power rating kW	Size	Type
11	2	MDX61B0110-5A3-4-XX
15	3	MDX61B0150-503-4-XX
22	3	MDX61B0220-503-4-XX
30	3	MDX61B0300-503-4-XX
37	4	MDX61B0370-503-4-XX
45	4	MDX61B0450-503-4-XX
55	5	MDX61B0550-503-4-XX
75	5	MDX61B0750-503-4-XX
90	6	MDX61B0900-503-4-XX
110	6	MDX61B1100-503-4-XX
132	6	MDX61B1320-503-4-XX
160	7	MDX61B1600-503-4-XX
200	7	MDX61B2000-503-4-XX
250	7	MDX61B2500-503-4-XX

3.2.2 MOVIDRIVE® MDX61B for a connection voltage of AC 230 V

Power rating kW	Size	Type
1.5	1	MDX61B0015-2A3-4-XX
2.2	1	MDX61B0022-2A3-4-XX
3.7	1	MDX61B0037-2A3-4-XX
5.5	2	MDX61B0055-2A3-4-XX
7.5	2	MDX61B0075-2A3-4-XX
11	3	MDX61B0110-203-4-XX
15	3	MDX61B0150-203-4-XX
22	4	MDX61B0220-203-4-XX
30	4	MDX61B0300-203-4-XX

3.3 Requirements on the installation

- The safety-related DC 24 V supply voltage must be routed according to EMC guidelines as follows:
 - Outside an electrical installation space, shielded cables must be routed permanently (fixed) and protected against external damage, or other equivalent measures have to be taken.
 - Single conductors can be routed inside an electrical installation space.
 - Adhere to the regulations in force for the application.
- Power cables and safety-related control cables must be installed in separate cables.
- Make sure that parasitic voltages cannot be generated in the safety-related control lines.
- The wiring technology must comply with EN 60204-1.
- Only grounded voltage sources with protective extra-low voltage (PELV) in accordance with VDE0100 and EN 60204-1 may be used. In case of a single fault, the voltage between the outputs or between any output and grounded parts must not exceed DC 60 V.
- For information concerning EMC-compliant cabling, refer to the "MOVIDRIVE® MDX60B/61B" operating instructions. It is essential that you connect the shield of the safety-related DC 24 V supply cable to the housing at both ends.
- The lines of the safety-related 24 V supply voltage (terminal X17) must be clamped under the signal electronics shield terminal.
- When planning the installation, observe the technical data of MOVIDRIVE® MDX60B/61B.
- Observe without fail the values specified for safety components when designing the safety circuits.
- The cable length of the safety-related DC 24 V supply voltage must not exceed 100 m.
- The safety-related DC 24 V supply voltage may not be used for feedback.
- All connections (e.g. lines or data communication using bus systems) must already have been taken into account in the performance level of one of the subsystems involved, or it must be possible that faults in the connections can be excluded or neglected.

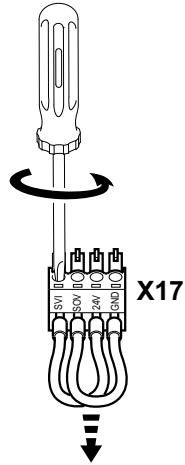
The fault assumption "Short circuit between any 2 conductors" can be excluded in accordance with EN ISO 13849-2 under the following conditions:

The conductors are

- Permanently (fixed) installed and protected against external damage (for example, using a cable duct or armored conduit)
- Routed in different cables in an electrical installation space provided that both the lines and the installation space fulfill the relevant requirements, see EN 60204-1
- Protected individually by a ground connection

The fault assumption "short circuit between any conductor and an exposed conductive part or ground or a protective conductor" can be excluded under the following condition:

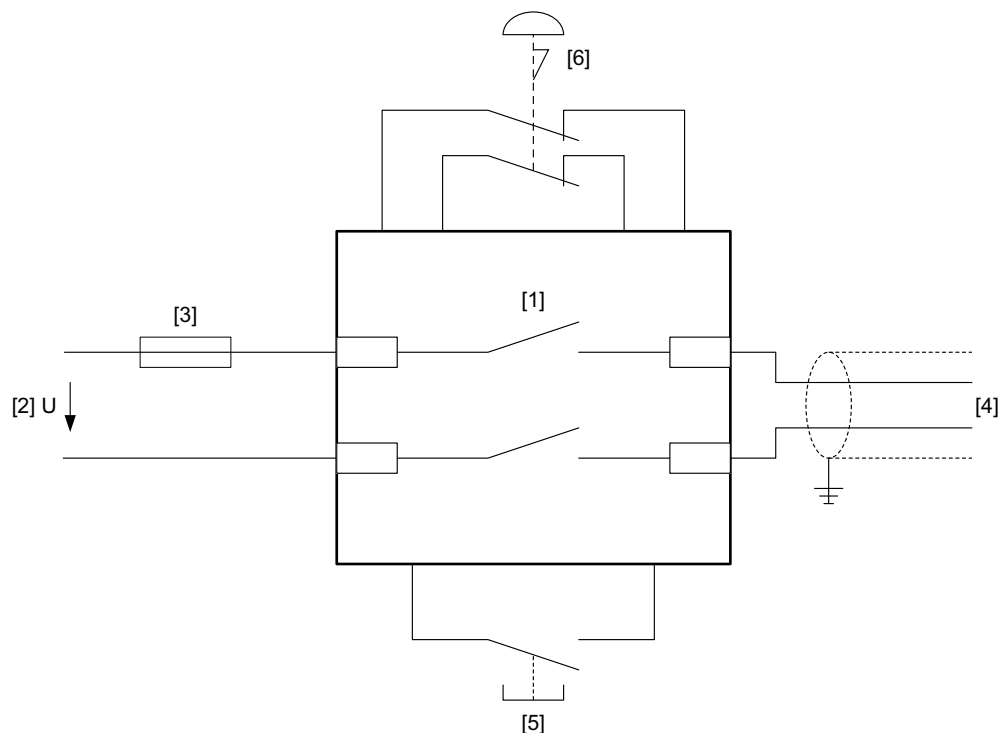
- Short circuits between a conductor and any exposed conductive part within an installation space.
- For applications with safety-related drive disconnection, remove the jumpers on X17:1 to X17:4 (see following figure).



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Removing jumpers

3.4 Requirements on the external safety controller



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- [1] Safety relay with approval
- [2] DC 24 V voltage supply
- [3] Fuses in accordance with the manufacturer's specifications of the safety relay
- [4] Safety-related DC 24 V voltage supply
- [5] Reset button for manual reset
- [6] Approved emergency stop actuating device

A safety relay can be used as an alternative to a safety controller. The following requirements apply analogously.

- The safety controller and all other safety-related subsystems must be approved for at least the safety class required in the overall system for the respective application-related safety function.

The following table shows an example of the required safety class of the safety controller:

Application	Safety controller requirements
Performance Level d in accordance with EN ISO 13849-1	Performance Level d in accordance with EN ISO 13849-1 SIL 2 in accordance with EN 61508

- The wiring of the safety controller must be suitable for the required safety class (see manufacturer documentation).
 - If the DC 24 V supply voltage is safely disconnected at the positive pole only, no test pulses must be applied to this pole in disconnected condition.

If the DC 24 V supply voltage is disconnected at both poles, the test pulses must not be applied at the same time at the plus and minus outputs. In this case, the test pulse must be applied with a time delay.

- SEW-EURODRIVE recommends to switch off the 24 V voltage supply at two poles.
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- The switching capacity of the safety relays or the relay outputs of the safety controller must correspond at least to the maximally permitted, limited output current of the 24 V supply voltage.

Observe the manufacturer's instructions concerning the permitted contact loads and fusing that may be required for the safety contacts. If the manufacturer provides no specific information, the contacts must be protected with 0.6 times the nominal value of the maximum contact rating specified by the manufacturer.

- To ensure protection against unintended restart in accordance with EN ISO 14118, the safe control system must be designed and connected in such a way that resetting the command device alone does not lead to a restart. This means that a restart may be carried out only after a manual reset of the safety circuit.

3.5 Requirements on startup

- To validate the implemented safety functions, they must be documented and checked after successful startup (validation).

The limitations for the safety functions in chapter "Limitations" must be observed for validating safety functions. Non-safety-related parts and components that affect the result of the validation test (e.g. motor brake) must be deactivated, if necessary.

- For using MOVIDRIVE® MDX60B/61B in safety-related applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.

3.6 Requirements on operation

- Operation is only allowed within the limits specified in the data sheets. This principle applies to the external safety controller as well as to MOVIDRIVE® MDX60B/61B and approved options.
- You must check the safety functions on a regular basis to ensure proper functioning. Test intervals must be specified in accordance with the risk assessment.

4 Connection variants

4.1 General information

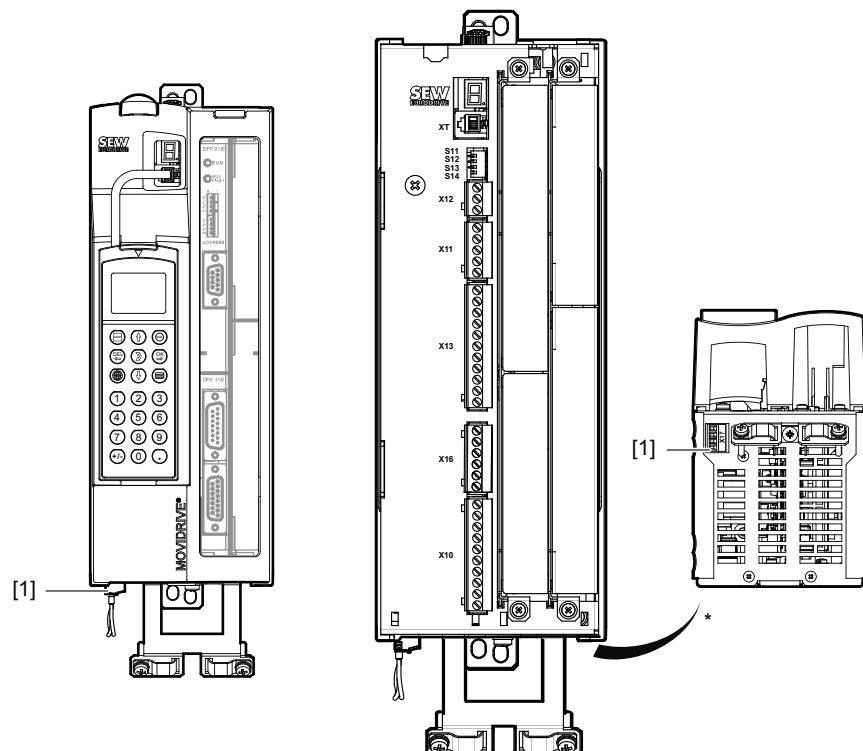
Generally, all the connection variants listed in this documentation are permitted for safety-relevant applications as long as the basic safety concept is met. This means that you must always make sure that the DC 24 V safety inputs are operated by an external safety relay or safety controller, thereby preventing an automatic restart.

All safety conditions mentioned in chapters 2, 3 and 4 of the present documentation must be met for the basic selection, installation, and application of the safety components, such as safety relay, EMERGENCY STOP switch, etc., and the approved connection variants.

The wiring diagrams are block diagrams whose only purpose is to show the safety function(s) with the relevant components. Circuit-related measures, which usually always have to be implemented additionally, are not shown in the diagrams to enhance clarity. Such measures are taken, for example, to ensure protection against contact, to handle overvoltage and undervoltage, to detect insulation faults, line-to-ground faults and short circuits, which can occur on externally installed lines, or to ensure the necessary immunity against electromagnetic interference.

4.1.1 Terminal X17 on the MOVIDRIVE® MDX60B/61B

The following figure shows the X17 terminal at the bottom of the control unit.



* View of the underside of the unit

[1] X17: Signal terminal block for STO safety contacts

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4.2 Requirements

4.2.1 Use of safety relays

The requirements of the manufacturers of safety relays (such as protecting the output contacts against welding) or of other safety components must be strictly observed. For cable routing, the basic requirements apply as described in this documentation.

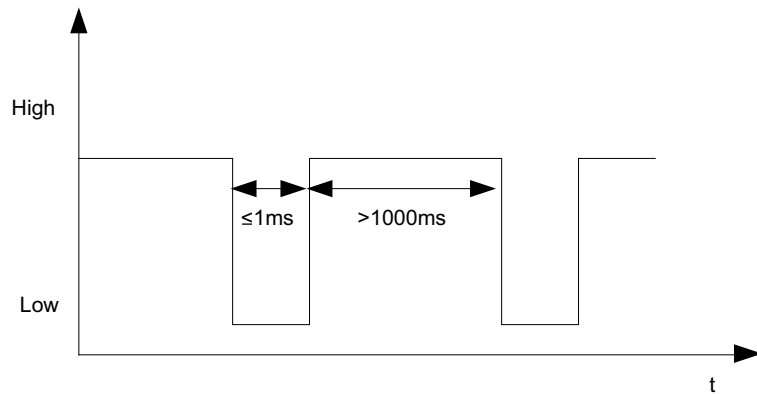
For connecting MOVIDRIVE® to the safety relays, the installation requirements in accordance with chapter "Installation requirements" (→ 14) must be observed.

Other information from the manufacturer about the use of safety relays for specific applications must also be observed.

4.2.2 Using safety controllers

Observe the ZVEI specifications for safety sensors if you use a safety PLC.

The starting and stopping pulses of the safe digital outputs (F-DO) used must be ≤ 1 ms. The ratio must not fall below 1:1000.



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INFORMATION



If the DC 24 V supply at X17 is switched off safely (STO activated), you must observe chapter "Requirements on the external safety controller" with regard to the test pulses.

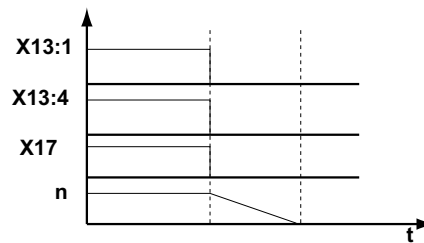
4.3 Disconnection of a single drive

4.3.1 STO according to PL d (EN ISO 13849-1)

The procedure is as follows:

- Recommendation: X13:1 and X13:4 are disconnected **at the same time**, e.g. in the event of an emergency stop.
- The 24 V safety input X17 is disconnected.
- The motor coasts to a halt, if no brake is installed.

STO – Safe Torque Off (EN 61800-5-2)



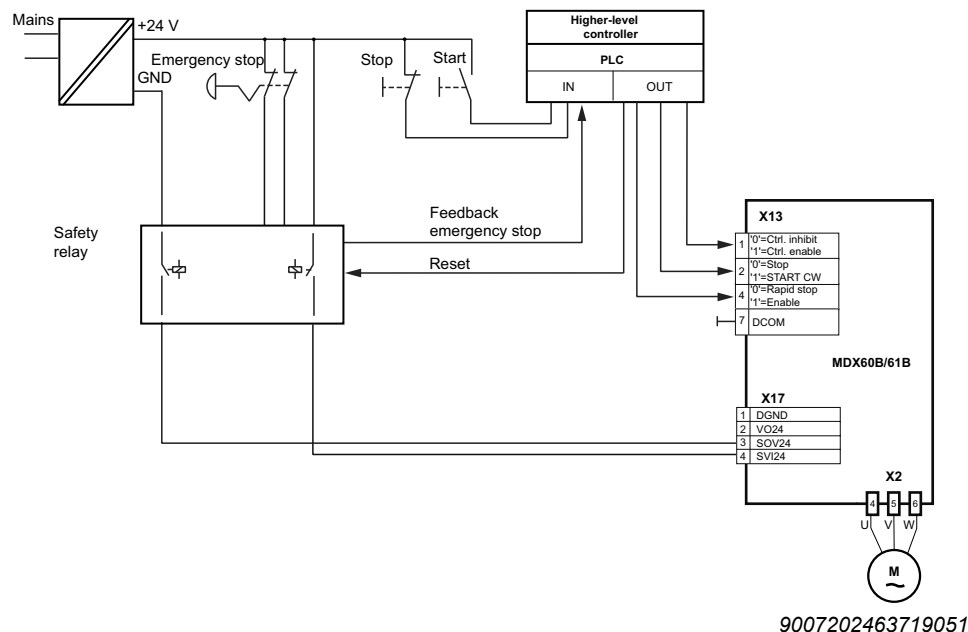
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INFORMATION



The shown STO disconnections can be used up to PL d in accordance with EN ISO 13849-1, taking chapter "Requirements" (→ 19) into consideration.

Binary control with safety relay (dual-channel)



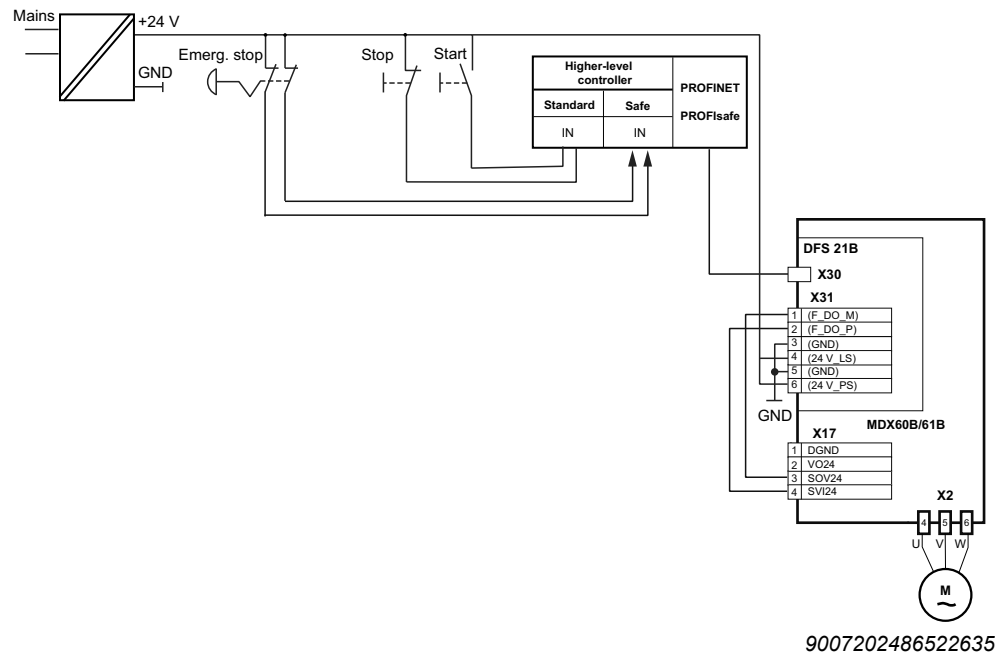
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The diagram illustrates a PLC-based motor control system with safety features. The main components and their connections are as follows:

- Power Supply:** Mains supply is connected to a transformer. The secondary provides +24 V and 0 V (ground).
- Emergency Stop:** A normally closed (NC) emergency stop button is connected to the +24 V supply. The other end of the button is connected to the IN input of the PLC and the Reset input of the Safety relay.
- Stop and Start Buttons:** A normally open (NO) Stop button and a normally closed (NC) Start button are connected to the IN input of the PLC.
- PLC (Higher level controller):** The PLC has an IN input and an OUT output. The OUT output is connected to the coil of the Safety relay.
- Safety relay:** The Safety relay has a coil and two contacts. One contact is connected to the +24 V supply, and the other contact is connected to the motor (M).
- Motor (M):** The motor is connected to the Safety relay and the 0 V supply.
- Feedback emergency stop:** A feedback signal from the motor is connected to the Feedback emergency stop input of the PLC.
- Terminal Block X13:** This block contains the following connections:
 - 1: 0=Ctrl. inhibit, 1=Ctrl. enable
 - 2: 0=Stop, 1=START CW
 - 4: 0=Rapid stop, 1=Enable
 - 7: DCOM
- Terminal Block X17:** This block contains the following connections:
 - 1: DGND
 - 2: VO24
 - 3: SOV24
 - 4: SVI24
- Terminal Block X2:** This block contains the following connections:
 - U: Phase U
 - V: Phase V
 - W: Phase W

SEW-EURODRIVE recommends switching off the 24 V voltage supply of the STO input X17 at two poles.

Fieldbus control with safety PLC



INFORMATION



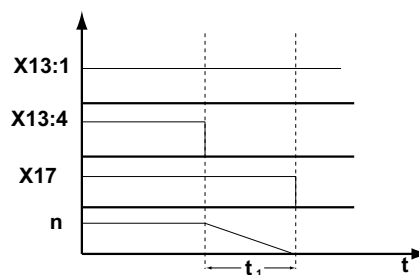
- Controller inhibit/enable and rapid stop/enable are set via fieldbus.
- Pay attention to the respective fieldbus manuals, e.g.
 - "DFS11B PROFIBUS DP-V1 Fieldbus Interface with PROFIsafe" manual
 - "DFS21B PROFINET IO Fieldbus Interface with PROFIsafe" manual

4.3.2 SS1-t in accordance with PL d (EN ISO 13849-1)

The procedure is as follows:

- X13:1 must not be disconnected.
- X13:4 is disconnected, e.g. in the event of an emergency stop.
- During the safety time interval t_1 , the motor decelerates to a complete stop along the ramp.
- After t_1 has elapsed, the safety input X17 is disconnected. The safe time t_1 must be sufficient for the motor to reach a complete stop.

SS1-t – Safe Stop 1 (EN 61800-5-2)



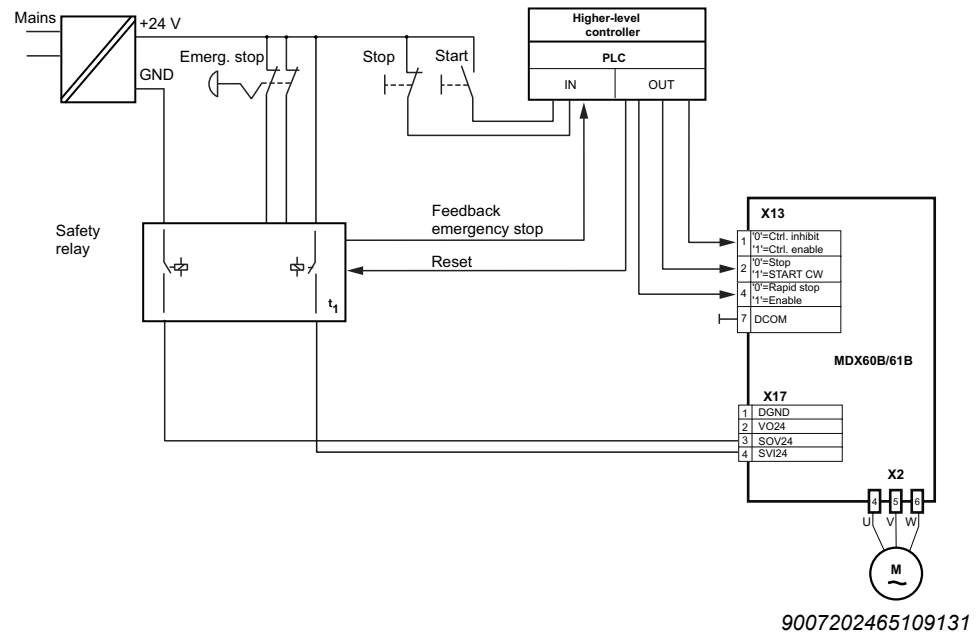
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INFORMATION

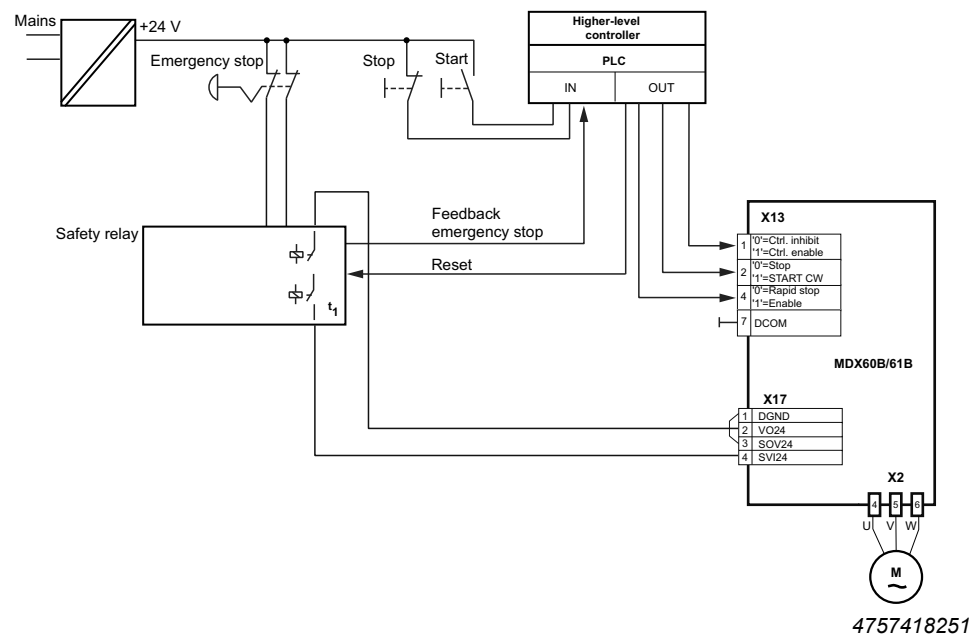


The shown SS1-t disconnections can be used up to PL d according to EN ISO 13849-1, taking the chapter "Requirements" (→ 19) into consideration.

Binary control with safety relay (dual-channel)



Binary control with safety relay (single-channel)



INFORMATION



- Controller inhibit/enable and rapid stop/enable are set via fieldbus.
- Pay attention to the respective fieldbus manuals, e.g.
 - "DFS11B PROFIBUS DP-V1 Fieldbus Interface with PROFIsafe" manual
 - "DFS21B PROFINET IO Fieldbus Interface with PROFIsafe" manual

4.4 Disconnection of group drives

This chapter describes how several MOVIDRIVE® MDX60B/61B units are safely controlled.

INFORMATION



SEW-EURODRIVE recommends against group disconnection via safety PLC.

4.4.1 Requirements

With group drives, the 24 V safety inputs of several MOVIDRIVE® MDX60B/61B units can be made available via a single safety relay. The maximum number of axis modules results from the maximum permitted contact load of the safety relay or safety controller.

Other requirements of the manufacturers of safety relays (such as protecting the output contacts against welding) or other safety components must be strictly observed. For cable routing, observe the basic requirements in the "Installation requirements" (→ 14) chapter.

To connect MOVIDRIVE® with the safety relays, observe the installation requirements in chapter "Installation requirements" (→ 14).

Other information by the manufacturer on the use of safety relays for specific applications must also be observed.

Determining the maximum number of MOVIDRIVE® units for group disconnection

The number (n units) of MOVIDRIVE® MDX60B/61B units that can be controlled with group disconnection is limited by the following points:

1. Switching capacity of the safety relay.

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

The project planner is responsible for ensuring that the specifications for the switching capacity according 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 safety relay manufacturer are strictly observed.

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

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

3. Maximum cable cross section of $1 \times 1.5 \text{ mm}^2$ or $2 \times 0.75 \text{ mm}^2$.

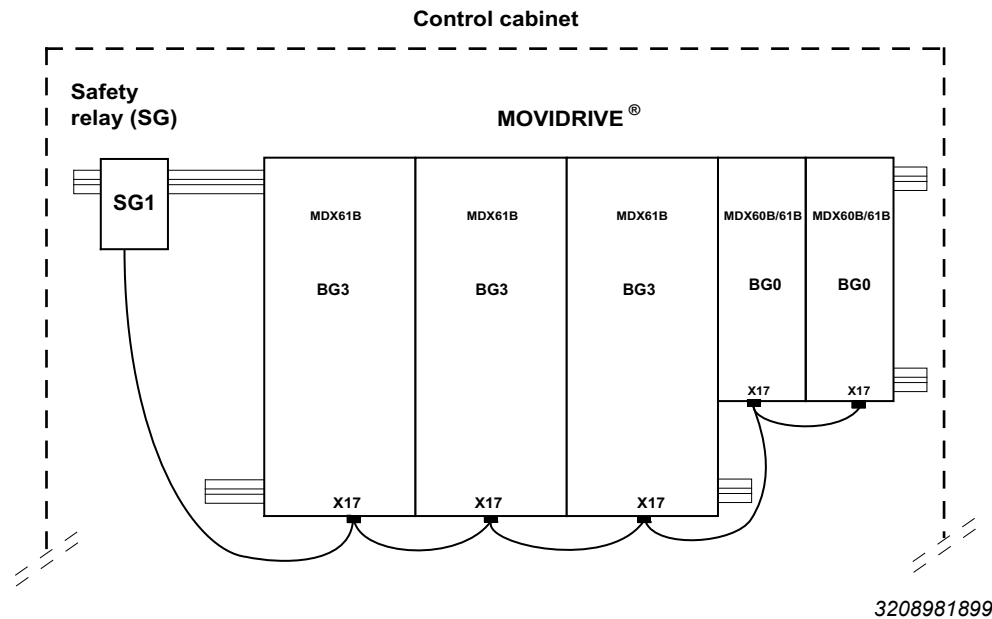
4. Power consumption of STO input X17: For the input voltage, see chapter "Technical data" (→ 29).

5. When using self-testing semiconductor outputs, the increased capacitances of STO input X17 caused by group disconnection (parallel connection) might result in diagnostics errors.

4.4.2 Implementing group disconnection with a safety relay

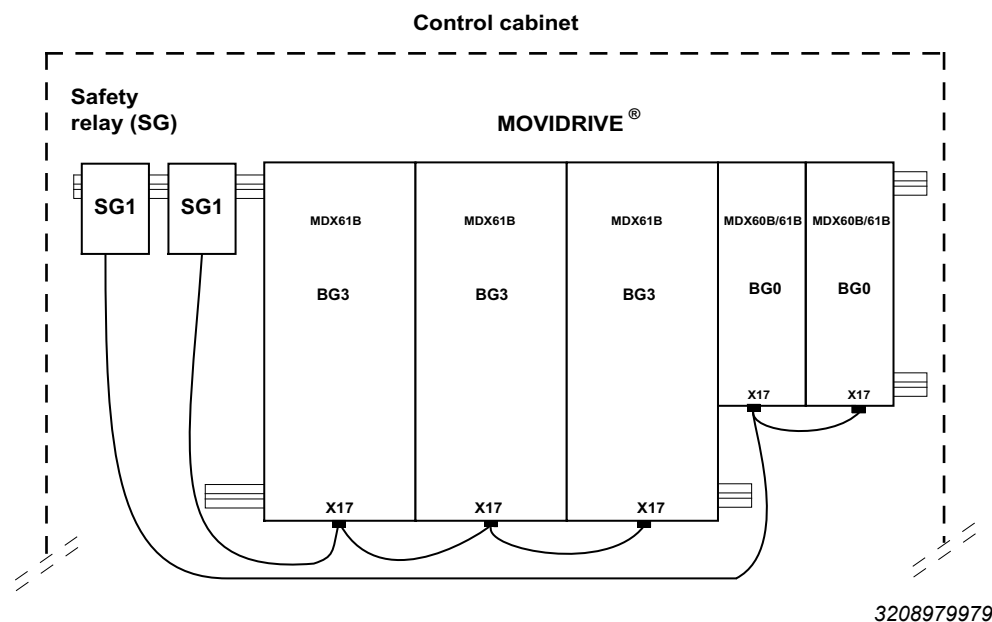
Group disconnection with one safety relay

The safety inputs of all MOVIDRIVE® MDX60B/61B units can be controlled with one safety relay.



Group disconnection with two safety relays

With several safety relays, you can control the safety inputs of the assigned MOVIDRIVE® MDX60B/61B units. In the following example, the MOVIDRIVE® MDX60B/61B units of size 3 and the MOVIDRIVE® MDX60B/61B® units of size 0 each form one group, and each group is controlled by a safety relay.

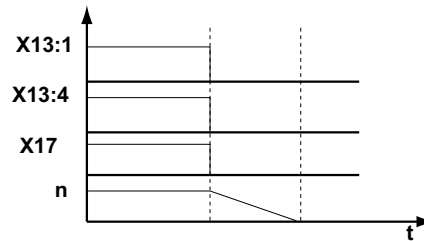


4.4.3 STO according to PL d (EN ISO 13849-1)

The procedure is as follows:

- Recommendation: X13:1 and X13:4 are disconnected **at the same time**, e.g. in the event of an emergency stop.
- The 24 V safety input X17 is disconnected.
- The motor coasts to a halt, if no brake is installed.

STO – Safe Torque Off (EN 61800-5-2)



3211071243



INFORMATION

The shown STO disconnections can be used up to PL d according to EN ISO 13849-1.

Connection variants

Disconnection of group drives

27778037/EN – 01/2022

5 Technical data

The following table shows the technical data of MOVIDRIVE® MDX60B/61B in relation to the integrated safety equipment. The technical data and approvals from the relevant MOVIDRIVE® MDX60B/61B operating instructions must be observed.

5.1 Safety characteristics

Characteristic safety values	
Tested safety class/underlying standards	Performance level d in accordance with EN ISO 13849-1
Probability of a dangerous failure per hour (PFH value)	0 (fault exclusion)
Service life	20 years, after which the component must be replaced with a new one.
Safe state	Safe torque off (STO)
Safety subfunction	STO, SS1 ¹⁾ in accordance with EN 61800-5-2

1) with suitable external control

5.2 Electronics data X17: Signal terminal block for STO safety contact

MOVIDRIVE® MDX60/61B	General electronics data
Safety contact X17:1	DGND: Reference potential for X17:2
X17:2	VO24: : $U_{OUT} = DC\ 24\ V$, only to supply X17:4 of the same device; must not be used to supply further devices.
X17:3	SOV24: Reference potential for DC +24 V "STO" input (safety contact)
X17:4	SVI24: DC+24 V "STO" input (safety contact)
Permitted cable cross section	One core per terminal: 0.08...1.5 mm ² (AWG28...16)
Power consumption X17:4	Two cores per terminal: 0.25 ... 1.0 mm ² (AWG23...17)
Input capacitance X17:4	Size 0: 3 W
	Size 1: 5 W
	Size 2: 6 W
	Size 3: 7.5 W
	Size 4: 8 W
	Size 5: 10 W
	Size 6: 6 W
	Size 7: 6 W
	Size 0: 27 µF
	Sizes 1 to 7: 270 µF

	Min.	Typical	Max.
Input voltage range	DC 19.2 V	DC 24 V	DC 30 V
Time to inhibit output stage			100 ms
Time for restart		200 ms	

Index

A

Approved devices 12

C

Checking the disconnection device 17

Connection variants 18

Copyright notice 7

D

Decimal separator 6

Disconnection of a single device 20

 Requirements 19

 SS1 according to PL d (EN 13849-1) 22

 STO according to PL d (EN 13849-1) 20

Documentation content 7

Documents, applicable 7

E

Embedded safety notes 6

External safety controller 16

G

Group disconnection 25

 Requirements 25

 STO according to PL d (EN 13849-1) 27

 With safety relay 26

H

Hazard symbols

 Meaning 6

I

Installation

 Information on routing control cables 14

 Requirements 14

Integrated safety technology 8

N

Notes

 Designation in the documentation 5

 Meaning of the hazard symbols 6

O

Operation, requirements 17

R

Requirements

 External safety controller 16

 Installation 14

 Operation 17

 Startup 17

Rights to claim under limited warranty 6

S

Safe state 8

Safe Torque Off (STO) 10

Safety concept 8

 Limitations 11

 Schematic representation 9

Safety conditions 12

Safety controller, external 16

 Requirements 16

Safety controllers, requirements 19

Safety notes

 Designation in the documentation 5

 Meaning of the hazard symbols 6

 Structure of embedded 6

 Structure of section-related 6

Safety relays, requirements 19

Safety technology 8

 Safe state 8

Safety-relevant conditions 12

Section-related safety notes 6

Signal words in safety notes 5

SS1 according to PL d (EN 13849-1) 22

Standards 5

Startup, requirements 17

STO (Safe Torque Off) 10

STO according to PL d (EN 13849-1) 20, 27

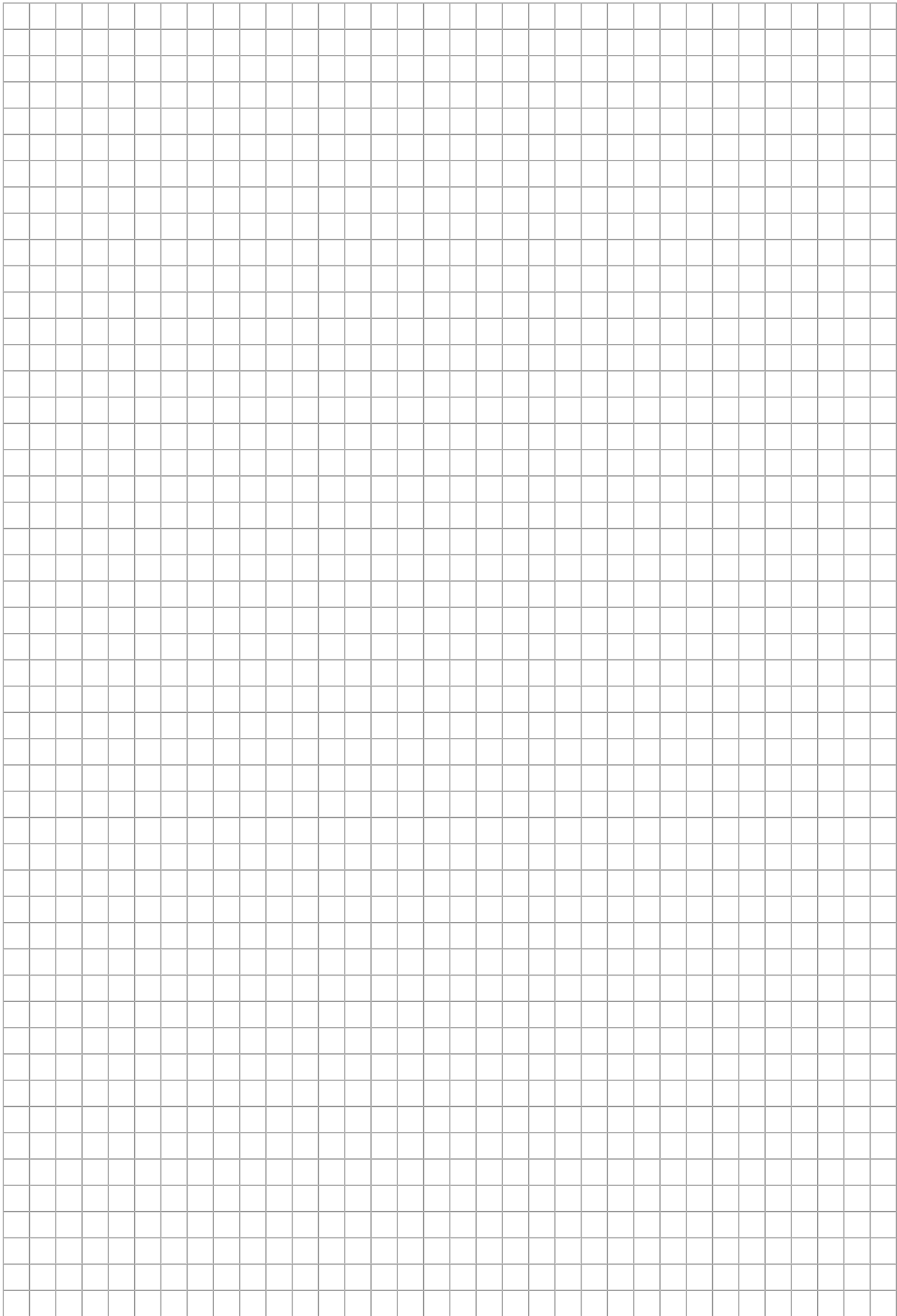
Switching capacity of the safety relay 17

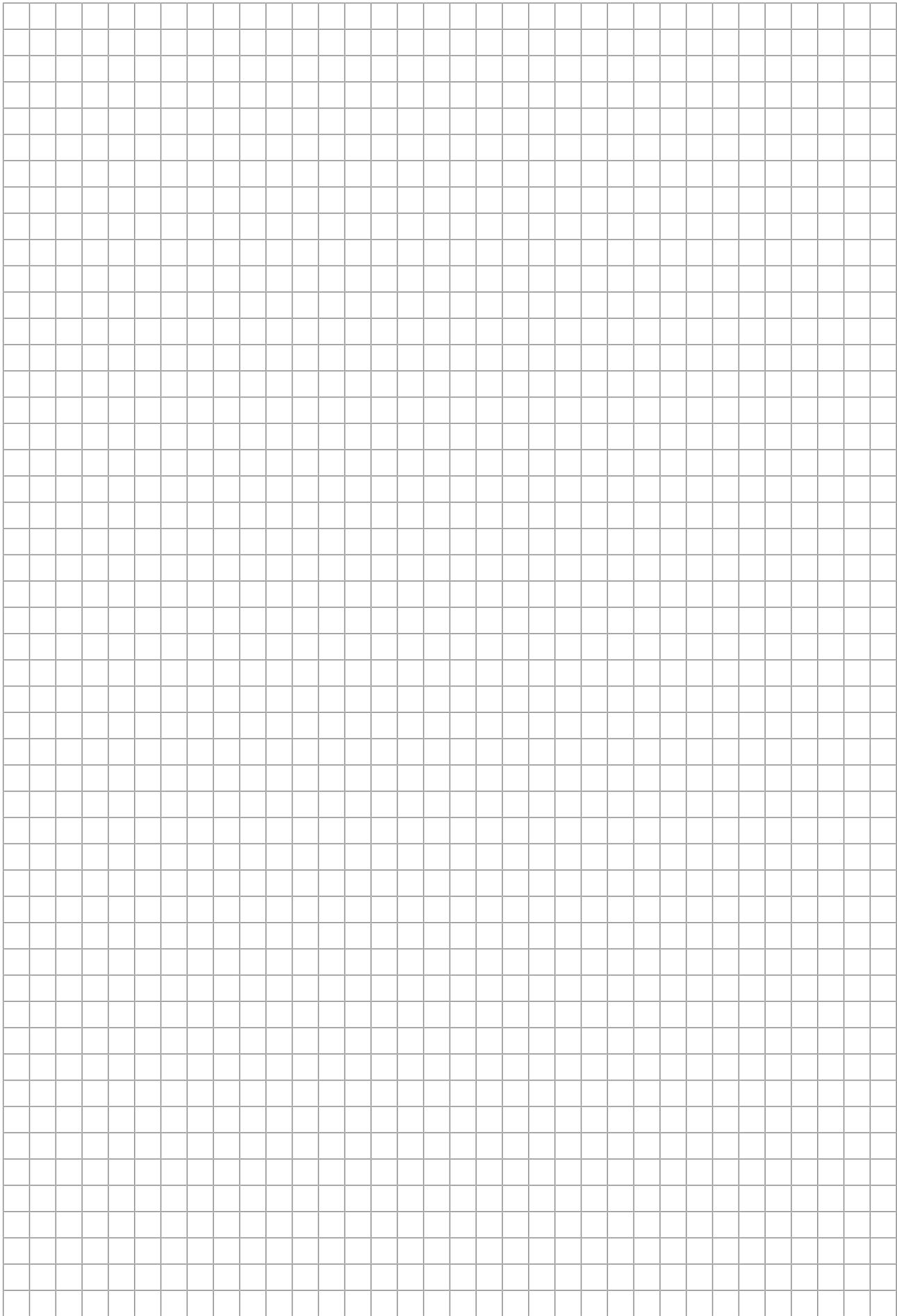
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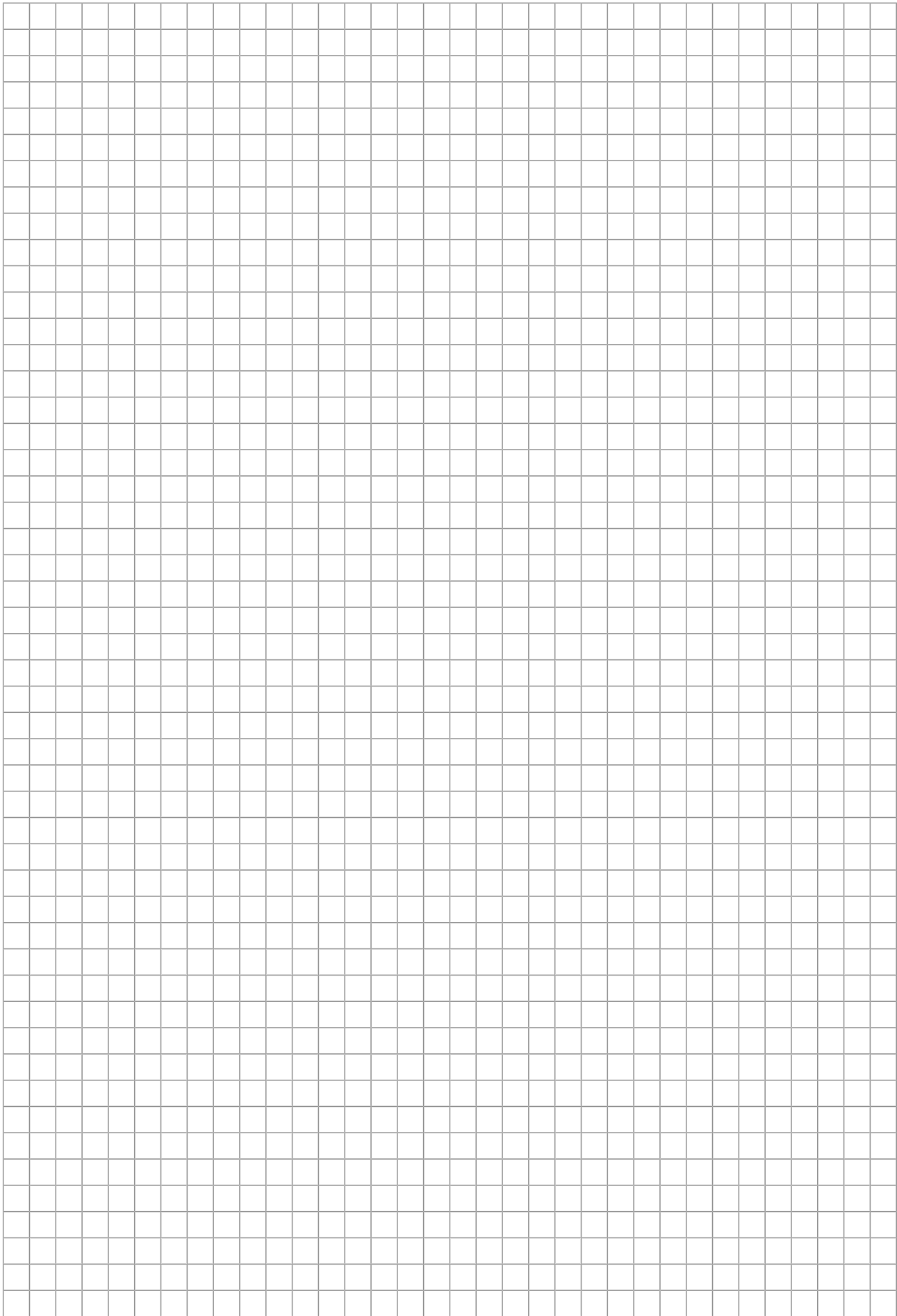
Validation 17

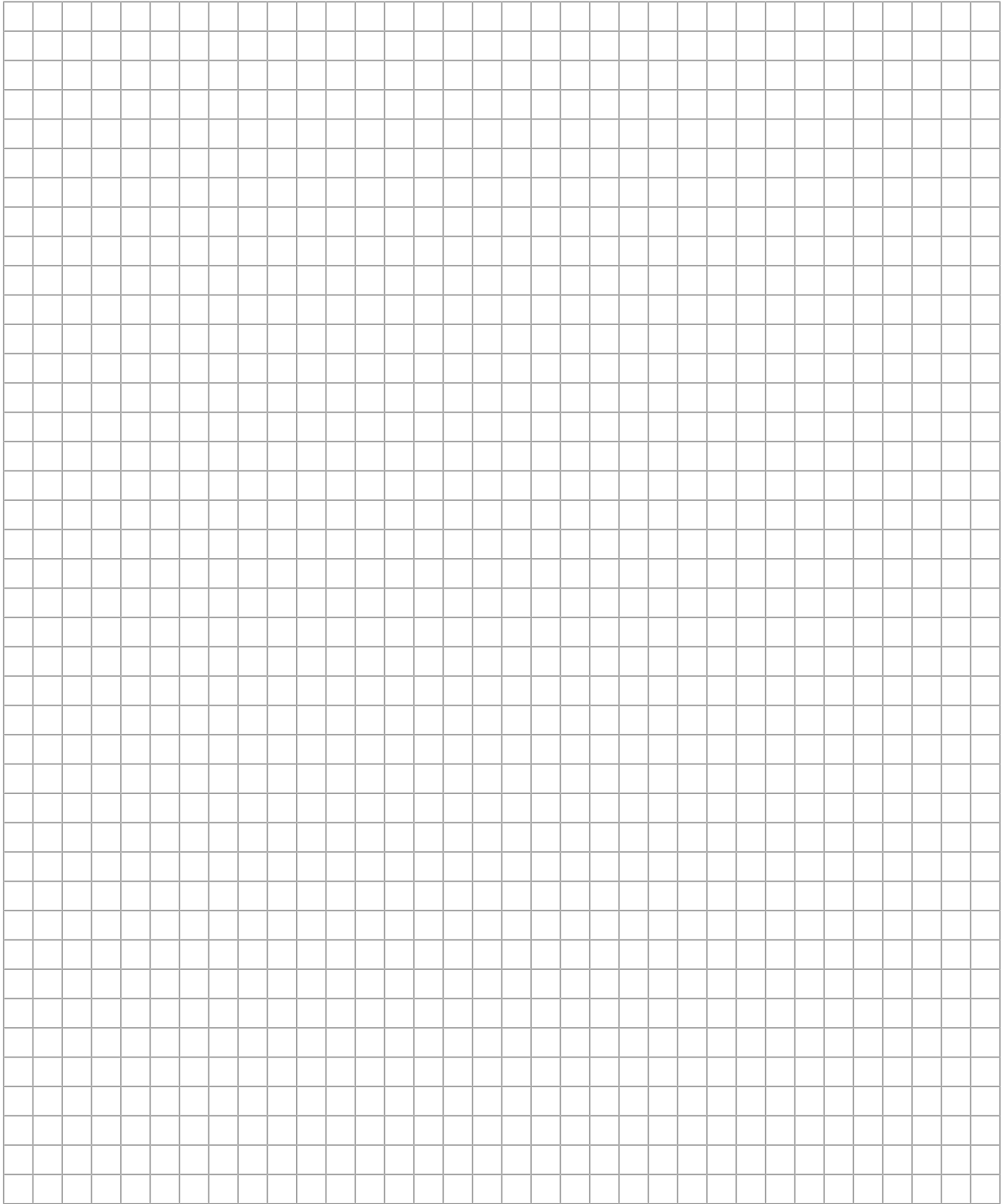
Validity 5

Verifying safety functions 17











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