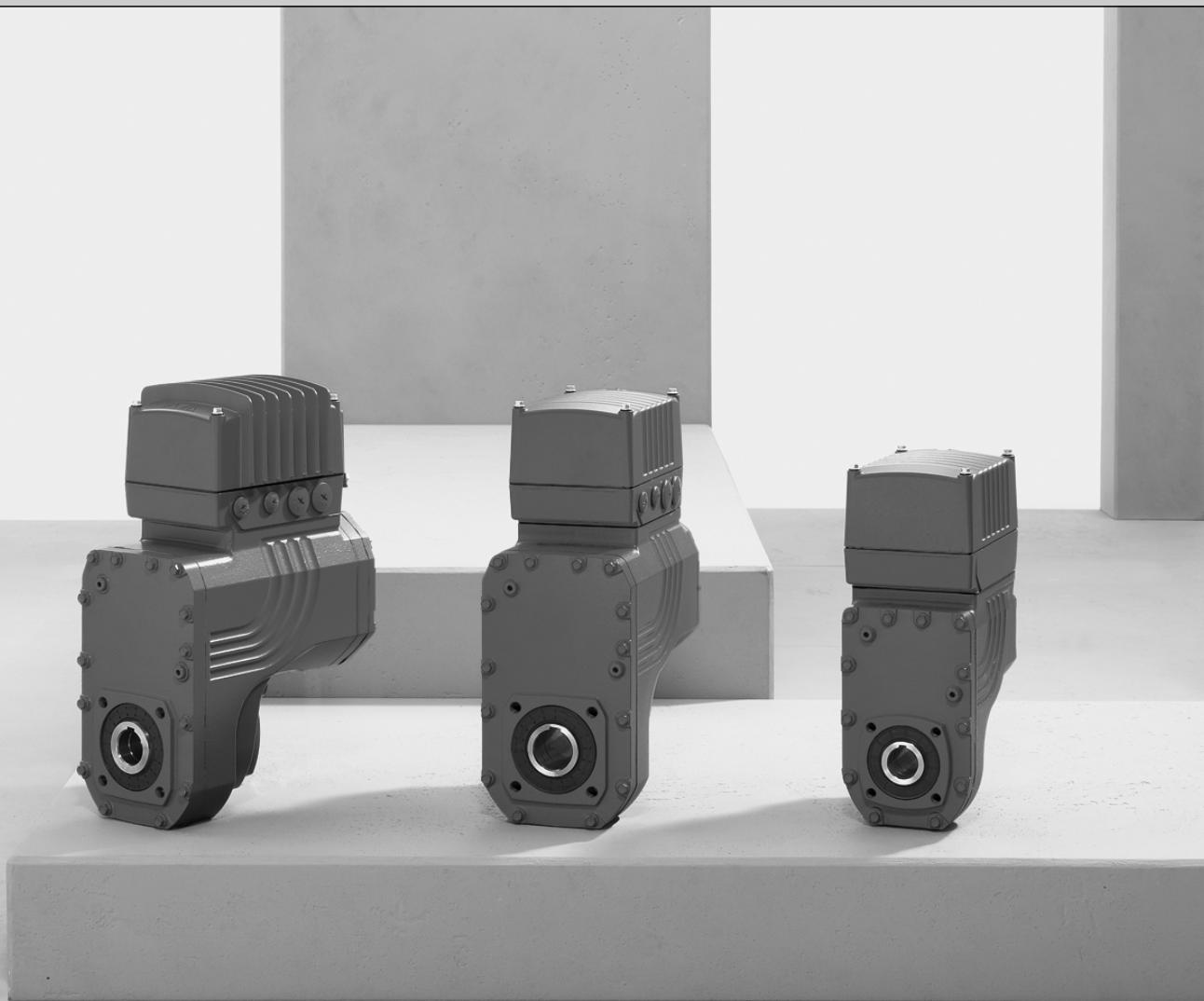




**SEW
EURODRIVE**

Manual



Mechatronic Drive System
MOVIGEAR® B
Functional Safety



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1 General information

1.1 About this documentation

The current version of the documentation 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	<ul style="list-style-type: none"> • Performance Level (PL) in accordance with EN ISO 13849-1:2015 • Safety Integrity Level (SIL) in accordance with EN 61800-5-2:2017

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 Content of the documentation

This documentation contains additional safety-related information and conditions for operation in safety-related applications.

1.6 Other applicable documentation

This documentation supplements the operating instructions of the associated product. Use this document only in connection with the operating instructions.

Always use the latest edition of documentation and software.

The SEW-EURODRIVE website (www.sew-eurodrive.com) provides a wide selection of documents for download in various languages. If required, you can also order printed and bound copies of the documentation from SEW-EURODRIVE.

General information

Decimal separator in numerical values

1.7 Decimal separator in numerical values

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

Example: 30.5 kg

1.8 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.9 Copyright notice

© 2019 SEW-EURODRIVE. All rights reserved. Unauthorized reproduction, modification, distribution or any other use of the whole or any part of this documentation is strictly prohibited.

2 Integrated safety technology

The safety technology of MOVIGEAR® described below has been developed and tested in accordance with the following safety requirements:

- SIL 3 in accordance with EN 61800-5-2:2017
- PL e in accordance with EN ISO 13849-1:2015 (applicable up to category 3)

This was certified by TÜV Nord. Copies of the TÜV certificate and the corresponding report are available from SEW-EURODRIVE on request.

2.1 Safe condition

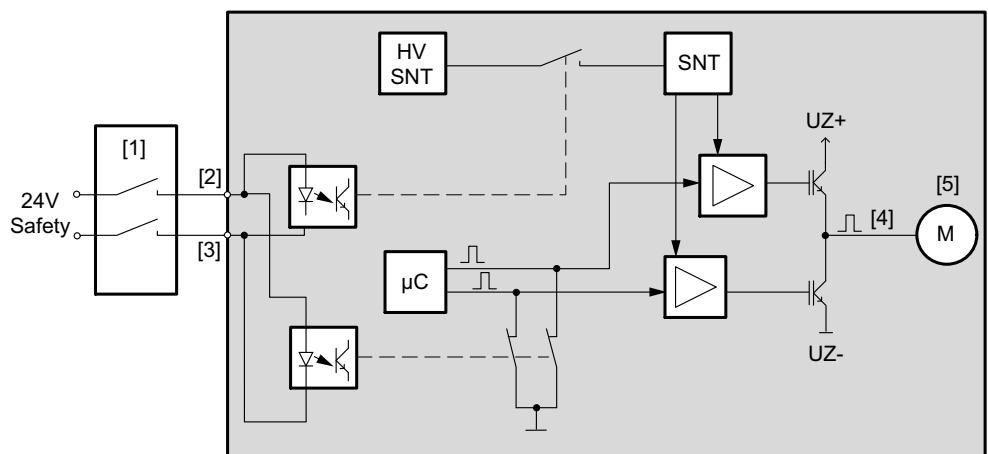
For safety-related operation of MOVIGEAR®, safe torque off is defined as safe condition (see STO safety function). The safety concept is based on this definition.

2.2 Safety concept

- The MOVIGEAR® drive unit can be connected to an external safety controller or safety relay. This disconnects the safety-related STO input via a 2-pole 24 V switching signal (sourcing/sinking) when a connected control device (e.g. emergency stop button with latching function) is activated. This activates the STO function (safe disconnection) of the MOVIGEAR®.
- An internal, dual-channel structure with diagnostics prevents the generation of pulse trains at the power output stage (IGBT). On the one hand, the internal supply voltage for controlling the upper and lower IGBTs is disconnected, and on the other hand the controlling pulse patterns are short-circuited. This means that the output stage can no longer supply power to the motor for generating torque.
- Instead of galvanic isolation of the drive from the supply system by means of contactors or switches, the disconnection of the STO input described here safely prevents the control of the power semiconductors in the output stage. The rotary-field generation for the respective motor is deactivated even though the line voltage is still present.

2.2.1 Schematic representation "Safety concept for MOVIGEAR®"

The following figure shows a schematic representation of the safety concept for MOVIGEAR®:



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- [1] Safety controller/safety relay external
- [2] Connection "STO+"
- [3] Connection "STO-"
- [4] Motor phase
- [5] Motor

2.3 Safety functions

The following drive-related safety functions can be used:

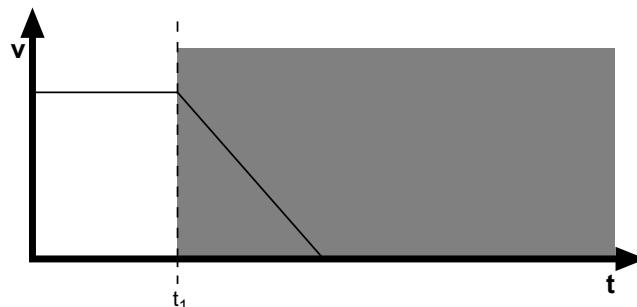
2.3.1 STO

- **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 function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.

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

The following figure shows the STO function:



2463228171

<i>v</i>	Velocity
<i>t</i>	Time
<i>t</i> ₁	Time at which STO is triggered
	Disconnection range

2.3.2 SS1(c)

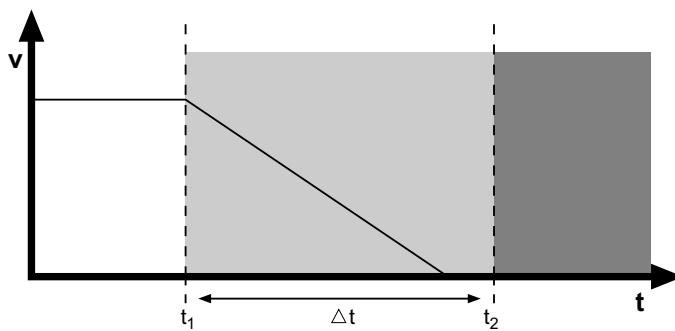
- **SS1(c)** (safe stop 1, function variant c according to IEC 61800-5-2) by means of suitable external control (e.g. safety relay with delayed disconnection).

The following sequence is mandatory:

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

This safety function corresponds to a controlled stop according to EN 60204-1, stop category 1.

The following figure illustrates the SS1(c) function:



2463226251

v	Velocity
t	Time
t_1	Point of time when the brake ramp is initiated
t_2	Point of time when STO is triggered
Δt	Time between initiating the brake ramp and STO
	Safe time delay range
	Disconnection range

2.4 Limitations

⚠ WARNING



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

When the STO signal is disconnected, the line voltage is still present at the DC link of the MOVIGEAR® drive unit.

- 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.
- MOVIGEAR® has no mechanical brake. This means coasting of the drive depends on the application (subject to 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).
→ MOVIGEAR® 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(c) function as described in chapter "Safety functions", the brake ramp of the drive is not monitored with respect to safety. In case of a fault, the drive might not be decelerated after the delay time, or it might be accelerated in the worst case. In this case, the STO function (see chapter "Safety functions") is only activated after the set time delay has elapsed. The resulting danger must be taken into account in the risk assessment of the system/machine. Additional safety measures might have to be implemented.

3 Safety conditions

The requirement for safe operation is that the safety functions of MOVIGEAR® are properly integrated into an application-specific higher-level safety function. A system/machine-specific risk assessment must be carried out through the system/machine manufacturer and taken into account for the use of the drive system with MOVIGEAR®.

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

The following requirements are mandatory when installing and operating MOVIGEAR® units in safety-related applications.

The requirements are divided into:

- Approved units
- Installation requirements
- Requirements on external safety controllers and safety relays
- Startup requirements
- Operational requirements

3.1 Approved units

Only the following unit variants of MOVIGEAR® B are permitted for safety-related applications.

Type code example	MG	F	A	S	2-	DSM-	SNI-	B	/XX
Explanation	Product family	Gear unit type	Shaft design	Housing mounting types	Size	Motor type	Installation technology	Version	Options
Permitted variants	MG	F	A T •	S T F Z	2 4	DSM	SNI DSC DAC DBC	B	/ECR /ACR /ET /XT /DSP /IV /EBW /WA /HA /CA /PE /PG /A

Permitted application options:

- GIO12A
- GIO13A
- GIO12B
- GIO13B

3.2 Installation requirements

- Power lines and STO control lines have to be routed in separate cables. This does not apply to cables approved by SEW-EURODRIVE specifically for this case of application.
- The line length between the safety controller and MOVIGEAR® may not exceed 100 m.
- The wiring technology used must comply with EN 60204-1.
- The STO control lines must be routed according to EMC guidelines and as follows:
 - Outside an electrical installation space: Shielded cables must be routed permanently (fixed) and protected against external damage, or equivalent measures have to be taken.
 - Inside an electrical installation space: Individual conductors can be routed.
 - Adhere to the relevant regulations in force for the application.
- Observe the values specified for safety components when designing the safety circuits.
- The STO signal may not be used for feedback.
- Observe the notes in the MOVIGEAR® operating instructions for EMC-compliant installation.

It is important that the shielding of the STO control line is connected to the housing at both ends.

- Only use grounded voltage sources with safe disconnection (PELV) according to VDE 0100 for all signal interfaces (SBus, digital inputs, digital output, etc.) of MOVIGEAR® and all SBus stations.

According to EN 61131-2, the voltage between the outputs or between any output and grounded parts may not exceed DC 60 V in case of a single fault in the voltage supply.

- When planning the installation, observe the technical data of MOVIGEAR®.
- Do not use the DC 24 V output of MOVIGEAR® for safety-related applications with MOVIGEAR®.

⚠ WARNING



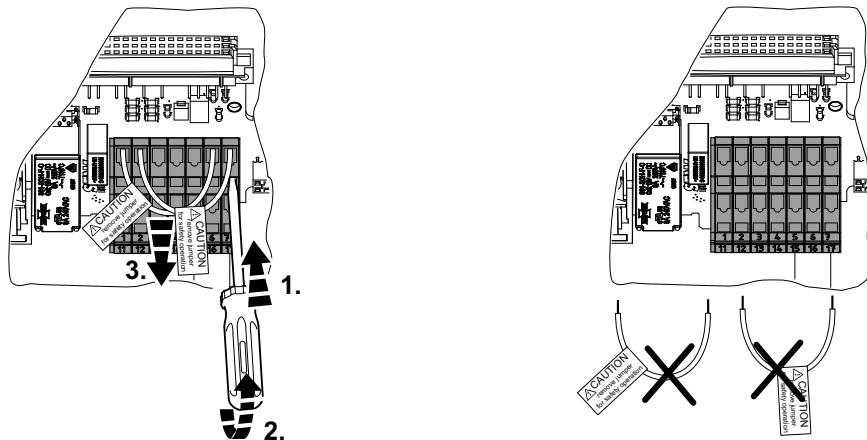
No safety-related disconnection of the MOVIGEAR® drive unit.

Severe or fatal injuries.

- Do not use the 24 V output for safety-related applications with MOVIGEAR® drive units.
- You may only jumper the STO input with 24 V when the MOVIGEAR® drive unit is not used to fulfill any safety functions.
- For safety-related applications with MOVIGEAR® drive units, you have to remove the jumpers labeled "Caution, remove jumper for safety operation", see following figures (jumpers are not installed in unit variants with STO plug connectors X5502 and X5503):

MOVIGEAR® DBC-B and DAC-B

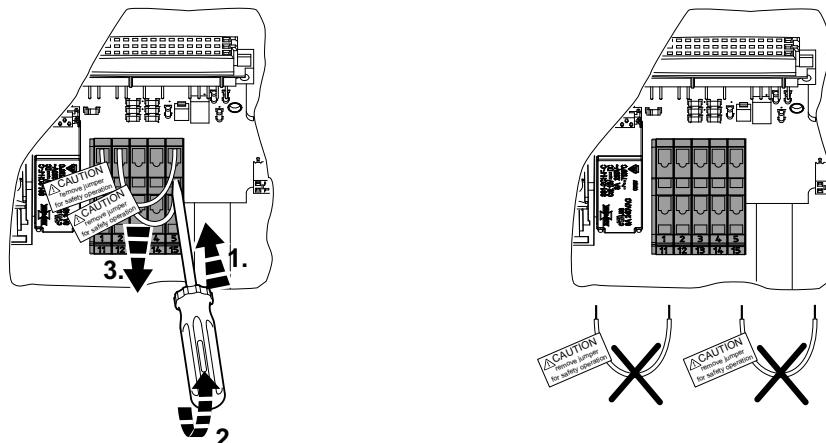
Remove the jumpers between STO input (terminals 1/2) and 24 V output (terminals 6/7):



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MOVIGEAR® DSC-B and SNI-B

Remove the jumpers between STO input (terminals 1/2) and 24 V output (terminals 5/15):



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3.3 Requirements for external safety controllers and safety relays

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 and tested for at least that safety class which is 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:

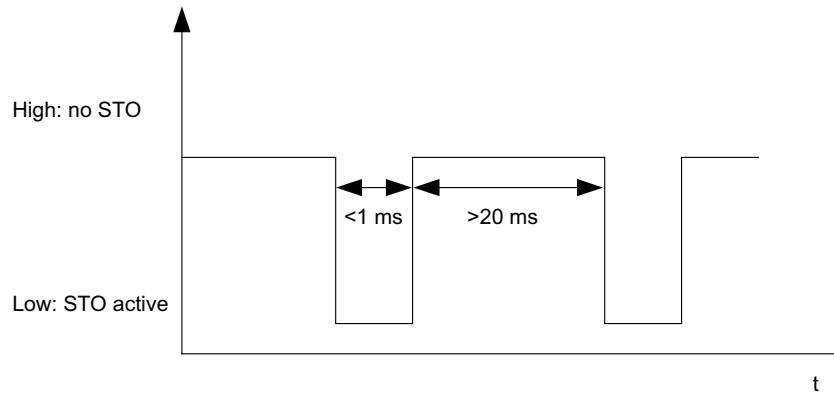
Application	Safety controller requirements
Performance level e in accordance with EN ISO 13849-1	Performance level e in accordance with EN ISO 13849-1 SIL 3 in accordance with EN 61508
SIL 3 in accordance with EN 62061	Performance level e in accordance with EN ISO 13849-1 SIL 3 in accordance with EN 61508

- The wiring of the safety controller must be suitable for the required safety class (see manufacturer documentation). The STO input of MOVIGEAR® requires 2-pole disconnection (P-M switching).
- MOVIGEAR® does not detect short circuits in the STO control cables. For this reason, the safety control or the safety relay must detect crossfaults and interference voltage of the STO control cable against any external potential, also cross-faults and interference voltage against mass or PE.
- 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 voltage supply.

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.
- Note the following with regard to the two-pole disconnection of MOVIGEAR® with tested, safe outputs:
 - When disconnected, the switch-on test pulses may never occur at the plus and minus output at the same time.

- When connected, the switch-off test pulses may not be longer than 1 ms. The next pulse blanking cannot reoccur earlier than after 20 ms.

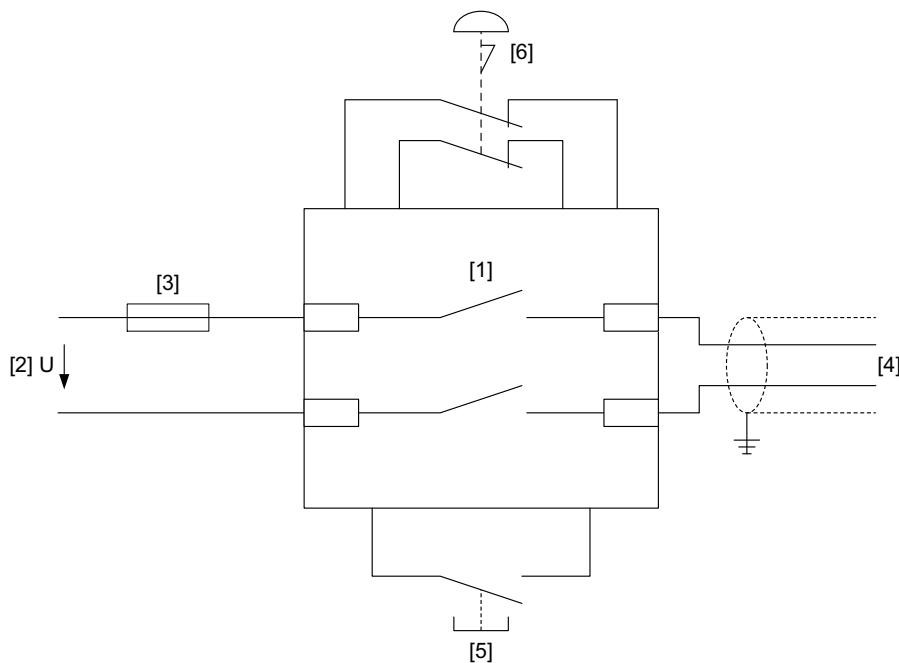


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3.3.1 Sample circuit "safety relay"

The following figure shows the basic connection of an external safety relay (according to the requirements listed above) to MOVIGEAR®.

The information in the respective manufacturer's data sheets must be observed for connection.



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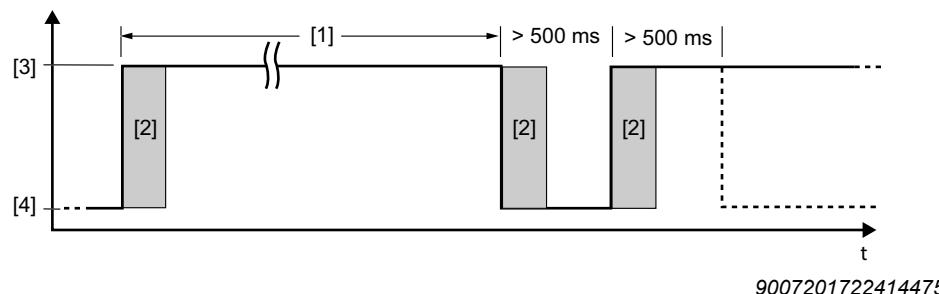
- | | | | |
|-----|--|-----|--|
| [1] | Safety relay with approval | [4] | STO signal |
| [2] | DC 24 V voltage supply | [5] | Reset button for manual reset |
| [3] | Fuses in accordance with the manufacturer's specifications of the safety relay | [6] | Approved emergency stop actuating device |

3.4 Startup requirements

- To validate the implemented safety functions, they must be documented and checked after successful startup (validation). Observe the limitations for safety functions in chapter "Limitations" for the validation of the safety functions. Non-safety-relevant parts and components that affect the result of the validation test must be deactivated, if necessary.
- For using MOVIGEAR® in safety-relevant applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.

3.5 Operation requirements

- Operation is only allowed within the limits specified in the data sheets. This principle applies to the external safety controller as well as to MOVIGEAR® and the approved options.
- The built-in diagnostic function is limited in the case of a permanently enabled or permanently disabled STO input. Advanced diagnostic functions are performed only upon a level change of the STO signal. This is why the safety function via the STO input must be triggered with connected line voltage at least once every 12 months for PL d in accordance with EN ISO 13849-1 and SIL 2 EN 61800-5-2 and at least once every 3 months for PL e in accordance with EN ISO 13849-1 and SIL 3 EN 61800-5-2 to achieve complete test coverage. Adhere to the following test procedure.



- [1] Maximum 12 months for PL d/SIL 2
Maximum 3 months for PL e/SIL 3
- [2] Internal diagnostics
- [3] High: No STO
- [4] Low: STO active

- To achieve complete test coverage after a unit reset (e.g. after connecting the supply system), the test transition (STO active → not active) can only be started at least 10 seconds later. The unit must (already) be signaling "ready for operation" or "STO – safe torque off" and may not be in error state.
- A detected hardware fault in the internal switch-off channels for STO will lead to a locking error state of MOVIGEAR®. When the error is reset (e.g. by switching the power supply off and back on), a complete internal diagnostics test run must be performed according to the above test procedure. If the error re-occurs, replace the unit or contact SEW Service (for detailed information about possible error states, refer to the respective MOVIGEAR® operating instructions).

4 Technical data

The following table provides the technical data for MOVIGEAR® related to integrated safety technology. In addition, the technical data and approvals in the respective MOVIGEAR® operating instructions must be observed.

Technical data of the STO input	Min.	Typical	Max.	Unit
Input voltage range	-3	24	30	V DC
Input impedance		990		Ohm
Capacitance of the STO input (capacitance between STO+ and STO-)		≤ 10		nF
Switch-on/switch-off threshold		11		V
Input voltage for ON status (STO)	15			V
Input voltage for OFF status (STO)			5	V
Permitted leakage current of the external safety controller		0	2	mA
Required current for STO-IN supply		26		mA
Time from disconnecting the safety voltage until deactivation of the rotating field		4	20	ms
Time from connecting the safety voltage until activation of the rotating field		220	300	ms
Test interval for STO function: See test procedure in the chapter "Operation requirements"			3 (for SIL 3/ PL e) 12 (for SIL 2/ PL d)	months

Safety characteristics	
Approved safety classes	SIL 3 in accordance with EN 61800-5-2 Performance level e in accordance with EN ISO 13849-1 (applicable up to category 3)
Probability of a dangerous failure per hour (= PFH value)	2.1×10^{-9} 1/h
Service life	20 years, after which the component must be replaced with a new one.
Safe state	Safe torque off (STO)

5 Appendix

5.1 Unit variants with DynaStop®

⚠ WARNING



The electrodynamic deceleration function DynaStop® does not allow for a definite stop at a position.

Severe or fatal injuries.

- Do not use the electrodynamic deceleration function for hoists.
- DynaStop® may only be used for inclining tracks after a risk assessment.

The optional DynaStop® function is not safety-related. It is not part of the safety functions described in chapter "Integrated safety technology/safety functions".

5.1.1 Using the DynaStop® function in connection with the STO function

To use the DynaStop® function in connection with the STO function, we recommend control in line with SS1(c).

In connection with electronic variants DAC, DSC, and SNI, the parameter "8584.0 – Brake function" must be set to "1" for this purpose.

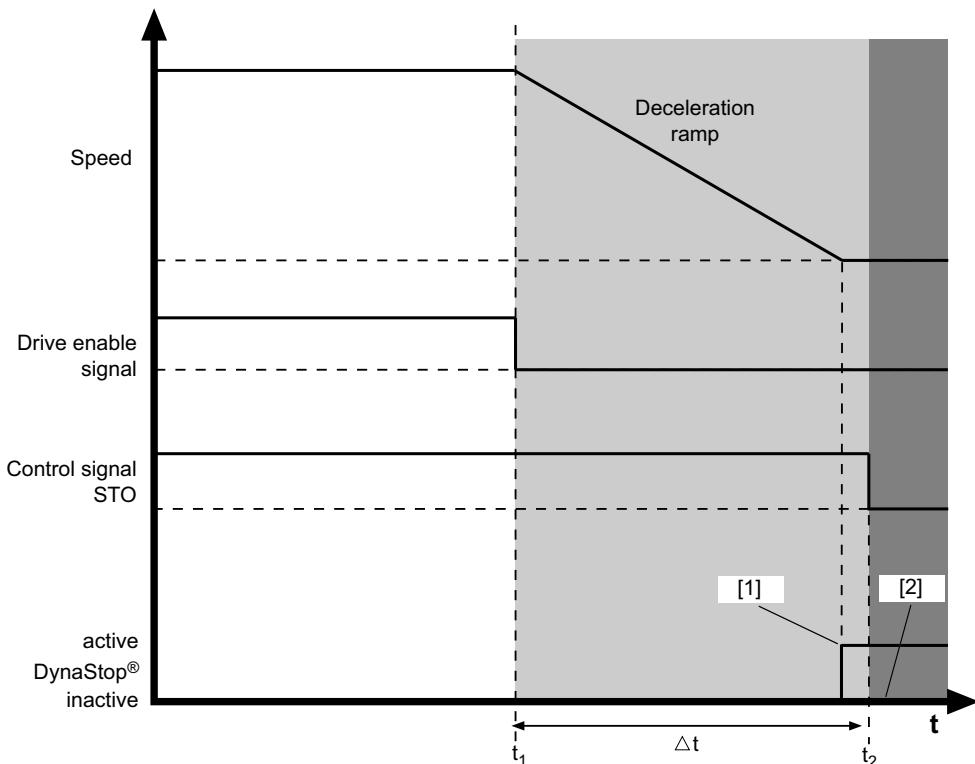
The following table shows the behavior of the DynaStop® function depending on the parameter setting:

Index	Parameter/setting	Meaning	
		DAC, DSC, SNI electronics variant:	DBC electronics variant
8584.0	Brake function 0 = OFF	The drive decelerates along the set ramp. When the drive reaches speed "0", DynaStop® is not activated.	The drive decelerates along the set ramp. When the speed is "0", DynaStop® is activated.
	Brake function 1 = ON	The drive decelerates along the set ramp. When a speed of "0" is reached, there is no safety-related activation of DynaStop®.	
9833.20	Activation of DynaStop® for STO 0 = NO	The DynaStop® status remains unchanged when STO is triggered.	
	Activation of DynaStop® for STO 1 = Yes	DynaStop® is activated (not safety-related) when STO is triggered.	

Necessary setting in connection with electronic variants DAC, DSC, SNI

Recommended setting

The following figure shows the use of the DynaStop® function in connection with the STO function:



[1]

Parameter setting "8584.0 – Brake function": 1 = ON
(All variants)

[2]

Factory setting of parameter "8584.0 – Brake function": 0 = OFF
(in connection with electronic variants DAC, DSC, SNI)

t

Time

t_1

Point of time when the brake ramp is initiated

t_2

Point of time when STO is triggered

Δt

Time between initiating the brake ramp and STO



Safe time delay range

Disconnection range

5.1.2 Behavior when STO is activated before standstill

NOTICE



Depending on the setting in parameter "9833.20", the DynaStop® function can be activated outside the permitted operating range.

This can cause a high torque load/high motor currents, which may damage the drive unit and the application.

- Use the factory settings or recommended settings.

If STO is activated before the motor has come to a standstill, the DynaStop® function behaves as set in parameter "9833.20 – Activation of DynaStop® for STO":

Parameter "9833.20 – Activation of DynaStop® for STO":1 = Yes

- DynaStop® is activated when STO is triggered.

Parameter "9833.20 – Activation of DynaStop® for STO":0 = NO

(Factory setting/recommended setting)

The DynaStop® status remains unchanged when STO is triggered.

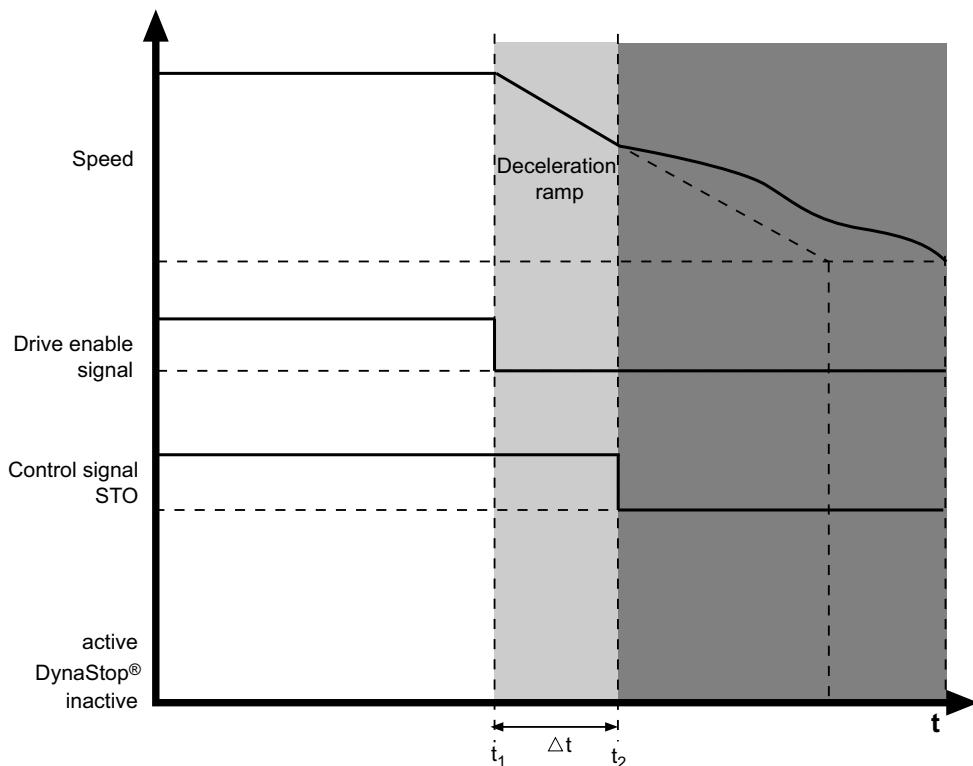
- Depending on the application, the motor coasts to a halt or even accelerates.
- The deceleration distance is not defined.

Factory setting/recommended settings

The following figure shows the behavior when STO is activated before the motor is at standstill in connection with the following parameter setting:

Parameter "9833.20 – Activation of DynaStop® for STO": 0 = NO

(Factory setting/recommended settings):



9007201718958603

t	Time
t_1	Point of time when the brake ramp is initiated
t_2	Point of time when STO is triggered
Δt	Time between initiating the brake ramp and STO
	Safe time delay range Disconnection range

Activating the STO function during the execution of the ramp aborts the controlled ramp-down:

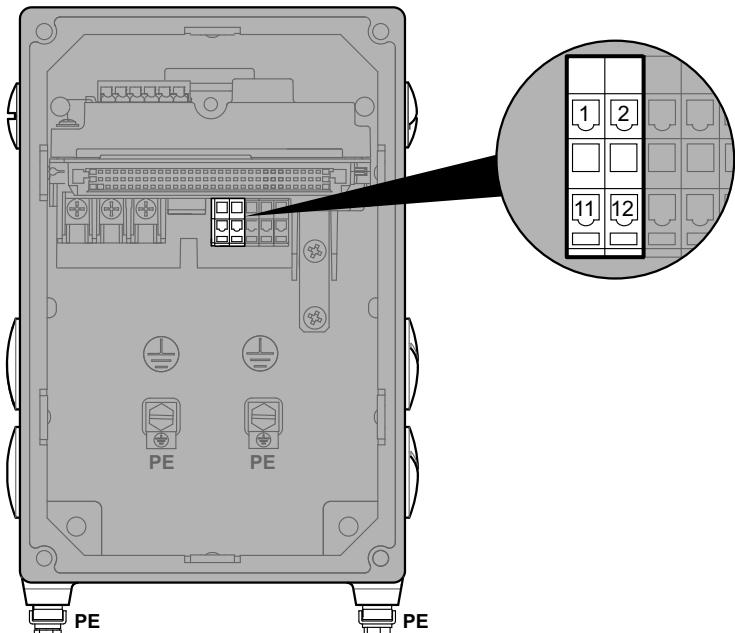
Possible reasons for premature activation of STO:

- Deceleration time Δt too short
- Extension of the deceleration ramp due to the current limit
e.g. when load is too high

5.2 Connection variants

5.2.1 Position of the terminals for safe torque off (STO)

The following figure shows an example of the terminal positions at MGF..-DSC-B for safe torque off (STO) of MOVIGEAR®:



2552708747

5.2.2 Assignment of the terminals for safe torque off (STO)

The following figure shows the terminal assignment for safe torque off (STO) of MOVIGEAR®:

Assignment			
No.	Name	Color	Function
1	STO +	Yellow	Input STO +
2	STO -	Yellow	Input STO -
11	STO +	Yellow	Output STO + (to loop through)
12	STO -	Yellow	Output STO - (to loop through)

INFORMATION



For information about looping STO through, refer to chapter "Connecting an external safety relay for STO".

Connection cable

INFORMATION

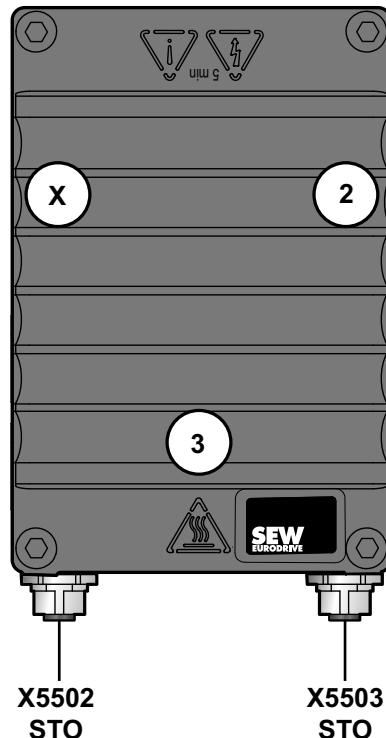


Use only shielded cables for this connection.

5.2.3 Position of the optional plug connectors for safe torque off (STO)

The following figure shows an example of the position of the STO plug connectors X5502 "STO" and X5503 "STO". The plug connectors are always in "position 3".

Plug connector	Color	Position	Position
X5502: STO	Orange	Fixed	3 (left)
X5503: STO	Orange	Fixed	3 (right)



27021600262348299

INFORMATION



For information about looping STO through, refer to chapter "Connecting an external safety relay for STO".

5.2.4 Assignment of the optional plug connectors for safe torque off (STO)

X5502: STO



⚠ WARNING

No safe disconnection of the MOVIGEAR® drive unit.

Severe or fatal injuries.

- Do not use the 24 V output (pins 1 and 3) for safety-related applications with MOVIGEAR® drive units.
- You may only jumper the STO connection with 24 V when the MOVIGEAR® drive unit is not used to fulfill any safety functions.

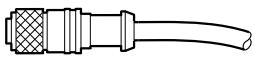
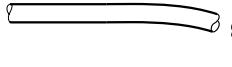
The following table shows information about this connection:

Function		
Connection for safe disconnection (STO)		
Connection type		
M12, 5-pin, female, A-coded		
Wiring diagram		
Assignment		
No.	Name	Function
1	+24V_O	DC 24 V output
2	STO -	STO - connection
3	0V24_O	0V24 reference potential
4	STO +	STO + connection
5	Res.	Reserved

*Connection cable***INFORMATION**

Use only shielded cables for this connection and only appropriate plug connectors that connect the shield with the unit in an HF-compatible manner.

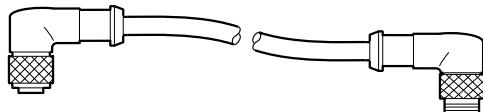
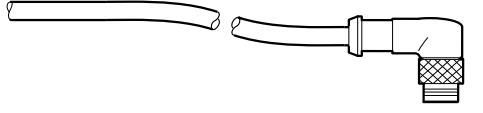
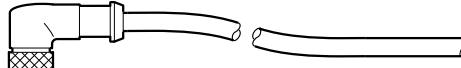
The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/in- stallation type	Cable cross section/ operating voltage
 M12, 5-pin, A-coded, female	CE: 18124968	LEONI BETAflam® – 145C-flex	Variable 	2 × 0.75 mm ² / DC 60 V
	CE/UL: 18147402	HELU-KABEL® SUPER-PAAR-TRONIC 340-C-PUR	Variable 	
 Open	CE: 18124976	LEONI BETAflam® – 145C-flex	Variable 	2 × 0.75 mm ² / DC 60 V
	CE/UL: 18147690	HELU-KABEL® SUPER-PAAR-TRONIC 340-C-PUR	Variable 	
 M12, 5-pin, A-coded, female	CE/UL: 18164390	HELU-KABEL® SUPER-PAAR-TRONIC 340-C-PUR	Variable 	2 × 0.75 mm ² / DC 60 V
 Open				

5

Appendix

Connection variants

Connection cable	Conformity/ part number	Cable type	Length/in- stallation type	Cable cross section/ operating voltage
 M12, 5-pin, A-coded, female M12, 5-pin, A-coded, male	CE: 18127401	LEONI BETAflam® – 145C-flex	Variable 	2 × 0.75 mm ² / DC 60 V
	CE/UL: 18147704	HELU-KABEL® SUPER-PAAR-TRONIC 340-C-PUR	Variable 	
 Open M12, 5-pin, A-coded, male	CE: 18127398	LEONI BETAflam® – 145C-flex	Variable 	2 × 0.75 mm ² / DC 60 V
	CE/UL: 18153445	HELU-KABEL® SUPER-PAAR-TRONIC 340-C-PUR	Variable 	
 M12, 5-pin, A-coded, female Open	CE: 18164315	LEONI BETAflam® – 145C-flex	Variable 	2 × 0.75 mm ² / DC 60 V

Connection of cables with open end

The following table shows the conductor assignment of cables with the following part numbers:

- 18124976
- 18147690
- 18164390
- 18127398
- 18153445
- 18164315

Signal name	Core color/designation
STO -	Black/1
STO +	Black/2

X5503: STO

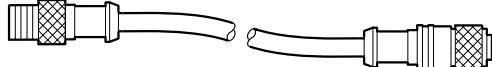
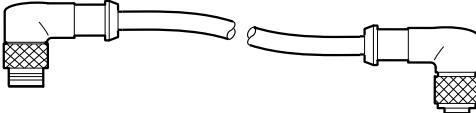
The following table shows information about this connection:

Function		
Connection for safe disconnection (STO)		
Connection type		
M12, 5-pin, male, A-coded		
Wiring diagram		
Assignment		
No.	Name	Function
1	Res.	Reserved
2	STO -	STO – connection
3	Res.	Reserved
4	STO +	STO + connection
5	Res.	Reserved

*Connection cable***INFORMATION**

Use only shielded cables for this connection and only appropriate plug connectors that connect the shield with the unit in an HF-compatible manner.

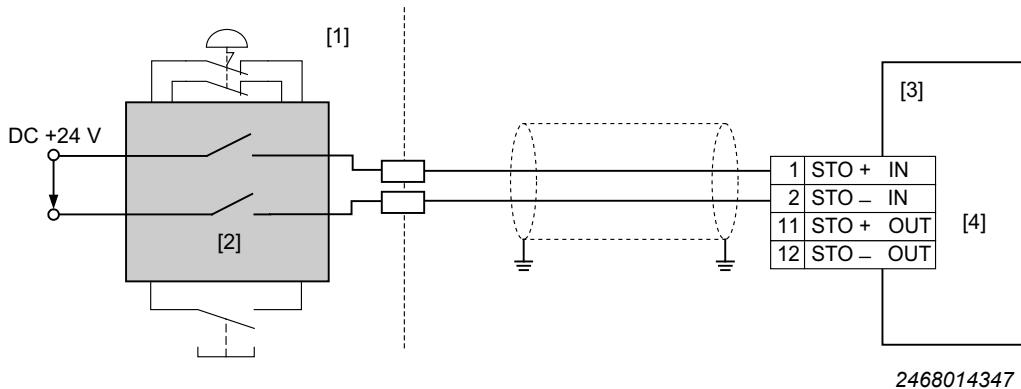
The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/in- stallation type	Cable cross section/ operating voltage
 M12, 5-pin, A-coded, male	CE: 18124968	LEONI BETAflam® – 145C-flex	Variable 	2 × 0.75 mm ² / DC 60 V
	CE/UL: 18147402	HELU-KABEL® SUPER-PAAR-TRONIC 340-C-PUR	Variable 	
 M12, 5-pin, A-coded, male	CE: 18127401	LEONI BETAflam® – 145C-flex	Variable 	2 × 0.75 mm ² / DC 60 V
	CE/UL: 18147704	HELU-KABEL® SUPER-PAAR-TRONIC 340-C-PUR	Variable 	

5.3 Connection of an external safety relay for STO

5.3.1 Connection via terminals

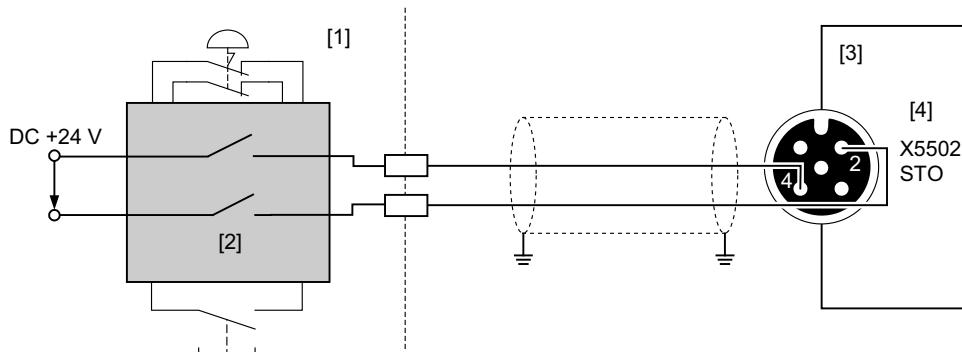
The following figure shows a connection example with a safety relay and disconnection of all poles:



- [1] Installation space
- [2] Safety relay
- [3] MOVIGEAR® B
- [4] Connection terminals for STO

5.3.2 Connection via M12 plug connector

The following figure shows a connection example with a safety relay and disconnection of all poles:



9007201723385995

- [1] Installation space
- [2] Safety relay
- [3] MOVIGEAR® B
- [4] Plug connector for STO

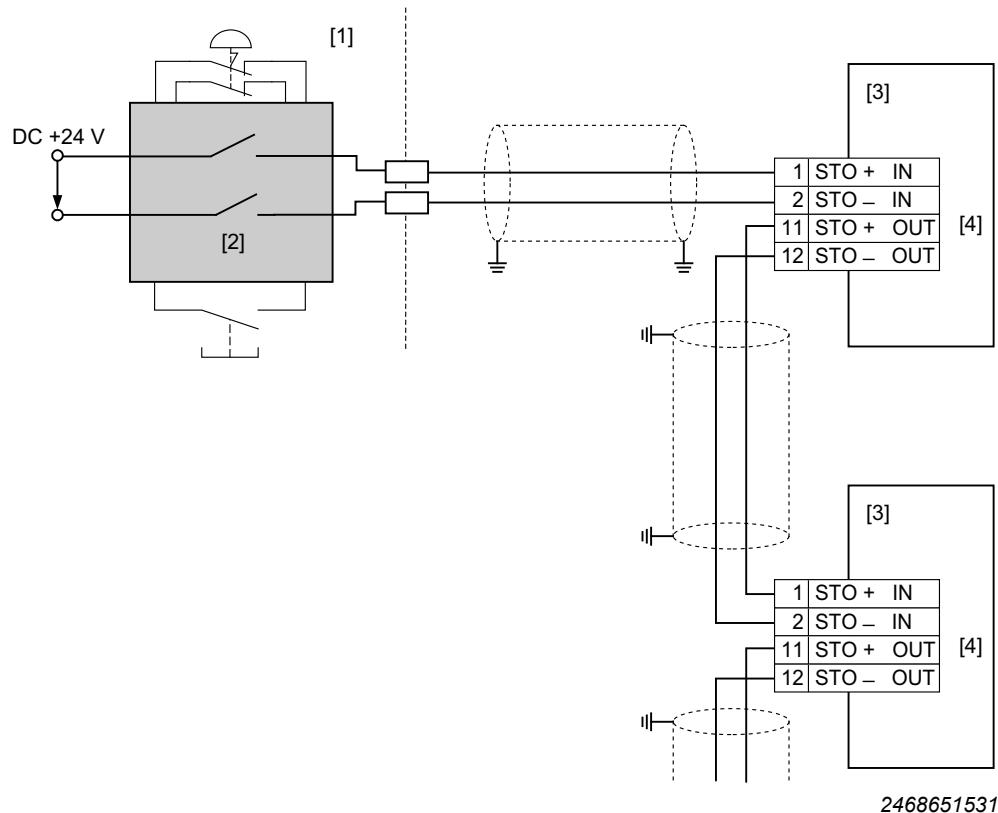
INFORMATION



When wiring the STO signals, possible faults in plug connectors and cables/lines have to be considered (see EN ISO 13849-2) and the installation has to be designed according to the required safety class. MOVIGEAR® does not detect short circuits in the supply line. SEW-EURODRIVE therefore recommends to connect only STO signals to the STO input using a two-core cable, as shown in the figure.

5.3.3 Connection via terminals – group disconnection

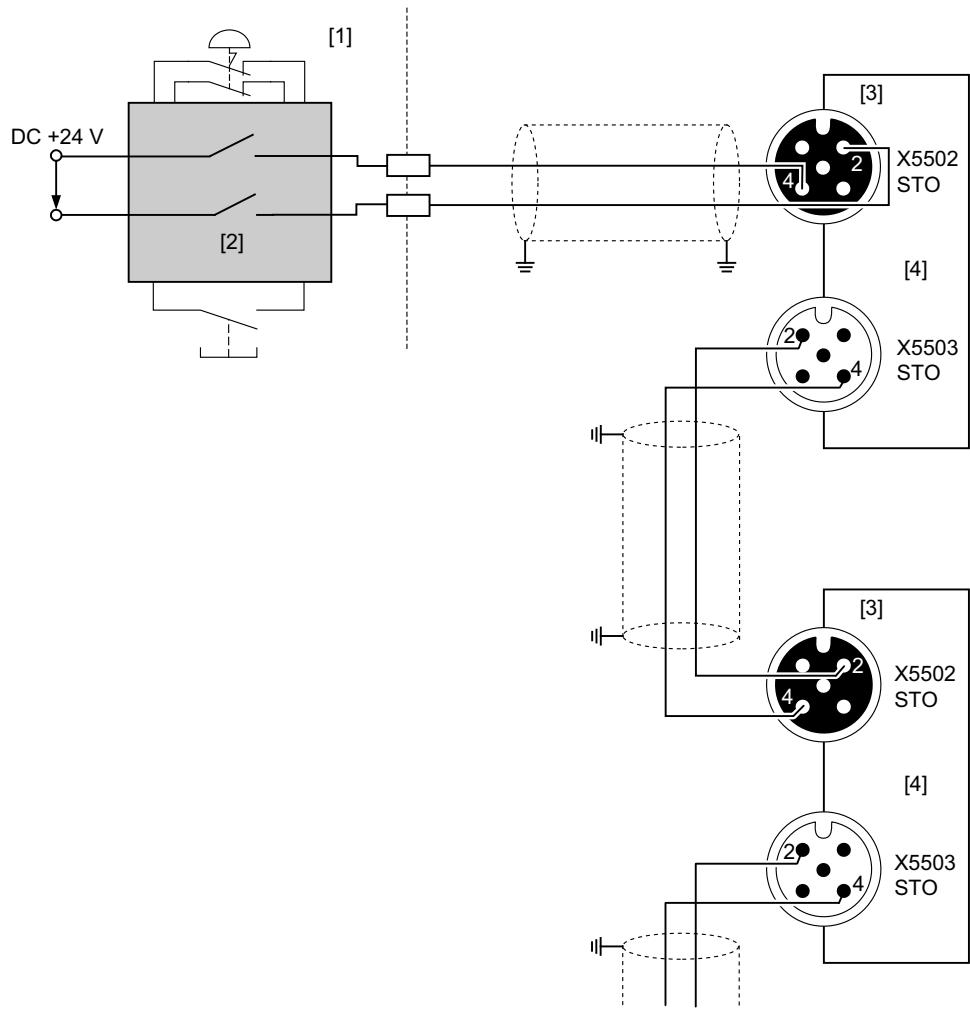
The following figure shows a connection example for disconnection of group drives with a safety relay:



- [1] Installation space
- [2] Safety relay
- [3] MOVIGEAR® B
- [4] Connection terminals for STO

5.3.4 Connection via M12 plug connectors – group disconnection

The following figure shows a connection example for disconnection of group drives with a safety relay:



9007201723394443

- [1] Installation space
- [2] Safety relay

- [3] MOVIGEAR® B
- [4] Plug connector for STO

INFORMATION



When wiring the STO signals, possible faults in plug connectors and cables/lines have to be considered (see EN ISO 13849-2) and the installation has to be designed according to the required safety class. MOVIGEAR® does not detect short circuits in the supply line. SEW-EURODRIVE therefore recommends to connect only STO signals to the STO input using a two-core cable, as shown in the figure.

5.3.5 STO signal for group disconnection

Requirements

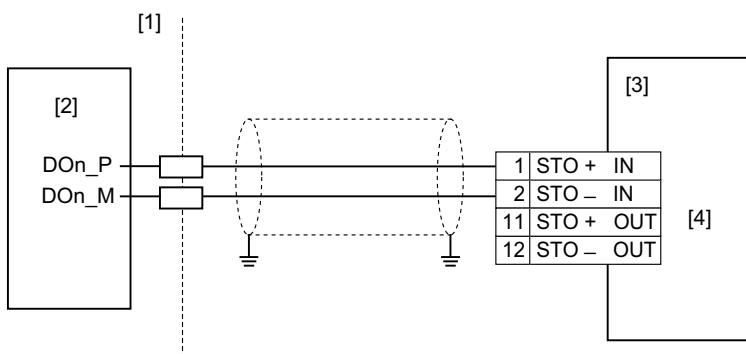
For group drives, the STO signal for several MOVIGEAR® drives can be provided by a single safety relay. The following requirements must be met:

- For EMC reasons, the maximum cable length is limited to max. 100 m. Other instructions published by the manufacturer on the use of safety relays (for specific applications) must also be observed.
- The maximum output current/the maximally permitted contact load of the safety relay must be observed.
- You must comply with the permitted signal levels at the STO input and all other technical data of MOVIGEAR®. The routing of the STO control cables and the voltage drop must be considered.
- Other requirements of the safety relay manufacturer (such as protecting the output contacts against welding) must be strictly observed. You must also observe the basic cable routing requirements from chapter "Installation requirements".
- A calculation based on the technical data of MOVIGEAR® must be performed separately for each case of group drive disconnection.

5.4 Connection of an external safety controller for STO

5.4.1 Connection via terminals

The following figure shows a connection example with a safety controller and disconnection of all poles for STO:

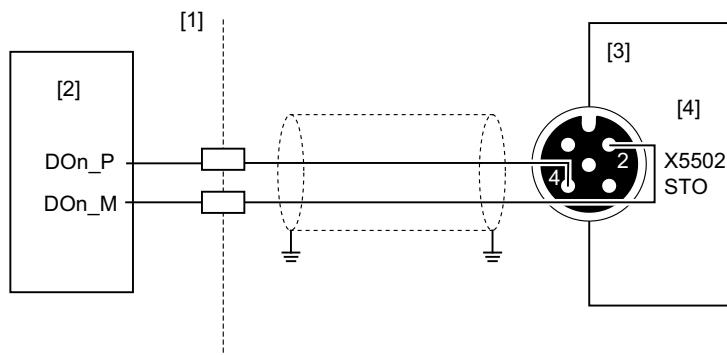


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- [1] Installation space
- [2] Safety controller
- [3] MOVIGEAR® B
- [4] Connection terminals for STO

5.4.2 Connection via plug connectors

The following figure shows a connection example with a safety controller and disconnection of all poles for STO:



9007201726583563

- [1] Installation space
- [2] Safety controller
- [3] MOVIGEAR® B
- [4] Plug connector for STO

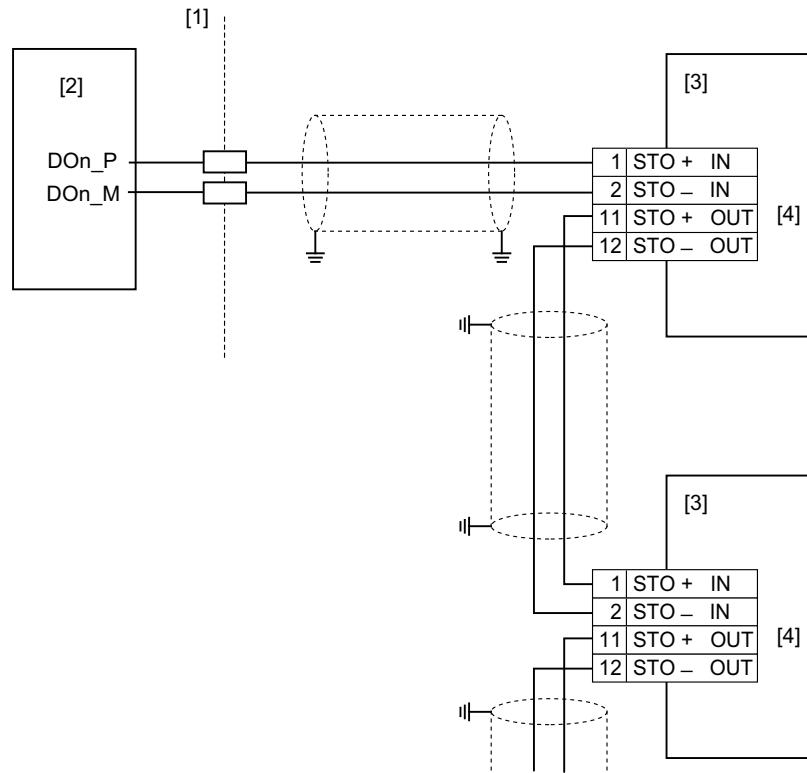
INFORMATION



When wiring the STO signals, possible faults in plug connectors and cables/lines have to be considered (see EN ISO 13849-2) and the installation has to be designed according to the required safety class. MOVIGEAR® does not detect short circuits in the supply line. SEW-EURODRIVE therefore recommends to connect only STO signals to the STO input using a two-core cable, as shown in the figure.

5.4.3 Connection via terminals – group disconnection

The following figure shows a connection example for disconnection of group drives with a safety controller:

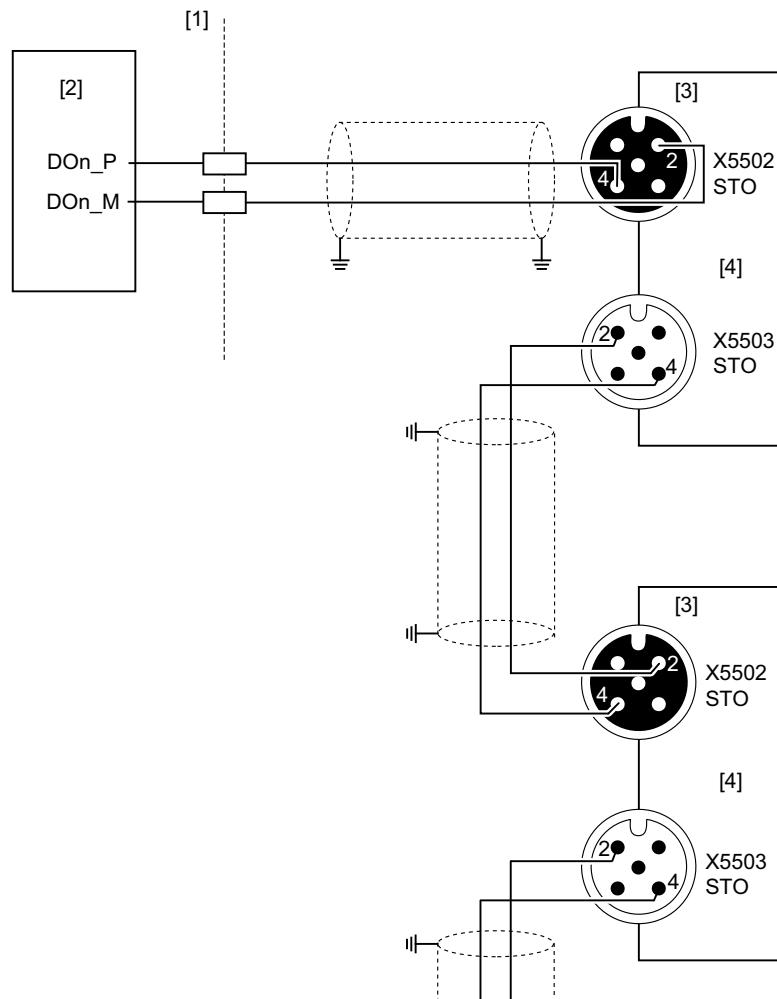


2808079627

- [1] Installation space
- [2] Safety controller
- [3] MOVIGEAR® B
- [4] Connection terminals for STO

5.4.4 Connection via M12 plug connectors – group disconnection

The following figure shows a connection example for disconnection of group drives with a safety controller:



9007202062818699

- [1] Installation space
- [2] Safety controller

- [3] MOVIGEAR® B
- [4] Plug connector for STO

INFORMATION



When wiring the STO signals, possible faults in plug connectors and cables/lines have to be considered (see EN ISO 13849-2) and the installation has to be designed according to the required safety class. MOVIGEAR® does not detect short circuits in the supply line. SEW-EURODRIVE therefore recommends to connect only STO signals to the STO input using a two-core cable, as shown in the figure.

5.4.5 STO signal for group disconnection

Requirements

For group drives, the STO signal for several MOVIGEAR® drives can be provided by a single safety controller. The following requirements must be met:

- For EMC reasons, the maximum cable length is limited to max. 100 m. Other instructions published by the manufacturer on the use of the safety controller (for the respective application) must also be observed.
- The maximum output current/the maximally permitted contact load of the safety controller must be observed.
- You must comply with the permitted signal levels at the STO input and all other technical data of MOVIGEAR®. The routing of the STO control cables and the voltage drop must be considered.
- Other requirements stipulated by the manufacturer of the safety controller must be strictly observed. You must also observe the basic cable routing requirements from chapter "Installation requirements".
- A calculation based on the technical data of MOVIGEAR® must be performed separately for each case of group drive disconnection.

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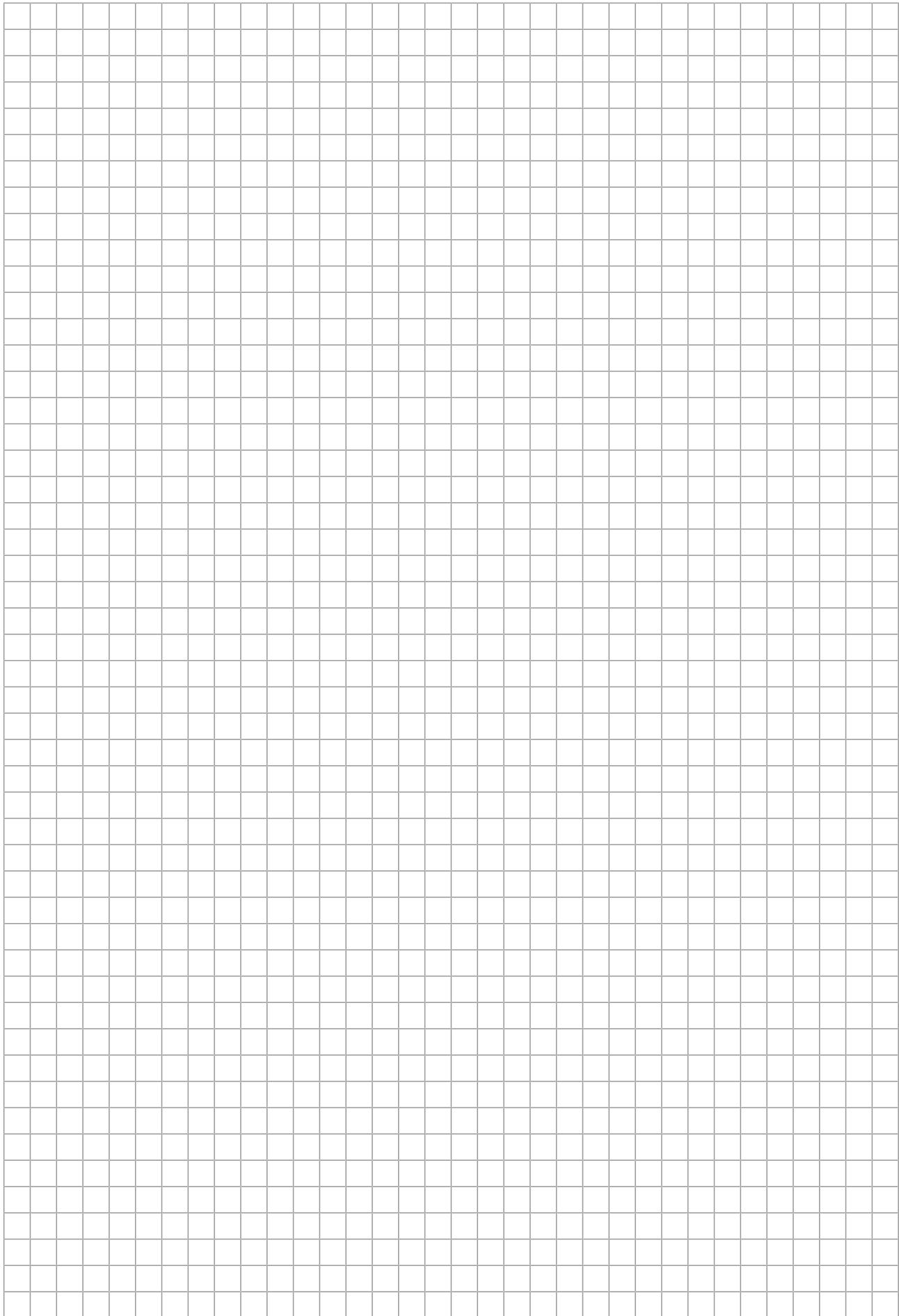
 Structure of section-related 4

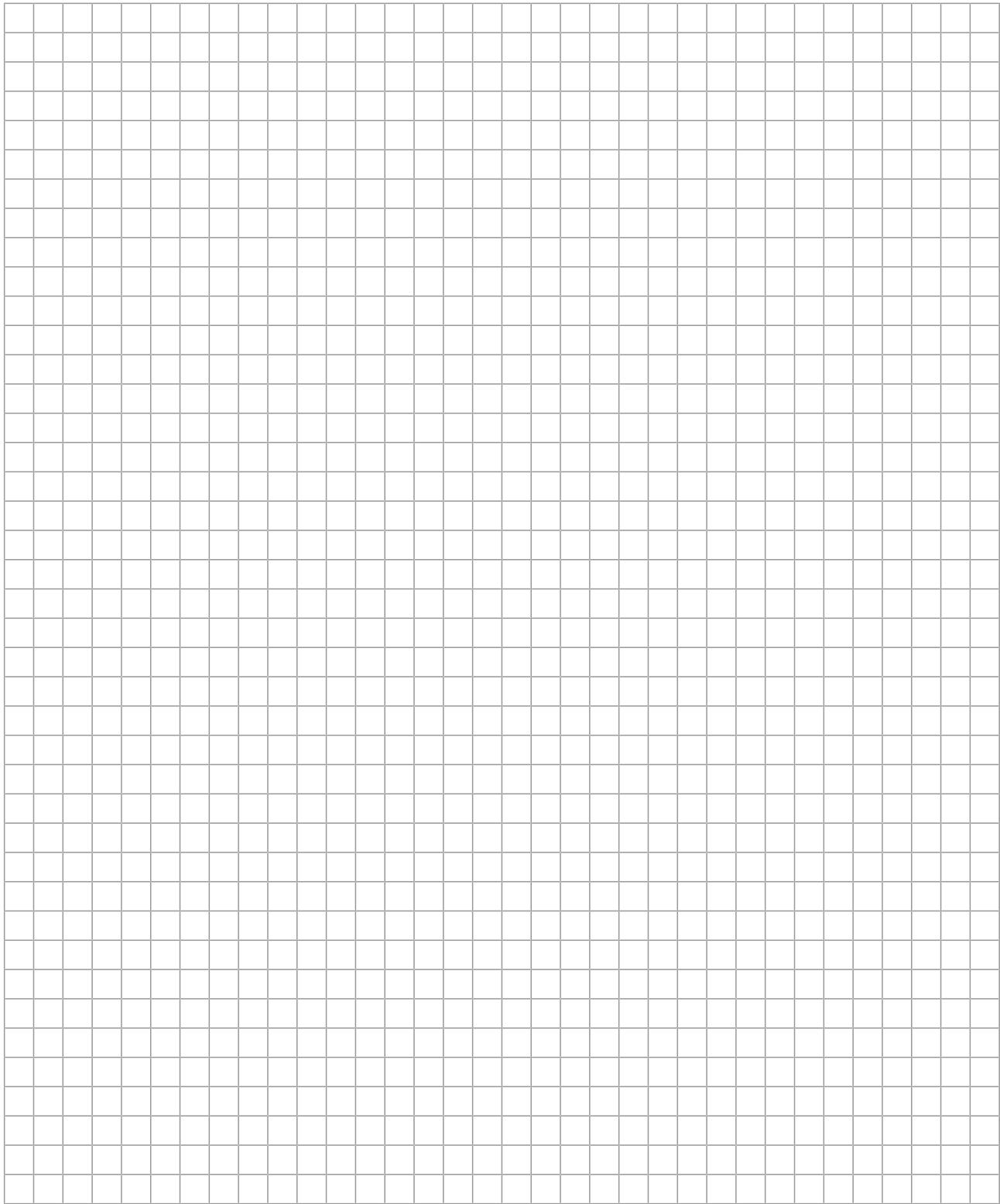
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