MOVITRAC® MC07B
Functional Safety
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1 General information

1.1 About this documentation

This documentation is an integral part of the product. The documentation is written for all employees who assemble, install, start up, and service this product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its 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 require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

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

<table>
<thead>
<tr>
<th>Signal word</th>
<th>Meaning</th>
<th>Consequences if disregarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td>Imminent hazard</td>
<td>Severe or fatal injuries</td>
</tr>
<tr>
<td>WARNING</td>
<td>Possible dangerous situation</td>
<td>Severe or fatal injuries</td>
</tr>
<tr>
<td>CAUTION</td>
<td>Possible dangerous situation</td>
<td>Minor injuries</td>
</tr>
<tr>
<td>NOTICE</td>
<td>Possible damage to property</td>
<td>Damage to the product or its environ-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rment</td>
</tr>
<tr>
<td>INFORMATION</td>
<td>Useful information or tip: Simplifies handling of the product.</td>
<td></td>
</tr>
</tbody>
</table>

1.2.2 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:

<table>
<thead>
<tr>
<th>Hazard symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚠️</td>
<td>General hazard</td>
</tr>
<tr>
<td>⚠️ ⚡</td>
<td>Warning of dangerous electrical voltage</td>
</tr>
</tbody>
</table>

1.2.3 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.

1.3 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.

1.4 Content of the documentation

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

1.5 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.

1.6 Decimal separator in numerical values

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

Example: 30.5 kg
1.7 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 MOVITRAC® MC07B described below has been developed and tested in accordance with the following safety requirements:

- EN-ISO 13849-1:2015 PL d (applicable up to category 3)

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

2.1 Underlying standards

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

<table>
<thead>
<tr>
<th>Underlying standards</th>
<th>Performance level (PL) and category (cat.) according to EN ISO 13849-1:2015</th>
</tr>
</thead>
</table>

2.2 Safe condition

For safety-related operation of MOVITRAC® MC07B, safe torque off is defined as 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 MOVITRAC® MC07B 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.
2.3.1 Schematic representation

[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
2.4 Safety functions

The following drive-related safety functions can be used.

2.4.1 STO – Safe Torque Off according to IEC 61800-5-2

STO (Safe Torque Off in accordance with IEC 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:

![Diagram of STO function]

- $v$: Speed
- $t$: Time
- $t_1$: Point of time when STO is triggered
- Gray: Disconnection range

2463228171
2.4.2 SS1(c) – Safe Stop 1 according to IEC 61800-5-2

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:

\[
\begin{align*}
v & \quad \text{Speed} \\
t & \quad \text{Time} \\
t_1 & \quad \text{Point of time when brake ramp is initiated} \\
t_2 & \quad \text{Point of time when STO is triggered} \\
\Delta t & \quad \text{Delay time until STO is triggered} \\
\text{Safe time delay range} & \quad \text{Disconnection range}
\end{align*}
\]
2.5 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).

MOVITRAC® MC07B 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 the chapter "Safety functions", the brake ramp of the drive is not monitored with respect to safety. In the event of a fault, deceleration may fail during the delay time or, in the worst-case, there might be an acceleration. 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, 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 MOVITRAC® MC07B.

- 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.

INFORMATION

In case of safety-related disconnection of the DC 24 V supply at X17 (STO activated), the brake is always applied. The brake control in MOVITRAC® MC07B is not safety-related.
3 Safety conditions

The requirement for safe operation is that the safety functions of MOVITRAC® MC07B 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 using the drive system with MOVITRAC® MC07B.

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 MOVITRAC® MC07B 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

3.1 Approved devices

The following device variants of MOVITRAC® MC07B are permitted for safety-related applications.
### 3.1.1 MOVITRAC® MC07B for a supply voltage of 3 × AC 380 to 500 V

<table>
<thead>
<tr>
<th>Power kW</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.55</td>
<td>0S</td>
<td>MC07B0005-5A3-4-S0</td>
</tr>
<tr>
<td>0.75</td>
<td>0S</td>
<td>MC07B0008-5A3-4-S0</td>
</tr>
<tr>
<td>1.1</td>
<td>0S</td>
<td>MC07B0011-5A3-4-S0</td>
</tr>
<tr>
<td>1.5</td>
<td>0S</td>
<td>MC07B0015-5A3-4-S0</td>
</tr>
<tr>
<td>2.2</td>
<td>0L</td>
<td>MC07B0022-5A3-4-S0</td>
</tr>
<tr>
<td>3.0</td>
<td>0L</td>
<td>MC07B0030-5A3-4-S0</td>
</tr>
<tr>
<td>4.0</td>
<td>0L</td>
<td>MC07B0040-5A3-4-S0</td>
</tr>
<tr>
<td>5.5</td>
<td>2S</td>
<td>MC07B0055-5A3-4-00</td>
</tr>
<tr>
<td>7.5</td>
<td>2S</td>
<td>MC07B0075-5A3-4-00</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>MC07B0110-5A3-4-00</td>
</tr>
<tr>
<td>15</td>
<td>3</td>
<td>MC07B0150-503-4-00</td>
</tr>
<tr>
<td>22</td>
<td>3</td>
<td>MC07B0220-503-4-00</td>
</tr>
<tr>
<td>30</td>
<td>3</td>
<td>MC07B0300-503-4-00</td>
</tr>
<tr>
<td>37</td>
<td>4</td>
<td>MC07B0370-503-4-00</td>
</tr>
<tr>
<td>45</td>
<td>4</td>
<td>MC07B0450-503-4-00</td>
</tr>
<tr>
<td>55</td>
<td>5</td>
<td>MC07B0550-503-4-00</td>
</tr>
<tr>
<td>75</td>
<td>5</td>
<td>MC07B0750-503-4-00</td>
</tr>
</tbody>
</table>

### 3.1.2 MOVITRAC® MC07B for a supply voltage of AC 200 to 240 V

<table>
<thead>
<tr>
<th>Power kW</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.55</td>
<td>0S</td>
<td>MC07B0005-2A3-4-S0</td>
</tr>
<tr>
<td>0.75</td>
<td>0S</td>
<td>MC07B0008-2A3-4-S0</td>
</tr>
<tr>
<td>1.1</td>
<td>0L</td>
<td>MC07B0011-2A3-4-S0</td>
</tr>
<tr>
<td>1.5</td>
<td>0L</td>
<td>MC07B0015-2A3-4-S0</td>
</tr>
<tr>
<td>2.2</td>
<td>0L</td>
<td>MC07B0022-2A3-4-S0</td>
</tr>
<tr>
<td>3.7</td>
<td>1</td>
<td>MC07B0037-2A3-4-00</td>
</tr>
<tr>
<td>5.5</td>
<td>2</td>
<td>MC07B0055-2A3-4-00</td>
</tr>
<tr>
<td>7.5</td>
<td>2</td>
<td>MC07B0075-2A3-4-00</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td>MC07B0110-203-4-00</td>
</tr>
<tr>
<td>15</td>
<td>3</td>
<td>MC07B0150-203-4-00</td>
</tr>
<tr>
<td>22</td>
<td>4</td>
<td>MC07B0220-203-4-00</td>
</tr>
<tr>
<td>30</td>
<td>4</td>
<td>MC07B0300-203-4-00</td>
</tr>
</tbody>
</table>
3.2 Installation requirements

- For size 0 units of the type MC07B...-S0, an external 24 V supply must always be connected because the control electronics can only be powered in this way.

- 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.
  - Individual 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 no parasitic voltages can be generated in the safety-related control cables.

- Wiring technology must comply with EN 60204-1.

- Use only grounded voltage sources with protective extra-low voltage (PELV) according to VDE0100 and EN 60204-1. 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 on EMC-compliant cabling, refer to the "MOVITRAC® MC07B" 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 DC 24 V voltage supply (terminal X17) must be connected to the "signal electronics" shield clamp.

- When planning the installation, observe the technical data of MOVITRAC® MC07B.

- 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 two conductors" can be excluded in accordance with EN ISO 13849-2:2012 under the following conditions:

The conductors are
  - Permanently (fixed) installed and protected against external damage (for example using a cable duct or armored conduit).
  - Installed in different light plastic-sheathed cables in an electrical installation space provided that both the lines and the installation space meet 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:
3.3 Requirements on the external safety controller

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

![Diagram of safety conditions]

[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:

<table>
<thead>
<tr>
<th>Application</th>
<th>Safety controller requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance level d according to EN ISO 13849-1</td>
<td>Performance level d according to EN ISO 13849-1</td>
</tr>
<tr>
<td></td>
<td>SIL 2 according to EN 61508</td>
</tr>
</tbody>
</table>

- The wiring of the safety controller must be suitable for the required safety class (see manufacturer documentation).
  - If the DC 24 V supply 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 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 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.

### 3.4 Requirements on startup

- To validate the implemented safety functions, they must be documented and checked after successful startup (validation).
  Observe the limitations for safety functions in the chapter "Limitations" 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 MOVITRAC® MC07B in safety-related applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.
3.5 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 MOVITRAC® MC07B 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.

3.6 Connection variants

3.6.1 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 you have to make sure that the DC 24 V safety inputs are operated by an external safety relay or safety controller, in this way preventing an automatic restart.

All safety-relevant conditions mentioned in chapters 2, 3 and 4 of the documentation in hand must be met for the basic selection, installation, and application of the safety components, such as safety relay, emergency off 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.
X17 terminal at MOVITRAC® MC07B

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

3.6.2 Requirements

Using 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 information on how to connect MOVITRAC® to safety relays, refer to the chapter "Installation requirements".

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

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.

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.
3.6.3 Disconnection of a single drive

STO Safe Torque Off (EN 61800-5-2)

The procedure is as follows:

- Recommendation: X12:1 and X12:4 are disconnected at the same time, e.g. in case of an emergency stop.
- The 24 V safety input X17 is disconnected.
- The motor coasts to a halt, if no brake is installed.

![Disconnection Diagram]

**INFORMATION**

- The illustrated STO disconnections can be used up to PL d according to EN ISO 13849-1:2015 taking account of the chapter "Requirements".
- MOVITRAC® MC07B size 0 requires an external DC 24 V voltage supply.

**Binary control with safety relay (dual-channel)**

![Binary Control Diagram]
Binary control with safety relay (single-channel)

INFORMATION

With single-channel disconnection, you have to make certain fault assumptions and provide for corresponding fault exclusions. Observe the "Requirements" chapter.

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

Binary control with safety PLC
### Fieldbus control with safety PLC

- **Mains**
- **+24 V**
- **Emergency Stop**
- **Stop**
- **Start**
- **Higher-level controller**
- **Standard Safe**
- **PROFINET**
- **PROFIsafe**
- **IN**
- **GND**
- **IN**
- **Emergency Stop**
- **Start**
- **Stop**
- **DGND**
- **VO24**
- **SVI24**
- **SOV24**
- **(GND)**
- **(24 V_LS)**
- **(24 V_PS)**
- **(F_DO_M)**
- **(F_DO_P)**
- **(GND)**
- **X2**
- **MC07B**
- **X31**
- **X30**
- **DFS 21B**
- **4 5 6**
- **1**
- **2**
- **3**
- **4**
- **U V W**
- **PROFINET**
- **PROFIsafe**

### INFORMATION

- Controller inhibit/enable and rapid stop/enable are set via fieldbus.
- Note the respective fieldbus manuals:
  - "DFS11B PROFIBUS DP-V1 Fieldbus Interface with PROFIsafe" manual
  - "DFS21B PROFINET IO Fieldbus Interface with PROFIsafe" manual

### SS1(c) Safe Stop 1 (EN 61800-5-2)

The procedure is as follows:

- X12:1 must not be disconnected.
- X12:4 is disconnected, e.g. in case 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 X7 is disconnected. The safe time $t_1$ must be sufficient for the motor to reach a complete stop.
INFORMATION

• The illustrated SS1(c) disconnections can be used up to PL d according to EN ISO 13849-1:2015 taking account of the chapter “Requirements”.

• MOVITRAC® MC07B size 0 requires an external DC 24 V voltage supply.

**Binary control with safety relay (dual-channel)**

**Binary control with safety relay (single-channel)**
INFORMATION

With single-channel disconnection, you have to make certain fault assumptions and provide for corresponding fault exclusions. Observe the "Requirements" chapter.
SEW-EURODRIVE recommends to switch off the 24 V supply of the STO input X17 at two poles.

**Binary control with safety PLC**

**Fieldbus control with safety PLC**
INFORMATION

- Controller inhibit/enable and rapid stop/enable are set via fieldbus.
- Note the respective fieldbus manuals:
  - "DFS11B PROFIBUS DP-V1 Fieldbus Interface with PROFIsafe" manual
  - "DFS21B PROFINET IO Fieldbus Interface with PROFIsafe" manual

3.6.4 Disconnection of group drives

This chapter describes how several MOVITRAC® MC07B are controlled in a safe manner.

INFORMATION

SEW-EURODRIVE recommends against group disconnection via safety PLC.

Requirements

For group drives, the 24 V safety inputs of several MOVITRAC® MC07B can be made available by 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 chapter "Installation requirements".

For connecting MOVITRAC® to safety relays, observe the installation requirements in the chapter "Installation requirements".

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

Determining the maximum number of MOVITRAC® devices for group disconnection

The number (n units) of MOVITRAC® MC07B devices that can be connected to a group drive is limited by the following factors:

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 power 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 × 1.5 mm² or 2 × 0.75 mm².

4. Power consumption of STO input X17: Input voltage, see chapter "Technical data".

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.
Implementing group disconnection with a safety relay

Group disconnection with one safety relay

The safety inputs of all MOVITRAC® MC07B can be controlled with one safety relay.

Group disconnection with two safety relays

With several safety relays, the safety inputs of the allocated MOVITRAC® MC07B can be controlled. In the following example, MOVITRAC® MC07B size 3 and MOVITRAC® MC07B size 0 each form one group, and each group is controlled by a safety relay.

STO Safe Torque Off (EN 61800-5-2)

The procedure is as follows:

- Recommendation: X12:1 and X12:4 are disconnected at the same time, e.g. in case of an emergency stop.
• The 24 V safety input X17 is disconnected.
• The motor coasts to a halt, if no brake is installed.

INFORMATION

The indicated STO disconnections can be used up to PL d according to EN ISO 13849-1:2015.
Example: Group disconnection with three MOVITRAC® MC07B
4 Technical data

The following table shows the technical data for MOVITRAC® MC07B related to the integrated safety technology. Additionally observe the technical data and approvals provided in the respective MOVITRAC® MC07B operating instructions.

4.1 Safety characteristics

<table>
<thead>
<tr>
<th>Characteristic safety values</th>
<th>EN ISO 13849-1:2015 PL d (applicable up to cat. 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested safety class/underlying standards</td>
<td></td>
</tr>
<tr>
<td>Probability of a dangerous failure per hour (PFH value)</td>
<td>0 (fault exclusion)</td>
</tr>
<tr>
<td>Service life</td>
<td>20 years, after which the component must be replaced with a new one.</td>
</tr>
<tr>
<td>Safe state</td>
<td>Safe torque off (STO)</td>
</tr>
<tr>
<td>Safety function</td>
<td>STO, SS1(c)(^1) according to EN 61800-5-2</td>
</tr>
</tbody>
</table>

\(^1\) With suitable external control
### 4.2 Electronics data X17: Signal terminal block for STO safety contact

<table>
<thead>
<tr>
<th>MOVITRAC®MC07B</th>
<th>Terminal</th>
<th>Electronics data X17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety contact</td>
<td>X17:1</td>
<td>DGND: Reference potential for X17:2</td>
</tr>
<tr>
<td></td>
<td>X17:2</td>
<td>VO24: $U_{out} = 24 \text{ V}$, only to supply X17:4 of the same device; must <strong>not</strong> be used to supply further devices.</td>
</tr>
<tr>
<td></td>
<td>X17:3</td>
<td>SOV24: Reference potential for DC $+24 \text{ V}$ input &quot;STO&quot;</td>
</tr>
<tr>
<td></td>
<td>X17:4</td>
<td>SVI24: DC$+24 \text{ V}$ input &quot;STO&quot;</td>
</tr>
</tbody>
</table>

**Permitted line cross section**

| X17:1 – 4 | • One core per terminal: 0.08 – 1.5 mm$^2$ (AWG28 – 16)
|           | • Two cores per terminal: 0.25 – 1.0 mm$^2$ (AWG23 – 17) |

**Power consumption**

| 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

**Input capacitance**

| X17:4 | Size 0: 27 µF
|       | Sizes 1 – 5: 270 µF

### Technical data of the STO input

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage range</td>
<td>DC 19.2 V</td>
<td>DC 24 V</td>
</tr>
<tr>
<td>Time to inhibit output stage</td>
<td></td>
<td>BG0 = 20 ms</td>
</tr>
<tr>
<td>Time for restart</td>
<td></td>
<td>200 ms</td>
</tr>
</tbody>
</table>
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