SEW
EURODRIVE

Manual

MOVIPRO® ADC/SDC

Functional Safety / PROFIsafe Option S11B

Table of contents

Table of contents

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 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.

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.	

1.2.2 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:

Hazard symbol	Meaning
	General hazard
	Warning of automatic restart

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 the documentation and the 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 Product names and trademarks

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

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 Copyright notice

2 Safety-related conditions

2.1 Basics

The requirement for safe operation is that the safety functions of the device are properly integrated into an application-specific higher-level safety function or safety system. The system or machine manufacturer has to make a risk analysis for this purpose. The required safety requirements and functions must be validated before start-up.

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 the device in safety-related applications.

2.2 Approved devices

MOVIPRO® units are only permitted for applications with safe disconnection of the drive if these safety properties are documented in their operating instructions.

2.3 Installation requirements

- Use only hybrid cables from SEW-EURODRIVE for safety-related applications with the device.
- Do not shorten the hybrid cables of SEW-EURODRIVE. The original cable lengths must be used with factory-assembled plug connectors. Ensure proper connections.
- Power lines and safety-related control lines have to be installed in separate cables. This does not apply to hybrid cables from SEW-EURODRIVE.
- The cable length between the safety controller and the device must not exceed 100 m.
- The wiring technology used must comply with EN 60204-1.
- The safety-related 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. If this is not possible, take equivalent measures.
  – Single conductors may be routed inside an electrical installation space.

  Observe the regulations applicable to the application.
- Do not use the safety-related DC 24 V supply voltage for feedback.
- Make sure that no parasitic voltages can be generated in the safety-related control cables.
- When designing the safety circuits, always observe the values specified for safety components.

- For all DC 24 V supply voltages of the device, use only grounded voltage sources with safe electrical isolation (PELV) according to EN 60204-1.

  In case of a single fault, the DC voltage between 2 outputs or between an output and grounded housing parts must not exceed 60 V.

- Observe the permissible signal levels at the input for safe disconnection of the device. When installing the safety-related power supply, take into account the voltage drop over the cable length.

2.4 Requirements for the external safety controller

A safety relay can be used as an alternative to a safety controller.

The following figure shows a wiring example of a safety relay:
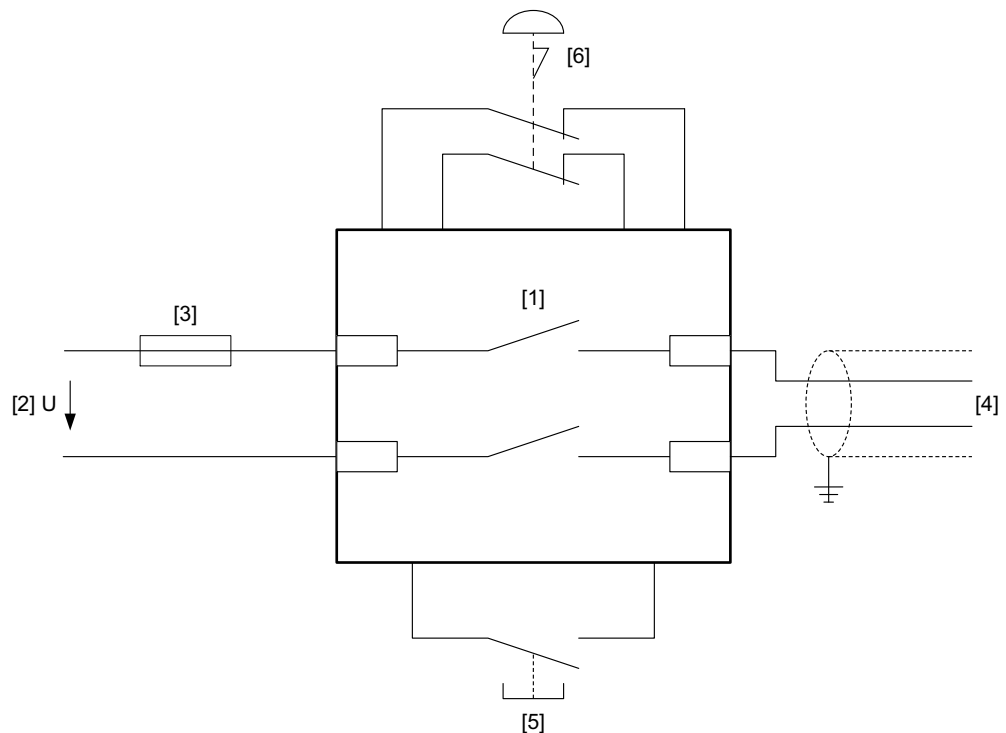
18014400103440907

[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

The following requirements apply to both a safety controller and a safety relay.

- 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:

Underlying standards	
Safety class/underlying standards	• Performance level (PL) in accordance with EN ISO 13849-1:2015
	• Safety Integrity Level (SIL) in accordance with EN 61800-5-2:2017

- The wiring of the safety controller must be suitable for the required safety class (see manufacturer documentation).

- When designing the circuits, always observe the values specified for the safety controller.

- 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 DC 24 V voltage supply.

 **Observe the manufacturer's instructions concerning the permitted contact loads and fusing that may be required for the safety contacts. Unless specified otherwise, 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 safety controllers must be designed and connected in such a way that resetting the control device alone does not lead to a restart. A restart may only be carried out after a manual reset of the safety circuit.

- SEW-EURODRIVE recommends bipolar disconnection of the safety circuit.

- The input for the safety-related DC 24 V voltage supply of the device has an input capacitance. For detailed information, refer to the "Technical data" chapter of the operating instructions of the respective device. This must be taken into account as load when designing the switching output.

- The requirements of the safety relay manufacturer must be observed. In particular, the maximum output current for jointly switched safety circuits must be complied with because of the sticking of switching contacts in the safety relay. Also observe the basic cable routing requirements in chapter "Installation requirements." (→ 🖺 8)

- If the safety circuit is disconnected at both poles, the test pulses may not be applied at the same time. The length of a test pulse must not exceed 1 ms. The interval between 2 test pulses must be at least 1 s.
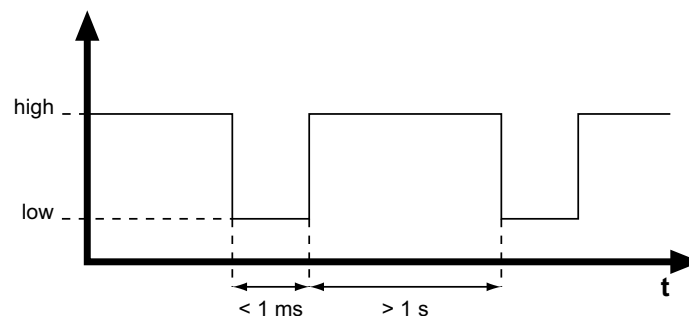
9007199938827659

2.5 Startup requirements

- Startup must be documented. Evidence for the safety functions must be provided. Observe the limitations for safety functions in chapter "Restrictions" (→ 🗎 11) for verification of the safety functions. Non-safety-related parts and components that affect the result of the verification test (e.g. motor brake) must be deactivated, if necessary.

- For using MOVIPRO® units in safety-related applications, you must perform and document startup checks for the disconnecting device and for correct wiring.

- During startup/function test, the correct assignment of the respective voltage supply must be checked by means of a measurement.

- The function test must be carried out in succession for all potentials, i.e. separately.

2.6 Operational requirements

- Operation is only permitted within the limits defined in the respective product documentation. This applies to both the external safety relay as well as to MOVIPRO® units and approved options.

- The safety functions must be checked for proper function at regular intervals. The period of time between tests must be determined in accordance with the risk analysis.

2.7 Restrictions

- **Notice:** The standard brakes of brakemotors are usually not designed to be safety-related. They are not part of the safety functions described in this documentation.

  If the motor brake fails, the drive can coast for much longer depending on the application, i.e. the friction and inertia of the system. In case of regenerative loads (e.g. lifting axes, declining conveying lines), the drive can even accelerate. This must be taken into account for the risk analysis of the system/machine and prevented by safety-related additional measures (e.g. safety-rated braking system), if required.

- **Notice:** When using the SS1(c) function, the brake ramp of the drive is not monitored with respect to safety.

  In the event of a fault, the drive might not be braked after the delay time, or it might be accelerated in the worst case. In this case, the STO function (see above) is only activated after the set time delay has elapsed. The resulting hazard must be taken into account in the risk assessment of the system/machine. Additional safety measures have to be implemented if required.

- **Notice:** The system/machine manufacturer must perform a system/machine-specific risk assessment. The use of the MOVIPRO® drive system must be taken into account for this purpose.

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

- **Danger of death:** When the DC 24 V supply voltage is switched off, the voltage is still present on the inverter DC link.

- **Notice: Before carrying out work on the electrical section of the drive system, the supply voltage must be disconnected using an external maintenance switch.**

3 Axis module with safe torque off

You can basically use the following drive-related safety functions with the device:

- STO (Safe Torque Off):

  Safe Torque Off according to EN 61800-5-2

- SS1(c) (Safe Stop 1):

  Safe Stop 1, function variant c according to EN 61800-5-2

The safety technology was developed and tested according to the following safety requirements:

- Performance level d in accordance with EN ISO 13849-1

- Protection against restart in accordance with EN ISO 14118

3.1 Safe state

For safety-related operation of MOVIPRO® units, **safe torque off is defined as a safe state** (see STO safety function). The safety concept is based on this definition.

3.2 Safety concept

- The device allows for the connection of an external safety controller or an external safety relay. They de-energize all active elements that generate the pulse trains to the power output stage (IGBT) when a connected command device (e.g. emergency stop button with latching function) is activated. For this purpose, the safety-related DC 24 V supply is disconnected.

  This ensures that the frequency inverter no longer supplies power to the motor for generating torque.

- Disconnecting the safety-related DC 24 V supply voltage ensures that the voltage supplies required for operating the drive are safely interrupted.

- Instead of galvanic isolation of the drive from the supply system using contactors or switches, the disconnection of the safety-related DC 24 V supply described here safely prevents the gating of the power semiconductors in the frequency inverter. This means the rotary-field generation for the respective motor is deactivated even though the mains voltage is still present.

The following figure shows the safety concept:
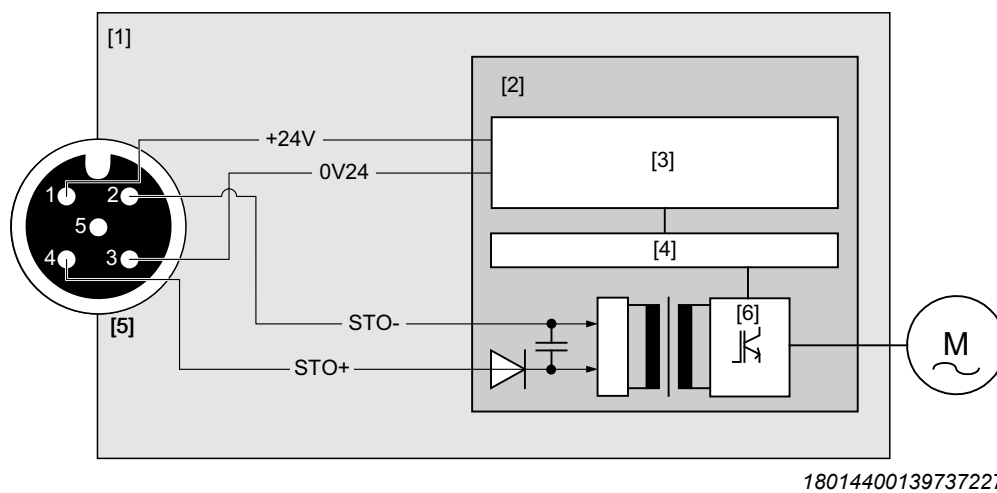
18014400139737227

[1]   MOVIPRO®
[2]   Frequency inverter
[3]   DC 24 V power supply
[4]   CPU
[5]   X5502: Input for safe disconnection
[6]   Power semiconductor

INFORMATION

Observe chapter "Restrictions" (→ 🖺 11).

3.3 Safety functions

The following drive-related safety functions can be used:

3.3.1 STO – Safe Torque Off

When the STO function is active, the inverter does not supply any power to the motor. The drive cannot generate 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 illustrates the STO function:
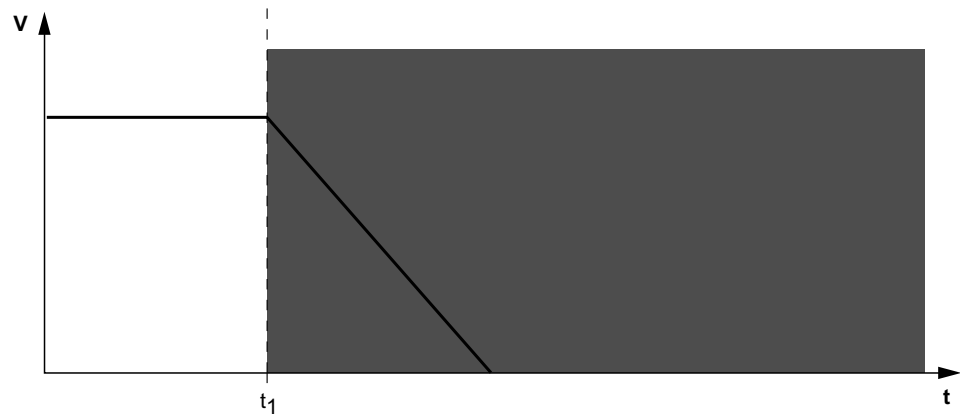
9007201225613323

■	Drive safety function trips
v =	Speed
t =	Time
t_1 =	Point of time when STO is triggered

INFORMATION

ℹ️ The motor coasts to a halt or is stopped mechanically.

Controlled standstill is preferred, if possible (see SS1).

3.3.2 SS1(c) – Safe Stop 1

Adhere to the following procedure:

- Decelerate the drive using an appropriate brake ramp specified via setpoint inputs.
- 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:
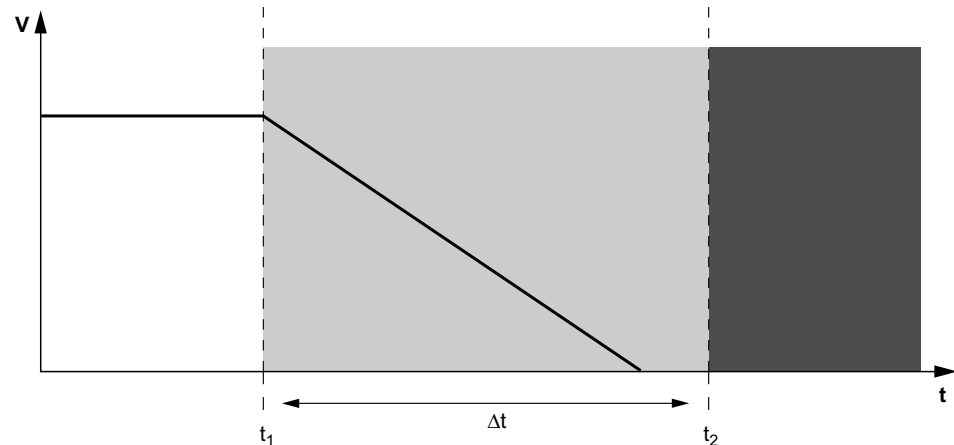
9007201225618443

▢	Drive safety function monitoring
▮	Drive safety function trips

v = Speed
t = Time
t_1 = Point of time when SS1(c) is activated and the braking action is triggered
t_2 = Point of time when STO is triggered
Δt = Safety-related period of time

INFORMATION

- The SS1(c) function does not monitor the stopping of the drive.
- The safety-related period of time Δt allows the drive to come to a stop. In the event of a fault, the drive does not come to a stop and becomes de-energized at the time t_2 (STO).

3.4 Connection variants

INFORMATION

i

For technical data, refer to the operating instructions.

3.4.1 X5502: Safe disconnection – input

⚠ WARNING

Risk of injury due to non safety-related disconnection of the device if the connection is jumpered.

Severe or fatal injuries.

- Jumper this connection only if the device will not perform any safety functions according to EN ISO 13849-1.

INFORMATION

i

Use only shielded cables for this connection.

This connection is marked with a yellow ring.

Function
Input for safe disconnection

Connection type
M12, 5-pole, female, A-coded

Wiring diagram

No.	Name	Function
1	+24V	DC 24 V output
2	STO-	0V24 reference potential for safe disconnection
3	0V24	0V24 reference potential
4	STO+	DC 24 V input for safe disconnection
5	res.	Reserved

3.4.2 Connection of an external safety relay for STO

The following figure shows a connection example with a safety relay and disconnection of all poles:
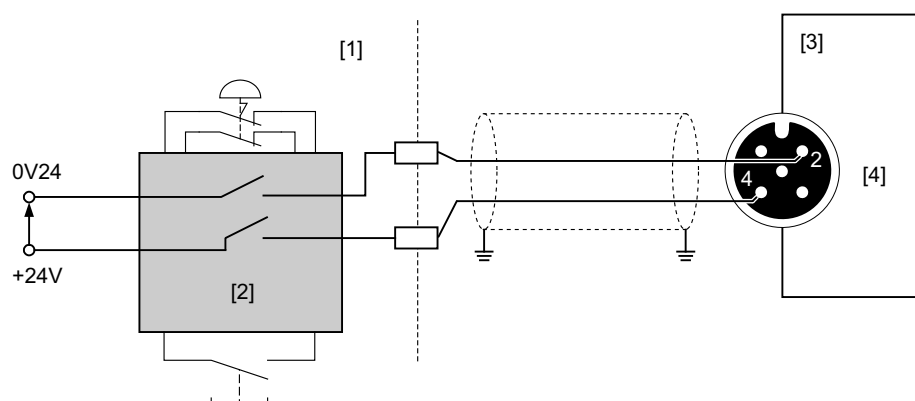
45035997951516171

[1] Installation space
[2] Safety relay
[3] MOVIPRO®
[4] X5502: Input for safe disconnection

INFORMATION

When wiring the safety-related voltage supply, possible faults according to EN ISO 13849-2 in plug connectors, cables and lines have to be considered and the installation has to be designed according to the required safety class. The drive controller does not detect short circuits in the supply line. SEW-EURODRIVE therefore recommends to connect only the safety-related voltage supply to X5502 using a 2-core cable as shown in the figure.

3.4.3 Disconnection of group drives

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

45035998308676363

[1]   Installation space
[2]   Safety relay
[3]   MOVIPRO®
[4]   X5502: Input for safe disconnection

INFORMATION

When wiring the safety-related voltage supply, possible faults according to EN ISO 13849-2 in plug connectors, cables and lines have to be considered and the installation ha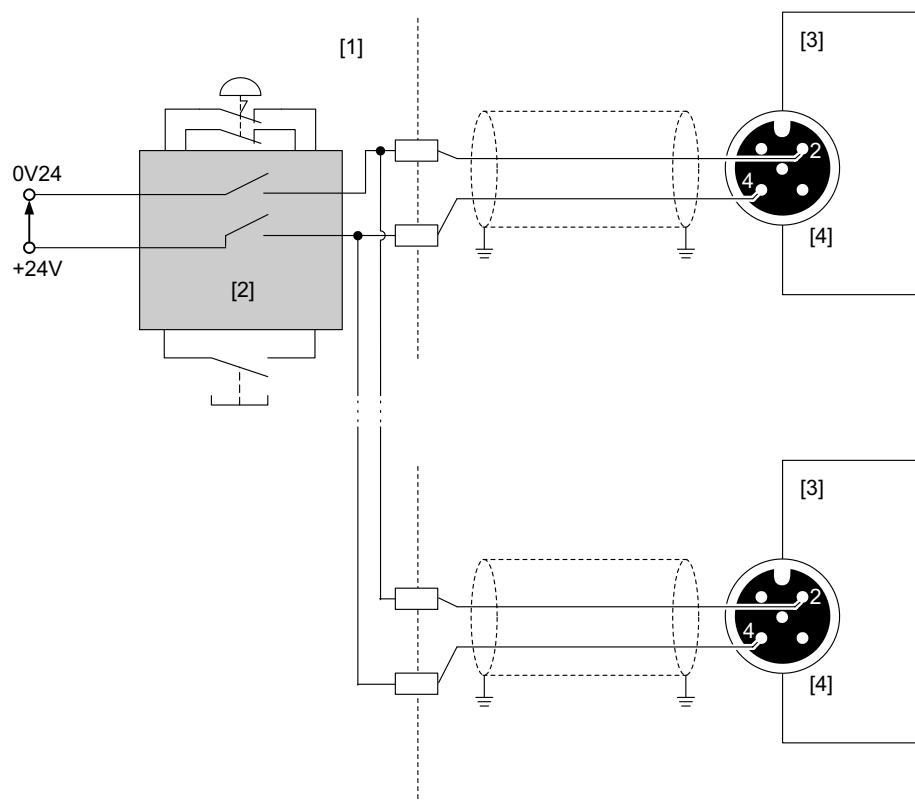s to be designed according to the required safety class. The drive controller does not detect short circuits in the supply line. SEW-EURODRIVE therefore recommends to connect only the safety-related voltage supply to X5502 using a 2-core cable as shown in the figure.

Requirements

The safety-related voltage supply for jointly switched safety circuits in several devices can be provided by one safety relay. The following requirements must be met:

*   The maximum output current and the maximally permitted contact load of the safety relay must be observed.

*   The total input currents and total input capacities for jointly connected safety circuits must be calculated separately for each application. For the nominal input currents and nominal input capacities for the safety circuits of a device, refer to the chapter "Technical data" in the respective operating instructions.

3.4.4 Connection of an external safety controller for STO

The following figure shows a connection example with a safety controller and disconnection of all poles for STO:
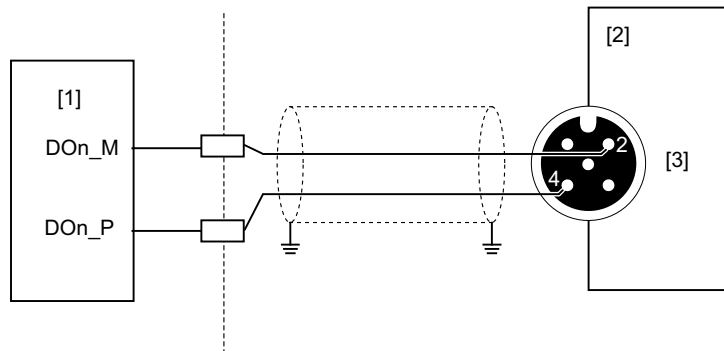
18014400187769483

[1] F PLC safety controller
    DOn_M: Ground output
    DOn_P: Plus output
[2] Drive controller
[3] X5502: Input for safe disconnection

INFORMATION

When wiring the safety-related voltage supply, possible faults according to EN ISO 13849-2 in plug connectors, cables and lines have to be considered and the installation has to be designed according to the required safety class. The drive controller does not detect short circuits in the supply line. SEW-EURODRIVE therefore recommends to connect only the safety-related voltage supply to X5502 using a 2-core cable as shown in the figure.

3.5 Technical data

For technical data and approvals of the drive controller, refer to the respective operating instructions. This is also where the electrical data of the plug connector X5502 (Input for safe disconnection) are documented. The specific, safety-related data is listed below:

Safety characteristics of axis module with safe torque off STO	
Approved safety classes	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
Safe state	Safe torque off (STO)

Safety data Input for safe disconnection	
Switch-on/switch-off threshold	Max. DC 8 V
Input voltage for safe state (STO)	Max. DC 5 V

Safety data Input for safe disconnection	
Time from disconnecting the safety-related DC 24 V supply until the deactivation of the rotating field	Max. 100 ms

	2.2 kW – 7.5 kW		11.0 kW – 22.0 kW	
Safety function	Power consumption	Input capacitance	Power consumption	Input capacitance
STO	2.5 W	27 µF	7.5 W	270 µF

4 Safety-related BST brake module

The safety-related BST brake module adds the safe SBC brake control function to the axis module.

Refer to the type designation of the "power section" function unit to find out if your device is configured for this:

Type designation "power section" function unit	Device configured
PFA-MD...B-G..-**BS**.-../C../000	Yes
PFA-MD...B-G..-**BG**-../C../000	No

4.1 Safe state

Relating to the safety-related brake module, the **de-energized condition of the connected brake is defined as safe state**. The safety concept is based on this.

4.2 Safety concept

- Disconnecting the safety-related DC 24 V power supply de-energizes the connected brake. The power supply required for releasing the connected brake is interrupted safely.

- Instead of separating the brake control galvanically from the power supply using contactors or switches, the disconnection procedure described here prevents the power semiconductors in the safety-related brake module from being activated, in this way ensuring safe disconnection. This means that all connected brakes are de-energized although the supply voltage is still present at the safety-related brake module.

The following figure shows the safety concept of the safety-related brake module in connection with the axis module:
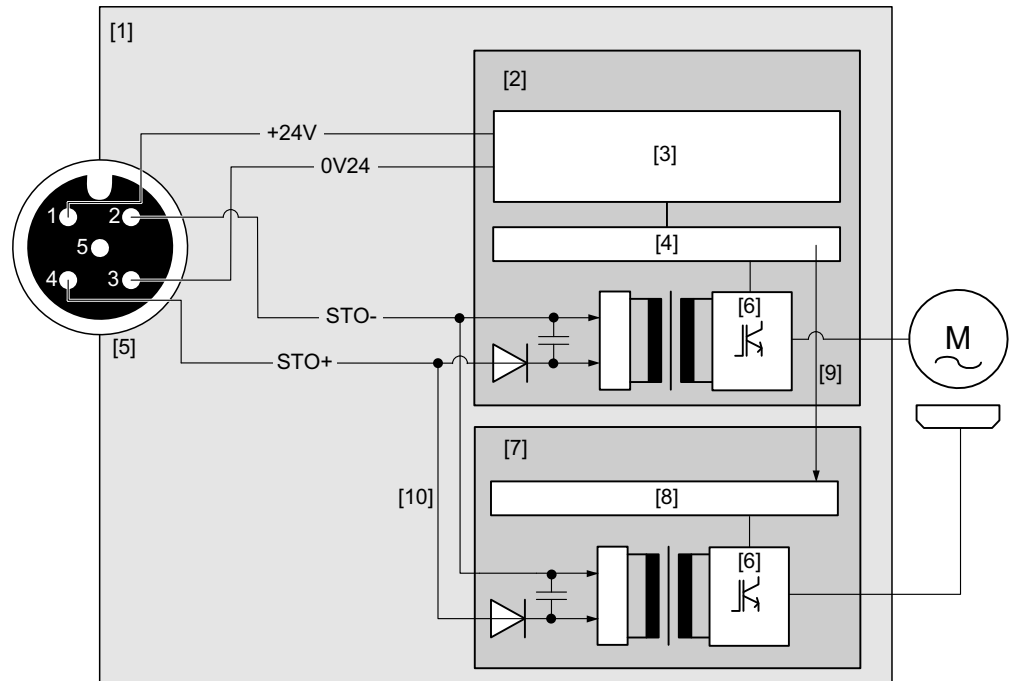
1801400139736715

[1]   Drive controller
[2]   Frequency inverter
[3]   DC 24 V power supply
[4]   CPU
[5]   X5502: Input for safe disconnection
[6]   Power semiconductor
[7]   Safety-related brake module
[8]   Control
[9]   Non-safe operation/control of the brake
[10] Safety-related brake control

4.3   Safety function

The following drive-related safety function can be used:

• **SBC** (Safe Brake Control according to EN 61800-5-2).

The SBC function safely de-energizes the connected brake by disconnecting the safety-related control voltage. The control voltage must be disconnected by a suitable external safety relay or safety controller.

4.4   Connection options

For connection options, refer to the "Connection options" section in chapter "Axis module with safe torque off" (→ 🖹 17).

4.5 Technical data

For technical data and approvals of the drive controller, refer to the respective operating instructions. This is also where the electrical data of the plug connector X5502 (Input for safe disconnection) are documented. The specific, safety-related data is listed below:

Safety data Input for safe disconnection		
Control voltage range safe state	U_{in}	< DC 4 V
Residual current safe state	I_{in}	< DC 6 mA
Control voltage range for non-safe state	U_{in}	DC 4 V < DC 28.8 V
Output current limit		DC 24 V, maximum 2 A (until thermal shutdown). The continuous output current must not exceed 500 mA.
Duration from switching off the safety-related control voltage at the safety-related brake module until switching off the brake voltage (plus the brake application time of the connected brake).		Max. 6 ms

Characteristic safety values of the safety-related brake module	
Safe state	Brake de-energized
Maximum possible safety class	Performance level d in accordance with EN ISO 13849-1
Probability of a dangerous failure per hour (PFH value)	0 (fault exclusion)
Service life	Maximum 20 years

	2.2 kW – 7.5 kW		11.0 kW – 22.0 kW	
Safety function	Power consumption	Input capacitance	Power consumption	Input capacitance
STO and SBC	3.7 W	32 µF	8.7 W	275 µF

5 PROFIsafe option S11B

PROFIsafe option S11B supplements MOVIPRO® with a communication connection to an external safety controller via safety-related PROFIsafe communication.

5.1 Safe state

The safe state for the PROFIsafe option is defined as:

- Safe outputs switched off
- Value "0" for the safety-related process data (PROFIsafe F user data)

The safety concept is based on this definition.

5.2 Safety concept

- The PROFIsafe option S11B is an integrated, safety-related electronics component with safe outputs.
- The high safety requirements are achieved by the 2-channel system structure of the safety module and suitable monitoring mechanisms (see chapter "Technical data"). When the system detects a fault, it responds by reverting to a safe state.
- Inside MOVIPRO®, the safety-related DC 24 V supply voltage of the axis module and – if applicable – of the safety-related brake module is switched off with a safe output of the PROFIsafe option S11B. This stops the drive safely. In this context, observe the safety concept of the axis module and of the brake module and all relevant conditions and installation regulations in this publication.

> **⚠ WARNING**
>
> With respect to safe stop, the safety class of the basic unit is decisive for the entire system with PROFIsafe option S11B.
>
> Severe or fatal injuries.
>
> - The device may only be used in applications up to performance level d in accordance with EN ISO 13849-1.

The following figure shows a schematic view of the PROFIsafe option S11B integrated in a MOVIPRO® unit with one axis module:
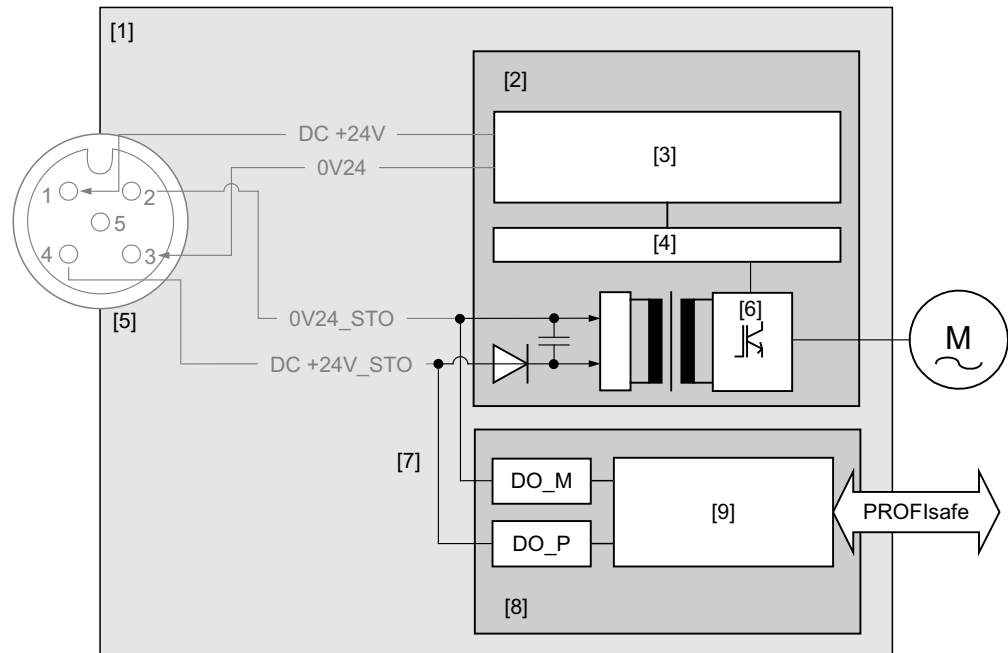
2073085963
2073085963

[1] MOVIPRO®

[2] Frequency inverter

[3] 24V power supply

[4] CPU

[5] X5502: Connection for external safety relay (if option S11B is not used)

[6] Power semiconductor

[7] Safety-related activation of safe disconnection

[8] PROFIsafe option S11B

[9] Safe S11B control electronics (dual-channel)

⚠ WARNING

Safe disconnection of MOVIPRO® is not possible when the X5502 terminal is connected externally.

Severe or fatal injuries.

- Use the STO jumper plug only if MOVIPRO® will not perform any safety function according to DIN EN ISO 13849-1.
- When using the PROFIsafe option S11B, the X5502 terminal must not be connected externally.

5.3 Safety function

The PROFIsafe option S11B provides the safety function in the form of safe outputs, which are controlled by a higher-level controller via PROFIsafe communication.

5.4 Startup

PROFIsafe option S11B is basically compatible with the previous GSDML files for MOVIPRO® with PROFIsafe option S11, and can be operated without errors.

The additional error codes of the PROFIsafe option S11B are not displayed with error text in the usual way with the old GSDML files.

If you want to make full use of the usual diagnostic convenience when using PROFIsafe option S11B, make sure that you use the latest version of the device-specific GSDML file.

The latest GSDML files of SEW-EURODRIVE are available free of charge at www.sew-eurodrive.de in the Online Support section.

5.4.1 Setting the PROFIsafe address

Once you have connected MOVIPRO® with PROFIsafe option S11B to a DC 24 V power supply, you have to set the PROFIsafe device address (= F destination address) in MOVITOOLS® MotionStudio. You can enter an address ranging from 1 to 65534.

Ensure that the entry made on the device matches the PROFIsafe address set in the project planning software of the bus master (e.g. Siemens STEP7 HW Config).

Enter the PROFIsafe address (= F destination address) in MOVITOOLS® MotionStudio using the parameter tree of the communication and control unit "PFH-..0AC0-B..-I100-00/.../000", see below figure.
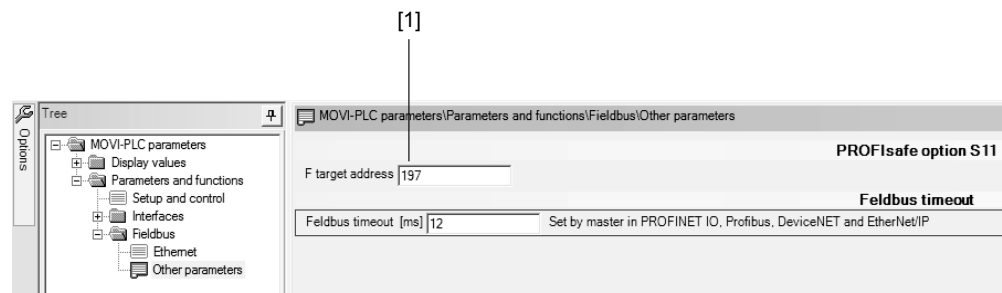

18014400148466443

[1]   Setting the PROFIsafe device address (= F destination address)

5.4.2 Project planning for PROFIsafe option S11B in the STEP7/TIA portal

- Make sure that you have installed the latest version of the appropriate GSDML file.
- Configure the "F module I/O (2 byte)" module to slot 1 and enter the required I/O or periphery address. The following figure shows a sample configuration of MOVIPRO® with PROFINET.
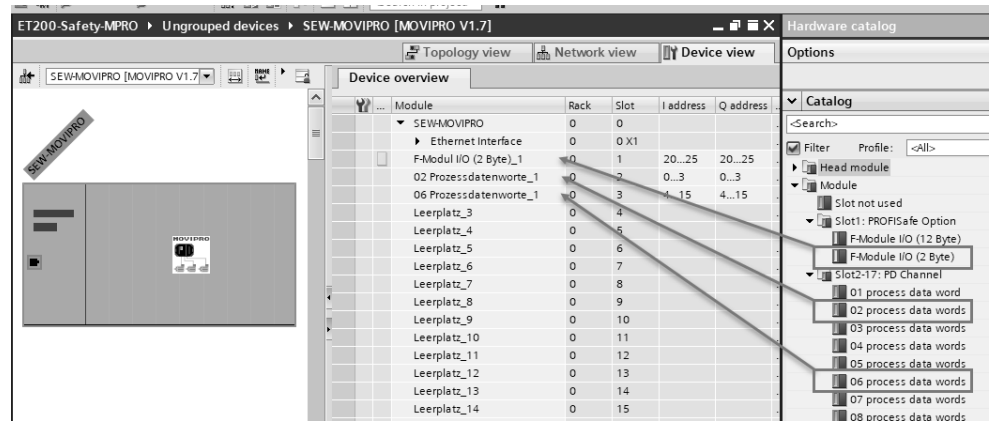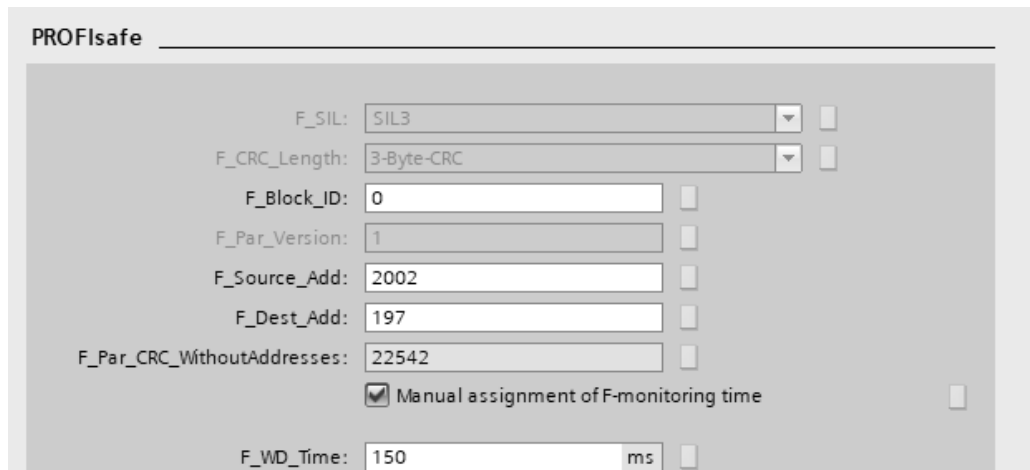

31223096075

- Next, you have to parameterize the PROFIsafe option S11B.

Parameterizing the PROFIsafe option S11B

Select the F module in slot 1 of MOVIPRO®.

Click on the F module and select "PROFIsafe" from the context menu.

Select "PROFIsafe" on the "General" tab. The following figure shows an example of the properties of a parameterized PROFIsafe option S11B.

9007203350760075

When the fieldbus or network system starts up, the bus master sends the safety-relevant parameters in an F parameter block to the PROFIsafe option of the MOVIPRO® for PROFIsafe operation. These parameters are checked for plausibility in the option. The PROFIsafe option only exchanges data with the bus master after a positive confirmation for this F parameter block has been received.

The following table shows the safety-related parameters that are transmitted to the PROFIsafe option. The following parameters are available for PROFINET IO:

PROFIsafe F parameter	PROFINET IO
F_Check_SeqNr	Not available
F_SIL	Fixed
F_CRC_Length	Fixed
F_Par_Version	Fixed
F_Source_Add	Variable
F_Dest_Add	Variable
F_WD_Time	Variable

Parameter "F_Check_ SeqNr"

This parameter determines whether the ready counter (consecutive number) is to be included in the consistency check (CRC calculation) of the F user data telegram.

The PROFIBUS version supports the following setting:

• F_Check_SeqNr = "No check"

Parameter "F_SIL"

This parameter allows F stations to check whether the safety class matches that of the F host. Safety circuits with different safety classes SIL 1 to SIL 3 (SIL = safety integrity level) are available for these safety-relevant cases according to the risk.

PROFIsafe option S11B supports the following setting:

• F_SIL = SIL 3

INFORMATION

i

The safety class SIL 3 only applies to the PROFIsafe option S11B. The possible safety class for the drive safety functions depends on the type of the respective MOVIFIT® basic device.

Parameter "F_CRC_Length"

The required length of the CRC test value depends on the length of the F user data (process values) and the PROFIsafe version. This parameter communicates the anticipated length of the CRC2 key in the safety telegram to the F component.

Parameter "F_Par_Version"

This parameter identifies the PROFIsafe version supported by the PROFIsafe option S11B. PROFIsafe V2 is supported with PROFINET.

Parameter "F_Source_Add"

The PROFIsafe addresses are used for unique identification of the source (F_Source_Add) and destination (F_Dest_Add). The combination of source and target address must be unique across the network and all nodes. The source address F_Source_Add is automatically provided by STEP7 depending on the master configuration.

Parameter "F_Dest_Add"

In this parameter, enter the PROFIsafe address previously set for the MOVIPRO® device using MOVITOOLS® MotionStudio.

Values ranging from 1 to 65534 can be entered in parameter "F_Dest_Add".

Parameter "F_WD_Time"

This parameter defines a monitoring time in the failsafe PROFIsafe option S11B.

A valid safety telegram must arrive from the F-CPU within this monitoring time. Otherwise the PROFIsafe option S11B reverts to safe state.

Select a monitoring time of sufficient length so that communication can tolerate telegram delays, but also short enough for your safety application to run without restrictions.

With the PROFIsafe option S11B, you can enter the "F_WD_Time" parameter in steps of 1 ms, ranging from 1 ms to 65535 ms.

5.5 Data exchange with PROFIsafe option S11B

5.5.1 General information

MOVIPRO® units with integrated PROFIsafe option S11B support parallel operation of standard communication and safety-related communication via a bus system or network. Safety-related PROFIsafe communication can be performed via PROFINET IO.

Data between bus master and MOVIPRO® is exchanged using the respective communication system that acts at the same time as a "gray channel" for the safety-related application. This means the transmitted bus telegrams contain standard information for conventional operation of MOVIPRO® and the PROFIsafe safety telegram. Depending on the configuration, the maximum available expansion level enables parallel exchange of PROFIsafe safety data, parameter data, and process data between the bus master and MOVIPRO®.
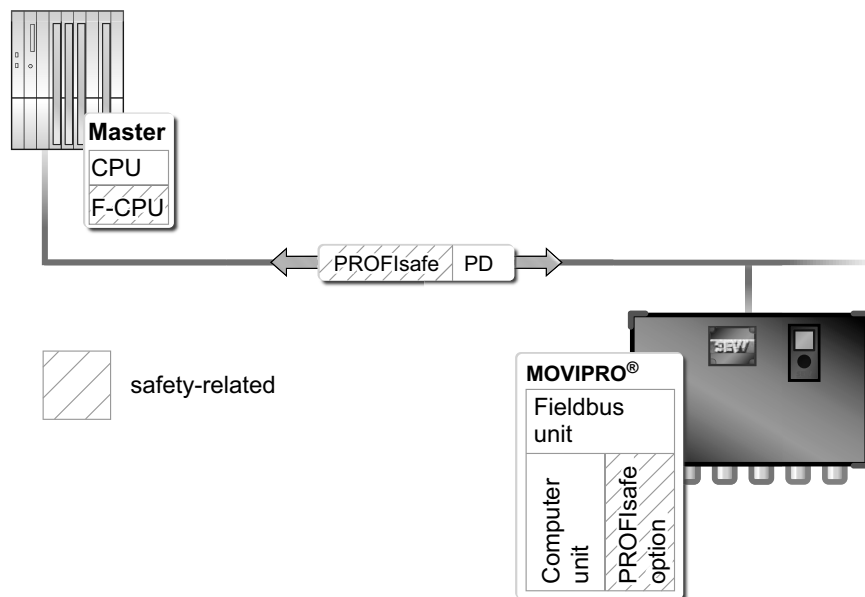
1640898955

5.5.2 Access to F periphery of PROFIsafe option S11B in STEP7/TIA portal

For safety-related communication, the PROFIsafe option S11B requires a total of 6 bytes for the PROFIsafe telegram portion and 6 bytes for the process image. Of these, 2 bytes (= 16 bits) constitute the actual safety-related I/O data (F user data), and the remaining 4 bytes are required for storing the telegram in accordance with the PROFIsafe specifications ("PROFIsafe" header).

F periphery DB of PROFIsafe option S11B

During compilation in the configuration tool (TIA portal or STEP7), the system automatically generates an F periphery DB for each PROFIsafe option S11B. The F periphery DB provides users with an interface in which they can evaluate or control variables in the safety program.

The symbolic name consists of the invariable prefix "F", the start address of the F periphery, and the name entered in the object properties during configuration for the F periphery (e.g. F00008_198).

The following table shows the F periphery DB of the PROFIsafe option S11B:

	Address	Symbol	Data type	Function	Presetting
User-controllable variables	DBX0.0	"F00008_198.PASS_ON"	Bool	1 = activate passivation	0
	DBX0.1	"F00008_198.ACK_NEC"	Bool	1 = acknowledgment required for reintegration with S11B	1
	DBX0.2	"F00008_198.ACK_REI"	Bool	1 = acknowledgment for reintegration	0
	DBX0.3	"F00008_198.IPAR_EN"	Bool	Variable for resetting parameters (not supported with PROFIsafe option S11B)	0
Variables that can be evaluated	DBX2.0	"F00008_198.PASS_OUT"	Bool	Run passivation	1
	DBX2.1	"F00008_198.QBAD"	Bool	1 = substitute values are output	1
	DBX2.2	"F00008_198.ACK_REQ"	Bool	1 = acknowledgment required for reintegration	0
	DBX2.3	"F00008_198.IPAR_OK "	Bool	Variable for resetting parameters (not supported with PROFIsafe option S11B)	0
	DBB3	"F00008_198.DIAG"	Byte	Service information	

PASS_ON

This variable lets you activate passivation of the PROFIsafe option S11B. Passivation of the F-periphery takes place, provided that PASS_ON = "1".

ACK_NEC

⚠ WARNING

Risk of unexpected start of the drive. The variable ACK_ NEC = 0 may only be parameterized if automatic reintegration is safe for the process in question.

Severe or fatal injuries.

- Check if automatic reintegration is permitted for the respective process.

After a fault has been corrected, the PROFIsafe option S11B is reintegrated depending on the parameter ACK_NEC.

- ACK_NEC = 0: Automatic reintegration of S11B
- ACK_NEC = 1: Reintegration of S11B with user acknowledgment

ACK_REI

In order to reintegrate the PROFIsafe option S11B after the fault has been corrected, user acknowledgment with positive edge of variable ACK_REI is required. Acknowledgment is only possible if variable ACK_REQ = 1.

ACK_REQ

The F control system sets ACK_REQ = 1 after all faults in the data exchange with PROFIsafe option S11B have been corrected. After successful acknowledgment, the F control system sets ACK_REQ = 0.

PASS_OUT

Indicates whether PROFIsafe option S11B has been passivated. Substitute values are output.

QBAD

Fault during data exchange with PROFIsafe option S11B. Indicates passivation. Substitute values are output.

DIAG

For service information purposes, the DIAG variable supplies non-failsafe information about faults that have occurred in the F control system. For further information, refer to the relevant F control system manual.

F user data of PROFIsafe option S11B

31222739467
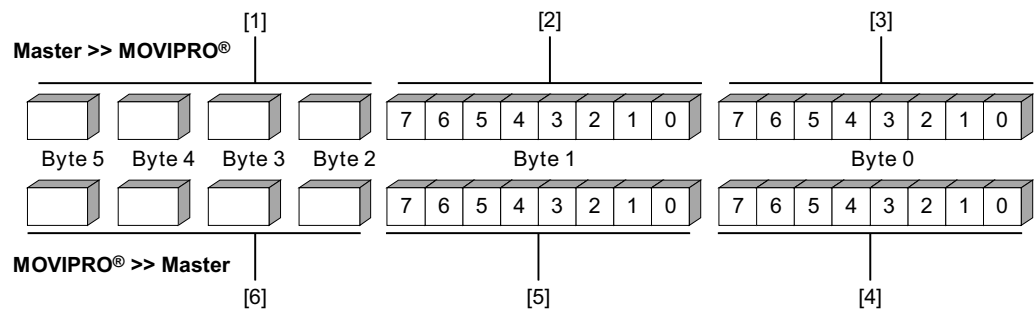
Meaning of individual bits in PROFIsafe F user data

F user data coding is based on the "PROFIdrive on PROFIsafe" V1.0 specifications (PNO order No. 3.272). The "PROFIdrive Safety Block 1" specified there is mapped in byte 0. Byte 1 is manufacturer-specific. With the PROFIsafe option S11B, it is used for the safety-related inputs and outputs.

Output data

	Byte	Bit	Name	Default	Function	Comment
[3]	0	0	STO	0	Safe disconnection of the drive "Safe Torque Off"	0-active
		1 – 7	–	0	Reserved	Do not use.
[2]	1	0 – 7	–	0	Reserved	Do not use.
[1]	2 – 5	–	–	–	Reserved for PROFIsafe telegram backup	–

Input data

	Byte	Bit	Name	Default	Function	Comment
[4]	0	0	POWER_REMOVED	0	Response safe digital output F-DO_STO switched– "Power removed"	1-active
		1 – 7	–	0	Reserved	Do not use.
[5]	1	1 – 7	–	0	Reserved	Do not use.
[6]	2 – 5	–	–	–	Reserved for PROFIsafe telegram backup	–

Example of PROFIsafe option S11B control

The example for triggering the failsafe functions of the PROFIsafe option S11B is based on the following assumptions:

- You have already created a safety program and a process group,
- An F control program module exists.

You can activate the failsafe functions and the F periphery as well as the evaluation of the responses by the F periphery by using flags. Note that in STEP7, flags are only permitted as links between the standard user program and the safety program. Flags may not be used as buffers for F data.

INFORMATION

i

SEW-EURODRIVE accepts no liability for the information provided in this example. This example does not represent a customer-specific solution. Its aim is simply to assist the reader.

The following table shows the allocation of input/output addresses to flags:

| Address	Symbol	Flag	Meaning
E 8.0	S11_PowerRemoved	M 8.0	Feedback "safety-related output switched"
E 9.0	S11_FDI00	M 9.0	Safe digital input 00
E 9.1	S11_FDI01	M 9.1	Safe digital input 01
E 9.2	S11_FDI02	M 9.2	Safe digital input 02
E 9.3	S11_FDI03	M 9.3	Safe digital input 03
A 8.0	S11_STO	M 80.0	Safety-related disconnection of the drive
A 9.0	S11_FDO00	M 90.0	Safe digital input 00

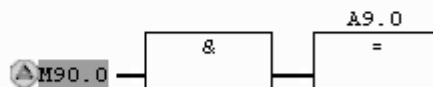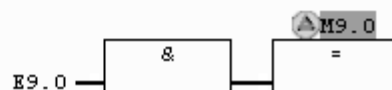| Address	Symbol	Flag	Meaning
A 9.1	S11_FDO01	M 90.1	Safe digital output 01
DB811.DBX0.0	"F00008_198".PASS_ON	M 10.0	Activating the passivation of S11B
DB811.DBX0.1	"F00008_198".ACK_NEC	M 10.1	Setting the parameters for reintegration of S11B
DB811.DBX0.2	"F00008_198".ACK_REI	M 10.2	Activating the user acknowledgment S11B
DB811.DBX2.0	"F00008_198".PASS_OUT	M 10.3	Passivation of S11B has occurred
DB811.DBX2.1	"F00008_198".QBAD	M 10.4	Fault in S11B occurred
DB811.DBX2.2	"F00008_198".ACK_REQ	M 10.5	Indicates whether user acknowledgment is required for reintegration of S11B.

Network 1: Control STO

Comment:

```
             ┌─────┐        A8.0
  M80.0 ─────┤  &  ├───────┐  =
             └─────┘       └─────┘
```

Network 2: STO feedback

Comment:

```
             ┌─────┐       M8.0
  E8.0 ──────┤  &  ├──────┐  =
             └─────┘      └─────┘
```
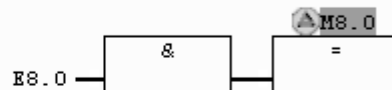
Network 3: Control FDO 0

Comment:

```
             ┌─────┐        A9.0
  M90.0 ─────┤  &  ├───────┐  =
             └─────┘       └─────┘
```

Network 4: FDI 0 feedback

Comment:

```
             ┌─────┐       M9.0
  E9.0 ──────┤  &  ├──────┐  =
             └─────┘      └─────┘
```

4096029963

```
Network 5 : F-feedback
```

```
1=PASSIVATION OUTPUT
```

```
                    &
    "F00164_                    △M10.3
      198".                        =
    PASS_OUT
```

```
Network 6: F-feedback
```

```
1=REPLACEMENT VALUES
```

```
                    &
    "F00164_                    △M10.4
    198".QBAD                      =
```

```
Network 7: F-feedback
```

```
1=ACKNOLEDGEMENT REQUEST
```

```
                    &
    "F00164_                    △M10.5
      198".                        =
    ACK_REQ
```

```
Network 8: User can activate passivation
```

```
1=ACTIVATE PASSIVATION
```

```
                                "F00008_
                                  198".
                                 PASS_ON
                    &                =
    △M10.0
```

4096083851

Network 9: Parameterizes the reintegration

1=ACKNOWLEDGEMENT NECESSARY

```
                                          "F00008_
                                           198".
                                          ACK_NEC
              ┌──────┐        ┌──────┐
  M10.1 ──────┤  &   ├────────┤  =   │
              └──────┘        └──────┘
```

Network 10: User must acknowledge the reintergratioin of S11

1=ACKNOWLEDGEMWNT FOR REINTEGRATION OF S11

```
                                          "F00164_
                                           198".
                                          ACK_REI
              ┌──────┐        ┌──────┐
  M10.2 ──────┤  &   ├────────┤  =   │
              └──────┘        └──────┘
```

4096087563

5.6 Response times

Response times play a decisive role in the design and execution of safety functions of systems and machines. In order to match the response time to the requirements of a safety function, always take the entire system from sensor (or command device) to actuator into account. The following times are of particular importance in connection with the PROFIsafe option S11B:

- Response time of the connected sensors
- PROFIsafe cycle time
- Processing time (cycle time) in the safety controller
- PROFIsafe monitoring time "F_WD_Time"
- Internal response times
- Response and switching time of the actuators (axis module, brake module, and brake)

Establish the response sequence for each safety function in your application and determine the maximum response time for each case considering the relevant manufacturer data. Observe in particular the information contained in the safety documentation of the safety controller used.

For data on the maximum response time of PROFIsafe option S11B, refer to section "Technical data PROFIsafe option S11B" (→ 🖺 46). For detailed information about response time consideration for safety-related PROFIsafe communication, refer to the respective standard IEC 61784-3-3.

The maximum switch-off times for the safe axis and brake module are listed in the respective "Technical data" chapters.

5.7 Diagnostics

INFORMATION

i

Depending on the safety controller used, other terms may be used for "passivation" and "reintegration" in the safety controller documentation. For more information, refer to the safety control documentation.

5.7.1 Faults in the safety module

PROFIsafe option S11B is capable of detecting faults. For information on the types of faults, exact responses, and how to correct the faults, refer to section "Fault table for PROFIsafe option S11B". If a fault occurs in the safety module, the PROFIsafe option S11B usually responds by passivating the module and switching to substitute values instead of process values. All safety-related process values are set to "0" (→ safe state).

After the fault has been remedied, the PROFIsafe option S11B is reintegrated upon user acknowledgment.

After reintegration, the provided output values are transferred to the safe output (F-DO_STO).

5.7.2 PROFIsafe timeout

⚠ WARNING

Automation reintegration can also be set in the safety controller.

Severe or fatal injuries.

- Do not use automatic reintegration in safety-related applications.

If safety-related PROFIsafe communication is interrupted or delayed, the PROFIsafe option S11B also responds with passivation after the adjustable monitoring time "F_WD_Time" (see description of F parameters) has expired, and enters safe state. After expiry of this time, the respective module is passivated in the safety controller and the associated safety-related process values for the safety application are set to "0" (→ safe state).

Whenever passivation occurs, user acknowledgement is required to reintegrate the module in question.

5.7.3 PROFINET alarms

Diagnostics alarms are disabled in the delivery state of the device. You can activate diagnostic alarms in the device view of the TIA portal.
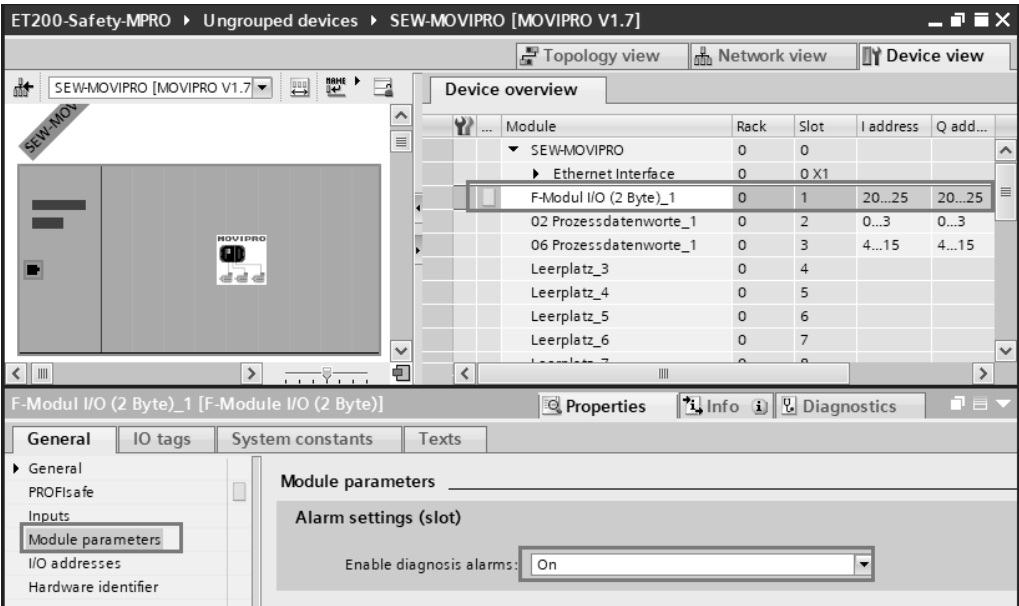
31225804683

1. With safe PROFIsafe communication, the diagnostic alarm can be activated for the integrated PROFIsafe option S11B. To do so, select slot 1 of the device in the device overview.

2. In the group "Module parameters", set the choice box "Enable diagnostic alarms" to "On".

3. Fault messages of the PROFIsafe option S11B (fault number and description of the fault) are reported as diagnostic alarm and are displayed as text in the module diagnostics.

INFORMATION

If you use the previous GSDML files, the additional fault codes of the PROFIsafe option S11B are not displayed with the corresponding fault text.

If you want to make full use of the usual diagnostic convenience when using PROFIsafe option S11B, make sure that you use the latest version of the device-specific GSDML file. The latest GSDML files are available at www.sew-eurodrive.de in the Online Support section.

5.7.4 Safety diagnostics via PROFINET IO

The status of PROFIsafe communication and fault messages of the PROFIsafe option S11B are reported to the PROFINET-IO controller where they can then be diagnosed.

Diagnostic messages of the PROFIsafe layer

The following table shows the diagnostic messages of the PROFIsafe layer:

	PFOFINET diagnostic text (German)	PFOFINET diagnostic text (English)
0_{hex} / 0_{dec}	Kein Fehler	–

	PFOFINET diagnostic text (German)	PFOFINET diagnostic text (English)
40$_{hex}$ / **64**$_{dec}$	F_Dest_Add stimmt nicht überein	Mismatch of F_Dest_Add
41$_{hex}$ / **65**$_{dec}$	F_Dest_Add ist ungültig	F_Dest_Add not valid
42$_{hex}$ / **66**$_{dec}$	F_Source_Add ist ungültig	F_Source_Add not valid
43$_{hex}$ / **67**$_{dec}$	F_WD_Time ist 0 ms	F_WD_Time is 0 ms
44$_{hex}$ / **68**$_{dec}$	F_SIL Level größer max SIL Level	F_SIL exceeds SIL f. application
45$_{hex}$ / **69**$_{dec}$	Falsche F_CRC_Length	F_CRC_Length does not match
46$_{hex}$ / **70**$_{dec}$	Falsche F-Parameter Version	F-parameter set incorrectly
47$_{hex}$ / **71**$_{dec}$	Fehler im CRC1-Wert	CRC1 fault

INFORMATION

i

For more information on the meaning of fault messages and how to eliminate faults, refer to the PROFIBUS IO controller manuals.

Fault codes of the PROFIsafe option S11B

The table below shows the fault codes of the PROFIsafe option S11B:

	Designation (German)	Designation (English)	Meaning / fault correction
5F00$_{hex}$ / 24320$_{dec}$	Kein Fehler	---	see Fault table of the PROFIsafe option S11B
5F01$_{hex}$ / 24321$_{dec}$	Interner Ablauffehler	Internal sequence fault	
5F02$_{hex}$ / 24322$_{dec}$	Interner Systemfehler	Internal system fault	
5F03$_{hex}$ / 24323$_{dec}$	Fehler Kommunikatio	Communication fault	
5F04$_{hex}$ / 24324$_{dec}$	Fehler Elektronikversorgung	Circuitry supply voltage fault	
5F14$_{hex}$ / 24340$_{dec}$	Interner Fehler am Digitaleingang (F-DI.)	Internal fault failsafe input	
5F15$_{hex}$ / 24341$_{dec}$	Kurzschluss am sicheren Digitaleingang (F-DI.)	Short-circuit failsafe input	
5F32$_{hex}$ / 24370$_{dec}$	Interner Fehler am sicheren Digitalausgang (F-DO)	Internal fault failsafe output	
5F33$_{hex}$ / 24371$_{dec}$	Kurzschluss am sicheren Digitalausgang (F-DO.)	Short-circuit failsafe output	
5F34$_{hex}$ / 24372$_{dec}$	Überlast am sicheren Digitalausgang (F-DO.)	Overload failsafe output	
5F7F$_{hex}$ / 24447$_{dec}$	Fehler Initialisierung S11B	F init fault	

Fault table of the PROFIsafe option S11B

Code	Error	Response	Possible cause	Measure
0000	No fault	–	–	–
0001	Internal sequence fault	• F-DO. = 0 (disconnection of safe digital outputs) • F-DI. = 0 (→ safe state) • Passivation of S11B	Fault in safety electronics, possibly due to EMC influence	• Check the installation (EMC) • Switch off the 24 V voltage and on again. • Reintegration of S11B • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0002	Internal system error			
0003	Communication error		PROFIsafe communication interrupted	• Check the configuration (e.g. PROFIsafe monitoring time) • Reintegration of S11B
0004	Circuit supply voltage fault		Electronics supply is outside the specified limits	• Check the installation (EMC) • Switch off the 24 V voltage and on again. • Reintegration of S11B • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0008[1]	Fault external memory S11B	• F-DI. = 0 (→ safe state) • Passivation of S11B	EEPROM data error	• Check the installation (EMC) • Switch off the 24 V voltage and on again. • Reintegration of S11B • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0014	Hardware diagnostics: F-DI internal fault	• F-DI. = 0 (→ safe state) • Passivation of S11B	Fault detected in internal evaluation of safe F-DI digital inputs	• Acknowledge the fault • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0020[1]	Crossfault at safe digital input F-DI00	• F-DI. = 0 (→ safe state) • Passivation of S11B	Crossfault detected at safe digital input F-DI.	Check the external wiring/connection of the safe digital input F-DI. for crossfaults
0021[1]				
0022[1]				
0023[1]				
0028[1]	Connection fault F-DI00	Parameterizable F-DI fault response	No stable input signal of the parameterized input filter time at safe F-DI digital input.	Check the switch/sensor connected to the safe digital input F-DI.
0029[1]	Connection fault F-DI01			
002A[1]	Connection fault F-DI02			
002B[1]	Connection fault F-DI03			

Code	Error	Response	Possible cause	Measure
0032	Hardware diagnostics: F-DO internal fault	• F-DO. = 0 (→ safe state) • Passivation of S11B	Fault detected in internal hardware of safe F-DO digital outputs	• Acknowledge the fault • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0034	F-DO overcurrent fault	• F-DO. = 0 (→ safe state) • Passivation of S11B	The safe F-DO digital outputs are overloaded in total	Reduce the sum of the current load at the safe F-DO digital outputs.
0035[1]	Fault F-DO_STO crossfault		Fault in internal hardware of safe F-DO_STO digital output	• Acknowledge the fault • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0036[1]	Fault F-DO_STO: Overcurrent	• F-DO. = 0 (→ safe state) • Passivation of S11B	Current load at safe F-DO_STO digital output is too high	Reduce the current load at the safe F-DO_STO digital output
0037[1]	Fault F-DO_STO: Overvoltage		Crossfault detected at the safe F-DO_STO digital output	Check the external connection of safe F-DO_STO digital output for crossfaults
0038[1]	Fault F-DO_STO: Internal measuring fault		Fault in internal hardware of safe F-DO_STO digital output	• Acknowledge the fault • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0039[1]	Fault F-DO00: Crossfault		Fault in internal hardware of the safe F-DO00 digital output (internal crossfault)	
003A[1]	Fault F-DO00: Overcurrent		Current load at safe F-DO00 digital output is too high	Reduce the current load at the safe F-DO00 digital output
003B[1]	Fault F-DO00: Overvoltage		Crossfault at safe F-DO00 digital output	Check external connection of the safe F-DO00 digital output for crossfaults
003C[1]	Fault F-DO00: Internal measuring fault		Fault in internal hardware of the safe F-DO00 digital output	• Acknowledge the fault • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
003D[1]	Fault F-DO01: Crossfault		Fault in internal hardware of the safe F-DO00 digital output (internal crossfault)	
003E[1]	Fault F-DO01: Overcurrent		Current load at safe F-DO01 digital output is too high	Reduce the current load at the safe F-DO01 digital output
003F[1]	Fault F-DO01: Overvoltage		Crossfault detected at safe F-DO01 digital output	Check external connection of safe F-DO01 digital output for crossfaults
0040[1]	Fault F-DO01: Internal measuring fault		Fault in internal hardware of the safe F-DO01 digital output	• Acknowledge the fault • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.

Code	Error	Response	Possible cause	Measure
0050	Internal fault at safety-related output (F-DO.)	• F-DO. = 0 (disconnection of safety-related outputs) • Passivation of S11B	Fault in safety electronics, possibly due to EMC influence	• Check the installation (EMC) • Switch off the 24 V voltage and on again. • Reintegration of S11B • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0051	Short circuit at safety-related output (F-DO.)		• Short circuit in 24 V supply voltage or reference potential • Short circuit between F-DO._P and F-DO._M	• Check the installation/cabling and repair the short circuit • Reintegration of S11B
0052	Overload at safety-related output (F-DO.)		Overload at F-DO. (current is too high!)	• Check the installation/wiring and eliminate overload • Reintegration of S11B
0111	Internal communication error	• F-DO. = 0 (disconnection of safety-related outputs) • F-DI. = 0 ($\rightarrow$ safe state) • Passivation of S11B	Fault in safety electronics, possibly due to EMC influence	• Check the installation (EMC) • Switch off the 24 V voltage and on again. • Reintegration of S11B • If the fault is still present, replace the device or contact SEW-EURODRIVE Service.
0127	Initialization error	• F-DO. = 0 (disconnection of safety-related outputs) • F-DI. = 0 ($\rightarrow$ safe state) • Passivation of S11B	• F_Dest_Add is set to zero • The S11B option is not compatible with the desired (configured) safety functions	• Use MOVITOOLS® MotionStudio to set F_Dest_Add to a configured value
1040[1]	Ambient temperature too high	• F-DO. = 0 ($\rightarrow$ safe state) • Passivation of S11B	The temperature sensor of the device signals that the maximum permitted temperature is exceeded	• Improve the cooling of the device • Reduce the load of the safe digital outputs • Reduce the motor load/PWM frequency of the inverter
1041[1]	Ambient temperature too low		The temperature sensor of the device signals that the temperature dropped below the minimum permitted temperature	Increase the ambient temperature.
1042[1]	Supply voltage too high	F-DO. = 0 (disconnection of safe digital outputs)	Voltage supply (24V_O) too high	Check the 24 V voltage supply at terminal 24V_O.
1043[1]	Supply voltage too low		Voltage supply (24V_O) too low	

Code	Error	Response	Possible cause	Measure
2000[1]	S11B status fault when receiving FPAR	Warning	Safety protocol fault: SetPrm process – S11B is not in a valid state	Switch off the S11B PROFIsafe option and on again
2001[1]	Fault applying FPAR to S11B	• F-DO. = 0 (→ safe state) • Passivation of S11B	Safety protocol fault: SetPrm process – Transfer of FPAR failed	
2002[1]	Faulty process data length	• F-DO. = 0 (→ safe state) • Passivation of S11B	Safety protocol fault: Check configuration process – faulty process data length of PO/PI data	
2003[1]	CRC2 configuration fault		Safety protocol fault: Check configuration process – configuration in SPD failed, invalid CRC length	
2004[1]	Configuration error		Safety protocol fault: Check configuration process – invalid return when configuring SPD	
2005[1]	State S11B with receipt check cfg	Warning	Safety protocol fault: SetPrm check configuration process	
2006[1]	Error in SPD	• F-DO. = 0 (→ safe state) • Passivation of S11B	Safety protocol fault: Check configuration process – faulty process data length of PO/PI data	Switch off the S11B PROFIsafe option and on again
2007[1]	Communication error	Warning	Safety protocol fault: Cyclic data exchange error	• Acknowledge the fault • Reintegration of S11B
2008[1]	Timeout safety protocol		Safety protocol fault: Cyclic data exchange error, timeout detected	
2009[1]	Safe process data set		Safety protocol fault: Cyclic data exchange fault, process data in safe state	
200A[1]	SP zero message received		Safety protocol fault: Cyclic data exchange fault, zero telegram was received	

1) Extended fault code from device description file GSDML-V2.25-SEW-MOVIPRO-2020... or later

5.8 Device replacement (S11 replaced by S11B)

Observe the following instructions when replacing a device with PROFIsafe option S11 by a new device with PROFIsafe option S11B:

- Observe the information in chapter "Technical data PROFIsafe option S11B" (→ 🗎 46).
- The basic safety functions, the PROFIsafe process data assignment and the configuration in the PROFINET/PROFIsafe environment are identical.
- In existing projects, the previous GSDML file can also be used for operation with PROFIsafe option S11B.
- The additional error codes of PROFIsafe option S11B are not displayed with error text in the usual way when using the previous GSDML files.

If you want to make full use of the usual diagnostic convenience when using PROFIsafe option S11B, make sure that you use the latest version of the GSDML file. The latest GSDML files of SEW-EURODRIVE are available free of charge at www.sew-eurodrive.de in the Online Support section.

5.9 Technical data

5.9.1 General information

The technical data and approvals (CE, UL, etc.) of the respective MOVIPRO® basic unit apply to the overall MOVIPRO® system with PROFIsafe option S11B. They are listed in the respective operating instructions.

The table below specifies the technical data of PROFIsafe option S11B:

5.9.2 Characteristic safety values PROFIsafe option S11B

The following table shows the characteristic safety values of PROFIsafe option S11B:

Designation	Characteristic safety values according to	
	IEC 62061/ IEC 61508-5-2	**EN ISO 13849-1**
Classification/underlying standards	SIL 3	PL e
Structure	HFT = 1	2 channels (corresponds to category 3)
Operating mode selection	High demand	–
Probability of dangerous failure per hour (PFH$_d$ value)	< 1 x 10^{-9} 1/h	
Mission time/service life	20 years	
Proof test interval	Not required	–
Safe state	Value "0" for all safety-related F-DO process values (outputs disabled)	
Safety functions	• Safe digital output F-DO_STO • PROFIsafe communication	

5.9.3 Technical data PROFIsafe option S11B

Voltage supply

The following table shows the technical data of the voltage supply.

Designation	Value
Voltage supply	DC 24 V -15%/+20% according to EN 61131-2
Own consumption	≤ 160 mA
Total current consumption	Own consumption + output current F-DO_STO

Safe output F-DO_STO

The following table shows the technical data of safe output F-DO-STO.

Designation	Value
Features	DC 24 V output according to EN 61131-2, protected against short circuits and overloads
Rated current F-DO_STO	 1 A
Leakage current (for "0" signal)	≤ 1 mA according to EN 61131-2
Internal voltage drop	Maximum 3 V (sourcing and sinking output)
Short-circuit protection F-DO_STO	Electronic, response value: 2.8 A – 9 A
Overload protection F-DO_STO	 1.2 A – 1.4 A
Load resistance range F-DO_STO	 24 Ω – 1 kΩ

Permitted loads	• STO deactivation:
	   – MOVIPRO®
	   – BST safe brake module

Response time (command via PROFIsafe → the output switches)	≤ 26 ms
Cable length	Maximum 30 m

Index

SEW-EURODRIVE
Driving the world