

Valid for converters with Article No. 6SL5310-1B...

Edition

06/2023

OPERATING INSTRUCTIONS

# SINAMICS/SIMOTICS

## SINAMICS S210 servo drive system

SINAMICS S210 converter from FW V6.1  
SIMOTICS S-1FS2 servo motors



# SIEMENS

## SINAMICS/SIMOTICS

### SINAMICS S210 servo drive system with SIMOTICS S-1FS2

#### Operating Instructions


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## Legal information

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 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.

 <b>CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.

<b>NOTICE</b>
indicates that property damage can result if proper precautions are not taken.


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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.



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# Introduction

## 1.1 About SINAMICS

### Description

With the SINAMICS converter series you can solve drive tasks in the low, medium and DC voltage range. All Siemens drive components, such as converters, motors, and controls, are matched to each other and can be integrated into your existing automation systems.

You can find more information via the SINAMICS YouTube playlist (<https://www.youtube.com/playlist?list=PLw7lLwXw4H53rtHeTeifKtVMr2aXTYt0X>).

## 1.2 About this manual

### 1.2.1 Content

### Description

These operating instructions provide a summary of all of the information required to safely and reliably operate the converter-motor combination.

The operating instructions enable the target groups being addressed to mount, install, connect, and commission the converter and motor safely and in the correct manner.

To illustrate possible application areas for our products, typical use cases are listed in this product documentation and in the online help. These are purely exemplary and do not constitute a statement on the suitability of the respective product for applications in specific individual cases. Unless explicitly contractually agreed, Siemens assumes no liability for such suitability. Suitability for a particular application in specific individual cases must be assessed by the user, taking into account all technical, legal, and other requirements on a case-by-case basis. Always observe the descriptions of the technical properties and the relevant constraints of the respective product contained in the product documentation.

## 1.2.2 Target group

### Description

These operating instructions are intended for persons who perform different tasks in the drive environment, e.g. for:

- Planning engineers
- Project engineers
- Machine manufacturers
- Commissioning engineers
- Electricians
- Installation personnel
- Service technician
- Warehouse personnel

## 1.2.3 Standard scope

### Description

This documentation describes the functionality of the standard scope. This scope may differ from the scope of the functionality of the system that is actually supplied. Please refer to the ordering documentation only for the functionality of the supplied drive system.

Further functions may be executable in the system, which are not explained in this documentation. However, there is no entitlement to these functions in the case of a new delivery or service.

This documentation does not contain all detailed information on all types of the product. Furthermore, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications they make to the product themselves.

## 1.2.4 Websites of third-party companies

### Description

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

## 1.3 SINAMICS documentation

### Description

Comprehensive documentation on the SINAMICS converter series can be found at Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/13205/man>).



Figure 1-1 The SINAMICS converter family

You have the option of either displaying the documents or downloading them in the PDF and multimedia format.

The converter documentation essentially comprises the following manuals:

Table 1-1 SINAMICS documentation

Information	Documentation class	Content
Basic information	Operating instructions	Comprehensive collection of all information necessary for the safe operation of products, plant units, and complete plants (IEC/IEEE 82079-1)
	Product Information	Information that only becomes known shortly before or even after start of delivery and is therefore not included in the associated user documentation
General information	Industrial Security Configuration Manual	Information on the security functions and safe converter operation

## 1.4 Service and Support

### 1.4.1 Siemens Industry Online Support on the Web

#### Description

The following is available via Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/>), among others:

- Product support
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via the contact person database (→ Contact)
- Search for product info
- Important topics at a glance
- FAQs (frequently asked questions)
- Application examples
- Manuals
- Downloads
- Compatibility tool
- Newsletters with information about your products
- Catalogs/brochures

### 1.4.2 Siemens Industry Online Support on the road

#### Description



Figure 1-2 "Siemens Industry Online Support" app



The "Industry Online Support" app supports you in the following areas, for example:

- Resolving problems when executing a project
- Troubleshooting when faults develop
- Expanding a system or planning a new system

Furthermore, you have access to the Technical Forum and other articles that our experts have drawn up:

- FAQs
- Application examples
- Manuals
- Certificates
- Product announcements and much more

There is a data matrix code or QR code on the nameplate of your product. Scan the code using the "Industry Online Support" app (<https://support.industry.siemens.com/cs/ww/en/sc/2067>) to obtain technical information about the device.

The app is available for Apple iOS and Android.

### 1.4.3 Getting information about the product

#### Overview

You can use the ID link to get information about your product.

The ID link is a globally unique identifier according to IEC 61406-1.

#### Requirement

There is a QR code on the product and on the product packaging.



Figure 1-3 QR code with ID link included

You can recognize the ID link by the frame with a black frame corner at the bottom right.

#### Procedure

Scan the QR code using either a standard code scanner or the "Industry Online Support" app.

When using a standard code scanner, you open the scanned ID link in an Internet browser that is provided on your device.

## Result

You can use the ID link to get product data, manuals, declarations of conformity, certificates and other information about your product.

### 1.4.4 Feedback on the technical documentation

#### Description

We welcome your questions, suggestions, and corrections for this technical documentation. Please use the "Provide feedback" link at the end of the entries in Siemens Industry Online Support.

##### Requests and feedback

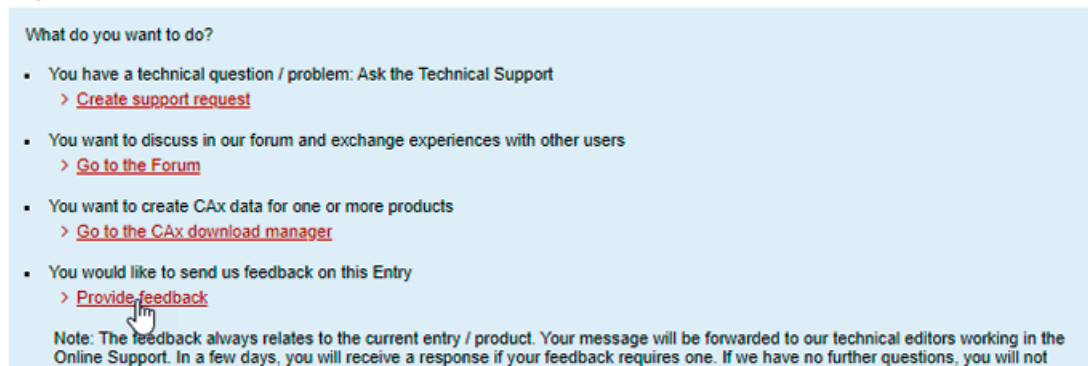


Figure 1-4 Requests and feedback

### 1.4.5 mySupport documentation

#### Description

With the "mySupport documentation" web-based system, you can compile your own individual documentation based on Siemens content and adapt this for your own machine documentation.

To start the application, click the "My Documentation" tile on the mySupport homepage (<https://support.industry.siemens.com/cs/ww/en/my>):



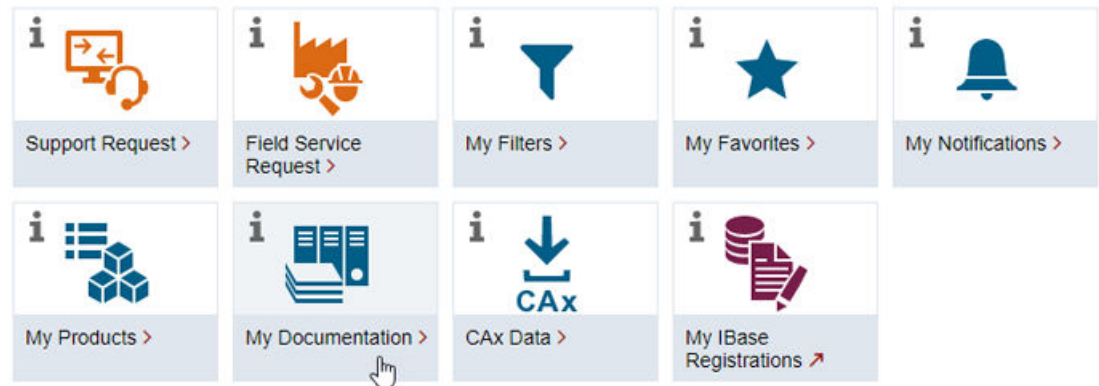
**mySupport Links and Tools**

Figure 1-5 mySupport

The configured manual can be exported in the PDF or XML format.

Siemens content that supports the mySupport documentation can be identified by the "Configure" link.

## 1.4.6 Technical support

### Description

Your routes to technical support (<https://support.industry.siemens.com/cs/ww/en/sc/4868>):

- Support Request (<https://www.siemens.com/SupportRequest>)
- Contact person database ([https://www.automation.siemens.com/asp\\_a\\_app](https://www.automation.siemens.com/asp_a_app))
- "Industry Online Support" mobile app

The Support Request is the most important input channel for questions relating to products from Siemens Industry. This will assign your request a unique ticket number for tracking purposes. The Support Request offers you:

- Direct access to technical experts
- Recommended solutions for various questions (e.g. FAQs)
- Status tracking of your requests

Technical support also assists you in some cases via remote support (<https://support.industry.siemens.com/cs/ww/en/view/106665159>) to resolve your requests. A Support representative will assist you in diagnosing or resolving the problem through screen transfer.

More information on the Support service packages is available on the Internet via the following address (<https://support.industry.siemens.com/cs/ww/en/sc/4869>).

### 1.4.7 Training

#### Description

SITRAIN – Digital Industry Academy offers a comprehensive range of training courses on Siemens industrial products – directly from the manufacturer, for all industries and use cases, for all knowledge levels from beginner to expert.

More information can be found on the Internet via the following address (<https://www.siemens.com/sitrain>).

### 1.4.8 Spare parts services

#### Description

By using the online spare parts service "Spares on Web", you ensure the smooth operation of your product. The spare parts service is aimed at the following:


- Improved spare parts inventories by balancing stock and spare parts on call
- Minimized downtimes during a plant standstill
- Reduced costs


More information can be found on the Internet via the following address (<https://www.sow.siemens.com/>).

## 1.5 Important product information

### 1.5.1 Proper and intended use

#### Requirement

 <b>WARNING</b>
<b>Death or serious injury if not used as intended</b> Not using as intended can result in hazardous states. <ul style="list-style-type: none"><li>• Carefully observe the description of proper and intended use</li></ul>

 <b>WARNING</b>
<b>Incorrect use of the motor</b>
Incorrect use of the motor may cause death, serious injury (crushing) and/or property damage.
<ul style="list-style-type: none"><li>• Carefully observe the description of proper and intended use</li><li>• Do not use the motors in hazardous areas (where there is a risk of explosion), if the motors have not been expressly released and authorized for these types of applications. Carefully observe any special supplementary notes that may be attached.</li><li>• Make sure that the conditions at the location of use comply with all the rating plate data.</li><li>• Make sure that the conditions at the location of use comply with the conditions specified in this documentation. When necessary, take into account deviations regarding approvals or country-specific regulations.</li></ul>

---

**Note**

It cannot be guaranteed that EMC emission limits are complied with if the products are connected to an isolated line supply grounded through a high ohmic connection or a line supply with grounded line conductor.

- Draw-up an EMC plan to comply with the EMC requirements of the intended application.
- 

## Description

The products described in this document, together with software, accessories and options, form an electric drive to supply low-voltage, three-phase motors.

The products are professional devices for stationary indoor use in industrial, light-industrial and commercial applications and are intended for supply from a non-public (industrial) low-voltage network. The products are not intended for use in residential areas and are not intended for supply from a public low-voltage network.

The products must be correctly transported and stored and must be installed, commissioned and maintained by professionals who have adequate knowledge to implement the safety, security and EMC measures in accordance with the specifications described in this manual and recognized state-of-the-art engineering practice.

You may only use the products when the following requirements are complied with:

- All regulations and directives that are applicable at the place of final use, especially with regard to electrical safety, functional safety and electromagnetic compatibility (EMC).
- All instructions, notes, technical specifications, safety information and security information contained in this document and other supporting documentation.

The products are part of a machine or system. They must guarantee the safety of persons and material assets as well as electromagnetic compatibility by applying suitable measures when designing the system.

Perform a risk assessment of the complete application including third-party products and implement adequate safety and security measures before using the product.

Products without protective enclosure (IP00 or IP20) are intended for installation in control panels or control cabinets that provide the required level of protection.

## 1.5 Important product information

Any other use that is not expressly permitted can result in malfunctions and unpredictable hazards.

The motor is only approved for converter operation.

### 1.5.2 Updates and constraints

#### Description

Updates and constraints for the converters with the current firmware are available in SIOS:

Updates and constraints for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109812303>)

### 1.5.3 Open-source software (OSS)

#### Description

The license conditions and copyright information of the open-source software components used by the device are saved on the device itself. You can download license and copyright information onto your PC via the support page of the integrated web server.

### 1.5.4 Compliance with the General Data Protection Regulation

#### Description

Siemens complies with the principles of the **General Data Protection Regulation (EU)**, in particular the principle of data minimization (privacy by design). For this SINAMICS product, this means:

- **User management and access control (UMAC)**

The product processes or stores the following personal data:

- Login data for user management and access control:  
User name, group, password, role, rights.

The data for user management and access control are stored in the converter and optionally on a memory card.

- **Support data (optional)**

For optimal support in service cases, the end user or machine manufacturer (OEM) can optionally store contact data (header, email address, telephone number, homepage) in the converter.

If these data are created, the author must give thought to data protection consent for these optional data. Siemens takes no responsibility for these data.

These support contact data can be read and are freely accessible in, for example, the user interface as well as in the diagnostics report. These data are not encrypted.

These data are used for user management and access control (UMAC) and for the support function. The storage of these data is appropriate and limited to what is necessary, as it is essential to identify the authorized operators and service contact.

The personal data are also available as part of the backup system to ensure fast recovery of use cases.

The above-mentioned personal data cannot be stored anonymously or pseudonymized, as they serve the purpose of identifying the operating personnel. The anonymization or pseudonymization, e.g. of the login data, must be performed using suitable login names and contact data by the plant/machine operator.

Our product does not provide any functions for automatically deleting personal data. Individual UMAC data can be deleted manually by authorized personnel as soon as this is deemed recommended/required.



## Fundamental safety instructions

### 2.1 General safety instructions



#### WARNING

##### **Electric shock and danger to life due to other energy sources**

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.



#### WARNING

##### **Risk of electric shock and fire from supply networks with an excessively high impedance**

Excessively low short-circuit currents can lead to the protective devices not tripping or tripping too late, and thus causing electric shock or a fire.

- In the case of a conductor-conductor or conductor-ground short-circuit, ensure that the short-circuit current at the point where the converter is connected to the line supply at least meets the minimum requirements for the response of the protective device used.
- You must use an additional residual-current device (RCD) if a conductor-ground short circuit does not reach the short-circuit current required for the protective device to respond. The required short-circuit current can be too low, especially for TT supply systems.



**⚠ WARNING**

**Risk of electric shock and fire from supply networks with an excessively low impedance**

Excessively high short-circuit currents can lead to the protective devices not being able to interrupt these short-circuit currents and being destroyed, and thus causing electric shock or a fire.

- Ensure that the prospective short-circuit current at the line terminal of the converter does not exceed the breaking capacity (SCCR or I<sub>cc</sub>) of the protective device used.



**⚠ WARNING**

**Electric shock if there is no ground connection**

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.



**⚠ WARNING**

**Electric shock due to connection to an unsuitable power supply**

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.



**⚠ WARNING**

**Electric shock due to damaged motors or devices**

Improper handling of motors or devices can damage them.

Hazardous voltages can be present at the enclosure or at exposed components on damaged motors or devices.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged motors or devices.





**! WARNING**

**Electric shock due to unconnected cable shields**

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of cables that are not used at one end at the grounded housing potential.



**! WARNING**

**Arcing when a plug connection is opened during operation**

Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.



**! WARNING**

**Electric shock due to residual charges in power components**

Because of the capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.

- Wait for 5 minutes before you check that the unit really is in a no-voltage condition and start work.

**NOTICE**

**Damage to equipment due to unsuitable tightening tools.**

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Only use screw inserts that exactly match the screw head.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.
- Adjust the tools used regularly.

**! WARNING**

**Electromagnetic interference due to inadequate shield support**

A lack of adequate shield support for the power cables can cause malfunctions and impermissibly high levels of interference.

- Use the shield connection plates supplied or recommended.
- Use the shield connection clips recommended.

 **WARNING**

**Spread of fire from built-in devices**

Built-in devices can cause a fire and a pressure wave in the event of a fault. Fire and smoke can escape from the control cabinet and cause serious personal injury and property damage.

- Install built-in appliances in a robust metal control cabinet that is suitable for protecting people from fire and smoke.
- Only operate built-in devices with the control cabinet doors closed.
- Ensure that smoke can only escape via controlled and monitored paths.

 **WARNING**

**Active implant malfunctions due to electromagnetic fields**

Converters generate electromagnetic fields (EMF) in operation. Electromagnetic fields may interfere with active implants, e.g. pacemakers. People with active implants in the immediate vicinity of an converter are at risk.

- As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants.
- Observe the data on EMF emission provided in the product documentation.



 **WARNING**

**Active implant malfunctions due to permanent-magnet fields**

Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.

- If you have a heart pacemaker or implant, maintain the minimum distance specified in the Chapter "Technical data".
- When transporting or storing permanent-magnet motors always use the original packing materials with the warning labels attached.
- Clearly mark the storage locations with the appropriate warning labels.
- IATA regulations must be observed when transported by air.

 **CAUTION****Symptomatic respiratory and skin reaction to chemicals**

A newly purchased product might contain traces of substances that are identified as sensitizers.

Sensitizers are substances which can cause sensitization in the lungs and skin after exposure to them.

Once sensitized, individuals can have severe reactions to further exposure, even in small amounts. In the most extreme cases, individuals might develop asthma or dermatitis respectively.

- If the product has a strong smell, keep it in a well-ventilated area for 14 days.

 **WARNING****Unexpected machine movement caused by radio devices or mobile phones**

Using radio devices, cellphones, or mobile WLAN devices in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices, cellphones or WLAN devices.
- Use the "SIEMENS Industry Online Support App" or a QR code scanner only on equipment that has already been switched off.

**NOTICE****Damage to motor insulation due to excessive voltages**

When operated on systems with grounded line conductors or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage against ground. If you use motors that have insulation that is not designed for operation with grounded line conductors, you must perform the following measures:

- IT system: Use a ground fault monitor and eliminate the fault as quickly as possible.
- TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.

 **WARNING****Fire due to inadequate ventilation clearances**

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

**NOTICE**

**Overheating due to inadmissible mounting position**

The device may overheat and therefore be damaged if mounted in an inadmissible position.

- Only operate the device in admissible mounting positions.



**WARNING**

**Unrecognized dangers due to missing or illegible warning labels**

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

**NOTICE**

**Device damage caused by incorrect voltage/insulation tests**

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.



**WARNING**

**Unexpected movement of machines caused by inactive safety functions**

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

**Note****Important Safety instructions for Safety Integrated**

If you want to use Safety Integrated functions, you must observe the Safety instructions in the Safety Integrated documentation.

 **WARNING****Malfunctions of the machine as a result of incorrect or changed parameter settings**

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

 **WARNING****Injury caused by moving or ejected parts**

Contact with moving motor parts or drive output elements and the ejection of loose motor parts (e.g. feather keys) out of the motor enclosure can result in severe injury or death.

- Remove any loose parts or secure them so that they cannot be flung out.
- Do not touch any moving parts.
- Safeguard all moving parts using the appropriate safety guards.

 **WARNING****Fire due to incorrect operation of the motor**

When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors.

- Operate the motor according to the relevant specifications.
- Only operate the motors in conjunction with effective temperature monitoring.
- Immediately switch off the motor if excessively high temperatures occur.



**CAUTION**

**Burns and thermal damage caused by hot surfaces**

Temperatures above 100 °C may occur on the surfaces of motors, converters, and other drive components.

Touching hot surfaces may result in burns. Hot surfaces may damage or destroy temperature sensitive parts.

- Ensure that temperature-sensitive parts do not come into contact with hot surfaces.
- Mount drive components so that they are not accessible during operation.

Measures when maintenance is required:

- Allow drive components to cool off before starting any work.
- Use appropriate personnel protection equipment, e.g. gloves.

## 2.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.



**NOTICE**

**Equipment damage due to electric fields or electrostatic discharge**

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

## 2.3 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. Application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

## 2.4 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit

<https://www.siemens.com/industrialsecurity>.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

<https://www.siemens.com/cert>.

Further information is provided on the Internet:

Industrial Security Configuration Manual (<https://support.industry.siemens.com/cs/ww/en/view/109810578>)

### WARNING

#### Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- On completion of commissioning, check all security-related settings.

## 2.5 Residual risks of power drive systems

When assessing the machine or system-related risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer or system integrator must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
  - Hardware faults and/or software errors in the sensors, control system, actuators, and connections
  - Response times of the control system and of the drive
  - Operation and/or environmental conditions outside the specification
  - Condensation/conductive contamination
  - Parameterization, programming, cabling, and installation errors
  - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
  - External influences/damage
  - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures inside and outside the components, including open flames, as well as emissions of light, noise, particles, gases, etc. due to fault conditions, e.g.:
  - Component failure
  - Software errors
  - Operation and/or environmental conditions outside the specification
  - External influences/damage
  - Short circuits or ground faults in the intermediate DC circuit of the converter
3. Hazardous shock voltages caused by, for example:
  - Component failure
  - Influence during electrostatic charging
  - Induction of voltages in moving motors
  - Operation and/or environmental conditions outside the specification
  - Condensation/conductive contamination
  - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly



6. Influence of network-connected and wireless communications systems, e.g. ripple-control transmitters or data communication via the network or mobile radio, WLAN or Bluetooth.
7. Motors for use in potentially explosive areas:  
When moving components such as bearings become worn, this can cause enclosure components to exhibit unexpectedly high temperatures during operation, creating a hazard in areas with a potentially explosive atmosphere.

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.



## Reference to risks regarding food

Special risks occur when the motor is used in food processing machinery. More detailed information is provided in section "Mounting instructions when using the motor in food processing machinery (compliance with EHEDG) (Page 148)".



# Overview

## 4.1 System overview

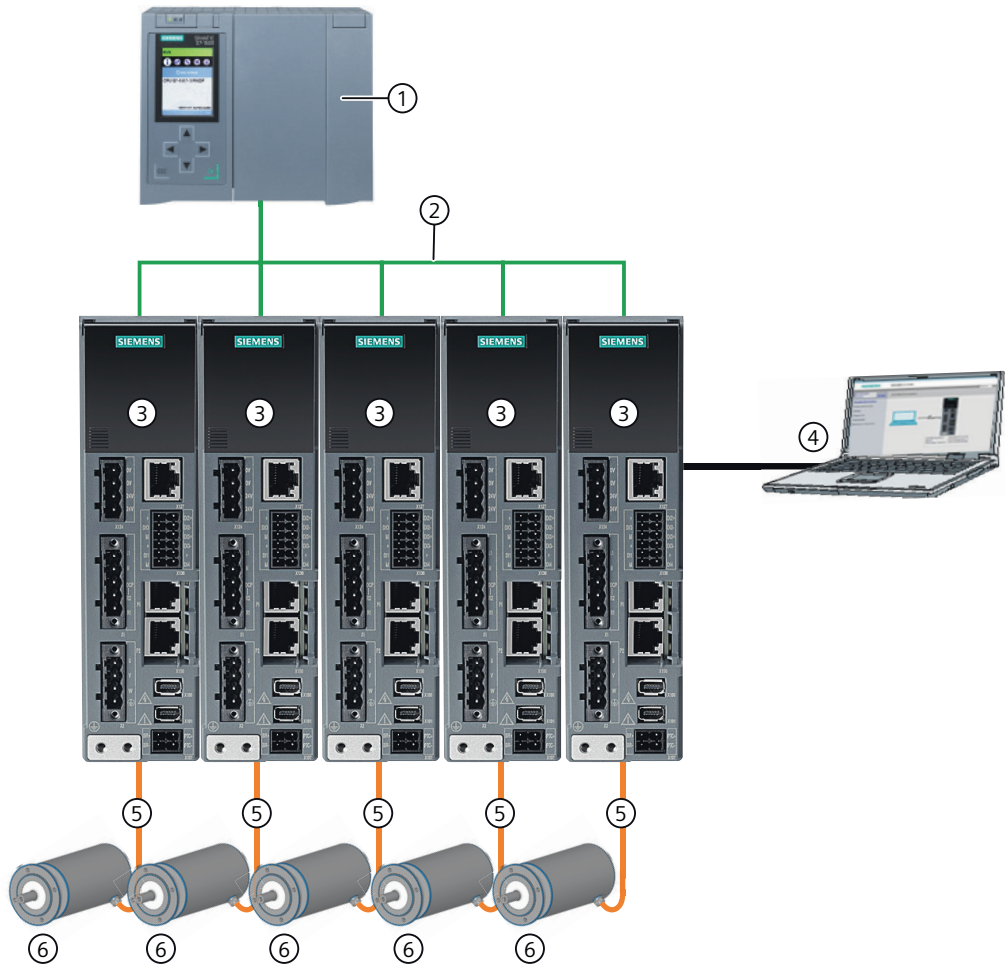
The drive system comprises the following system components tailored to one another:

- SINAMICS S210 converter with firmware V6.1 or higher
- SIMOTICS S-1FS2 motor
- OCC MOTION-CONNECT cable (OCC = "One Cable Connection") with connector or free cable ends

The converter and the motor are intended for use with a higher-level controller (PLC).  
Connection to the controller is via PROFINET:

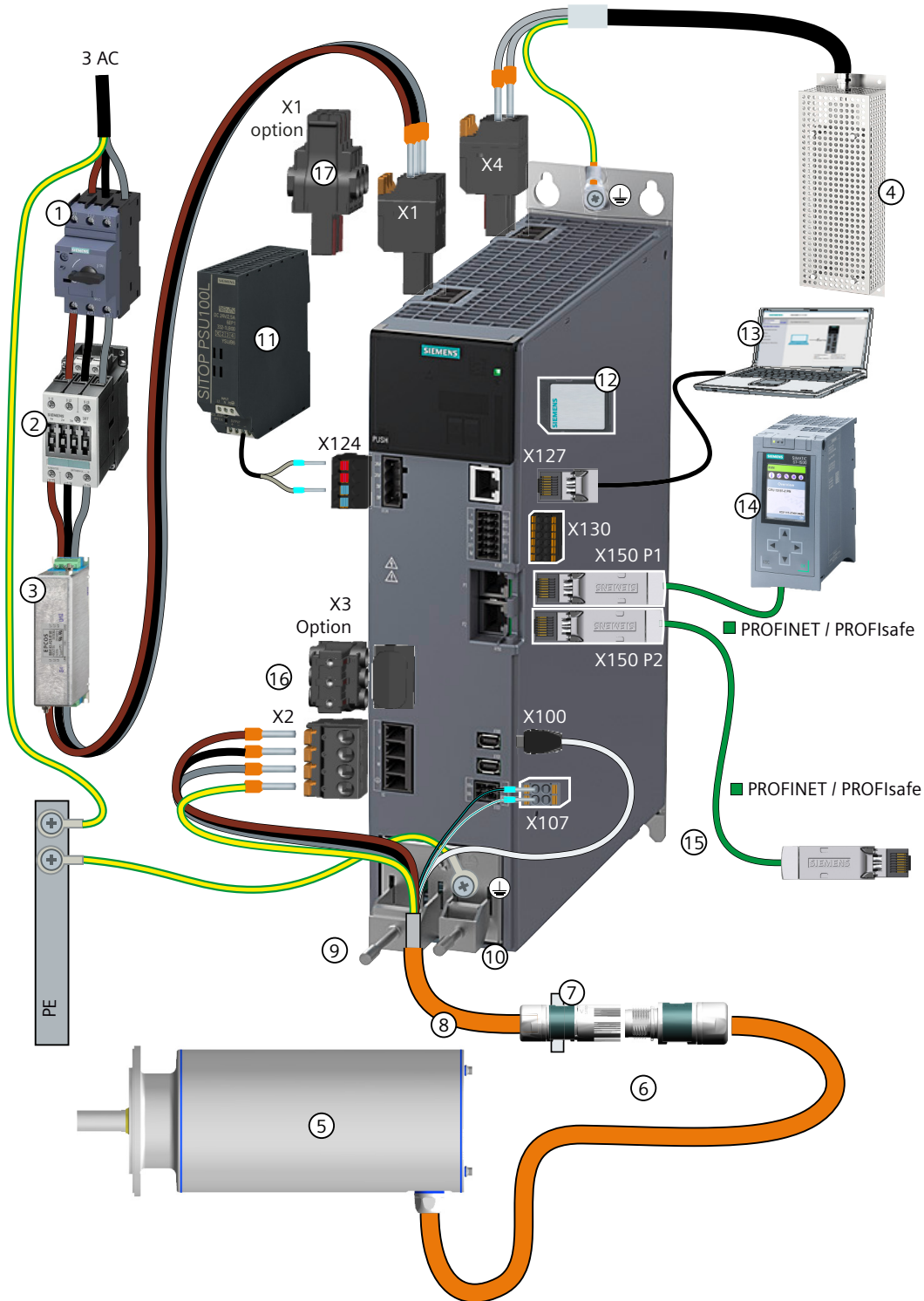
Prefabricated MOTION-CONNECT cables in various lengths are available to simply connect the motor to the converter and to ensure safe and reliable operation.

4.1 System overview



- ① Controller (PLC), e.g. SIMATIC S7-1500
- ② Communication between the converter and the controller via PROFINET
- ③ SINAMICS S210 converter
- ④ Operating unit, e.g. a PC with a LAN connection to the web server in the converter
- ⑤ OCC MOTION-CONNECT cable for the power connection, the motor holding brake, and the encoder
- ⑥ SIMOTICS S-1FS2 motor

Figure 4-1 System



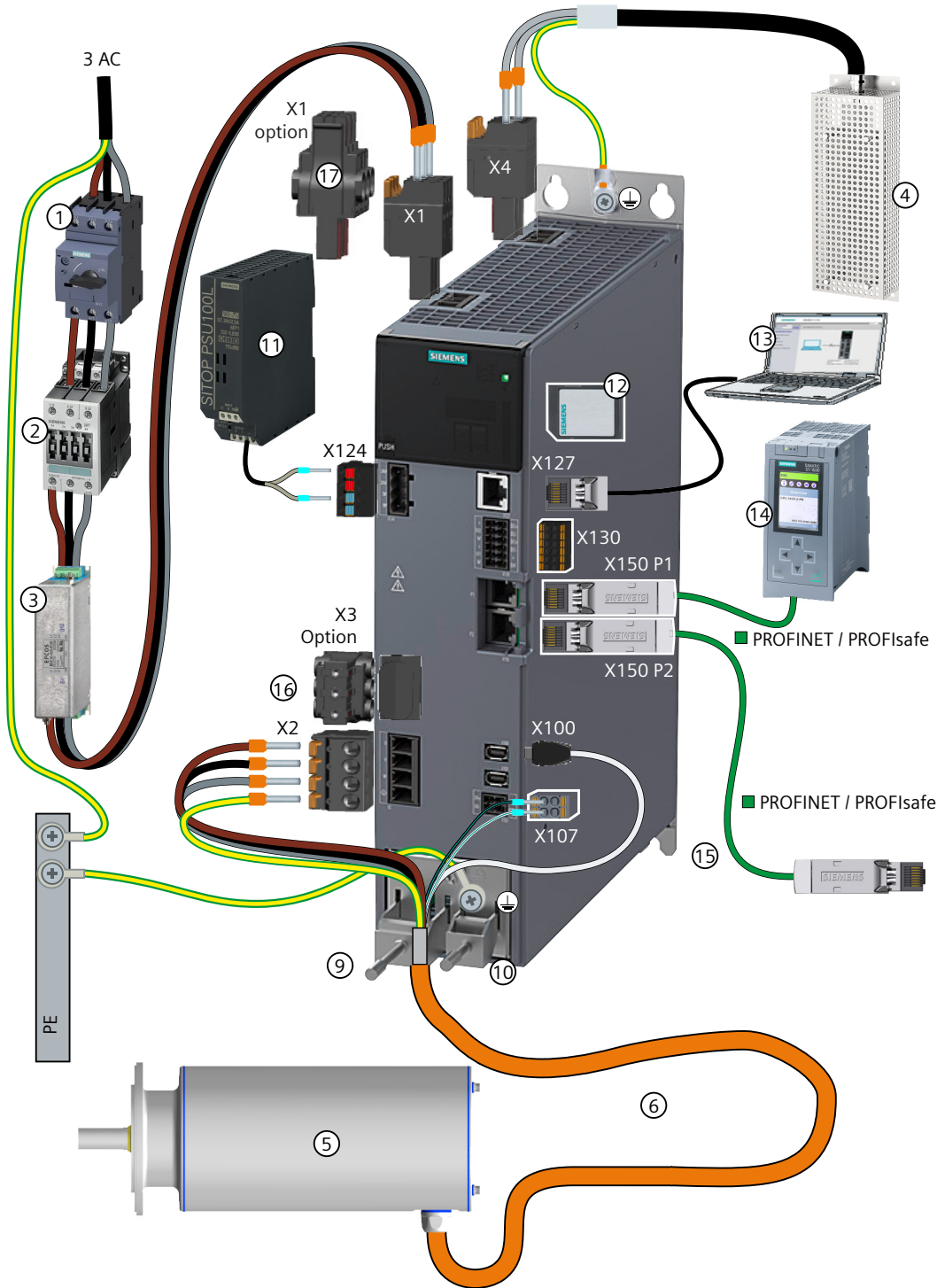
- |  |                      |
|--|----------------------|
| ① Fuse or circuit breaker              | ⑨ Shield clamp       |
| ② Line contactor (optional)            | ⑩ Shield plate       |
| ③ Line filter (optional)               | ⑪ 24 V power supply  |
| ④ External braking resistor (optional) | ⑫ SD card (optional) |

#### 4.1 System overview

- |   |   |   |   |
|---|---|---|---|
| ⑤ | Servo motor 1FS2  | ⑬ | Operating unit, e.g. PC with a LAN connection to the web server in the converter          |
| ⑥ | OCC extension cable (optional)                                  | ⑭ | Controller, e.g. SIMATIC S7-1500  |
| ⑦ | Mounting flange for control cabinet bushing (optional)          | ⑮ | PROFINET/PROFIsafe to the next participant  |
| ⑧ | OCC connection cable for motor, motor holding brake and encoder | ⑯ | X1: Connector for line cabling (optional)<br>X3: Connector for DC link cabling (optional) |

Figure 4-2 System overview 3 AC for 1FS2 with OCC cable and connector





- |  |                      |
|--|----------------------|
| ① Fuse or circuit breaker              | ⑨ Shield clamp       |
| ② Line contactor (optional)            | ⑩ Shield plate       |
| ③ Line filter (optional)               | ⑪ 24 V power supply  |
| ④ External braking resistor (optional) | ⑫ SD card (optional) |

### 4.3 The scope of supply for the system components

- |   |   |
|---|---|
| ⑤ Servo motor 1FS2  | ⑬ Operating unit, e.g. PC with a LAN connection to the web server in the converter          |
| ⑥ OCC connection cable for motor, motor holding brake and encoder | ⑭ Controller, e.g. SIMATIC S7-1500  |
| ⑦ Not available   | ⑮ PROFINET/PROFIsafe to the next participant  |
| ⑧ Not available   | ⑯ X1: Connector for line cabling (optional)<br>X3: Connector for DC link cabling (optional) |

Figure 4-3 System overview 3 AC for 1FS2 with OCC cable and free cable ends

## 4.2 Commissioning tools

### Overview

The web server and Startdrive commissioning tools are available for commissioning and configuring the converter.

### Description

#### Web server

The web server commissioning tool is an **online tool** for the complete life cycle of a drive application. The web server is integrated in the SINAMICS converter.

The web server offers functions for online commissioning, for diagnostics, for local operation and monitoring as well as for carrying out service and maintenance work. This means that the web server is suitable as universal tool for SINAMICS drives locally and directly **online**.

#### Startdrive

The Startdrive commissioning tool is an **offline and online tool** to support all usage phases of a drive application. Startdrive is installed on an external system (e.g. PC with Windows 11 Professional) and is integrated in the TIA Portal.

Startdrive provides all functions that are required for editing drive applications both offline and online. As a consequence, the entire engineering process for configuring, commissioning, optimizing and maintaining & updating drive solutions while operational is addressed both **offline and online**.

## 4.3 The scope of supply for the system components

You must order the following components individually.

### Motor

Included in the scope of supply:

- A "Safety instructions" sheet
- A sheet referencing links to product information

- A second rating plate to attach to the plant documentation or for fastening to the cabinet
- Flange seal

## Converter

The components listed below are included in the scope of delivery:

### For all converters

- A "Safety instructions" sheet
- A warning label for affixing in the control cabinet
- X2: Connector for motor connection
- X107: Connector for motor holding brake
- X124: Connector for 24 V DC supply voltage
- X130: Connector for digital inputs

### For converters with 1 AC line connection

- Shield plate
- X1: Connector for line connection and external braking resistor (jumper for internal braking resistor is included)

### For converters with 3 AC line connection

- The shield plate for frame size FSA  
For frame sizes FSB and FSC, the shield connection is integrated in the converter itself.
- X1: Connector for line connection
- X4: Connector for external braking resistor (jumper for internal braking resistor is included)
- X3: Cover for DC link connection

---

### Note

All connectors are designed so that they cannot be inadvertently interchanged.

---

## MOTION-CONNECT cable (OCC cable)

The scope of supply for the prefabricated MOTION-CONNECT cables includes:

- The MOTION-CONNECT cable with assembled connectors for connecting to motors and encoders
- A shield clamp for the connection of the shield to the shield plate of the converter
- A safety data sheet

Details of the MOTION-CONNECT OCC cables can be found in section "Ordering data of the connection system (Page 458)".

## Optional accessories

The optional accessories are listed in section "Accessories (Page 427)".

## 4.4 Motor

### 4.4.1 Properties and characteristics

SIMOTICS S-1FS2 motors, referred to as "1FS2" in this document, are permanent-magnet excited compact synchronous motors with integrated encoder and a high degree of protection.

1FS2 motors comply with the requirements of standards EN 60034 as well as EN 60204-1 and comply with the Low-Voltage Directive 2014/35/EU.

Where applicable, 1FS2 motors comply with the requirements of standards EN ISO 14159 (hygiene requirements) and EN 1672-2 (food processing machinery).

### Torque range

- 3.1 Nm for a 1 AC 230 V line supply
- 3.1 Nm ... 23.5 Nm for a 3 AC 240 V line supply
- 3.1 Nm ... 23.5 Nm for a 3 AC 400 V line supply

### Degree of protection

- IP66/67 at the motor enclosure and shaft extension
- IP69K according to ISO 20653 at the motor enclosure.

You can find more information on the degree of protection in Chapter "Degree of protection (Page 375)".

### Cooling

The 1FS2 is a non-ventilated motor.

The motor thermal losses are dissipated by thermal conduction, thermal radiation and natural convection.

If the ambient temperature exceeds 40 °C (104 °F) or the installation altitude 1000 meters above sea level, you must reduce torque and power of the motor (derating).

Information on derating can be found in Chapter "Derating factors (Page 372)".

Observe the instructions for mounting the motor in Chapter "Cooling (Page 371)".

### Bearing version

The motors have deep groove ball bearings with life-long lubrication.

The average bearing service life is designed for 25000 operating hours.

The motors have spring-loaded bearings in the NDE direction. For version with holding brake, the NDE bearing is a locating bearing.

The permissible axial and radial forces can be found in the technical specifications in Chapter "Axial and radial forces (Page 381)".

## Shaft extension

The motors are available with two different shaft extensions.

- Cylindrical shaft without feather key
- Cylindrical shaft with feather key (half-key balancing)

You can find more information in Chapter "Shaft extension (Page 379)".

## Encoder

The encoder resolution is 22 bits per revolution. The encoder is also equipped with a 12 bit revolution counter. This corresponds to a traversing range of 4096 revolutions.

The encoder designation is AM22DQC.

You can find more information in Chapter "Available encoders (Page 386)".

## Holding brake

The 1FS2 motor can be supplied with an integrated holding brake.

The holding brake closes in the current-free state and locks the motor shaft at a standstill. When current flows, the holding brake opens and releases the motor shaft.

SINAMICS S210 controls the holding brake without any additional devices.

The holding brake is not a working brake for braking the rotating motor. Limited EMERGENCY STOP operation is permissible.

Holding brake data are provided in Chapter "Data of the holding brake (Page 386)".

## Connection variants

The motor connection cable of the 1FS2 enables pressure equalization in the motor.

The motor connection cable is available in two versions.

- Connection variant Q0□: Pressure equalization via the motor connection cable with free cable ends
- Connection type Q1□: Pressure equalization via the motor connection cable with SPEED-CONNECT coupling M17 or M23

You can find more information in Chapter "Connection system (Page 376)".

### Rating plate

The rating plate contains the article number and the technical data of the motor.

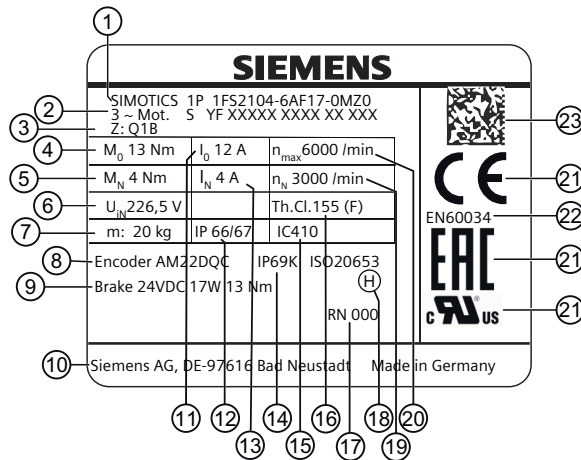


Figure 4-4 Rating plate

Position	Description / technical specifications	Position	Description / technical specifications
1	Article number	13	Rated current $I_N$
2	ID No., serial number	14	Degree of protection according to ISO 20653
3	Order code for the connection system	15	Cooling method according to EN 60034-6
4	Static torque $M_0$	16	Temperature class of the insulation system
5	Rated torque $M_N$	17	Revision
6	Induced voltage at rated speed $U_{IN}$	18	Type of balancing (only for motors with feather key)
7	Motor weight $m$	19	Rated speed $n_N$
8	Marking of encoder type	20	Maximum speed $n_{max}$
9	Data of the holding brake	21	Certifications
10	Manufacturer's address	22	Standard for all rotating electrical machines
11	Stall current $I_0$	23	Data matrix code
12	Degree of protection acc. to EN 60034-5		

## 4.5 Motor-converter combinations

### 4.5.1 Motor-converter combinations for 1 AC 200 ... 240 V

The following table lists recommended combinations of converters with a 1 AC 200 V ... 240 V line connection and motors with the associated connection cables.

Table 4-1 Converter with line connection 1 AC 200 V ... 240 V

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque $M_0$ / Nm	Rated power $P_N$ / kW	Article number 6SL5310-1BB10-...	Connector size	Article number 6FX□002-8Q... <sup>1)</sup>
1FS2104-6AF	3.1	0.45	...8CF0	M17	...N08... (0.75 mm <sup>2</sup> / AWG19)

<sup>1)</sup> Only for motors with option Q1□

### 4.5.2 Motor-converter combinations for 3 AC 200 ... 240 V

The following table lists recommended combinations of converters with a 3 AC 200 V ... 240 V line connection and motors with the associated connection cables.

Table 4-2 Converter with 3 AC 200 V ... 240 V line connection

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque $M_0$ / Nm	Rated power $P_N$ / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX□002-8Q... <sup>1)</sup>
1FS2104-6AF	3.1	0.8	...1-ODF0	M17	...N08... (0.75 mm <sup>2</sup> / AWG19)
1FS2105-6AF	7.6	0.97	...2-ODF0		
1FS2106-6AE	14	1.47	...5-ODF0	M23	...N11... (1.5 mm <sup>2</sup> / AWG16)
1FS2106-6AF		1.73			
1FS2208-5AC	23.5	2.04	...7-ODF0		

<sup>1)</sup> Only for motors with option Q1□

### 4.5.3 Motor-converter combinations for 3 AC 380 ... 480 V

The following table lists possible combinations of converters with a 3 AC 380 V ... 480 V line connection and motors with the associated connection cables.

Table 4-3 Converter with 3 AC 380 V ... 480 V line connection

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque $M_0$ / Nm	Rated power $P_N$ / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX□002-8Q... <sup>1)</sup>
1FS2104-6AF	3.1	0.8	...1-ODF0	M17	...N08... (0.75 mm <sup>2</sup> / AWG19)
1FS2105-6AF	7.6	1.29	...2-ODF0		
1FS2106-6AF	14	1.81	...5-ODF0	M23	...N11... (1.5 mm <sup>2</sup> / AWG16)
1FS2106-6AF		1.95			
1FS2208-5AC	23.5	2.51	...7-ODF0		

<sup>1)</sup> Only for motors with option Q1□



## 4.6 Converter

The converter is a single-axis device (complete converter with integrated infeed). It is characterized by a compact design, side-by-side installation and high overload capability.

The converter is intended for use with 1FS2 motors and is available in the following versions:

- Line connection voltage 1 AC 230 V (200 V ... 240 V)  
Power range 0.75 kW
- Line connection voltage 3 AC 240 V (200 V ... 240 V) and 3 AC 400 V (380 V ... 480 V)  
Power range when connected to 3 AC 400 V: 0.4 kW ... 7 kW

### Control type

Servo control, optimized for 1FS2 motors

### Safety Integrated Functions

The converter offers the following Safety Integrated Functions:

Table 4-4 Safety Integrated Functions

Functions	Abbr.	Brief description
Safe Torque Off	STO	Safe Torque Off according to stop Category 0
Safe Stop 1	SS1	Safe stopping process according to Stop Category 1
Safe Brake Control	SBC	Safe brake control
Safe Speed Monitor	SSM	Safe output signal to monitor speed limits
Safe Direction	SDI	Safe monitoring of the direction of motion
Safely-Limited Speed	SLS	Safe speed monitoring

You can find more information in Chapter "Selection of the Safety Integrated Functions (Page 121)".

### Integrated braking resistor

In order to absorb the regenerative load of the motor, converters have an internal braking resistor (exception: 100 W device)<sup>1)</sup>.

If the internal braking resistor is not sufficient, you have the option of connecting an external braking resistor.

More information:

- "Configuring the braking resistor (Page 78)"
- "Connecting the converter (Page 162)"

<sup>1)</sup> An internal braking resistor is not required for normal operation (as a result of the available DC link capacitance).

### DC link coupling (devices of the 3 AC series only)

For devices of the 3 AC series, the DC links of up to 6 converters can be coupled. This means that energy balancing between axes is possible, and the braking energy of an axis can be used by other axes when accelerating. This also reduces the dissipated heat in the control cabinet because the braking energy no longer has to be converted into heat in the braking resistor.

More information:

- "DC link coupling (for converters with 3 AC line connection) (Page 85)"

### Communicating with the controller via PROFINET

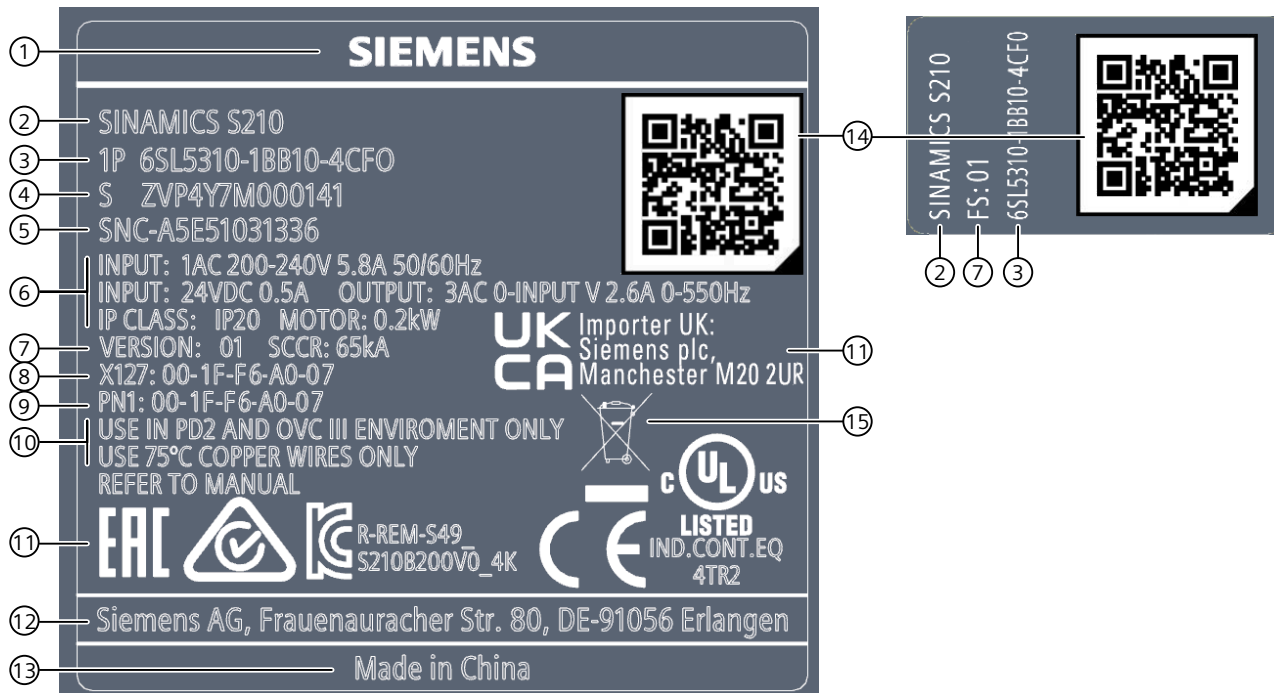
The converter supports the following functions:

- RT (real time)
- IRT (isochronous real time) with the telegrams 5 and 105
- MRP (media redundancy) with RT
- MRPD (seamless media redundancy) with IRT
- Shared device
- PROFIsafe
- PROFlenergy
- Automatic telegram selection

### Commissioning, operator control and monitoring and data backup

- Web server (integrated in the converter):  
"Commissioning (web server) (Page 187)"
- Startdrive (commissioning software):  
"Commissioning (Startdrive) (Page 241)"

### Nameplate, information plate and date of manufacture - 1 AC



- ① Manufacturer
- ② Product designation
- ③ Article number
- ④ Serial number
- ⑤ Material number
- ⑥ Electrical data and degree of protection
- ⑦ Function release/version
- ⑧ MAC address of the service interface
- ⑨ MAC address of the PROFINET interface
- ⑩ Environmental conditions
- ⑪ Certificate examples
- ⑫ Manufacturer's address
- ⑬ Production location
- ⑭ ID link
- ⑮ Note on disposal

#### Date of manufacture

The date of manufacture of the converter is coded in the serial number:

S Z V P 4 Y 7 M 0 0 0 1 4 1

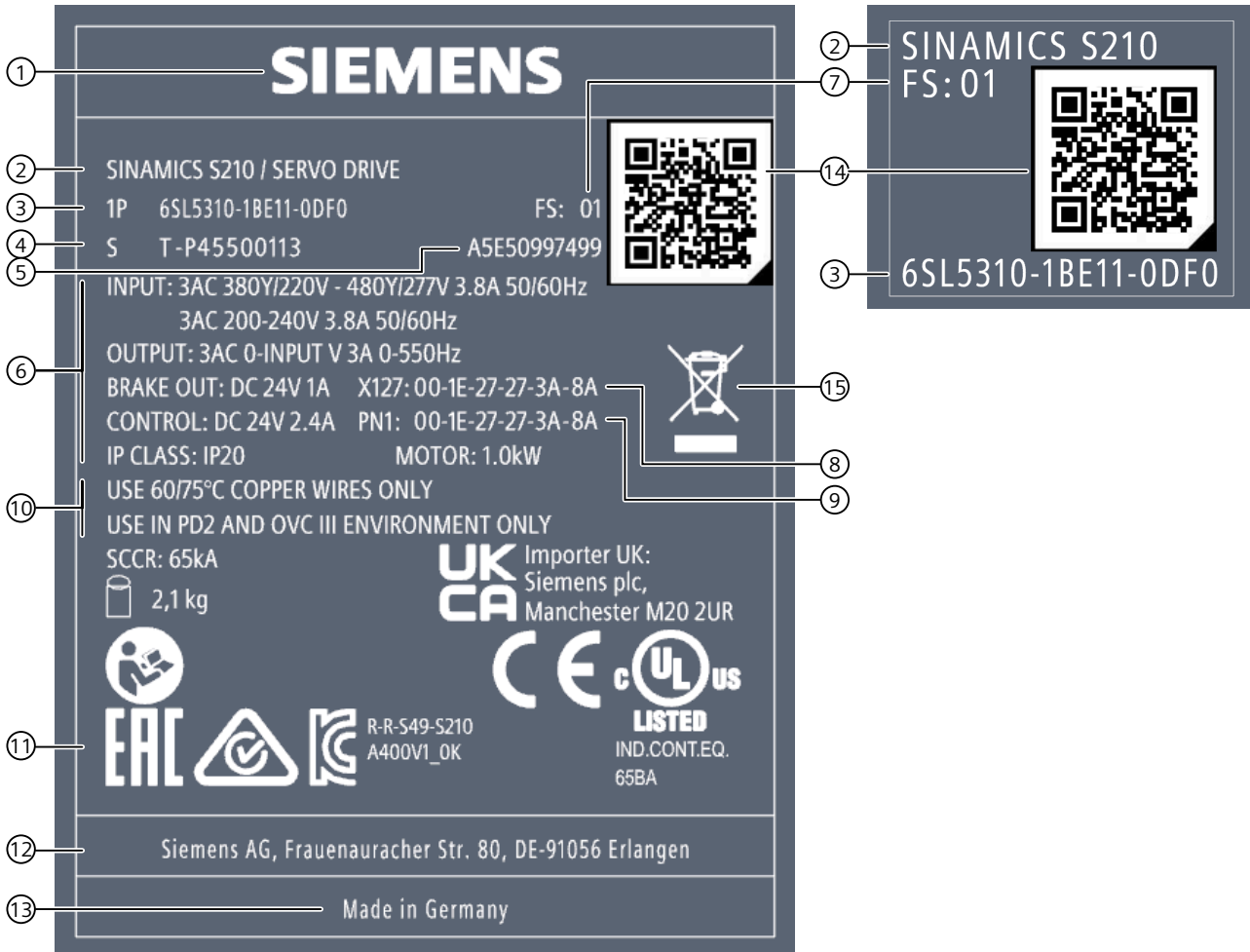
Month of manufacture			
1 January	2 February	3 March	4 April
5 May	6 June	7 July	8 August
9 September	0 October	N November	D December

Year of manufacture						
E 2014	F 2015	H 2016	J 2017	K 2018	L 2019	M 2020
N 2021	P 2022	R 2023	S 2024	T 2025	U 2026	V 2027
W 2028	X 2029					

Figure 4-5 Date of manufacture (example, April 2022)

**Nameplate, information plate and date of manufacture - 3 AC**



- |  |   |
|--|---|
| ① Manufacturer                             | ⑨ MAC address of the PROFINET interface |
| ② Product designation                      | ⑩ Environmental conditions              |
| ③ Article number                           | ⑪ Certificate examples                  |
| ④ Serial number                            | ⑫ Manufacturer's address                |
| ⑤ Material number                          | ⑬ Production location                   |
| ⑥ Electrical data and degree of protection | ⑭ ID link                               |
| ⑦ Function release/version                 | ⑮ Note on disposal                      |
| ⑧ MAC address of the service interface     |   |

**Date of manufacture**

The date of manufacture of the converter is coded in the serial number:

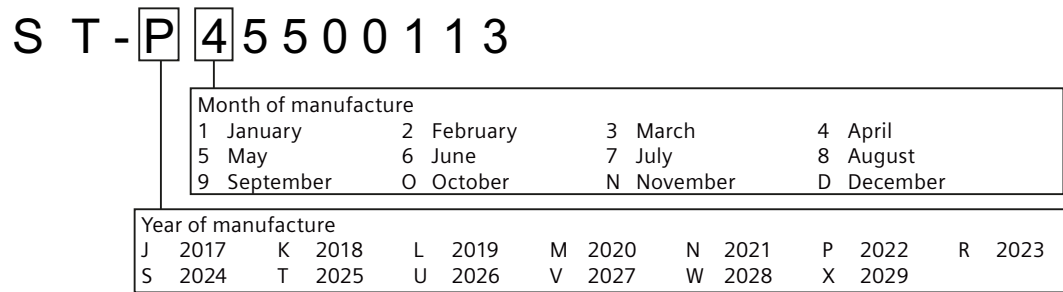


Figure 4-6 Date of manufacture (example, April 2022)

## 4.7 Connection system

The motor is connected to the converter by a MOTION-CONNECT cable.

The cable uses all-in-one cable technology (One Cable Connection, OCC cable). As a result of its flexibility and low diameter, it permits very tight bending radii.

The OCC cables are available in the following variants:

- MOTION-CONNECT 500
  - Cost-effective solution for mainly fixed installation
  - Suitable for low mechanical loading
- MOTION-CONNECT 800PLUS
  - Fulfills the requirements for use in cable carriers
    - Tested for horizontal traversing paths up to 50 m
    - Not self-supporting
  - Suitable for high mechanical loading
  - Oil-resistant
- MOTION-CONNECT 400
  - For use in the food processing industry
  - FEP is used as the outer sheath
  - With integrated flexible tube for pressure equalization

The OCC cables can be supplied in lengths by the decimeter.

Extensions and cabinet bushings are available for the OCC cables.

You will find more information at:

- "Connection system (Page 376)"
- "Determining the article number of a prefabricated OCC MOTION-CONNECT cable (Page 460)"
- "Technical data and properties of the connection system (Page 414)"

# Configuring

## 5.1 Permissible line supplies and connection options

### 5.1.1 Converters with 1 AC line connection

The converter is designed for grounded TN and TT line systems and non-grounded IT line systems according to IEC 60364-1 (2005).

You can find more information in Chapter "Line connection conditions for the S210 converter system with 1FS2 motors (Page 367)".

#### Connecting a converter to a 1 AC IT line system

You must remove the grounding screw when operating the converter on an IT line system. This means that you remove the connection of the integrated line filter to ground.

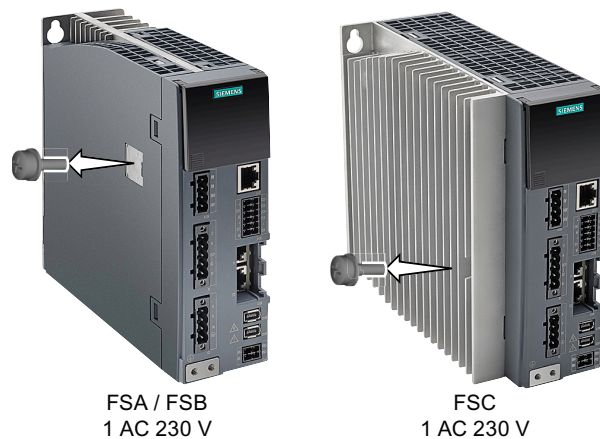


Figure 5-1 Removing the grounding screw

For converters, sizes FSA and FSB, the grounding screw is located behind a plastic cover. Open the cover, and after removing the grounding screw, close it again.

5.1 Permissible line supplies and connection options

Keep the grounding screw in a safe place in case it must be reinstalled.  
Type: M3, tightening torque: 0.8 Nm



<b>! WARNING</b>
<b>Electric shock when the grounding screw is removed</b>
As a result of the capacitors, a hazardous voltage is present at the grounding screw for up to 5 minutes after the line supply has been switched off.
Contact with live parts can result in death or serious injury.
<ul style="list-style-type: none"><li>• After switching off the supply voltage, wait for 5 minutes before you check that the device really is in a no-voltage condition and start work.</li></ul>

5.1.2 Converters with 3 AC line connection

The converter is designed for grounded TN and TT line systems and non-grounded IT line systems according to IEC 60364-1 (2005). Specific measures are required when connecting to IT line systems.

You can find more information in Chapter "Line connection conditions for the S210 converter system with 1FS2 motors (Page 367)".



<b>! WARNING</b>
<b>Electric shock when operating the converter without grounding screw</b>
If the converter is operated without a grounding screw, there is a risk of electric shock through contact with live parts when the cover is open or missing.
<ul style="list-style-type: none"><li>• Do not open the cover and do not remove the grounding screw.</li></ul>

<b>NOTICE</b>
<b>Destruction of the converter when operated without grounding screw</b>
Operating the converter with 3 AC line connection without grounding screw will destroy it.
<ul style="list-style-type: none"><li>• Do not remove the grounding screw.</li></ul>

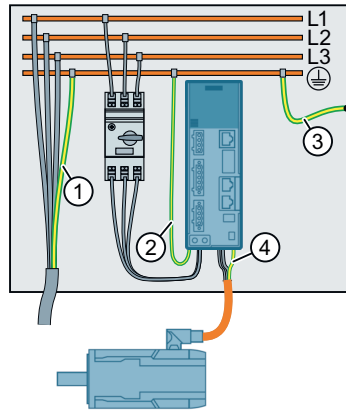
5.1.3 Permissible line system configurations for motors

In combination with the drive system, the motors are generally designed for grounded TN and TT line systems and non-grounded IT line systems.

You can find more information in Chapter "Line connection conditions for the S210 converter system with 1FS2 motors (Page 367)".



### 5.1.4 Minimum cross-section of the protective conductor



- ① The protective conductor (PE) must be dimensioned in accordance with the local installation rules for equipment with increased discharge currents. As a minimum, one of the following conditions must be satisfied:
  - The protective conductor is routed so that along its complete length it is protected against mechanical damage.
  - The protective conductor has a cross-section  $\geq 10 \text{ mm}^2 \text{ Cu}$ .  
For a cross-section  $< 10 \text{ mm}^2$  copper, a 2nd protective conductor with the same cross-section is provided.
  - When establishing the connection using an industrial plug connector according to EN 60309, the insulated conductor of a multi-conductor cable must have a cross-section  $\geq 2.5 \text{ mm}^2 \text{ Cu}$ .
  - As an insulated conductor of a multi-conductor cable, the protective conductor has a cross-section  $\geq 2.5 \text{ mm}^2 \text{ Cu}$ .
- ② The protective conductor must be dimensioned in compliance with local installation rules.
  - If each converter is individually protected, the protective conductor with the same cross-section must be routed in the same way as the line connecting cable to the converter.
  - If a group of converters is connected via the AC coupling, the protective conductor must be implemented as follows:
    - Group protection according to IEC: as a minimum  $6 \text{ mm}^2 \text{ Cu}$ <sup>1)</sup>
    - Group protection according to NEC/CEC: AWG 8 Cu<sup>2)</sup>
- ③ The cable cross-section must be dimensioned in compliance with local installation rules.
- ④ Same cross-section as the line conductor of the motor cable. The protective conductor is part of the OCC cable.

<sup>1)</sup> According to IEC 60364-5-54, Chap. 543.1.2

<sup>2)</sup> According to NEC (NFPA 70) Table 250.122 / CEC (CSA 22.1.18) Rule 10-6149

Figure 5-2 Protective connection concept

### 5.1.5 Connection options for converters with 1 AC line connection

#### Basic connection options

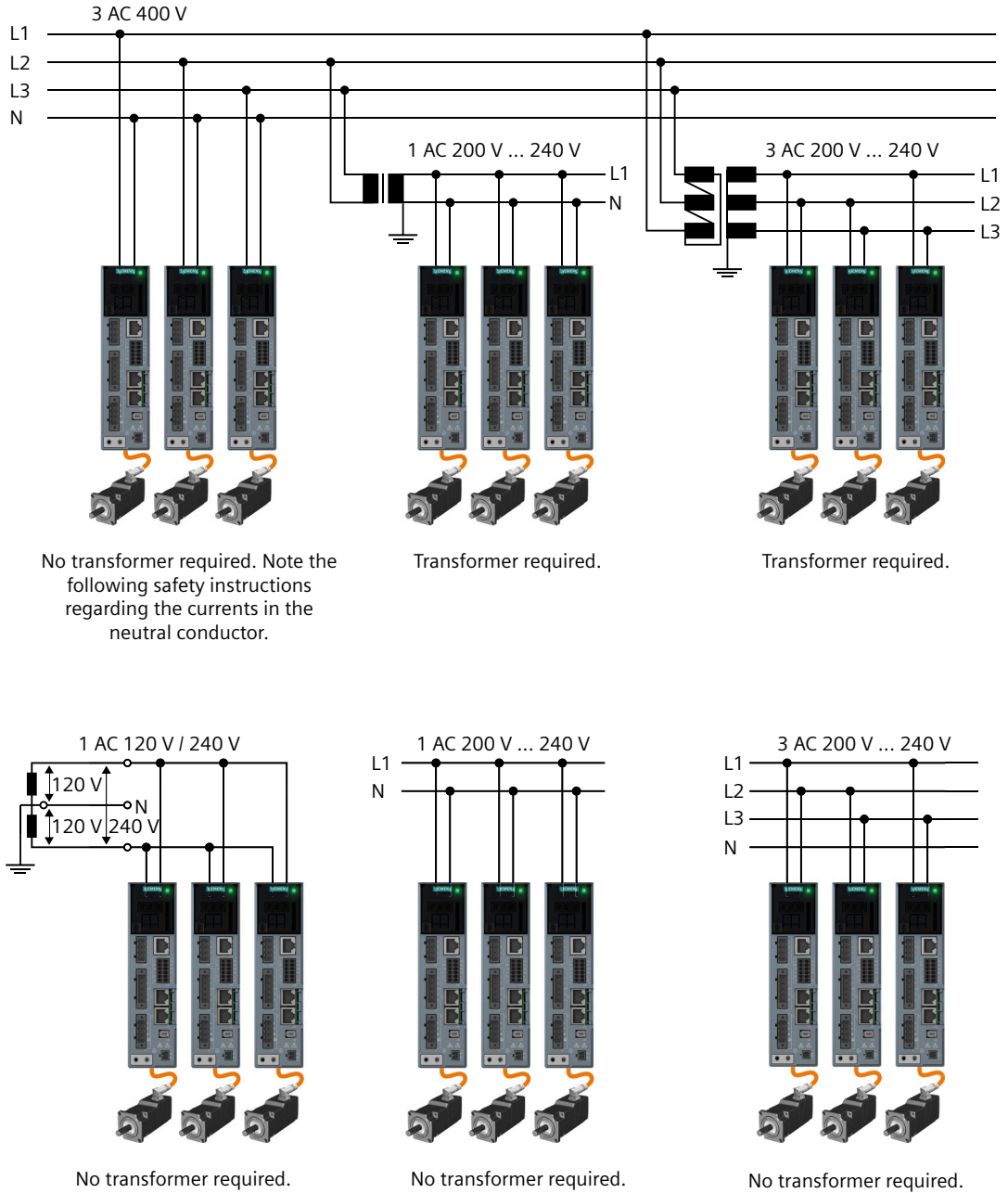


Figure 5-3 Connection options

** WARNING****Neutral conductor fire caused by high currents**

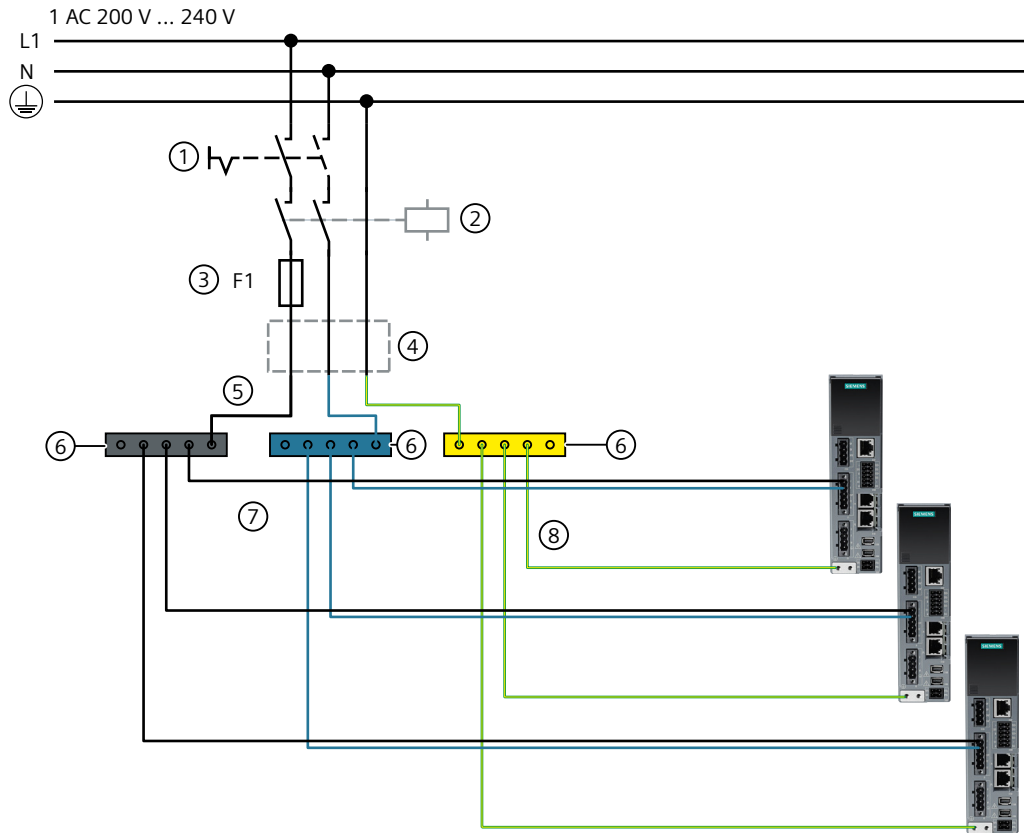
If you connect the converter without an isolating transformer to a supply system with 400 V 3 AC between the N-conductor and a line conductor (L1, L2 or L3), the harmonic currents in the N-conductor can add up to values that are greater than the currents in the line conductors. This heats up the N-conductor and can cause a fire.

- Take the harmonic currents into account when dimensioning the line connecting cables, e.g. according to DIN VDE 100-520 Insert 3.

**Connection examples and cable cross-sections**

The protective devices should be provided to protect the cable in the case of a short-circuit or ground fault. Overload converter protection is integrated in the converter itself.

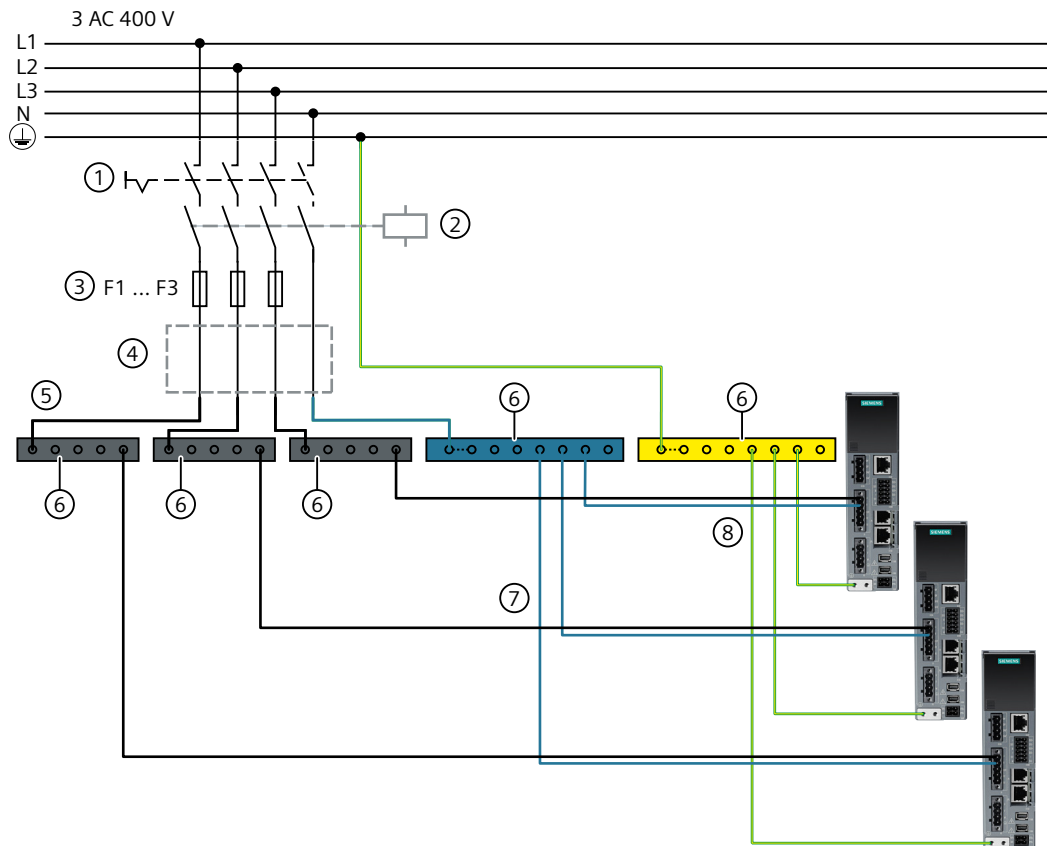
Connecting devices to line voltage 1 AC 230 V



- ① Line disconnecting device e.g. load disconnector
- ② Line contactor optional
- ③ Protective device for fault protection e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109815356>)")
- ④ Line filter (optional) 6SL3203-0BB21-8VA1 rated current 18 A  
In conjunction with the line filter, the sum of the rated input currents must not exceed 18 A. The rated current of the protective device ③ must be appropriately adapted.
- ⑤ Cable to the distribution block Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents.  
The same cross-section should be used for the protective conductor.
- ⑥ Distribution block
- ⑦ Line connection 0.75 mm<sup>2</sup> ... 2.5 mm<sup>2</sup> / AWG 18 ... AWG 12 in accordance with the installation conditions (type of cable routing and ambient temperature) and the local regulations
- ⑧ Protective conductor connection Same cross-section as the line connecting cable ⑦

Figure 5-4 Example for connecting devices to a line voltage of 1 AC 230 V

## Connecting devices to line voltage 3 AC 400 V



- |   |  |   |
|---|--|---|
| ① | Line disconnecting device              | e.g. load disconnector  |
| ② | Line contactor                         | optional  |
| ③ | Protective device for fault protection | e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 ( <a href="https://support.industry.siemens.com/cs/ww/en/view/109815356">https://support.industry.siemens.com/cs/ww/en/view/109815356</a> )") |
| ④ | Line filter (optional)                 | from third-party manufacturers  |
| ⑤ | Cable to the distribution block        | Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents.<br>The same cross-section should be used for the protective conductor.                           |
| ⑥ | Distribution block                     |   |
| ⑦ | Line connection                        | 0.75 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> / AWG 18 ... AWG 12 in accordance with the installation conditions (type of cable routing and ambient temperature) and the local regulations   |
| ⑧ | Protective conductor connection        | Same cross-section as the line connecting cable ⑦   |

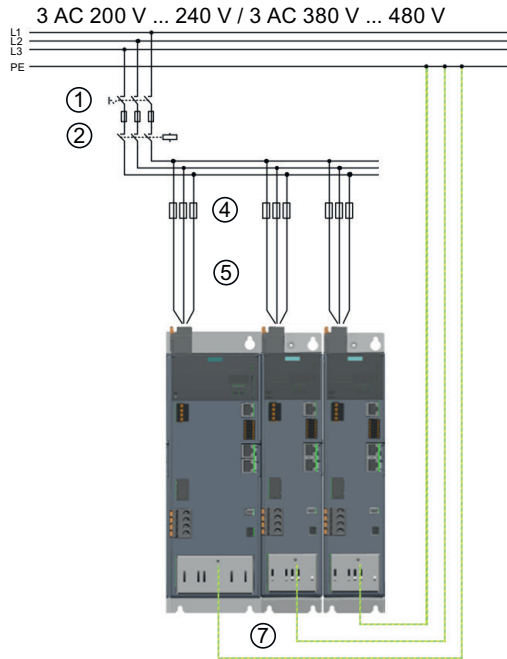
Figure 5-5 Example for connecting devices to a line voltage of 3 AC 400 V

### 5.1.6 Connection options for converters with 3 AC line connection

You can connect each converter individually via the standard terminals and the protective devices assigned to them in accordance with the local installation regulations or you can connect a group of converters via the optional AC coupling and a common protective device.

In addition, you can couple the DC links of up to 6 converters to exchange energy within this drive line-up. To couple the DC links, the line connections of the coupled converters must also be connected.

#### Individual connection using standard terminals



- ① Line disconnecting device      e.g. load disconnecter
- ② Line contactor                      optional
- ④ Protective device for fault protection      e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109815356>)")
- ⑤ Line connection                      1.5 mm<sup>2</sup> ... 6 mm<sup>2</sup> / AWG 16 ... AWG 10 in accordance with the conditions in the installation (type of cable installation and ambient temperature) and the local regulations
- ⑦ Protective conductor connection      Same cross-section as the line connecting cable ⑤

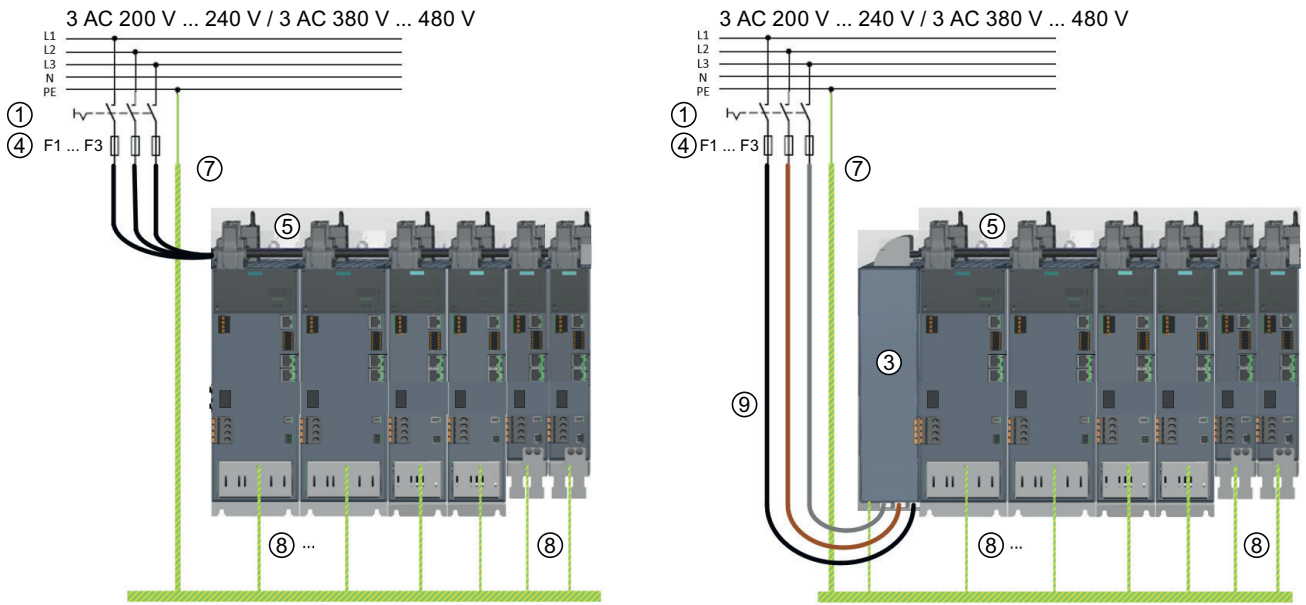
Figure 5-6 Individually connected converters via standard terminals

### Common connection via an AC coupling

You can connect a group of converters via a common protective device if you order the connector kit for AC coupling 6SL3260-2DC10-0AA0 (AC link) for each converter. It is not permissible that the sum of the rated input currents of the converter exceed the continuous current carrying capacity of the cables and/or the rated current of the optional line filter; see Section "Connecting DC links via the DC link coupling".

The connector in the connector kit for the AC coupling (16 mm<sup>2</sup>/AWG 6) replaces the line connector contained in the scope of delivery of the converter (6 mm<sup>2</sup>/AWG 10). The single-core cable is routed through this connector and electrical contact with the cable is made with a set screw. In this way, the line connections of a phase are connected via a cable for all converters (see also Chapter "Establishing the AC coupling and the DC link coupling (Page 177)").

5.1 Permissible line supplies and connection options



- ① Line disconnecting device e.g. load disconnector
- ③ Line filter (optional) 6SL3203-0BE23-5HA0: Rated current 35 A  
6SL3203-0BE26-5HA0: Rated current 65 A
- ④ Protective device for fault protection e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109815356>)")
- ⑤ Cables for the AC coupling For permissible cables for IEC, UL and CSA applications, see Chapter "Establishing the AC coupling and the DC link coupling (Page 177)"
- ⑦ Protective conductor For the cross-section according to ⑨  
minimum cross-section, see ⑧
- ⑧ Protective connection Group protection according to IEC:
  - 6 mm<sup>2</sup> / AWG 10
 Group protection according to NEC/CEC:
  - 6 mm<sup>2</sup> / AWG 10 for overcurrent protective devices up to 60 A
  - 10 mm<sup>2</sup> / AWG 8 for overcurrent protective devices up to 100 A
- ⑨ Cable to the line filter Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents.

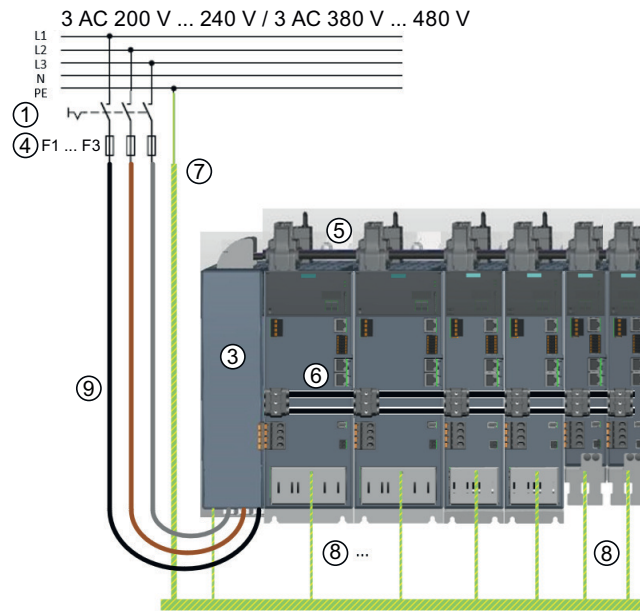
Figure 5-7 Converter with AC coupling (without/with line filter)

**DC links coupled via the DC link coupling**

You can couple the DC links of up to 6 converters to exchange energy within this drive line-up. To couple the DC links, the line connections of the coupled converters must also be connected. For each converter, order connector kit 6SL3260-2DC00-0AA0 for the AC and DC link coupling (AC and DC link).

The following figure shows the basic structure of such a system.





- |   |  |   |
|---|--|---|
| ① | Line disconnecting device              | e.g. load disconnecter  |
| ③ | Line filter (optional)                 | 6SL3203-0BE23-5HA0: Rated current 35 A<br>6SL3203-0BE26-5HA0: Rated current 65 A  |
| ④ | Protective device for fault protection | e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 ( <a href="https://support.industry.siemens.com/cs/ww/en/view/109815356">https://support.industry.siemens.com/cs/ww/en/view/109815356</a> )")   |
| ⑤ | Cables for the AC coupling             | For permissible cables for IEC, UL and CSA applications, see Chapter "Establishing the AC coupling and the DC link coupling (Page 177)"   |
| ⑥ | Cables for the DC link coupling        | same as ⑤   |
| ⑦ | Protective conductor                   | For the cross-section according to ⑨<br>minimum cross-section, see ⑧  |
| ⑧ | Protective connection                  | Group protection according to IEC: <ul style="list-style-type: none"> <li>• 6 mm<sup>2</sup> / AWG 10</li> </ul> Group protection according to NEC/CEC: <ul style="list-style-type: none"> <li>• 6 mm<sup>2</sup> / AWG 10 for overcurrent protective devices up to 60 A</li> <li>• 10 mm<sup>2</sup> / AWG 8 for overcurrent protective devices up to 100 A</li> </ul> |
| ⑨ | Cable to the line filter               | Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents.  |

Figure 5-8 Converters with AC coupling and DC link coupling

Note that for the cables for the line connection ⑤ and for coupling the DC links ⑥, only the specified cable types are permissible to achieve degree of protection IP20 and ensure reliable contacting.

The cables for the AC coupling ⑤ of a drive line-up must be loaded with no more than 65 A due to the plug-in connector. Calculate the permissible current-carrying capacity of the cables in accordance with the local installation regulations and make sure that the total of

5.1 Permissible line supplies and connection options

the rated input currents of all devices that are connected to a common AC coupling does not exceed the calculated current-carrying capacity of the cables or the optional line filter.

Example of a calculation according to IEC 60364-5-52:

- Cross-section: 16 mm<sup>2</sup>
- Insulating material: PVC
- No. of loaded conductors: 3
- Type of cable installation: E
- Ambient temperature: 50 °C
- Current carrying capacity: 56.8 A

Ambient temperature [°C]	Max. current at 70 °C cables [A]	Max. current at 90 °C cables [A]
40	65.0	65.0
45	63.2	65.0
50	56.8	65.0

For end use in the USA or Canada, the relevant national standards that apply there must be observed in installations.

The common protective device must disconnect the power supply of the drive line-up in the event of a fault without thermally overloading the AC coupling.

For suitable protective devices, see Product Information "Protective devices for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109815356>)".

The selection of the protective device can be as follows with estimation:

- Calculate the input current of group  $I_{L\_group}$  as the total of the rated input currents (see Chapter "Specific data of the converter with 3 AC line connection (Page 412)").
- The input current of group  $I_{L\_group}$  must be less than the current-carrying capacity  $I_z$  of the AC coupling.
- The rated current  $I_N$  of the protective device should be 25% greater than the previously calculated input current of the group. However, the maximum permissible rated current of the largest protective element according to "Protective devices for SINAMICS S210" must not be exceeded.

5.1.7 Line connection via protection and monitoring equipment

5.1.7.1 Overcurrent protective devices (mandatory)

Standard fuses for IEC and UL

Examples of suitable fuses are provided in the technical data.

Permissible protective devices are described for 3 connection types (1 AC, 3 AC and 3 AC with AC coupling) in the subsequent chapters with connection options for converters.

More detailed information is provided in the product information "Protective Devices for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109815356>)".

For installation in conformance with UL and cUL, additional information is provided in the Appendix: UL Markings (Page 725)".

### 5.1.7.2 Residual current devices (optional)

Residual current circuit breakers (RCCB) can be used in addition to overcurrent protective devices.

#### Using residual current circuit breakers for converters with 1 AC line connection

- Only use super-resistant (short time-delayed) type A or type B residual current circuit breakers.
- Use a residual current circuit breaker with a rated fault current of 300 mA.
- Carefully ensure that the loop impedance is maintained corresponding to local installation regulations.
- Only operate the system with the internal line filters or recommended external line filters.
- Ensure that the switching elements (disconnecter unit, contactors) for connecting and disconnecting the drive system have a delay time of max. 35 ms between the closing/opening of the individual main contacts.

#### Using residual current circuit breakers for converters with 3 AC line connection

- Only use super-resistant (short time-delayed) type B residual current circuit breakers.
- Use a residual current circuit breaker with a rated fault current of 300 mA.
- Carefully ensure that the loop impedance is maintained corresponding to local installation regulations.
- Only operate the system with the internal line filters or recommended external line filters.
- Ensure that the switching elements (disconnecter unit, contactors) for connecting and disconnecting the drive system have a delay time of max. 35 ms between the closing/opening of the individual main contacts.
- Install separate residual current circuit breakers for each converter or for a group of converters when using an AC coupling.



#### WARNING

##### **Electric shock or fire when using unsuitable residual current devices**

In the case of a fault, converters with 3 AC line connection can generate smooth DC fault currents, which means that type A or AC residual current circuit breakers cannot be used.

- Use the recommended type B residual current circuit breakers to protect converters.
- If higher-level residual current circuit breakers are used, then these must also be type B devices.

**Typical converter leakage currents**

**Note**

**Nuisance tripping of residual current circuit breakers**

For unfavorable line supply conditions, as a result of the inherent system, converters can generate capacitive discharge currents. These capacitive discharge currents can cause a residual current circuit breaker to unnecessarily trip (nuisance tripping).

**Typical leakage currents for converters with 1 AC line connection**

Table 5-1 Decision-making support/guide values for leakage currents of 1 AC devices<sup>1)</sup>

Device	$I_{cm}$ , typical 50 Hz component up to 240 V	$I_{cm}$ , typical 60 Hz component up to 240 V	$I_{cm}$ , typical Complete frequency spectrum for 50 Hz, up to 240 V
Frame size FSA	13 mA	15 mA	70 mA (maximum @ 8 kHz)
Frame size FSB	13 mA	15 mA	70 mA (maximum @ 8 kHz)
Frame size FSC	13 mA	15 mA	70 mA (maximum @ 8 kHz)
1 AC line filter (18 A)	7 mA	8 mA	A statement is not possible, as this depends heavily on the system
Supplementary filter (for additional load, three-phase)	40 mA	48 mA	

<sup>1)</sup> Actual values can deviate significantly from the data as a result of the dependency of the leakage current on the load, cable length, line voltage and frequency, component tolerances as well as the protective conductor connection.

By removing the grounding screw of the integrated line filter, for an appropriate configuration, multiples of the leakage currents of the complete frequency spectrum can occur from the table above.

**Typical leakage currents for converters with 3 AC line connection**

Table 5-2 Decision-making support/guide values for leakage currents of 3 AC devices<sup>1)</sup>

Device	$I_{cm}$ , typical 50 Hz component up to 480 V	$I_{cm}$ , typical 60 Hz component up to 480 V	$I_{cm}$ , typical Complete frequency spectrum for 50 Hz, up to 480 V
Frame size FSA	10 mA	12 mA	85 mA (maximum @ 8 kHz)
Frame size FSB	15 mA	17 mA	100 mA (maximum @ 750 Hz)
Frame size FSC	24 mA	29 mA	100 mA (maximum @ 750 Hz)

Device	$I_{cmr}$ typical 50 Hz component up to 480 V	$I_{cmr}$ typical 60 Hz component up to 480 V	$I_{cmr}$ typical Complete frequency spectrum for 50 Hz, up to 480 V
3 AC line filter (35 A and 65 A)	9 mA	11 mA	A statement is not possible, as this depends heavily on the system
Supplementary filter (for additional load, three-phase)	40 mA	48 mA	

<sup>1)</sup> Actual values can deviate significantly from the data as a result of the dependency of the leakage current on the load, cable length, line voltage and frequency, component tolerances as well as the protective conductor connection.

By removing the grounding screw of the integrated line filter, for an appropriate configuration, multiples of the leakage currents of the complete frequency spectrum can occur from the table above.

## 5.2 Configuring the motor

### 5.2.1 Configuration sequence

#### Motion Control

Drives are optimized for motion control applications. They execute linear or rotary movements within a defined travel cycle. All movements should be optimized in terms of time.

As a result, drives must meet the following requirements:

- High dynamic response, i.e. short rise times
- Capable of overload, i.e. a high reserve for accelerating
- Wide control range, i.e. high resolution for precise positioning.

The following table "Configuring procedure" is applicable for synchronous and induction motors.

**General configuring procedure**

The function description of the machine provides the basis for configuration. The components are selected according to physical interdependencies and the selection process is usually carried out in the following sequence of steps:

Table 5-3 Configuration sequence

step	Description of the configuring activity	
1.	Clarify the drive type	Refer to the next Chapter
2.	Define the constraints and incorporate them into the automation system	
3.	Define the load case, calculate the maximum load torque and determine the motor	
4.	Define the converter required	See the Catalog
5.	Repeat steps 3 and 4 for additional axes	
6.	Determine line-side power options (main switch, fuses, line filters, etc.)	
7.	Define other system components (e.g. braking resistors)	
8.	Calculate the current demand of the components for the 24 V DC power supply - and specify the power supplies (SITOP devices, Control Supply Modules)	
9.	Determine the connection system components	
10.	Configure the drive line-up components	
11.	Calculate the required cable cross sections for power supply and motor connections	
12.	Inclusion of mandatory installation clearances	

Observe also the recommended combinations of converters and motors with the associated connecting cables in the Chapter "Motor-converter combinations (Page 49)".

**More information**

We recommend using the "SIZER" configuration software to select the converter.

You can find additional information about SIZER on the Internet:

Download SIZER (<https://support.industry.siemens.com/cs/ww/en/view/54992004>)

**5.2.2 Clarify the drive type**

Select the motor on the basis of the required torque (load torque), which is defined by the application, e.g. traveling drives, hoisting drives, test stands, centrifuges, paper and rolling mill drives, feed drives or main spindle drives.

Gearboxes to convert motion or to adapt the motor speed and motor torque to the load conditions must also be taken into account when selecting the motor.

You must know the following mechanical data in order to determine the torque to be supplied by the motor:

- The load torque specified by the application
- Masses to be moved

- Diameter of the drive wheel
- Leadscrew pitch, gear ratios
- Frictional resistance data
- Mechanical efficiency
- Traversing distances
- Maximum velocity
- Maximum acceleration and maximum deceleration
- Cycle time

### 5.2.3 **Define the boundary conditions and incorporate them into the automation system**

When configuring, take into account the following:

- The line system configuration when using specific motor types and/or line filters
- Rated values of the motor
- The ambient temperatures and the installation altitude of the motors and drive components
- Heat dissipation from the motors

Other conditions apply when integrating the drives into an automation environment such as SIMATIC or SIMOTION.

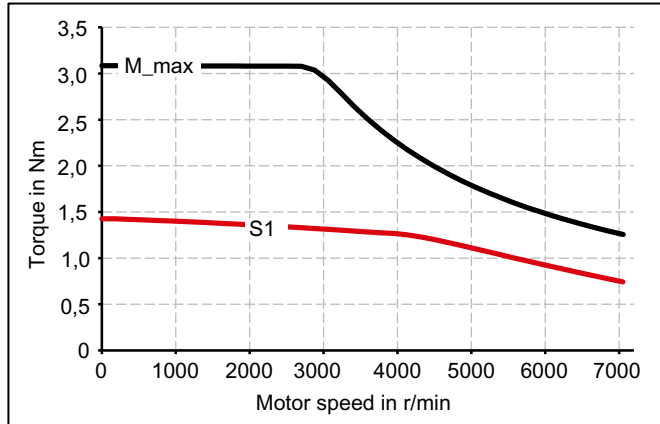
For motion control and technology functions (e.g. positioning), as well as for synchronous operation functions, the corresponding automation system, e.g. SIMATIC S7-1500 or SIMOTION D is used.

### 5.2.4 Define the load case, calculate the maximum load torque and determine the motor

The motors are defined bases on the motor type-specific limiting characteristic curves.

The limiting characteristic curves describe the torque or power curve over the speed.

The limiting characteristic curves take the limits of the motor into account on the basis of the DC-link voltage. The DC-link voltage is dependent on the line voltage.



M\_max Curve of the maximum torque

S1 S1 characteristic

Figure 5-9 Limit characteristics for synchronous motors

#### Procedure

1. Determine the load that is specified by the application itself. Use different characteristics for the different loads. The following operating scenarios have been defined:
  - Duty cycle with constant ON duration
  - Free duty cycle
2. Determine the characteristic torque and speed operating points of the motor for the defined load.
3. Calculate the acceleration torque of the motor. Add the load torque and the acceleration torque. to obtain the maximum required torque.
4. Verify the maximum motor torque with the limiting characteristic curves of the motors. The following criteria must be taken into account when selecting the motor:
  - Compliance with the dynamic limits  
All torque-speed points of the load must be below the relevant limiting characteristic curve.
  - Compliance with the thermal limits  
At average motor speed, the effective motor torque must be below the S1 characteristic (continuous motion) during the load.



### Duty cycles with constant ON duration

For duty cycles with constant ON duration, there are specific requirements for the torque characteristic curve as a function of the speed, for example:

$$M = \text{constant}, M \sim n^2, M \sim n \text{ or } P = \text{constant}$$

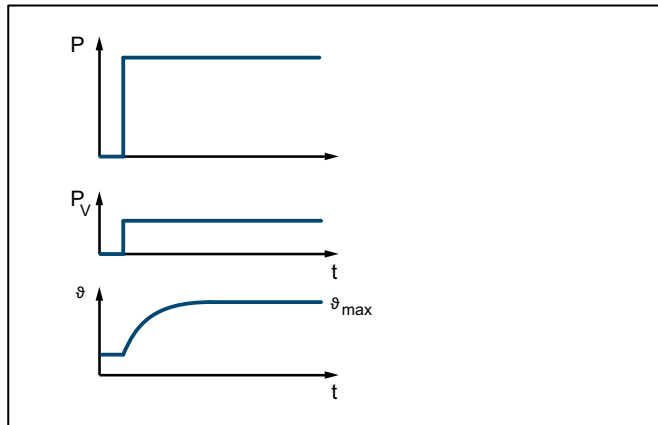
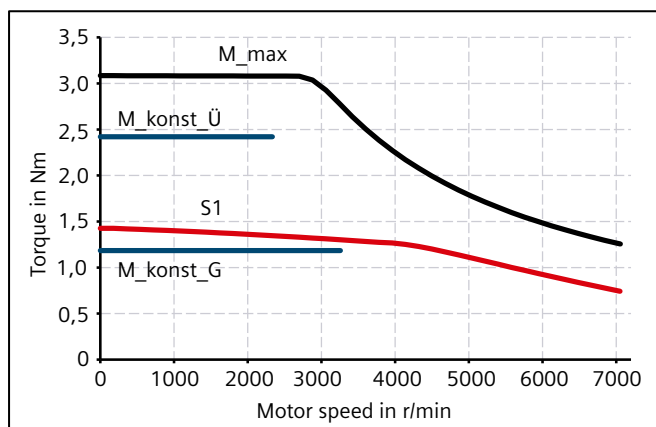


Figure 5-10 S1 duty (continuous motion)

The drives with this load cycle typically operate at a stationary operating point.

#### Procedure

1. Configure a base load for the stationary operating point. The base load torque must lie below the S1 characteristic.
2. In the event of transient overloads (e.g. during acceleration), configure an overload. Calculate the overload current in relation to the required overload torque. The overload torque must lie below the M\_max characteristic.  
In summary, the motor is configured as follows:



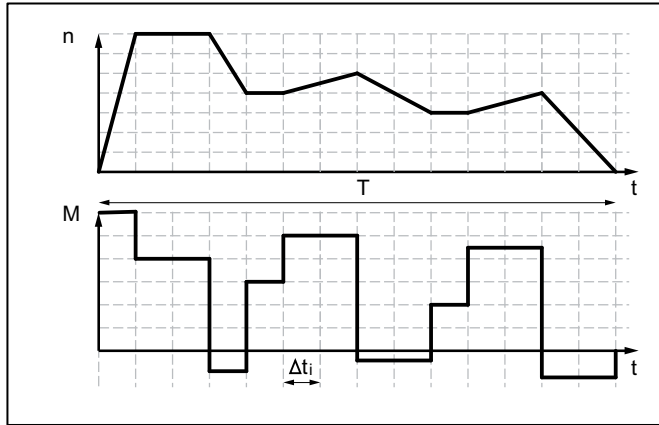
- |       |                             |            |                               |
|-------|-----------------------------|------------|-------------------------------|
| M_max | Curve of the maximum torque | M_const_ov | Curve of the overload torque  |
| S1    | S1 characteristic           | M_const_ba | Curve of the base load torque |
|       |                             | se         |                               |

Figure 5-11 Motor selection for a duty cycle with constant switch-on duration

3. Select a motor that satisfies the requirements of S1 duty.

**Free duty cycle**

A free duty cycle defines the curve of the motor speed and the torque over time.



$n$	Speed	$T$	Cycle time
$M$	Torque	$\Delta t_i$	Time interval
$t$	Time		

Figure 5-12 Example of free duty cycle

**Procedure**

Determine the required motor torque as follows:

- Define a load torque for each time slice. Also take the average load moment of inertia and motor moment of inertia into account for acceleration operations. If required, take a frictional torque into account that opposes the direction of motion.
- With mounted gearbox:  
Determine the load torque and the acceleration torque that must be supplied by the motor. Take the gear ratio and gear efficiency into account.

**Note**

A higher gear ratio increases positioning accuracy in terms of encoder resolution. For any given encoder resolution, as the gear ratio increases, so does the resolution of the machine position to be detected.

The following formulas can be used for duty cycles outside the field-weakening range.

For the motor torque in a time slice  $\Delta t_i$  the following applies:

$$M_{Mot, i} = (J_M + J_G) \cdot \frac{2\pi}{60} \cdot \frac{\Delta n_{Last, i}}{\Delta t_i} \cdot i + (J_{Last} \cdot \frac{2\pi}{60} \cdot \frac{\Delta n_{Last, i}}{\Delta t_i} + M_{Last, i} + M_R) \cdot \frac{1}{i \cdot \eta_G}$$

The motor speed is:

$$n_{Mot, i} = n_{Last, i} \cdot i$$

The effective torque is obtained as follows:

$$M_{\text{Mot, eff}} = \sqrt{\frac{\sum M_{\text{Mot, i}}^2 \cdot \Delta t_i}{T}}$$

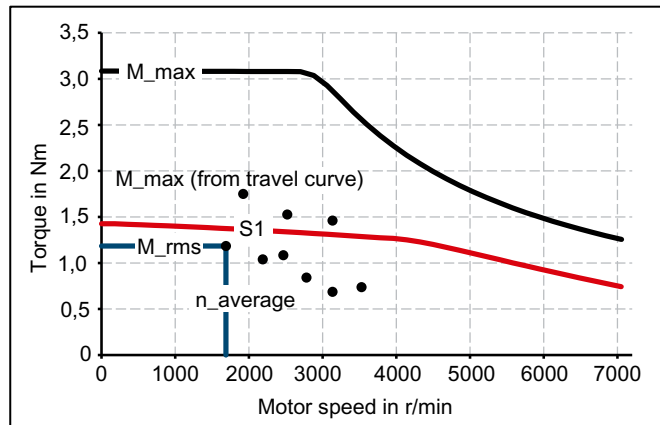
The average motor speed is calculated as follows:

$$n_{\text{Mot, mittel}} = \frac{\sum n_{\text{Mot, i, A}} + n_{\text{Mot, i, E}} \cdot \Delta t_i}{T}$$

- $J_M$  Motor moment of inertia
- $J_G$  Gearbox moment of inertia
- $J_{\text{load}}$  Load moment of inertia
- $n_{\text{load}}$  Load speed
- $i$  Gear ratio
- $\eta_G$  Gearbox efficiency
- $M_{\text{load}}$  Load torque
- $M_R$  Frictional torque
- $T$  Cycle time
- A; E Initial value, final value in time slice  $\Delta t_i$
- $t_e$  ON duration
- $\Delta t_i$  Time interval

The effective torque  $M_{\text{eff}}$  must lie below the S1 characteristic.

The maximum torque  $M_{\text{max}}$  is produced during the acceleration operation.  $M_{\text{max}}$  must lie below the voltage limiting characteristic curve. In summary, the motor is configured as follows:



- $M_{\text{max}}$  Curve of the maximum torque
- $M_{\text{eff}}$  Effective torque
- $n_{\text{mean}}$  Mean speed
- S1 S1 characteristic =  $M_0$
- Points from the traversing profile

Figure 5-13 Motor selection for duty cycle

### Defining the motor

By varying, you can find the motor that satisfies the conditions of the operating mode (duty cycle).

- Determine the motor current at base load. The calculation depends on the type of motor (synchronous motor or induction motor) and the operating mode (duty cycle) used.

---

**Note**

When configuring according to duty cycle with constant ON duration with overload, the overload current is calculated in relation to the required overload torque.

---

- Comply with the thermal limits of the motor.
- Configure the other properties of the motor through the available motor options.

## 5.3 Configuring the braking resistor

### 5.3.1 Configuring the braking resistor

The converters are equipped with a Braking Module that converts the regenerative energy of the servomotor into heat using an integrated braking resistor. Regenerative energy is produced, for example, when braking the connected mechanical system.

If the motor feeds back more energy than can be dissipated by the internal braking resistor, then the converter shuts down with fault F30002 (DC link overvoltage). In this case, you will require an external braking resistor.

If you know the moment of inertia of your system (referred to the motor shaft), then calculate the braking energy that occurs according to the information provided in Chapter "Calculating the braking energy (Page 79)".

Table 5-4 Braking power and braking energy with the internal braking resistor

Article number	Rated power in kW	Continuous braking power in W	Peak power in kW	Braking energy in kJ
<b>Converter with line connection 200 V ... 240 V 1 AC</b>				
6SL5310-1BB10-1CF0	0.1	5 <sup>1)</sup>	0.35	0.01
6SL5310-1BB10-2CF0	0.2	10	0.6	0.15
6SL5310-1BB10-4CF0	0.4	20	1.3	0.325
6SL5310-1BB10-8CF0	0.75	40	2.4	0.60
<b>Converters with 3 AC 200 ... 240 V line connection</b>				
6SL5310-1BE10-4DF0	0.4	50	0.6	0.3
6SL5310-1BE10-8DF0	0.75	50	0.8	0.3
6SL5310-1BE11-0DF0	1.0	50	0.8	0.3
6SL5310-1BE11-5DF0	1.5	100	1.6	0.6
6SL5310-1BE12-0DF0	2.0	100	1.6	0.6

Article number	Rated power in kW	Continuous braking power in W	Peak power in kW	Braking energy in kJ
6SL5310-1BE13-5DF0	3.5	325	5.0	1.95
6SL5310-1BE15-0DF0	5.0	325	5.0	1.95
6SL5310-1BE17-0DF0	7.0	325	5.0	1.95
<b>Converter with line connection 3 AC 380 V ... 480 V</b>				
6SL5310-1BE10-4DF0	0.4	50	1.2	0.30
6SL5310-1BE10-8DF0	0.75	50	2.4	0.30
6SL5310-1BE11-0DF0	1.0	50	3.0	0.30
6SL5310-1BE11-5DF0	1.5	100	5.7	0.60
6SL5310-1BE12-0DF0	2.0	100	6.0	0.60
6SL5310-1BE13-5DF0	3.5	325	15.0	1.95
6SL5310-1BE15-0DF0	5.0	325	19.0	1.95
6SL5310-1BE17-0DF0	7.0	325	19.5	1.95

<sup>1)</sup> The 1 AC 200 ... 240 V 100 W device is not equipped with an internal braking resistor. An internal braking resistor is not required for normal operation as a result of the available DC link capacitance.

### 5.3.2 Calculating the braking energy

To find out whether you require an external braking resistor, calculate the braking energy according to the following formula:

$$W = \frac{1}{2} (J_{mot} + J) \frac{4\pi^2}{3600} (n_1^2 - n_2^2)$$

$W / J$  Braking energy

$J_{mot} / \text{kgm}^2$  Moment of inertia of the servo motor

- Technical specifications and characteristics of 1FS2 connected to 1 AC 230 V, 3 AC 240 V (Page 389)
- Technical specifications and characteristics of 1FS2 connected to 3 AC 400 V, 3 AC 480 V (Page 394)

$J / \text{kgm}^2$  Moment of inertia of the driven mechanical system in relation to the shaft of the servomotor

$n_1 / \text{r/min}$  Initial speed

$n_2 / \text{r/min}$  Speed after braking

#### Note

As the friction is not taken into account in the above formula, less energy is fed back to the servo drive system in practice than that calculated in the formula.


**Example**

An 1FS2104-6AF1... Servomotor with low moment of inertia (with integrated holding brake) with mechanical system is fed from a SINAMICS S210 6SL5310-1BB10-8CF0. It is to be braked from 3000 r/min to 600 r/min

Moment of inertia of servo motor 1FS2104-6AF1...	$J_{mot} = 0.84 \times 10^{-4} \text{ kgm}^2$
Moment of inertia of the driven mechanical system	$J = 4 \times 10^{-4} \text{ kgm}^2$
$n_1 = 3000 \text{ r/min}$	$n_2 = 600 \text{ r/min}$
$\Rightarrow W = 22.9 \text{ J}$	$(1 \text{ J} = 1 \text{ Ws})$

The braking energy that can be absorbed by the integrated braking resistor (600 J) is higher than the actual braking energy (22.9 J). In this case, therefore, no external braking resistor is required.

**5.3.3 Requirements placed on the external braking resistor**

 <b>WARNING</b>
<b>Risk of fire caused by continuous overload</b> An explosion or a fire could occur if the external braking resistor is continuously overloaded (for example as the result of a defective Braking Module). This can result in severe injury or death and/or the enclosure could melt. <ul style="list-style-type: none"><li>• Use only braking resistors that are intrinsically safe.</li><li>• Use only a braking resistor with temperature monitoring and connect the temperature monitoring to digital input DI4 of the converter.</li></ul>
<b>NOTICE</b>
<b>Damage to the converter due to its maximum load being exceeded</b> If the maximum permissible continuous power, peak power or braking energy is exceeded, the converter may be damaged. <ul style="list-style-type: none"><li>• Only ever operate the converter within its maximum permissible working range.</li></ul>

### Load cycles for braking resistors

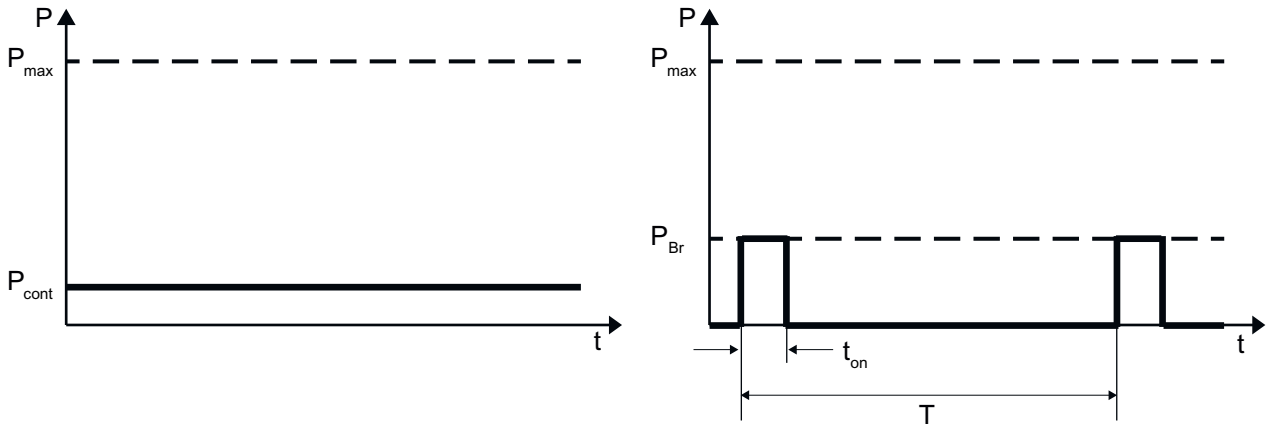


Figure 5-14 Peak power, continuous power and duty cycle of the braking resistor

$$P_{Br} \leq P_{max}$$

$$E_{Br} = P_{Br} \cdot t_{on}$$

$$E_{Br} \leq E_{max}$$

$$T \geq E_{Br} / P_{cont}$$

$P_{max}$  [kW]: Maximum peak power

$P_{cont}$  [kW]: Maximum continuous power

$P_{Br}$  [kW]: Application-specific braking power

$E_{max}$  [kJ]: Maximum braking energy

$E_{Br}$  [kJ]: Application-specific braking energy

$t_{on}$  [s]: Braking duration

$T$  [s]: Cycle duration

#### Observe the following points when calculating the braking power:

- The braking power required in the application must not exceed the maximum peak power (according to the following tables).
- The required braking energy results from the product of the required braking power and the duty cycle (integral of the braking power over time).
- The required braking energy must not exceed the maximum braking energy (according to the following tables).
- The average braking power (arithmetic mean value of the braking cycle) must not exceed the maximum continuous power (according to the following tables).

### Resistance data for an external braking resistor

Table 5-5 Resistance data for an external braking resistor

Converter		Braking resistor			
Article number	Rated power in kW	Minimum resistance in $\Omega$	Maximum continuous power in W	Maximum peak power in W	Maximum braking energy in kJ
Line voltage 1 AC 200 ... 240 V					
6SL5310-1BB10-1CF0	0.1	300	50	350	0.7

Converter		Braking resistor			
Article number	Rated power in kW	Minimum resistance in $\Omega$	Maximum continuous power in W	Maximum peak power in W	Maximum braking energy in kJ
6SL5310-1BB10-2CF0	0.2	150	100	600	1.3
6SL5310-1BB10-4CF0	0.4	100	200	1300	2.3
6SL5310-1BB10-8CF0	0.75	50	380	2400	3.8
<b>Line voltage 3 AC 200 ... 240 V</b>					
6SL5310-1BE10-4DF0	0.4	100	200	600	1
6SL5310-1BE10-8DF0	0.75	100	380	1200	1
6SL5310-1BE11-0DF0	1.0	100	500	1700	1
6SL5310-1BE11-5DF0	1.5	50	880	2900	20
6SL5310-1BE12-0DF0	2.0	50	1000	3800	20
6SL5310-1BE13-5DF0	3.5	15	1750	7500	25
6SL5310-1BE15-0DF0	5.0	15	2500	9500	25
6SL5310-1BE17-0DF0	7.0	15	3250	12500	25
<b>Line voltage 3 AC 380 ... 480 V</b>					
6SL5310-1BE10-4DF0	0.4	200	200	1200	8
6SL5310-1BE10-8DF0	0.75	200	380	2400	8
6SL5310-1BE11-0DF0	1.0	200	500	3400	8
6SL5310-1BE11-5DF0	1.5	100	880	5700	80
6SL5310-1BE12-0DF0	2.0	100	1000	7600	80
6SL5310-1BE13-5DF0	3.5	30	1750	15000	100
6SL5310-1BE15-0DF0	5.0	30	2500	19000	100
6SL5310-1BE17-0DF0	7.0	30	3250	25000	100

### Examples of suitable intrinsically safe braking resistors from a third-party supplier

Table 5-6 Examples of suitable intrinsically safe braking resistors from a third-party supplier

Converter		Braking resistor, Michael Koch GmbH <sup>1)</sup>				
Article number	Rated power in kW	Order designation with temperature sensor 190 °C	Continuous power in W for CE	Continuous power in W for UL	Maximum peak power in W	Maximum braking energy in kJ
<b>Line voltage 1 AC 200 ... 240 V</b>						
6SL5310-1BB10-1CF0	0.1	BWG250047TS-190 <sup>2)</sup>	50	50	350	0.7
6SL5310-1BB10-2CF0	0.2	BWG250047TS-190 <sup>2)</sup>	100	100	600	1.1
6SL5310-1BB10-4CF0	0.4	BWG250047TS-190 <sup>2)</sup>	100	100	1300	1.8
6SL5310-1BB10-8CF0	0.75	BWG500027TS-190	200	200	2400	2.7
<b>Line voltage 3 AC 200 ... 240 V</b>						
6SL5310-1BE10-4DF0	0.4	BWG500027TS-190	200	200	600	0.9
6SL5310-1BE10-8DF0	0.75	BWG600014TS-190 <sup>3)</sup>	380	240	1200	0.8
6SL5310-1BE11-0DF0	1.0	BWG600014TS-190 <sup>3)</sup>	400	240	1700	0.8



Converter		Braking resistor, Michael Koch GmbH <sup>1)</sup>				
Article number	Rated power in kW	Order designation with temperature sensor 190 °C	Continuous power in W for CE	Continuous power in W for UL	Maximum peak power in W	Maximum braking energy in kJ
6SL5310-1BE11-5DF0	1.5	BWD500027K03LIP65IS	600	600	2900	14.5
6SL5310-1BE12-0DF0	2.0	BWD500027K03LIP65IS	600	600	3800	13.9
6SL5310-1BE13-5DF0	3.5	BWD600014K03LIP65IS	1200	720	7500	18.7
6SL5310-1BE15-0DF0	5.0	BWD600014K03LIP65IS	1200	720	9500	17.8
6SL5310-1BE17-0DF0	7.0	BWD600014K03LIP65IS	1200	720	12500	18.2
<b>Line voltage 3 AC 380 ... 480 V</b>						
6SL5310-1BE10-4DF0	0.4	BWG500100TS-190	200	200	1200	5.2
6SL5310-1BE10-8DF0	0.75	BWG600047TS-190	380	240	2400	6.2
6SL5310-1BE11-0DF0	1.0	BWG600047TS-190	400	240	3400	6.1
6SL5310-1BE11-5DF0	1.5	BWD500100K03LIP65IS	600	600	5700	30.4
6SL5310-1BE12-0DF0	2.0	BWD500100K03LIP65IS	600	600	7600	30.4
6SL5310-1BE13-5DF0	3.5	BWD600047K03LIP65IS	1200	720	15000	50.0
6SL5310-1BE15-0DF0	5.0	BWD600047K03LIP65IS	1200	720	19000	47.5
6SL5310-1BE17-0DF0	7.0	BWD600047K03LIP65IS	1200	720	25000	41.7

<sup>1)</sup> Can only be directly sourced from Michael Koch GmbH

<sup>2)</sup> This resistor can be directly ordered through Siemens by specifying the following Article number: GXX:BWG250047TS-190

<sup>3)</sup> This resistor can be directly ordered through Siemens by specifying the following Article number: GXX:BWG600014TS-190

#### Note on braking resistors:

- Braking resistors from Michael Koch GmbH  
The resistance values of the braking resistors deviate from the listed general values in Table "Resistance data for an external braking resistor".  
The braking resistors have been tested in conjunction with S210 converters and are approved.
- Braking resistors from other manufacturers  
Braking resistors from other manufacturers should be dimensioned according to Table "Resistance data for an external braking resistor".

### 5.3.4 Connecting an external braking resistor

#### Connecting an external braking resistor

Use shielded cables to connect power to the external braking resistor.

How you connect an external braking resistor and the temperature monitoring is described in the following Chapters:

- For converters with 1 AC line connection: "Connecting a 1 AC braking resistor (Page 170)"
- For converters with 3 AC line connection: "Connecting a 3 AC braking resistor (Page 179)"

### Setting the temperature monitoring of the external braking resistor

Connect the temperature monitoring of the external braking resistor at digital input DI4: "Connecting the digital input (Page 180)".

If you have connected an external braking resistor with temperature monitoring, then you must activate the temperature monitoring.

Activate the DI4 digital input "Temperature monitoring of external braking resistor".

The converter switches the motor off as soon as the external braking resistor is too hot or when no external braking resistor is connected (wire break).

#### **F7860 power unit: Thermal overload of external braking resistor**

Cause: The external braking resistor is thermally overloaded. Its use is therefore disabled.

Note: The monitoring of the external braking resistor configured via DI4 of X130 has tripped.

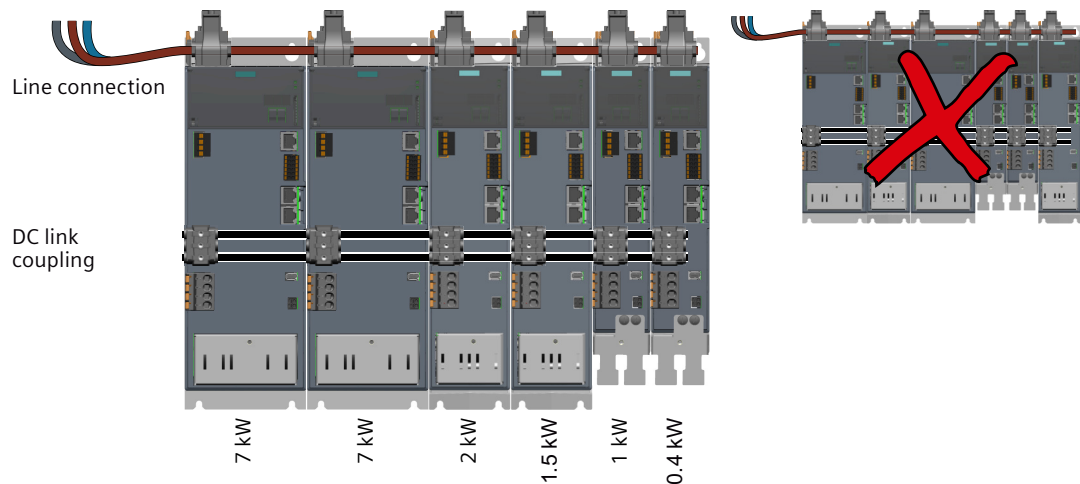
## 5.4 DC link coupling (for converters with 3 AC line connection)

Using connector X3 you can connect the DC links of up to six converters with one another.

With the DC link coupling, energy recovered by drives operating in the generating mode does not have to be converted into heat via the braking resistor, but is instead used by drives operating in the motoring mode.

### Prerequisites and conditions for the DC link coupling

- It is permissible to couple the DC links of converters with different power ratings.
- The converters must be mounted with decreasing power ratings starting from the line supply infeed.



- All converters whose DC links are coupled, must also be coupled on the line side (AC coupling).
- The coupled converters must be housed in the same control cabinet.
- Only a 1-row setup is permissible. It is not possible to distribute the coupled converters over 2 or more rows.
- You are not recommended to create a common DC link coupling for devices with Article No. 6SL5... and devices with Article No. 6SL3....

#### Note

- For a DC link coupling, line connection via the standard connector is not permissible.
- Feeding in DC power directly at the DC link is not permissible!

**Establishing the DC link coupling**

1. Mount the converters, without any lateral intermediate spaces, with decreasing power ratings starting from the line supply infeed.  
If a line filter is used, you must connect the line supply infeed from the left-hand side.
2. Establishing the AC and DC link coupling:  
Use the connectors and cables that are described in the following chapters:
  - "Establishing the AC coupling and the DC link coupling (Page 177)"
  - "Connectors and cables for the AC coupling and DC link coupling (Page 429)"

**Additional external braking resistors for the DC link coupling**

The entire braking power of all converters coupled in a group is always available for braking.

If you require an external braking resistor for your system in spite of a DC link coupling, then you must connect this to the converter with the highest power rating. You can find more information in Chapter:

- "Configuring the braking resistor (Page 78)"

**Special features for converters with a 200 V ... 240 V 3 AC line connection**

- The DC link coupling is only permissible for converters of the same frame size. Otherwise, the above mentioned points apply.

**5.5 Vertical axis**

**5.5.1 Setting SS1 in conjunction with vertical axes**

**Requirement**

One of the two Safety Integrated Functions "Safe Stop 1 with time control" (SS1-t) or "Safe Stop 1 with acceleration monitoring" (SS1-a) is enabled.

**Settings**

With a vertical axis, if you use the Safety Integrated Functions "Safe Stop 1 with time control" (SS1-t) or "Safe Stop 1 with acceleration monitoring" (SS1-a), then you must set p9556 as follows:

Table 5-7 SS1 setting

Parameter	Setting value	Description
p9556	$p9556 > p1135 + p1228 + r1217$	This setting prevents the vertical axis from sagging after the transition to STO.

## Result

After the correct setting is made, SS1-t and SS1-a behave as follows:

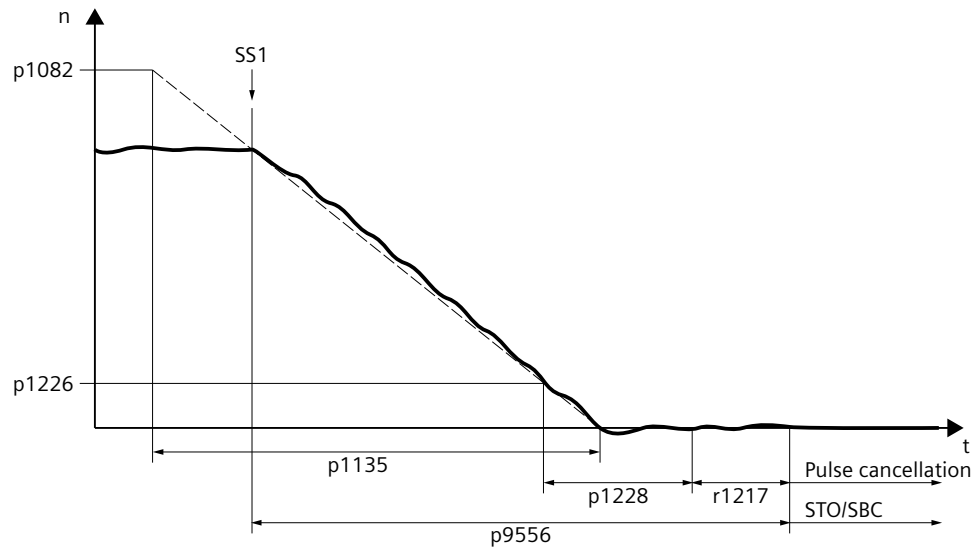


Figure 5-15 Correct setting of p9556 for SS1-t and SS1-a

- By immediately specifying  $n\_set = 0$ , the converter brakes along the OFF3 down ramp (p1135).
- Once standstill has been detected, the converter closes the motor holding brake. The converter detects standstill in the following cases:
  - If the speed actual value falls below the speed threshold (p1226).
  - When the monitoring time (p1227), which was started when the speed setpoint  $\leq$  speed threshold (p1226), has expired.
- At the end of the holding brake closing time (r1217), the converter cuts off the motor torque (pulse cancellation).
- The converter is in the "switching on inhibited" state.

## Parameters

The following list contains parameters to set SS1-t and SS1-a in conjunction with a vertical axis.

Number	Name	Unit
p1135[0]	OFF3 ramp-down time	[s]
r1217[0]	Motor holding brake closing time	[ms]
p1226[0]	Threshold for zero speed detection	[rpm]
p1227[0]	Zero speed detection monitoring time	[s]
p1228[0]	Pulse cancellation delay time	[s]
p9556	SI transition time SS1 to STO	[ms]

## 5.5.2 Setting the electronic counterweight for a vertical axis

### Overview

With a vertical axis without mechanical weight compensation, you can set an electronic counterweight.

### Requirement

The axis is at a standstill.

### Procedure

Proceed as follows to set the electronic counterweight:

1. Make a note of the necessary offset value when the axis is at standstill:  
r0031
2. Set the value from r0031 in p1532.
3. Save the change.
4. To prevent the axis from dropping after the brake is released, specify the torque offset as an additional torque setpoint (M\_ADD) via the supplementary telegram 750.  
The supplementary telegram 750 must be configured in the PLC.  
As a result, the holding torque is specified when the brake is released.

---

### Note

Due to the specified supplementary torque setpoint via the controller, a switchover of the supplementary torque is also possible. Thus, when the load is lifted, you can specify a supplementary torque that is different from the supplementary torque for movement without a load.

---

### Parameters

The following list contains parameters to set the electronic counterweight for a vertical axis.

Number	Name	Unit
r0031	Actual torque smoothed	[Nm]
p1532[0]	Torque limit offset	[Nm]

## 5.6 Application examples

You can find SINAMICS application examples in the Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/view/60733299>).

## 5.7 Establishing communication of the converter with the controller

To ensure that communication between the PLC and converter is possible, configure the converter or converters in the PLC, and activate the topology-based initialization. When powering up, the converter takes the PROFINET device name as well as the IP address from the PLC.

The converter also imports the telegram settings from the PLC.

The converter supports a standard telegram with 2 supplementary telegrams and a PROFIsafe telegram.

The following telegrams are possible:

- Standard telegrams
  - Telegram 3
  - Telegram 5
  - Telegram 102
  - Telegram 105

The telegrams are suitable for IRT communication.

Telegrams 3 and 102 are also suitable for RT communication.

IRT communication is mandatory for telegrams 5 and 105.

- Supplementary telegrams
  - Telegram 700
  - Telegram 750
- PROFIsafe telegrams
  - Telegram 30
  - Telegram 901

### More information

- Acyclic communication

The converter supports reading and writing parameters via acyclic communication. The converter can simultaneously establish a total of 8 acyclic connections via the integrated PROFINET interface.
- You can find more information about the telegrams here:  
Communication telegrams (Page 705)

## 5.8 Functions that require licensing

### 5.8.1 Fundamentals

#### Overview

When it is delivered from the factory, the converter contains the firmware files required for operation. It can be operated without a memory card. In this case, the converter is used with the basic functionality without functions that require licensing.

Refer to the ordering documentation (e.g. catalogs) for information on basic functions of the converter and functions that require licensing.

#### Using functions that require licensing

If you want to use functions that require licensing, you must purchase the relevant licenses.

In the commissioning tool, load the licenses into the converter in the form of a license file. The license file is stored retentively on the memory card. The memory card must be inserted in the converter so that the converter can check during ramp-up that the necessary licenses are present.

#### Web License Manager

See Web License Manager (<http://www.siemens.com/automation/license>) to find out which licenses are assigned to an existing memory card.

If you need additional licenses, you can assign these licenses to the memory card and create a new license file in the Web License Manager.

#### Ordering licenses together with a memory card

When licenses are purchased as Z options together with a memory card, the following applies:

- The certificates of license (eCoL) are stored with the license file on the memory card during the ordering process. The certificates of license are in PDF format.
- The license file is permanently assigned to the memory card during the ordering process. The license file is provided as a ZIP file.

#### Purchase licenses without memory card

If licenses are purchased and assigned to an existing memory card, the following applies:

- The purchaser receives individual certificates of license (eCoL) in PDF format for purchased licenses.  
If the purchaser wishes to include the certificates of license on the memory card, they must be copied to the memory card manually.
- The license file is created in the Web License Manager using the certificates of license, assigned to an existing memory card, and made available to download as a ZIP file.



### Differences between certificates of license and license files

Certificates of license and license files differ as follows:

Type	Description
Certificate of license (eCoL)	<ul style="list-style-type: none"> <li>• Provided as a PDF for each license purchased.</li> <li>• Contains the delivery note number and license number.</li> <li>• Necessary in order to create the license file in the Web License Manager.</li> <li>• It is not contained in the license file.</li> </ul>
License file	<ul style="list-style-type: none"> <li>• Provided as a ZIP file.</li> <li>• Contains serial number of the memory card in the file name. Cannot be transferred to other memory cards.</li> <li>• Necessary in order to activate licenses for functions that require licensing in the commissioning tool.</li> <li>• Contains a signature file. The converter uses the signature file to verify the authenticity of the licenses.</li> </ul>

### Trial License mode

Operation of a converter with one or more functions requiring licensing without sufficient licensing is only permissible during commissioning and servicing. To do this, activate Trial License mode in the license overview in the commissioning tool.

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### Note

Not all functions requiring licensing can be used in Trial License mode.

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## 5.8.2 System responses to under-licensing (ramp-up)

### Requirement

- A memory card is present and inserted into the converter.  
Licenses for functions requiring licensing must be assigned to a memory card. You can find more information in Chapter "Creating and downloading the license file (Page 92)".

### Description of function

Licensing is automatically checked during ramp-up of the converter.

Insufficient licensing is indicated as follows on the converter:

- F13000 License not adequate
- READY LED red light flashing at 2 Hz

### 5.8.3 System responses to under-licensing (operation)

#### Requirement

- A memory card is present and inserted into the converter.

#### Description of function

Insufficient licensing is indicated as follows on the converter:

- A13002 licensing not sufficient in operation

#### Possible cause:

- The memory card is defective or was removed.
- Functions requiring licensing were activated during operation and the licensing is not sufficient.

#### Possible consequence:

- If the cause is not eliminated, fault F13000 is output automatically at the next restart. The function that requires licensing can no longer be used.

### 5.8.4 Creating and downloading the license file

#### Requirement

The following information is required to create a license file in the Web License Manager:

- License number and delivery note number of the license
- Product designation
- Serial number of the memory card  
The serial number is on the memory card.  
Alternative: Copy the serial number from the license overview in the commissioning tool you are using, and then paste the number in the Web License Manager.

#### Procedure

1. Call the following link: Web License Manager (<http://www.siemens.com/automation/license>).
2. Click on "Direct access".  
The progress indicator shows the "Login" step.
3. Enter the license number and delivery note number of your license. Then click "Next".  
The progress indicator shows the "Identify product" step.
4. Enter the serial number of the memory card.

5. Select the product you are using. Then click "Next".  
The progress indicator shows the "Select licenses" step.  
In the "Already assigned licenses" column, you can see which licenses of a particular memory card have already been assigned and how often.  
In the "Additional licenses to be assigned" column, activate the licenses you want and specify how many additional licenses you require.
6. Activate the additionally required licenses. Then click "Next".  
The progress indicator shows the "Assign licenses" step.  
This page shows a summary of the selected licenses for checking.
7. To start the assignment, click "Assign".  
The progress indicator shows the "Generate license key" step.  
The licenses are assigned to the specified memory card.  
The license file is displayed and is available to download.
8. Download the license file to the file directory of your operating unit.

## Result

The license file is stored in the file directory of your operating unit.

### 5.8.5 Downloading the license file at a later time

#### Requirement

The license file has already been created in the Web License Manager.

#### Procedure

To display the license file so you can download it, proceed as follows:

1. Call the following link: Web License Manager (<http://www.siemens.com/automation/license>).
2. In the navigation, click the "Display license key" option in the "User menu".
3. Enter the serial number of the memory card you are using in the "Hardware serial number" field.  
OR  
In the "License number" field, enter your license number.
4. Click the "Display license key" button.  
The license file is displayed and is available to download.
5. Download the license file to the file directory of your operating unit.

## Result

The license file is stored in the file directory of your operating unit.

## 5.8.6 Transferring the license file to the converter and activating it

### Overview

Check the license status for the converter at the license overview page. All functions that require licensing for the converter are listed in a table. The table also shows which functions are enabled and whether licenses are missing for individual functions.

You can call the license overview page from the web server or the Startdrive project of the converter.

The procedure is described below using Startdrive as an example.

### Requirement

- A memory card is plugged into the converter.
- The license file is in the file directory of your operating unit.
- The data in the converter and in the Startdrive project are consistent.
- There is an online connection between the operating unit and the drive.

### Procedure

1. Call the license overview page.
2. Click the "Activate the license key file" button.  
A corresponding dialog opens.
3. Select the license file in the file system of your operating unit.
4. Close the load dialog.  
The licenses are checked.  
After a check has been successfully completed, dialog "Licensing" opens.
5. Click on the "Activate " button.  
The dialog closes.

### Result

The licenses are active. The license status for the converter is updated.

### More information

For additional information about the license overview in Startdrive, see Chapter "Overview of licenses (Page 322)".

For additional information about the license overview in the web server, see Chapter "Licenses (Page 236)".

## 5.8.7 Restoring licensing after the memory card is removed

### Overview

When a license file is loaded into the converter, the license file is stored retentively on the memory card.

If you remove the memory card from the converter and perform a restart, the function requiring licensing is blocked after ramp-up.

### Requirement

The license file has been loaded into the converter.

### Procedure

Proceed as follows to start using blocked functions again:

1. Reinsert the memory card into the converter.
2. Perform a restart.
3. Check the license status on the license overview page.

## 5.8.8 Loading certificates of license (eCoL) into the file directory of the operating unit

### Overview

Use this function to back up the certificates of license (eCoL) contained on the memory card to your operating unit.

### Requirement

- The memory card contains certificates of license.

### Procedure

1. Click on the "Save eCoL archive" button.
2. Select a file directory in your operating unit and then confirm the selection.

### Result

The certificates of license are stored in the file directory of your operating unit.



# Safety Integrated Functions

## WARNING

### Unexpected machine movement caused by inactive Safety Integrated Functions

Inactive Safety Integrated Functions or Safety Integrated Functions that have not been adapted can trigger unexpected machine movements that may result in serious injury or death.

If a card without Safety Integrated Functions is inserted instead of a memory card with active Safety Integrated Functions, when the supply voltage is switched on the next time, the Safety Integrated Functions are deactivated.

- Only insert a memory card with the required settings into the drive.
- Prevent unauthorized persons accessing the drive.
- Protect configurations with active Safety Integrated Functions against changes by assigning roles using user management (UMAC).

## Note

### Fault of Safety Integrated Functions in the case of non-EMC-compliant installation

A non-EMC-compliant installation of your machine/system can result in sporadic faults in Safety Integrated Functions.

- Install the drive so that it is EMC-compliant.

## 6.1 Safety Integrated Functions

### Overview

Safety Integrated Functions are used to reduce risk in safety-related applications.

### Description

In comparison to standard converter functions, Safety Integrated Functions have especially high failsafety. The Performance Level (PL) and Safety Integrity Level (SIL) of the corresponding standards are a measure of failsafety.

Safety Integrated Functions are accordingly suitable for reducing risk in safety-related applications. If the risk analysis of the machine or the system indicates a special hazard potential in the application, an application is safety-related.

6.2 Certification

Safety Integrated means that the functions are integrated into the converter and can be executed without need of external components.

**Note**

**Protection against manipulation by unauthorized third parties**

Safety Integrated Functions protect against hardware faults and software errors, but not against manipulation by unauthorized third parties.

Protective measures against unauthorized manipulation are described in the Startdrive Operating Instructions and online help. The measures address the following issues:

- Parameter configuration of the Safety Integrated Functions
- Connection
- Hardware components

**More information**

There is an overview of Safety Integrated Functions requiring licenses in Chapter "Selection of the Safety Integrated Functions (Page 121)".

## 6.2 Certification

**Description**

The Safety Integrated Functions comply with:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 3 or 4 to ISO 13849-1

The Safety Integrated Functions correspond to functions according to IEC 61800-5-2 and IEC 61800-5-3.

The individual Safety Integrated components have the following certifications:

Table 6-1 Certifications for the converter Safety Integrated component

Converter	SIL	PL	Category
Control via PROFIsafe	SIL3	PL e	Category 4
Control via F-DI	SIL3	PL e	Category 3 or 4 <sup>1)</sup>
Stop functions STO, SS1	SIL3	PL e	Category 4
Safe Brake Control (SBC)	SIL3	PL e	Category 3 or 4 <sup>2)</sup>
Motion monitoring functions SLS, SDI, SSM	SIL3	PL e	Category 3

<sup>1)</sup> Depends on the parameterized diagnostic function (online self-test)

<sup>2)</sup> Depends on the test stop version



Table 6-2 Certification for the motor encoder Safety Integrated component

<b>Motor encoder</b>	<b>SIL</b>	<b>PL</b>	<b>Category</b>
Safe Incremental Position (SIP)	SIL3	PL e	Category 3

Independent institutes also certify Safety Integrated Functions. A list of currently certified components is available on request from your sales partner.

## 6.3 PFH values

### Description

The probability of failure for Safety Integrated Functions must be specified in the form of a PFH value (probability of failure per hour) according to IEC 61800-5-2, IEC 62061 and EN ISO 13849-1. The PFH value of a Safety Integrated Function depends on the safety concept of the converter and its hardware configuration, as well as on the PFH values of other components used for this Safety Integrated Function.

### More information

The PFH values can be found under: PFH values (<https://support.industry.siemens.com/cs/ww/en/view/76254308>)

You can map the PFH values of all Safety Integrated components from Siemens using the "Safety evaluation" function in the TIA selection tool: Safety evaluation (<http://www.siemens.com/safety-evaluation-tool>)

## 6.4 Usage time

### Description

You may not operate converters with Safety Integrated Functions for longer than 20 years. The 20 years starts when the device is delivered. The mission time cannot be extended. This is the case even if a service department checks the converter – or in the meantime, the converter was decommissioned.

## 6.5 Stop functions

### 6.5.1 Safe Torque Off (STO)

#### Overview

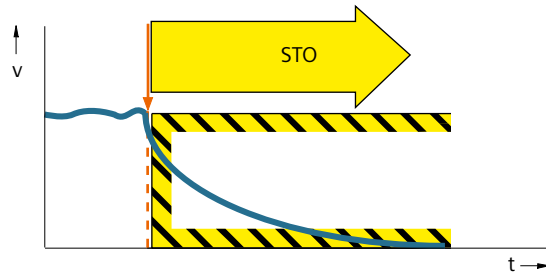



Figure 6-1 Overview STO

The Safe Torque Off (STO) function prevents the torque-generating supply of energy to the motor and prevents the motor from unexpectedly starting.

#### Requirement

 <b>WARNING</b>
<p><b>Unexpected motor movement through active Safe Torque Off</b></p> <p>There may be unexpected motor movements if the Safe Torque Off (STO) function is active. For instance, the motor can coast down to a standstill or a hanging load may accelerate the motor. Unexpected movements can lead to damage to property, risk to persons, severe injury and death.</p> <ul style="list-style-type: none"> <li>• Take account of the way the Safe Torque Off (STO) function works when you perform risk assessments of the machine or system.</li> <li>• Prevent movements of the motor, for example by using a holding brake.</li> </ul>

STO is enabled in the function selection.

Description of function

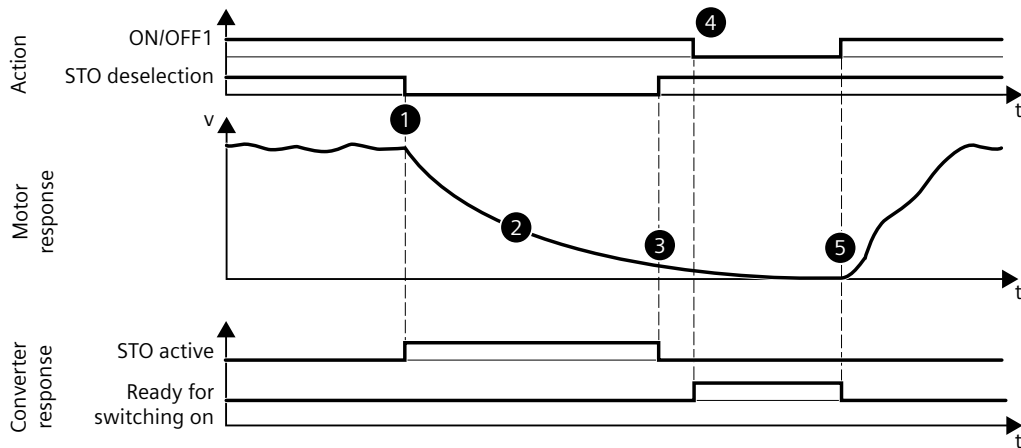


Figure 6-2 Flow diagram STO

	Action	Motor/converter response
①	Selection of STO	<ul style="list-style-type: none"> <li>The converter detects selection of STO and signals the status "STO active" (r9722.0).</li> <li>The converter interrupts the torque-generating energy feed to the motor.</li> <li>If you use a line contactor, the converter opens the line contactor.</li> <li>The "switching on inhibited" status prevents the motor from restarting automatically.</li> </ul>
②		<ul style="list-style-type: none"> <li>The motor coasts down to a standstill.</li> </ul>
③	Deselection of STO	<ul style="list-style-type: none"> <li>The converter detects deselection of STO.</li> </ul>
④	Signal change at ON/OFF1 from 1 to 0	<ul style="list-style-type: none"> <li>The converter is ready to start again.</li> </ul>
⑤	Signal change at ON/OFF1 from 0 to 1	<ul style="list-style-type: none"> <li>The motor starts again.</li> </ul>

Example

Applications include all machines and systems with moving axes (for example, conveyor technology, handling).

With STO, maintenance work on the machine with an open protective door is possible, for example. An EMERGENCY STOP with electromechanical disconnection is not required.

## 6.5.2 Safe Stop 1 (SS1)

### Overview

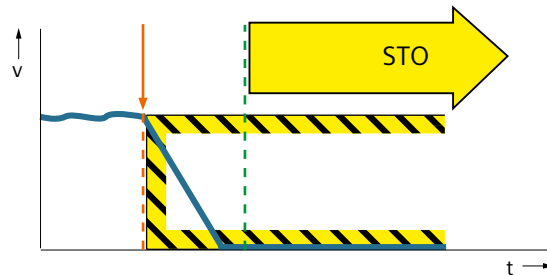


Figure 6-3 Overview SS1

With Safe Stop 1 (SS1), the converter stops dangerous movement of an electrically driven machine component (e.g. motor). After stopping, the Safe Torque Off (STO) function prevents the machine component from restarting.

### Description of function

Table 6-3 Versions of the function

Abbreviation	Brief description
SS1-t	Safe Stop 1 with time control
SS1-a	Safe Stop 1 with acceleration monitoring (SAM)
SS1-r	Safe Stop 1 with braking ramp monitoring (SBR)

#### Interruption of SS1

- If SS1 is deselected again within the delay time, after the delay time elapses or after the shutdown speed is fallen below, the converter selects and deselects STO. This terminates the SS1 function normally. It cannot be interrupted.
- During the delay time, SS1 cannot be deselected by withdrawing the control command, therefore fulfilling the requirements of EN 60204-1 relating to an EMERGENCY STOP function.

#### SS1 delay time

Select the SS1 delay time so that before the torque is shut down, the motor can completely ramp down along the OFF3 ramp, and if available, the motor holding brake can be closed. The OFF3 ramp-down time must be oriented to the actual braking capacity of the system or machine.

6.5 Stop functions

Use the following procedure to select the SS1 delay time:

- SS1 delay time **with** parameterized motor holding brake:  
 $SS1 \text{ delay time (p9556)} \geq \text{OFF3 ramp-down time (p1135)} + \text{pulse cancellation delay time (p1228)} + \text{motor holding brake closing time (r1217)}$
- SS1 delay time **without** parameterized motor holding brake:  
 $SS1 \text{ delay time (p9556)} \geq \text{OFF3 ramp-down time (p1135)} + \text{pulse cancellation} + \text{delay time (p1228)}$

Example

Table 6-4 SS1 application example


Example	Possible solution
A converter must brake a motor as quickly as possible after the EMERGENCY STOP button has been actuated. It is not permissible that the stationary motor undesirably restarts.	Select SS1 via a failsafe digital input or via PROFIsafe.

6.5.2.1 Safe Stop 1 with time control (SS1-t)

Overview

With SS1-t, the converter stops the motor along the OFF3 ramp within the set delay time. After the delay time elapses, irrespective of the current speed, the converter activates the Safe Torque Off (STO) function.

Requirement

<p> <b>WARNING</b></p> <p><b>Unexpected motor movement through active Safe Torque Off</b></p> <p>There may be unexpected motor movements if the Safe Torque Off (STO) function is active. For instance, the motor can coast down to a standstill or a hanging load may accelerate the motor. Unexpected movements can lead to damage to property, risk to persons, severe injury and death.</p> <ul style="list-style-type: none"> <li>• Take account of the way the SS1-t function works when you perform risk assessments of the machine or system.</li> <li>• Prevent movements of the motor, for example by using a holding brake.</li> </ul>
--

SS1 is enabled in the function selection.

Description of function

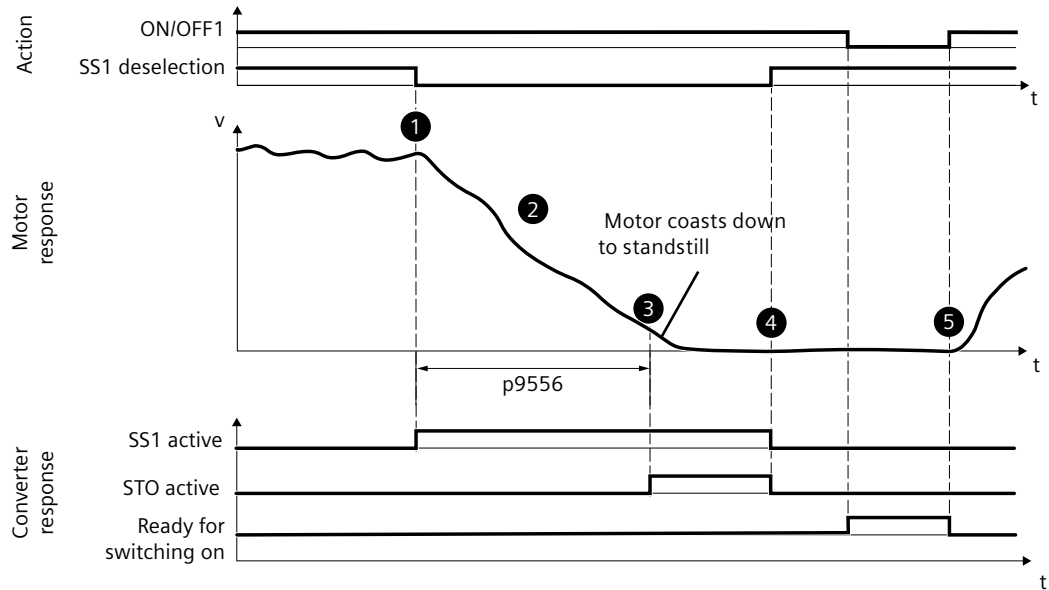


Figure 6-4 Flow diagram Safe Stop 1 with time control (SS1-t)

Action		Motor/converter response
①	Selection of SS1	<ul style="list-style-type: none"> <li>The converter detects selection of SS1 and signals the status "SS1 active" (r9722.1).</li> <li>The converter starts the transition time SS1 to STO (p9556).</li> <li>The converter initiates braking along the OFF3 ramp.</li> </ul>
②		<ul style="list-style-type: none"> <li>The converter brakes the motor along the OFF3 ramp. Braking along the OFF3 ramp is not monitored.</li> </ul>
③		<ul style="list-style-type: none"> <li>The transition time from SS1 to STO (p9556) elapses.</li> <li>The converter activates STO and signals the status "STO active" (r9722.0) and the status "SS1 active".</li> <li>STO interrupts the torque-generating supply of energy to the motor and prevents the motor from restarting.</li> <li>The motor coasts down to a standstill.</li> </ul>
④	Deselection of SS1	<ul style="list-style-type: none"> <li>The converter detects deselection of SS1.</li> <li>The converter deactivates STO.</li> </ul>
⑤	Signal change at ON/OFF1 from 1 to 0	<ul style="list-style-type: none"> <li>The converter is ready to start again.</li> </ul>
⑥	Signal change at ON/OFF1 from 0 to 1	<ul style="list-style-type: none"> <li>The motor starts again.</li> </ul>

6.5.2.2 Safe Stop 1 with acceleration monitoring (SS1-a)

Overview

SS1-a with Safe Acceleration Monitor (SAM) monitors whether or not the motor inadmissibly accelerates when braking. After a defined time interval has elapsed or the speed falls below a defined shutdown speed, Safe Torque Off (STO) becomes active.

Requirement

SS1 is enabled in the function selection.

Description of function

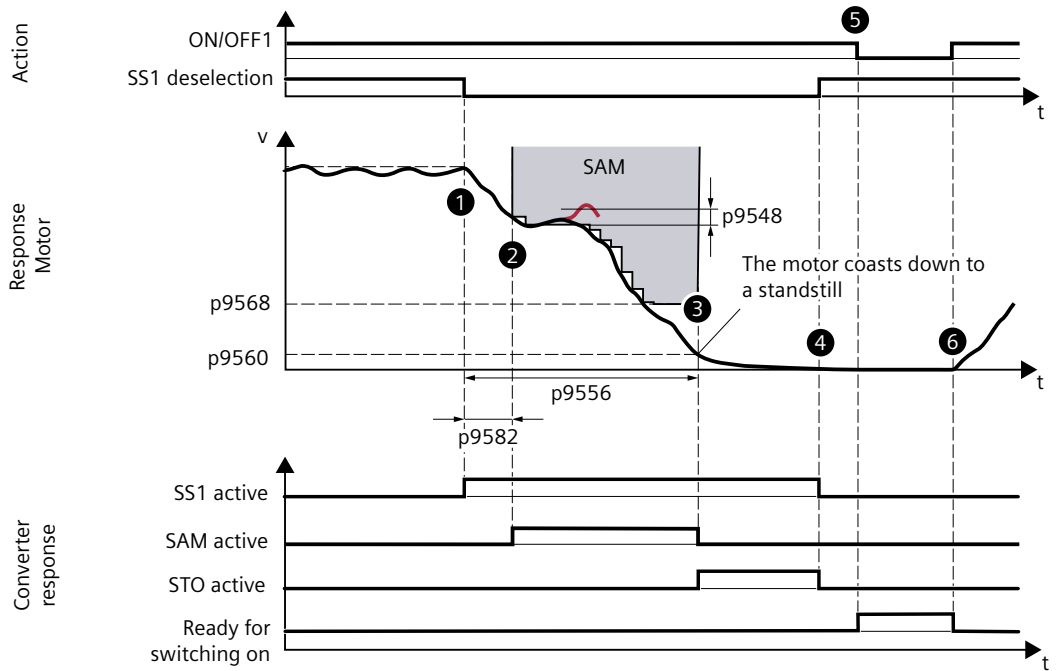


Figure 6-5 Flow diagram Safe Stop 1 with acceleration monitoring (SS1-a)

Action	Motor/converter response
① Selection of SS1	<ul style="list-style-type: none"> <li>The converter detects selection of SS1 and signals the status "SS1 active" (r9722.1).</li> <li>The converter starts the transition time SS1 to STO (p9556) and the SAM delay time (p9582).</li> <li>The converter brakes the motor along the OFF3 ramp.</li> </ul>



②		<ul style="list-style-type: none"> <li>• The SAM delay time elapses. With SAM, the converter monitors whether the motor impermissibly accelerates.</li> <li>• The SAM limit value follows the falling motor speed: The converter reduces the SAM monitoring speed in steps when the absolute value of the motor speed is less than the previous SAM monitoring speed. It is not possible to increase the SAM monitoring speed while braking.</li> <li>• If the motor speed exceeds the SAM monitoring speed by more than the speed tolerance (p9548), then the converter signals a fault and activates STO.</li> <li>• If the motor speed reaches the SAM limit value (p9568), then the converter limits the value for the SAM monitoring to p9568.</li> <li>• As long as the speed decreases, the converter continuously adds the configurable tolerance p9548 to the current speed and the monitoring of the speed adjusts accordingly. If the speed temporarily increases, the monitoring threshold remains at the last value.</li> </ul>
③		<ul style="list-style-type: none"> <li>• SAM ends when the motor speed falls below the STO shutdown speed (p9560), or the SS1 to STO (p9556) transition time expires. STO is then activated.</li> <li>• The converter detects selection of STO and signals the status "STO active" (r9722.0). SS1 remains active.</li> <li>• STO interrupts the torque-generating supply of energy to the motor and prevents the motor from unexpectedly restarting.</li> <li>• The motor coasts down to a standstill.</li> </ul>
④	Deselection of SS1	<ul style="list-style-type: none"> <li>• The converter detects deselection of SS1. STO is deactivated simultaneously.</li> </ul>
⑤	Signal change at ON/OFF1 from 1 to 0	<ul style="list-style-type: none"> <li>• The converter is ready to start again.</li> </ul>
⑥	Signal change at ON/OFF1 from 0 to 1	<ul style="list-style-type: none"> <li>• The motor starts again.</li> </ul>

### 6.5.2.3 Safe Stop 1 with braking ramp monitoring (SS1-r)

#### Overview

With SS1-r, while braking, the converter monitors whether the speed of the motor remains below a defined ramp using the safe brake ramp monitoring (SBR).

#### Requirement

SS1 is enabled in the function selection.

Description of function

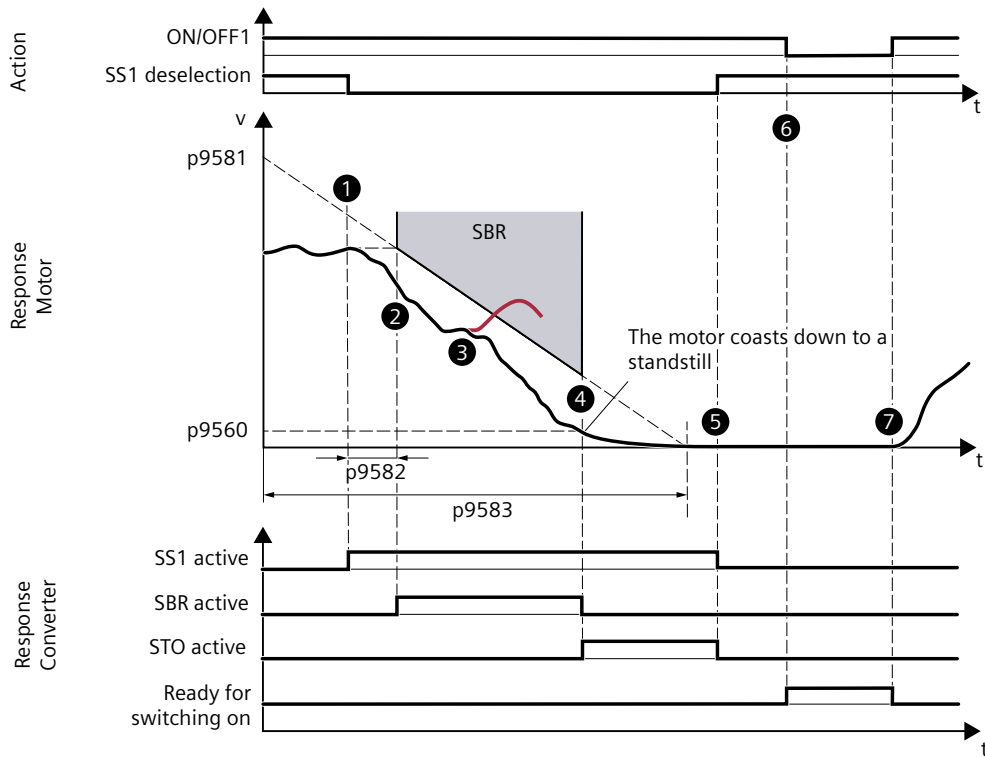


Figure 6-6 Flow diagram Safe Stop 1 with braking ramp monitoring (SS1-r)

Action		Motor/converter response
①	Selection of SS1	<ul style="list-style-type: none"> <li>The converter detects selection of SS1 and signals the status "SS1 active" (r9722.1).</li> <li>The converter brakes the motor along the OFF3 ramp.</li> <li>The converter starts the SBR delay time (p9582).</li> </ul>
②		<ul style="list-style-type: none"> <li>The SBR delay time elapses.</li> <li>The converter starts the Safe Brake Ramp SBR.</li> </ul>
③		<ul style="list-style-type: none"> <li>The converter monitors whether the motor exceeds the set safe brake ramp when braking.</li> <li>If the motor speed fails to follow the braking ramp, the converter signals a fault and activates STO.</li> </ul>
④		<ul style="list-style-type: none"> <li>SBR ends as soon as the actual speed value is below the STO switch-off speed (p9560).</li> <li>The converter detects selection of STO and signals the status "STO active" (r9722.0). SS1 remains active.</li> <li>STO interrupts the torque-generating supply of energy to the motor and prevents the motor from unexpectedly restarting.</li> <li>The motor coasts down to a standstill.</li> </ul>
⑤	Deselection of SS1	<ul style="list-style-type: none"> <li>The converter detects deselection of SS1. STO is deactivated simultaneously.</li> </ul>

⑥	Signal change at ON/OFF1 from 1 to 0	<ul style="list-style-type: none"> <li>The converter is ready to start again.</li> </ul>
⑦	Signal change at ON/OFF1 from 0 to 1	<ul style="list-style-type: none"> <li>The motor starts again.</li> </ul>

## 6.6 Safe Brake Management

### 6.6.1 Safe Brake Control (SBC)

#### Overview

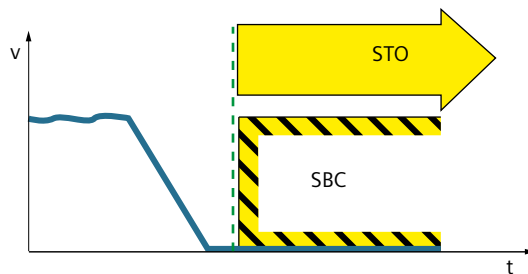


Figure 6-7 Overview SBC


Safe Brake Control (SBC) is used to safely control a holding brake integrated in the motor. The holding brake operates according to the closed-circuit principle.

SBC cannot be selected as an autonomous function: SBC is activated immediately when STO is selected.

For SBC, the converter assumes a controlling function, and ensures the following response:

- The converter interrupts the brake current if it detects a fault or failure of the brake.
- The brake closes and a safe state is reached.

#### Requirement

 <b>WARNING</b>
<p><b>Unexpected movement due to a defective, worn or soiled holding brake</b></p> <p>SBC does not detect mechanical defects, wear or soiling of the holding brake. SBC only detects a broken cable or short-circuit in the brake winding when the holding brake is opened. Undetected defects, wear or soiling can trigger unexpected movements. Unexpected motor movements can result in severe injury or death.</p> <ul style="list-style-type: none"> <li>• Test the function of the holding brake regularly.</li> <li>• Replace a defective, worn or soiled holding brake.</li> </ul>

STO/SS1 and SBC are enabled in the function selection.

Description of function

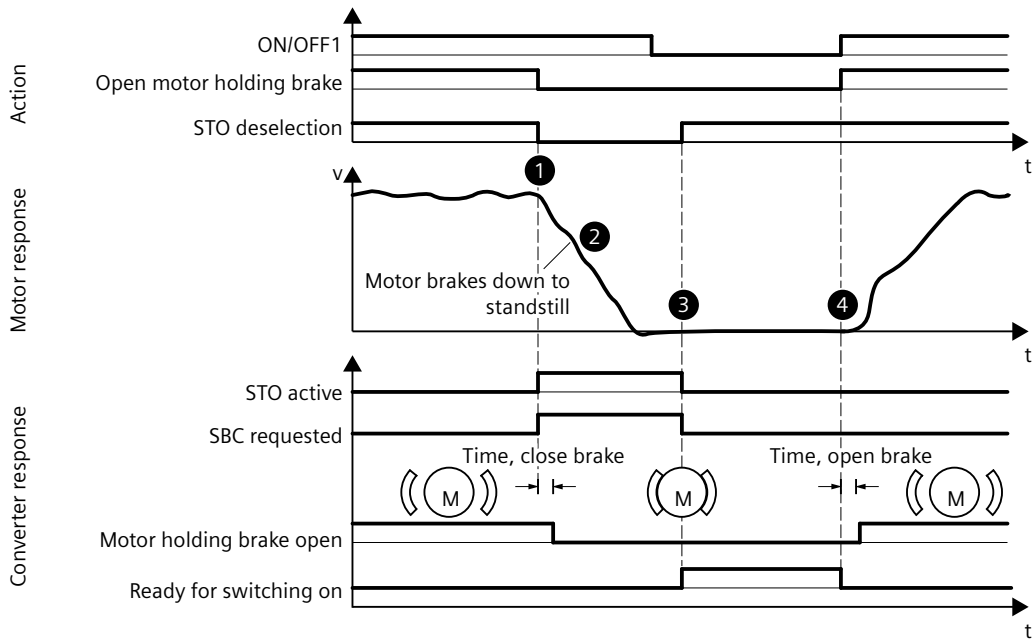


Figure 6-8 Flow diagram SBC

Action		Motor/converter response
①	Selection of STO	<ul style="list-style-type: none"> <li>The converter detects selection of STO and signals the status "STO active" (r9722.0). The converter interrupts the torque-generating energy feed to the motor. The "switching on inhibited" status prevents the motor from restarting automatically.</li> <li>The converter requests SBC at the same time as STO. The holding brake is safely controlled using SBC. The converter immediately closes the holding brake.</li> </ul>
②		<ul style="list-style-type: none"> <li>The motor brakes down to standstill.</li> <li>With SBC, the converter ensures that the brake current is interrupted and the holding brake remains closed.</li> </ul>
③	Deselection of STO	<ul style="list-style-type: none"> <li>The converter detects deselection of STO. SBC is also deactivated when STO is deselected.</li> <li>The holding brake remains (unsafely) closed, until the standard program issues a command to open the brake.</li> </ul>
④	Command to open the brake	<ul style="list-style-type: none"> <li>The converter opens the brake taking into account the brake opening time.</li> </ul>

Example

SBC is suitable for applications where the converter must maintain a safe position, even when the motor is in a no-current condition.

SBC prevents that hanging or pulling loads sag. Hanging or pulling loads include e.g. hoisting gear, elevators and windings. External logic or switching elements not required, as the functionality is integrated in the converter.

## 6.7 Motion monitoring

### 6.7.1 Safely-Limited Speed (SLS)

#### Overview

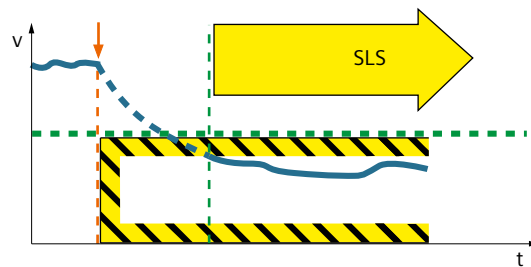


Figure 6-9 Overview SLS

With Safely-Limited Speed (SLS), the converter monitors the motor speed. The converter executes the set stop response if the motor exceeds the permitted speed.

#### Description of function

SLS can be used in various ways:

- SLS with 4 independent speed levels that can be toggled between during the runtime
- SLS with a variable speed limit value

SLS is controlled via PROFIsafe.

On selection of SLS or switchover to a lower SLS level, the SLS delay time (p9551) starts. The active SLS level remains active during the delay time. The selected SLS level only becomes effective afterwards.

Changing the variable speed limit value via PROFIsafe should also be considered as SLS level switchover.

**Example**

SLS is suitable for machines where hazards due to excessive speeds are possible. In the following work steps, the use of SLS is particularly useful for direct contact between man and machine:

- During commissioning
- During setup
- For maintenance work

Table 6-5 Application examples SLS

Example	Solution
Setup mode: The machine operator must enter the dangerous area of a machine and manually introduce material into a machine part.	With SLS, the converter monitors the speed of the machine component.
To protect the drill chuck from destruction, a turning machine must not exceed a certain maximum speed of the machine part.	

**6.7.1.1 SLS with one limit value only**

**Overview**

Safely-Limited Speed (SLS) monitors the motor speed. If the motor speed violates the SLS limit value, the converter initiates the set stop response.

**Description of function**

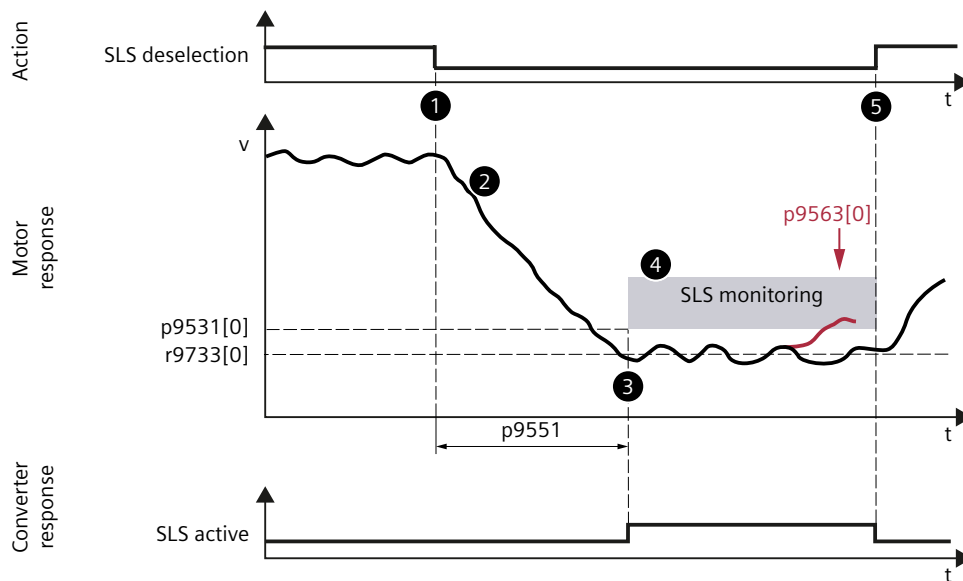


Figure 6-10 Flow diagram SLS with a speed level

Action		Motor/converter response
①	Selection of SLS	<ul style="list-style-type: none"> <li>The converter detects the selection of SLS.</li> <li>The converter starts the SLS delay time (p9551).</li> </ul>
②		<ul style="list-style-type: none"> <li>The motor follows the external setpoint and brakes.</li> <li>The motor speed must remain below the SLS limit value until the SLS delay time has elapsed.</li> </ul>
③		<ul style="list-style-type: none"> <li>Monitoring of the SLS limit value p9531[0] is effective once the SLS delay time (p9551) has elapsed.</li> <li>The converter reports the status "SLS active" (r9722.4).</li> </ul>
④		<ul style="list-style-type: none"> <li>If the SLS limit value is violated, the converter executes the set stop response p9563[0].</li> </ul>
⑤	Deselection of SLS	<ul style="list-style-type: none"> <li>The converter detects deselection of SLS.</li> <li>The motor follows the external setpoint and accelerates, e.g. following the change to an "Automatic" mode.</li> </ul>

### 6.7.1.2 SLS with multiple limit values

#### Overview

Safely-Limited Speed (SLS) has 4 independent SLS limit values that can be switched between during operation. If the motor speed violates the currently selected SLS limit value, the converter initiates a set stop response.

#### Requirement

SLS is enabled in the function selection.

The SLS limit values are parameterized as follows:

SLS1 limit value < SLS2 limit value < ... < SLS3 limit value.

#### WARNING

##### Unexpectedly high speed due to incorrect parameterization

If you parameterize the SLS limit values incorrectly, the motor can accelerate beyond the selected SLS limit value. Unexpectedly high speeds can result in serious injury and death.

- Parameterize the SLS limit values as specified.

**Description of function**

This figure illustrates the change from a higher SLS limit value to a lower SLS limit value. For the change from a lower SLS limit value to a higher SLS limit value, there is no SLS delay time. The new SLS limit value is active immediately.

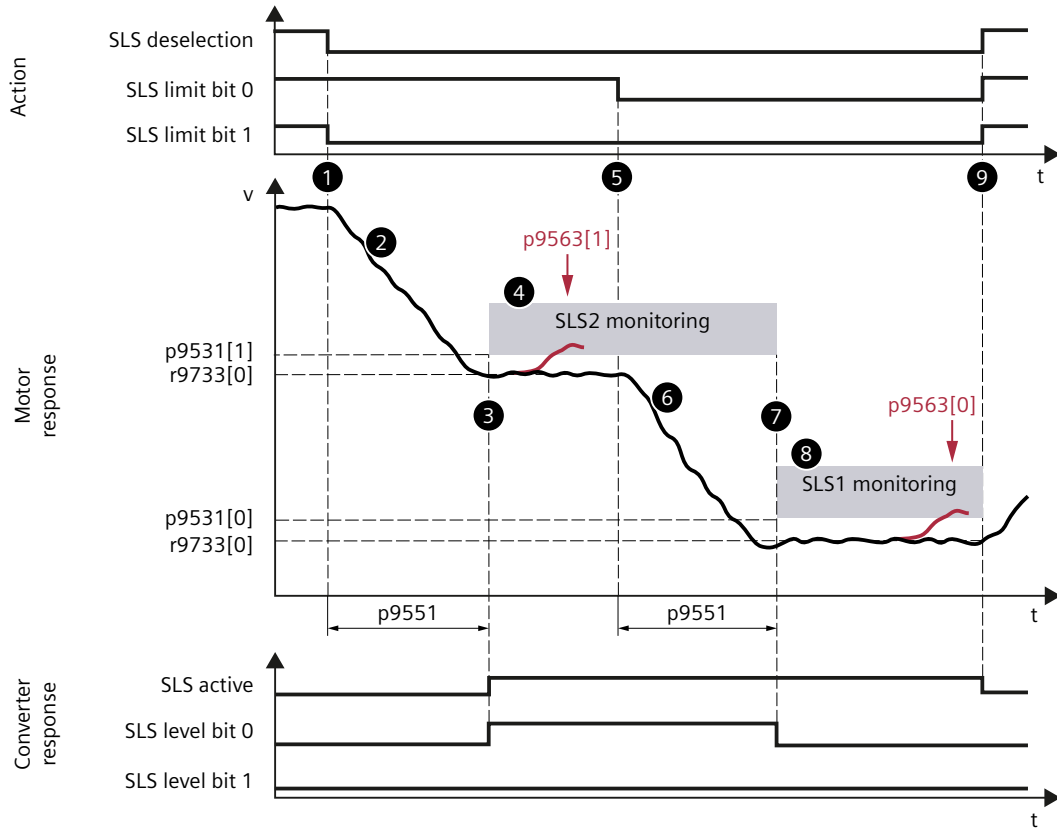


Figure 6-11 SLS with change between two SLS limit values

Action		Motor/converter response
①	Selection of SLS	<ul style="list-style-type: none"> <li>The converter detects when the SLS2 limit value is selected.</li> <li>The converter starts the SLS delay time (p9551).</li> </ul>
②		<ul style="list-style-type: none"> <li>The motor follows the external setpoint and brakes.</li> <li>The actual speed must remain below the SLS2 limit value until the SLS delay time has elapsed.</li> </ul>
③		<ul style="list-style-type: none"> <li>Monitoring of the SLS2 limit value (p9531[1]) is effective once the SLS delay time (p9551) has elapsed.</li> <li>The converter signals the status "SLS active" (r9722.4) and the active SLS level (r9722.9 = 1, r9722.10 = 0).</li> </ul>
④		<ul style="list-style-type: none"> <li>If the motor speed violates the SLS2 limit value, the converter initiates the set stop response p9563[1].</li> </ul>
⑤	Change to SLS1 limit value	<ul style="list-style-type: none"> <li>The converter detects when the SLS1 limit value is selected.</li> <li>The converter starts the SLS delay time (p9551). The SLS2 limit value remains while the SLS delay time is active.</li> </ul>



⑥		<ul style="list-style-type: none"> <li>The motor follows the external setpoint and brakes.</li> <li>The actual speed must remain below the SLS1 limit value until the SLS delay time has elapsed.</li> </ul>
⑦		<ul style="list-style-type: none"> <li>Monitoring of the SLS1 limit value (p9531[0]) is effective once the SLS delay time (p9551) has elapsed.</li> <li>The converter signals the active SLS level (r9722.9 = 0, r9722.10 = 0).</li> </ul>
⑧		<ul style="list-style-type: none"> <li>If the motor speed violates the SLS1 limit value, the converter initiates the set stop response p9563[0].</li> </ul>
⑨	Deselection of SLS	<ul style="list-style-type: none"> <li>The converter detects deselection of SLS.</li> <li>The motor follows the external setpoint and accelerates, e.g. following the change to an "Automatic" mode.</li> </ul>

### 6.7.1.3 SLS with variable speed limit value

#### Overview

The SLS1 limit value is scalable during operation with the PROFIsafe telegram 901.

#### Requirement

The SLS1 limit value is selected with the PROFIsafe telegram. p9604.9 is set: Transfer of the SLS limit value via PROFIsafe is enabled.

#### Description of function

The signal S\_SLS\_LIMIT\_A in PROFIsafe telegram 901 scales the SLS1 limit value.

The S\_SLS\_LIMIT\_A scaling has the value range 1 ... 32767.

The scaled SLS1 limit value is calculated as follows: Scaled SLS1 limit value =  $S\_SLS\_LIMIT\_A / 32767 \cdot p9531[0]$

Before the higher-level control (F-CPU) selects an SLS limit value or changes the SLS1 limit value, the control must reduce the motor speed according to the changed SLS limit value.

With the scaled SLS1 limit value, too, the SLS2, SLS3 and SLS4 limit values can be selected with r9720.9 and r9720.10.

An invalid value in S\_SLS\_LIMIT\_A results in the stop response parameterized in p9563[0].

### 6.7.1.4 Limitation of the speed setpoint for SLS

#### Overview

For Safely-Limited Speed (SLS), it is useful to limit the speed setpoint with the higher-level control.

### Description of function

The higher-level control receives the value for the required limitation of the speed setpoint from the Safety Info Channel (SIC) in telegram 700.

With SLS active, the converter sends the required setpoint limit r9733 in the S\_V\_LIMIT\_B signal of telegram 700.

The converter calculates r9733 as follows:

- $r9733[0] = p9531[x] \cdot p9533$  (converted from the load to the motor side)
- $r9733[1] = -p9531[x] \cdot p9533$  (converted from the load to the motor side)  
[x] = selected SLS limit value

p9533 is the weighting factor to determine the setpoint limit from the selected actual speed limit in percent.

Conversion factor from the motor to the load side:

- Motor type = rotary and axis type = linear:  $p9522/(p9521 \cdot p9520)$
- Otherwise:  $p9522/p9521$

### 6.7.2 Safe Speed Monitor (SSM)

#### Overview

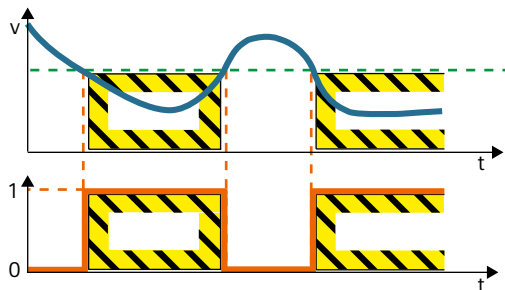


Figure 6-12 Overview SSM

Safe Speed Monitor (SSM) safely detects when the speed falls below a speed limit in both directions of motion. SSM is a pure signaling function. The converter provides a safety-related signal for further processing.

If the speed of the motor exceeds the SSM limit value, no stop response is initiated, contrary to other Safety Integrated Functions.

#### Requirement

SSM is enabled in the function selection.

Description of function

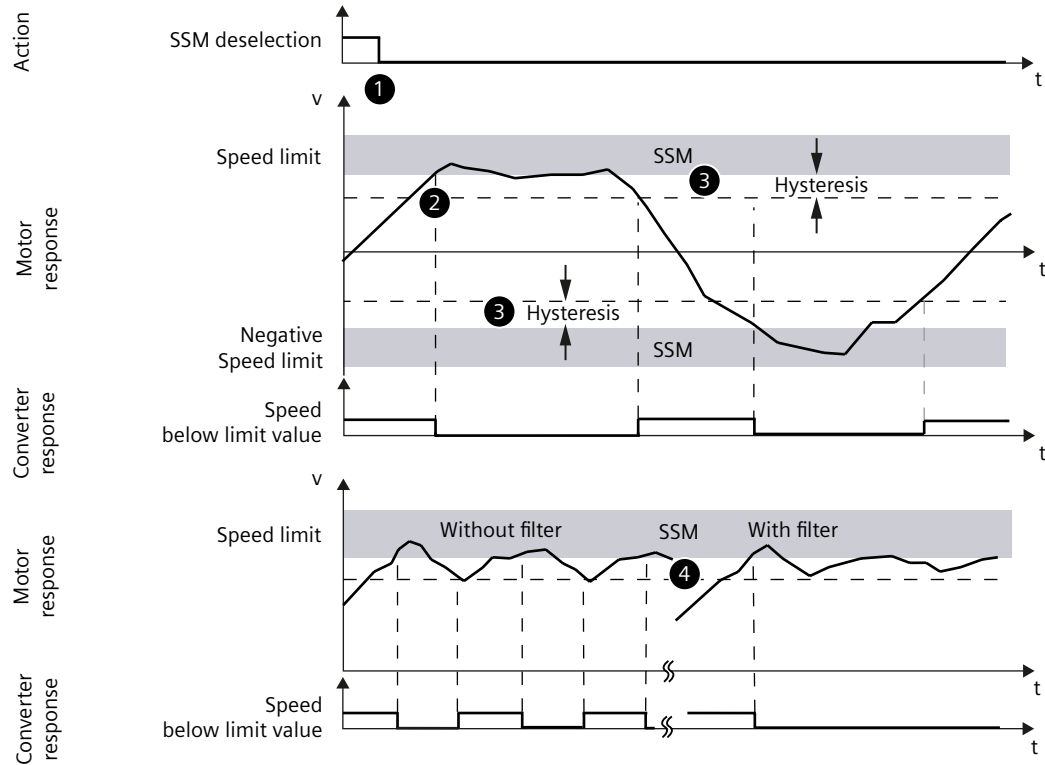


Figure 6-13 Representation of SSM

Action		Motor/converter response
①	Selection of SSM	<ul style="list-style-type: none"> <li>The converter detects when SSM is selected.</li> <li>SSM checks the speed actual value.</li> </ul>
②		<ul style="list-style-type: none"> <li>If the speed of the motor falls below the speed limit, then signal "Speed below limit value" (p9722.15 = 1) is set.</li> <li>If the speed is greater than the limit, the "Speed below limit value" signal is not set.</li> <li>The speed limit (p9546) is effective in both directions of motion.</li> </ul>
③		<ul style="list-style-type: none"> <li>Speed hysteresis (p9547) stabilizes signal "Speed below limit value".</li> <li>As a result of the hysteresis, in the vicinity of the monitoring threshold, the "Speed below limit value" signal does not jump between values "0" and "1".</li> <li>When "hysteresis and filtering" is activated with output signal SSM, a time-delayed SSM feedback signal occurs for the axes. This is a property of the filtering.</li> </ul>
④		<ul style="list-style-type: none"> <li>The signal filter smooths the speed measured by the converter.</li> <li>The filter is suitable for monitoring speeds that lie just below the speed limit.</li> <li>The response can be set using filter time (p9545).</li> </ul>

**Example**

SSM is suitable for enabling access to the machine by way of safe SSM feedback. For example, it is possible to unlock safety doors only when the speed falls below critical levels.

**6.7.3 Safe Direction (SDI)**

**Overview**

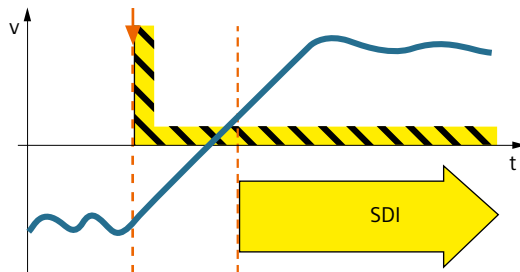


Figure 6-14 Overview SDI

With Safe Direction (SDI), the converter monitors the direction of motion of the motor. If the motor moves in the inhibited direction, then the converter stops the motor with an SDI-specific stop response.

The following SDI variants are available, depending on the direction of motion:

- SDI positive (SDI+)
- SDI negative (SDI-)

**Requirement**

SDI is enabled in the function selection.

Description of function

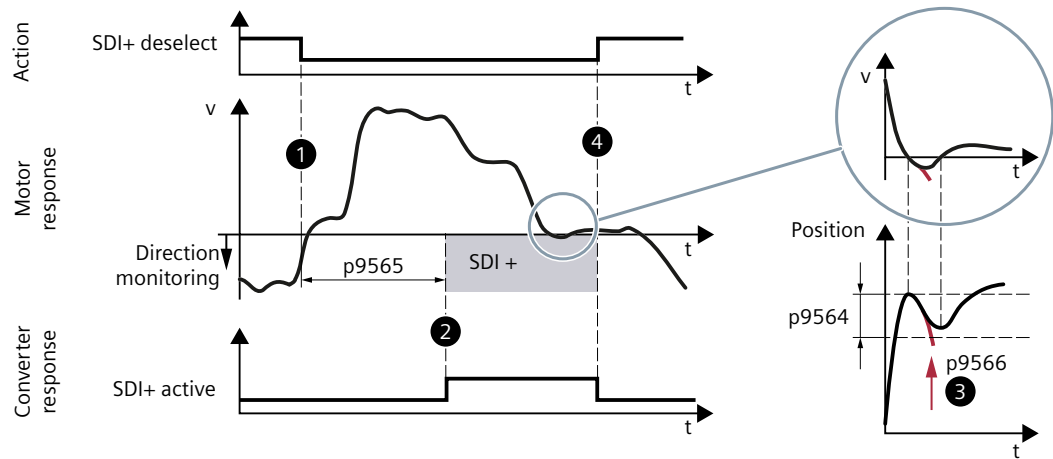


Figure 6-15 SDI+ with tolerance violation and direction of movement monitoring

Action	Motor/converter response
① Selection of SDI+	<ul style="list-style-type: none"> <li>The converter detects the selection of SDI+.</li> <li>The converter starts the SDI delay time (p9565).</li> </ul>
②	<ul style="list-style-type: none"> <li>After the SDI delay time has expired, the converter monitors the direction of motion of the motor.</li> <li>The converter reports the status "SDI positive active" (r9722.12).</li> <li>The converter continuously calculates the position of the motor.</li> <li>As soon as the motor moves in the inhibited direction, the converter stores the current position and monitors the discrepancy between the current position and the stored position.</li> </ul>
③	<ul style="list-style-type: none"> <li>If the discrepancy between the current position and the stored position is greater than the SDI tolerance p9564, the converter brakes the motor with the set stop response (p9566) and outputs a safety message<sup>1)</sup>.</li> </ul>
④ Deselection of SDI+	<ul style="list-style-type: none"> <li>The converter detects deselection of SDI+.</li> <li>The converter stops monitoring the motion direction.</li> <li>The motor can now be moved in both directions.</li> </ul>

<sup>1)</sup> The following steps are required to acknowledge the safety message:  
 - Deselect and reselect SDI  
 - Safe acknowledgement

**Note**

**No detection of a change in direction using p1821**

If the direction of motion is reversed using p1821, then safe monitoring is still possible. However, in this case, the setpoint limitation r9733 is calculated with the wrong direction of rotation. p9539 can be used to set the direction of motion for safety monitoring.

### 6.7.3.1 Limitation of the speed setpoint for SDI

#### Overview

For Safe Direction (SDI) it makes sense to limit the speed setpoint with the higher-level control.

#### Description of function

The higher-level control receives the value for the required limitation of the speed setpoint from the Safety Info Channel (SIC) in telegram 700.

With SDI active, the converter sends the required setpoint limit r9733 in the S\_V\_LIMIT\_B signal of telegram 700.

The converter calculates r9733 as follows:

- For SDI negative (SDI-): r9733[0] = 0
- For SDI positive (SDI+): r9733[1] = 0

## 6.8 Safety Integrated commissioning and configuration

#### Overview

The following commissioning tools are available for commissioning and configuring the converter:

- Web server integrated in the converter as web application
- Startdrive in the TIA Portal

#### Description of function

Commissioning Safety Integrated involves the steps:

- Function selection
- Parameter assignment
- Control
- Completing commissioning with acceptance test

Once Safety Integrated has been commissioned, the converter adopts the modified commissioning settings. The converter is then automatically restarted.

Commissioning of Safety Integrated has been completed after the restart.

Specific information about the tools is provided in the Commissioning chapters.

## 6.8.1 Selection of the Safety Integrated Functions

### Overview


In the function selection, the available Safety Integrated Functions are available depending on the control type.

The function selection offers the following setting options:

- Selection of each individual function
- Axis type





The converter must be restarted after making changes to the configuration.

### Description of function

Safety Integrated Functions requiring a license are marked in the function selection using the  symbol. You require the Safety Extended license for the corresponding functions. Safety Integrated is available in the Trial License mode for test purposes.

The functions available for selection depend on the selected control type:

Table 6-6 Safety Integrated Functions for every control type (p9603)

Control type	STO	SS1 <sup>1)</sup> 	SBC	SLS 	SSM 	SDI 
PROFIsafe	x	x	x	x	x	x
PROFIsafe and EMERGENCY STOP via terminals <sup>2)</sup>	x	x	x	x	x	x
Terminals <sup>2)</sup>	x	x	x	-	-	-

<sup>1)</sup> SS1-t does not require a license. SS1-a and SS1-r require a license.

<sup>2)</sup> SLS, SSM, SDI cannot be controlled via terminals. When switching over to this control type, the system automatically deactivates these functions.

Safety Integrated Functions are enabled with default settings after function selection (p9604). The default settings can be parameterized.

The stop responses STO and SS1 shown in the function selection must always be parameterized because the stop responses stop the motor in the case of a fault and for a limit value violation. If the STO and SS1 functions are also to be controlled via PROFIsafe and/or F-DI, then STO and SS1 must additionally be enabled in the function selection.

The function selection displays the actual value acquisition cycle and the monitoring cycle. The actual value acquisition cycle (p9511) and the monitoring cycle (p9500) cannot be changed.

Selecting the axis type (p9502) influences the display in the function view for the actual value acquisition/mechanical system and changes the units.

## 6.8.2 Safety Integrated parameterization

### Overview

All of the Safety Integrated Functions enabled in the function selected are listed in the parameterization and can be changed. If a monitoring function is enabled, then "Actual value acquisition/mechanical system" is also displayed.

For Safety Integrated Functions that have been enabled, the function view shows the interconnection diagram and the setting options.

### Description of function

The following settings can be edited in the function view of the parameterization:

Table 6-7 Possible settings the Safety Integrated Functions

Function	Possible settings
Safe Torque Off (STO)	Settings not required
Safe Brake Control (SBC)	SBC is always used together with STO or SS1
Safe Stop 1 (SS1)	<ul style="list-style-type: none"> <li>• Monitoring mode:                             <ul style="list-style-type: none"> <li>– SS1-t: time-controlled</li> <li>– SS1-a: with acceleration monitoring (SAM)</li> <li>– SS1-r: with braking ramp monitoring (SBR)</li> </ul> </li> <li>• Detail settings for SAM or SBR</li> <li>• Delay time for SS1</li> <li>• Optional with SAM active: STO shutdown speed</li> </ul>
Safely-Limited Speed (SLS)	<ul style="list-style-type: none"> <li>• Delay time for SLS</li> <li>• Speed limits for max. 4 levels</li> <li>• Stop responses (STO or SS1) for each level</li> <li>• Activate/inhibit PROFIsafe override für SLS of level 1 With this, you transfer variable SLS limits via PROFIsafe to the converter.</li> </ul>
Safe Speed Monitor (SSM)	<ul style="list-style-type: none"> <li>• Speed hysteresis</li> <li>• Speed limit</li> <li>• Filter time</li> </ul>
Safe Direction (SDI)	<ul style="list-style-type: none"> <li>• Delay time for SDI</li> <li>• Monitoring tolerance</li> <li>• Stop response (STO or SS1)</li> </ul>



The following settings can be changed in the function view of the actual value acquisition/mechanical system:

Table 6-8 Explanation of actual value acquisition/mechanical system - can be changed

Possible settings	Explanation
Load revolutions (p9521) and encoder revolutions (p9522)	The two setting options are required when using a gear ratio. A gear ratio is the ratio of encoder revolutions to revolutions of the drive shaft (load revolutions).
Reverse direction of the load (p9539)	This setting is required if the gearbox used is associated with a "Reverse direction".
Leadscrew pitch (p9520) for type "Linear axis"	The transmission ratio between the encoder and load in mm/revolution (linear axis with rotary encoder) is set using the leadscrew pitch.

### 6.8.3 Safety Integrated control

#### Overview

The Safety Integrated Functions can be controlled centrally via PROFIsafe or locally via terminals.

#### Description of function

The fundamental control type for Safety Integrated Functions is "via PROFIsafe".

The following options are also supported:

- When required, a local EMERGENCY STOP concept as well as PROFIsafe: Control of STO or SS1 via terminals (F-DI 0)
- For applications without PROFIsafe: subsequent control of EMERGENCY STOP via terminals (F-DI 0)

#### 6.8.3.1 PROFIsafe configuration

#### Overview

After PROFIsafe has been configured, Safety Integrated Functions can be selected and deselected, and safety faults can be safely acknowledged using PROFIsafe telegrams.

## Description of function

The PROFIsafe configuration encompasses the following settings:

Table 6-9 PROFIsafe settings

Settings	Explanation
PROFIsafe telegram number (p9611)	<p>Selection of the PROFIsafe telegram</p> <p>PROFIsafe telegrams can be used in various ways:</p> <ul style="list-style-type: none"> <li>Telegram 30: Control of the functions</li> <li>Telegram 901: Control of the functions + transfer of the F-DI status via PROFIsafe (c10050) + transfer of the SLS limit value via PROFIsafe (p9064.9)</li> </ul> <p>The Safety Info Channel in the supplementary telegram 700 is available for non-safety-related diagnostics of the Safety Integrated Functions on the higher-level controller.</p>
F-source address (p9613) F-destination address (9610) F-monitoring time (p9614)	<p>When using PROFIsafe address type 1, the uniqueness of the PROFIsafe address is only guaranteed as a result of the F-destination address.</p> <p>When using PROFIsafe address type 2, the uniqueness of the PROFIsafe address is guaranteed as a result of the combination of F-source address and F-destination address.</p> <p>The PROFIsafe address must be unique throughout the network and the CPU. The PROFIsafe address is unique if these conditions are satisfied:</p> <ul style="list-style-type: none"> <li>The F-source address of the F-CPU is unique throughout the network.</li> <li>The F-destination address of the converter is unique throughout the complete CPU.</li> </ul> <p>Within the monitoring time, a valid and current PROFIsafe telegram must be received from the F-CPU. This therefore secures the following:</p> <ul style="list-style-type: none"> <li>Detection of faults and failures</li> <li>Initiation of responses, which keep the F-system in a safe state or transition it into a safe state</li> </ul>
Response to a PROFIsafe failure (p9612)	Selection options for communication failure between STO and SS1

## More information

More information about telegrams and how to assign control and status words is provided in the Appendix under Communication telegrams (Page 705).

### 6.8.3.2 Transferring the F-DI status via PROFIsafe

#### Overview

The configuration of the transfer of the F-DI status defines the input mode of an F-DI, and activates the transfer of an F-DI state to the F-control.

#### Requirement

A PROFIsafe telegram with transfer of the F-DI status is set.

### Description of function

The configuration of the transfer of the F-DI status includes the following settings:

- p10040 defines whether the F-DI should operate as NC contact/NC contact (default setting) or as NC contact/NO contact.
- c10050 contains the F-DI state to be transferred to the F-control.

### 6.8.3.3 EMERGENCY STOP via terminals of the failsafe digital input (F-DI)

#### Overview

After the configuration, a stop function for EMERGENCY STOP via terminals is defined.

### Description of function

EMERGENCY STOP is permanently assigned to F-DI 0. The following functions can be selected:

- Safe Torque Off (STO)
- Safe Stop 1 (SS1)

### 6.8.3.4 F-DI configuration

#### Overview

The F-DI configuration includes the following steps:

- Assignment of Safety Integrated Functions to a failsafe digital input (F-DI)
- Defining the input modes of an F-DI

### Description of function

The F-DI configuration allows the assignment of Safety Integrated Functions to the F-DI. After configuring the F-DI, the interconnected Safety Integrated Function can be selected and deselected.

In the F-DI configuration, it is also possible to set the input modes of an F-DI (p10040). The setting defines whether the F-DI should operate as NC contact/NC contact (default setting) or as NC contact/NO contact.

At the F-DI, the following components can be used:

- Non-self-monitoring sensors (e.g. EMERGENCY STOP button)
- Self-monitoring components (OSSD)

### 6.8.3.5 Discrepancy time

#### Overview

During the discrepancy time, the converter tolerates inconsistent input signals.

#### Description of function

The converter monitors at the two input terminals of the F-DI whether the input signals attain the same logical signal state within the discrepancy time. With electromechanical sensors, e.g. EMERGENCY STOP buttons or position switches, the two sensor contacts never switch at exactly the same time. The input signals of the F-DI are inconsistent (discrepancy).

During the discrepancy time, the converter tolerates inconsistent input signals. The discrepancy time does not extend the converter response time.

A permanent discrepancy signifies an error in the F-DI interconnection. In this case, the converter responds with a safety message

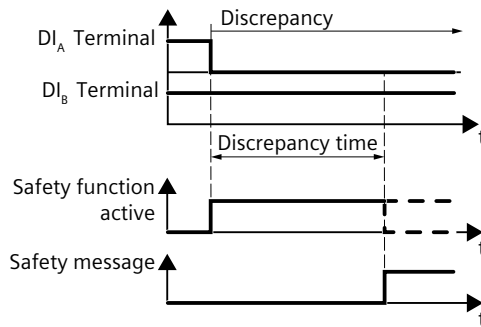
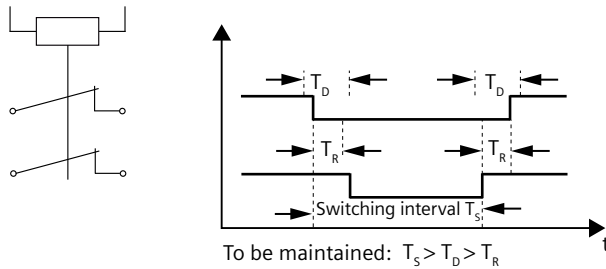


Figure 6-16 Permanent discrepancy

The discrepancy time must be set so that it is less than the smallest expected switching interval of the signal at the F-DI, see the illustration below.



- $T_S$  Switching interval
- $T_D$  Discrepancy time
- $T_R$  Response time


Figure 6-17 Discrepancy time when a relay is switched

### 6.8.3.6 Input filter

#### Overview

The input filter suppresses unwanted brief signal changes at a fail-safe digital input (F-DI).

#### Requirement

 <b>WARNING</b>
<p><b>Unexpected movements due to long connecting cables</b></p> <p>If a cable at a fail-safe digital input is too long, the fail-safe digital input might not reliably detect a short-circuit of the connecting cable to 24 V or to ground. An undetected short-circuit may mean that the connected sensor is no longer working. This may impair the functional safety of the machine or the system and therefore endanger people or lead to material damage.</p> <ul style="list-style-type: none"> <li>• Only connect cables with a length of <math>\leq 30</math> m to a fail-safe digital input.</li> </ul>

#### Description of function

If a fail-safe digital input (F-DI) is connected to an electromechanical sensor, for example, then contact bounce leads to brief signal changes. In this case, an immediate response of the converter to signal changes is not desirable. Too many signal changes within a specific time result in a converter fault.

During the filter time (p10017) of the input filter, the converter ignores signal changes.

The input filter lengthens the response time of the Safety Integrated Function connected to the F-DI.

### 6.8.3.7 Self-test of the failsafe digital input (F-DI)

#### Overview

To detect faults at an early stage, the converter continuously tests its shutdown paths, functions and interfaces.

Various modes are available to test a failsafe digital input (F-DI):

- Self-test with internal test signals
- Self-test using entered dark pulses
- Self-test using externally entered dark pulses

#### Description of function

The self-test checks with test signals at the input terminals of the F-DI whether the F-DI can be switched to the failsafe state (to "low"). If the converter does not detect a feedback signal, then it triggers a fault response.

The debounce time (p10017) prevents a converter response to the dark pulse. If the debounce time is shorter than the test signal or dark pulse length, then the converter interprets the dark pulse as a switching operation.

**Self-test with internal test signals**

The converter internally generates test signals for the input circuit of the F-DI (p10041 = 0).

The test signal length and the test cycle cannot be changed.

The self-test using internal test signals meets the following requirements:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 3 to ISO 13849-1

**Self-test using entered dark pulses**

The converter provides the switchable voltage source VS+ at terminal block X130. VS+ generates dark pulses, to diagnose the control circuit, for example.

The self-test using specified dark pulses with VS+ (p10041 = 1) offers additional short-circuit detection between ground and 24 V.

The dark pulse length of the switchable power supply (p10018) can be parameterized. The test cycle has a fixed value of 5 seconds.

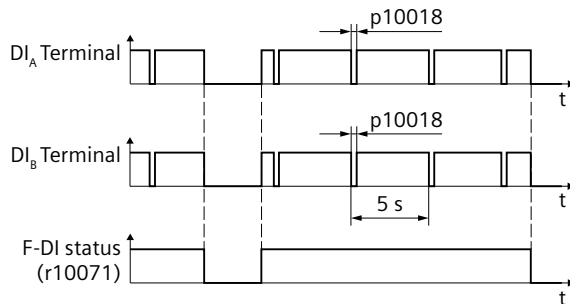


Figure 6-18 Dark pulses through switchable power supply

For the debounce time:

- $p10017 > \text{dark pulse length (p10018)} + 2 \text{ ms}$

The self-test using entered dark pulses meets the following requirements:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 4 to ISO 13849-1

**Self-test using externally entered dark pulses**

An electronic control, e.g. F-PLC, generates dark pulses at the input terminals of the F-DI (p10041 = 3).

The dark pulse length is determined by the control. The maximum wait time for dark pulses (p10019) can be parameterized.

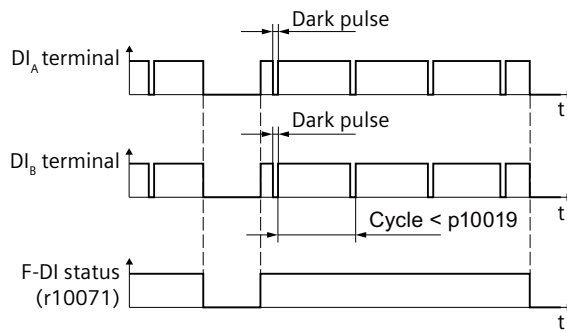


Figure 6-19 Dark pulses through control

For the debounce time:

- $p10017 > \text{dark pulse length (p10018)} + 2 \text{ ms}$   
The test pulse length of the external control must be checked and the debounce time must be adapted.

The self-test using externally entered dark pulses meets the following requirements:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 4 to ISO 13849-1

## 6.8.4 Acceptance - completion of commissioning

### 6.8.4.1 Acceptance test requirements

#### Overview

The machine manufacturer is responsible in ensuring that the plant or machine functions perfectly. As a consequence, after commissioning, the machine manufacturer must check those functions which represent an increased risk of injury or material damage, or have them checked by specialist personnel. This acceptance or validation is specified in the European Machinery Directive and comprises 2 parts:

- **Acceptance test:** Check the safety-relevant functions and machine parts after commissioning.
- **Documentation:** Generate an "Acceptance report" that describes the test results.

ISO 13849-1 provides additional information relating to validation, for example. The acceptance test requirements (configuration check) for the safety functions of electric drives are based on IEC 61800-5-2.

## Description of function

### Acceptance test of the machine or plant

The acceptance test checks whether the safety-relevant functions in the plant or machine function correctly. The documentation of the components used in the Safety Integrated Functions can also provide information about the tests required. Testing the safety-relevant functions includes, e.g. the following:

- Is all safety equipment, such as protective door monitoring devices, light barriers or EMERGENCY STOP buttons, connected and ready for operation?
- Does the higher-level control respond as expected to the safety-relevant feedback signals of the drive?
- Do the drive settings match the configured safety-relevant function in the machine?

### Acceptance test of the converter

The acceptance test of the converter is a part of the acceptance test of the entire machine or plant.

The acceptance test of the converter tests whether Safety Integrated Functions have been set to match the configured Safety Functions of the machine. The acceptance test documents the settings with which the real function fulfills the intended functionality.

### Documentation

The documentation encompasses the following:

- Result of the acceptance tests
- Settings of the Safety Integrated Functions

This documentation must be countersigned.

### Persons authorized to perform the acceptance test

Personnel from the machine manufacturer, who, on account of their technical qualifications and knowledge of the safety functions, are in a position to perform the acceptance test in the correct manner are authorized to perform the acceptance testing of the converter and the motor.

## 6.8.4.2 Acceptance test for the converter

### Overview

An acceptance test must be performed in the following cases:

- After commissioning
- After importing a new firmware version into the converter
- After changing the parameterization
- After a component is replaced



## Description of function

The converter acceptance test comprises the following steps:

- Documentation
  - Supplement/change the hardware data
  - Supplement/change the software data (specify version)
- Function test of the Safety Integrated Functions:  
Each function that is used and every configured control must be individually tested. Acceptance tests should be performed at the maximum speeds and acceleration rates that are possible for the machine. The maximum braking distances and braking times that can be expected can be determined based on the maximum speeds and acceleration rates.

### 6.8.4.3 Examples of acceptance tests

#### Overview

The following examples show the principal steps for performing an acceptance test for a Safety Integrated Function. The examples are not suitable for every converter setting.

The Startdrive commissioning tool offers functions for the converter acceptance test (Safety Acceptance Test), as well as the system interfaces (Safety Activation Test).

#### Requirement

The converter is ready for operation.

The converter signals neither faults nor alarms of the Safety Integrated Functions (r0945[0...7], r2122[0...7], r60047[0...7]).

The function to be tested is not active.

## Description of function

The acceptance test for the individual functions encompasses the steps:

- Switch on the motor
- Selection of the Safety Integrated Function
- Deselection of the Safety Integrated Function

## Examples

### STO acceptance test

- Switch on the motor:  
Enter speed setpoints  $\neq 0$  + switch on the motor + test whether the motor runs as required
- Selection of STO while the motor is running  
Test whether each configured control, e.g. via F-DI and via PROFIsafe, functions  
Test whether the following points apply:
  - If a mechanical brake is not available, the motor coasts to a standstill.  
A mechanical brake brakes the motor and holds it to ensure that it remains at a standstill.
  - The motor signals neither faults nor alarms of the Safety Integrated Functions (r0945[0...7], r2122[0...7], r60047[0...7]).
  - The converter signals: "STO is active" (r9722.0 = 1).
- Deselection of STO  
Test whether the following points apply:
  - STO is not active (r9722.0 = 0).
  - The converter signals neither faults nor alarms of the Safety Integrated Functions (r0945[0...7], r2122[0...7], r60047[0...7]).
  - The motor runs as required.

### SS1-t acceptance test

- Switch on the motor:  
Enter speed setpoints  $\neq 0$  + switch on the motor + test whether the motor runs as required
- Selection of SS1-t while the motor is running  
Test whether each configured control, e.g. via F-DI and via PROFIsafe, functions  
Test whether the following points apply:
  - The motor brakes on the OFF3 ramp.
  - The converter signals: "SS1 is active" (r9722.1 = 1).
  - STO becomes active after time p9556 elapses. The converter signals: "STO is active" (r9722.0 = 1).
- Deselection of SS1-t  
Test whether the following points apply:
  - SS1 is not active (r9722.1 = 0).
  - The converter signals neither faults nor alarms of the Safety Integrated Functions (r0945[0...7], r2122[0...7], r60047[0...7]).
  - The motor runs as required.

**SBC acceptance test**

- Switch on the motor:  
Enter speed setpoints  $\neq 0$  + switch on the motor + test whether the motor runs as required + then enter a speed setpoint = 0
- Selection of STO or SS1 while the motor is switched on  
Test whether the following point applies:
  - The converter signals: "SBC is active" (r9722.0 = 1 and r0899.12 = 0).
- Deselection of STO or SS1  
Test whether the following points apply:
  - The converter signals: "SBC is not active" (r9722.0 = 0 and r0899.12 = 1).
  - The converter signals neither faults nor alarms of the Safety Integrated Functions (r0945[0...7], r2122[0...7], r60047[0...7]).

**More information**

More information is provided in the chapter on commissioning (Startdrive) under "Performing the acceptance test (Page 292)".

**6.8.4.4 Test of brake output****Overview**

To meet the requirements of the ISO 13849-1 and IEC 61800-5-2 standards in terms of timely fault detection, the converter must test its brake output regularly - at least once a year - for correct functioning.

**Description of function**

To test the brake output of the converter, the SBC (Safe Brake Control) function must be activated within a defined time interval. The time interval depends on the required Safety Integrity Level (SIL) and on the desired Performance Level (PL) category:

- SIL2 / PL d / Category 3: 1 year
- SIL3 / PL e / Category 3: 3 months
- SIL3 / PL e / Category 4: 1 day

A timer is available to test the brake output for the safe brake control using SBC. In the standard, this is preset to 2160 h  $\cong$  3 months (p9659). The remaining time is shown in r9660. Message "Test brake output required" is output after the timer elapses. After the next time that the brake is either closed or opened, the message is withdrawn and the monitoring time is reset. In operation, the monitoring time is reset each time the brake is actuated.

### 6.8.4.5 Information about series acceptance

#### Overview

When the project is transferred to other machines (series commissioning) a reduced acceptance test of the Safety Integrated Functions is necessary.

#### Description of function

In series commissioning, the reduced acceptance test involves the following steps:


- Test of the EMERGENCY STOP function (STO or SS1) and the SBC function that is potentially used
- A general test of the actual value acquisition by switching on and operating briefly with traversing in both directions
- Only for motion monitoring functions - testing the safe actual value acquisition: Brief movement of the motor with the motion monitoring functions active (e.g. SLS) in both directions.
- Countersigned acceptance report with the following content:
  - New converter data (HW/SW version)
  - Changed checksum
  - Time stamp

### 6.8.4.6 Information pertaining to component replacements

#### Overview

After making changes to the machine, a new acceptance test must be performed with documentation.

#### Requirement

 <b>WARNING</b>
<b>Unexpected movement due to incorrect component replacement</b>
After a component has been replaced, connections or functions may be defective. This can lead to unexpected movements of motors that may result in death or serious injury.
<ul style="list-style-type: none"><li>• After component replacement, run a simplified function test.</li></ul>

The faulty component was replaced.

## Description of function

The following table shows the converter response after a component replacement and the resulting action required:

Table 6-10 Response after a component has been replaced

Replaced component	Control type	Converter response (alarm)	User action	Diagnostic parameters
			Save by copying from RAM to ROM (p0977 = 1) <sup>1)</sup>	
Motor	All	A01641.5 = 1	Yes	r9776.2 = 1

<sup>1)</sup> The condition for saving is: There is no firmware update active on the converter. Without saving, the converter signals the fault again after the next POWER ON.

### Acceptance test and acceptance report

Alarm A01641 reports which component was replaced.

Each time a component is replaced, a function test must always be carried out so that incorrect connections or wiring can be ruled out.

### Replacing a motor

The converter reports motor replacement with the alarm A01641. If the replaced motor is of the same type with the same integrated encoder and sensor, the converter does not trigger a stop response. Motor operation is not restricted. The message is deleted after saving by copying from RAM to ROM and restarting the converter.

A reduced acceptance test of the Safety Integrated Functions is required:

- A general test of the actual value acquisition by switching on and operating briefly with traversing in both directions after a component has been released.
- Only for motion monitoring functions - testing the safe actual value acquisition: With the motion monitoring functions active (e.g. SLS), briefly move the motor in both directions.
- Only for motion monitoring functions and after the encoder has been replaced: Test the encoder parameterization (a trace recording is not required)
- Countersigned acceptance report with the following content:
  - New converter data (HW/FW version)
  - Changed checksum
  - Time stamp

### Converter replacement

A message is not issued after the converter is replaced. The converter is ready for use after the project data have been transferred to it. Project data are transferred by inserting the SD card, backing up and restoring the data using the web server, or downloading the data from the commissioning tool.

A reduced acceptance test of the Safety Integrated Functions is required:

- Test of the EMERGENCY STOP function (STO or SS1) and the SBC function that is potentially used
- A general test of the actual value acquisition by switching on and operating briefly with traversing in both directions
- Countersigned acceptance report with the following content:
  - New converter data (HW/FW version)
  - Changed checksum
  - Time stamp

## 6.9 Status and diagnostics of the Safety Integrated Functions

### Overview

Function status/diagnostics shows information about the Safety Integrated settings and states of the converter.

If no Safety Integrated Function is enabled, then a function status cannot be viewed.

### Description of function

Function status/diagnostics shows the status of the enabled Safety Integrated Functions. If a function is active, then the status indicates "active" (r9722). When STO and SS1 are active, then EMERGENCY STOP is initiated. The brake is safely controlled if SBC is active. When SLS, SDI and SSM are active, then the monitoring of the particular function is also active.

In addition to the function status, the following data can be viewed:

- Supplementary information (depending on the function)
  - Example of SLS: Displays the active level, the active SLS limit value and the speed actual value (r9714).
- Status of the converter:  
Provides information as to whether internal events (e.g. software errors in the converter or a discrepancy in the monitoring channels) have been signaled and whether the communication functions.

- Overview of the checksums:
  - Functional checksum (r9780) and time stamp (r9781)  
The checksum displays the functional checksum of the converter and is used to track changes (safety logbook). The functional checksum corresponds to a fingerprint of the parameterized Safety Integrated Functions on the converter. The checksum is updated after completing the Safety Integrated commissioning. The time stamp displays the update time.
  - Functions (offline: p9799 and online: r9798) and PROFIsafe (offline: p9797 and online: r9796)  
The checksum is displayed using the checksum-checked parameters for the converter configuration. Based on these data, it can be identified whether the parameterization of the Safety Integrated Functions was changed. The checksum of the PROFIsafe parameterization is displayed next to it.  
The checksums are calculated and displayed once offline and online commissioning have been completed.
- Version:  
The version shows the software versions of the corresponding components relevant for Safety Integrated. These data are predominantly provided as information for service and update.
  - SINAMICS Safety firmware version
  - I/O processor firmware version
  - Encoder firmware version

### Checksums

Using the checksums, it can be identified as to whether the configuration and/or parameterization of Safety Integrated was changed.

An acceptance test is required after changing the checksums. The system outputs the appropriate messages to indicate that an acceptance test is required. The checksums are used for documentation purposes within the scope of an acceptance test.

The parameterization can be transferred to several devices by separating the checksums for function and communication. When transferring the parameterization to several devices, you must check whether the device is correctly assigned in the communication group.

### More information

Further information about the checksums is provided in the parameter list.

## 6.10 Responses to safety faults and alarms

### 6.10.1 Stop responses

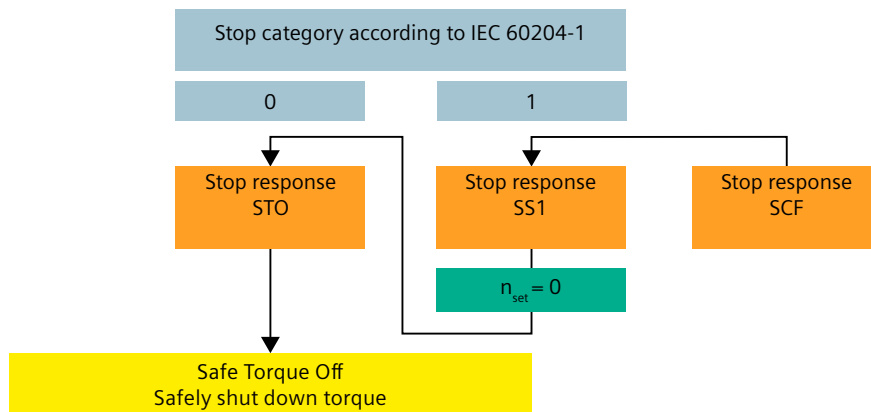
#### Description of function

The converter triggers a fault reaction in response to certain events:

- Stop response SCF  
The converter detects a discrepancy in the Safety Integrated monitoring channels, e.g. an error in the result and data comparison.  
The time p9555 delays the transition to the stop response SS1.
- Stop response STO or SS1  
The converter detects a limit violation, for example involving the Safely-Limited Speed (SLS) function. The stop response is settable.  
If stop response SS1 is set, stop response STO automatically follows when the motor comes to a standstill.

It is not possible to select a stop response externally, for example via PROFIsafe.

All stop responses bring the motor to a standstill.



STO Safe Torque Off  
SS1 Safe Stop 1  
SCF Safety Channel Failure

Figure 6-20 Stop responses

### 6.10.2 Fail-safe acknowledgment of safety messages

#### Overview

In the event of safety messages, e.g. due to limit value violations of the motor with active Safety Integrated Functions, the converter detects an internal event.



A safety message requires a failsafe acknowledgement.

### Requirement

You checked and eliminated the cause of the internal event.

### Procedure

You must acknowledge safety messages with a failsafe signal. You have the following options for failsafe acknowledgement:

#### Via PROFIsafe

Acknowledge the fault with bit 7 of safety control words 1 or 2:

- Bit 7 = 0 → 1 → 0

#### Via selection and deselection of STO/SS1

Select the Safety Integrated Function STO or SS1 and then deselect again:

- Via F-DI = 1 → 0 → 1  
or
- With bit 0 or 1 of the PROFIsafe safety control word 1 or 2: Bit 0 or 1 = 1 → 0 → 1

#### By switching the supply voltage on and off

Temporarily switch the power supply of the converter off and on again.

---

#### Note

#### Additional acknowledgement via the "standard" acknowledgement signal

Safety Integrated uses its own message type (C) by default. With p3117 you have the option of reparameterizing safety messages as Alarm (A) or Fault (F). In this case, you must additionally acknowledge the internal event with the "Standard" acknowledgement signal.

---

## 6.11 Priority of stop responses and stop functions

### Overview

If multiple Safety Integrated Functions or stop responses are active at the same time, the priority of each function determines the behavior of the motor.

### Description of function

The priority determines whether a stop response or a stop function influences another active Safety Integrated Function.

The stop responses and stop functions have a higher priority than all other Safety Integrated Functions.

Amongst themselves, the stop responses and stop functions have different priorities.

Table 6-11 Priority of stop responses and stop functions

Priority	Stop response or stop function
High	Safe Torque Off (STO)
Low	Safe Stop 1 (SS1)

A stop response or stop function with a higher priority influences an active stop response or stop function with a lower priority.

A stop response or stop function with a lower priority has no influence on an active stop response or stop function with a higher priority.

### Example

Examples of the behavior of the motor if a stop response is active or if a stop function is selected:

- Safely-Limited Speed (SLS) is active and Safe Stop 1 (SS1) is selected.  
Result: The converter brakes the motor because the stop function Safe Stop 1 (SS1) has a higher priority than Safely-Limited Speed (SLS).
- Safely-Limited Speed (SLS) is active and the converter detects a limit value violation.  
Safe Torque Off (STO) is set as the stop response to a limit value valuation.  
During the stop response, the stop function Safe Stop 1 (SS1) is selected.  
Result: The selection of Safe Stop 1 (SS1) has no influence on the behavior of the motor. The motor coasts down because Safe Torque Off (STO) has a higher priority than Safe Stop 1 (SS1).

## 6.12 Response times

### 6.12.1 Monitoring cycle and PROFIsafe cycle

#### Description

The Safety Integrated Functions are executed in the monitoring cycle (p9500).

The PROFIsafe telegrams are evaluated in the monitoring cycle.

## 6.12.2 Response times when controlling via PROFIsafe

### Technical data

The response times are converter-internal response times. Program runtimes in the F-host and the transmission time via PROFINET are not taken into account. Consider the following with regard to the calculation of the response times between F-CPU and converter: Safety Integrated Functions are only selected after the PROFIsafe monitoring time (F\_WD\_Time) has elapsed, e.g. due to communication faults. The PROFIsafe monitoring time (F\_WD\_Time) must therefore also be included as a relevant component in the calculation when an error occurs.

#### Notes regarding understanding the following table

The specified response times are applicable for a fault-free drive system as well as when a fault is active in the system.

- Worst Case Delay Time (WCDT): Maximum response time between a PROFIsafe telegram being received and a stop function being initiated when there is no fault
- One Fault Delay Time (OFDT): Maximum response time between a PROFIsafe telegram being received and a stop function being initiated when a fault is active
- Watchdog Time (WDTIME): Time between receiving the last valid PROFIsafe telegram and the initiation of a stop function after the PROFIsafe monitoring time elapses
- Device Acknowledgement Time (DAT): Time between receiving a PROFIsafe telegram and sending a response to this telegram
- State change at the failsafe digital input (F-DI): Response time when switching an F-DI up to sending the F-DI state in the PROFIsafe telegram to the F-PLC

Table 6-12 Technical specifications - Response times

Property	Function	Unit	Value
WCDT / OFDT	STO / SS1 / SBC	ms	$(2 \cdot p9500) + t_{K1}$
WDTIME	STO / SS1 / SBC	ms	$F\_WD\_Time + (2 \cdot p9500) + t_{K1}$
DAT		ms	$(2 \cdot p9500) + t_{K1} + t_{K2}$
State change F-DI		ms	$p10017 + (2 \cdot p9500) + 3.5 \text{ ms} + t_{K2}$

p9500: Monitoring cycle (factory setting: 4 ms)

If an isochronous PROFIsafe telegram is used, and synchronism with the F-CPU is optimally set, then p9500 can be reduced from 2 cycles to one cycle. Optimally matched: bus clock cycle = p9500. The F-PLC receives one PROFIsafe telegram per cycle from the converter, and the converter receives one PROFIsafe telegram per cycle from the F-PLC.

p10017: Debounce time of the F-DI (factory setting: 4 ms)

F\_WD\_Time: PROFIsafe monitoring time

Take the F\_WD\_Time from your PROFIsafe configuration.

6.12 Response times

- t<sub>K1</sub>: Time for the internal converter communication when receiving a PROFIsafe telegram
  - For isochronous communication: t<sub>K1</sub> = T<sub>o</sub>. Determine T<sub>o</sub> from the bus configuration on the control side.
  - For non-isochronous communication: t<sub>K1</sub> = 4 ms
- t<sub>K2</sub>: Time for the internal converter communication when sending a PROFIsafe telegram
  - For isochronous communication: t<sub>K2</sub> = bus cycle time. The bus cycle time is the send clock of the PROFINET controller.
  - For non-isochronous communication: t<sub>K2</sub> = 4 ms

6.12.3 Response times when controlling via terminals

Technical data

The following response times are applicable for stop functions for control via terminals of the failsafe digital input (F-DI). The response time of a stop function is the time between the selection of the stop function and the initiation of a stop response.

The specified response times are applicable for a fault-free drive system as well as when a fault is active in the system.

Table 6-13 Technical specifications - Response times

Function	Unit	Worst case delay time
STO / SS1 / SBC	ms	p10017 + (2 · p9500) + 3.5 ms

p10017: Debounce time des F-DI (factory setting: 4 ms)

p9500: Monitoring cycle (factory setting: 4 ms)

6.12.4 Response times - independent of the control type

Technical data

The following response times of the monitoring functions are independent of the control type.

The response times of Safety Integrated Functions are defined as follows:

- Safe Direction (SDI) and Safely-Limited Speed (SLS): The response time is the time between a limit value being violated and initiating the respective stop function.
- Safe Speed Monitor (SSM): The response time is the time between a limit value being violated up to sending the information via PROFIsafe.

The specified response times are applicable for a fault-free drive as well as when there is a fault.

Table 6-14 Technical specifications - Response times

Function	Unit	Worst case delay time
SDI	ms	$(3 \cdot p9500) + t\_R$
SLS	ms	$(3 \cdot p9500) + t\_R$
SSM (output to the bus)	ms	$(3 \cdot p9500) + p9545 + t\_K_2$

p9500: Monitoring cycle (factory setting: 4 ms)

t\_R: t\_R depends on the relevant stop response initiated after the limit is breached:

- STO: 0.5 ms
- SS1: 2 ms

p9545: SSM filter time

t\_K<sub>2</sub>: Time for the internal converter communication when sending a PROFIsafe telegram

- For isochronous communication:  $t\_K_2 = T_{dp}$ . Determine  $T_{dp}$  from the bus configuration on the control side.
- For non-isochronous communication:  $t\_K_2 = 4$  ms

## 6.13 Functional safety

### Overview

A system or machine is considered functionally safe if the safety-relevant parts of the protection and control equipment function correctly.

### Description

Safety, from the perspective of the object to be protected, cannot be split-up. The causes of danger and therefore also the technical measures to prevent them can vary widely. This is why a differentiation is made between different types of safety (e.g. by specifying the cause of possible hazards). "Functional safety" is involved if safety depends on the correct function.

To ensure the functional safety of a system or machine, the safety-related parts of the protection and control devices must function correctly. In the case of a fault, systems must respond in such a way that either the plant remains in a safe state or it is brought into a safe state. In this case, it is necessary to use specially qualified technology that fulfills the requirements described in the associated Standards. The requirements to implement functional safety are based on the following basic objectives:

- Avoiding systematic faults
- Controlling random faults or failures

Benchmarks for establishing whether or not a sufficient level of functional safety has been achieved include the probability of hazardous failures, the fault tolerance and the

quality that is to be guaranteed by avoiding systematic faults. This is expressed in the standards using specific classification. In IEC 61800-5-2, IEC 62061 "Safety Integrity Level" (SIL) and ISO 13849-1 "Category" and "Performance Level" (PL).

## 6.14 Machinery Directive

### Overview

The basic safety and health requirements specified in Annex I of the Directive must be fulfilled for the safety of machines.

### Description

The protective goals must be implemented responsibly to ensure compliance with the Directive.

Manufacturers of a machine must verify that their machine complies with the basic requirements. This verification is facilitated by means of harmonized standards.

IEC 61800-5-2 Adjustable-speed electrical power drive systems Part 5-2 is relevant for the Machinery Directive: Safety requirements - Functional safety.

Within the context of EN 61508, IEC 61800-5-2 considers adjustable-speed electrical power drive systems (PDS), which are suitable for use in safety-related applications (PDS(SR)).

IEC 61800-5-2 places requirements on PDS(SR) as subsystems of a safety-related system. This therefore permits the implementation of the electrical/electronic/programmable electronic elements of a PDS(SR) taking into account the safety-relevant performance of the safety function(s) of a PDS.

Manufacturers and suppliers of PDS(SR) can prove to users (e.g. integrators of control systems, developers of machines and plants etc.) the safety-relevant performance of their equipment by implementing the specifications stipulated in standard IEC 61800-5-2.

---

### Note

#### Requirements in relation to food processing

Pay particular attention to Annex I, 2.1 of the Machinery Directive regarding requirements in relation to food processing.

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## Installing

### 7.1 EMC-compliant installation of a machine or system

The converter is designed for operation in industrial environments.


Reliable and disturbance-free operation is only guaranteed for EMC-compliant installation.

#### More information

More information about EMC-compliant installation is available in the Internet:

- EMC installation guideline (<https://support.industry.siemens.com/cs/ww/en/view/60612658>)

### 7.2 Installing the motor

 <b>WARNING</b>
<p><b>Fire due to inadequate cooling</b></p> <p>Inadequate cooling can cause the motor to overheat, resulting in smoke and fire. Possible consequences can be serious injury or death. This can also result in increased failures and reduced service lives of motors.</p> <ul style="list-style-type: none"> <li>• Comply with the specified cooling requirements for the motor.</li> </ul>

#### Note

##### Required checks

The checklists below do not purport to be complete. It may be necessary to perform additional checks and tests in accordance with the situation specific to the particular installation site.

- Install the motor as described in the following chapters of the operating instructions.
- Thoroughly familiarize yourself with the safety instructions and observe the checklists below before starting any work.

Table 7-1 Checklist prior to installation

Check	OK
<b>General checks</b>	
Are all necessary components of the configured drive available?	
Are the ambient conditions in the permissible range?	
<ul style="list-style-type: none"> <li>• Section "Permissible environmental conditions for the motor (Page 369)"</li> </ul>	

Table 7-2 Checklist to check the mechanical system

Check	OK
<b>Checking the mechanical system</b>	
Is the motor free of visible damage?	
Have the mounting surfaces (e.g. flange, shaft) on the customer machine and on the motor been cleaned?	
Are the mounting surfaces free of corrosion?	
Do the mounting dimensions (e.g. shaft diameter, shaft length, true run) on the customer machine meet the specification?	



## 7.2.1 Mounting instructions for the motor

**NOTICE****Damage to shaft sealing rings caused by solvent**

If shaft sealing rings come into contact with solvents when preservation coating is removed, the shaft sealing rings can be damaged.

- Avoid contact between solvents and shaft sealing rings.

**NOTICE****Damage to the motor due to radial eccentricity at the shaft extension**

Radial eccentricity and axial forces at the shaft extension can damage the motor.

- Mount the motor in such a way that no radial eccentricity and axial forces occur at the shaft extension.

- Adhere to the specifications on the rating plate.
- Observe the warning and information plates on the motor.
- Check the permissible ambient conditions (e.g. temperature, installation altitude) at the installation location.
- Thoroughly remove any anti-corrosion agents from the shaft extension. Use commercially available solvents.
- Ensure that power losses are adequately dissipated. See Chapter "Cooling (Page 371)".
- If the motor is installed vertically with the shaft extension facing up, ensure that no liquid can enter the upper bearing.
- Carefully ensure that the flange is in even contact with the mounting surface.
- Use hexagon socket head cap screws with a property class of at least 8.8.
- When tightening the fastening bolts avoid any uneven stressing.
- Observe the tightening torques for the fixing screws (see table below).

## 7.2.2 Mounting instructions when using the motor in food processing machinery (compliance with EHEDG)

### 7.2.2.1 Requirements for compliance with EHEDG

#### Requirement

If you want to use motor 1FS2 in food processing machinery in compliance with EHEDG, you must fulfill the following requirements:

- Use only components that are EHEDG-compliant.
- Observe the national, local, and plant-specific regulations of the final product (including Machinery Directive 2006/42/EC).
- The motor must always be installed by trained and qualified personnel.

#### Procedure

- Comply with the permissible EHEDG mounting positions, see Chapter "Mounting positions (Page 149)".
- Maintain the original condition of the stainless steel surface of the motor. Prevent the stainless steel surface of the motor from being damaged (EHEDG requirement Ra <0.8).
- Mount the motor in such a way that liquids are self-draining at the motor cable outlet and at the shaft sealing ring.
- Secure the motor with EHEDG-certified stainless steel bolts in hygienic design.
- Seal the motor flange with the flat gasket provided.
- Cover the motor flange with an EHEDG-compliant gearbox or an EHEDG-compliant bell housing.
- Make sure that the installed motor can be cleaned from all sides without restriction. Avoid surfaces on the installed motor that are shielded from spraying.
- The end of the motor cable (plug-in connection or free cable ends) is not EHEDG-compliant. Make sure that the end of the motor connection cable is located outside the food processing area.
- If you use strain relief, the strain-relief assembly must be EHEDG-compliant.
- Always commission the motor with covered shaft, see Chapter "Sealing the mounting flange and transmission element (Page 150)".

### 7.2.2.2 Mounting positions

#### Requirement

---

**Note**

The motor mounting flange must be covered for permissible mounting positions IM B5 and IM V3.

---

#### EHEDG-compliant mounting positions

To ensure EHEDG compliance, the following mounting positions are permissible and recommended:

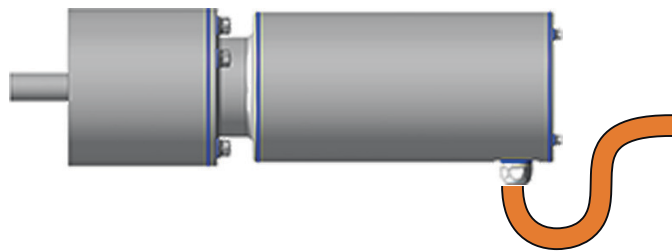


Figure 7-1 Mounting position B5

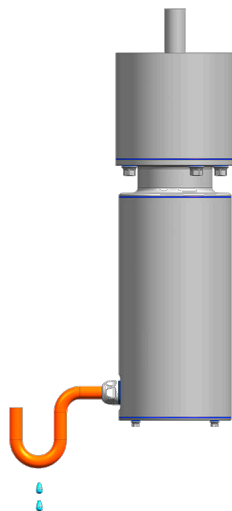


Figure 7-2 Mounting position IM V3

### Non-EHEDG-compliant mounting position

EHEDG compliance does not apply to mounting position IM V1 as liquids can collect on the horizontal surfaces.

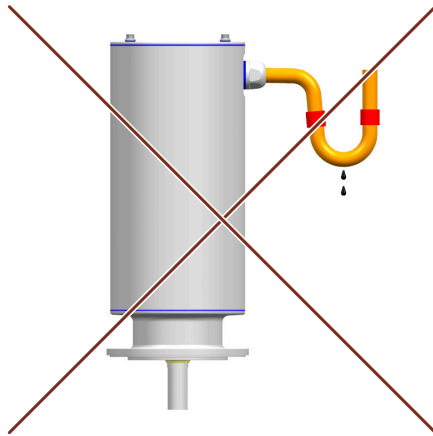


Figure 7-3 Non-EHEDG-compliant mounting position IM V1

### 7.2.2.3 Sealing the mounting flange and transmission element

#### Requirement

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**Note**

**Installation under hygienic conditions**

Make sure that you maintain hygienic conditions during installation. Only install hygienically clean surfaces.

---

**Note**

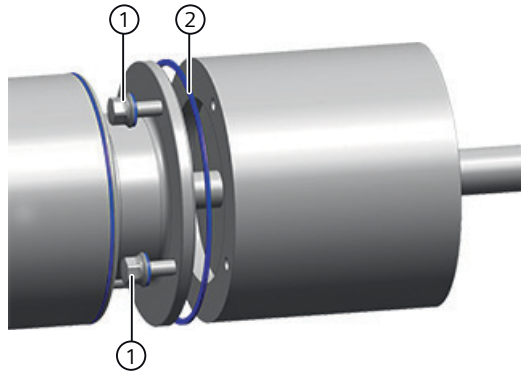
**Avoid dirt-collecting edges**

The diameter of the mounting flange and the gearbox must be identical to ensure that no dirt-collecting edges are formed where food residue can collect.

---

## Procedure

- Only use the following components to install the motor:
  - ① EHEDG-certified hygienic design stainless steel bolts.
  - ② Flat gasket provided



- Observe the permitted tightening torques:  
You can find more information in Chapter "Dimension drawings (Page 417)".

## 7.2.3 Tightening torques for fixing screws

### Tightening torques for fixing screws

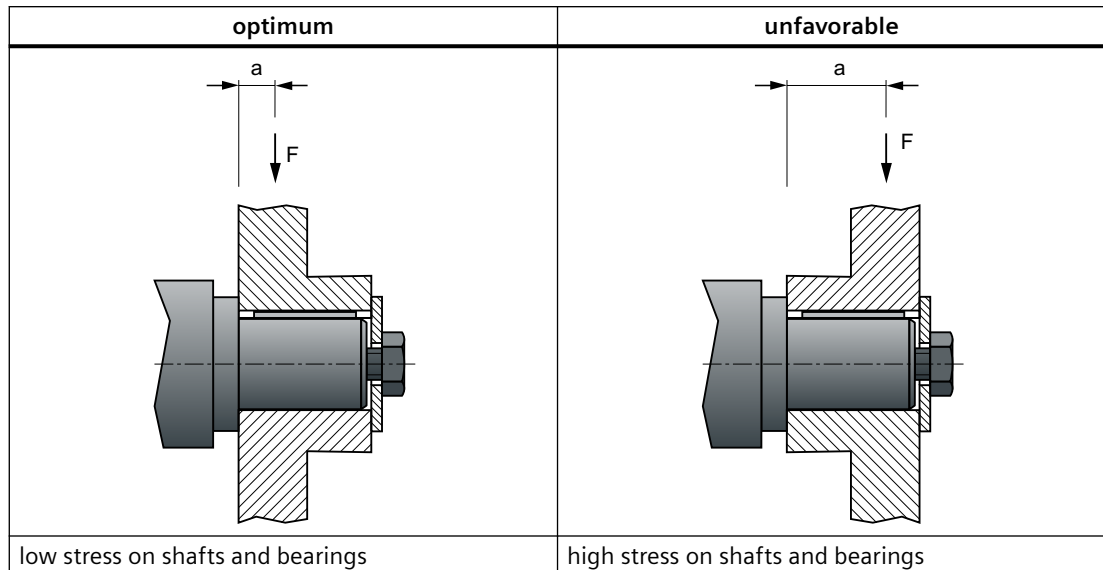
The general tolerance for the tightening torque is 10%. The tightening torque is based on a friction coefficient of  $\mu = 0.14$ .

Motor	Screw DIN 7984	Tightening torque for bolts (not for electrical connections)
1FS2104	M6	5.3 Nm
1FS2105	M8	12.5 Nm
1FS2106		
1FS2208	M10	25 Nm

## 7.2.4 Attaching the output elements

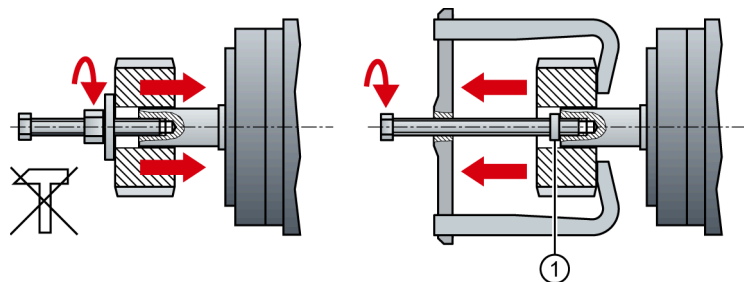
Reduce the bending torque load applied to the shaft and the bearing by appropriately arranging the output elements.

Mount the output elements as close as possible to the motor bearing.



Mount or remove the power output elements (e.g. couplings, gear wheels, belt pulleys) using suitable devices only (see figure).

- Use the threaded hole in the shaft extension.
- If required, heat up the output elements before mounting or removing.
- When removing the output elements, use an intermediate disk to protect the centering in the shaft extension.



1 Intermediate washer/disk (to protect the centering in the shaft extension)

Figure 7-4 Example drawing: Mounting and removing output elements

- If necessary, completely balance the motor together with the output elements according to ISO 1940.

**Note**

Motors with feather key are half-key balanced. The motors have been balanced with half a feather key.

The motor dimensions can be found in section "Dimension drawings (Page 417)".

## 7.3 Installing the converter

### 7.3.1 Installation conditions

When installing the converter carefully observe the conditions listed below in order to guarantee reliable, continuous and trouble-free operation.

- The converter is designed for installation in a control cabinet.
- The converter is certified for use in environments with degree of pollution 2 without condensation; i.e. in environments where no conductive pollution/dirt occurs. Condensation is not permissible.
- The converter fulfills degree of protection IP20 according to IEC 60529.
- EMC-compliant installation  
Chapter: EMC-compliant installation of a machine or system (Page 145)

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#### Note

Keep the cover of the operator panel closed to protect the operator controls and the SD card.

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### Additional requirements for plants and systems in the United States / Canada (UL/cUL)

A label with the following number is provided with the device: A5E36790112.

Note the instructions on the label and attach the label in a clearly visible location close to the converter in the control cabinet.

### Installation notes

- Install the converter vertically with the flap for the LED display facing upwards.



Figure 7-5 Mounting position of the converter

- Maintain the minimum clearances to other components.
- Use the recommended fastening elements and comply with the specified torques.

### Clearances to cabinet panels and other components

Leave a minimum 100 mm clearance to other devices at the top and bottom. A lateral clearance between several SINAMICS S210 converters is not mandatory. Observe a lateral clearance of at least 10 mm to other devices.

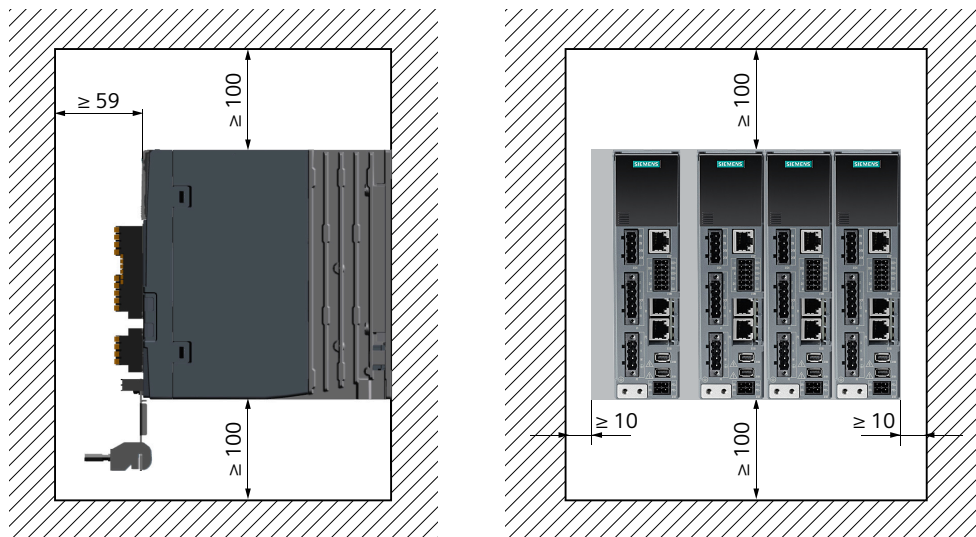


Figure 7-6 Clearances to cabinet panels and other components for converters with 1 AC line connection

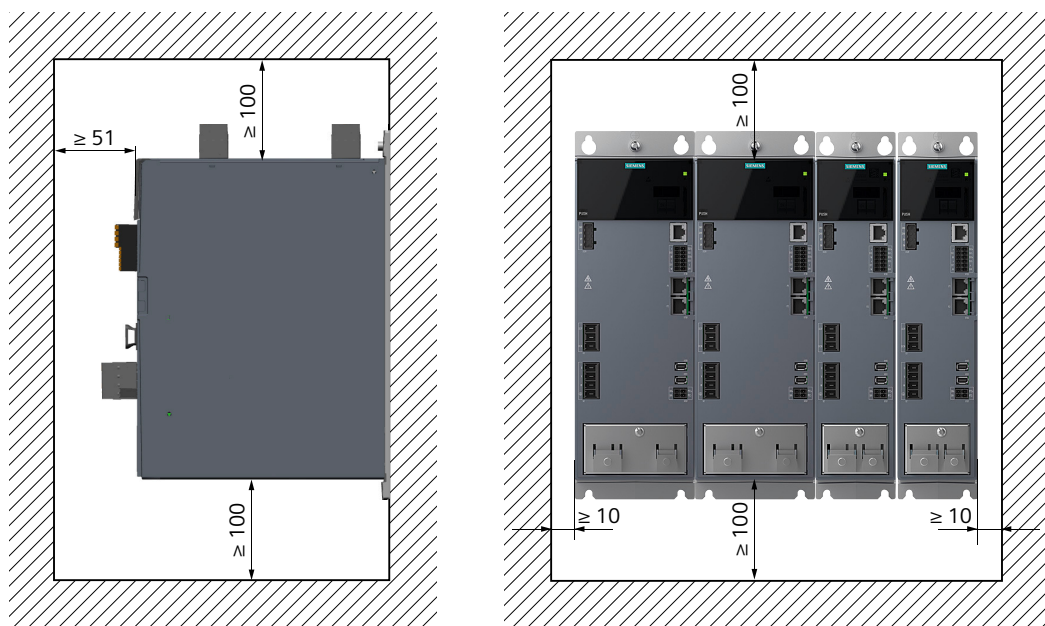


Figure 7-7 Clearances to cabinet panels and other components for converters with 3 AC line connection



## 7.3.2 Dimensions and drilling dimensions

### Dimension drawings and drilling dimensions for converters with 1 AC line connection

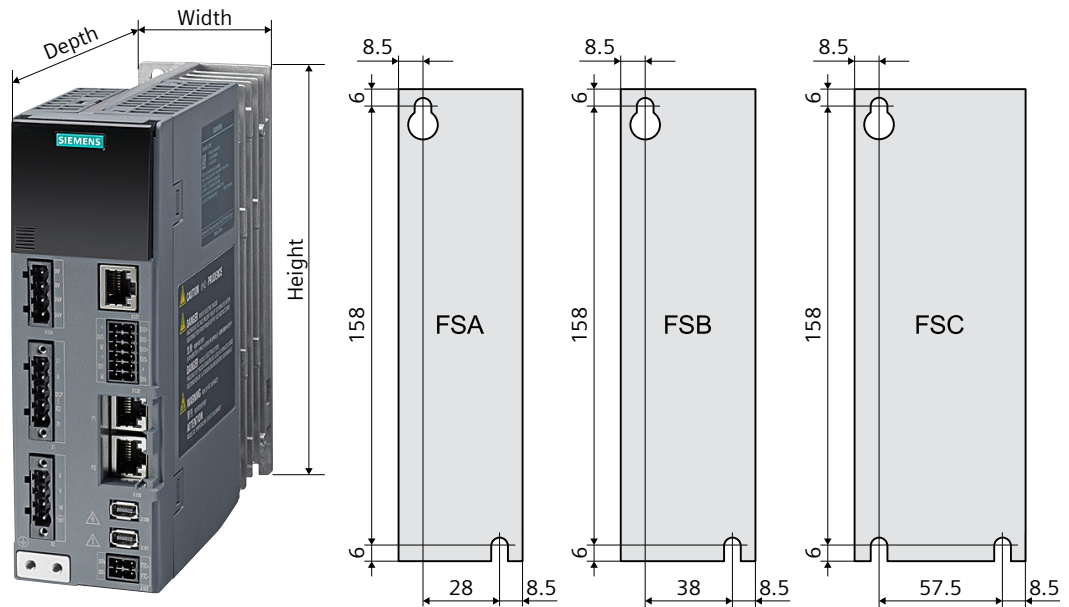


Figure 7-8 Dimension drawing and drilling dimensions

Table 7-3 Dimensions and mounting

Frame size	Width	Height	Depth	Weight	Fixing
FSA	45 mm	170 mm	172.4 mm	1.1 kg	2 x M5 / 4 Nm
FSB	55 mm	170 mm	172.4 mm	1.2 kg	2 x M5 / 4 Nm
FSC	74.5 mm	170 mm	197.4 mm	1.9 kg	3 x M5 / 4 Nm

**Dimension drawings and drilling dimensions for converters with 3 AC line connection**

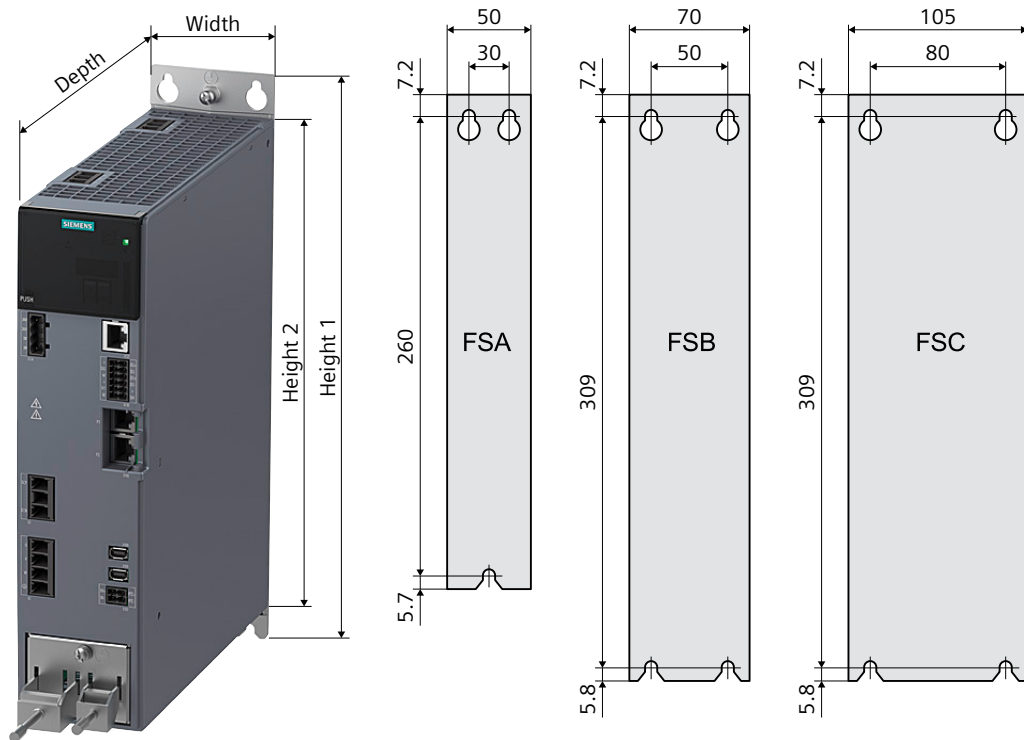


Figure 7-9 Dimension drawing and drilling dimensions

Table 7-4 Dimensions and mounting

Frame size	Width	Height 1	Height 2	Depth	Weight	Fixing
FSA	50 mm	272.9 mm	231 mm	223.3 mm	2.1 kg	3 x M5 / 4 Nm
FSB	70 mm	322 mm	280 mm	223.3 mm	3.3 kg	4 x M5 / 4 Nm
FSC	105 mm	322 mm	280 mm	223.3 mm	5.0 kg	4 x M5 / 4 Nm

## 7.4 Connecting the converter and the motor

You can find general information in chapter "Permissible line supplies and connection options (Page 57)".

## 7.4.1 Cable lengths

### Cable lengths for the converter connections

Type of connection	Connection via	Permissible cable length
Control voltage 24 V DC	X124	30 m
External braking resistor for converters with 1 AC line connection	X1 (R1, DCP)	10 m
External braking resistor for converters with 3 AC line connection	X4 (R1, DCP)	10 m
Service interface	X127	10 m
Digital inputs	X130	30 m
Connection to the control system via PROFINET	X150 P1 X150 P2	100 m
Motor power connections	X2	50 m
Encoder	X100	50 m
Motor holding brake	X107	50 m

### Cable lengths for connecting the motor to the converter

The motor is connected to the converter using a one cable system (OCC - one cable connection) via the MOTION-CONNECT cable. The MOTION-CONNECT cable includes the power connections for the motor, the encoder connection and the connections for the motor holding brake.

The permissible cable lengths for the various EMC categories are given in Chapter:

- "Electromagnetic compatibility according to IEC 61800-3 (Page 402)"

Ordering information for MOTION-CONNECT cables is provided in Chapter:

- "Determining the article number of a prefabricated OCC MOTION-CONNECT cable (Page 460)"

Ordering information for external line filters is provided in Chapter:

- "Technical data (Page 441)"

## 7.4.2 Connecting a MOTION-CONNECT cable at the motor

### Requirement

NOTICE
<p><b>Destruction of the motor if it is directly connected to the three-phase line supply</b></p> <p>The motor will be destroyed if it is directly connected to the three-phase line supply.</p> <ul style="list-style-type: none"> <li>• Only operate motors with the permitted converters.</li> </ul>

Ensure that the associated warning labels in the appropriate national language are attached.

**Description**

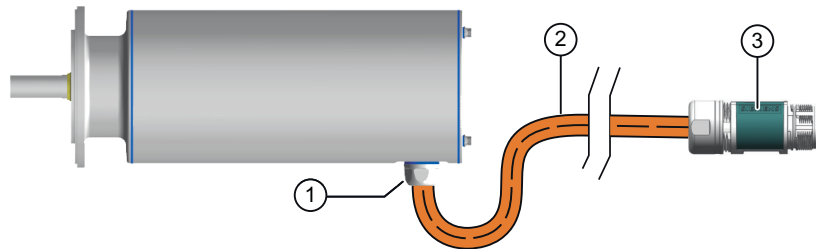
The manufacturing company of the system/machine is responsible for the proper installation. You connect the motor to the converter using a MOTION-CONNECT OCC cable. The cables for power, the holding brake, the encoder, and the shielding are integrated in the OCC cable. The OCC motor connection cable is connected to the motor using a cable connection.

**Note**

You diminish the degree of protection if you open the screwed joint of the cable connection.

Two versions of the OCC motor connection cable to connect to the converter are available for ordering:

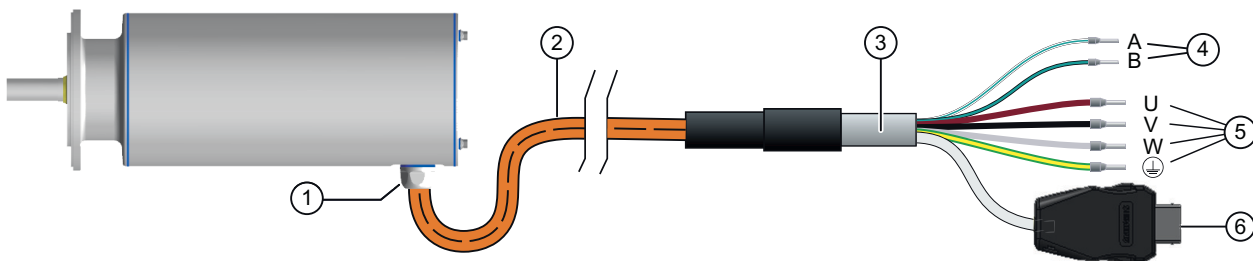
- OCC cable with SPEED-CONNECT M17 or M23 coupling



- ① Cable connection (do not open)
- ② MOTION-CONNECT OCC cable
- ③ SPEED-CONNECT coupling

Figure 7-10 MOTION CONNECT cable at the 1FS2 with coupling

- OCC cable with free cable ends



- ① Cable connection (do not open)
- ② MOTION-CONNECT OCC cable
- ③ Shielding
- ④ Cables for a holding brake, A (WT) = "-", B (BK) = "+"
- ⑤ Power cable cores
- ⑥ SIEMENS IX connector for signal line

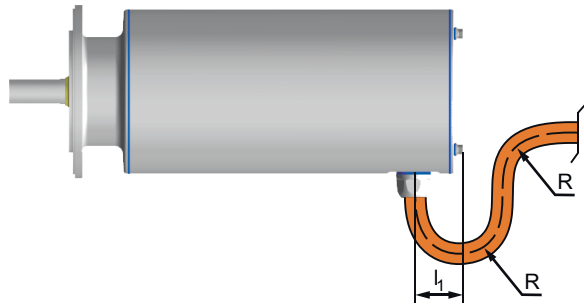
Figure 7-11 MOTION CONNECT cable connected at the 1FS2 with free cable ends

- Use the prefabricated MOTION-CONNECT OCC cables from SIEMENS. This reduces the installation time and costs, and increases the operational reliability of the drive.

### Minimum permissible bending radius of the OCC motor connection cable and clearance of the cable connection - NDE

#### Note

The motor requires a minimum clearance of 100 mm at all sides to guarantee that heat is reliably dissipated.



R Bending radius

$l_1$  Cable connection clearance - NDE

Figure 7-12 Minimum permissible bending radii

Motor	Connector size for connecting to the converter, if available	Clearance of the cable connection to the motor NDE	Minimum bending radius, static
			MC400
		$l_1$ / mm	$R_{static}$ / mm
1FS2□04	M17		48.5 / 97 <sup>1)</sup>
1FS2□05			
1FS2□06	M23		57 / 114 <sup>1)</sup>
1FS2□08			

<sup>1)</sup> The larger bending radius applies to bends during repeated installation and removal of the motor.

### 7.4.3 Connecting the MOTION-CONNECT cable to the motor

#### Establishing a SPEED-CONNECT connection

##### Procedure

#### WARNING

#### Unexpected motion of the motor and/or the machine

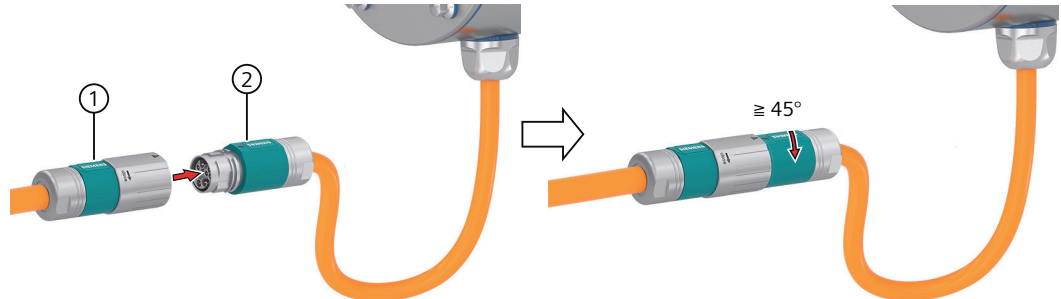
When establishing a live connection to the motor, the motor can immediately start and result in death or severe injury.

- Ensure that the MOTION-CONNECT cable from the converter is in a no-voltage condition.

**Note**

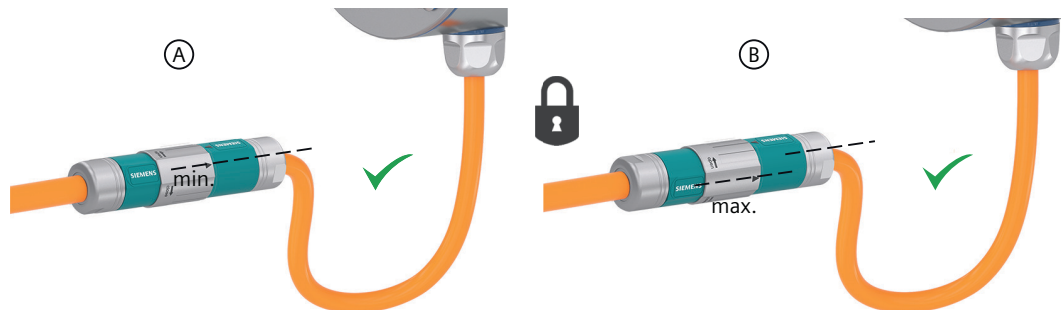
- Only tighten the plug connection by hand.
- Do not use any wrenches or similar tools.

1. Ensure that the union nut of the SPEED-CONNECT connector is rotated to the end stop in the direction of the "open" arrow.
2. Align the SPEED-CONNECT connector so that the triangles on the top of the connector and the upper part of the coupling are opposite one another.



- ① Connector of the MOTION-CONNECT cable from the converter
- ② Coupling of the motor connection cable

3. Push the connector of the MOTION-CONNECT cable onto the coupling of the motor connection cable up to the end stop.
4. Turn the union nut of the connector by hand in the direction of "close" through at least 45° (position A) or up to the end stop (position B)



- A Minimum locking
- B Maximum locking up to the end stop (recommended)

**Note**

A secure connection is only guaranteed from position A onward.

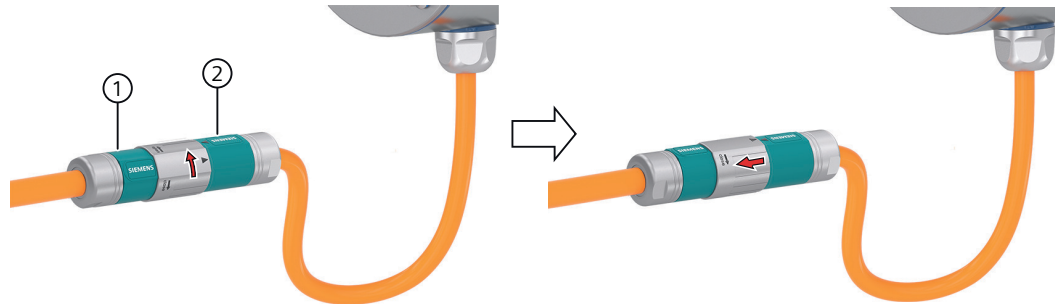
## Releasing a SPEED-CONNECT connection

### Procedure

#### Note

#### Voltage-free connection

Carefully ensure that the plug connection is in a no-voltage condition.



- ① Connector of the MOTION-CONNECT cable from the converter
- ② Coupling of the motor connection cable

1. Turn the union nut of the SPEED-CONNECT connector in the direction of "open" to the end stop. The triangles on the top of the connector and the upper part of the coupling must be aligned opposite one another.
2. Withdraw the connector out of the coupling.

#### Note

Pull on the connector and the cable, do not pull on the cable.

## Routing cables in damp environments

If you are operating the motor in environments in which moisture can arise, follow the subsequent instructions for routing the connecting cables.

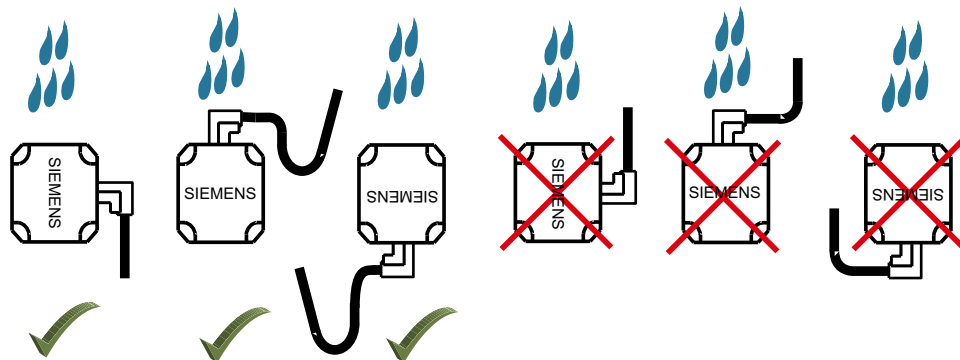


Figure 7-13 Permissible and impermissible cable routing when connecting in a damp environment

### 7.4.4 Connecting the converter

Install the converter so that you are compliant with local regulations for erecting and installing low-voltage systems.

Carefully observe the following product memorandum about protection against electric shock:

Ensure protection against electric shock in the motor circuit of a converter according to IEC/EN 61800-5-1 through automatic shut down in the case of a fault according to IEC/EN 60364-4-41 (VDE 0100-410) (<https://support.industry.siemens.com/cs/ww/en/view/103474993>)

#### Notes for connecting up the converter

##### Operating displays for converter operation

If, when switching over a function from ON to OFF, an LED or other similar display is not lit or not active; this does not indicate that the device is switched-off or in a no-current condition.

##### Shield plate

For converters, frame sizes FSB and FSC with 3 AC line connection, the shield plate is integrated in the converter itself. For the other converters, the shield plate is included in the accessories pack of the converter.

##### Fixing connecting cables

Fix all of the connecting cables using shield clamps or suitable cable ties to the converter shield plate.

##### Power connections

###### NOTICE

###### Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects, or malfunctions.

- Tighten all power connections to the specified torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

##### Connection of motor holding brake, connector X107

Also connect the insulated conductors for the motor holding brake to the connector at X107, even when you are using a motor without holding brake.

##### Shielded cables

Shielded cables are required for connecting the OCC cable, the external braking resistor and the digital inputs to ensure that the drive functions perfectly.

Use the converter shield support to connect the shield at the converter. We recommend connecting the shield using the shield clamp that is provided with the prefabricated OCC cable used to connect the motor (see the following diagram).



Use shielded cables to establish the following connections:

- Cable between the converter line filter (only for 1 AC 230 V)
- Cable between the converter and motor
- Cable between the converter and external braking resistor
- Signal cables if they are routed next to cables with high levels of noise and interference

#### NOTICE

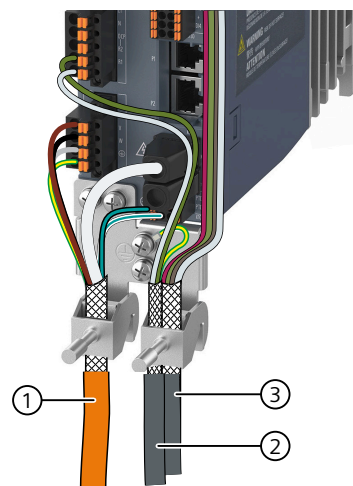
##### Damage/fault caused by connecting several loads to the same line infeed point

For loads not belonging to the SINAMICS S210 drive system, make sure that a sufficient EMC interference suppression is provided. If several such loads are connected to the same line infeed point, this may result in damage or faults.

- Provide interference suppression for such loads using appropriate line filters. To prevent mutual interference, it is not permissible that this line filter is equipped with capacitors with respect to ground on the line side. A series B84144A\*R120 filter from EPCOS is recommended for a 24 V power supply with a 3-phase connection.

Cable routing and shielding must be compliant with the EMC zone concept.

- Connect the shield at the converter. We recommend that the shield of the preassembled OCC connecting cable is connected with the shield terminal on the shield connection plate of the converter (see ① in the diagram).
- Use cables with finely-stranded, braided shields.
- Carefully ensure that the shield is not interrupted or broken.



- ① OCC connection cable to the motor
- ② Connecting cable for external braking resistor
- ③ Connecting cable for the digital inputs

Figure 7-14 Shield support with shield plate and shield clamps for prefabricated OCC cable shown using an example of a converter with 1 AC line connection

Connections and operating elements of the converter with 1 AC line connection

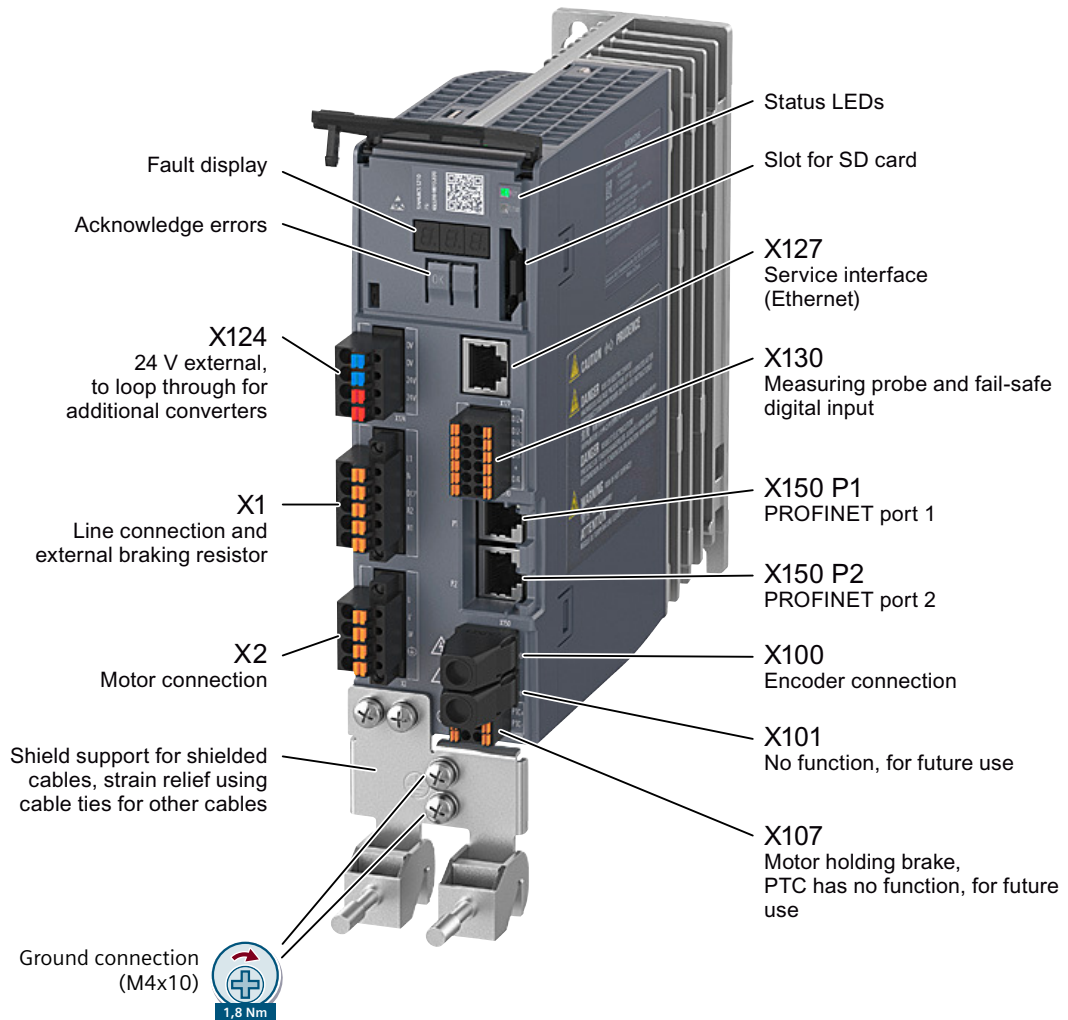


Figure 7-15 Connections and operating elements of the converter with 1 AC line connection  
 Connectors X1, X2, X107, X124 and X130 are included in the scope of delivery of the converter.

Encoder connector X100 is included with the OCC cable.

You require Ethernet cables with RJ45 connectors to connect service interface X127, as well as for PROFINET ports X150 P1 and X150 P2.

### Connections and operating elements of the converter with 3 AC line connection

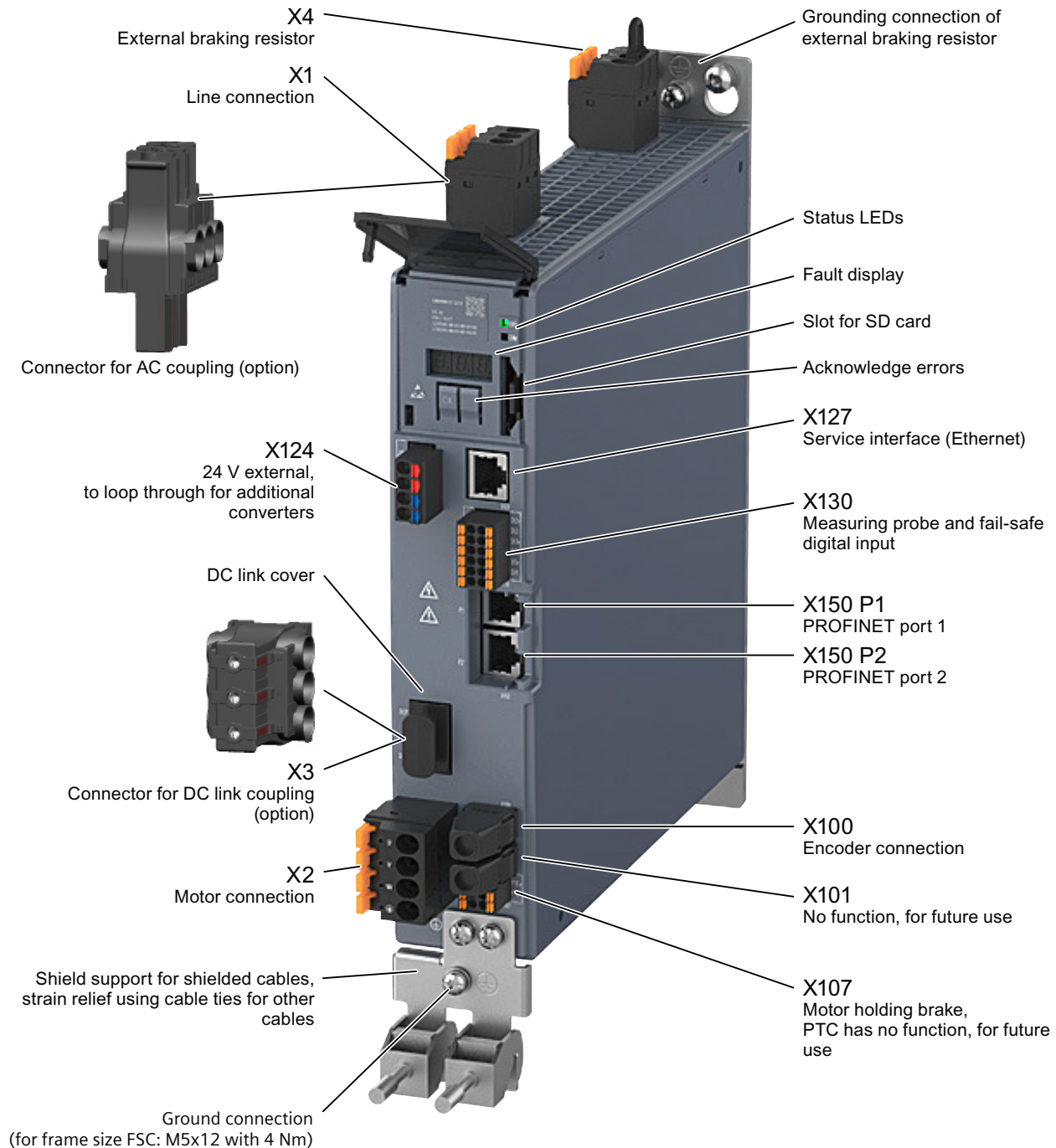


Figure 7-16 Connections and operating elements of the converter with 3 AC line connection

Connectors X1 standard, X2, X4, X107, X124 and X130 are included in the scope of delivery of the converter.

Encoder connector X100 is included with the OCC cable.

You require Ethernet cables with RJ45 connectors to connect service interface X127, as well as for PROFINET ports X150 P1 and X150 P2.

You must order the connectors for AC coupling X1 and for DC link coupling X3 separately as required:

see Chapter "Connectors and cables for the AC coupling and DC link coupling (Page 429)".

## 7.4.5 Converters with 1 AC line connection

### 7.4.5.1 Connecting the MOTION-CONNECT cable to the converter

In addition to the motor connections, the MOTION-CONNECT cable from the motor to the converter also includes the conductors for the encoder and the motor holding brake.

#### NOTICE

##### Damage to the device by connecting other motors or devices

Connecting other devices (motors, encoders) can destroy the converter or the connected device.

- Only connect 1FK2, 1FT2 and 1FS2 motors to the converter.
- Use only MOTION-CONNECT cables from Siemens or cables that you have fabricated yourself with the correct pin assignment.

### Connecting the motor cable to the converter

Connect conductors U, V, W of the MOTION-CONNECT cable to connector X2 of the converter as shown below.

Connect the shield of the MOTION-CONNECT cable to the shield plate through a large surface area. Use commercially available clamps, the clamps supplied with the prefabricated cable or the shield connection clamps supplied as accessories.

The terminals are spring-loaded terminals.

Color coding for MOTION-CONNECT cables:

- Phase U = brown
- Phase V = black
- Phase W = gray

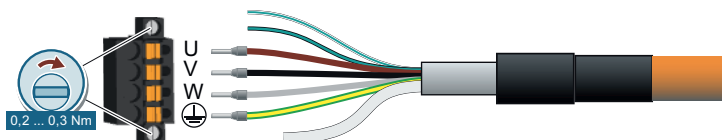


Figure 7-17 X2 - motor connection

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

### Connecting the encoder to the converter

The cables and the connector for the encoder connection are part of the MOTION-CONNECT cable from the motor to the converter.

Insert the Siemens IX plug-in plug socket X100 as shown below.

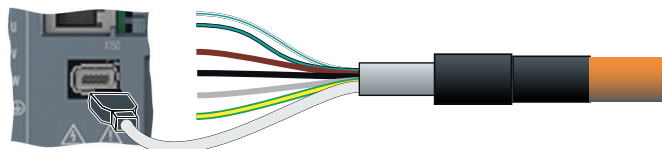


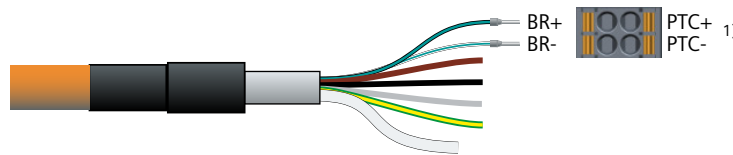
Figure 7-18 X100 - encoder connection

### Connecting the motor holding brake

The cables for the motor holding brake are part of the MOTION-CONNECT cable from the motor to the converter.

Connect the cables as shown below to the connector X107 of the converter.

The terminals are spring-loaded terminals.



1) no function, for future use

Figure 7-19 X107 - Motor holding brake connection

Permissible conductor cross-sections:

- For single-conductor cables or for flexible cable conductors with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 0.75 mm<sup>2</sup>
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

**Note****Connection of motor holding brake, connector X107**

Connect the conductors for the motor holding brake to connector X107 even if you are using a motor without holding brake.

**7.4.5.2 Connecting the converter to the line supply**

Connect the line feeder cable as shown below to the connector X1 of the converter. Connect the protective conductor with a cable lug and an M4 screw to the shield plate of the converter.

The terminals are spring-loaded terminals.

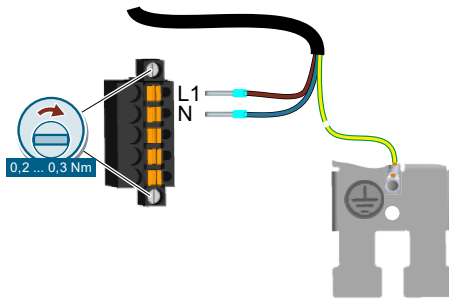


Figure 7-20 X1 - line connection 1 AC

The shield plate is fixed with two M4x10 screws with a tightening torque of 1.8 Nm.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

**7.4.5.3 Using several single-phase converters in machines and plants****Overview**

Evaluate the input currents of single-phase converters in your machine or plant in terms of harmonics and unbalance.

## Description

In unfavorable cases, the harmonic currents of several converters in the neutral conductor (N) add up to a value greater than the currents of the line conductors (L1, L2, L3). The current-carrying capacity of the neutral conductor must be sufficient for this. IEC 60364-5-52:2019, Section 524, provides recommendations for dimensioning the neutral conductor. If no more precise information is available, the standard recommends dimensioning the neutral conductor for 1.45 times the current-carrying capacity of the line conductors.

 **WARNING****Fire caused by neutral conductor (N) overload**

The neutral conductor can heat up due to the load from harmonic currents and cause a fire.

- Consider the harmonic currents when dimensioning the neutral conductor.

 **WARNING****Electric shock caused by PEN conductor overload**

In TN-C supply networks, the protective function of the PEN conductor can be adversely affected by exposure to harmonic currents.

- Consider the harmonic currents when dimensioning the PEN conductor.

#### 7.4.5.4 Connecting a braking resistor

You can either use the internal braking resistor or connect an external braking resistor.

##### Using the internal braking resistor

If you are using the internal braking resistor, terminals DCP and R2 must be jumpered at connector X1.

The jumper is included in the scope of delivery of the converter.

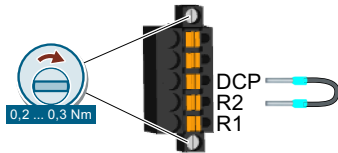


Figure 7-21 X1 - connection for using the internal braking resistor

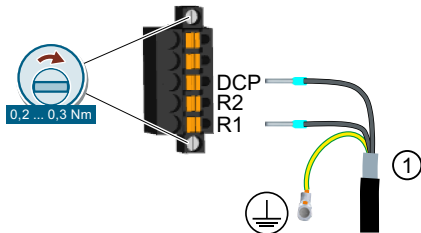
##### Using an external braking resistor

If you are using an external braking resistor, terminals DCP and R2 must not be jumpered at connector X1. Connect the braking resistor via the DCP and R1 terminals.

The converter shield plate is used for the protective conductor connection and the shield support.

The terminals are spring-loaded terminals.

The permissible cable length is 10 m.



① Shield

Figure 7-22 X1 - connection for using an external braking resistor

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 26 ... 12
- Insulation stripping length: 10 mm



## 7.4.6 Converter with 3 AC line connection

### 7.4.6.1 Connecting the MOTION-CONNECT cable to the converter

In addition to the motor connections, the MOTION-CONNECT cable from the motor to the converter also includes the conductors for the encoder and the motor holding brake.

<b>NOTICE</b>
<b>Damage to the device by connecting other motors or devices</b>
Connecting other devices (motors, encoders) can destroy the converter or the connected device.
<ul style="list-style-type: none"><li>• Only connect 1FK2, 1FT2 and 1FS2 motors to the converter.</li><li>• Use only MOTION-CONNECT cables from Siemens or cables that you have fabricated yourself with the correct pin assignment.</li></ul>



### Connecting the motor cable to the converter

Connect conductors U, V, W of the MOTION-CONNECT cable to connector X2 of the converter as shown below.

Connect the shield of the MOTION-CONNECT cable to the shield plate through a large surface area. Use commercially available clamps, the clamps supplied with the prefabricated cable or the shield connection clamps supplied as accessories.

The terminals are spring-loaded terminals.

Color coding for MOTION-CONNECT cables:

- Phase U = brown
- Phase V = black
- Phase W = gray

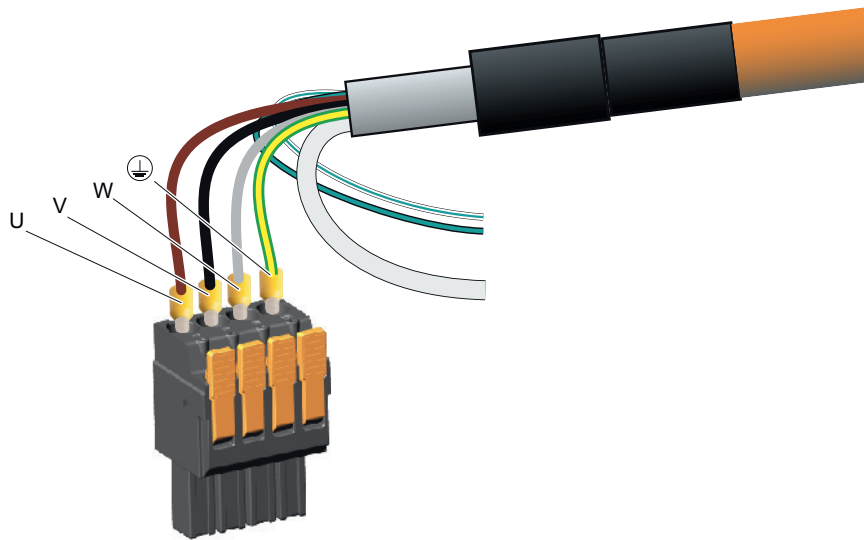


Figure 7-23 X2 - motor connection

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm<sup>2</sup> ... 6 mm<sup>2</sup>
- AWG: 18 ... 10
- Insulation stripping length: 18 mm

### Connecting the encoder to the converter

The cables and the connector for the encoder connection are part of the MOTION-CONNECT cable from the motor to the converter.

Insert the Siemens IX plug-in plug socket X100 as shown below.

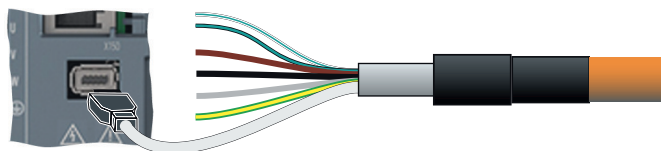


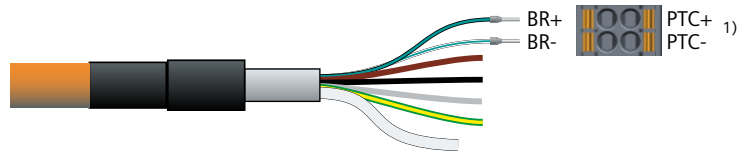
Figure 7-24 X100 - encoder connection

### Connecting the motor holding brake

The cables for the motor holding brake are part of the MOTION-CONNECT cable from the motor to the converter.

Connect the cables as shown below to the connector X107 of the converter.

The terminals are spring-loaded terminals.



1) no function, for future use

Figure 7-25 X107 - Motor holding brake connection

Permissible conductor cross-sections:

- For single-conductor cables or for flexible cable conductors with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 0.75 mm<sup>2</sup>
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

---

#### Note

##### Connection of motor holding brake, connector X107

Connect the conductors for the motor holding brake to connector X107 even if you are using a motor without holding brake.

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### 7.4.6.2 Connecting the converter to the line supply

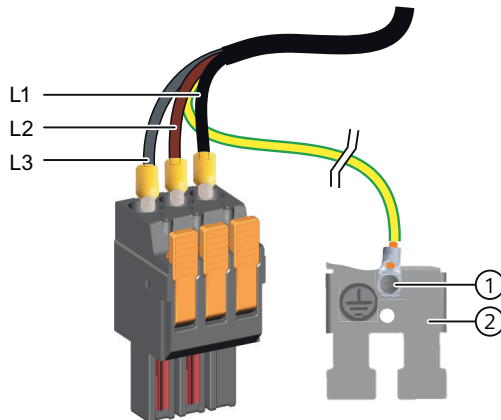
The converter is supplied with connectors for connecting it to the line supply.

If you connect several converters in parallel, the optional connectors for the AC coupling are available to connect to the line supply. This significantly reduces the wiring costs.

Both connection options are shown below.

### Connecting a converter with standard terminals

The terminals are spring-loaded terminals.



- L1, L2, L3    Cores of the line connecting cable  
 ①            M4x10 screw to fasten the protective conductor and the shield plate  
 ②            Shield plate

Figure 7-26 X1 - line connection with standard terminals (example for frame size FSA)

The shield plate for frame size FSA is fixed with two M4x10 screws with a tightening torque of 1.8 Nm.

For frame sizes FSB and FSC, the shield connection is integrated in the converter itself.

The protective conductor for frame size FSC is fixed with one M5x12 screw with a tightening torque of 4 Nm.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm<sup>2</sup> ... 6 mm<sup>2</sup>
- AWG: 18 ... 10
- Insulation stripping length: 18 mm

---

#### Note

##### Connector X4 for braking resistor

Insert connector X4 even if you are not using an external braking resistor. In this case, you need to bridge the terminals DCP and R2 to use the internal resistor with the supplied jumper. Otherwise, pre-charging of the converter will not take place.

You can find more detailed information in the section "Connecting a braking resistor (Page 179)".

---

### Connecting a converter with terminals for the AC coupling

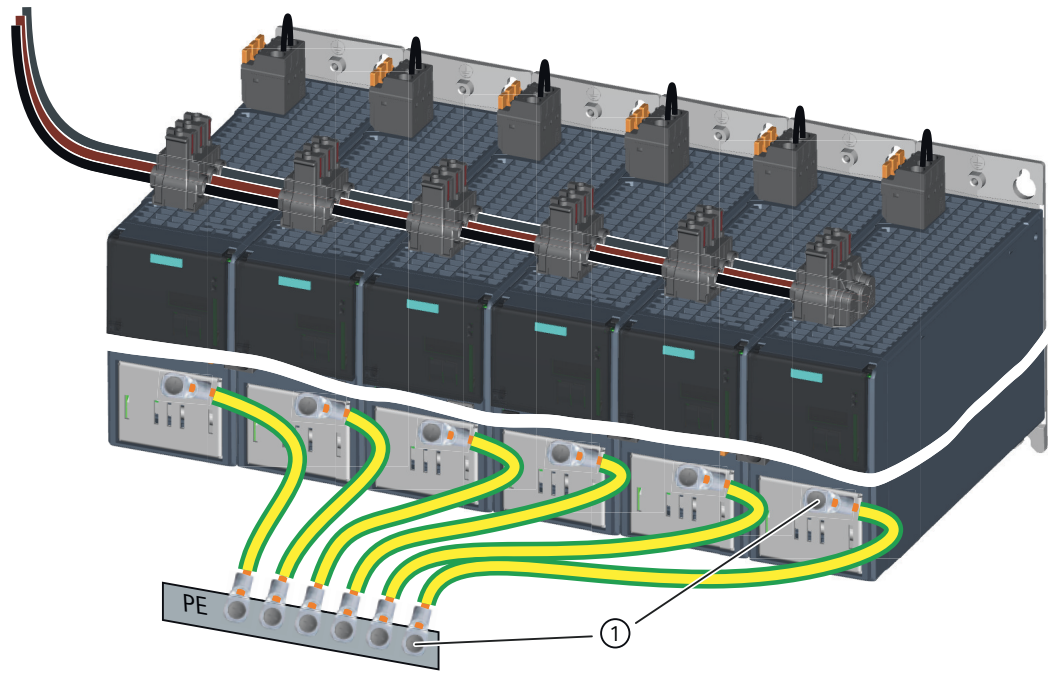
The connectors for the AC coupling are not included in the scope of delivery of the converter.

Ordering data:

- "Connectors and cables for the AC coupling and DC link coupling (Page 429)"

The permissible cables for the AC coupling as well as the installation instructions are provided in section:

- "Establishing the AC coupling and the DC link coupling (Page 177)"



- ① M4 for frame sizes FSA and FSB  
M5 for frame size FSC

Figure 7-27 X1 - line connection with AC coupling

### 7.4.6.3 DC link coupling

The connectors for the DC link coupling are not included in the scope of delivery of the converter.

Ordering data:

- "Connectors and cables for the AC coupling and DC link coupling (Page 429)"

The permissible cables for the DC link coupling as well as the installation instructions are provided in Chapter:

- "Establishing the AC coupling and the DC link coupling (Page 177)"

You can find the prerequisites for the DC link coupling in Chapter:

- "DC link coupling (for converters with 3 AC line connection) (Page 85)"

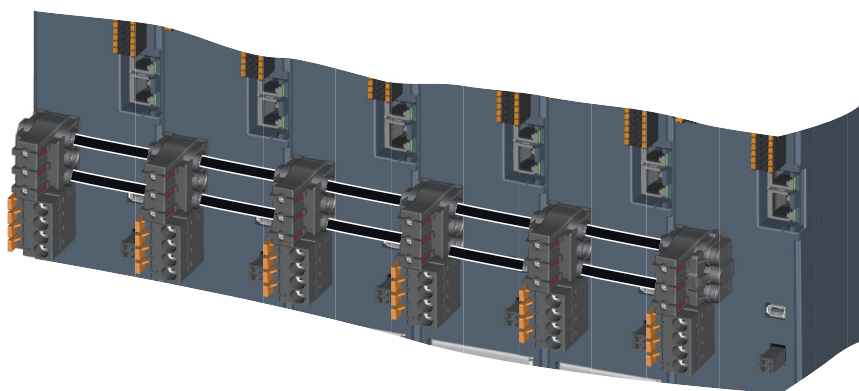


Figure 7-28 X3 - connection of the coupling



If no DC link coupling is used, seal the socket in the device with a DC link cover.

#### 7.4.6.4 Establishing the AC coupling and the DC link coupling

The connection of the individual converters for the AC coupling and the DC link coupling are established by inserting the cables, together with their insulation through the openings of the connector one after the other. The electrical contact is established when tightening the screw connections of the individual connectors with the specified torque.

#### Permissible cables for the AC coupling and DC link coupling

The cables required for the AC coupling and DC link coupling are standard cables, and therefore not included in the scope of delivery.

##### Permissible cables for IEC applications:

Use the following cables for the AC coupling and for the DC link coupling:

- 16 mm<sup>2</sup>, Class 5 (finely stranded, PVC-insulated), H07V-K + H07V2-K according to DIN EN 50525-2-31
- HELUTHERM® 145 [helukabel.com]: 16 mm<sup>2</sup>, Class 5 (finely-stranded, crosslinked polyolefin-copolymer, halogen-free)
- Outer diameter 6.7 mm ... 8.1 mm

##### Permissible cables for UL and cUL applications:

Only use copper cables for 60/75 °C with the following properties for the AC coupling and the DC link coupling:

- AWG 6, copper conductor with PVC insulation, with or without nylon jacket, 19 strands
- Types: MTW, THHW, THW, THW-2, THHN, THWN-2, TW, TWN
- CSA types: TW, TWU, TWN75, TW75, TWU75, T90. It is not permissible that other cables are used.

You can also use cables with a higher rated temperature value. It is not permissible to reduce the conductor cross-section.

### Establishing the coupling

1. Thread the insulated cables through the connector, allow the cables to protrude by 3 mm ... 5 mm at the end connectors.  
Markings are provided on the end caps showing the permissible amount of protrusion. To do this, place the end cap on the connector as shown in the diagram and then shorten the conductors appropriately.



2. Tighten the screws with a torque of 3 Nm to establish an electrical contact. Please note that you must tighten the screws so that the red marking on the connector is no longer visible. The electrical contact has not been reliably established if the red marking is still visible.
3. For the AC coupling, close and seal the connector of the last converter using an end cap. For the DC link coupling, close and seal the connectors of the first and last converters using end caps.

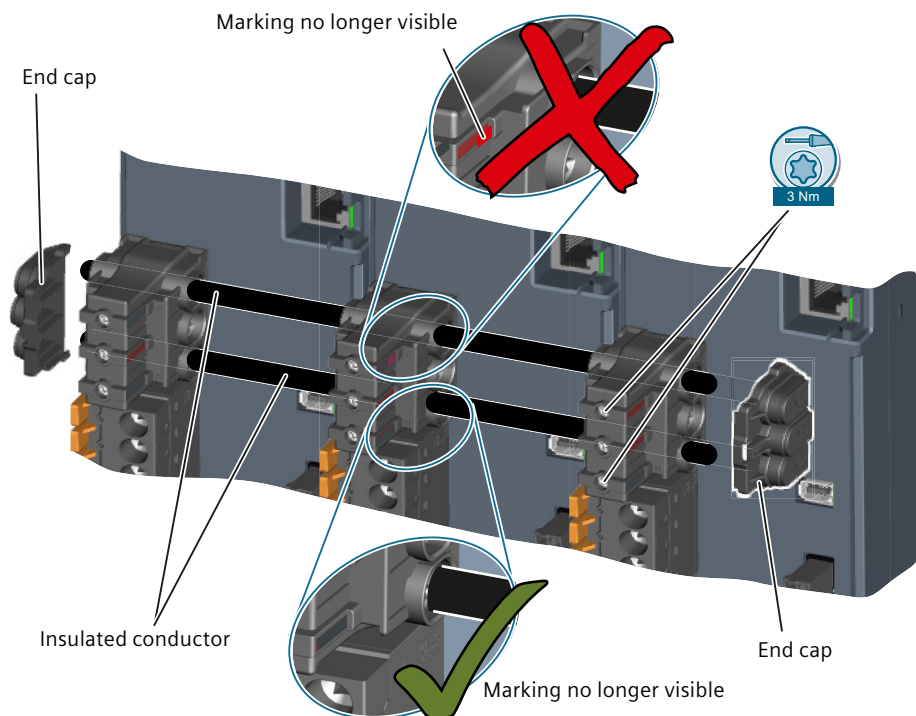


Figure 7-29 Establish a coupling - example for a DC link coupling

#### Note

The cables for the AC coupling and the DC link coupling may only be used once to establish a connection.

Further, comply with the notes provided in the documentation supplied with the contactors.



### 7.4.6.5 Connecting a braking resistor

You can either use the internal braking resistor or connect an external braking resistor.

#### Using the internal braking resistor

If you are using the internal braking resistor, terminals DCP and R2 must be jumpered at connector X4.

The jumper is included in the scope of delivery of the converter.

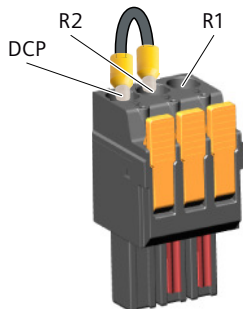


Figure 7-30 X4 - connection for using the internal braking resistor

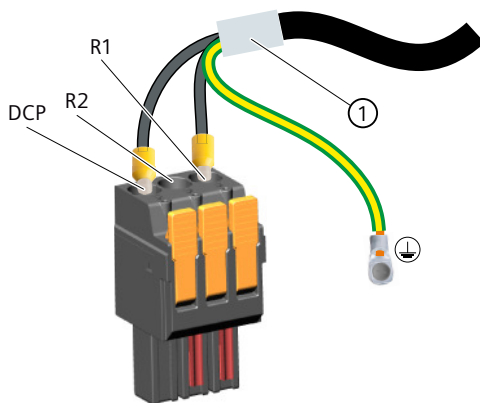
#### Using an external braking resistor

If you are using an external braking resistor, terminals DCP and R2 must not be jumpered at connector X4. Connect the braking resistor via the DCP and R1 terminals. Pre-charging of the converter then takes place via the external braking resistor.

The protective conductor is connected at the upper grounding connection of the device. The shield support is realized at the rear panel of the electrical cabinet; the shield must be connected through a large surface area.

The terminals are spring-loaded terminals.

The permissible cable length is 10 m.



① Shield

Figure 7-31 X4 - connection for an external braking resistor

## 7.4 Connecting the converter and the motor

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm<sup>2</sup> ... 6 mm<sup>2</sup>
- AWG: 18 ... 10
- Insulation stripping length: 18 mm

### 7.4.7 Additional connections at 1 AC / 3 AC converters

#### 7.4.7.1 Connecting digital inputs and the external 24 V supply

##### Connecting the external 24 V supply

Connect a 24 V power supply to the converter.

The terminals are spring-loaded terminals.

Permissible cable length: 30 m

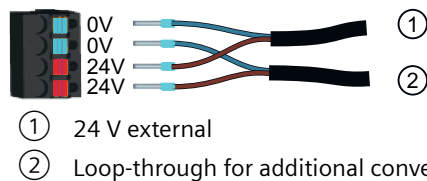


Figure 7-32 X124 - 24 V external (connection at converters with 1 AC line connection)

##### Note

##### Connecting converters with 3 AC line connection

For converters with 3 AC line connection, the mounting position of the connector is rotated 180°.

Maximum current for looping through via the internal jumper (blue-blue, red-red): 24 A.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 24 ... 12
- Insulation stripping length: 10 mm

##### Connecting digital inputs

Digital inputs DI 0 and DI 1 are high-speed digital inputs and can be used as measuring probes.

Digital inputs DI 2 and DI 3 form a failsafe digital input.

You can connect the temperature monitoring for an external braking resistor to DI 4. When you use the temperature monitoring function, the converter shuts down the motor if the external braking resistor temperature becomes too high.

The terminals are spring-loaded terminals.

Permissible cable length: 30 m

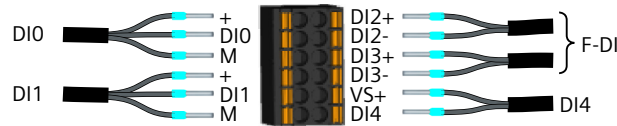


Figure 7-33 X130 - connector for digital inputs

### Note

#### Switchable voltage source VS+

A switchable voltage source is available at the terminal marked with "VS+".

Via this terminal, adjustable dark pulses can be generated that can be used to diagnose the control circuits for the failsafe digital inputs. For additional information, see Chapter "Self-test of the failsafe digital input (F-DI) (Page 127)."

When using dark pulses via terminal "VS+", the power supply for the temperature monitoring of an external braking resistor must be realized via a terminal marked "+", or must be externally provided.

Permissible conductor cross-sections:

- For single-conductor connection:
  - 0.2 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves:
  - 0.25 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 0.75 mm<sup>2</sup>
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

The three terminals marked with "+" and "VS+" are provided as power supply for external sensors. They are short-circuit-proof and provide a max. of 50 mA per sensor. A sensor short-circuit interrupts the power supply for all three sensors.

### 7.4.7.2 Connecting service interface and PROFINET

Connect your operating unit, for example a PC, via an Ethernet cable to the service interface (socket X127).

The transmission rates are 10 Mbit/s or 100 Mbit/s.

Connect the converter with PROFINET cables with RJ45 FastConnect connectors or with PROFINET patch cables (see accessories) via the sockets X150 P1 and X150 P2 to the PROFINET network.



Figure 7-34 RJ45 FastConnect connector

Table 7-5 Pin assignment for X127, X150 P1 and X150 P2

	Pin	Pin assignment	Explanation
	1	RXP	Receiving data +
	2	RXN	Receiving data -
	3	TXP	Sending data +
	4	Reserved	-
	5	Reserved	-
	6	TXN	Sending data -
	7	Reserved	-
	8	Reserved	-

Permissible cable length for the service interface (terminal X127): 10 m

Permissible cable length for PROFINET (terminals X150 P1 and X150 P2): 100 m

#### LED states

For diagnostic purposes, the PROFINET interface X150 P1/P2 features a green and a yellow LED.

The following status information is displayed:

Table 7-6 LED states of PROFINET interface X150 P1/P2

LED	Color	Status	Description
Link port	-	Off	Missing or faulty link
	Green	Continuous light	10 or 100 Mbit link is available
Activity port	-	Off	No activity
	Yellow	Flashing light	Sending or receiving data

### 7.4.8 Connection examples

#### Connection example for converters with 1 AC line connection

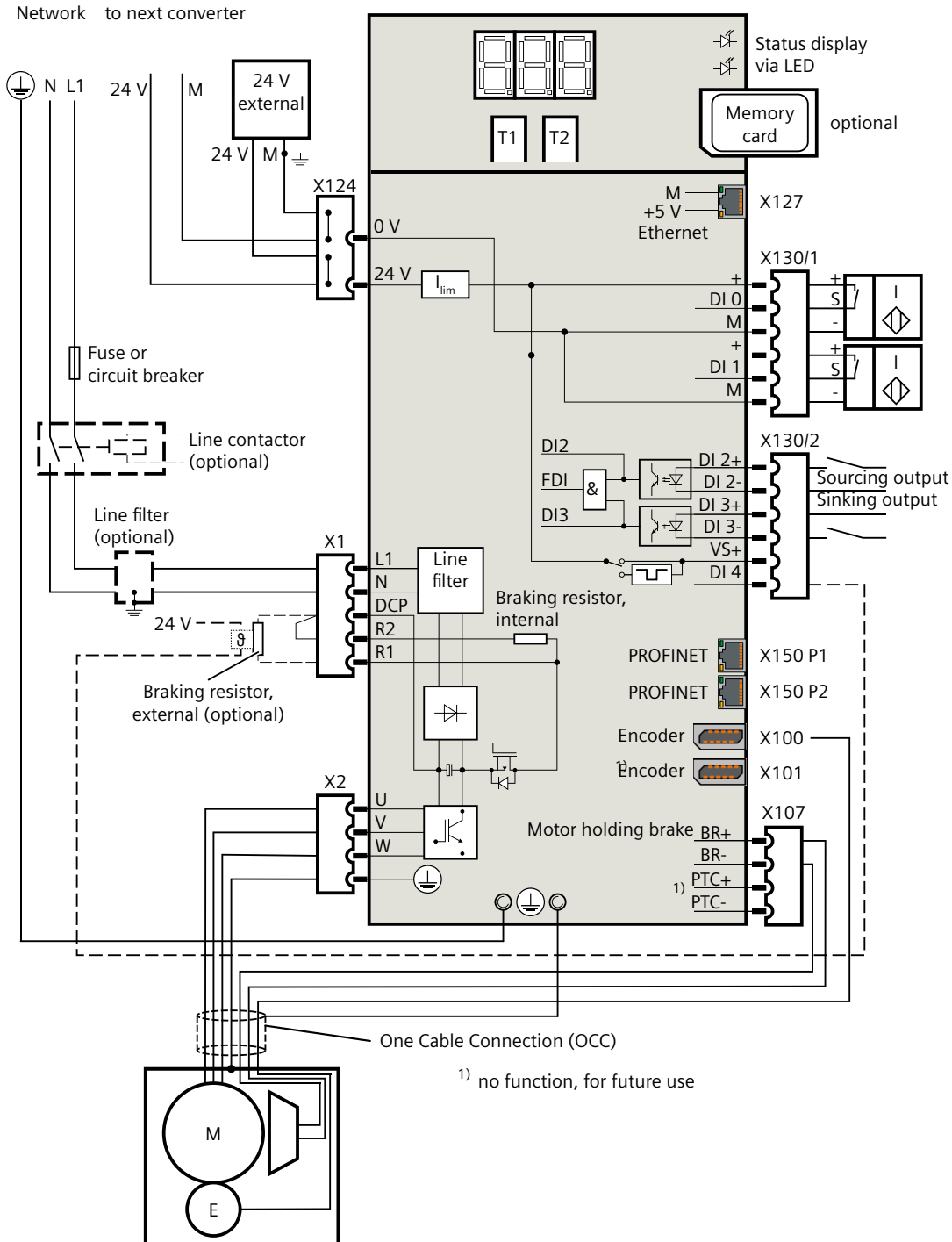


Figure 7-35 Connection example for converters with 1 AC line connection

Connection example for converters with 3 AC line connection

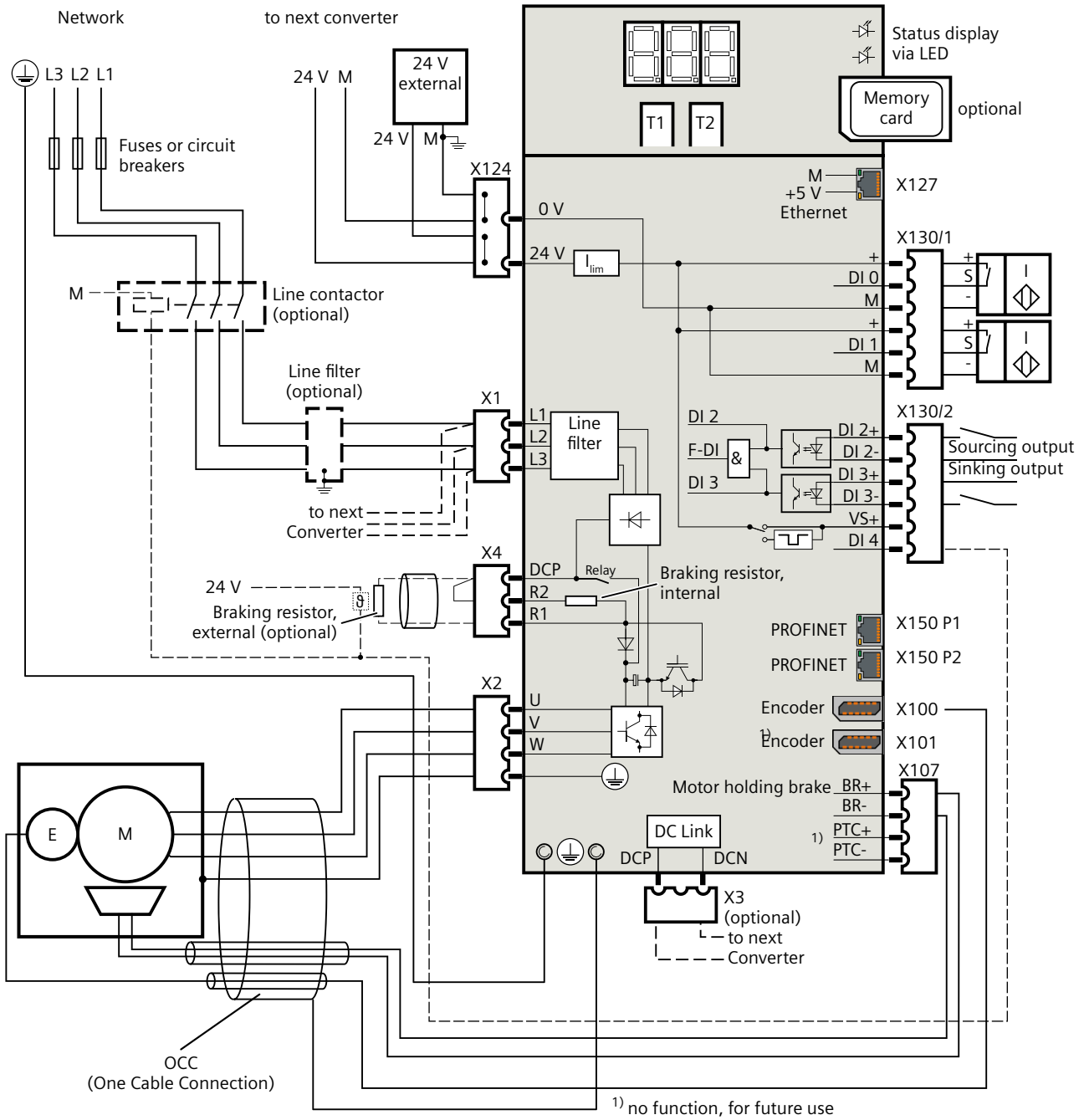


Figure 7-36 Connection example for converters with 3 AC line connection

## 7.4.9 Connection examples of the fail-safe digital input

### Interconnection for an EMERGENCY STOP button with 24 V internal

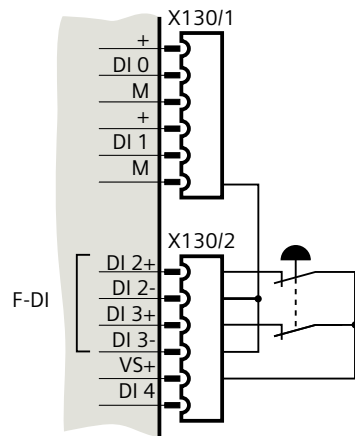


Figure 7-37 Interconnection for an EMERGENCY STOP button with 24 V internal

Uses of the interconnection:

- Self-test using dark pulses entered via terminal VS+
- Category 4 according to ISO 13849-1 can be achieved (local use, e.g. EMERGENCY STOP)
- Short-circuit detection (with respect to ground and 24 V)

### Interconnection for an EMERGENCY STOP button with 24 V DC external

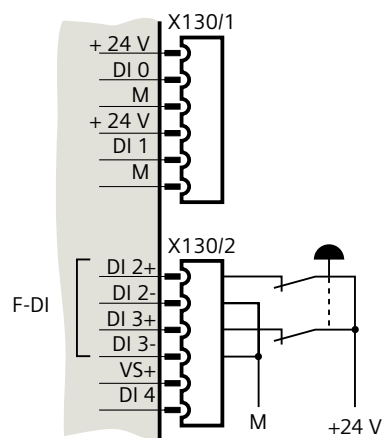


Figure 7-38 Interconnection for an EMERGENCY STOP button with 24 V DC external

Uses of the interconnection:

- Self-test using internal test signals
- Category 3 according to ISO 13849-1 can be achieved (local use, e.g. EMERGENCY STOP)

### Interconnection of the failsafe digital input with a failsafe digital output

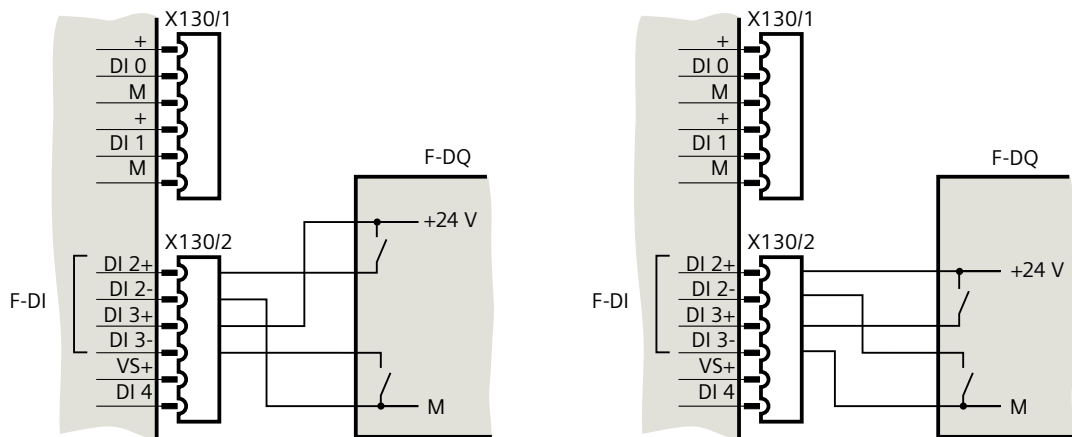


Figure 7-39 Interconnection of the failsafe digital input with a failsafe digital output

Uses of the interconnection:

- Self-test using externally entered dark pulses
- Category 4 according to ISO 13849-1 can be achieved (local use, e.g. EMERGENCY STOP)



# Commissioning (web server)

## 8.1 Introduction

### Description

The web server commissioning tool is integrated in the converter.

The web server supports you throughout the service life of the application:

- Online commissioning
- Diagnostics
- Operator control and monitoring
- Service and maintenance
- Support

The settings made are applied after commissioning has been completed and transferred to the converter.

The web server has multi-level security functionality.

### More information

Detailed information about security settings in the web server is provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>).

## 8.2 Requirements for commissioning

### Description

- You have correctly installed the converter and the motor.
- You have mounted the motor including encoder to the mechanical system.
- You have connected the motor to the converter.
- You have connected the converter to the operating unit via the service interface (X127).
- You have switched on the converter supply voltage.
- The converter has ramped up.

## 8.3 Fundamentals

### 8.3.1 Supported operating units

#### Description

The following operating units are supported for the connection with the web server:

- Programming device, PC, notebook
- Tablet, smartphone  
Mobile end devices are connected to the converter via SINAMICS Smart Adapter.  
More information about the SINAMICS Smart Adapter can be found in Chapter "SINAMICS Smart Adapter (Page 428)".

As a result of the responsive design, content is adapted to the display size of the operating unit.

### 8.3.2 Supported browsers

#### Description

The web server supports the following browsers:

Browser <sup>1)</sup>	Version
Apple Safari	≥ Version 15.0
Google Chrome	≥ Version 83
Microsoft Edge	≥ Version 88
Mozilla Firefox	≥ Version 91

<sup>1)</sup> Whichever browser you use, we recommend using the most up-to-date version.

### 8.3.3 Communication interfaces

#### Description

The following interfaces are available for accessing the converter:

Interface	Information
Service interface X127	The default access to the web server is via the service interface X127.
	Ethernet interface X127 is intended for commissioning and diagnostics, which means that it must always be accessible.
	Defaults: <ul style="list-style-type: none"> <li>• IP address: 169.254.11.22</li> <li>• Subnet mask: 255.255.0.0</li> <li>• Connection type: HTTPS</li> </ul>
	Restrictions: <ul style="list-style-type: none"> <li>• Only local access is allowed.</li> <li>• No networking or only local networking in a closed and locked electrical cabinet is permissible.</li> <li>• For remote access to the electrical cabinet, you must apply additional security measures to prevent misuse through sabotage, data manipulation by unqualified persons and interception of confidential data.</li> </ul>
	Access using mobile end devices: <ul style="list-style-type: none"> <li>• If you carry out commissioning or diagnostics using a mobile end device such as a smartphone or tablet, you may temporarily connect the service interface X127 to an external WLAN access point.</li> <li>• The SINAMICS Smart Adapter establishes a point-to-point connection to the mobile end device via WLAN.</li> </ul>
PROFINET interface X150	The IP addresses of the service interface X127 and the PROFINET interface X150 must not be in the same subnet.

### 8.3.4 Making the operating instructions available for the web server information system

#### Overview

For selected topics, you can use the information system of the web server to access the operating instructions directly. To do this, you must make the operating instructions available on a prepared memory card (SD card).

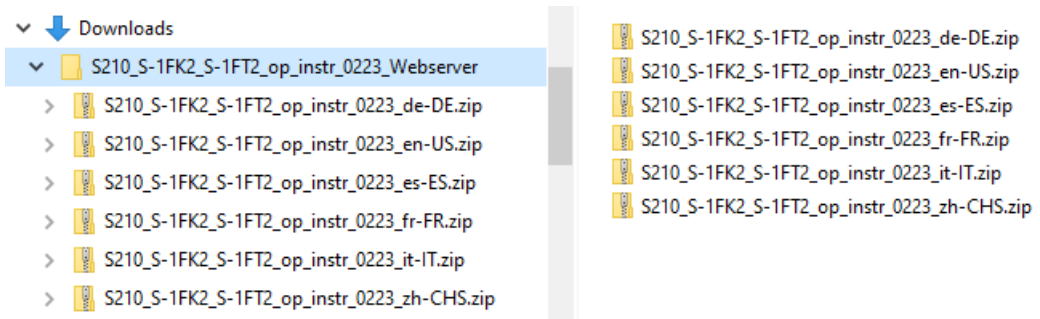
#### Requirement

- You have an empty SD card with a maximum storage capacity of 32 GB (e.g. 6SL5970-0AA00-0AA0) onto which you can load the operating instructions.
- You have connected a suitable SD card reader to your PC.

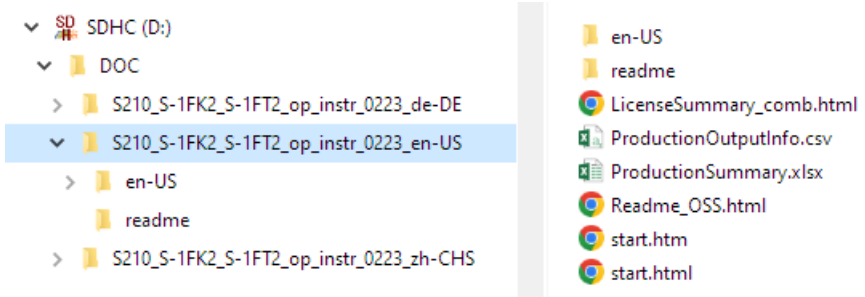
### Procedure

To make the operating instructions available for the web server information system, proceed as follows:

1. Load the web server information system to your PC.  
The operating instructions for the web server information system are available to download at this address (<https://support.industry.siemens.com/cs/ww/en/view/109815715>).  
The operating instructions are provided as a zipped file "S210\_S-1FK2\_S-1FT2\_op\_instr\_0223\_Webserver.zip" under "Annex to this entry".
2. Unzip the file that you downloaded "S210\_S-1FK2\_S-1FT2\_op\_instr\_0223\_Webserver.zip".  
The annex contains all available language versions as an individually zipped language-dependent file.



3. Unzip the relevant language-dependent ZIP file to a folder with the name of the ZIP file (e.g. for the English version "S210\_S-1FK2\_S-1FT2\_op\_instr\_0223\_en-EN").  
The unzipped files are contained in this folder.
4. Insert the SD card into your PC's SD card reader.
5. In the root directory of the memory card, create a folder called "DOC".
6. Copy the unzipped folder (e.g. in the English version "S210\_S-1FK2\_S-1FT2\_op\_instr\_0223\_en-EN") to the "DOC" directory on the SD card.



Depending on the available space on the SD card, you can copy all available language versions to the SD card. To do this, repeat the unzip/copy process for each language version.

7. Eject the SD card from the PC.
8. Remove the SD card from the reader.
9. Insert the SD card into the converter.

## Result

You have made the operating instructions available for the web server information system.  
For selected topics, you can now access the instructions via the context-sensitive information system.

## 8.3.5 Using the web server information system

### Overview

In the web server, you have the support of an integrated, multi-level information system.  
You decide in a context-sensitive interface how much and what kind of information is displayed.

## Information in the current view

Information displayed in the current view of the web server:

The screenshot shows the Siemens SINAMICS S210 web server interface. The top navigation bar includes the Siemens logo, the product name 'SINAMICS S210', and user information 'Administrator' and 'English'. The main content area is titled 'Motor' and contains a section 'About the motor configuration' with an expand/collapse icon and an info icon. Below this, there are settings for 'Motor type' (1FT2 synchronous motor) and 'Direction of rotation' (Clockwise/Counterclockwise). A table of 'Nameplate data' is displayed, with columns for 'Nameplate data', 'Value', and 'Unit'. The table includes rows for 'Rated current', 'Rated speed', 'Rated voltage', 'Maximum motor speed', and 'Maximum motor current'. An 'Optional motor data' section is also visible. Annotations 1, 2, and 3 are placed on the interface to highlight specific features.

Nameplate data	Value	Unit
Rated current	4.1	Arms
Rated speed	4500	rpm
Rated voltage	310	Vrms
Maximum motor speed	8000	rpm
Maximum motor current	22.5	Arms

### ① Display general information about the function of the current view

- Click or tap on the header or on the expand icon to show general information about the function of the current view.
- Click or tap again on the header or on the collapse icon to hide the general information about the function of the current view.

### ② Display a tooltip with context-sensitive short information about a setting

- Point with the mouse pointer or tap on the setting you need information about. The setting is highlighted and the assigned info icon appears.
- If you hold the mouse pointer or keep the tap pressed on the setting for longer, a tooltip with the context-sensitive short information is displayed.



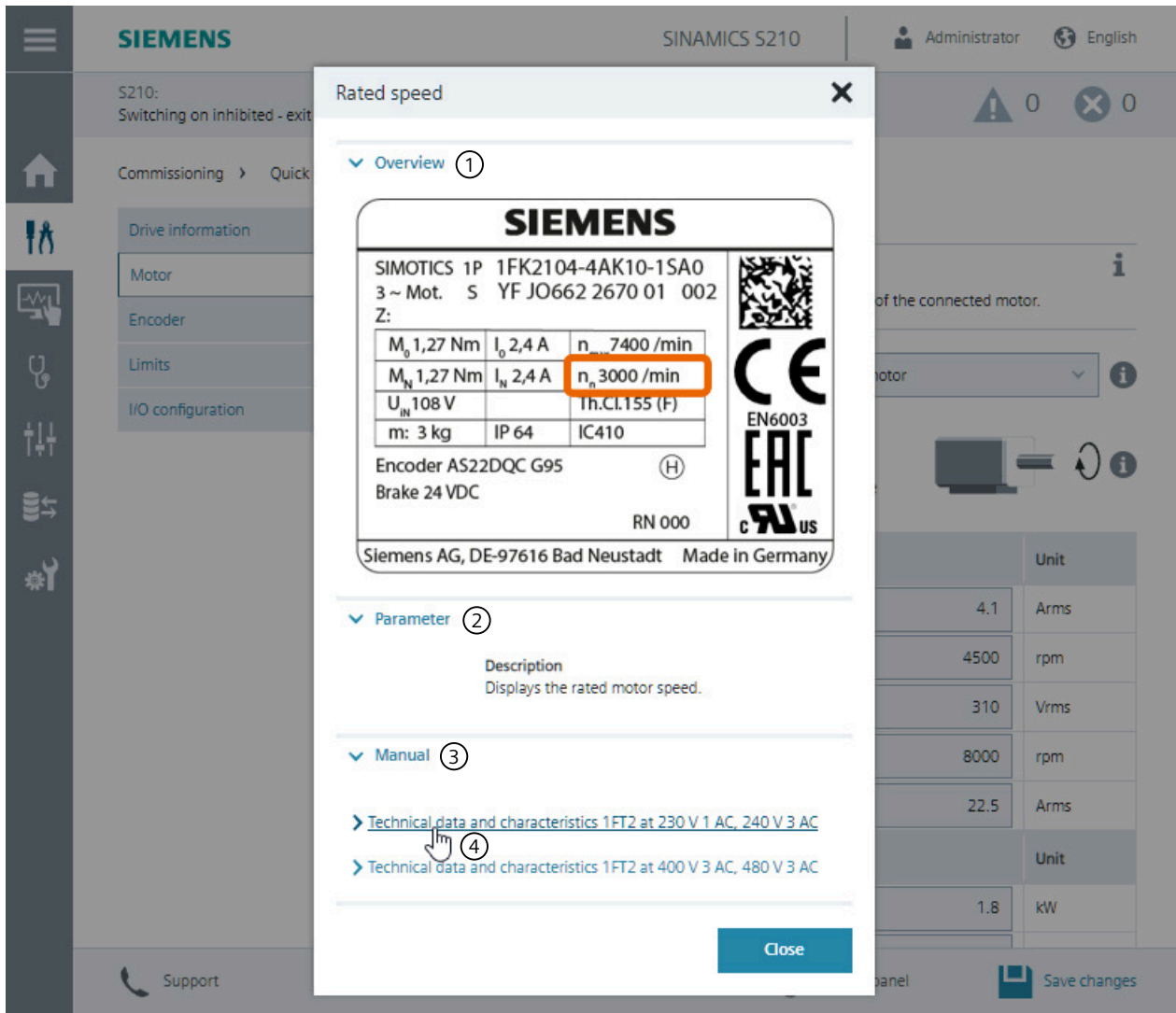
- ③ **Display detailed information in a context-sensitive help window**
  -  Point with the mouse pointer or tap on the setting you need information about.  
The setting is highlighted and the assigned info icon appears.
  -  When you move the mouse pointer to the info icon, the icon and the mouse pointer change their appearance.  
If you now click or tap on the info icon, a context-sensitive help window appears with detailed information.

Figure 8-1 Information in the current view

### Detailed information in a context-sensitive help window

Detailed information about a setting displayed in a context-sensitive help window:



- ① **Overview**

Display general information about the meaning or function of the setting.

  - Click or tap on "Overview" or on the associated expand icon to show general information about the meaning or function of the setting.
  - ✓ Click or tap again on "Overview" or on the associated collapse icon to hide the general information about the meaning or function of the setting.
- ② **Parameter**

Display detailed information about the parameter defined by the setting.

  - Click or tap on "Parameter" or on the associated expand icon to show detailed information about the parameter.
  - ✓ Click or tap again on "Parameter" or on the associated collapse icon to hide the detailed information about the parameter.



③

**Manual**

For selected settings, you can use the links under "Manual" to access the operating instructions directly.

The requirements in order to do this are set out in Chapter "Making the operating instructions available for the web server information system (Page 189)".



Click or tap on "Manual" or on the associated expand icon to show links to the operating instructions.



Click or tap again on "Manual" or on the associated collapse icon to hide the links to the operating instructions.

④


Click or tap on a link to open the web browser and display the linked information in the operating instructions.

Figure 8-2 Information in a context-sensitive help window

### 8.3.6 Reloading pages

#### Procedure

If the web server does not respond, or if buttons are inactive or are not labeled, although the converter is not fully utilized with internal calculations, reload the web server pages as follows:

- At the PG/PC via <F5>
- At the tablet PC or smartphone via 

## 8.4 Getting Started

### 8.4.1 Calling the web server

#### Overview

Converter commissioning takes place with the user interface of the web server.

#### Requirement

- You have connected the converter to the operating unit via the service interface X127.

#### Procedure

To access the web server, enter the IP address of the converter, e.g. `https://169.254.11.22`, in the browser.

#### More information

When you call the web server for the first time, you are prompted to define the basic settings.

## 8.4 Getting Started

If you have already made the basic settings, then the web server starts and opens the home page. You can commission the converter, troubleshoot it, operate it, monitor it or call up support through the support pages.

### 8.4.2 Settings for brand-new converters

#### Overview

The basis settings are required before performing first commissioning for a brand-new converter.

#### Requirement

- The operating unit is connected to the converter via the service interface X127 or the PROFINET interface X150.
- The web server is accessed with the IP address (default: 169.254.11.22).

#### Description of function

If the web server was called, then you are automatically transferred to define the settings. When doing, this several function views are run through.

The function views contain the following settings:

- Basic settings (Page 196)
- Security settings (Page 197)

### 8.4.3 Basic settings

#### Overview

Initial basic settings are defined in the function view.

#### Requirement

The web server is being called for the first time.

#### Description of function

The basic settings are as follows:

- Preferred language of the user interface
- Converter date and time; either manually or via NTP

After these entries have been made, using the "Next" button, you can continue to the Security Wizard.

## 8.4.4 Security settings

### Overview

The settings for user management and access control (UMAC) are defined using the Security Wizard.

### Requirement

#### NOTICE

##### Converter damage due to data manipulation

Inadequate protection of drive data makes it easier to gain unauthorized access to the converter. Unauthorized data manipulation can change the converter settings. Changed settings can stop the converter working properly or damage the converter.

- Only deploy low protection in exceptional cases and only when no outsider can access the converter, e.g. if the converter is not yet connected to a network.
- Protect the interfaces of the converter against unauthorized access, e.g. with a locking control cabinet.
- Create a higher level of security as soon as possible.

### Description of function

One of the following options can be selected:

- "Configure security settings"  
We recommend this setting for comprehensive protection.
- "Continue with low security settings"  
With this setting, UMAC is deactivated.  
You can configure the security settings at a later time, see Chapter "Protection & Security (Page 234)".

### Select "Configure security settings"

Define the settings for UMAC:

- "Activate User Management & Access Control":  
Activation is preset.  
If UMAC is activated, it can only be deactivated by a full reset of the converter to factory settings. This causes all security settings to be lost.  
You can find more information about the full reset to factory settings in Chapter "Manual reset to factory settings with memory card (Page 351)".
- "Administrator setup":  
Specify the user name and password of the drive administrator.  
The drive administrator is permanently assigned the runtime role "Drive Administrator". This assignment cannot be changed.
- "Read access configuration":  
Specify whether the user has read rights without logging in and whether the user is allowed to acknowledge results without logging in.  
The option is deactivated in the factory setting. If read access is not permitted, then the login page is displayed when the web server is called.

Define the settings to access the web server:

- "Web server activation":  
Factory settings to access the web server:
  - Via service interface X127 with the HTTPS protocol
  - Via PROFINET interface X150 with the HTTPS protocol  
If both factory settings are deactivated, then it is not possible to access the web server.

Check the selected security settings:

- "Summary":  
The summary provides an overview of the selected settings.

### Finish and continue

The security settings are checked by clicking on "Finish". If there is no error, the settings are applied.

After finishing, you can continue with one of the following options:

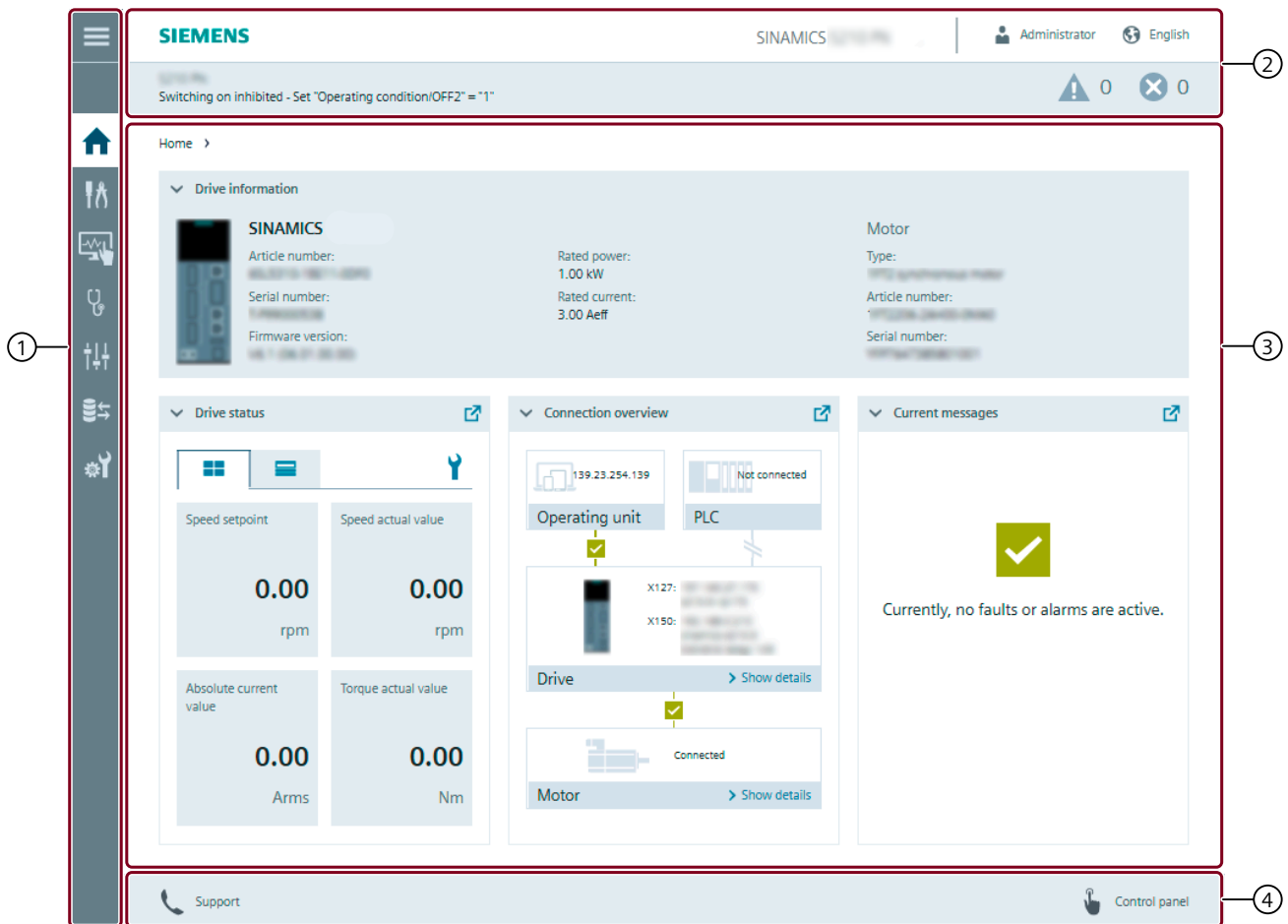
- Continue with quick setup
- Continue with the web server home page

## 8.5 Functions and menus

### 8.5.1 Home page

#### Description

The following figure shows the basic structure of the web server pages.



① Navigation bar

② Status bar

③ Main window

Access to the function views depends on the access rights of the logged-in user.

④ Action bar


Note: The action bar may also contain a save button if manual saving (factory setting) is activated in the menu "System" > "Settings". However, if automatic saving is activated there is no save button .

Figure 8-3 Structure of the web server (example)

## **8.5.2 Commissioning**

### **8.5.2.1 Complete commissioning workflow**

#### **Overview**

The web server guides users step-by-step through the drive commissioning.

Description of function

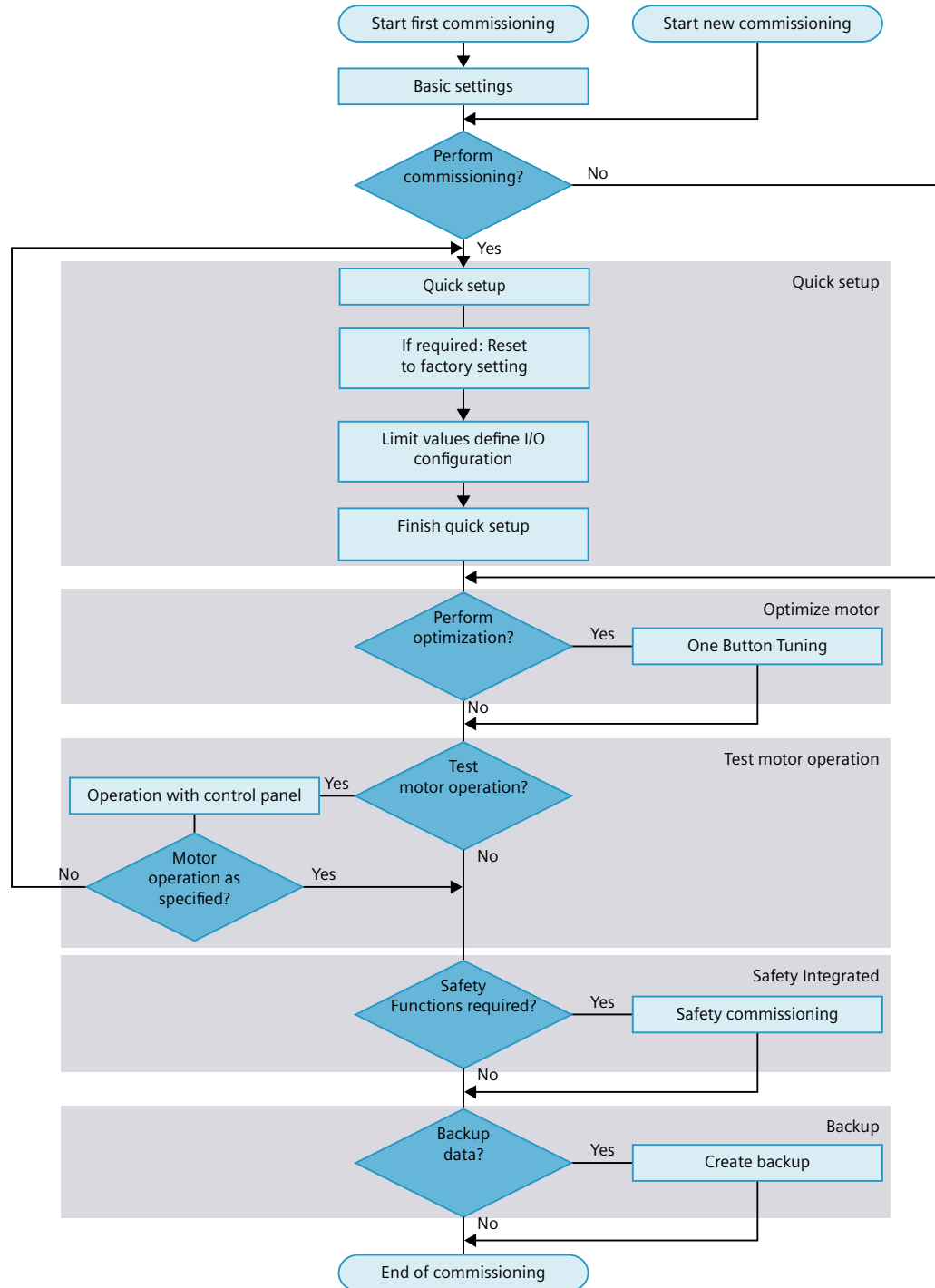


Figure 8-4 Procedure for commissioning with web server

Commissioning involves the following steps:

- **Basic settings:**  
If the converter has already been commissioned, then the web server jumps to the basic settings.  
The following settings are required for a brand-new converter:
  - Language, date, time
  - Configuring security settings  
The Security Wizard can be called again at any time from the menu "System".
- **Quick setup:**  
Menu "Commissioning" > "Quick setup"  
The converter identifies the motor and encoder data via the DRIVE-CLiQ connection after the supply voltage has been switched on.  
Optionally, you can define the limit values to be respected and the I/O configuration.
- **Optimize motor:**  
Menu "Commissioning" > "Optimization"  
With the One Button Tuning (OBT) function, the mechanical drive train is measured using short test signals.  
In this way, the controller parameters are optimally adapted to the existing mechanical system.
- **Test motor operation:**  
Action bar > "Control panel"  
The closed-loop speed control of the motor can be tested by moving the motor from the web server control panel in jog or continuous motion.
- **Safety Integrated commissioning:**  
Menu "Commissioning" > "Safety Integrated"  
If Safety Integrated Functions are required, you must set the Safety Integrated Functions and test using an acceptance test.
- **Backup:**  
Menu "Backup and restore"  
We recommend a backup of the drive settings.

## More information

More detailed information on user management and security settings is provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>).

### 8.5.2.2 Quick setup

#### Overview

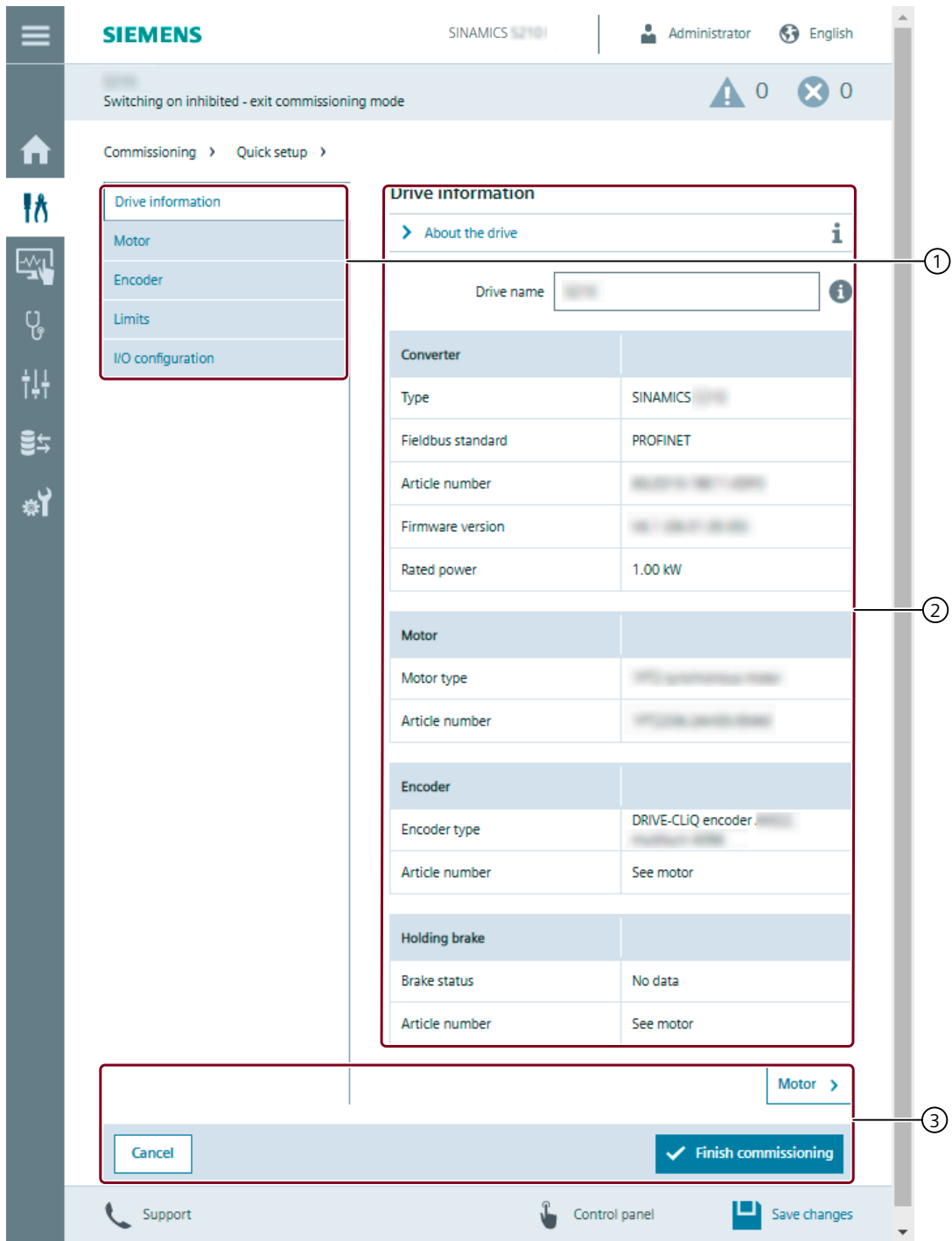
The converter can generally be operated without making additional settings using quick setup. We recommend that quick setup is performed to set the limit values and the I/O configuration to optimally address the target application.



## Requirement

- The drive system has been configured. The components are wired.
- Web server access is active.

Description of function



- ① Menu and navigation for quick setup
- ② Display of the individual quick setup steps
- ③ Navigation

Figure 8-5 Quick setup using the web server

Only the most important properties of the converter are configured in the quick setup.

Motor and encoder are directly detected during ramp-up as a result of the DRIVE-CLiQ connection. The data are accepted and shown in steps "Motor" and "Encoder". These data are for information only and cannot be changed during quick setup.

The converter creates a restore point when quick setup is started. The converter saves the changes after every commissioning step. The converter is reset to the restore point if quick setup is canceled.

For fast navigation through the quick setup, for example to check the set configuration data, the web server has a read-only mode.

The commissioning Wizard of the web server guides users through the following quick setup steps.

### **Drive information**

The step provides information about the converter, motor, encoder and motor holding brake being used.

The following data can be changed:

- Drive name  
A specific drive name can be assigned.

### **Motor**

The data of the motor being used are displayed. It is not possible to configure another motor.

The direction of rotation of the motor can be selected:

- Right
- Left

### **Encoder**

The data of the encoder being used are displayed.

Configuration is not possible.

### **Limit values**

The converter limit values are shown graphically and in a tabular form.

The following data can be configured:

- Limit values by making an entry in the table  
From the content perspective, table and diagram are linked with one another.
- Device supply voltage

### **I/O configuration**

The configuration of the digital converter inputs is shown graphically and in a tabular form.

Configuration options:

- In the table, a function can be assigned to each digital input of the terminal. Specified functions can be selected. The selection is shown in the diagram.
- DI 2, 3 is reserved for Safety Integrated.  
If DI 2,3 was configured as FDI 0 via Safety Integrated, then the yellow F-DI symbol is displayed in the table.
- The digital input 0 or 1 can be defined as the equivalent zero mark. No equivalent zero mark is active in the default setting. The evaluation is realized via the encoder zero mark.

### 8.5.2.3 Testing the converter configuration

#### Overview

After the quick setup, the web server allows you to test the converter configuration in jog mode or continuous motion via the control panel.

#### Description

To test the configuration, the control panel must be open and the speed setpoint entered.

There are 2 ways of opening the control panel:

- Button "Finish quick setup" > Dialog query with selection option "Open control panel"
- Action bar > "Control panel"

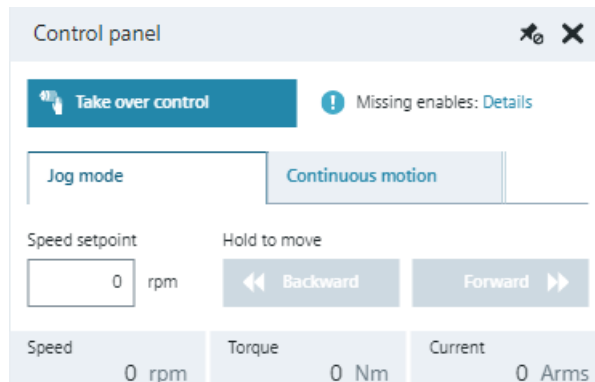


Figure 8-6 Testing the converter configuration via the control panel

#### More information

You can find more information in Chapter "Control panel (Page 239)".

## 8.5.2.4 Optimization

### Overview

Once quick setup has been completed the drive settings are optimized using the One Button Tuning (OBT) function.

With OBT, the mechanical drive train is measured using short test signals. In this way, the controller parameters are optimally adapted to the existing mechanical system.

### Requirement

To reduce the stress on the mechanical system, before OBT, the torque limit can be reduced, and after OBT has been completed, the previous value can be set again.

NOTICE
<p><b>Material damage caused by an impermissible direction of motion of the motor</b></p> <p>One Button Tuning runs the motor in both directions. Impermissible directions of motion can damage the machine or installation.</p> <ul style="list-style-type: none"><li>• If a particular direction of motion of the motor is impermissible, do not carry out One Button Tuning.</li></ul>

Description of function

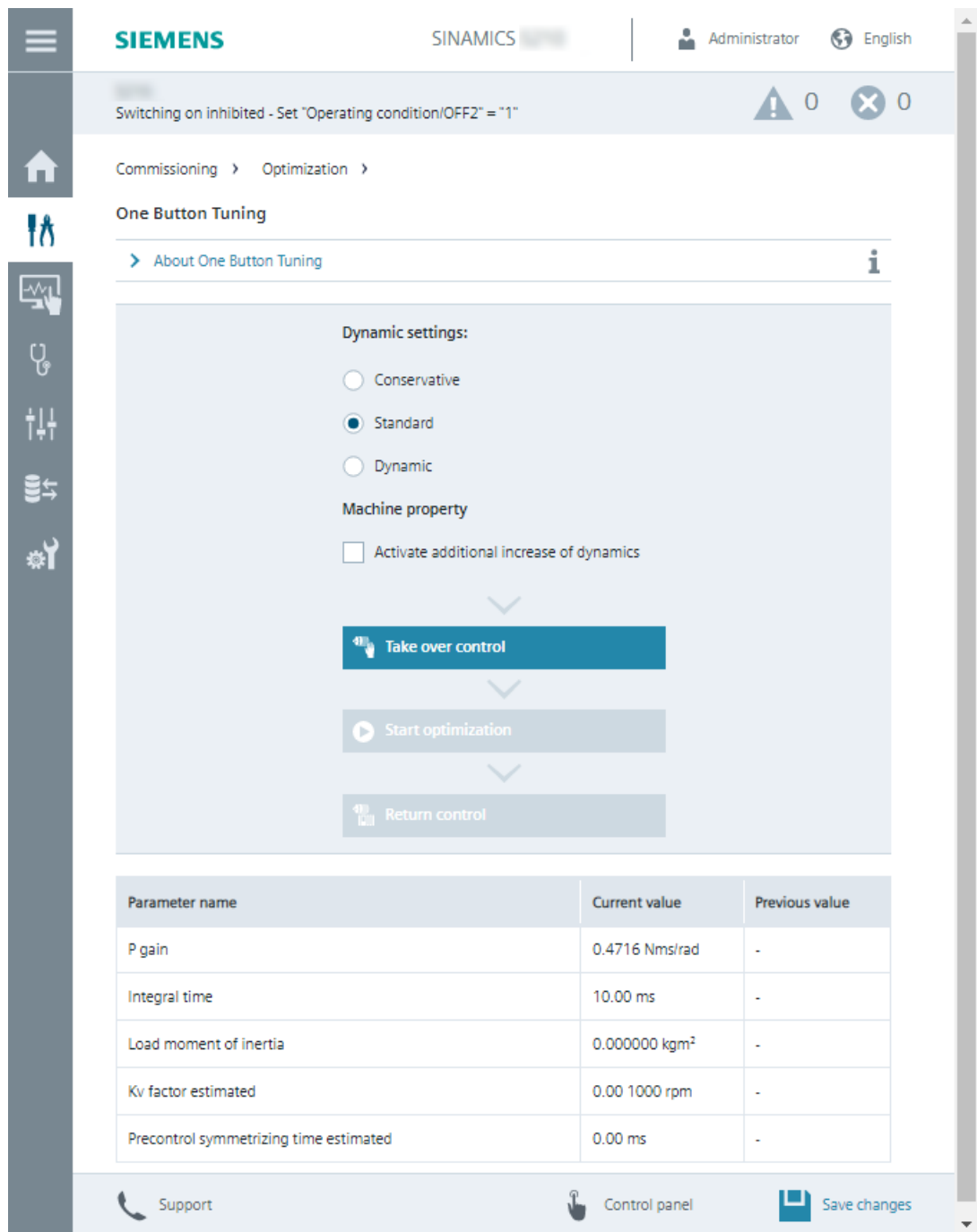


Figure 8-7 One Button Tuning

The optimum controller settings are determined using the following settings:

- Take over control and relinquish control:  
Take over master control before starting to optimize the controller.  
Relinquish master control back to the converter once the controller has been optimized.
- Select dynamic response settings:
  - Dynamic  
100% dynamic response; speed control with fast torque precontrol
  - Conservative  
60% dynamic response; speed control without torque precontrol
  - Standard  
80% dynamic response; speed control with torque precontrol
- Machine property:  
The "Activate additional dynamic response increase" option increases the proportional gain of the optimized speed control. The dynamic response is increased. The speed controller becomes faster.  
If the dynamic factor is increased too much, the speed controller may become unstable.
- Start optimization:
  - Enter the angle of rotation (rotation limit) through which the motor and the connected machine are permitted to turn for the required measurements (e.g. 360°) without the mechanical system being damaged. Sensible controller parameters are obtained from an angle > 90°.  
When a negative angle is entered, then the motor moves in the opposite direction.
  - The table shows how the settings have been changed by OBT.

If OBT was not successful, repeat the optimization with other settings.

### 8.5.2.5 Safety Integrated commissioning

#### Overview

Commissioning the Safety Integrated Functions of the converter includes the following:

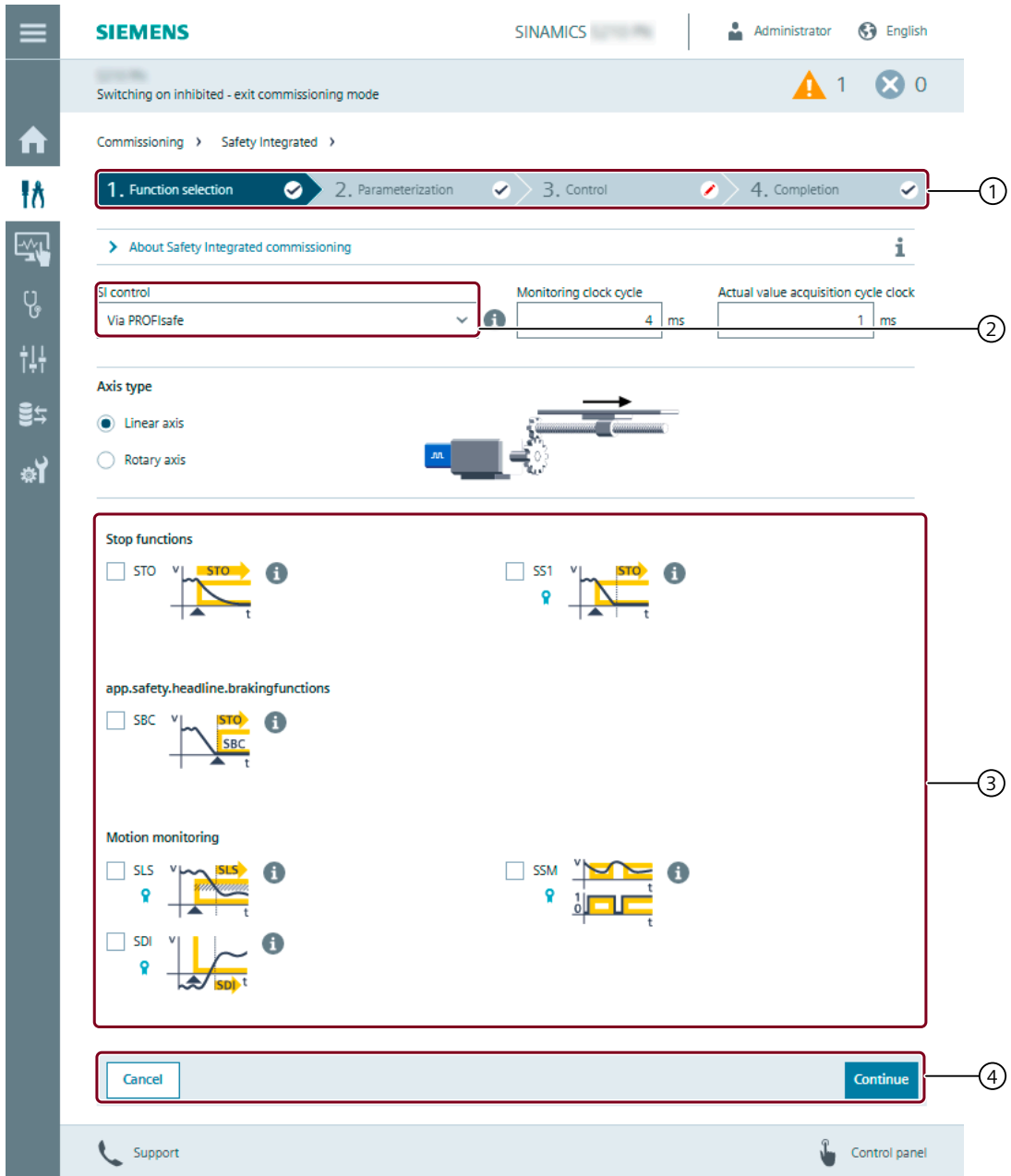
- Selecting the functions
- Parameterizing the functions as required for the application
- Control of the functions

#### Requirement

- The drive system has been configured. The components are wired.
- The converter and motor are completely created in the device configuration.
- Web server access is active.  
Commissioning using the web server is only possible if access to the web server via interfaces X127 and X150 was selected in the security settings.

- The appropriate license is available for Safety Integrated Functions requiring a license.
- Function rights have been assigned with the role "Drive Safety Engineer".

Description of function



- ① Step display of the Safety Integrated commissioning Wizards
- ② Control type
- ③ Function selection
- ④ Navigation

Figure 8-8 Safety Integrated commissioning using the web server (example)



Changes to Safety Integrated settings are only possible in the "Safety Integrated commissioning" mode. The drive is in the safe state as soon as the commissioning mode is active. Safe Torque Off (STO) is active.

Commissioning of Safety Integrated must be completely run through. No settings are applied if an interruption occurs during commissioning.

The activated user management protects against unauthorized changes to Safety Integrated settings. Login takes place when the web server starts. After this, only authorized users have the necessary rights to change Safety Integrated settings. The "Safety Integrated application" right is a component of the "Drive Safety Engineer" role.

When starting Safety Integrated commissioning, the converter creates a restore point. The converter saves the changes after every commissioning step. The converter is reset to the restore point if quick setup is canceled.

For fast navigation through Safety Integrated commissioning, for example to check the settings, the web server has a read-only mode.

Safety Integrated commissioning involves the following steps:

1. Function selection
  - Selecting the Safety Integrated control type
  - Monitoring cycle: Value is set to 4 ms in the factory and cannot be changed.
  - Actual value acquisition cycle: Value is set to 1 ms in the factory and cannot be changed.
  - Selecting the axis type  
When switching over the axis type, the units are also changed.
  - Selecting the available Safety Integrated Functions depending on the control type
  - License symbol  
The license symbol shows the Safety Integrated Functions that require a Safety Extended license. Safety Integrated can be used in the Trial License mode for test purposes.
2. Parameter assignment  
Configuration of the activated Safety Integrated Functions
  - Function-dependent display of the converter parameters  
The function view shows a graphic of the function. The parameters of the function are listed in the context-sensitive table.  
The parameter values can be changed. When required, additional parameters are displayed.
  - Actual value acquisition/mechanical system  
The actual value acquisition/mechanical system can be viewed if Safety Integrated motion monitoring functions were activated.  
The parameter values can be changed.
3. Control  
Parameterizing the control type
4. Completion  
The configurations are completed and applied by clicking on "Finish":
  - The subsequent parameter assignments are made
  - Checksums are calculated

### **More information**

You will find detailed information in Chapter "Safety Integrated Functions (Page 97)".

## **8.5.3 Operator control and monitoring**

### **8.5.3.1 Drive status**

#### **Overview**

Function view "Drive status" shows the current status of the converter.

## Description of function

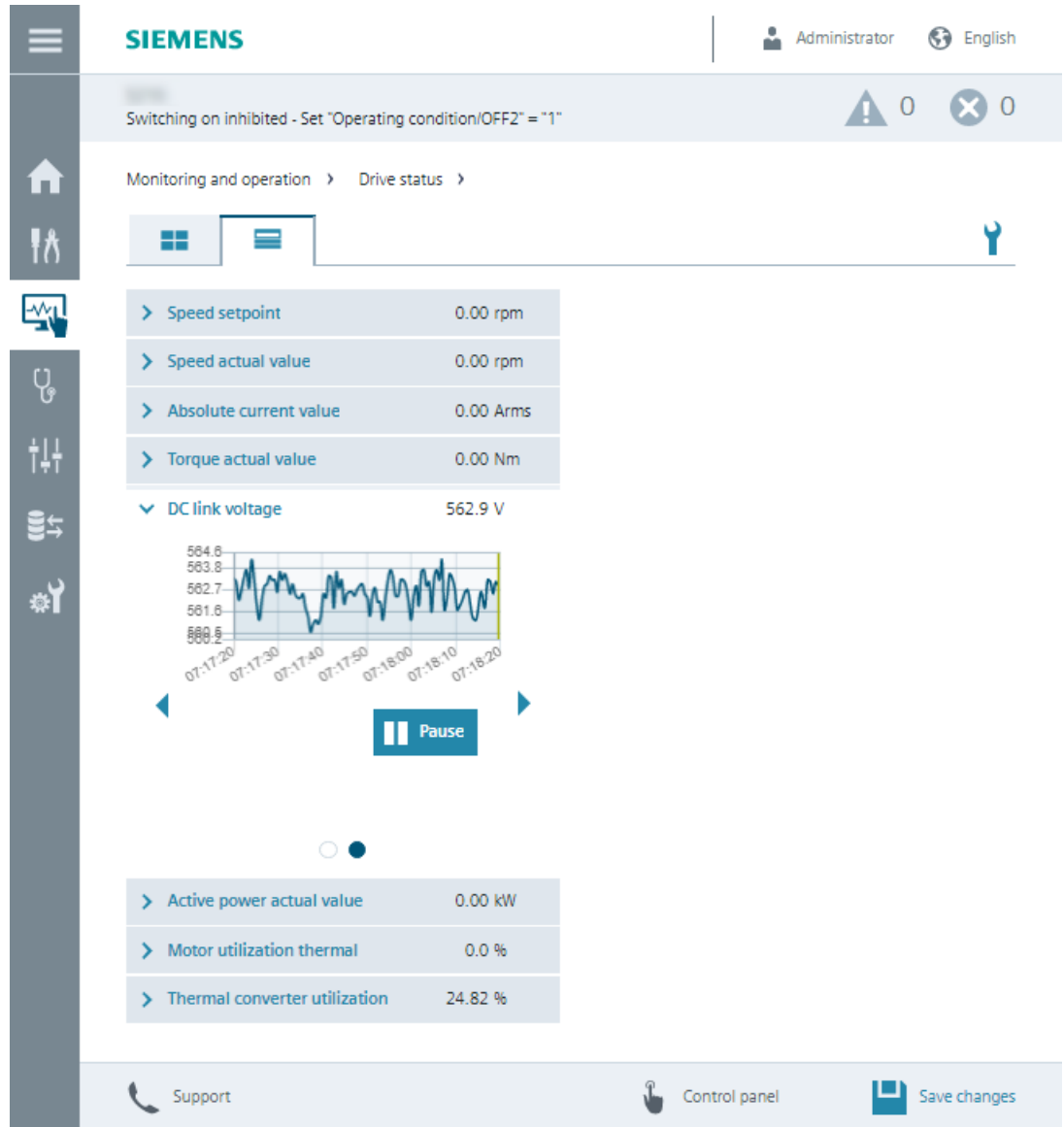


Figure 8-9 Drive status

The drive information displayed is preset in the factory setting, and when required, can be adapted using symbol . If user management is active, the "Edit web server configuration" right is required in order to make changes.

Values are indicated as follows:

- Factory setting: 8 values are displayed
- It is possible to display all values completely

The drive status is displayed as follows:

- : Individual values are continuously displayed
- : Individual values and trend diagrams are continuously displayed

### 8.5.3.2 Inputs/outputs

#### Overview

The function view "Inputs/outputs" shows the status of the digital inputs offered by the converter.

#### Description of function

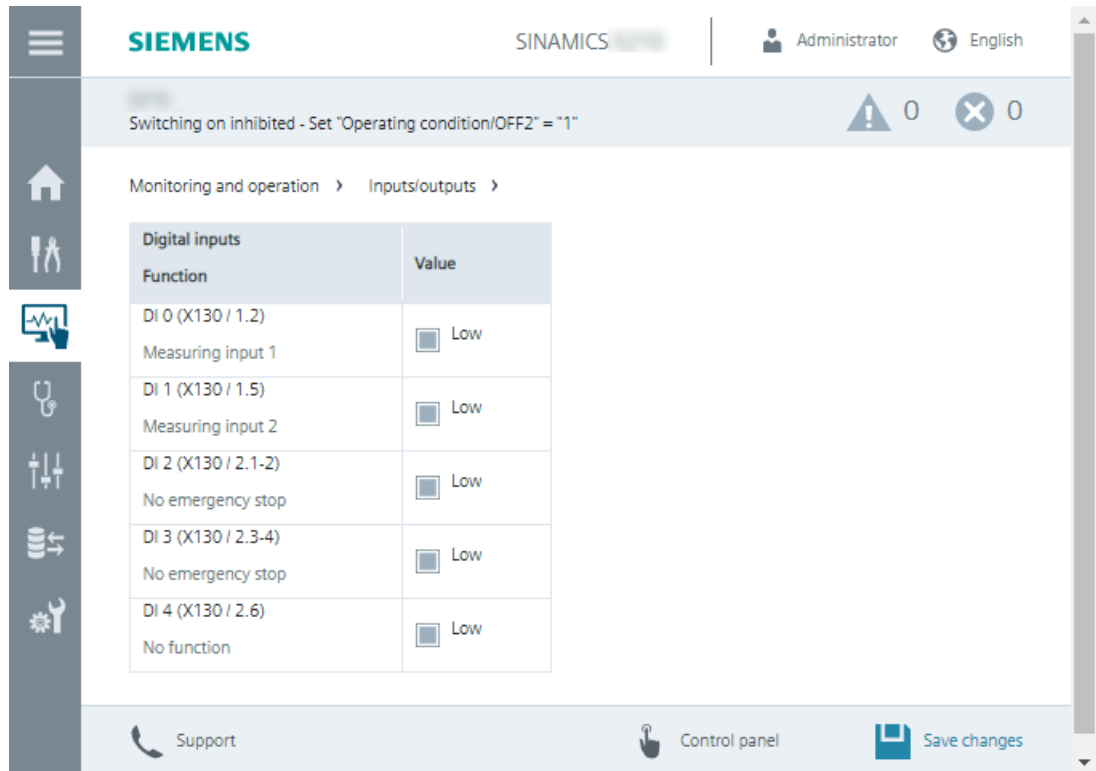


Figure 8-10 Inputs/outputs

### 8.5.4 Diagnostics

#### 8.5.4.1 Messages

#### Overview

The function view "Messages" shows active and historical messages.

## Description of function

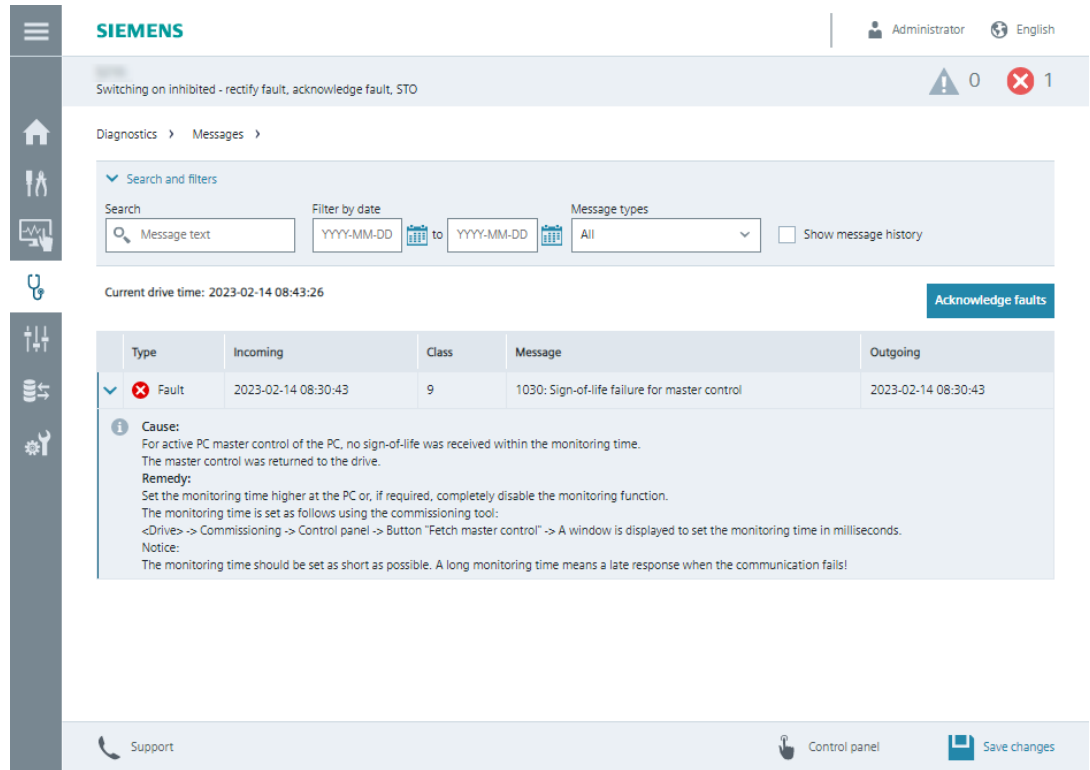


Figure 8-11 Messages

Using search and filter options, the number of alarms and faults can be restricted. The available filter options can be combined with one another and can be reset at any time.

The message history can be optionally displayed.

### Selecting messages

Search	Enter a keyword
Filter by date	Select a date or time interval
Message types	Select the message type that should be displayed: <ul style="list-style-type: none"> <li>• All</li> <li>• Faults</li> <li>• Alarms</li> </ul>

### Displaying messages

Type	Displaying the message type: <ul style="list-style-type: none"> <li>• Alarm</li> <li>• Fault</li> </ul>
Incoming	Time that the message was received

## 8.5 Functions and menus

Class	Assign the message to a message class according to PROFIdrive <ul style="list-style-type: none"><li>• The class is displayed at the integrated operator panel "SINAMICS SDI status".</li><li>• The message number is output on all operating units, e.g. PC, SIMATIC HMI.</li></ul>
Message	Specification of the message number with message text
Gone	Time when the message went <ul style="list-style-type: none"><li>• Faults are given the status "Outgoing" if the following are true:<ul style="list-style-type: none"><li>– The causes have been eliminated.</li><li>– The message has been acknowledged.</li></ul></li></ul>
>	Selection for more information: <ul style="list-style-type: none"><li>• Description of the message with cause and remedy</li></ul>

### 8.5.4.2 Diagnostics buffer

#### Overview

Function view "Diagnostics buffer" provides information about all system-relevant operations, e.g. commissioning, new ramp-up, generation of a certificate.

## Description of function

The screenshot shows the Siemens SINAMICS web interface. At the top, there is a navigation bar with the Siemens logo, the text 'SINAMICS', and user information 'Administrator' and 'English'. Below this, a status bar indicates 'Switching on inhibited - Set "Operating condition/OFF2" = "1"'. The main content area is titled 'Diagnostics > Diagnostics buffer >'. It features a search and filter section with a search box labeled 'Event text' and two date range filters labeled 'YYYY-MM-DD' and 'to YYYY-MM-DD'. Below the search section, the current drive time is shown as '2023-03-16 10:12:32'. A table displays the diagnostic buffer events:

No.	Date and time	Event text
1	2023-03-16 09:21:22	DO 1 retentively saved
2	2023-03-16 09:21:17	Retentive save DO 1 started
3	2023-03-16 09:19:51	Ramp-up completed, cyclic operation
4	2023-03-16 09:19:46	Commissioning DO 1 activated (0)
5	2023-03-16 09:19:46	A new certificate was automatically generated.
6	2023-03-16 09:19:40	TEC index 0: End address 0x26034572
7	2023-03-16 09:19:40	TEC index 0: Start address 0x26034571
8	2023-03-16 09:19:40	TEC index 0: End address 0x26034571

At the bottom of the interface, there are buttons for 'Support', 'Control panel', and 'Save changes'.

Figure 8-12 Diagnostics buffer

Reading out the diagnostic buffer facilitates converter diagnostics and supports fault analysis. The search can be limited by searching for keywords and using the filter function according to date.

The diagnostic buffer can only be cleared by performing a manual reset to factory settings with a memory card. For further information, refer to the Chapter "Manual reset to factory settings with memory card (Page 351)".

The diagnostic buffer is kept when restoring factory settings via menu "Backup and restore".

### 8.5.4.3 Safety Integrated

#### Overview

Function view "Safety Integrated" provides information about the Safety Integrated Functions that have been enabled.

## Description of function

The screenshot shows the Siemens SIMOTICS S-1FS2 web interface. At the top, the status bar indicates 'Switching on inhibited - rectify fault, acknowledge fault, STO' with 2 warning icons and 4 error icons. The breadcrumb navigation shows 'Diagnostics > Safety Integrated >'. A message box states: 'Internal event: A stop response was initiated due to a limit value being exceeded or a Safety Integrated Function fault.' The 'Status of Safety Integrated Functions' section displays three cards: STO (Function active), SBC (Function active), and SLS (Function active). The SLS card includes input fields for 'Active level' (1), 'SLS limit value' (1995 mm/min), and 'Speed actual value' (0 mm/min). The 'Status' section shows a red error icon and the text 'Internal event has occurred'. The 'Checksum' section lists: Checksum (F7D8 0967 H), Functions (90D7 0A79 H), PROFIsafe (BB17 F9E4 H), and Time stamp (2023-02-14 11:34:22:9E). The 'Versions' section lists: SINAMICS Safety Integrated firmware version, I/O processor firmware version, and Encoder firmware version. The bottom navigation bar contains 'Support', 'Control panel', and 'Save changes' buttons.

Figure 8-13 Safety Integrated

The following content is displayed:

- "Status of Safety Integrated Functions"  
The status of the enabled Safety Integrated Functions is displayed.
- "Status"  
"Active" is displayed if Safety Integrated Functions are active.



- "Selected"  
Under "Selected" you will see the following data about the Safety Integrated commissioning:
  - "Checksum"  
Displays the functional checksum of the converter to track changes (safety logbook)
  - "Functions"  
Displays the checksum over the checksum-checked parameters to configure the converter
  - "PROFIsafe"  
Displays the checksum of the PROFIsafe parameterization
  - "Time stamp"  
The time stamp indicates when the update was made.
- "Versions"  
Displays the safety-relevant software versions of the corresponding components

#### 8.5.4.4 Connection overview

##### Overview

Function view "Connection overview" provides information about the connections in the drive system.

### Description of function



Figure 8-14 Connection overview

The individual components with IP address and additional details are graphically displayed in the connection overview.

#### 8.5.4.5 Communication

##### Overview

Function view "Communication" provides information about the activated fieldbus interface.

## Description of function

The screenshot shows the Siemens SINAMICS web server interface. The top navigation bar includes the Siemens logo, the SINAMICS brand name, and user information (Administrator, English). The main content area is titled 'Switching on inhibited - exit commissioning mode' and shows the 'Diagnostics > Communication' menu. It displays the PROFINET IP and Name of the station, and the cyclic connection diagnostics status. Two tabs are visible: 'PROFIdrive telegram' (selected) and 'PROFIsafe telegram'. Below the tabs, the 'PROFIdrive PZD telegram selection' is shown. The interface is divided into two sections: 'Receive direction: control > converter' and 'Send direction: converter > control'. Each section contains a table with columns for PZD, Designation, Explanation, and Value. The 'Value' column includes a 'hex' button for each entry. At the bottom, there are links for 'Support' and 'Control panel'.

**Receive direction: control > converter**

PZD	Designation	Explanation	Value	
1	STW1	Control word 1	0000	hex
2_3	NSOLL_B	Speed setpoint B (32-bit)	0000 0000	hex
4	STW2	Control word 2	0000	hex
5	MOMRED	Torque reduction	0000	hex
6	G1_STW	Encoder 1 control word	0000	hex
7_8	XERR	Position deviation	0000 0000	hex
9_10	KPC	Position controller gain factor	0000 0000	hex

**Send direction: converter > control**

PZD	Designation	Explanation	Value	
1	ZSW1	Status word 1	0000	hex
2_3	NIST_B	Speed actual value B (32-bit)	0000 0000	hex
4	ZSW2	Status word 2	0000	hex
5	MELDW	Message word	0000	hex
6	G1_ZSW	Encoder 1 status word	0000	hex

Figure 8-15 Communication

The following content is displayed:

- Connection status
- Process data of the set telegram in the send and receive directions.  
The values are shown in the hexadecimal format. The display of individual values is switched between binary, decimal and hex format by clicking on the button to the right of the value.

### 8.5.4.6 Status word and control word

#### Overview

The function view "Control/status word" provides information about the current status of the sequence control system.

#### Description of function

Switching on inhibited - exit commissioning mode

Diagnostics > Control/status word >

Parameter	Value	Parameter	Value
Control word sequence control	1000 H	Status word sequence control	2240 H
00: ON/OFF1	No	00: Ready for switching on	No
01: Operating condition / OFF2	No	01: Ready	No
02: Operating condition / OFF3	No	02: Operation enabled	No
03: Enable operation	No	03: Jog active	No
04: Enable ramp-function generator	No	04: No coasting active	OFF2 active
05: Continue ramp-function generator	No	05: No Quick Stop active	OFF3 inactive
06: Enable speed setpoint	No	06: Switching on inhibited active	No
07: Command open brake	No	07: Drive ready	No
08: Jog 1	No	08: Controller enable	Yes
09: Jog 2	No	09: Control request	No
10: Master control by PLC	No	11: Pulses enabled	No
12: Speed controller enable	No	12: Open holding brake	No
14: Command close brake	Yes	13: Command close holding brake	Yes

Support Control panel

Figure 8-16 Control and status word

The control and status word is indicated by all sequence control states. This also includes states that are not available, which prevent the motor from being switched on and switched off. Diagnostics supports fault analysis.

## 8.5.5 Parameters

### 8.5.5.1 Parameter list

#### Overview

The parameter list shows all the parameters of the converter. The parameter list allows specific parameters to be changed.

## Description of function

The screenshot shows the Siemens SINAMICS web server interface. The top navigation bar includes the Siemens logo, the SINAMICS brand name, and user information (Administrator, English). A status bar indicates 'Switching on inhibited - exit commissioning mode' with a warning icon and a count of 1. The main content area is titled 'Parameter > Parameter list >'. It features a search and filter section with a search box for 'Parameter name', a dropdown for 'Parameter group' (set to 'All parameters'), and a dropdown for 'Parameter types' (set to 'Display and setting par...'). Below this are buttons for 'Copy marked...', 'List import/export', and 'Simple view'. The main table displays the following parameters:

No.	Parameter	Value	Unit
<input type="checkbox"/> r2	Operating display	Switching on inhibited - exit commissioning mode (46)	
<input type="checkbox"/> r20	Speed setpoint smoothed	0.0	rpm
<input type="checkbox"/> r21	Speed actual value smoothed	0.0	rpm
<input type="checkbox"/> r26	DC link voltage smoothed	551.4	V
<input type="checkbox"/> r27	Absolute actual current smoothed	0.00	Arms
<input type="checkbox"/> r31	Actual torque smoothed	-0.00	Nm
<input type="checkbox"/> r32	Active power actual value smoothed	0.00	kW
<input type="checkbox"/> r34	Motor utilization thermal	0	%
<input checked="" type="checkbox"/> r37[0]	Drive temperatures	36	°C
<input checked="" type="checkbox"/> r39[0]	Energy display	0.00	kWh
<input type="checkbox"/> r44	Thermal converter utilization	0.00	%
<input checked="" type="checkbox"/> r46[0]	Missing enable signal	100 0000 0000 0010 0001 1100 0000 1111 B	



At the bottom of the interface, there are links for 'Support' and 'Control panel'.

Figure 8-17 Parameter list in the extended view

The parameter list offers the following options:

- Toggling between two list views
  - Show as "Simple view" and "Advanced view" with parameter numbers
- Searching parameters
  - Search by parameter number or text search within parameter names

- Filtering the parameter list
  - Parameter groups: Only show the parameters that are assigned to a particular function.
  - Parameter types: display and/or setting parameters
- Changing parameter values directly in a parameter list
  - Exception: blocked parameters

p	Setting parameters	Are read/write.
		The setting parameter can only be parameterized in the active commissioning mode. Depending on the parameter, changes are possible in the quick setup or Safety Integrated commissioning.
		The setting parameter can only be parameterized when the user has the appropriate function rights.
r	Display parameters	Can only be read and cannot be edited.
c	Display parameters	Can only be read and cannot be edited.

### 8.5.5.2 User-defined parameter list

#### Overview

A user-defined parameter list is a combination of specific parameters from the standard parameter list of the converter. These can be used to configure frequently used user functions, for example.

## Description of function

With the user-defined parameter lists, the web server provides the following functions:

- Creating up to 20 user-defined parameter lists
- Configuring list properties
  - Name
  - Position or sequence of the tabs
  - Comment
  - Delete list
- Exporting and importing user-defined parameter lists
  - Export:
    - Export one or several user-defined parameter lists.
    - The web server exports the lists exclusively as a json file.
    - Export files generated by the web server can be imported into a Startdrive project.
  - Import:
    - The list import function in the web server exclusively imports json files.
    - User-defined parameter lists exported via the web server or Startdrive as a json file can be imported into another drive of the same type via the web server.  
Requirement: same drive type and same firmware version

If values are changed, the data must be saved retentively.

## 8.5.6 Backup and restore

### 8.5.6.1 Overview

#### Overview

With "Backup and restore" you can back up parameters and other settings and restore the settings again if necessary.



## Description of function

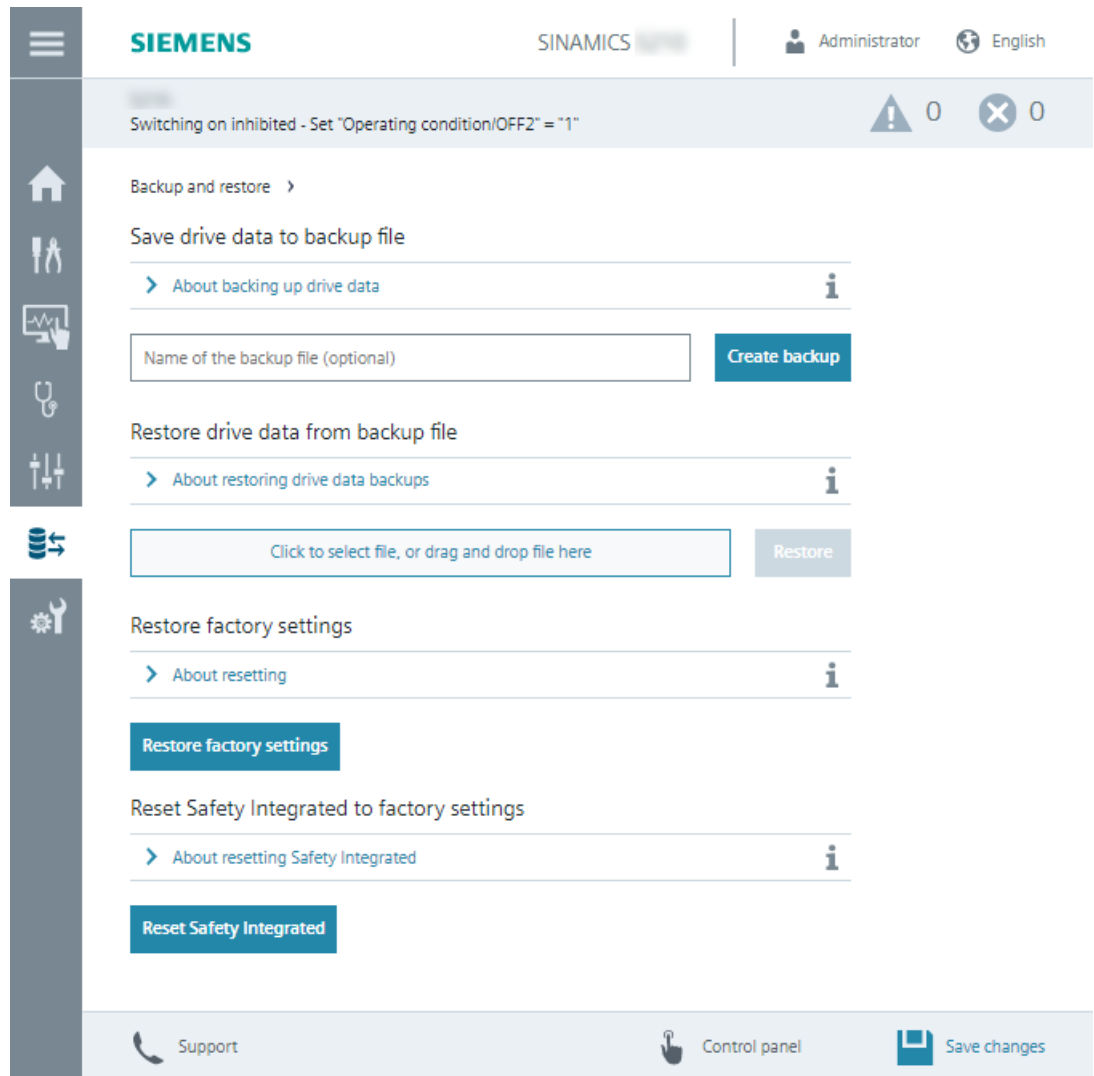


Figure 8-18 Backup and restore

The following functions are available to back up and restore data and settings:

- **Back up parameters**  
Back up the parameter settings to a file after commissioning.
- **Restore parameters from file**  
When replacing a device or for series commissioning, load the backed-up parameter settings to the converter.
- **Restore factory settings**  
Reset all converter settings to the factory values.
- **Restore Safety Integrated to factory settings**  
The converter only sets the settings of the Safety Integrated Functions to factory settings. All other settings remain unchanged.

## More information

If you want to restore the converter to factory settings with the memory card, see the information in Chapter "Manual reset to factory settings with memory card (Page 351)".

### 8.5.6.2 Save drive data to backup file

#### Overview

With "Save drive data to backup file" you can back up all converter settings to one file. Run the "Save drive data to backup file" function in the following situations:

- After commissioning
- Before "Restore factory settings"
- Before a firmware update/downgrade

#### Requirement

There are no active converter faults.

#### Procedure

1. Call the "Backup and restore" menu.
2. Click on the "Save drive data to backup file" button.  
A name can be optionally assigned to the backup file. Parameters are backed up. The backup file is saved in the download folder of your operating unit.
3. Optional: If you only wish to use the backup file at a later point in time, then place the backup file in a protected location in the operating unit.

## More information

You can load backed-up data and settings of a converter to other converters. The target converter must satisfy the following prerequisites:

- The rated power of the target converter is the same as the backed-up rated power.
- Firmware version of the target converter is  $\geq$  firmware version of the converter from which the backed-up data and settings originate.

### 8.5.6.3 Status after backing up

#### Overview

The "Back up parameters" function backs up all converter settings to one file.

## Description

The converter backs up the following data and settings:

- Communication interface settings
- Parameters (including safety parameters)
- Security settings
- UMAC data
- Web server settings:
  - Modified settings in window "Drive status" on the home page
  - User-defined parameter lists
  - Support settings
  - Save changes manually / automatically
- Displayed parameters (display standard parameters/all parameters):
  - Standard parameters
  - View all parameters
  - Display brightness

The converter firmware files are not backed up.

### 8.5.6.4 Restore drive data from backup file

#### Overview

When replacing a device or for series commissioning, you load the backed-up drive data to the converter.

#### Requirement

- You have a backup file on your operating unit.
- The rated power of the target converter is the same as the backed-up rated power.
- Firmware version of the target converter is  $\geq$  firmware version of the converter from which the backed-up drive data originate.
- Function rights required for active user management (UMAC):
  - Edit device configuration or drive applications
  - If Safety Integrated is contained in the backup file, the "Edit Safety Integrated application" right is required.

## Procedure

1. Call the "Backup and restore" menu.
2. Click on the "Restore drive data from backup file" button.
3. Select the backup file from the file system of the operating unit.

The backup file is loaded to the converter.

### 8.5.6.5 Restore factory settings

#### Overview

The reset to factory settings with the web server deletes the user-specific parameterization of the converter, for example the motor data.

The following data are retained when the factory settings are restored:

- Communication interface settings
- Security settings
- Language setting
- Date and time

In the following cases it may be necessary to restore the converter to factory settings:

- If the motor is changed
- If there is uncertainty regarding the previous parameterization and/or the previous use of the converter

#### Requirement

If User Management & Access Control is activated, you will need the following function rights:

- Edit device configuration or drive applications
- Edit Safety Integrated application (if Safety Integrated is contained in the parameterization)

## Procedure

1. Call the "Backup and restore" menu.
2. Click the "Restore factory settings" button.
3. Acknowledge the confirmation prompt.

The converter is reset and then restarted. If the "RDY" and "COM" LEDs on the converter light up green, resetting is complete.

#### More information

For a full reset of the converter, proceed as described in Chapter "Manual reset to factory settings with memory card (Page 351)".

### 8.5.6.6 Restore Safety Integrated to factory settings

#### Overview

It is not always necessary to reset all of the converter settings. A separate reset function exists for Safety Integrated settings, which exclusively restores Safety Integrated settings to factory settings.

#### Requirement

- Function rights required for active user management (UMAC):
  - Edit device configuration or drive applications
  - Edit Safety Integrated application

---

#### Note

Perform a parameter backup before resetting so you can restore the old settings.

---

#### Procedure

1. Call the "Backup and restore" menu.
2. Click on the "Reset Safety Integrated" button.
3. Acknowledge the confirmation prompt.
4. Wait: the converter resets its Safety Integrated settings.
5. Wait: the converter restarts.
6. The converter is ready for operation and the "RDY" and "COM" LEDs are on and green.

#### Result

The Safety Integrated settings for the converter have been reset.

## 8.5.7 System

### 8.5.7.1 Settings

#### Overview

The function view "Settings" offers basic settings for the web server and the converter.

## Requirement

- To edit the web server settings you will need the "Edit web server configuration" right.
- To edit the drive settings you will need the "Edit device configuration or drive applications" right.

## Description of function

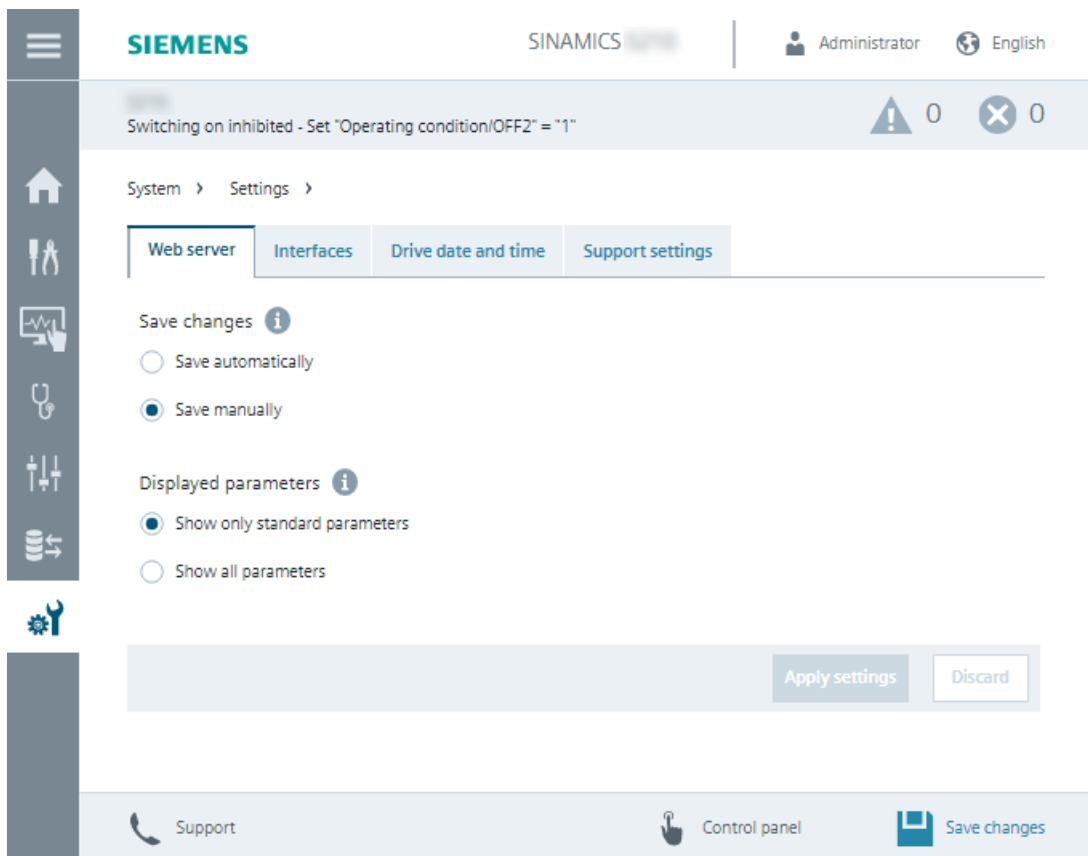


Figure 8-19 Settings

### Web server

Under "Web server", the web server offers options for saving changes and displaying parameters.

### Interfaces

Under "Interfaces", the web server provides information about the status and the settings of the interfaces of the converter.

### Drive date and time

Under "Drive date and time", the web server provides options for setting the date format and for obtaining the date, time and time zone of the converter.

## Support settings

Under "Support settings", the web server provides the option to store additional support and hotline data. The web server displays these data in the function view "Support".

## 8.5.7.2 User management

### Overview

In "User management" you manage users and configure their roles and rights for accessing the converter.

### Requirement

- You activated user management (UMAC) in "Configure security settings" during first commissioning.
- You are logged into the web server and have the necessary rights to manage users.

### Description of function

The screenshot displays the Siemens SINAMICS web server interface for user management. The top navigation bar includes the Siemens logo, 'SINAMICS', and user information: 'Administrator' and 'English'. A status bar at the top indicates 'Switching on inhibited - Set "Operating condition/OFF2" = "1"'. The main content area is titled 'System > User administration >' and has three tabs: 'Users', 'Roles', and 'Password policy'. The 'Users' tab is active, showing a '+ Add user' button and a table of users.

	User name	Roles	Session timeout	
>	Anonymous	Drive Ext. Role Fieldbus, Drive Guest	Never	
✓	Administrator	Drive Administrator	30 minutes	

Below the table, the 'Assigned roles' for the selected user are listed: 'Drive Administrator'. A table shows the rights for 'All operating units':

Right	All operating units
Manage users and roles	✓
Edit web server configuration	✓
Edit Safety Integrated application	✓
Edit device configuration or drive applications	✓

The bottom of the interface features a 'Support' button, a 'Control panel' button, and a 'Save changes' button.

Figure 8-20 User management

## 8.5 Functions and menus

### Users

Under "Users", the web server provides a summary of the created users and offers the following functions:

- Create new user accounts
- Change existing user accounts
- Activate or deactivate user accounts

Roles are assigned to give users read or write access to certain functions.

### Roles

Under "Roles", the web server provides a summary of the existing roles and the assigned rights.

### Password policy

Under "Password policy", you specify the requirements a password must meet. You define the password complexity and the time to password expiry (if any).

## More information

More detailed information on user management and security settings is provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>).

### 8.5.7.3 Protection & Security

#### Overview

In "Protection & Security", you configure basic security settings using the Security Wizard and the tables it contains.

#### Requirement

- You activated the security settings during first commissioning.
- You are logged into the web server and have the necessary rights to edit drive data.



## Description of function

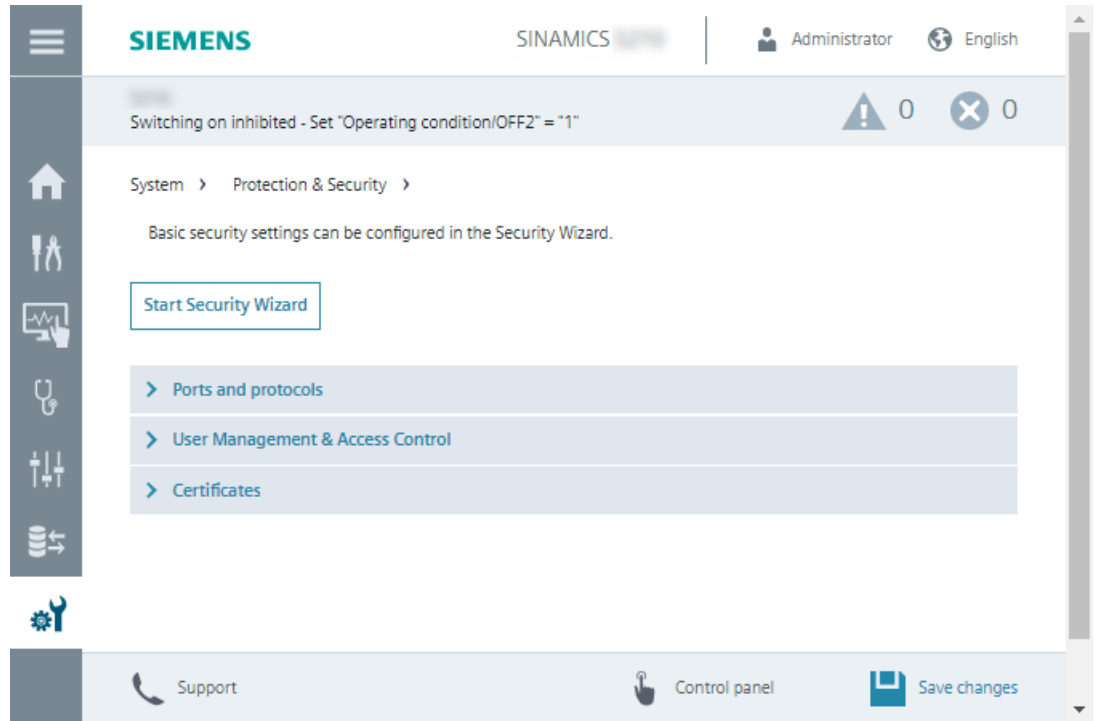


Figure 8-21 Protection & Security

### Start Security Wizard

In the Security Wizard, you configure the most important security settings for the drive. They include User Management & Access Control and web server activation.

### Ports and protocols

The web server provides an overview of the available ports and protocols and their status. This is where you activate or deactivate the communication interfaces.

### User Management & Access Control

The web server provides an overview of the settings in user management.

### Certificates

The web server provides an overview of the issued certificates. Digital certificates identify the converter as a "trusted device". The web server cannot be accessed from an operating unit without a digital certificate. When activating user management, a certificate is automatically created and assigned to the converter.

Use "Download certificate to operating panel" to download a certificate to the operating panel.

### More information

More detailed information on configuring secure communication is provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>).

### 8.5.7.4 Licenses

#### Overview

You must purchase licenses for supplementary functions and options.  
Use the function view "Licenses" to manage the licenses for drive functions and options.

#### Requirement

- You are logged into the web server and have the necessary rights to edit drive data.
- The operating panel is connected online with the drive.

#### Description of function

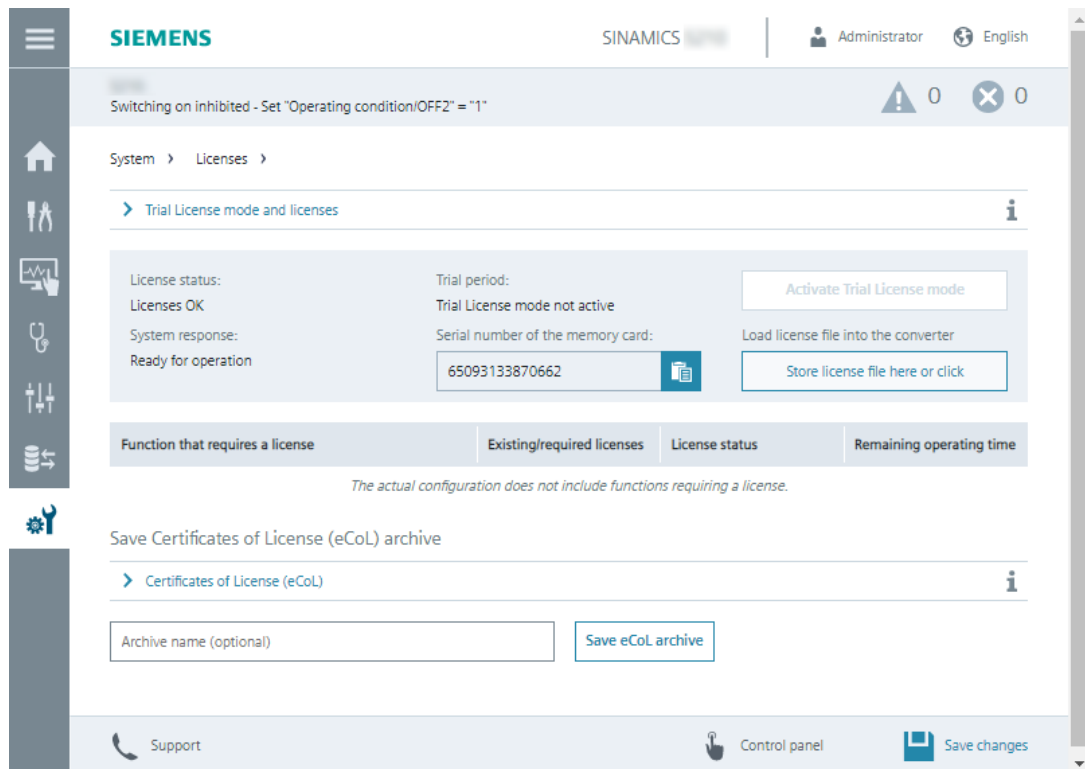


Figure 8-22 Licenses

The function view "Licenses" offers the following functions:

- Display the installed functions requiring licenses
- Read and copy the serial number of the SD card inserted into the converter
- Load and activate purchased licenses

#### **Load and activate licenses**

Under "Trial License mode and licenses", you upload license files created with the Web License Manager.

In Trial License mode, you can try out functions for a specified period.

#### **Using functions/options requiring a license**

The web server provides an overview of the options that require licensing and their license status.

#### **Certificates of License (eCoL)**

Under "Certificates of License (eCoL)", you load purchased licenses directly from a memory card into the file system of the operating unit.

### **More information**

- You can find additional information about creating and managing license files in Chapter "Functions that require licensing (Page 90)".
- Additional information about the licensing process or on the Trial License mode is provided in the TIA Portal information system. There, browse for S210 drives using the keyword phrase "Managing supplementary functions that require a license".

### **8.5.7.5 Firmware update**

#### **Overview**

You can perform a firmware update in the web server:

- For an upgrade, the converter settings are retained.
- For a downgrade, the converter is restored to factory settings.

#### **Requirement**

You have saved the ZIP file with the firmware to a drive, which you can access using the operating panel.

#### **Description of function**

This function view "Firmware update" displays the current version of the firmware and of the web server.

## 8.5 Functions and menus

To copy a different firmware version to the converter, load the ZIP file containing the firmware from the file system of the operating panel.

### 8.5.7.6 About web server

#### Overview

"About web server" contains information about the web server and links to additional information.

#### Description of function

Under "Versions" you can see the revision levels of the web server and the loaded firmware.

Under "Third-party software" there is a link to information about any third-party software used. The license conditions are loaded to the operating panel in the file "READ\_OSS.ZIP". You can display the HTML file included in the ZIP file using your browser.

There are more links to information about:

- Cookie policies
- Industrial Security
- Privacy policy

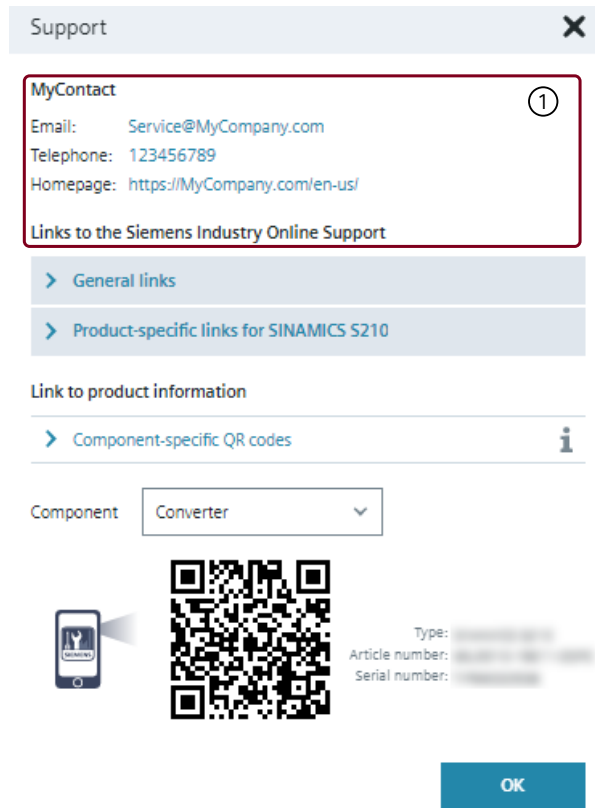
### 8.5.8 Support

#### Overview

The footer of the web server contains a support dialog.

## Description of function

The support dialog contains links to additional information for the converter.



- ① Display of additional support and hotline data  
For more information about configuration, see Chapter "Settings (Page 231)".

Figure 8-23 Support information

## 8.5.9 Control panel

### Overview

The control panel moves the motor using the operating unit, bypassing the higher-level controller, for example to test the converter settings after commissioning.

## Requirement



### WARNING

#### Unexpected motor movement through incorrect operation

If the control panel is active, the safety shutdowns of the higher-level controller have no effect. The "Stop with space bar" function is not guaranteed in all operating states. Incorrect operation by untrained personnel may result in unexpected motor movement which can cause death or serious injuries.

- Only use the control panel for commissioning, diagnostics and service purposes.
- Only use the control panel if you are trained and authorized accordingly.
- Install an EMERGENCY STOP for the drive which is independent of the higher-level controller.

## Description of function

The "Take over control" dialog deactivates the signals of the higher-level controller and switches the source for enables and the setpoint value to the control panel.

---

### Note

#### Drive responds immediately

Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

---

The control panel offers the following operating modes to move the motor:

- Jog mode moves the motor while the direction buttons are pressed.
- Continuous motion starts the motor when a direction button is pressed.

# Commissioning (Startdrive)

## 9.1 Introduction

### Description

You configure devices and commission your converter in the Startdrive commissioning tool. Further information about the Startdrive commissioning tool can be found in the information system of the TIA Portal.

## 9.2 Requirements for commissioning

### Description

- TIA Portal version V18 or higher is installed on your operating unit.
- Startdrive version V18 SP1 or higher is installed on your operating unit. You will find the download page at the following link (<https://support.industry.siemens.com/cs/ww/en/view/109807137>).
- Firmware version V6.1 or higher is installed in the converter.
- You have all of the required licenses to use the TIA Portal without any restrictions.
- Your converter is connected with a SIMATIC S7 controller. Alternatively, a SINUMERIK control system can be used.

## 9.3 Basics

### 9.3.1 Communication interfaces

#### Description

The following interfaces are available for accessing the converter:

Interface	Information
Service interface X127	The default access to the web server is via the service interface X127.
	Ethernet interface X127 is intended for commissioning and diagnostics, which means that it must always be accessible.
	Defaults: <ul style="list-style-type: none"> <li>• IP address: 169.254.11.22</li> <li>• Subnet mask: 255.255.0.0</li> <li>• Connection type: HTTPS</li> </ul>
	Restrictions: <ul style="list-style-type: none"> <li>• Only local access is allowed.</li> <li>• No networking or only local networking in a closed and locked electrical cabinet is permissible.</li> <li>• For remote access to the electrical cabinet, you must apply additional security measures to prevent misuse through sabotage, data manipulation by unqualified persons and interception of confidential data.</li> </ul>
	Access using mobile end devices: <ul style="list-style-type: none"> <li>• If you carry out commissioning or diagnostics using a mobile end device such as a smartphone or tablet, you may temporarily connect the service interface X127 to an external WLAN access point.</li> <li>• The SINAMICS Smart Adapter establishes a point-to-point connection to the mobile end device via WLAN.</li> </ul>
PROFINET interface X150	The IP addresses of the service interface X127 and the PROFINET interface X150 must not be in the same subnet.

#### Secure communication

If the Startdrive project and the converter are unprotected, access is possible via both interfaces. This enables unrestricted access from the project or a higher-level controller to the drive data.

Non-authorized users can manipulate the drive data. To avoid the risk of data manipulation, we recommend protecting access to the project and the converter.

Detailed information about security settings is provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>).



## 9.3.2 Loading data from the drive into the project


### Overview

If you change the configuration of a converter in the online mode, then the configuration deviates from the data in the Startdrive project. To update project data, load the drive data from the converter into the project.

### Requirement

- A project with a matching drive is created and is open in Startdrive.
- The converter and SIMATIC S7 controller are in offline mode.
- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Procedure

1. Click on icon  (Upload from device) in the toolbar.  
The "Upload preview" dialog opens. Startdrive checks whether all requirements for loading have been met. In the event of any obstructions, these are displayed as messages in the dialog.
2. Check the messages. If necessary, activate the actions in column "Action".  
As soon as uploading becomes possible, the "Upload from device" button is enabled.
3. Click the "Upload from device" button.  
The data are loaded from the converter into the project. The drive data are saved with the project.

## 9.3.3 Loading project data into the drive

### Overview


Load the data from your Startdrive project into a drive.

### Requirement

- A project has been created.
- A drive has been created and completely configured in the project.

- Optional: There is an active online connection between the drive and operating unit.
- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

1. Select a drive in the project tree.
2. Click on icon  (Load to device) in the toolbar.
  - If you have already established an online connection, then the "Load preview" dialog opens.  
This dialog displays alarms and proposes actions necessary for loading.
  - If you have still not established an online connection, then the "Extended loading" dialog opens.  
Using this dialog, establish an online connection to the required drive.
3. Check the messages in the "Load preview" dialog.  
The "Save parameterization retentively" action is enabled by default.
4. Click "Load".  
The project data are downloaded into the drive.

## 9.3.4 Saving changes in the project

### Overview

Project data that are not saved are lost when closing the project. The entire project must be saved in order for the settings to take effect permanently.

### Requirement

- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

In the toolbar, click on the icon .

OR

Select the "Project > Save" or "Project > Save as" menu.

## 9.3.5 Retentively saving changes

### Overview


Parameter assignments of your drive are always volatile and are lost when the drive is switched off. Information is subsequently provided as to how you can retentively save online data or offline data.

### Requirement

- A project has been created.
- A drive has been created and completely configured in the project.
- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Retentively saving online data


You are connected online with the drive; save your configuration as follows:

1. In the function view of the active Startdrive project, click on icon  (retentively save data of the complete device).  
OR
2. In the project tree of your drive device, double-click on "Online & Diagnostics".
  - In the secondary navigation select menu "Functions > Backup/Restore".
  - In the "Retentively save RAM data" area, click "Save".

The system checks whether a memory card is available. If an appropriate memory card is detected, then the parameter values are retentively saved to the memory card.

### Retentively saving offline data

When retentively saving data, it is important that the settings made are not only saved on your operating unit in the Startdrive project, but also permanently saved on the drive memory card (also known as "save retentively" or "RAM to ROM"). An online connection must be established to the drive for this purpose.

1. Establish an online connection to your drive.
2. Load the project data into your drive.
3. Click the  icon in the function view of the active Startdrive project.  
The current project settings are stored retentively on the memory card of the drive.

## 9.3.6 Using parameter lists and user-defined lists

### Overview

Users configure a drive in Startdrive as standard using specific configuration views. For the configuration, experienced users preferably take the parameter lists or user-defined lists.

### Requirement

- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Parameter list

The following functions are available:

- Monitoring parameter values
- Editing parameter values directly from the parameter view  
Only parameters with a light grey background can be directly edited in the parameter list. Other parameters are locked in the parameter list and cannot be edited.
- Exporting parameters as CSV
- Comparing parameter settings:
  - Offline - Factory setting
  - Online - Offline
  - Online - Factory setting

### User-defined list

You compile the selected parameters in a user-defined list. This involves an excerpt with specific parameters, from an underlying parameter list.

User-defined lists are only created and edited in the project tree.

You use user-defined lists for the following purposes:

- Compiling the most important parameters
- Assigning parameters to parameter groups with comments for users
- Carrying out series commissioning based on saved parameter values
- Documentation of the drive with listed parameters and setting values

### Opening and reading parameter lists in the web server

Parameter lists are exported in the json format. You can open lists and view parameter values if you access the converter using the web server.

**Example**

In the following application, you create a user-defined list with the objective of accepting parameter values for an additional drive.

1. You create a user-defined list with parameter values for a configured drive.
2. You open the list in another drive with the same hardware configuration.
3. You compare the parameter values of the drive with the saved values.
4. You apply the required parameter values for the drive.

**More information**

Detailed information about handling parameter lists and user-defined lists is provided in the TIA Portal information system.

## 9.4 Procedures for device configuration and commissioning

### 9.4.1 Overview

---

**Note****Only in the offline mode**

The drive components can only be combined and specified in the offline mode. In the online mode, all corresponding setting ranges are marked in the device view and in the inspector window.

---

---

**Note**

**User management and security**

SINAMICS drives of the latest generation generally have extended protection. This usually has the effect that, as a user, you have to log in to view or edit the drive data offline as well as online.

The most important protective measures in brief:

- Project protection can be activated for Startdrive projects in the TIA Portal (offline). If project protection is activated, corresponding rights are required for access. Once project protection has been activated, it cannot be deactivated.
- A "Security Wizard" usually appears when creating new drives in the project. With the help of this wizard, you can already make the most important security settings for this drive within the project when creating the drive. After loading the project data into the drive, the protection settings become effective there.
- To access a protected drive online, you ALWAYS need the corresponding access rights. This also applies if no project protection is activated for the Startdrive project.

Detailed information on this topic is provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

---

**Note**

**Editing mode required for online commissioning**

If you want to make important settings online, activation of the editing mode is mandatory. Restore points that are required as a return point following a cancellation of the current online parameterization are automatically created by the editing mode in the "guided quick startup" (and in the "Parameterization" area) during configuration.

No separate editing mode is necessary in the "Rotate & optimize" area.

---

**Note**

**Telegram configuration offline**

In the guided quick startup, telegram settings can in principle only be made offline.

---

## 9.4.2 Simple basic parameterization (offline)

### Overview

The following workflow represents the simplest form of commissioning.

## Procedure

1. Create or open project with Startdrive.
2. Create device configuration in Startdrive offline.
  - Insert the SINAMICS drive into the project and specify it
  - Create and specify SINAMICS components
  - Make detailed settings for drive and components
  - Optional: Configure user management and make protection settings for the drive
3. Make basic settings offline via the guided quick startup.
4. Load project data into the target device.
5. Establish an online connection between Startdrive and the target device.
6. Optimize commissioning.

## Result

The motor turns.

## More information

Detailed information can be found in the information system of the TIA Portal in Chapter "Configuring SINAMICS S210 drives".

### 9.4.3 Simple basic parameterization (online)

#### Overview

The basic parameterization can also be carried out in online mode as an alternative to offline mode.

#### Procedure

1. Create or open project with Startdrive.
2. Create device configuration in Startdrive offline.
  - Insert and specify the SINAMICS drive in the project.
  - Create and specify SINAMICS components.
  - Make detailed settings for the drive and components.
  - Optional: Configure user management and make protection settings for the drive.
3. Load project data to the target device.

## 9.4 Procedures for device configuration and commissioning

4. Establish an online connection between Startdrive and the target device.
5. Make basic settings online via the guided quick startup in the editing mode.
  - Make basic settings in the quick startup steps.
  - Optimize commissioning.

### Result

The motor turns.

### More information

Detailed information can be found in the information system of the TIA Portal in Chapter "Configuring SINAMICS S210 drives".

## 9.4.4 Basic parameterization together with a SIMATIC controller

### Overview

SINAMICS drives are frequently operated with SIMATIC or SINUMERIK controls. To speed up commissioning the individual components, the drive and control can be commissioned together in a Startdrive project.

### Procedure

1. Create or open project with Startdrive.
2. Create device configuration in Startdrive offline.
  - Insert and specify the SINAMICS drive in the project.
  - Create and specify SINAMICS components and make detailed settings.
  - Insert and specify the SIMATIC controller in the project.
  - Network the SIMATIC controller and drive.
  - Optional: Configure user management and protection settings for the drive and control system.
  - Insert a technology object into the SIMATIC controller.
  - Interconnect the technology object with the drive.
3. Load project data to the target devices.
4. Establish an online connection between Startdrive and the target device.
5. Make basic settings online via the guided quick startup in the editing mode.
  - Make basic settings in the quick startup steps.
  - Optimize commissioning.



**Result**

The motor turns.

**More information**

Detailed information can be found in the information system of the TIA Portal in Chapter "Configuring SINAMICS S210 drives".

## 9.5 Combining and configuring devices in the project

### 9.5.1 Converter

#### 9.5.1.1 Inserting a converter into the project

**Overview**

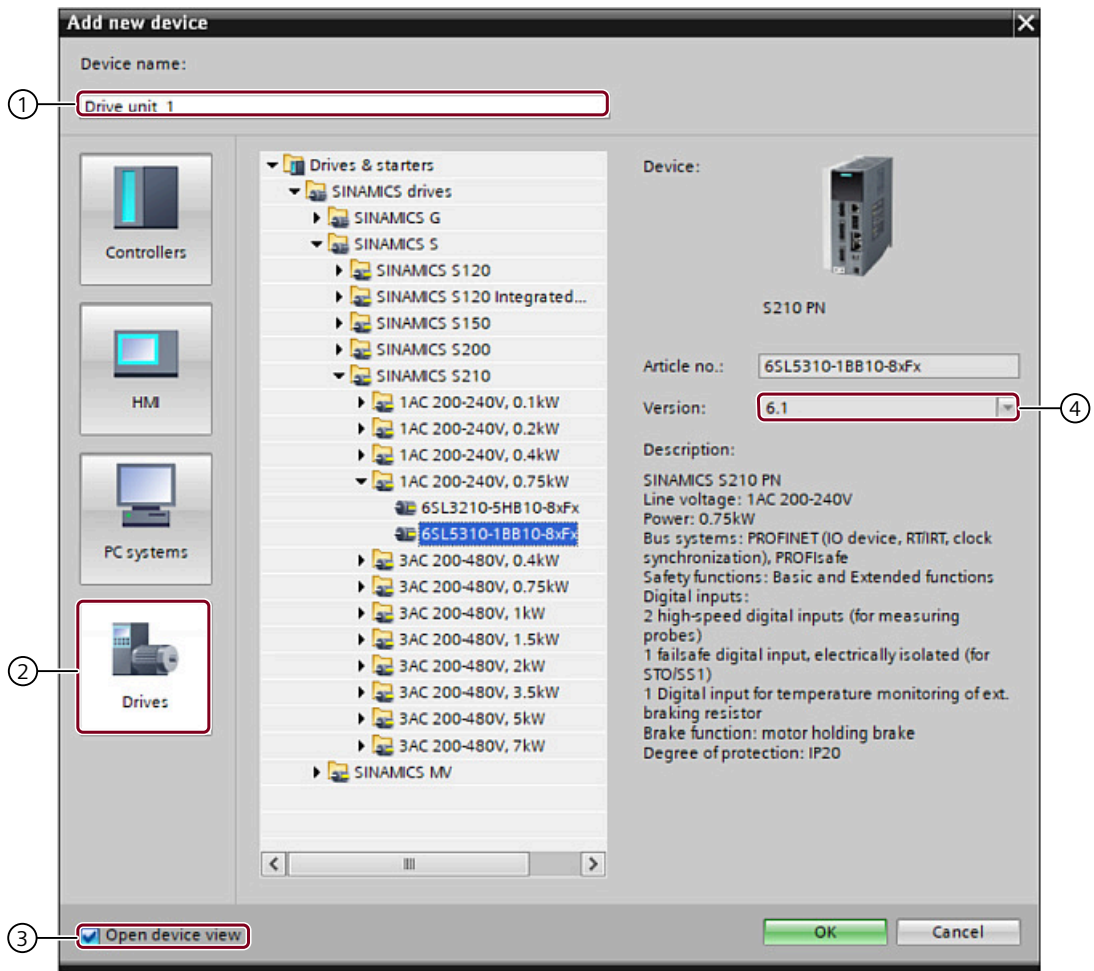
You either add a new converter to the project view or to the portal view. For the latest generation of SINAMICS converters, you can define the security settings for access to the drive data at the time of setup.

---

**Note****Firmware versions**

The description in these operating instructions refers exclusively to S210 drives with firmware version V6.1 or higher, which are configured with a Startdrive version V18 SP1 or higher.

---



- ① "Device name" input field (default: drive unit\_x)
- ② "Drives" button
- ③ Enable/disable the "Open device view" option
- ④ Firmware version drop-down list

**Requirement**

- A new project has been created.  
OR  
An existing project is open.
- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

1. Double-click "Add new device" in the project tree.  
The corresponding dialog opens.
2. Click the "Drives" button ② to display the available S210 converters.
3. Expand the "SINAMICS S210" entry in the displayed list.  
A list of all available SINAMICS S210 converters is displayed.
4. Expand the entry (e.g. 200-240 V 1AC, 0.1 kW) for the relevant S210 converter.  
The selected S210 converter is displayed with the corresponding article number.
5. Click on the desired SINAMICS S210 converter.  
When a SINAMICS S210 converter is created, the latest firmware version ④ is always suggested.
6. If the firmware version on the converter memory card deviates from the displayed firmware version, then change the firmware version via the drop-down list "Version" ④.  
It will not be possible to go online later if the firmware versions do not match.  
OR  
Install the corresponding firmware version on your converter.
7. Assign a different device name in the input field ① if required.
8. Click "OK".  
If the "Open device view" option ③ is activated, the converter is automatically created and displayed in the device view.

## Result

The inserted converter is displayed in the device view and can be configured.

### 9.5.1.2 Optional: Replacing a converter

#### Overview

In the device configuration and the project tree of an S210 drive, at any time, you can replace the current device by a device with another power rating. When replacing the drive, previous configurations of the motor and/or the encoder are kept if both devices are compatible with one another.

#### Requirement

- A project has been created.
- An S210 Control Unit has been inserted in the device configuration.
- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Replacing a device via the project tree

1. In the project tree, select the drive to be replaced. Open context menu "Change device". Dialog "Change device - S210 PN" opens:

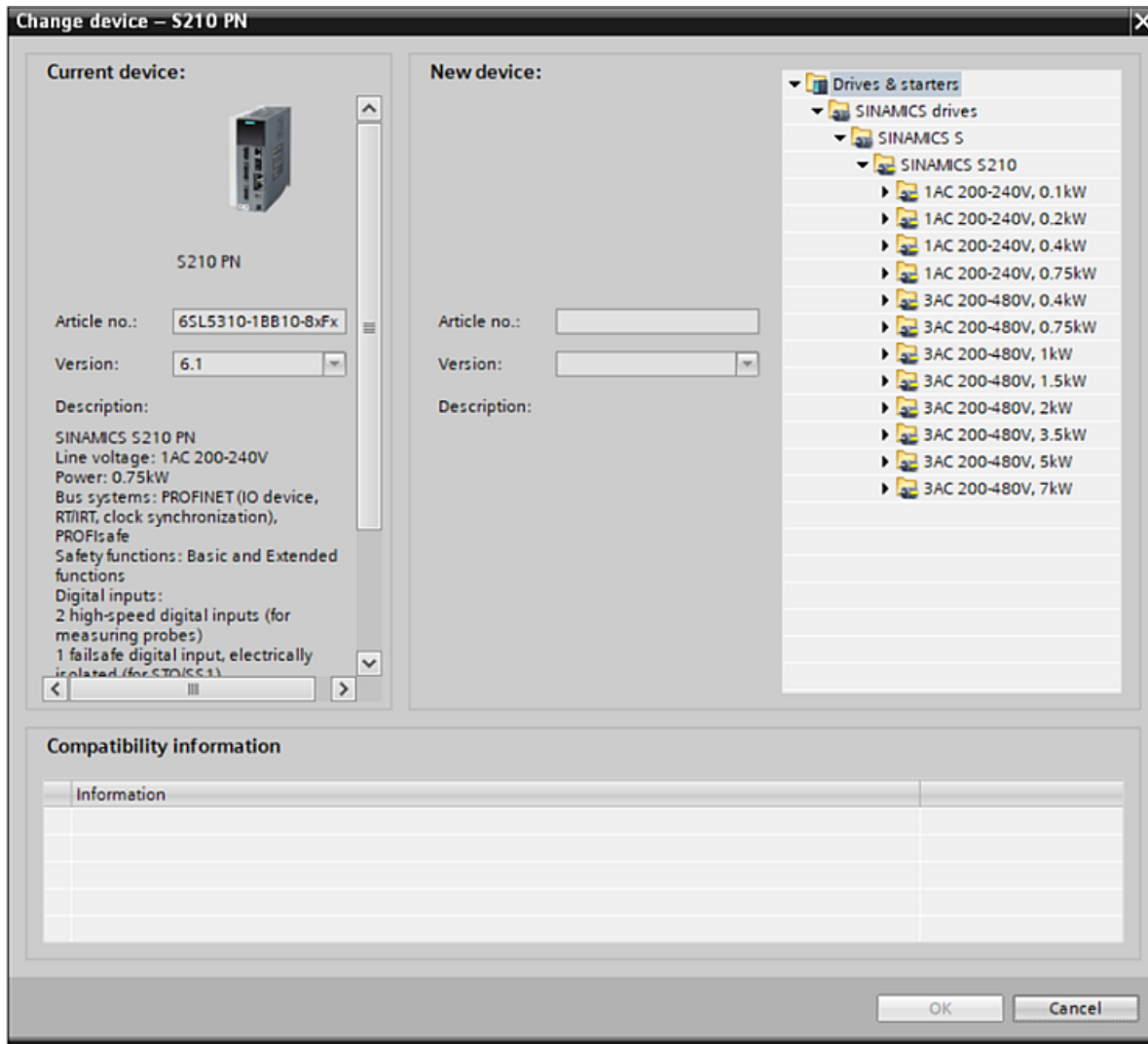


Figure 9-1 Changing the device using the project tree

The data of the current drive are displayed on the top left. At the top right, the replacement devices that are applicable are displayed in a hardware catalog.

2. In the hardware catalog of dialog "Change device", select the replacement device required. Now, only the most important data of the new device are displayed at the center of the dialog in the field "New device". You can compare these data with the data of the current device (left-hand side).  
If both drives are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field. This can mean that you must possibly assign another motor if you still go ahead and accept the required replacement device.
3. Click on "OK" to accept the new drive.

## Replacing a device using the hardware catalog

1. In the hardware catalog, select the new S210 drive. In the device view, drag the drive to the placeholder for the current drive.  
The "Change device" dialog opens:

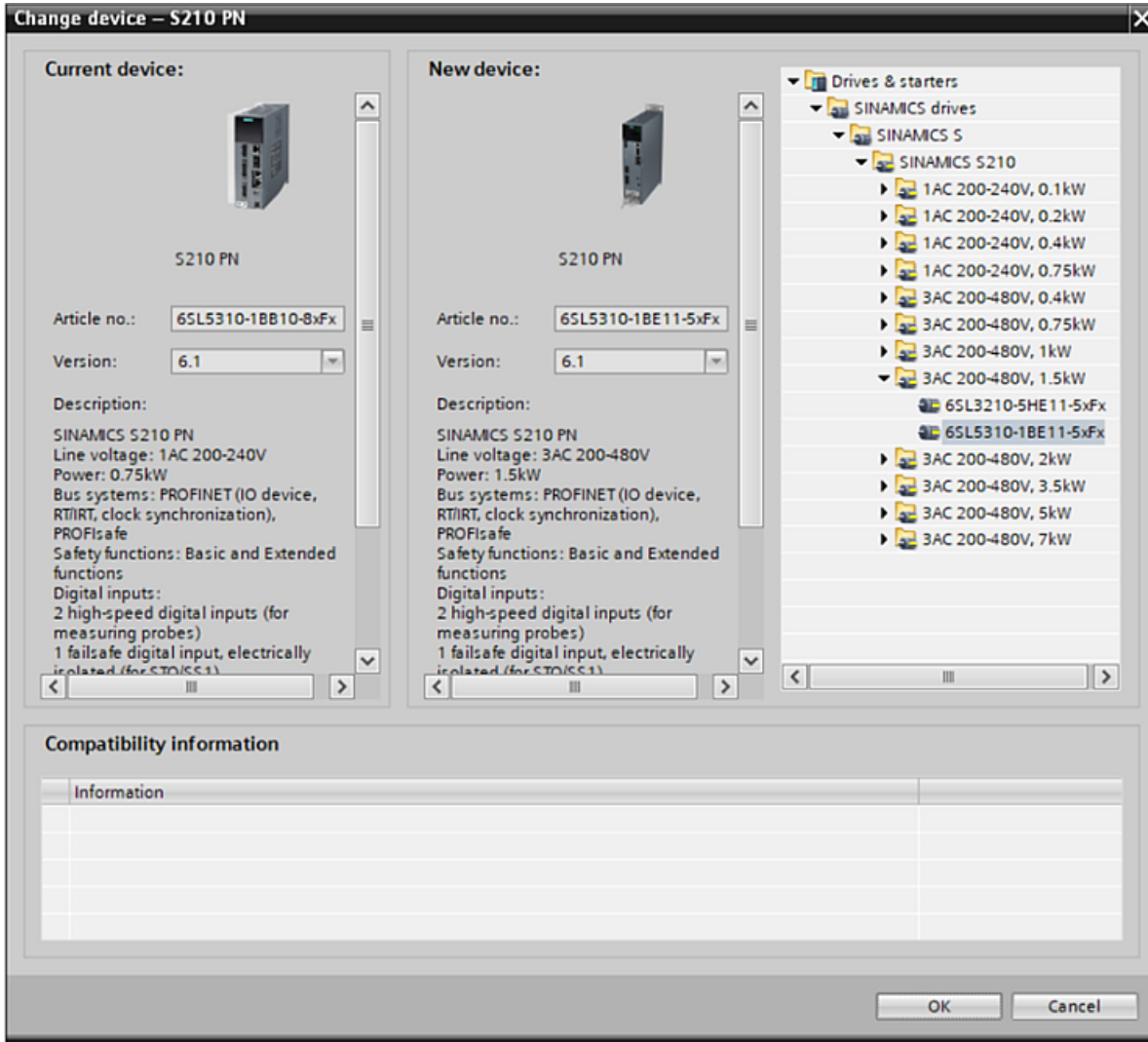


Figure 9-2 Changing the device using the hardware catalog

In the dialog, the most important data of the existing drive and the new drive are compared. If both drives are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field. This can mean that you must possibly assign another motor if you still go ahead and accept the required replacement device.

2. Click on "OK" to accept the new drive.

## Result

The current drive is replaced by the required replacement device.

9.5 Combining and configuring devices in the project

If the two drives are not completely compatible with one another, then in the device navigation, the placeholder for the motor is displayed unspecified. You must reassign an appropriate motor power.

9.5.1.3 Making detailed converter settings

Overview

You can configure the following details for the SINAMICS S210 drive:

Group	Settings
General	<ul style="list-style-type: none"> <li>• Product information Name data</li> <li>• Catalog information Brief description, description of the components included, firmware version used</li> <li>• Identification &amp; Maintenance Information and data to identify and localize a drive within a plant or system.</li> </ul>
PROFINET interface [X150]	<ul style="list-style-type: none"> <li>• General</li> <li>• Ethernet addresses Subnet, IP address, subnet mask, PROFINET names</li> <li>• Telegram configuration                             <ul style="list-style-type: none"> <li>– Telegrams of the closed-loop drive control: Send, receive, Safety Integrated Details are contained in Chapter "Configuring telegrams (Page 301)"</li> </ul> </li> <li>• Advanced options                             <ul style="list-style-type: none"> <li>– Interface options</li> <li>– Media redundancy</li> <li>– Clock cycle synchronization for local modules (isochronous mode)</li> <li>– Real time settings</li> <li>– Port [X150 P1] and port [X150 P2]</li> </ul> </li> </ul>
Module parameters	<ul style="list-style-type: none"> <li>• Activation of channel diagnostics</li> </ul>
Protection & Security	<ul style="list-style-type: none"> <li>• Wizard for security settings</li> <li>• User Management &amp; Access Control</li> <li>• Ports and protocols</li> <li>• Encryption of drive data</li> </ul> <p><b>Note:</b> Information about these protection settings is provided in the Configuration Manual "SINAMICS Industrial Security" or in the information system of the TIA Portal.</p>
Ethernet commissioning interface [X127]	<ul style="list-style-type: none"> <li>• General</li> <li>• Ethernet addresses:                             <ul style="list-style-type: none"> <li>– Subnet, IP address, subnet mask</li> </ul> </li> </ul>

Group	Settings
Time synchronization/Time	<ul style="list-style-type: none"> <li>Option "Synchronize with NTP server" If the drive is connected to a controller in the device configuration, the option "Use PLC as NTP server" is activated automatically. If the drive is connected to a PLC, the IP address of the PLC is displayed. In this case, the IP address and the time zone of the NTP server can be changed.</li> <li>Option "No synchronization" In this case, NTP synchronization is not managed in the project. You can configure this synchronization separately for the drive in online mode with the Online &amp; Diagnostics function "Set time".</li> </ul>
Hardware settings	<ul style="list-style-type: none"> <li>Output voltage</li> </ul>
Web server	<ul style="list-style-type: none"> <li>Enabling access to the PROFINET interface [X150] and/or the service interface [X127] via HTTP or HTTPS.</li> </ul>

## Requirement

- A new project has been created.  
OR  
An existing project is open.
- A SINAMICS S210 drive has been created in the project.
- For activated user management (UMAC):  
The function rights for editing drive data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

- Select the S210 drive in the device view and open the inspector window.
- In the secondary navigation of the inspector window, select the desired detail menu (see list in the summary).
- Make the required detail settings in the white fields. Default settings are usually available in most detail menus.  
The gray fields are corrected automatically in accordance with their setting. Fields with a gray background cannot be edited directly.

## Result

You have made the detailed settings for the drive in your device configuration.

### 9.5.1.4 Specifying a motor

#### Overview

The drive that has just been inserted in the project has a placeholder for the required motor (standard motor type: "1FK2"). You must specify this placeholder in the configuration.

---

#### Note

##### Different motor types

If your converter has a motor, type "1FT2" or "1FS2", before specifying the motor, the motor placeholder must first be exchanged. Proceed as described in the following chapter: "Optional: Replacing the motor (Page 259)".

---

#### Requirement

- A project has been created.
- An S210 drive is inserted in the device configuration.
- For activated user management (UMAC):  
The function rights for editing drive data and configuring in the inspector window are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Procedure

1. Double-click on the white motor placeholder (MOT) in the drive. The inspector window is displayed.
2. If required, select the "Motor - Selection 1Fxx" entry in the secondary navigation in the inspector window.
3. In the list, select the motor power rating and an associated encoder based on the article number. Then specify whether the motor should be equipped with a holding brake - or not. A DRIVE-CLiQ encoder is automatically assigned to all motors in the list.

#### Result

The motor placeholder is assigned the data of the selected motor. The white area turns gray.

The motor has been added. The assigned encoder and the encoder evaluation are automatically also added and specified.

You can then carry out the basic parameterization, or alternatively, you can carry out the guided quick startup.



**See also**

Carry out the basic parameterization (Page 284)

Carrying out guided quick startup (Page 271)

**9.5.1.5 Optional: Replacing the motor****Overview**

When creating an S210 drive in the device configuration, a motor placeholder is always used for motor type "1FK2". If you want to use another motor type, e.g. "1FS2", from the motor list, you can replace the motor placeholder before specifying.

**Requirement**

- The drive is offline.
- A project has been created.
- An S210 drive is inserted in the device configuration.
- For activated user management (UMAC):  
The function rights for editing drive data and configuring in the inspector window are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Replacing a motor using the hardware catalog

1. In the hardware catalog, select the required motor type. Drag the corresponding placeholder in the device view onto the placeholder for the currently used motor type. Dialog "Change device - XYZ motor" opens:

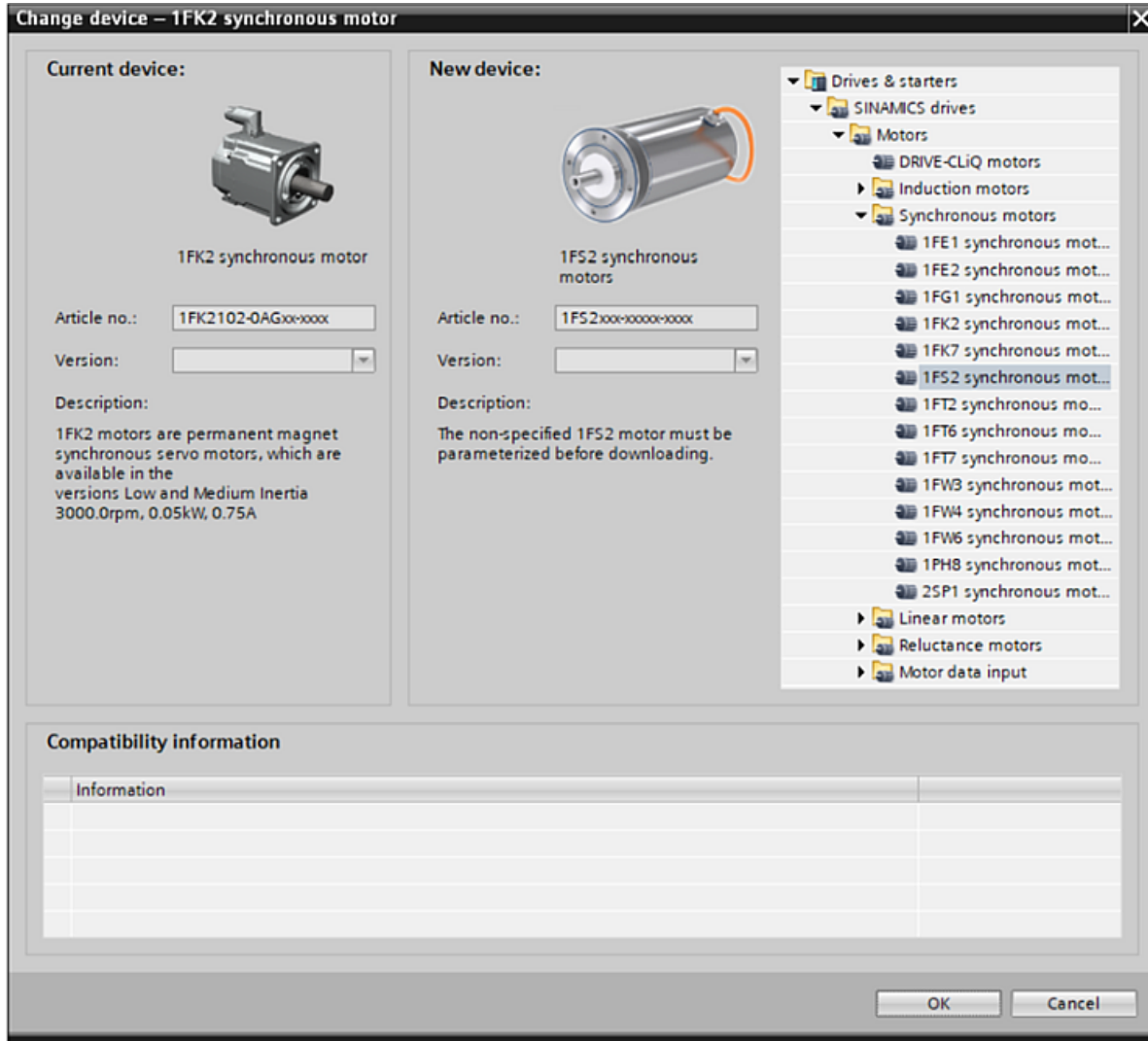


Figure 9-3 Replacing the motor placeholder using hardware selection

In the dialog, the most important data of the used motor type and the new motor type are compared. If the two types of motors are not fully compatible, the corresponding information is displayed in the "Compatibility information" field.

2. To accept the new motor type, click "OK".
3. Click on the unspecified motor in the device view.

4. If required, select the "Motor - Selection" entry in the secondary navigation in the inspector window.
5. In the list, select your motor based on the article number.  
The motor placeholder is assigned the data of the selected motor. The white area turns gray.  
If you have selected a motor with encoder, the encoder and the encoder evaluation are also added automatically.

### Replacing a motor using the context menu

1. In the device configuration, select the motor placeholder of the drive. Open context menu "Change device".  
Dialog "Change device - XYZ motor" opens:

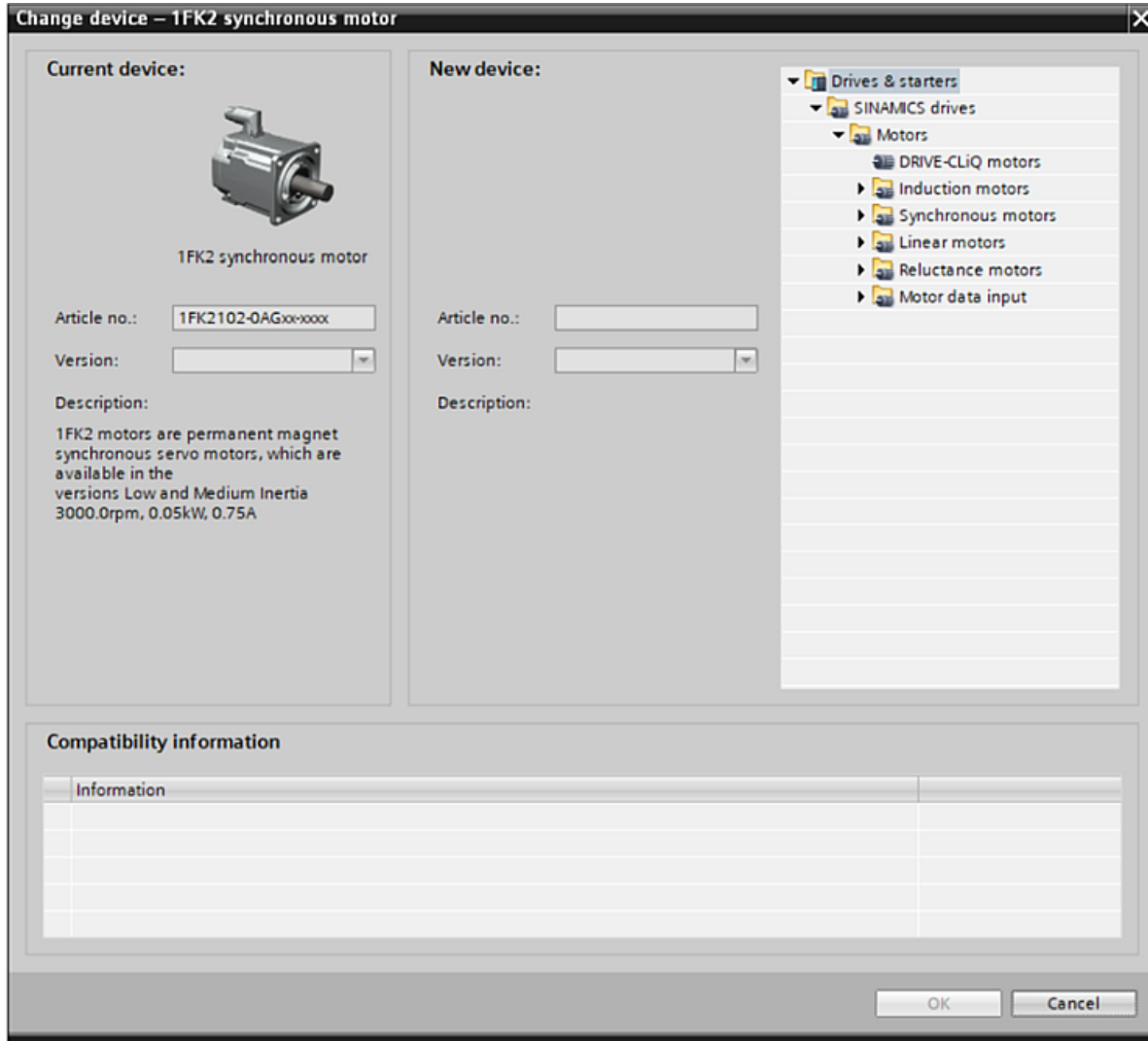


Figure 9-4 Manually changing the motor placeholder

The data of the current motor type are displayed at the top left. The motor types that are applicable are displayed in a hardware catalog at the top right.

2. In the hardware catalog, select the motor placeholder of the required motor type. The most important data of the new motor type are displayed at the center of the dialog in the field "New device". You can compare these data with the data of the current motor type (left-hand side).  
If both motor types are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field.
3. Click on "OK" to accept the motor type.
4. Click on the unspecified motor in the device view.

5. If required, select the "Motor - Selection" entry in the secondary navigation in the inspector window.
6. In the list, select your motor based on the article number.  
The motor placeholder is assigned the data of the selected motor. The white area turns gray. If you have selected a motor with encoder, the encoder and the encoder evaluation are also added automatically.

## Result

The motor has been added. If you had already inserted and specified an encoder before replacing the motor, you must do this again at this point. When replacing the motor, the encoder is deleted from the device configuration, since the encoder settings always refer to the motor used.

## 9.5.2 Control and technology object

### 9.5.2.1 Inserting a SIMATIC S7 controller into the project

#### Overview

If, in addition to the SINAMICS drive, you also wish to use a SIMATIC S7 controller in the device configuration, then create an appropriate PLC in your project.

---

#### Note

##### Other control systems

As an alternative to a SIMATIC S7 controller, a SINUMERIK ONE or a SINUMERIK MC can be used. The procedure remains the same.

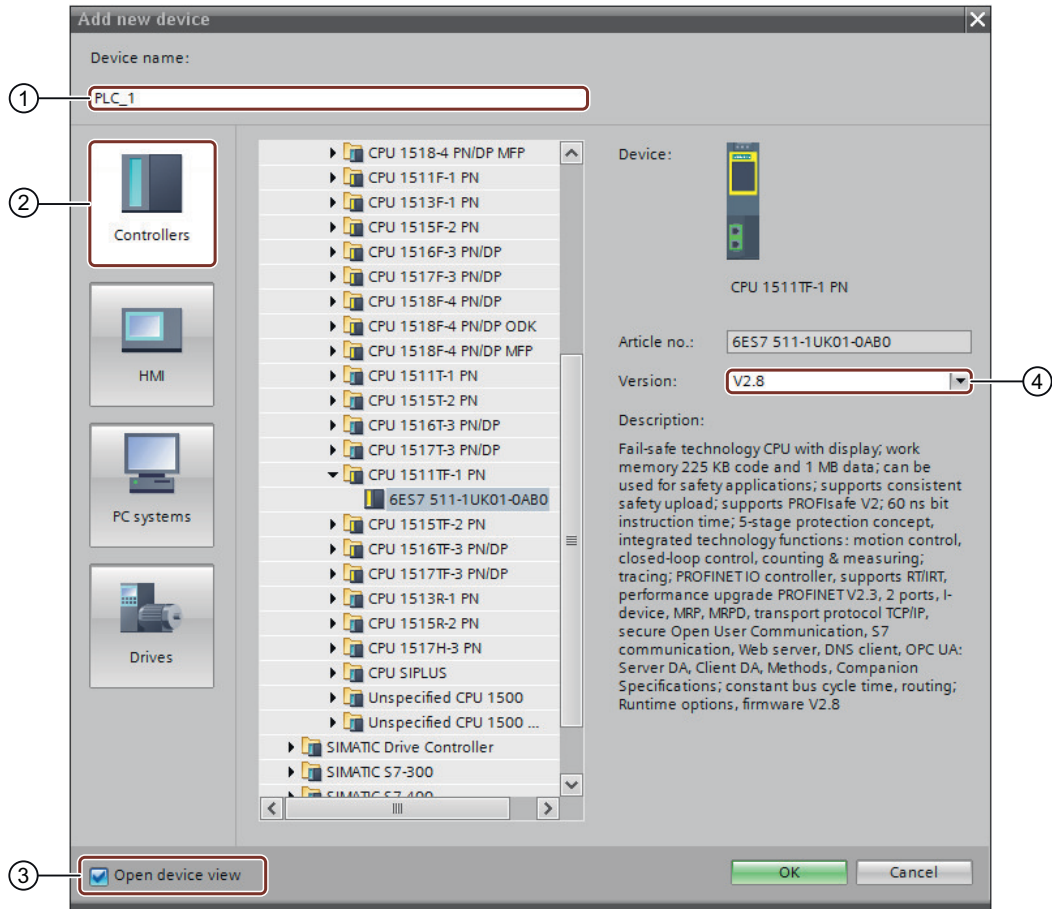
---

#### Requirement

- A new project has been created.  
OR  
An existing project is open.
- For activated user management (UMAC):  
The function rights for editing drive and control system data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

Procedure

1. Double-click "Add new device" in the project tree. The corresponding dialog opens.



- ① "Device name" input field (default: PLC\_xx)
- ② "Controller" button
- ③ Enable/disable the "Open device view" option
- ④ Firmware version drop-down list

2. Click the "Controllers" button ② to show the available controllers.
3. Expand the desired controller type (e.g. SIMATIC S7-1500) and select the desired CPU (e.g. CPU 1511TF-1 PN) in the list.  
When the CPU is expanded, the component is displayed with its article number.  
The current firmware version ④ is always suggested when creating a SIMATIC S7 controller.
4. If the firmware version on the memory card of your SIMATIC S7 controller deviates from the displayed firmware version, then change the firmware version via the drop-down list "Version" ④.  
It will not be possible to go online later if the firmware versions do not match.

5. Assign a different device name in the input field ① if required.
6. Click "OK".  
If the "Open device view" option ③ is activated, the SIMATIC S7 controller is automatically created in the project and then displayed in the device view.

## Result

The inserted SIMATIC S7 controller is displayed in the device view and can be configured.

### 9.5.2.2 Networking the SIMATIC S7 controller and converter

#### Overview

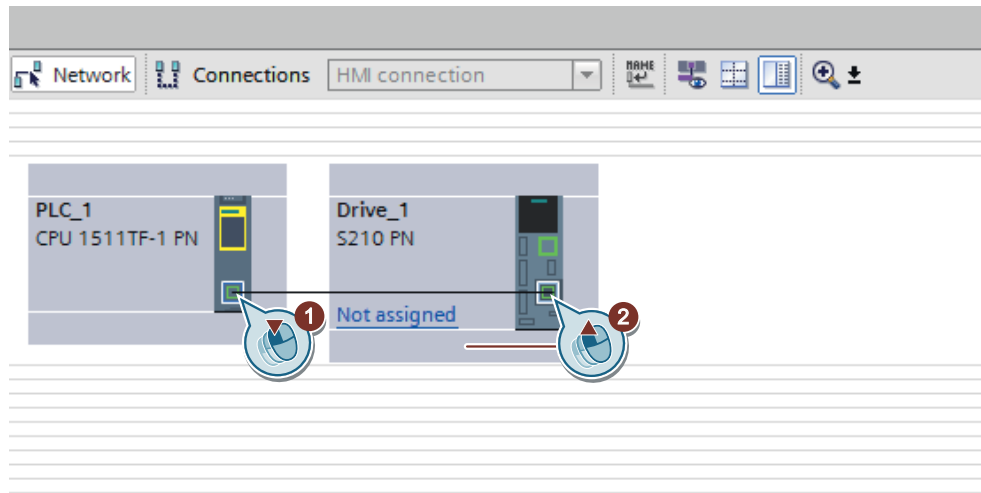
After inserting a SIMATIC S7 controller and a converter into the project, network the components in the network and topology view.

#### Requirement

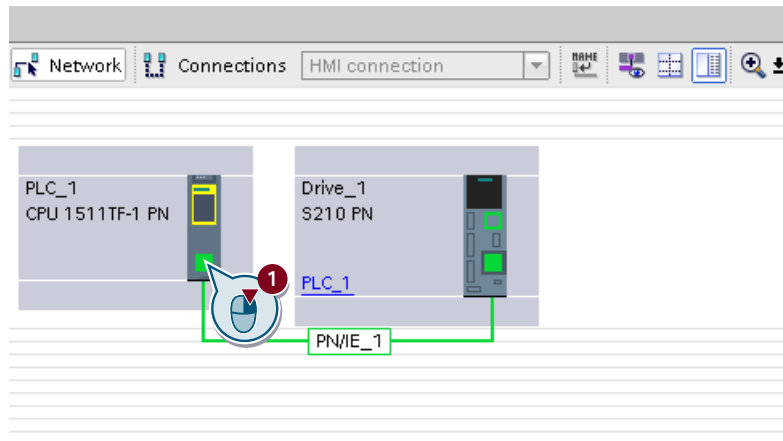
- A project is open.
- The project includes at least one drive and one control system.
- For activated user management (UMAC):  
The function rights for editing drive and control system data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Procedure

1. Open the network view by double-clicking on "Devices & networks" in the project tree.
2. Draw a connection between the PROFINET interface of the controller and the PROFINET interface X150 of the converter.  
The PROFINET connection is established, and the converter is assigned to the controller.



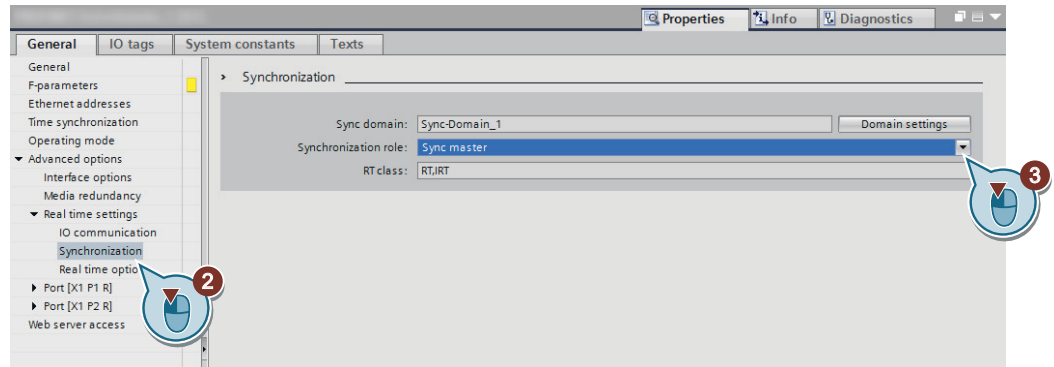
3. Click on the PROFINET interface\_1 [X1].



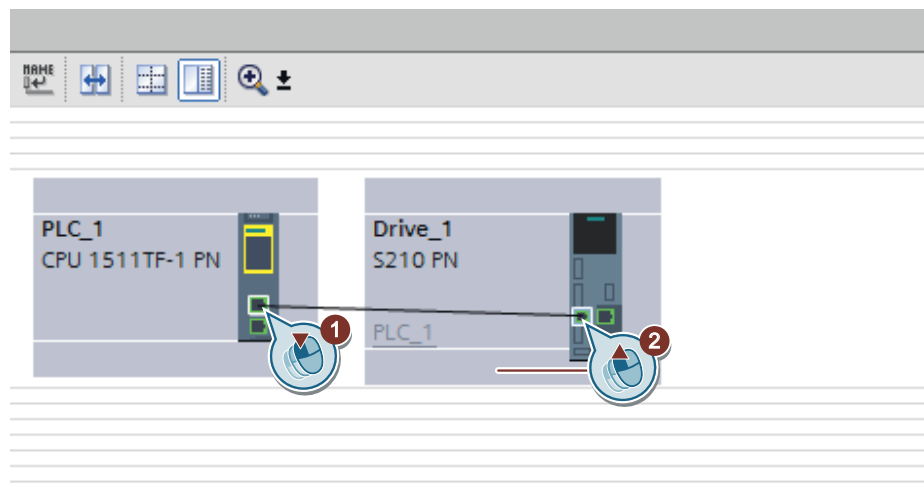
4. Open menu "Advanced options".  
The menu item is in the secondary navigation, in tab "General".
5. Open menu "Realtime settings".



- Open menu "Synchronization" with a double-click.



- Select the "Sync master" setting ③ from the "Synchronization role" drop-down list.
- Switch to the topology view.
- Draw a connection between Port\_1 [X1.P1] of the controller and Port\_1 [X150.P1] of the converter.



## Result

The SIMATIC S7 controller and the SINAMICS S210 converter are networked with one another in the network and topology view.

### 9.5.2.3 Inserting a technology object into the SIMATIC S7 controller

## Overview

Through the technology object, Motion Control functions such as positioning and synchronous axes are available to you. For this reason, insert a new technology object (TO) in the SIMATIC S7 controller. In the "Configuration" function view, you can directly assign the inserted SINAMICS drive and go to the drive configuration.

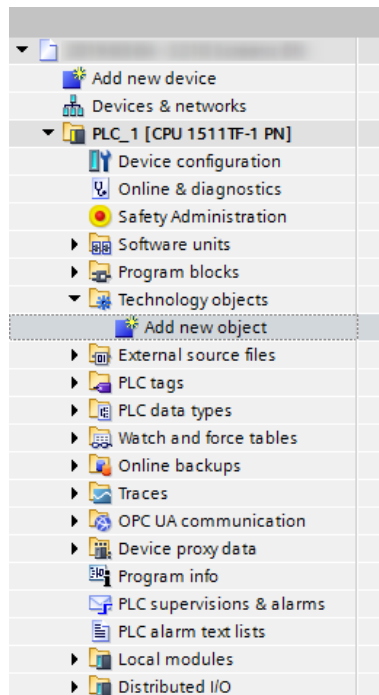
Positioning is the most frequent application for SINAMICS drives. To be able to perform positioning tasks in the SIMATIC S7 controller, you need to insert the Motion Control function "TO\_PositioningAxis". Inserting a TO is described below based on the example of the Motion Control function "TO\_PositioningAxis".

### Requirement

- A SINAMICS drive is created and specified.
- A control system (e.g. SIMATIC S7-1500) is created and networked with the drive.
- For activated user management (UMAC):  
The function rights for editing drive and control system data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

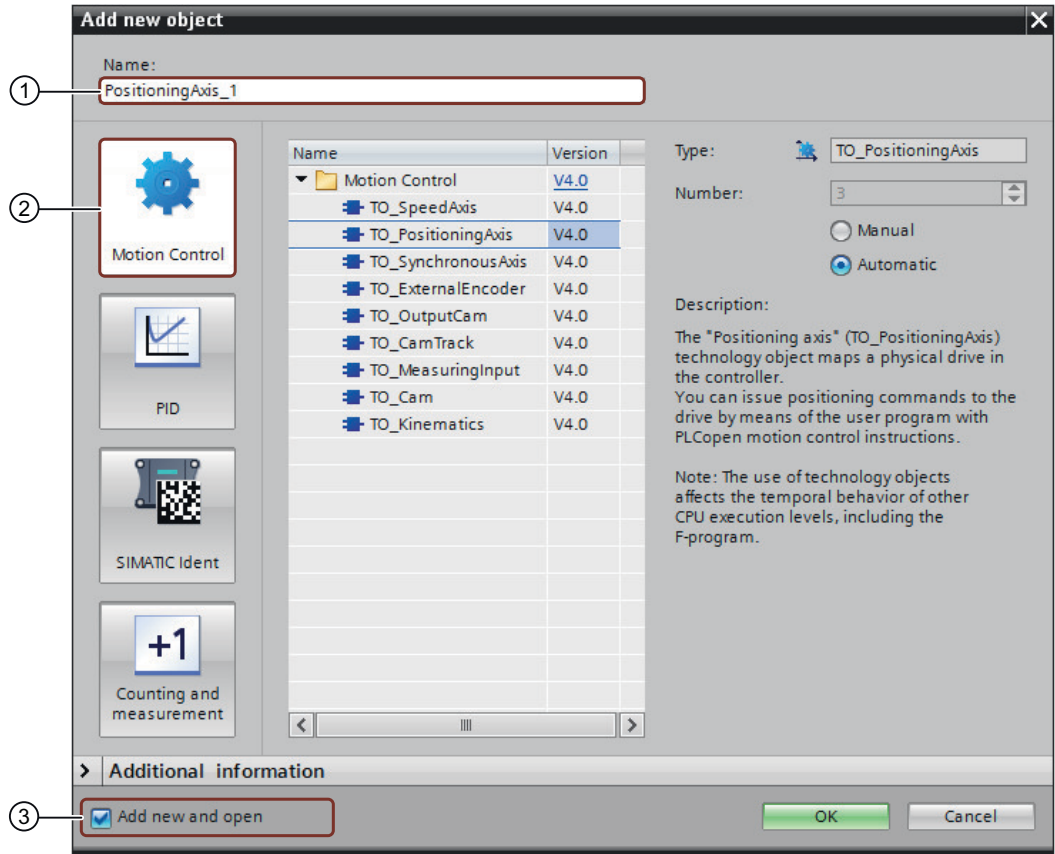
### Procedure

1. In the project tree, open the menu for the SIMATIC S7 controller.



2. Open menu "Technology objects".

- Open menu "Add new object" with a double-click.  
The corresponding dialog opens.



- "Object name" input field
- "Motion Control" button
- Enable/disable "Add new and open" option

- Click on "Motion Control" ②.
- Select object "TO\_PositioningAxis".
- If required, assign another name for the object in input field ①.
- Click "OK".

## Result

The "TO\_PositioningAxis" technology object has been inserted and can be configured.

### 9.5.2.4 Interconnecting the technology object and drive

## Overview

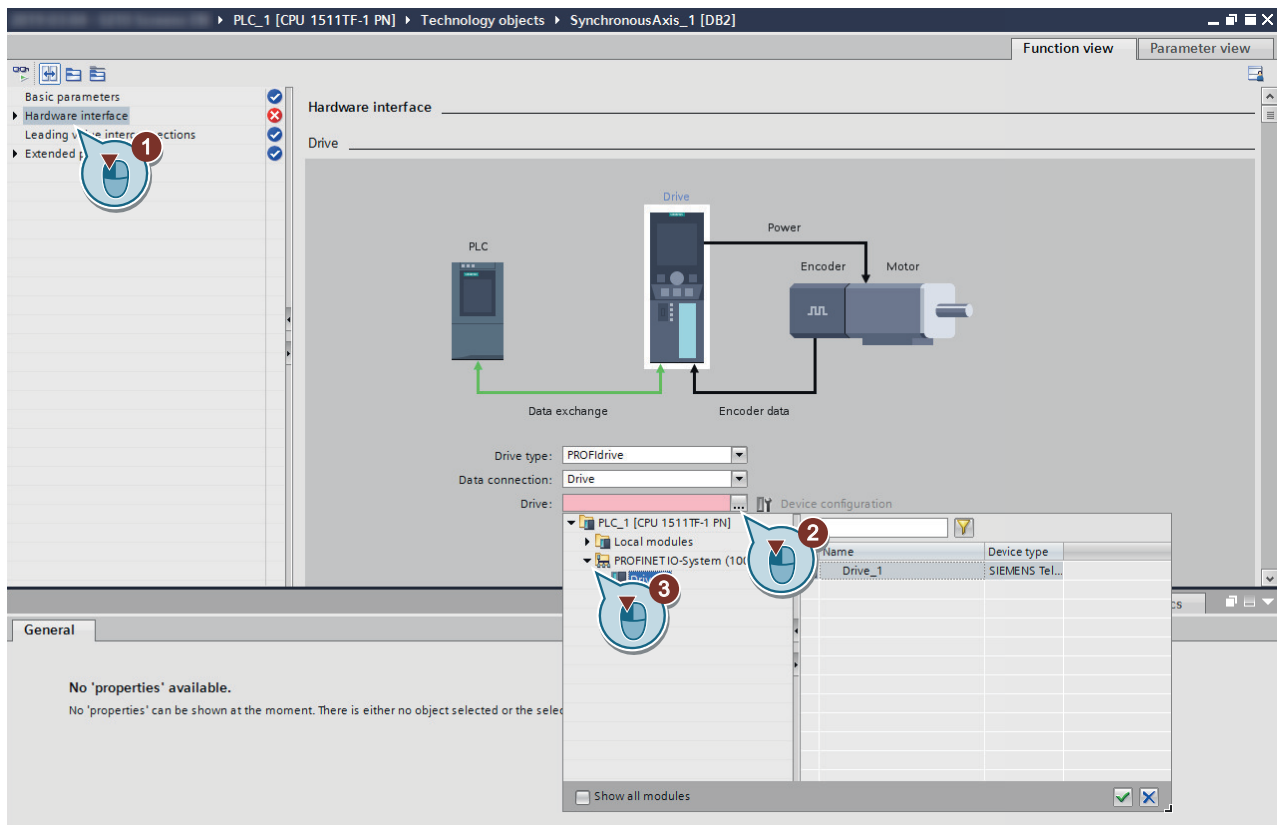
The inserted technology object "TO\_PositioningAxis", must be interconnected with the SINAMICS drive.

## Requirement



- A SINAMICS drive is created and specified.
- A control system (e.g. SIMATIC S7-1500) is created and networked with the drive.
- For activated user management (UMAC):  
The function rights for editing drive and control system data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

1. In the project tree, double-click the "Configuration" entry under the created technology object.
2. In the secondary navigation, select menu "Hardware interface" ①.  
The corresponding function view opens.



3. Open the selection list in the "Drive" selection box ②.
4. Expand the "PROFINET IO system (100)" entry ③.
5. Click on the displayed converter (in this case: "Drive unit\_1").  
Telegram 105 is automatically preset.

6. Click on the checkmark icon  to confirm the selection.  
The "Device configuration" setting option is enabled. In addition, the "Drive configuration" setting option is displayed and enabled.
7. To get to the basic parameter assignment of the converter, click the green arrow icon .

## 9.6 Carrying out guided quick startup

### 9.6.1 Overview

#### Overview

Using the "guided quick startup", you perform the basic settings for the drive in Startdrive that are used to avoid the following detailed settings as far as possible. All drive settings are pre-assigned according to the required application use via these basic settings.

#### Requirement

- The drive has been completely created and specified in the device configuration.  
Without a complete specification, the guided quick startup cannot be used and a message appears.
- If a control is also used, it must be connected to the drive in the topology view and in the network view. The connection between the devices must also be configured.
- Optional: The operating unit is connected to the drive via LAN (physically online).
- For activated user management (UMAC):  
The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Quick startup areas

You can define the following basic settings in the steps with the same name:

- **Connection to PLC**  
Here you define whether you want to configure the drive in the project together with a control and which of the two components then has master control.
- **Limits**  
Here, you define the minimum and maximum values of the motor used: Current, speed, running times.
- **I/O configuration**  
This is where you configure the function of individual inputs and outputs of the converter.

## 9.6 Carrying out guided quick startup

- **Telegrams**  
Telegrams are proposed here based on previous presettings. You can define different telegrams and/or make detailed settings. Telegram settings can only be made offline.
- **Rotate & Optimize**  
Here, you optimize the motor in the online mode. The control panel or One Button Tuning (OBT) is available for this purpose.
- **Overview**  
Here you will find a compilation of all settings made after completing the configuration in the guided quick startup.
  - Offline mode: When required, you can load these settings directly to the drive.
  - Online mode: When required, you can load these settings directly to the Startdrive project.

### More information

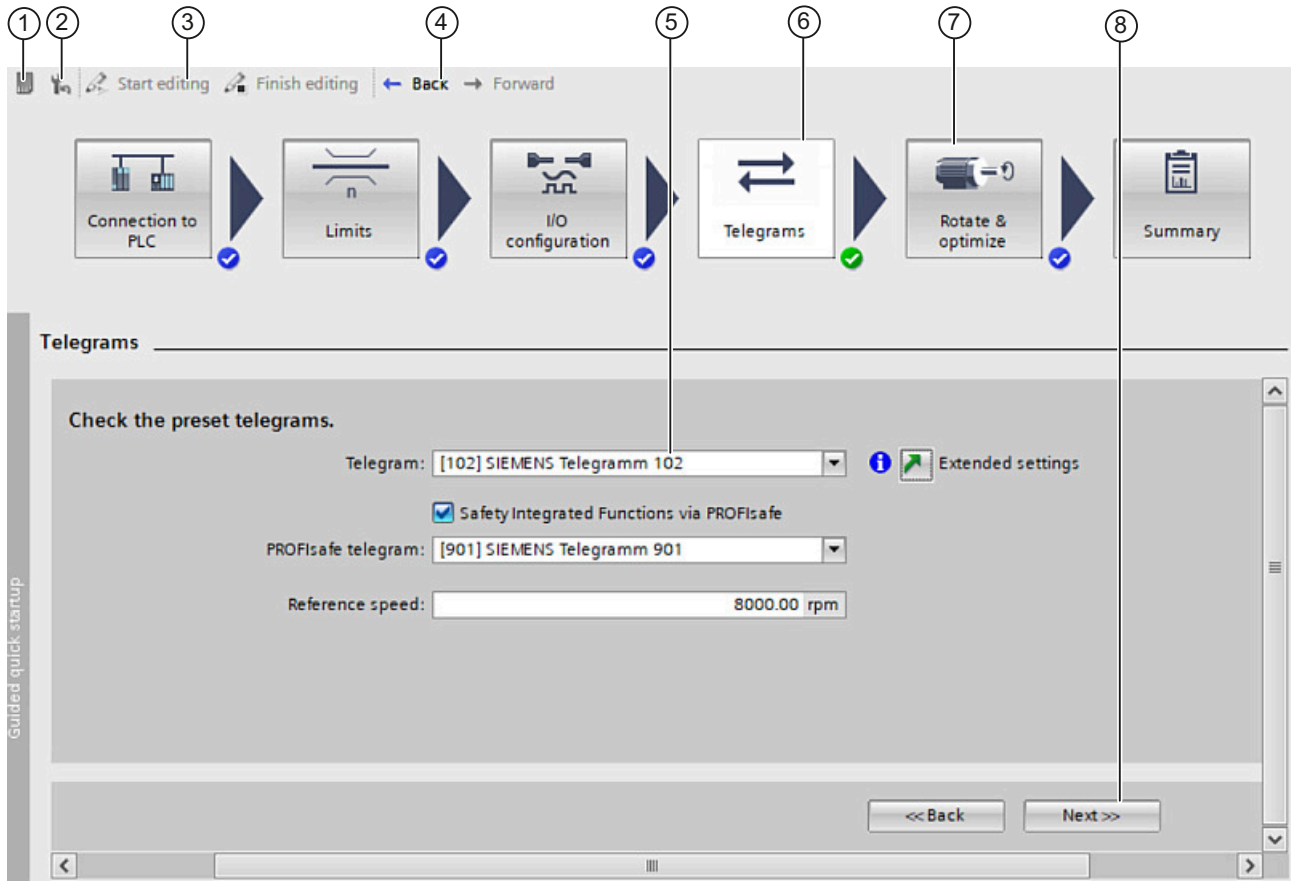
Detailed information on the topic of "Guided quick startup" can be found in the information system of the TIA Portal.

## 9.6.2 User interface

### Overview

The "Guided quick startup" is a commissioning wizard that you can use to set the most important basic settings of the S210 drive centrally.

## Structure






- ① Icon: Saves data retentively (in the online mode)
- ② Icon: Restores the factory settings (in online mode)
- ③ Buttons: Start or exit the editing mode (in the online mode)
- ④ Buttons: Jump to the next or previous step.
- ⑤ Detailed setting of active quick startup step.
- ⑥ Active quick startup step: Button is brightened
- ⑦ Inactive quick startup step: One of several possible steps
- ⑧ Quick startup buttons:
  - Back/Next: are always displayed.
  - Cancel/finish: only displayed in online mode.


Figure 9-5 Example: Guided quick startup in offline mode

### Status display after changes


Changes to individual settings can also affect settings in the guided quick startup. Status symbols indicate the change state of the particular step:

Icon	Meaning
	The system defaults in this step are valid.
	The settings made in this step are valid. The settings were made directly in this step, or are the consequences of settings in another step.
	The program changed the settings in this step. Possible causes are: <ul style="list-style-type: none"> <li>• Subsequent changes were made in other steps, which are not automatically valid.</li> <li>• The device configuration was subsequently changed. The changes influence the original settings.</li> </ul> Check the settings of this step.

### Status indicator in the quick startup steps

Settings of individual steps can also impact settings in previous steps. In this case, an appropriate note with the following icon  appears for the active quick startup step. Check and, if necessary, correct the corresponding settings.

#### Further identifications:

The  icon designates information or a context-sensitive note for users.

The  icon identifies an area of the step where an entry is urgently required.

## 9.6.3 Editing mode (only online)

### Overview

If you want to work with the guided quick startup in online mode, you need restore points in case commissioning is aborted. Restore points are stored retentively on the memory card of the converter.

Restore points are automatically created when activating or exiting the editing mode and also when switching from one step into the next step of the quick startup.

---

#### Note

##### Behavior when the online connection is terminated

If the connection to the drive is re-established after the online connection has been terminated, the program reverts to the stored data of the last restore point.

---


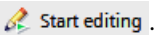
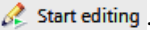

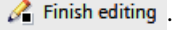
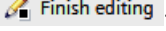


## Requirement

- The drive has been completely created and specified in the device configuration.
- If a control is also used, it must be connected to the drive in the topology view and in the network view. The connection between the devices must also be configured.
- There is an active online connection between the drive and the operating unit.
- No other access from another operating unit to the selected drive is active.

## Activating/exiting the editing mode

Settings in the guided quick startup can be made online only in an "editing mode".

Display	Status	Description
	The editing mode is not yet activated.	Proceed as follows to activate editing mode: <ul style="list-style-type: none"> <li>• In the toolbar of the step, click on the button  <b>Start editing</b> .</li> <li>OR</li> <li>• Click in the step below the button  <b>Start editing</b> . You can configure the settings.</li> </ul>
	The editing mode is active.	To exit the editing mode, proceed as follows: <ul style="list-style-type: none"> <li>• In the toolbar of the step, click on the button  <b>Finish editing</b> .</li> <li>OR</li> <li>• Click in the step below the button  <b>Finish editing</b> . Editing has been finished. A new restore point is assigned automatically. The current configuration is saved retentively.</li> </ul>

### Note

#### Message in case of multiple access

The editing mode can only be activated if the drive is not simultaneously accessed by another PC via Startdrive or the web server.

If another access is active, activation of the editing mode will be denied. An appropriate message is displayed.


### Note

#### Message when editing factory settings in the online mode

A message is displayed if a drive still has the factory settings, and the editing mode of the guided quick startup is started. This states that the motor data are based on the rated power of a standard motor.

Therefore, check the motor data online in dialog "Show motor data". When required, correct the motor data and close the dialog.

### Completing online commissioning

1. To complete online commissioning in the guided quick startup, click on button  **Finish editing** .  
All settings made in the quick startup are then saved retentively. You are provided with an overview of all of the settings made in the last "Overview" step.

### Canceling online commissioning

1. If you want to cancel online commissioning via the guided quick startup, click on the "Cancel" button.  
A confirmation prompt appears.
2. If you really want to cancel, click on "OK".  
All settings made in the quick startup are then discarded. Then the previous settings are restored via the last restore point.

## 9.6.4 Connection to PLC

### Overview


In the quick startup step "Connection to the PLC", you define whether you wish to commission and/or operate the drive together with a control system, and whether you also wish to use Safety Integrated Functions.

Startdrive then makes default settings to speed up commissioning.

### Requirement

- The drive has been completely created and specified in the device configuration.
- Optionally, a controller (PLC) also can be created in the device configuration and networked with the drive.
- For activated user management (UMAC):  
The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure


1. Specify whether the drive is connected to a controller (PLC). Click on the white part of the switch ()

### Note

This setting is automatically set to "Yes" and locked against change if a PROFIsafe telegram has been activated at another point in the program for the active drive:

- Quick startup step "Telegrams"
- "Telegram configuration" inspector window menu

The lock at this point can only be removed if the telegram setting at the setting location is undone.

The activated area of the switch is marked blue ()

2. If you wish to use Safety Integrated Functions with PROFIsafe, also activate option "Safety Integrated Functions via PROFIsafe".  
This option automatically activates PROFIsafe telegram 901 in the telegram configuring.
3. Click on "Next" to display the next quick startup step.

## Result

Startdrive defines the default settings of the setup based on your specifications.

## 9.6.5 Limits

### Overview

You define the basic properties of the closed-loop drive control using the "Limits" quick startup step.

Designation	Number	Description
Upper speed limit	p1083	Maximum speed for the positive direction. The set value must be less than or equal to the maximum speed (p1082).
Lower speed limit	p1086	Maximum speed for the negative direction. The set value must be less than or equal to the maximum speed (p1082).
Torque limit upper	p1520	Defines the upper torque limit or torque limit when motoring.
Torque limit lower	p1521	Defines the lower torque limit or the torque limit when generating
Quick stop Ramp-down time (OFF3)	p1135	The OFF3 ramp-down time is effective from the maximum speed down to the motor standstill.

The limits can be defined online as well as offline.

---

**Note**

**Displaying the actual motor data**

Using button "Display motor data", you can open a dialog window with the same name that displays the actual motor data of your drive.

---

**Requirement**

- The motor used in the device configuration of the drive has been completely specified and configured.
- For activated user management (UMAC):  
The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

**Procedure**

1. When required, adapt the specified default values (see the table above).
2. Click on "Next" to display the next quick startup step.

## 9.6.6 I/O configuration

**Overview**

In quick startup step "I/O configuration", make the basic settings for the digital inputs of the drive:

- Digital inputs DI 2 and DI 3
- 2 fast digital inputs (DI 0 and DI 1) as measuring probes for evaluation in the control
- Digital input DI 4 for monitoring the temperature of an optional external braking resistor

The function of the digital inputs DI 0 (≙ activate measuring probe 1) and DI 1 (≙ activate measuring probe 2) is already pre-configured and activated.

## Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- You do not want to manage the digital inputs via a technology object of the control system.
- For activated user management (UMAC):  
The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

If you are not using any measuring probes, then you can deactivate them manually using the corresponding drop-down lists. However, measuring probes are generally available. The default setting is correct in these cases.

1. Optional: For DI 0 or DI 1, deactivate the measuring probe.
2. In the drop-down list "Activate equivalent zero mark", select whether you wish to use an external zero mark and whether this external zero mark should apply for DI 0 or DI 1.
3. In the drop-down list on the right for DI4, select whether the temperature monitoring of the external braking resistor should be activated or not. Temperature monitoring is deactivated as default setting.
4. Click on the button to the right of "F-DI" if you wish to configure the failsafe digital input. The Safety Function view "Control" then opens. For additional settings, refer to Chapter "Safety Integrated control (Page 123)".
5. Click on "Next" to display the next quick startup step.

### 9.6.7 Telegrams (only offline)

#### Overview

The telegrams of the drive were preconfigured by the specifications previously defined in the guided quick startup.

In quick startup step "Telegrams", you can optimize these default settings if this is necessary for your drive.


#### Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- Optionally, a controller (PLC) also can be created in the device configuration and networked with the drive.

- There is **no** active online connection between the drive and operating unit. Telegrams can only be configured offline.
- For activated user management (UMAC):  
The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

The default telegrams are displayed in the "Telegrams" quick startup area.

1. Select the desired standard telegram from the "Telegram" drop-down list.
2. If you have not yet activated a PROFI-safe telegram in the quick startup area "Connection to PLC", then you can activate a PROFI-safe telegram here. For this purpose, activate the option "Use Safety Integrated Functions via PROFI-safe".  
This option automatically activates PROFI-safe telegram 901 in the telegram configuring.
3. If, instead of the suggested PROFI-safe telegram 901, you wish to use PROFI-safe telegram 30, then select the telegram in the "PROFI-safe Telegram" drop-down list.
4. Correct the preset reference speed (p2000) in the field with the same name.
5. Click on icon  "Extended settings" if you wish to optimize the settings of the telegrams used in the telegram configuration.  
The properties of the PROFINET interface are displayed in the inspector window. Make the required settings under "Telegram settings (Page 301)".
6. Switch back to the quick startup step "Telegrams".
7. Click on "Next" to display the next quick startup step.

## Result

The telegrams for communication are configured.

### 9.6.8 Rotating & optimizing

#### Overview

Optimize the converter online in quick startup step "Rotate & Optimize". To do this, use either the control panel or One Button Tuning (OBT).

Offline, no settings can be made. After an optimization, you can view the corresponding data offline.

---

**Note****Alternatively: Operate the drive from the control panel**

If you wish to traverse the drive, click on the "Use control panel" button. Instead of One Button Tuning, the control panel is now displayed in the quick startup step. Proceed as described in the following chapter: "Traversing the drive from the control panel with speed setpoint (Page 305)".

---

**Requirement**

- The motor used in the device configuration of the drive has been completely specified and configured.
- Direct optimization required:
  - There is an active online connection between the drive and the operating unit.
  - The editing mode (Page 274) is activated.
- For activated user management (UMAC):  
The function rights for configuring in the quick startup and using the control panel are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

**Procedure**

You can carry out the optimization settings both offline as well as online. Proceed as follows:

1. Choose the dynamic response setting for the OBT based on the mechanical system of your machine.  
The OBT optimizes the drive based on the selected dynamic response setting.
  - Conservative  
Slow closed-loop speed control – low mechanical load.
  - Standard  
Best compromise between fast closed-loop speed control and low mechanical load.
  - Dynamic  
Fast speed control – high mechanical load.
2. In the "Distance limit" field, enter the angle through which the motor and the connected machine are permitted to turn for the required measurements (e.g. 360°) without the mechanical system being damaged.  
The angle should be at least 60° in order to determine useful controller parameters. Longer traversing distances result in better optimization results.
3. If you want to perform extended settings, click on the "Extended settings" button.  
The "Machine property" dialog opens. You obtain information about the conditions under which you can increase the speed control dynamic performance. If you wish to increase the dynamic response, activate option "Set the current setpoint filter with loop compensation".

## 9.6 Carrying out guided quick startup

4. Establish an online connection to the drive if up until now you had worked in the offline mode.
  - Then activate master control.
  - Start the OBT.
  - Check the optimization results.
  - Deactivate the master control.

The individual steps are described in detail in Chapter "Perform One Button Tuning (Page 306)".

5. Click on "Next" to display the next quick startup step.

### Result

The result of the optimization is displayed in the "Status" area. If optimization was successful, the appropriate LED lights up green. The "Optimization result" list compares the settings changed by the optimization with the earlier settings prior to optimization.

If optimization was not successful, repeat the optimization, possibly with modified data.

## 9.6.9 Overview (offline)

### Overview

After completing the commissioning steps in the guided quick startup, here, you will find a compilation of all settings that were made offline.

If necessary, you can load the settings made offline from the overview into the device.

### Requirement

- The drive has been completely created and specified in the device configuration.
- For activated user management (UMAC):  
The function rights for configuring in the quick startup are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Optional: Downloading project data to the device

1. In function view "Overview", click on "Download".  
To transfer the protected project data, you must log into the device with your user data.
2. Proceed as described in Chapter "Loading project data into the drive (Page 243)".



## 9.6.10 (Online) overview


### Overview

After completing the commissioning steps in the guided quick startup, here, you will find a compilation of all settings that were made online. You can sort and export the corresponding information or also compare it with the factory settings.

### Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.
- The online configuration was completed.
- For activated user management (UMAC):  
The function rights for configuring in the quick startup are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Optional: Uploading project data from the device

1. After the online commissioning has been completed, if you want to transfer the current project data into the TIA project of your operating unit, click on "Finish".  
Icon (Upload from device) is subsequently displayed in function view "Overview".
2. Click on icon  (Upload from device).
3. Proceed as described in the following chapter: "Loading data from the drive into the project (Page 243)".

## 9.7 Configuring the converter

### 9.7.1 Fundamentals

#### Overview

After carrying out the basic configuration of devices in the project, make the extended settings for commissioning.

The following areas are provided in display area "Parameterization":

- **Basic parameter assignment**  
Here you can view the preassigned basic parameters of the converter, and if necessary you can change individual values. If the motor brake is available, then you can also set that this brake is forced open.
- **Inputs/outputs**  
Here you can configure the digital inputs of the converter.
- **Safety Integrated**  
Here, you can activate and configure the available safety functions.

---

**Note**

**Guided quick startup**

You can also easily configure the settings of the basic parameterization and the digital inputs using the guided quick startup.

Details are contained in Chapter "Carrying out guided quick startup (Page 271)".

---

**Note**

**Telegram configuration**

You configure the telegrams used in the drive configuration in the inspector window in the telegram configuration. The most important settings are listed in Chapter "Configuring telegrams (Page 301)".

---

## 9.7.2 Carry out the basic parameterization

### Overview

You can parameterize the most important operating parameters in the basic setting.

These include:

- Device supply voltage
- Direction of rotation
- Speed limit
- Torque limit
- Ramp-down times  
After an OFF1 command, and for a quick stop OFF3.
- Forced opening of the brake  
Only if the motor being used is equipped with a holding brake.

## Requirement

- The drive has been completely created and completely specified in the device configuration.
- For activated user management (UMAC):  
The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

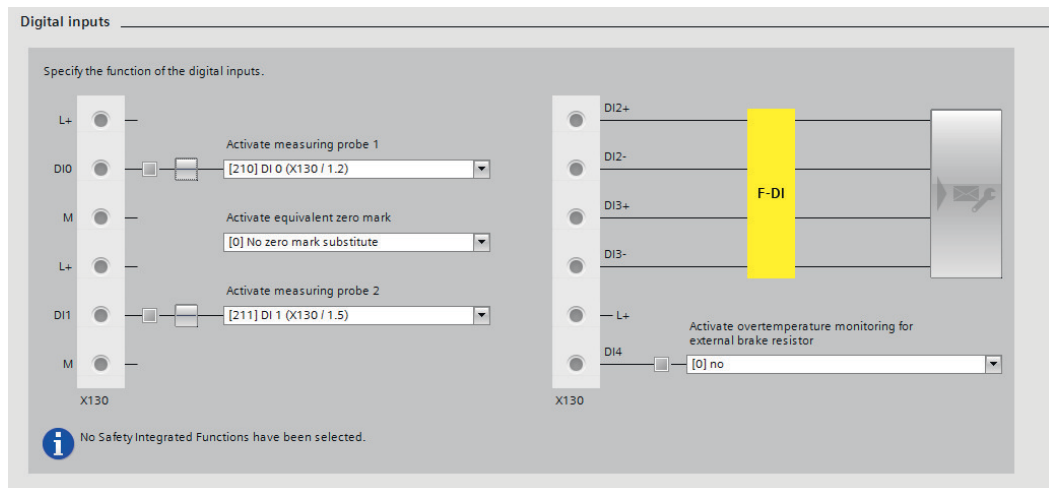
## Procedure

1. Change the default settings of this function view.
2. Optionally, if the motor being used is equipped with a "Standard holding brake", and you wish to permanently open this brake:  
Click on button "Force open brake".
3. Save the project to apply the settings.

### 9.7.3 Configuring digital inputs via technology object

#### Pre-assignment of the digital inputs DI 0, DI 1 and DI 4

The function of the digital inputs DI 0 (≙ activate measuring probe 1) and DI 1 (≙ activate measuring probe 2) is already pre-configured and activated.



### Requirement

- The drive has been completely created and completely specified in the device configuration.
- For activated user management (UMAC):  
The function rights required to edit the drive data are activated for your user role.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Procedure

If you are not using any measuring probes, then you can deactivate them manually using the corresponding drop-down lists. However, measuring probes are generally available. The default setting is correct in these cases.

1. In the drop-down list "Activate equivalent zero mark", select whether you wish to use an external zero mark and whether this external zero mark should apply for DI 0 or DI 1.
2. In drop-down list "Activate overtemperature monitoring for external braking resistor", select whether the temperature monitoring of the external braking resistor should be activated or not.
3. Click on the button to the right of "F-DI" if you wish to configure the failsafe digital input. The safety interconnection screen form "Control" then opens. For additional settings, refer to Chapter "Safety Integrated control (Page 123)".
4. Then save the project to apply the settings.

#### 9.7.3.1 Configuring a measuring probe using the technology object




### Requirement

- The project includes a control system, and is connected to the converter.
- A technology object "PositioningAxis\_1" is created for the control system and is active.

## Procedure

If you want to configure the measuring probes for the digital inputs of the drive using technology objects, proceed as follows:

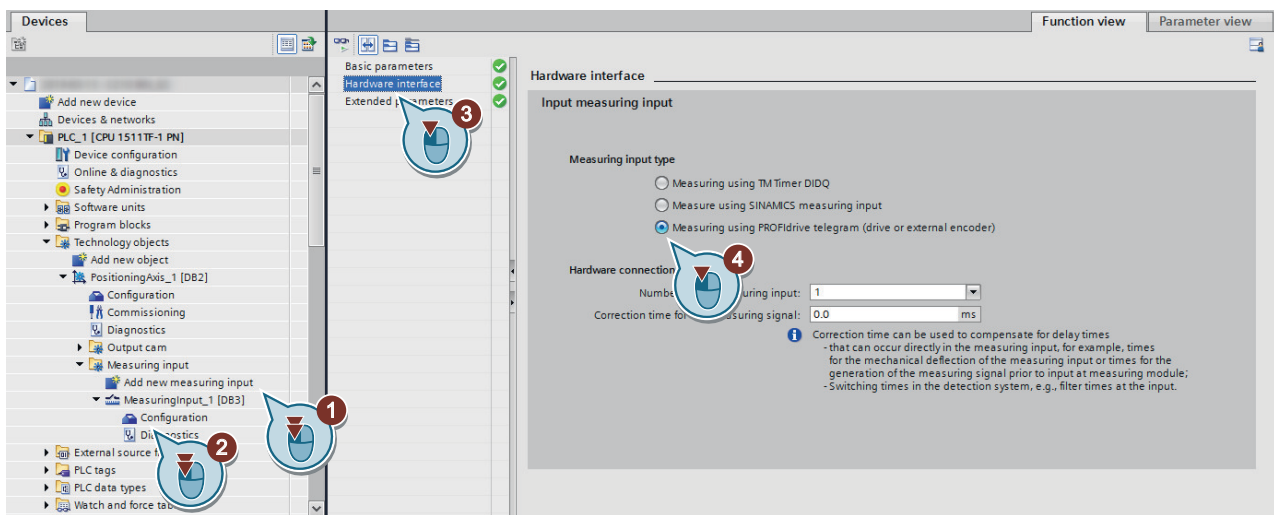
1. In the project tree, expand the follow entries in the order specified below:

-  Technology objects
-  PositioningAxis\_1
-  Measuring probes

The "Add new measuring probe" entry is displayed.

2. Double-click the "Add new measuring probe" entry ①.

A new measuring probe is created and additional functions are displayed.



3. Double-click the "Configuration" entry ②.

The corresponding function view opens in the device view.

4. Click the "Hardware interface" option ③ in the secondary navigation.

The corresponding function view is displayed.

5. Select the measuring probe type "Measuring using PROFIdrive telegram (drive or external encoder)" ④.

A measuring probe of the type "Measuring using PROFIdrive telegram (drive or external encoder)" is created.

You can configure a maximum of 2 measuring probes to an actual value or an encoder. For the measurement, only one measuring probe can be active.

6. To correct the measuring time point, set a correction time.

## Result

A measuring probe of the type "Measuring using PROFIdrive telegram (drive or external encoder)" is created and can be used.

## 9.7.4 Safety Integrated

### 9.7.4.1 Fundamentals for Safety Integrated commissioning

#### Overview

Commissioning the Safety Integrated Functions of the converter includes the following configurations:

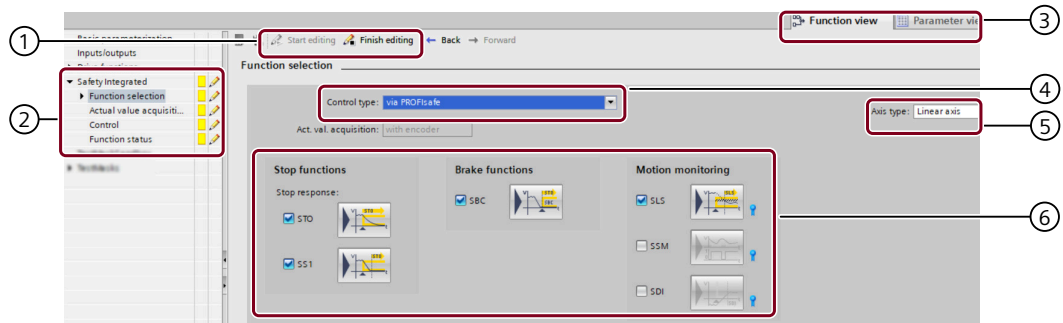
- Function selection
- Parameterizing the functions as required for the application
- Control of the functions

#### Requirement

The converter is completely created in the device configuration.

You have the function rights necessary for changing Safety Integrated settings.

#### Description of function



- ① Editing mode
- ② Secondary navigation
- ③ Function view / Parameter view
- ④ Function selection
- ⑤ Axis type
- ⑥ Function selection



Figure 9-6 Overview of Safety Integrated commissioning (example)

Changes to Safety Integrated settings are only possible in the Safety Integrated editing mode. The activated user management protects against unauthorized changes to Safety Integrated settings. When starting the editing mode, Startdrive checks whether the security rights required are available.

### Commissioning steps

- Function selection:
  - Selecting the Safety Integrated control type
  - Selecting the axis type  
When switching over the axis type, the units are changed.
  - Selecting the available Safety Integrated Functions depending on the control type  
The stop responses (STO and SS1) shown in the function selection must always be parameterized. The reason is that the stop responses must stop the motor in the case of a fault and for a limit value violation. If you also want the functions to be controlled via PROFIsafe and/or F-DI, then an additional enable is required through appropriate selection.  
The selection enables the function. The enabled function then appears in the secondary navigation as a subpoint of the function selection.
  - License symbol  
The license symbol shows the Safety Integrated Functions that require a Safety Extended license. For test purposes, there is a Trial License mode for Safety Integrated.
- Parameterization of the enabled Safety Integrated Functions
  - Function-dependent display of the converter parameters  
A function view is offered for every enabled Safety Integrated Function. The function view of the particular function is available in the drop-down list for function selection in the secondary navigation. The function view shows a graphic and the important setting parameters. If additional parameters must be set/observed for the particular function, it is necessary to switch to parameter view. Parameter view has two views: "Standard" and "Extended". Different parameters appear depending on whether the "Standard" view or "Extended" view is selected.  
Changes in the parameter view become effective after the editing mode is ended in the function view.
  - Actual value acquisition/mechanical system  
The actual value acquisition/mechanical system can be viewed if Safety Integrated motion monitoring functions were activated.

- Parameterization of the selected control type  
The parameterization of the control type determines the settings for PROFIsafe and the failsafe digital input (F-DI).
- Function status  
The function status shows the following values:
  - Function status of the enabled functions

Display	Function status
	Function is active
	Function is not active

Safety Integrated Function status of an enabled function

- Status of Safety Integrated in the device
- Checksums  
Offline: Shows the checksums calculated when Safety Integrated commissioning was completed.  
Online: Shows the current status of all configured Safety Integrated Functions as well as the checksums calculated when Safety Integrated commissioning was completed.
- Software versions in the converter

### Navigation tips

The secondary navigation of the parameterization can be used to navigate between the various commissioning steps.

Alternatively, "Next" and "Back" buttons are available at the lower edge of the screen form.

### More information

For detailed information, see Chapter "Safety Integrated Functions (Page 97)".

#### 9.7.4.2 Starting/exiting Safety Integrated editing mode

### Overview

You must start the editing mode in order to make changes to the Safety Integrated settings. This applies to both offline and online configurations.



The system behaves differently depending on whether you are working online or offline.

### Requirement

The converter is completely created in the device configuration.



## Procedure

1. Click on  **Start editing** to activate editing mode.  
If you are working online: If the current Safety Integrated settings deviate from the factory settings, you will be prompted to select which basis you want to use for the configuration:
  - Based on the current settings
  - Based on the factory settingsIf you are working offline, this prompt does not appear.
2. Click on  **Finish editing** to exit the editing mode.  
If you are working online: The checksums are calculated for the parameterization carried out, and saved directly in the converter. This activates the parameterization, and can be executed at the machine.  
If you are working offline: The checksums are calculated for the parameterization carried out, and saved in the project.

---

### Note

#### Loss of settings if commissioning is canceled in the online configuration

If you do not close editing mode with "Finish editing", the following applies:

You can discard the Safety Integrated settings made using the "Cancel" button. As a result, the Safety Integrated settings from before editing mode was started are restored.

---

### 9.7.4.3 Permanently saving Safety Integrated parameterization


#### Requirement



You have configured the Safety Integrated commissioning or made changes to the parameterization.

You are in the online configuration.

#### Procedure

Proceed as follows to permanently save the Safety Integrated parameterization:

1. Exit the editing mode.
2. To save the Safety Integrated parameters permanently in the drive, retentive saving is necessary.  
In the toolbar of the function view, click on the icon .
3. Observe the messages in the diagnostics window.

4. Restart the system if necessary.
5. Then establish consistency between the drive and Startdrive project:
  - Load the settings from the drive into the Startdrive project. To do this, click the icon .
  - Disconnect the online connection .
  - Save the Startdrive project.

#### 9.7.4.4 Security for Safety Integrated

##### Overview

Only authorized and authenticated personnel may change Safety Integrated settings. You protect these settings using the project protection and the user management (UMAC) of the Totally Integrated Automation Portal (TIA Portal).

##### Description of function

It is possible to create specific users and roles in the user management of the TIA Portal. Based on the assigned function rights, users are authorized to make changes to the settings in Safety Integrated Functions.

The following roles can make changes in Safety Integrated without the need to modify other settings:

- Drive Safety Engineer
- Engineering Standard

The system checks the UMAC status before each change to the Safety Integrated settings. An fault message is displayed if function rights are not available or authentication is not possible.

##### More information

More detailed information is provided in the Configuration Manual "SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>)" in Chapter "Security settings in Startdrive".

#### 9.7.4.5 Carrying out an acceptance test.

##### Acceptance test - notes

---

###### Note

###### Conditions for the acceptance test

As far as possible, the acceptance tests are to be carried out at the maximum possible machine speed and acceleration rates to determine the maximum braking distances and braking times that can be expected.

---

---

**Note**

**Acceptance test for Safety Integrated Functions**

In the function selection, the Safety Integrated acceptance test offers you the testable functions for selection, depending on the device type and its settings.

---

**Note**

**Trace recordings**

Trace recordings are used to analyze the machine response during a test run. Based on the signal characteristics, a check can be made as to whether the machine response corresponds to the expectations of the test engineer. The recorded signals can be used to evaluate delay times and over-travel distances, for example. The trace recordings are automatically parameterized and performed by the tool.

---

**Note**

**Non-critical alarms**

When evaluating the alarm buffer you can tolerate the following alarms:

- A01699 SI: Test brake output necessary  
This alarm occurs after the time in p9659 has expired.

You do not need to include these alarms in the acceptance report.

---

**Note**

**No acceptance test with alarm A01796**

If the alarm A01796 is active, the pulses are safely canceled, and an acceptance test is not possible.

---

---

**Note**

**Consistency between the offline project and drive**

The acceptance test is performed after commissioning has been completed. After this, it is no longer permissible that any parameters are changed in the drive.

Before the acceptance test, upload the drive to establish consistency between the offline project and the drive. This means that all checksums are consistent.

The results of the acceptance test are saved in the project.

Without additional changes to the project or to the drive parameterization, all checksums are kept unchanged.

A change to the checksums should be taken into consideration in the following cases:

- If the drive parameterization (offline or online) is changed after performing the acceptance test, then the functional checksums are changed.
- If drive components are replaced, then the hardware-specific checksums are changed.

After any changes, the acceptance test (complete or partial) must be performed again. Recommendations are described in the drive documentation.

The Safety Integrated acceptance test report can be exported at any time. When doing this, a check is not made as to whether the project is consistent between offline and online.

For the final documentation of the acceptance report, ensure that there are no inconsistencies in the system.

---




---

**Note**

**Startdrive supports the consistency check**

The consistency check in Startdrive is performed automatically and permanently online. The result of the consistency check is shown as an icon next to the acceptance test in the secondary navigation.

The following states are displayed:

- : The online and offline comparison values are identical.
  - : The online and offline comparison values are different. The consistency between the offline project and the drive must be established using "Download to device" or "Upload from device".
  - : An error occurred during the consistency check.
- 

## Acceptance test - overview

### Overview

The Safety Integrated acceptance test wizard supports you when running through the acceptance test.

## Description of function

The wizard provides the following support:

- The wizard guides you step-by-step through the acceptance tests for the individual Safety Integrated Functions.
- The wizard explicitly asks you for the entries and actions that you must go through.
- The wizard creates the trace recordings needed for analyzing the machine behavior during the tests.
- The wizard creates the required acceptance report.

## Preparing the acceptance test

### Requirement

- There is an active online connection between the drive and the operating unit.
- The drives to be tested are fully configured and operational.  
A subsequent change means that a new acceptance test must be performed.
- For active user management (UMAC): You have the required function rights for Safety Integrated.

### Procedure

Proceed as follows to prepare for the acceptance test:

1. Click "Acceptance test" in the project tree.
2. Select all Safety Integrated Functions to be tested for the desired drive in the secondary navigation.  
The active functions are automatically preselected. Depending on the specific requirement, change this preselection and either select or deselect functions.
3. To define the function selection for the Safety Integrated acceptance test, click "Apply".  
Entries are displayed in the secondary navigation for the functions to be tested. Navigate with these settings to the individual tests.

#### Optional: Resetting test results

1. To delete all tests performed for this drive so far, click the "Reset test results" button.  
As a consequence, the initial state is restored. New acceptance tests are possible before the initial state.

## Performing the acceptance test (example)

### Overview

After accepting the function selection in step "Prepare acceptance test", the functions to be tested are displayed in the secondary navigation. Work through the tests from top to bottom or in any order.

The status of the individual tests is shown as follows:

- Blue: The test for this function has still not been performed.
- Green: The test was successfully performed.
- Red: The test was canceled with an error. The test can be repeated by preselecting the function.

The guided wizards have the same distribution for each acceptance test. The workflow, which represents the individual test steps and their state, is located in the upper area.

These states have the following meaning:

- Blue: Active test step
- Green: Test step completed

The instructions for the various steps of the acceptance test are displayed in the area below the workflow.

## Requirement

- The drive has been completely created and specified in the device configuration.
- The Safety Integrated Functions of the selected drive have been completely configured.
- There is an active online connection between the drive and operating unit. The project data in the project and drive are consistent.
- For active user management (UMAC): You have the required function rights for Safety Integrated.

## Procedure

Proceed as follows to execute each acceptance test:

1. Click on a Safety Integrated Function to be tested.
2. Enter a test designation. This designation also appears later in the acceptance report.
3. Change the trace settings for this test or use the default settings.  
The preassignment is appropriate for the majority of applications. By changing the trace settings, you adapt the test to the mechanical conditions of the machine. Example: The mechanical system of the axis has a very high moment of inertia. As a consequence, longer ramp times are required for accelerating and braking.
4. Once you have completed all the preparations, click on "Start test".  
The wizard for the selected test opens.
5. Comply with the safety instructions and notes on the pages of the function view of the acceptance test wizard until the test has been (successfully) completed.
6. Follow the instructions and click on "Next".
7. Exit the acceptance test via "Finish".

## Result

You can see the test status in the secondary navigation.

---

### Note

#### Acceptance test canceled

If you open another window during the acceptance test, the acceptance test is canceled and is marked as "failed" in the acceptance report.

#### Remedy:

- Open the other window with function "Unpin" as separate window. Using "Embed", you reintegrate the separate window at a later point in time.
- 

## See also

Preparing the acceptance test (Page 295)

## Completing the acceptance test with report

### Overview

The overview under "Create report" lists all drives and their current test status.

You have the option of creating the acceptance report at any time. For example, intermediate states can be documented, even though some tests are still open or were ended with errors.

### Requirement

- For active user management (UMAC): You have the required function rights.
- For a final acceptance report: You have successfully completed all acceptance tests. All tests are marked positive with a green checkmark.

### Procedure

Proceed as follows to create an acceptance report:

1. In the "Completion" screen form, select the drives for which you wish to create a report. The drive instances to which the results were transferred are also displayed in the list as subentries that can be opened. These drive instances are always included in the acceptance report with the selection of the respective main drive.
2. Click on "Create".  
The "Save As..." dialog is displayed.
  - When selecting a drive, the file name of the acceptance report is preassigned the drive designation as default setting.
  - When selecting several drives, a dialog is displayed to select the directory where the report is saved. For each selected drive, a report is saved with the name of the drive.

3. Depending on the specific requirement, enter the file name of the report.
4. Click on "Save".

#### Optional: Creating a function table

You can use the function table to create a user-defined overview that is documented in the acceptance report in addition to the results of the acceptance test.

Table 9-1 Function table

Column	Explanation
Operating mode	Select one of the specified operating modes from the drop-down list to map the required scenario.
Description	Enter an explanatory comment for the selected operating mode.
Protective device	Select the applied protection mechanism from the drop-down list.
Version	Enter an explanatory comment on the protective device being used.
Axis	Select the relevant drive from the drop-down list.
Monitoring	Select the safety function being used from the drop-down list.

## Result

The acceptance report is created as table in the "xlsx" format. You can open the report in Microsoft Excel as well as in other spreadsheet programs (e.g. LibreOffice).

The report is in the form of several individual tables:

- Cover page: Introduction with the machine description
- Drive\_x - overview: Documentation of parameters for this drive
- Drive\_x - function test: Documentation of all test data and traces for this drive  
Test status color coding:
  - Red: Failed
  - Yellow: Not tested
  - Green: Test successful
- Completion: Summary and signatures



---

**Note****Correct display of the acceptance report**

How the acceptance report is actually displayed, depends on Microsoft Windows and the spreadsheet program used.

- Microsoft Excel  
If the following is configured in the display settings of Microsoft Windows, then the display of the report is correct:  
Control Panel > Appearance and Personalization > Display > Make text and other items larger or smaller > Option "Smaller – 100%"
  - LibreOffice  
The display of the acceptance report is independent of Microsoft Windows and is always correct.
- 

## Transferring acceptance test results

### Overview

To simplify additional acceptance tests, transfer the results of successfully performed tests to drives with the same functionality.

### Requirement

- You have successfully performed the acceptance tests.
- For active user management (UMAC): You have the required function rights.

### Procedure

Proceed as follows to transfer the results of an acceptance test:

1. Open the page of function view "Result transfer" for a drive for which you have successfully completed the acceptance test.
2. Click on "Determine" to determine suitable drives.
  - After initial determination, the button changes to "Refresh".
  - The acceptance test wizard lists all of the drives that could be involved.
3. Select the drives to which you want to transfer the results.  
The selected drives become instances of the tested drive.
4. Click on "Apply".  
The transfer status is displayed in the function view.
5. You disconnect instances from the tested drive using "Deselect" and "Apply".

## Optional acceptance test functions

### Overview

Startdrive provides additional functions for the acceptance test. More details on these functions can be found in the TIA Portal information system.

### Description of function

#### Safety Activation Test

You test the control signals in the automation topology using the "Safety Activation Test".

The "Safety Activation Test" tests the following:

- Is the defined signal path correctly run through from the sensor through the evaluation up to the drive and/or actuator?
- Are there wiring errors or other errors present?

You can use the acceptance test to test the Safety Integrated Functions in the SINAMICS drive for proper parameterization.

Test cases that define the input conditions (system states) and the expected system responses are defined for this purpose. Wizards are available for the tests. The results of the acceptance test are included in the acceptance report.

#### User-defined texts

You describe the instructions of the individual test steps together with the terminology using user-defined texts. Align the operating instructions to address the specific operation of your machine. A screen form shows the instruction texts for the individual steps of all test cases. These are marked with the "System" description.

Depending on the specific requirement, either filter the test cases of the current drive or the sum of all test cases for the drives in the project.

#### Multuser Engineering

The acceptance test is possible in the multi-user engineering. The following individual functions are available:

- The acceptance test for an axis is performed in a local session, and is checked into the test results of the server session.  
In the server session, the potentially available test results of this axis are overwritten with the results from the local session.
- The "Safety Activation Test" for a drive is performed in a local session and is checked into the test results of the server session.  
In the server session, test results potentially available for this drive are overwritten with the results from the local session.

## 9.7.5 Configuring telegrams

### 9.7.5.1 Calling the telegram configuration

#### Overview

The "Telegram configuration" function is part of the device configuration, and is displayed in the inspector window.

You can either call this function via the project tree or for Startdrive S drives, also via direct links from the communication screen forms.

Information about the telegrams used in the converter is provided in Chapter "Communication telegrams (Page 705)".

#### Requirement

- The drive has been completely created and specified in the device configuration.
- For activated user management (UMAC):  
The function rights required to configure telegrams in the inspector window are activated for your user role.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Procedure

1. Open the drive in the project tree and double-click on entry "Device configuration".  
The device configuration opens.
2. Select the S210 drive in the device configuration.
3. Select the entry "Telegram configuration" in the "Properties" tab of the inspector window.  
The settings for the telegram configuration are displayed below the respective fieldbus interface.

### 9.7.5.2 Telegram settings

#### Overview

The dialog box for the telegram configuration is structured as follows:

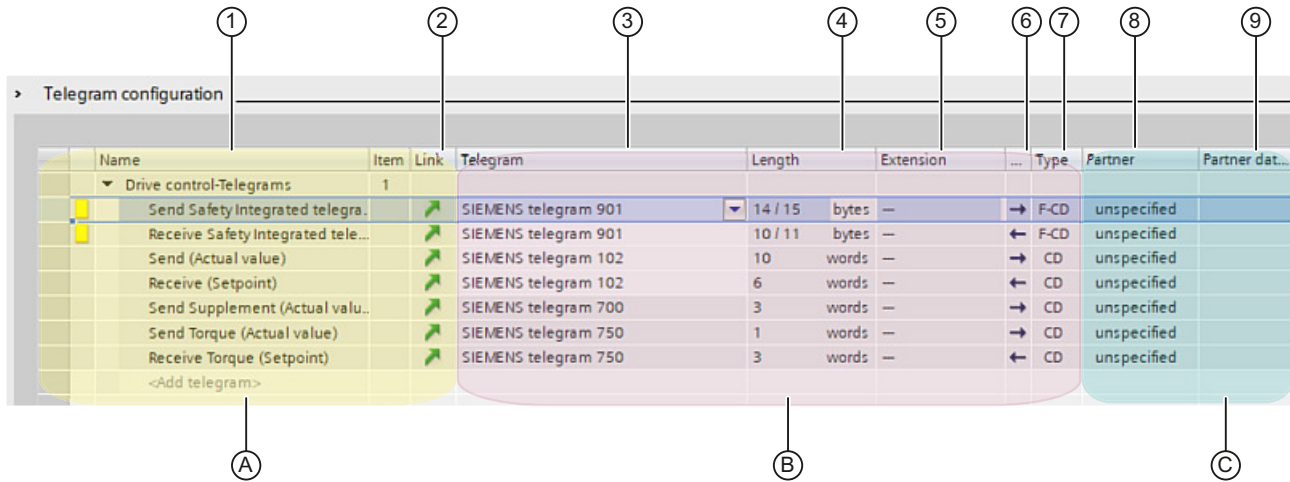


Figure 9-7 Telegram configuration

Number	Description
A	Area for drive objects (setpoints, actual values and safety components)
B	Area for the interfaces
C	Area for the communication partners of the drive (e.g. controller or another drive)
①	Drive object display
②	Link to the communication screen forms of the particular drive object
③	Drop-down list with the available telegrams
④	Length of the telegram
⑤	Telegram extension
⑥	Communication direction (send direction →/receive direction ←)
⑦	Type of communication
	CD = Controller - Device for PROFINET IO
	F_ = PROFIsafe-specific extension (safety telegram)
⑧	Name of the partner (controller)
⑨	Partner data area

#### More information

Detailed information on configuring telegrams is also provided in the TIA Portal information system.

### 9.7.5.3 Adding telegrams

#### Overview

You can add the following telegrams once, as long as they are still not available in the telegram list of the drive object:

- PROFIsafe telegram
- Supplementary telegram 700
- Torque telegram 750

#### Requirement

- A drive and a partner are created in the project, and connected via a fieldbus. The drive is selected and the parameter editor is open.
- For activated user management (UMAC):  
The function rights required to configure telegrams in the inspector window are activated for your user role.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Procedure

To add a telegram, proceed as follows:

1. Open the following menu path from the secondary navigation of the inspector window: "Properties > PROFINET interface > Telegram configuration".
2. Click on entry "Add telegram" (at the required drive object).  
A drop-down list opens. All telegram types that have not been assigned yet can be used.
3. Select the required telegram type.  
The entries for the telegram are created.
4. If required, now change the telegram type, e.g. from telegram 30 to telegram 901.
5. Save the project.

#### Result

Telegram is added.

## 9.8 Optimizing commissioning

### 9.8.1 Establishing online connection

#### Overview

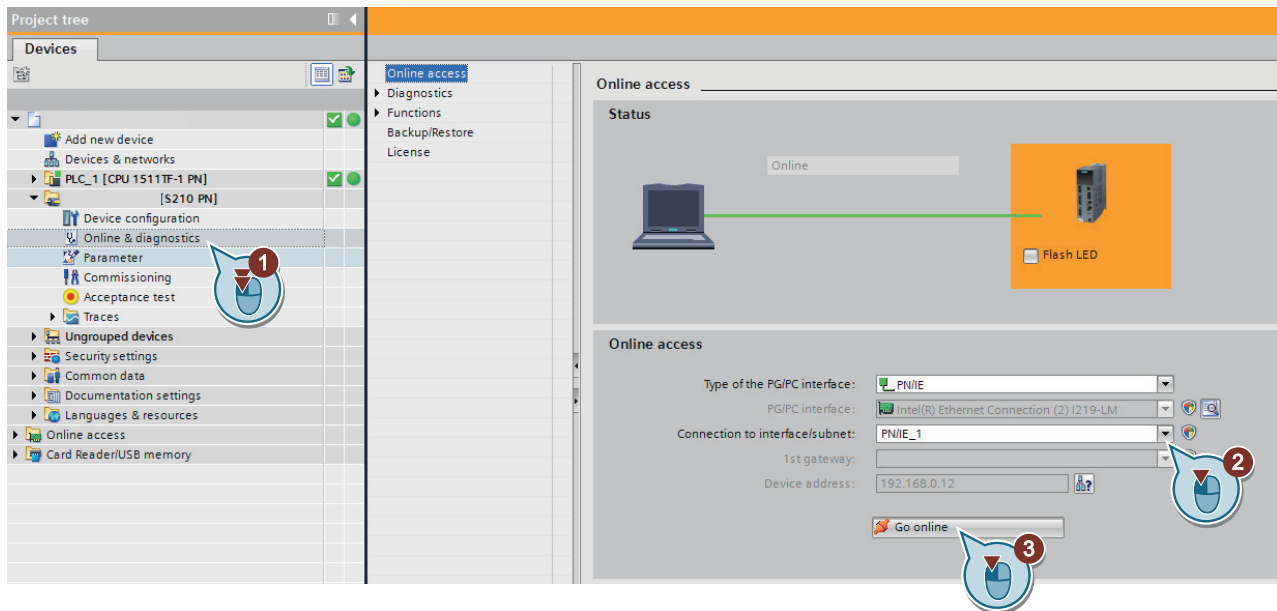
Before you traverse your drive from the control panel or optimize the axis, you need to establish an online connection to the drive.

#### Requirement

- The configuration is loaded into the SIMATIC S7 controller.  
The drive can therefore be accessed in the PROFINET network via the SIMATIC S7 controller and your operating unit is connected to the corresponding PROFINET interface of the controller (e.g. X1).
- For activated user management (UMAC):  
The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Procedure

1. Double-click the **Online & diagnostics** entry in the project tree under the S210 drive. The "Online access" function view is displayed.



2. Select the PROFINET network in the "Connection with interface/subnet" drop-down list.
3. Click the "Go online" button.

## Result


The online connection to the drive is established.

## 9.8.2 Traversing the drive from the control panel with speed setpoint

### Overview

Traverse the drive from the control panel and test the settings made. The control panel can only be activated for one drive.

By activating the control panel, you assume master control of the drive. Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.


 <b>WARNING</b>
<b>Risk of death if the safety instructions for the control panel are not carefully complied with</b>
The safety shutdowns from the higher-level controller have no effect with this function. The <b>Stop with space bar</b> function is not guaranteed in all operating states. Incorrect operation by untrained personnel – without taking into account the appropriate safety instructions – can therefore result in death or severe injury.
<ul style="list-style-type: none"><li>• Make sure that this function is only used for commissioning, diagnostic and service purposes.</li><li>• Make sure that this function is only used by trained and authorized skilled personnel.</li><li>• Ensure that EMERGENCY OFF circuit is always implemented as hardware circuit.</li></ul>

### Note

#### Drive responds immediately

Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

## Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.
- Display area "Rotate & Optimize"  was opened via the project tree.
- For activated user management (UMAC):  
The function rights required to edit the drive data and to use the control panel are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

You can traverse the drive using both the control panel of the technology object and the control panel of the drive itself.

Proceed as follows to traverse the drive from the control panel of the drive:

1. Select the "Control panel" function in the secondary navigation.  
The corresponding function view is displayed.
2. Click the "Activate" button to enable master control for the drive.  
The "Activate master control" message window is displayed.
3. Read the alarms carefully and check the value for the monitoring time.  
The monitoring time specifies the time during which the connection from your operating unit to the drive is cyclically monitored. The monitoring time is preset to 2000 ms and should only be changed if required.
4. Confirm the monitoring time with "OK".  
The message window closes and the control panel is enabled. The drive enables are set automatically.
5. In the "Speed" input field, enter a value  $\leq$  the maximum speed.
6. Traverse the drive in the desired direction using the controller buttons.
7. Click the "Deactivate" button to disable master control.  
The "Deactivate master control" dialog window is displayed.
8. Confirm deactivation of master control with "Yes".

## Result

The current values of various parameters are displayed under "Actual values". Enables and faults are displayed under "Drive status". In addition to "Active fault", the currently pending fault is displayed.

### 9.8.3 Perform One Button Tuning


#### Overview

For One Button Tuning (OBT), the mechanical drive train is measured using short test signals. This means that you optimally adapt the controller parameters to the mechanical system being used. Using this optimization routine, you can determine the optimum controller settings with just a few entries.



#### Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.



- Display area "Rotate & Optimize"  was opened via the project tree.
- For activated user management (UMAC):  
The function rights required to edit the drive data and to use the control panel are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure


1. Select the "One Button Tuning" function in the secondary navigation.  
The corresponding function view is displayed.
2. Select the desired setting (e.g. "Conservative") in the "Dynamic settings" area.  
The "Standard" setting is selected by default.
3. Enter a value (e.g. 360) in the input field "Path limit from 0° to".  
Sensible controller parameters are obtained from an angle > 90°.
4. Confirm the entry with "Enter".  
The error icon  is then hidden.
5. Click the "Activate" button to enable master control for the drive.  
The "Activate master control" message window is displayed.
6. Read the alarms carefully and check the value for the monitoring time.  
The monitoring time specifies the time during which the connection from your operating unit to the drive is cyclically monitored. The monitoring time is preset to 2000 ms and should only be changed if required.
7. Confirm the monitoring time with "OK".  
The message window is closed and One Button Tuning is activated.
8. Click the "Start" button to start the optimization.  
Optimization of the drive is performed. After optimization is completed successfully, the green status icon  appears and the changed values are shown in the "Current value" column in the "Result of optimization" area.



### NOTICE

#### Unpredictable drive response when making manual changes after One Button Tuning

Manual changes of the calculated values can lead to unpredictable behavior of the drive. This can damage the drive.

- After the One Button Tuning, carefully check that the optimized values are not subsequently changed manually.
- Always first restore the factory settings if you do not want to use the values optimized using One Button Tuning.

9. Click the "Deactivate" button to disable master control.  
The "Deactivate master control" dialog window is displayed.
10. Confirm deactivation of master control with "Yes".
11. Click the memory card icon  to store the result of the optimization permanently in your drive.

12. To load the data from your drive into the project, first select the drive unit in the project tree and then click the  icon (Upload from device) in the toolbar.
13. Click the icon  (Save project) to store the result of the optimization permanently in your drive.

## Result

You have performed the optimization routine and saved the result of the optimization permanently in your drive and project.

## 9.8.4 Terminating the online connection

### Overview

After you traverse your drive from the control panel or optimize the axis, you need to disconnect the online connection to the drive.

### Requirement

- For activated user management (UMAC):  
The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

### Procedure

1. Click on the S210 drive in the project tree.
2. Click on "Disconnect online connection" in the menu bar.

## Result

The online connection to the drive is disconnected.

## 9.9 Using online diagnostic functions

### 9.9.1 Diagnostics icons

#### Overview













Faults, alarms and any maintenance that is required are indicated using diagnostic icons.

## Description of function

The icons are displayed in the following areas of the TIA Portal:

- Project tree
- Device view
- Device overview

The icons are displayed in both the line as well as topology views.

Icon	Meaning
	No fault or maintenance required
	Maintenance required
	Maintenance requirement for a subordinate component
	Maintenance request
	Maintenance request for a subordinate component
	Fault/error
	Fault/error on a subordinate component
	Connection error to the device
	Establish a connection
	The diagnostic status is determined
	The configured device and the actual device have incompatible types.
	The device is only available in the offline configured device configuration and has been deactivated.

## 9.9.2 Display messages


### Overview

The diagnostic icons, which are displayed in the network and topology views, are assigned to specific messages.

### Requirement

- For activated user management (UMAC):  
The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

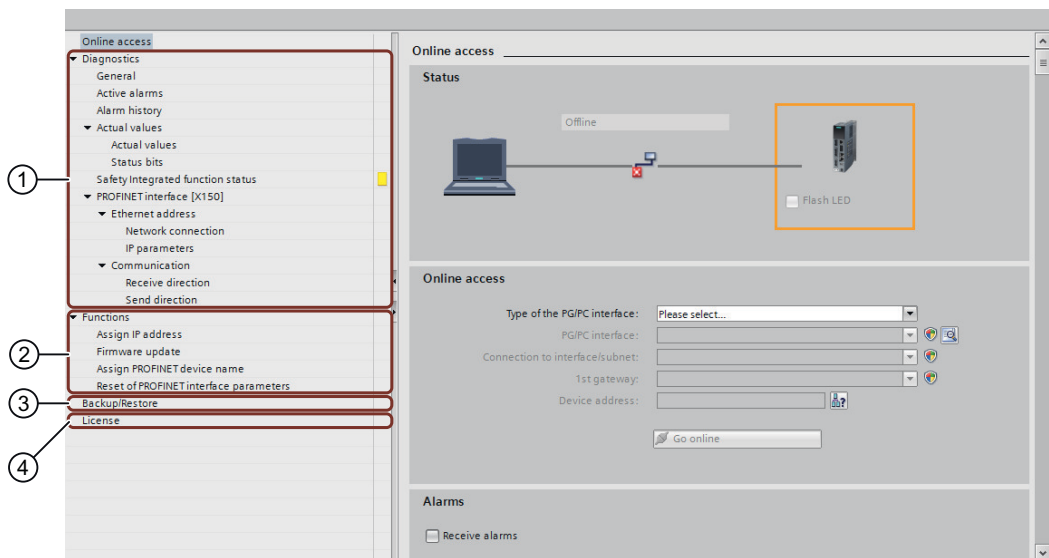
Procedure

1. Double-click on a diagnostics icon, for example . The inspector window opens.
2. Click the "Message display" tab. All current messages are displayed.

### 9.9.3 Calling Online & Diagnostics

Overview

In the diagnostics view, you can see important information about the drive or make important basic settings.



- ① "Diagnostics" (information on the condition of the drive)
- ② "Functions" (configuration of the physical interfaces)
- ③ "Backup / Restore"
- ④ Overview of licenses

Figure 9-8 Overview: Diagnostic functions

Requirement

- For activated user management (UMAC): The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

1. In the project tree, double-click on menu "Online & 'Diagnostics".  
Diagnostics and diagnostic functions are displayed in the secondary navigation and can be called from here.
2. Select the "Online access" entry in the secondary navigation.
3. Select the network interface of your operating unit.
4. Click on "Go online".  
The online connection to the drive is established.
5. Click on "Go offline" in the menu bar.  
The online connection to the drive is disconnected.

### 9.9.4 Diagnostics


#### Requirement

- There is an online connection between the drive and the operating unit.  
Diagnostic information can only be read out in the online mode.
- For activated user management (UMAC):  
The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Description of function

You call the individual diagnostic information in the secondary navigation of the diagnostics view.

The following information on the connected drive is provided in the diagnostics view:

- General:  
Information about component, module and manufacturer is displayed.
  - This means that you identify the drive, and the most important drive data are displayed.
- Security:  
Information about security settings of the connected drive is displayed.  
You can find more information in Chapter "Security (Page 312)".
- Active messages:  
Information about active alarms and faults is displayed.
  - For a fault, the status signal ZSW1.3 is sent. Faults must be acknowledged once the cause has been resolved. To do this, use the function icon at the top of the function view ().
  - For an alarm, status signal ZSW1.7 is set. The alarm is also entered into the alarm buffer. Alarms are self-acknowledging.

- Message history:
  - The message history records all alarms and faults.
  - Using the function icons in the function view, you can either delete the fault buffer (🗑️) or export to a CSV file (📄➡️).
- Actual values:

Information about the most important parameter actual values and status bits is displayed.
- Safety Integrated Function status:

Information about the current status of Safety Integrated Functions is displayed. You can find more information in Chapter "Fundamentals for Safety Integrated commissioning (Page 288)", in "Function status".
- PROFINET interface (X150):
  - Ethernet address:

Information about IP parameters (IP address and subnet mask) and network connection (MAC address) is displayed.
  - Communication:

Information about send and receive directions (PZDs of telegrams e.g. 105) is displayed. More detailed information on PZDs and telegrams is provided in Section "Communication (Page 313)".

## 9.9.5 Security

### Requirement

- There is an online connection between the drive and the operating unit. Diagnostic information can only be read out in the online mode.
- The user administration (UMAC) is activated for the project and drive. The following applies: The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Description of function

A summary of the active security settings of the connected converter is displayed in diagnostics view "Security".

- Logged-in user:
  - The user that is logged into the drive.  
OR
  - No logged-in user, as UMAC is not active.  
In this case, we recommend activating UMAC.
- Ports & protocols:
 

Displays the activation state for the interfaces of the following areas:

  - Web server access
  - Fieldbus and associated protocols
  - S7 commissioning reports
  - DHCP configuration
- UMAC settings:
 

Shows certain UMAC settings which are activated for the drive. Shows, for example, whether UMAC is active and what rights the user account "Anonymous" has.

You can only change the displayed security settings offline in the inspector window of the converter in the project.

## 9.9.6 Communication

### 9.9.6.1 Receive direction


#### Requirement

- For activated user management (UMAC):
 

The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Description of function

As standard, the components and interconnections of PROFIdrive telegrams in the receive direction for the converter are displayed in this function view (e.g. 105, 700 or 750).

You can add additional telegrams via the telegram configuration (). The content of the selected telegram is then displayed in the "PROFIsafe" or "Supplementary data" area.

#### Telegram structure

The process data in the receive direction are created automatically.

Only those telegrams available for the converter are offered. The following information of the displayed telegrams is displayed:

Telegram type	PZD	Display of the value	Format switchover	Control words
	The numbering and arrangement of the process data.	Value of the process data (PZD)	The value of the process data is switched to a different representation (hex, bin, dec).	List of the control words that are transmitted in the telegram.
PROFIdrive 3, 5, 102, 105	X	X	X	X
PROFIsafe 30, 901	X	X	X	X
Supplementary data 700	X	X	X	X
Torque supplementary telegram 750	X	X	X	X

### 9.9.6.2 Send direction

#### Requirement

- For activated user management (UMAC):  
The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Description of function

As standard, the components and interconnections of PROFIdrive telegrams in the send direction for the converter are displayed in this function view (e.g. 105, 700 or 750).

You can add additional telegrams via the telegram configuration (). The content of the selected telegram is then displayed in the "PROFIsafe" or "Supplementary data" area.

#### Telegram structure

The interconnections for the process data in the send direction are created automatically for the standard and manufacturer-specific telegrams.



The following information of the displayed telegrams is displayed:

Telegram type	Status words	Value	Format switchover	PZD
	List of the status words that are transferred in the telegram.	Value of the process data (PZD)	The value of the process data is switched to a different representation (hex, bin, dec).	Numbering and arrangement of the process data.
PROFIdrive 3, 5, 102, 105	X	X	X	X
PROFIsafe 30, 901	X	X	X	X
Supplementary data 700	X	X	X	X
Torque supplementary telegram 750	X	X	X	X

## 9.9.7 Functions

### Overview

In the "Functions" area, you can call the following functions via the secondary navigation of the diagnostic view and make settings within them:

- Assign IP address
- Firmware update
- Assign PROFINET device name
- Reset PROFINET interface parameters
- Set time

### 9.9.7.1 Resetting PROFINET interfaces

#### Overview

To restore the converter to the delivery state, you need to reset the PROFINET interfaces of the converter in addition to restoring the factory settings.

If the converter is connected to a SIMATIC S7 controller while the PROFINET interfaces are being reset, the controller assigns new interface parameters to the converter immediately after the reset. To prevent this, switch the controller to "Stop" mode before the reset or terminate the connection between controller and converter.

## Requirement

- The connection between the converter and control system is disconnected.
- For activated user management (UMAC):  
The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

1. In the secondary navigation, open menu "Functions".
2. Click on menu "Reset of PROFINET interface parameters".  
The corresponding function view opens.
3. Select one of the following options:
  - Retain I&M data  
If the option "Retain I&M data" is active, the I&M1 to I&M3 data are retained.
  - Delete I&M data  
If the option "Delete I&M data" is active, the I&M1 to I&M3 data are deleted.
4. Click on the "Reset" button.

## Result

The parameters of the PROFINET interfaces are reset. The reset data are displayed in the "Online access" function view.

## More information

More information on restoring the factory settings is provided in Chapter "Restore factory settings (Page 320)".

## Overview

The option "Synchronize with an NTP server" is activated when the "Set time" diagnostics view is called up for the first time.


## Description of function

For the operation of a drive, the definition of a drive time is important. The following options are available:

- Synchronize with NTP server  
If the drive is connected to other devices and a central NTP server is to provide the time for the connected devices. Alternatively, a controller can also act as NTP server.
- No synchronization, set time manually  
if the drive is initially operated without control.

You set the drive time in the diagnostics view as a direct function. If a time has already been set, it is displayed in the "Current drive time" area. If it is a synchronized time, the NTP server used is also displayed in the "Time source" field.

Alternatively, you can set the time settings offline in the inspector window of the drive. However, these settings are only transferred to the drive when the drive data are loaded.

If you differentiate the time settings between the drive and the project, this is indicated by the icon . In this case, reload the drive data into the drive.

### 9.9.7.2 Setting the time with synchronization (NTP server)

#### Requirement

- The drive is operated with a controller.
- There is an online connection between the drive and the operating unit.  
The direct functions can only be performed in online mode.

#### Procedure

1. If the "Synchronize with NTP server" option is not enabled, enable this option.  
By default, the "Use PLC as NTP server" option is now enabled. If the drive is connected to a PLC, the IP address of the PLC is displayed.
2. Disable the option "Use PLC as NTP server".  
The input field for the IP address is cleared.
3. Enter the IP address of the desired NTP server in the "IP address" field.
4. Select the time zone of your country in the "Time zone" area.  
Example: For Central Europe, use the time zone "GMT+01:00".
5. Then click "Apply".

#### Result

The set time is directly transferred to the drive. The current time settings are displayed in the "Current drive time" area.

### 9.9.7.3 Setting the time with synchronization (PLC as NTP server)

#### Requirement

- The drive is operated with a controller.
- There is an online connection between the drive and the operating unit.  
The direct functions can only be performed in online mode.

## Procedure

To synchronize the time, proceed as follows:

1. If the "Synchronize with NTP server" option is not enabled, enable this option.  
By default, the "Use PLC as NTP server" option is now enabled. If the drive is connected to a PLC, the IP address of the PLC is displayed.
2. Select the time zone of your country in the "Time zone" area.  
Example: For Central Europe, use the time zone "GMT+01:00".
3. Then click on "Apply".

## Result

The set time is directly transferred to the drive. The current time settings are displayed in the "Current drive time" area.

### 9.9.7.4 Setting the time without synchronization

#### Overview

A time of the drive without synchronization is used if the drive is operated for test purposes without a control unit connected.

#### Requirement

- There is an online connection between the drive and the operating unit.  
The direct functions can only be performed in online mode.

#### Procedure

1. Activate the option "No synchronization, set time manually".  
You can then choose whether to copy the time from your operating unit or enter the time manually.
2. If you want to use the time from your operating unit, activate the option "Use time from PG/PC".  
- Or -  
If you want to set the time manually, proceed as follows:
  - In the "Drive time" area, set the current calendar day, the current year, and the desired time.
  - Select the time zone of your country in the "Time zone" area.  
Example: For Central Europe, use the time zone "GMT+01:00".
3. Then click "Apply".

## Result

The set time is directly transferred to the drive. The current time settings are displayed in the "Current drive time" area.

## 9.9.8 Backup and restore

### Overview

Perform the following actions in function view "Backup/Restore":

- Restart the drive now
- Retentively save the drive data in the converter
- Restore the drive data to factory settings  
Security and interface settings are excluded.
- Restore Safety Integrated settings to factory settings

### 9.9.8.1 Restart the drive now

#### Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing online connection (Page 304)").
- The drive is switched on and has voltage.
- For activated user management (UMAC):  
The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Procedure

1. In the secondary navigation, click on menu "Backup/Restore".  
The corresponding function view opens.
2. In the "Restart the drive" field, click on "Restart".

#### Result

The drive is restarted. The restart is finished when the RDY and COM LEDs on the drive light up green.

### 9.9.8.2 Retentively saving the drive data

#### Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing online connection (Page 304)").
- Optional memory card is inserted (for a parameter backup).
- For activated user management (UMAC):  
The function rights required to edit and save the drive data are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

#### Procedure

1. In the secondary navigation, click on menu "Backup/Restore".  
The corresponding function view opens.
2. Click on the "Save" button in the "Save RAM data retentively" field.

#### Result

Drive data are retentively saved in the drive.

If you have inserted an SD card in the drive, the drive data are stored on the memory card in addition.

### 9.9.8.3 Restore factory settings

#### Overview

With this function, you restore the user-specific parameterization of the converter to factory settings.

The following data are retained when the factory settings are restored:

- Communication interface settings
- Security settings
- Language setting
- Date and time

In the following cases it may be necessary to restore the converter to factory settings:

- Incomplete commissioning
- If the motor is changed
- If there is uncertainty regarding the previous parameterization and/or the previous use of the converter

## Requirement

- There is an online connection between the project and the drive.  
You can find more information in Chapter "Establishing online connection (Page 304)".
- For activated user management (UMAC):  
The function rights required for "Restore factory settings" are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Procedure

1. In the secondary navigation, click on menu "Backup/Restore".  
The corresponding function view opens.
2. Click the "Start" button in the "Restore factory setting" field.

## Result

The converter is reset and then restarted. If the "RDY" and "COM" LEDs on the converter light up green, resetting is complete.

## More information

For a full reset of the converter, proceed as described in Chapter "Manual reset to factory settings with memory card (Page 351)".

### 9.9.8.4 Restoring the Safety Integrated factory settings

#### Overview

It is not always necessary to reset all of the converter settings. A separate reset function exists for Safety Integrated settings, which explicitly only restores Safety Integrated settings to factory settings.

#### Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing online connection (Page 304)").
- For activated user management (UMAC):  
The function rights required to edit drive settings and Safety Integrated settings are activated for your user account.  
Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

**Procedure**

To restore the Safety Integrated factory settings, proceed as follows:

1. In the secondary navigation, click on menu "Backup/Restore".  
The corresponding function view opens.
2. In field "Restore Safety Integrated factory setting", click on "Start".

**Result**

The current Safety Integrated settings in the converter are reset. The converter is then restarted. When both LEDs on the converter are lit green, the Safety Integrated settings of the converter have been reset to factory settings.

**9.9.9 Overview of licenses****Overview**

In the online mode, in function view "License", you can view information about options/ functions that require licensing and also perform the following actions:

- View status of individual licenses.
- Load license file.
- Display and copy serial number of the memory card being used.
- Activate Trial License mode.




**Requirement**

- For activated user management (UMAC):  
The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

**Description of function**

Element	Description
General license status	Indicates the current license status (e.g. you do not have all of the licenses you need).
System response	Displays the system response to the current license status, e.g. "Blocks the drive from being switched on again."
Trial period	Displays of the Trial License status; e.g. "Trial License mode not active".
Serial number of the memory card	Serial number of the memory card and button to copy the serial number
Activate Trial License mode	Button for activating Trial License mode
Activate the license key file	Button for loading a license file
Save eCoL archive	Button for saving the license certificates to the file system of the operating unit



Element	Description
<b>Table columns</b>	
Status	The following icons indicate the status:  License is complete.  Trial License mode is active.  License is not available or the memory card with license is not inserted (under licensed).
Function that requires licensing	List of all used system options/functions subject to licensing
Existing/required licenses	The required number of licenses compared with the number of licenses included with the license key. For operation, the number of available licenses $\geq$ the number of licenses required.
License status	Displays the current status of the function subject to licensing.
Remaining operating time	Displays the remaining operating time of a trial period.

### Trial License mode

Licenses for functions requiring licensing can either be ordered together with an SD card for an S210 drive or, when ordered later, can be assigned to an existing SD card via the Web License Manager. Most of the functions that require licensing can also be operated for a limited period of time in Trial License mode.

Before you activate Trial License mode, make sure to read the information and notes in the "About the licensing process" dialog.

### More information

- More information about the license file and about extending licenses is provided in Chapter "Functions that require licensing (Page 90)".
- Additional information about the licensing process or on the trial license mode is provided in the TIA Portal information system. There, browse for S210 drives using the keyword phrase "Managing supplementary functions that require a license".

## 9.9.10 Updating the firmware in the Startdrive project

### Overview

You upgrade the converter firmware directly in the Startdrive project.

---

#### Note

##### Firmware version in Startdrive project and drive


Online connections between the Startdrive project and drive are only possible if the firmware versions in the project and the drive are the same.

- Create a new project if your current project works with a firmware version that is older than the firmware version of the drive. Set the firmware version of the project to the currently upgraded version of the drive. Apply all of the other settings from the old project.
  - If you are using an old Startdrive version, it may be necessary to install a new Startdrive version that supports the firmware version.
- 




### Requirement

- For an update via an online connection:  
A physical connection between the Ethernet interface of your operating unit and the Ethernet or PROFINET interface of your drive.
- For activated user management (UMAC):  
The function rights required for the firmware update are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".



### Procedure

1. Open the  Online access entry in the project tree.
2. Select the network interface of your operating unit.
3. Double-click "Update accessible devices".  
The accessible device is displayed with the IP address.
4. Call the "Online & diagnostics" function for the displayed device.  
An online connection to the selected participant is established and the "Online access" function view opens.
5. Expand the "Functions" entry in the secondary navigation.
6. Click the "Firmware update" entry.  
The corresponding function view opens.  
In the "Online data" area, the article number of the drive and the firmware version currently in use are displayed.
7. Click the "Browse" button in the "Firmware loader" area.  
A selection dialog opens.

8. Select the firmware file with the required version in the file system of your operating unit.  
The firmware file is displayed in the line with the same name in the "Firmware loader" area.
9. Check in the "Firmware version" field whether you have selected the required firmware version.
10. In the "Status" field, check that the firmware can be read.
11. Optional: Activate the option "Restart drive automatically".  
If this option is activated, there is no need to restart the drive manually after the firmware update. Step 13 is omitted in this case.
12. To load the firmware to the drive, click on "OK".
  - The status of the firmware update is displayed in the "Status" field.  
The new firmware is installed. The installation may take up to 15 minutes or longer.  
The progress is displayed at the converter LEDs.

RDY	COM	Explanation of LED displays
		Firmware update is active: <ul style="list-style-type: none"> <li>• Do not switch off the power supply.</li> <li>• Do not disconnect the motor from the converter.</li> </ul>
	-	Initializing firmware

- If the firmware is loaded, then the connected DRIVE-CLiQ components are updated.

RDY	Explanation of LED displays
 (0.5 Hz)	Firmware of the connected DRIVE-CLiQ components being updated: <ul style="list-style-type: none"> <li>• Do not switch off the power supply.</li> <li>• Do not disconnect the motor from the converter.</li> </ul>
 (2 Hz)	Firmware of the DRIVE-CLiQ components has been updated: <ul style="list-style-type: none"> <li>• Waiting for POWER ON of the respective component. <b>Remedy:</b> Switch the component off and on again.</li> </ul>

#### Note

#### Check that the firmware has been updated

Startdrive displays an appropriate message when completing the update. After the message has been displayed, using the LEDs, check whether the converter update has been completed.

13. Optional: If you have not activated the option "Restart drive automatically...", switch the converter off and on again.
14. Optional: Call the catalog information using the secondary navigation in the inspector window. Check whether the new firmware version is installed.

### More information

Additional information about available firmware versions can be found on this website: (<https://support.industry.siemens.com/cs/ww/en/view/109812303>)

## 9.10 Checking using the trace function

### Overview

In a trace configuration, depending on the SINAMICS S drive being used, define the following:

- Signals to be recorded
- Recording duration
- Trigger conditions

### Requirement

- For activated user management (UMAC):  
The function rights required for trace configuration are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

## Description of function

The trace configuration for S210 drives is characterized by the following special features and device-specific default settings:

- Preset trace signals:
  - For the first trace that you create for an S210 drive, the first four signals are preassigned with the following parameters, which are typical for Motion Control applications:
    - r0062 (Speed setpoint after filter)
    - r0061[0] (Actual speed unsmoothed: Encoder 1)
    - r0080 (Torque actual value)
    - r0479[0] (Diagnostics encoder position actual value Gn\_XIST1: Encoder 1)

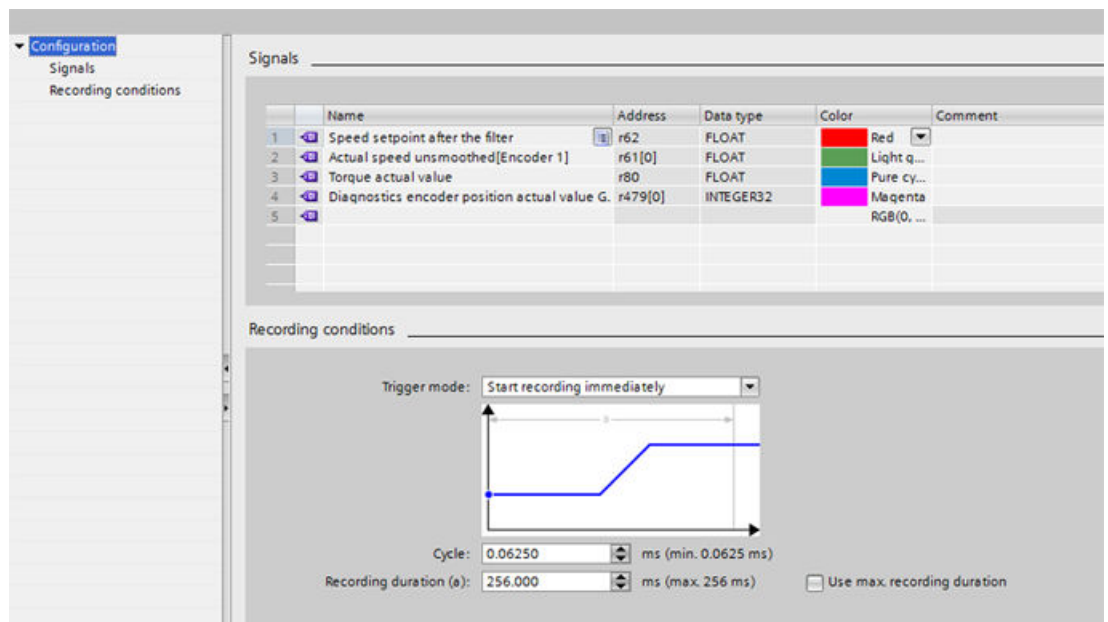


Figure 9-9 S210 trace called

No signals are preset for other traces you create for an S210 drive.

### Note

Other lines are not preassigned. When further signals are inserted, the cycle is changed to 4 ms.

- Possible cycle times:
  - In the "Cycle" input field of the trace configuration, you can enter the cycle time with which the trace should be recorded. The possible cycle times for an S210 drive depend on the number of signals to be recorded:
    - Up to four signals: 0.0625 ms minimum recording cycle
    - As of five signals: 4.0 ms minimum recording cycle
- Selecting signal bits based on plain text descriptions:
  - By selecting a trigger variable, you can display individual signal bits based on plain text descriptions (e.g. "Drive control.control word sequence control.ON / OFF1") in the trace

9.10 Checking using the trace function

configuration and select them directly. A description of how you can select an individual signal bit and set a trigger event is provided below using the "Drive control.control word sequence control" trigger variable as an example.

More information

Additional information on the trace function and configuration in the TIA Portal is provided in the TIA Portal information system.

9.10.1 Example: Selecting signal bits and setting the trigger event


Destination

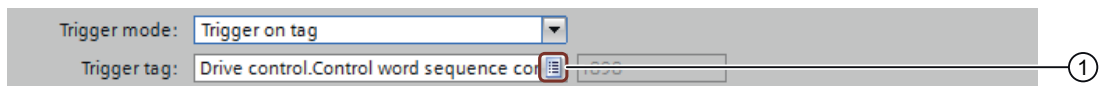
You want to make the basic settings for evaluating a trace.

Requirement


- For activated user management (UMAC):  
The function rights required for trace configuration are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>) in Chapter "Security settings in Startdrive".

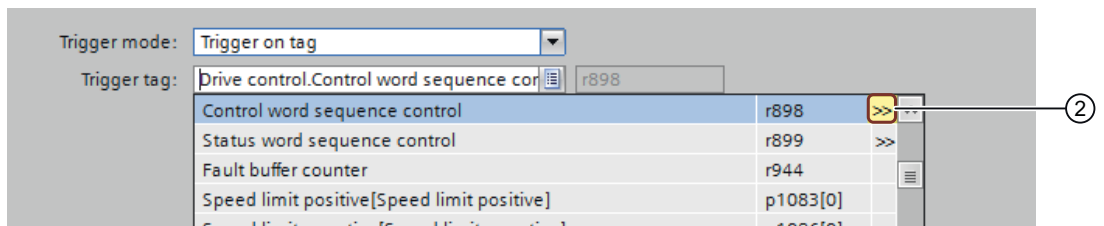
Procedure

1. Define a trigger mode (e.g. "Trigger on tag") via the "Trigger mode" drop-down list.
2. To open the signal selection table, click on the  icon in the "Trigger tag" input field.



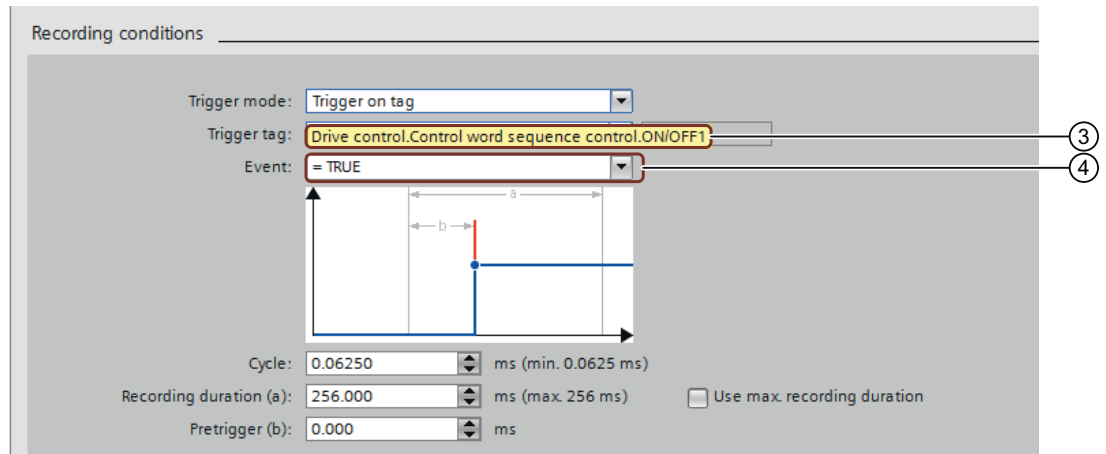
The signal selection table is displayed.

3. In the signal selection table, scroll to the desired signal (e.g. "control word sequence control").
4. To open the bit selection table, click on the  icon (2) in the row with the desired signal.



The bit selection table shows the bits of the selected signal in plain text (e.g. "control word sequence control.ON / OFF1").

5. Select the required bit.  
The selected bit is displayed in the "Trigger tag" input field ③.



6. To show the "Event" input field, press "Enter".  
The "Event" input field is displayed with a preset trigger event ④.
7. Select the desired trigger event, if necessary, using the drop-down list in the "Event" input field.  
The selected trigger event is displayed in the "Event" input field.





# Series commissioning

## Overview

In series commissioning, the backed-up data and settings of a converter are loaded to other converters.

## Requirement

The target converter must satisfy the following prerequisites:

- The rated power of the target converter is the same as the rated power of the converter from which the backed-up data and settings originate.
- The firmware version of the target converter is higher than or equal to the firmware version of the converter from which the backed-up data and settings originate.
- The machines that are commissioned via series commissioning are identical in terms of the application, converter and motor.
- The target converters are all configured to factory settings.

## Description of function

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### Note

PROFINET-IP address and PROFINET device name are not transferred for series commissioning. You must configure the PROFINET IP address and the PROFINET device names in the PLC. The converter takes the settings from the PLC.

---

There are two options when carrying out series commissioning of the converter:

- **Series commissioning with memory card**  
All settings on the memory card (including user management and access control) are transferred to the converter.
- **Series commissioning using the web server**  
All settings from the parameter backup (including user management and access control) are transferred to the converter.  
When performing series commissioning, also observe the fundamental principles for working with the web server (see Chapter "Fundamentals (Page 188)").

## 10.1 Series commissioning with memory card

### Series commissioning with a memory card

Proceed as follows to perform series commissioning using a memory card:


1. Insert an empty SD card with a maximum capacity of 32 GB (e.g.: 6SL5970-0AA00-0AA0) into the card slot of the converter while it is switched off.
2. Switch on the converter and perform commissioning.
3. Save the settings retentively at the end of commissioning.  
This saves the settings retentively not only on the converter but also to the memory card.
4. Switch off the converter and remove the memory card from the converter.
5. Insert the memory card into the next, switched off converter.
6. Switch on the converter and wait until it has ramped up - the RDY LED lights green.  
During ramp-up, the converter takes the settings from the memory card - including user management and access control.
7. Switch off the converter and remove the memory card from the converter.

Repeat steps 5 to 7 for all converters to which you want to transfer these settings.

## 10.2 Series commissioning using the web server

### Series commissioning using the web server

Proceed as follows to perform series commissioning using the web server:

1. Switch on the converter supply voltage and use your operating unit, e.g. a PC, to perform commissioning.  
You can find more information in Chapter "Commissioning (web server) (Page 187)".
2. Save the settings at the end of commissioning via .
3. Select "Backup and Restore" in the navigation - and back up the parameter settings in a file using "Back up parameters".
4. Connect your operating unit to the next converter.
5. Switch on the supply voltage to the converter.
6. Enter the IP address of the converter, e.g. https://169.254.11.22, in the browser.
7. Select the option "Exit the Security Wizard and continue with low security settings".  
User management and access control (UMAC) is not activated.  
You can configure the security settings at a later time, see Chapter "Protection & Security (Page 234)".
8. In the navigation, select "Backup and Restore" - and load the parameter settings using "Restore parameters via file" to the converter.  
The converter accepts the parameters (including from user management and access control) from the file and restarts.

Repeat steps 4 to 7 for all converters to which you want to transfer these settings.

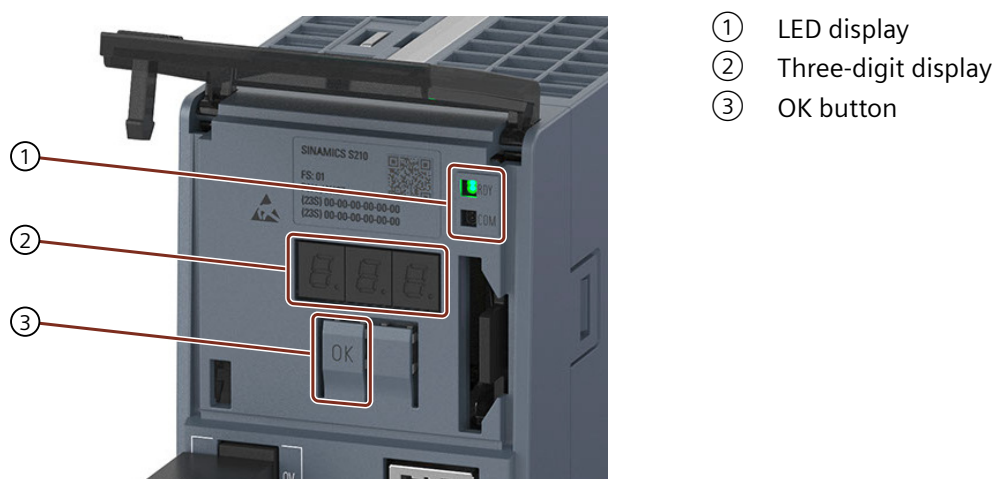


## Diagnostics

### 11.1 Status displays and operating elements on the converter

#### 11.1.1 Overview of display and operating elements on the converter

The status of the converter is displayed via the three-digit display as well as by the "RDY" and "COM" LEDs.



- ① LED display
- ② Three-digit display
- ③ OK button



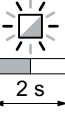


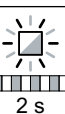

Display and operating elements on the converter

- Status display via LEDs
  - The converter displays the current operating state via two LEDs.
  - RDY: converter state
  - COM: communication state

During ramp-up, the LEDs assume different states.  
The converter is ready for operation when the "RDY" LED is permanently green.  
The LEDs always operate independently of one another, except when updating the firmware.
- Status display via the three-digit display
  - Normally, the display is dark.
  - During ramp-up, "210" appears as a reference to the SINAMICS S210 converter.
  - Faults are shown according to the message classes defined in PROFIdrive. If PROFIdrive diagnostics is active, the faults are simultaneously transferred to the control system.
  - More detailed information about alarms and faults is provided by the web server of the converter.
- OK button
  - You can acknowledge the faults whose cause has been corrected with the OK button.

### 11.1.2 Status display via LEDs

Table 11-1 Significance of the icons for the subsequent tables

Icon	Meaning
	LED is bright
	LED is OFF
	LED flashes slowly
	LED flashes in alternating order 3 times quickly - 2 s pause - ...
	LED is on for 3 s then flashes 3 times quickly
	LED flashes quickly
	LED flashes with variable frequency

Please contact Technical Support for LED states that are not subsequently described.

Table 11-2 Meaning of RDY and COM LEDs during converter ramp-up











RDY	COM	Meaning
		POWER ON All LEDs light up for approx. 1 s.
		BIOS loaded
-		Firmware has been checked. No CRC error detected.
		Loading firmware: RDY LED lights up red, COM LED flashes orange without fixed frequency.
	-	Firmware has been loaded.
	-	Initializing firmware
	-	Converter is ready for operation.

Table 11-3 Other states of RDY and COM LEDs during converter ramp-up




















RDY	COM	Meaning
		BIOS error: "An error occurred while loading the BIOS."
		Firmware has been checked. CRC error detected.
		File error: <ul style="list-style-type: none"> <li>Memory card is not available or is faulty.</li> <li>Software on the memory card is not available or is faulty.</li> </ul>
-		File error during firmware update
	-	Project being backed up.
	-	Manual reset to factory settings with memory card is completed.
		Firmware update is active.
	-	Firmware update completed. Converter waits until the power supply is switched off and switched on again after a firmware update.

Table 11-4 Significance of LED RDY in operation

RDY	Meaning
	The electronics power supply is missing or outside the permissible tolerance range. <b>Remedy:</b> Check the power supply.
	Temporary status after the supply voltage is switched on.
	The device is ready for operation. Cyclic DRIVE-CLiQ communication is in progress.
	Writing to the memory card
	Commissioning or restore factory settings via commissioning tool
	Manual reset to factory settings with memory card is active. The settings are reset.
	Manual reset to factory settings with memory card is completed.

11.2 Message classes in accordance with PROFIdrive











RDY	Meaning
	Active fault or missing license <b>Remedy:</b> <ul style="list-style-type: none"> <li>• Check the converter settings/configuration.</li> <li>• Activate the required license</li> </ul>
	Firmware update in progress for the connected DRIVE-CLiQ components. <ul style="list-style-type: none"> <li>• Do not switch off the power supply.</li> <li>• Do not disconnect the motor from the converter.</li> </ul>
	DRIVE-CLiQ component firmware update has been completed. Waiting for POWER ON of the respective component. <b>Remedy:</b> Switch the component off and on again.
	Converter detection via DCP flashing. RDY LED is green for 3 s and flashes red 3 times at 1 Hz <b>Additional flashing</b> on the PROFINET interface (X150) or Ethernet interface (X127): The Activity and Link LEDs flash 3 times at 1 Hz
	Missing license: There is no license, however, the Trial License Mode has been activated.

Table 11-5 Significance of LED COM in operation

COM	Meaning
	No bus fault is present.
	Temporary status after the supply voltage is switched on.
	Bus ok. cyclic communication running perfectly
	Bus ok; however, no setpoints (PLC in stop) In isochronous mode: Bus ok, no synchronization
	No bus connection <b>Remedy:</b> Make sure that the bus cables are connected and are not damaged.

## 11.2 Message classes in accordance with PROFIdrive

The message classes according to PROFIdrive are shown in the converter display.



Example: Message class 4: F04

Message class	PN <sup>1)</sup> (hex)	Explanation of the message class according to PROFIdrive - cause and remedy.
1	9000	<b>Hardware fault/software error</b> A hardware or software malfunction has been identified. <ul style="list-style-type: none"> <li>• Carry out a POWER ON for the relevant component.</li> <li>• If it occurs again, replace again.</li> </ul>
2	9001	<b>Line fault</b> A line supply fault has occurred (phase failure, voltage level, ...). <ul style="list-style-type: none"> <li>• Check the line supply/fuses.</li> <li>• Check the supply voltage.</li> <li>• Check the wiring.</li> </ul>
3	9002	<b>Supply voltage fault</b> An electronics power supply fault (24 V) has been identified. <ul style="list-style-type: none"> <li>• Check the wiring.</li> <li>• Check the voltage level.</li> </ul>
4	9003	<b>DC link overvoltage</b> The DC link voltage has assumed an inadmissibly high value. <ul style="list-style-type: none"> <li>• Check the dimensioning of the system (line supply, voltages).</li> <li>• Check the infeed settings.</li> </ul>
5	9004	<b>Power electronics fault</b> An inadmissible operating state of the power electronics has been identified (overcurrent, overtemperature, IGBT failure, ...). <ul style="list-style-type: none"> <li>• Check compliance with the permissible load cycles.</li> <li>• Check the ambient temperatures (fan).</li> </ul>
6	9005	<b>Electronic component overload</b> The temperature in the component has exceeded the highest permissible limit. <ul style="list-style-type: none"> <li>• Check the ambient temperature / control cabinet ventilation.</li> </ul>
7	9006	<b>Ground fault / inter-phase short-circuit detected</b> A ground fault / inter-phase short-circuit has been identified in the power cables or in the motor windings. <ul style="list-style-type: none"> <li>• Check the power cables (connection).</li> <li>• Check the motor.</li> </ul>
8	9007	<b>Motor overload</b> The motor was operated outside the permissible limits (temperature, current, torque, ...). <ul style="list-style-type: none"> <li>• Check the load cycles and set limits.</li> <li>• Check the ambient temperature / motor cooling.</li> </ul>

Message class	PN <sup>1)</sup> (hex)	Explanation of the message class according to PROFIdrive - cause and remedy.
9	9008	<p><b>Communication error to the higher-level controller</b></p> <p>The communication to the higher-level controller is faulted or interrupted.</p> <ul style="list-style-type: none"> <li>• Check the state of the higher-level controller.</li> <li>• Check the communication connection/wiring.</li> <li>• Check the bus configuration / clock cycles.</li> </ul>
10	9009	<p><b>Safety monitoring channel has identified an error</b></p> <p>A safe operation monitoring function (Safety) has detected an error.</p>
11	900A	<p><b>Actual position value / actual speed value incorrect or not available</b></p> <p>An illegal signal state was detected while evaluating the encoder signals (track signals, zero marks, absolute values, ...).</p> <ul style="list-style-type: none"> <li>• Check the encoder / state of the encoder signals.</li> <li>• Observe the maximum permissible frequencies.</li> </ul>
12	900B	<p><b>Internal (DRIVE-CLiQ) communication error</b></p> <p>The internal communication between the SINAMICS components is faulted or interrupted.</p> <ul style="list-style-type: none"> <li>• Check the DRIVE-CLiQ wiring.</li> <li>• Ensure an EMC-compliant design.</li> </ul>
13	900C	<p><b>Infeed fault</b></p> <p>The infeed is faulted or has failed.</p> <ul style="list-style-type: none"> <li>• Check the infeed and its environment (line supply, filters, fuses, ...).</li> <li>• Check the infeed control.</li> </ul>
14	900D	<p><b>Braking controller / Braking Module faulted</b></p> <p>The internal or external Braking Module is faulted or overloaded (temperature).</p> <ul style="list-style-type: none"> <li>• Check the connection/state of the Braking Module.</li> <li>• Comply with the permissible number of braking operations and their duration.</li> </ul>
15	900E	<p><b>Line filter faulted</b></p> <p>The line filter monitoring has identified an excessively high temperature or other inadmissible state.</p> <ul style="list-style-type: none"> <li>• Check the temperature / temperature monitoring.</li> <li>• Check the configuration to ensure that it is permissible (filter type, in-feed, thresholds).</li> </ul>
16	900F	<p><b>External measured value / signal state outside of the permissible range</b></p> <p>A measured value / signal state read in via the input area (digital/analog/temperature) has assumed an inadmissible value/state.</p> <ul style="list-style-type: none"> <li>• Identify and check the relevant signal.</li> <li>• Check the set thresholds.</li> </ul>
17	9010	<p><b>Application / technology function faulted</b></p> <p>The application / technological function has exceeded a (set) limit (position, speed, torque, ...).</p> <ul style="list-style-type: none"> <li>• Identify and check the relevant limit.</li> <li>• Check the setpoint specification of the higher-level controller.</li> </ul>

Message class	PN <sup>1)</sup> (hex)	Explanation of the message class according to PROFIdrive - cause and remedy.
18	9011	<b>Error in the parameterization/configuration/commissioning sequence</b> An error in the parameter assignment or in a commissioning run was identified, or the parameter assignment does not match the prevailing device configuration. <ul style="list-style-type: none"> <li>• Determine the precise cause of the fault using the commissioning tool.</li> <li>• Adapt the parameterization or device configuration.</li> </ul>
19	9012	<b>General drive fault</b> Group fault. <ul style="list-style-type: none"> <li>• Determine the precise cause of the fault using the commissioning tool.</li> </ul>

<sup>1)</sup> "Channel Error Type" of the PROFINET channel diagnostics. When channel diagnostics is activated, then the fault texts are indicated in the PLC.

## 11.3 Alarms

### Alarms

Alarms have the following properties:

- Alarms have no direct influence on the drive.
- Alarms disappear again when the cause is eliminated.
- Alarms cannot be acknowledged.
- Alarms are displayed as follows:
  - In the PLC according to the PROFIdrive message class
  - On the drive via LEDs
  - At the drive using the three-digit display according to the PROFIdrive message class
  - In the web server  
You can find more information on the display of alarms in Chapter "Messages (Page 214)".
  - In Startdrive  
You can find more information on the display of alarms in Chapter "Display messages (Page 309)".

Alarm code or alarm value describe the cause of the alarm.

### More information

You can find more information on alarms in Chapter "Overview of faults and alarms (Page 583)".

## 11.4 Faults

### Faults

Faults have the following properties:

- A fault may cause the motor to switch off.
- Faults must be acknowledged.
- Faults are displayed as follows:
  - In the PLC according to the PROFIdrive message class
  - On the drive via LEDs
  - At the drive using the three-digit display according to the PROFIdrive message class
  - In the web server  
You can find more information on the display of faults in Chapter "Messages (Page 214)".
  - In Startdrive  
You can find more information on the display of faults in Chapter "Display messages (Page 309)".

## Acknowledge fault

Before you can acknowledge a fault, you must have resolved the cause of the fault.

To acknowledge, you have the following options:

- Acknowledging via the PLC
- Acknowledging via the OK button under the front cover
- Switching off the converter power supply and switch on again
- Acknowledging via the web server or Startdrive
- The Safety Integrated error is acknowledged by selecting/deselecting the STO function. As a result of the extended message acknowledgment (p9507.0 = 1), possibly active messages of other Safety Integrated Functions are simultaneously acknowledged. You must also execute the standard acknowledgment mechanism.

You can only acknowledge faults detected by the internal converter monitoring of hardware and firmware by switching the supply voltage off and on again. In the list of faults, you will find the information on limitations when acknowledging at the corresponding fault codes.

## More information

You can find more information on faults in Chapter "Overview of faults and alarms (Page 583)".



## Service and maintenance

### 12.1 Service and maintenance for the motor

#### 12.1.1 Cleaning the motor

##### Information on cleaning

- The servicing and cleaning schedule must contain activities that ensure that the required hygiene status for food processing machinery is maintained over defined intervals.
- Clean the motor only when the drive is disconnected and de-energized.
- Clean the motor only when it has cooled down.
- Clean the motor in such a way that all surfaces are accessed and cleaned.
- Do not use cleaning equipment that can damage surfaces by abrasion or scratching, such as wire brushes and scrapers.
- For cleaning the motor enclosure, we recommend cleaning equipment that applies pressures of no more than 30 bar (3 MPa).  
Do not clean the shaft exit with a pressure washer.

##### NOTICE

##### Do not open the motor for cleaning

The motor must not be opened or disassembled for cleaning. This also applies to the cable gland.

##### Permissible cleaning agents


All surfaces of the motor are resistant to the following cleaning agents according to test regulation PM40-1 from ECOLAB.

Cleaning agent	Concentration in demineralized water
<b>Alkaline and chlorinated alkaline foam cleaners</b>	
Topaz CL1	3%
P3 topax 66	3%
Topax 960	5%
<b>Acidic foam cleaners</b>	
Topaz AC3	5%
Topaz AC4	5%
Topaz AC5	5%

12.1 Service and maintenance for the motor

Cleaning agent	Concentration in demineralized water
<b>TFC cleaner</b>	
Topactive 500	5%
Topactive 200	5%
Topaz MD5	5%
<b>Disinfectant cleaner</b>	
Topactive OKTO	3%
Topax 990	5%
Topactive DES	3%
<b>Others</b>	
Hydrogen peroxide H <sub>2</sub> O <sub>2</sub>	35 %
Demineralized water	-

**Requirement**

 <b>WARNING</b>
<p><b>Risk of injury if protective devices are removed.</b></p> <p>Operation without functioning protective devices can cause death or severe injury.</p> <ul style="list-style-type: none"> <li>• Operate the motor, even in test operation, only with functioning protective devices.</li> </ul>



## Procedure

If there are deviations from normal operation or if faults occur, proceed as follows.

1. Identify the fault using the following table.  
You should also take account of the messages of the converter.

Fault	Fault cause (see "Fault causes and remedial measures" key table)															
Motor does not start	A	B														
Motor starts slowly	A		C		F											
Humming sound when starting			C		F											
Humming sound in operation	A		C		F											
High temperature rise under no-load operation				D		I										
High temperature rise under load	A		C			I										
High temperature rise of individual winding sections					F											
Uneven running							J	K								
Grinding sound, running noise									L							
Radial vibrations										M	N	O	P			R
Axial vibrations												O		Q		R

2. Rectify the fault using the following table.

No.	Fault cause	Remedial measures
A	Overload	Reduce load
B	Interruption of a phase in the supply cable / motor winding	Check the frequency converter and supply cables, measure the winding resistances and insulation resistances, repair after consultation with manufacturer
C	Interrupted phase in the feeder cable after switching on	Check the frequency converter, supply cables and the winding resistances
D	Converter output voltage too high, frequency too low	Check the settings on the frequency converter, perform automatic motor identification
F	Winding short-circuit or phase short-circuit in stator winding	Measure the winding resistances and insulation resistances, repair after consultation with the manufacturer, if required, replace the motor
I	Heat dissipation impeded by deposits	Clean the surface of the drives and ensure that the cooling air can flow in and out unimpeded
	Cooling air inlet/outlet is blocked by foreign bodies	Remove the reason for the blocking and ensure that the cooling air can flow in and out unimpeded
J	Insufficient shielding for motor and/or encoder cable	Check the shielding and grounding
K	Excessive drive controller gain	Adjust the controller
L	Rotating parts are grinding	Determine cause and adjust parts
	Foreign bodies inside the motor	Replace the motor
	Bearing damage	For SH20... SH50, replace the motor; for SH63 ... SH100, replace the bearings and encoder
M	Rotor not balanced	Replace the motor

12.1 Service and maintenance for the motor

No.	Fault cause	Remedial measures
N	Rotor out of true, shaft bent	Consult the manufacturer
O	Poor alignment	Align motor set, check coupling
P	Coupled machine not balanced	Re-balance coupled machine
Q	Shocks from coupled machine	Check coupled machine
R	Fault originating from the gear-box	Adjust/repair gearbox

If the fault still cannot be resolved after taking the measures stated above, please contact the manufacturer or the Siemens Service Center.

### 12.1.2 Replacing the motor bearings

Motor bearings are wearing parts. They must be replaced after a defined number of operating hours.

At medium loads, the motor bearings last approx. 25000 h.

The motor bearings can only be replaced by the Siemens Service workshops. Contact Siemens Product Support for this.

Especially favorable ambient conditions, such as low average speed, low radial force (transverse force) and vibration load can prolong the interval until motor replacement.

---

**Note**

**Premature bearing and motor replacement**

Harsh operating conditions, e.g. continuous operation at  $n_{max}$ , high vibration/shock loads, frequent reversing duty reduce the bearing or motor replacement interval by up to 50 %.

---

### 12.1.3 Replacing the motor

#### 12.1.3.1 Replacement of the motor with a motor with the same article number


**Requirement**

The new motor has the same article number as the motor to be replaced.

## Procedure


1. Verify absence of operating voltage to the converter.



 <b>WARNING</b>
<b>Danger to life due to unintentional starting of the drive unit</b>
Unintentional starting of the drive unit can cause death or severe injury.
<ul style="list-style-type: none"> <li>• Make sure that the drive unit cannot be started accidentally.</li> <li>• Post a warning notice to this effect at the point where the switch is located.</li> </ul>

2. Replace the motor.



 <b>CAUTION</b>
<b>Burns as a result of touching hot surfaces</b>
In operation, the motor enclosure can reach high temperatures, which can cause burns if touched.
<ul style="list-style-type: none"> <li>• Do not touch any hot surfaces.</li> <li>• Allow the motor to cool down before starting any work.</li> <li>• Use the appropriate personnel protection equipment, e.g. gloves.</li> </ul>

- Release the motor plug. You will find detailed information in Chapter "Connecting the MOTION-CONNECT cable to the motor (Page 159)".
- Release the motor fixing screws.  
Do not on any account open the cable gland on the motor.
- Remove the motor.
- Mount and install the new motor. You will find detailed information in Chapter "Installing the motor (Page 145)".

3. Switch the converter on.

### 12.1.3.2 Replacement of the motor with a motor with a different article number

#### Overview

If the converter has already been operated with a motor, and you wish to replace this motor by another motor with a different Article No., then after replacing the motor, you must commission the converter again.


#### Requirement

The new motor has an article number that is different from that of the motor to be replaced.

**Procedure**


1. Verify absence of operating voltage to the converter.



 <b>WARNING</b>
<b>Danger to life due to unintentional starting of the drive unit</b>
Unintentional starting of the drive unit can cause death or severe injury.
<ul style="list-style-type: none"><li>• Make sure that the drive unit cannot be started accidentally.</li><li>• Post a warning notice to this effect at the point where the switch is located.</li></ul>

2. Replace the motor.



 <b>CAUTION</b>
<b>Burns as a result of touching hot surfaces</b>
In operation, the motor enclosure can reach high temperatures, which can cause burns if touched.
<ul style="list-style-type: none"><li>• Do not touch any hot surfaces.</li><li>• Allow the motor to cool down before starting any work.</li><li>• Use the appropriate personnel protection equipment, e.g. gloves.</li></ul>

- Release the motor plug. You will find detailed information in Chapter "Connecting the MOTION-CONNECT cable to the motor (Page 159)".
  - Release the motor fixing screws.  
Do not on any account open the cable gland on the motor.
  - Remove the motor.
  - Mount and install the new motor. You will find detailed information in Chapter "Installing the motor (Page 145)".
3. Switch the converter on.
  4. Reset the converter to the factory settings.  
You can find more information in Chapter "Restoring the converter to factory settings (Page 351)".
  5. Commission the converter. You can find more information in the following sections:
    - "Commissioning (web server) (Page 187)"
    - "Commissioning (Startdrive) (Page 241)"
    - "Series commissioning (Page 331)"

## 12.2 Service and maintenance for the converter

### 12.2.1 Restoring the converter to factory settings

#### 12.2.1.1 Restoring factory settings via a commissioning tool

##### Description

The reset to factory settings with a commissioning tool (web server, Startdrive) only deletes the user-specific parameterization of the converter, for example motor data.

The following settings are retained with the reset:

- Activation and settings of User Management & Access Control
- The "IP configuration" and "Device name" communication settings of the service interface (X127) and PROFINET interface (X150)
- Installed firmware on the converter

The reset to factory settings with the commissioning tool is described in the following chapters:

- Web server: Restore factory settings (Page 230)
- Startdrive: Restore factory settings (Page 320)

#### 12.2.1.2 Manual reset to factory settings with memory card

##### Overview

In the following cases it may be necessary to restore the converter to factory settings:

- The available credentials do not allow the necessary configuration of the converter (no password for example).
- Before recommissioning of the converter, for example if the application use of the converter changes.
- Before the converter is sold or disposed of, in order to erase all user-defined settings.

The manual reset to factory settings with SD card deletes the following user-defined settings on the converter:

- Parameterization of the converter
- Activation and settings of User Management & Access Control
- "IP configuration" and "Device name" communication settings of the service interface (X127) and PROFINET interface (X150)
- Self-generated certificates
- User-defined parameter lists in the web server

The reset to factory settings with SD card retains the installed SINAMICS firmware on the converter.

## Requirement

- You can access the converter manually.
- The converter must be disconnected from the motor:
  - Disconnect all of the electrical connections to the motor (encoder, power and brake cables).
  - Disconnect the PROFINET connection to the control system and other devices.
- You have an empty writable SD card (max. 32 GB; e.g. 6SL5970-0AA00-0AA0).
- The files necessary for the manual reset to factory settings are available from the following address (<https://support.industry.siemens.com/cs/ww/en/view/109815742>).

## Procedure

Proceed as follows to manually reset the converter to factory settings with a memory card:

1. Copy the files necessary for the reset to the empty SD card.
2. Switch off the converter.
3. Insert the SD card with the copied files into the card slot of the converter.
4. Switch on the converter again.  
While the settings are being reset to factory settings, the RDY LED flashes quickly.



5. Wait until the reset to factory settings is completed.  
The RDY LED flashes in alternating order 3 times quickly - pause.



6. Switch off the converter.
7. Remove the SD card with the copied files.  
If the SD card with the copied files is left plugged in, the converter performs the manual reset to factory settings every time it restarts.

## Result

All user-defined converter settings are deleted.

After the manual reset to factory settings, access to the web server is possible via the service interface (X127) and via the PROFINET interface (X150). For access via the service interface (X127), use the secure transmission protocol HTTPS.

## 12.2.2 Converter firmware update

### Requirement

<b>NOTICE</b>
<b>Damage to equipment during firmware update due to voltage supply interruption</b>
If the firmware is being updated, interrupting the power supply or disconnecting the motor can result in defects or cause the devices to malfunction.
<ul style="list-style-type: none"><li>• Do not switch off the converter's supply voltage while the firmware update is running.</li></ul>

### Description

Firmware updates change the settings in the converter according to the relative firmware version:

- If the converter is upgraded to a more recent firmware version, the converter settings are retained.
- Downgrading to an older firmware version resets the converter to the factory settings.

The following options are available for a firmware update:

- Firmware update via memory card (Page 353)
- Firmware update via web server (Page 237)
- Firmware update via Startdrive (Page 324)

## 12.2.3 Firmware update via memory card

### Overview

If you can physically access your S210 drive, you can directly update the firmware on the S210 drive using a memory card (SD card).




### Requirement

- You have an SD card with the appropriate firmware, e.g. 6SL3570-0GB00-0AA0.
- You have an empty SD card with a maximum storage capacity of 32 GB (e.g. 6SL5970-0AA00-0AA0) onto which you can load the firmware.  
You can find the available firmware versions at the following link: "Firmware versions (<https://support.industry.siemens.com/cs/ww/en/view/109812303>)".



**Procedure**

Proceed as follows to update the firmware using an SD card:

1. Switch off the converter.
2. Insert the SD card into the converter and switch on the converter.  
The new firmware is installed. The process takes approx. 2 minutes.

RDY	COM	Explanation of LED displays
		Firmware update is active <ul style="list-style-type: none"> <li>• Do not switch off the power supply.</li> <li>• Do not disconnect the motor from the converter</li> </ul>
	-	Firmware update is completed

3. Switch off the converter.
4. Remove the SD card.
5. Switch on the converter again. The firmware of the connected DRIVE-CLiQ components is updated. This may require a restart (see active alarms in the web server).

RDY	Explanation of LED displays
	Firmware of the connected DRIVE-CLiQ components being updated: <ul style="list-style-type: none"> <li>• Do not switch off the power supply.</li> <li>• Do not disconnect the motor from the converter.</li> </ul>
	Firmware of the DRIVE-CLiQ components has been updated: <ul style="list-style-type: none"> <li>• Waiting for POWER ON of the respective component.</li> </ul> <b>Remedy:</b> Switch the component off and on again.

6. Check whether the new version is installed. The firmware version of the converter is displayed on the home page of the web server under the converter.

**12.2.4 Replacing fans - only for converters with 3 AC line connection**

The fan module is installed in the lower section of the converter.

**Operating period of the fan**

The average operating period of the fan is 40,000 hours. However, in practice the operating period may be shorter. Especially a dusty environment can block up the fan.

Parameter r0277 is used to display the fan wear as a percentage of the operating period.

The alarm A30042 appears if the maximum operating period will shortly be reached or has already been exceeded.



The alarm value is contained in r2124 (interpret as a binary value):

- Bit 0 = 1: The wear counter has reached 99%, and after the remaining 1% has elapsed, bit 0 is cleared and bit 2 is set.
- Bit 2 = 1: The wear counter has exceeded 100%.

The fan must be replaced in good time to ensure that the converter remains ready for operation.

You can find the article number for the replacement fan in Chapter "Spare parts (Page 447)".

## Replacing fans

### CAUTION

#### **Injury caused by a rotating fan**

Touching a fan while it is rotating can result in injury.

- Switch off the supply voltage to the converter.
- Wait until the fan is stationary before work on it.

Proceed as follows to remove the fan module:

1. Switch off the converter power supply.
2. If necessary, remove the converter. To do so, loosen all connections at the converter.

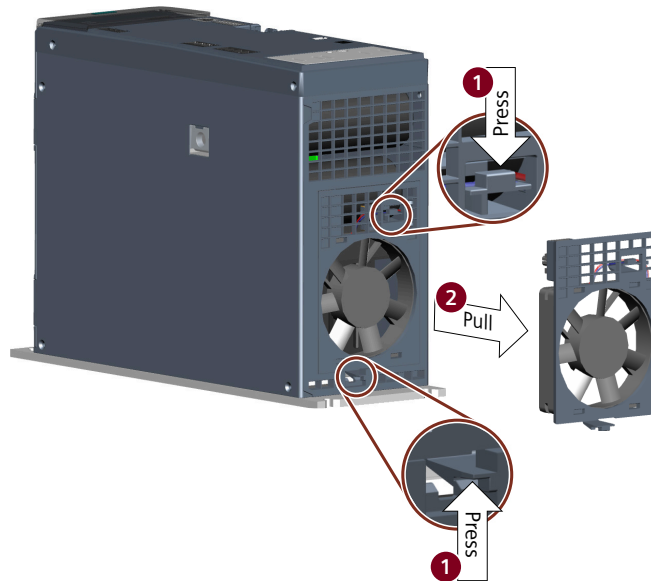
### WARNING

#### **Electric shock as a result of a residual charge in power components**

After the power supply has been switched off, it takes up to 5 min. until the capacitors in the converter have discharged so that the residual charge is at a non-hazardous level.

- Check the voltage at the converter connections before releasing the connections at the converter.

3. Remove the fan as shown in the diagram.



4. Install the new fan in the reverse order.
5. Set the wear counter (r0277) of the fan to 0 using an operating unit such as a PC with access to the web server.

### 12.2.5 Forming the DC link capacitors

#### Requirement

If the cabinet is commissioned within two years of its date of manufacture, the DC link capacitors do not need to be reformed. The date of manufacture can be taken from the serial number on the nameplate.

#### NOTICE

##### Damage caused by supply voltage after a long storage time

After being in storage for more than two years, the converter may be damaged when the supply voltage is switched on.

- Form the DC link capacitors of the converter.

#### Storage period

The storage period starts from the production date and not from the date on which the equipment was shipped.

The production date can be derived from the following assignment to the serial number (e.g. S ZV-P4Y7M000141 for April 2022, ST-P455500113 for April 2022):

Table 12-1 Production year and month

Symbol	Year of manufacture	Symbol	Month of manufacture
M	2020	1 to 9	January to September
N	2021	O	October
P	2022	N	November
R	2023	D	December
S	2024		
T	2025		
U	2026		
V	2027		
W	2028		

The serial number is found on the nameplate.

## Forming circuit

When DC link capacitors are formed, a defined voltage is connected to them and a defined current flows so that the appropriate capacitor characteristics are restored for them to be re-used as DC link capacitors.

The forming circuit can be configured using resistors.

### Forming circuit for converters with 1 AC line connection

Components required for forming outside the drive line-up:

- 1 fuse switch 2-pole 230 V / 10 A
- Cable 1.5 mm<sup>2</sup> (AWG 16)
- 2 resistors 1 k $\Omega$  each / 100 W (e.g. GWK150J1001KLX000, Vishay company)

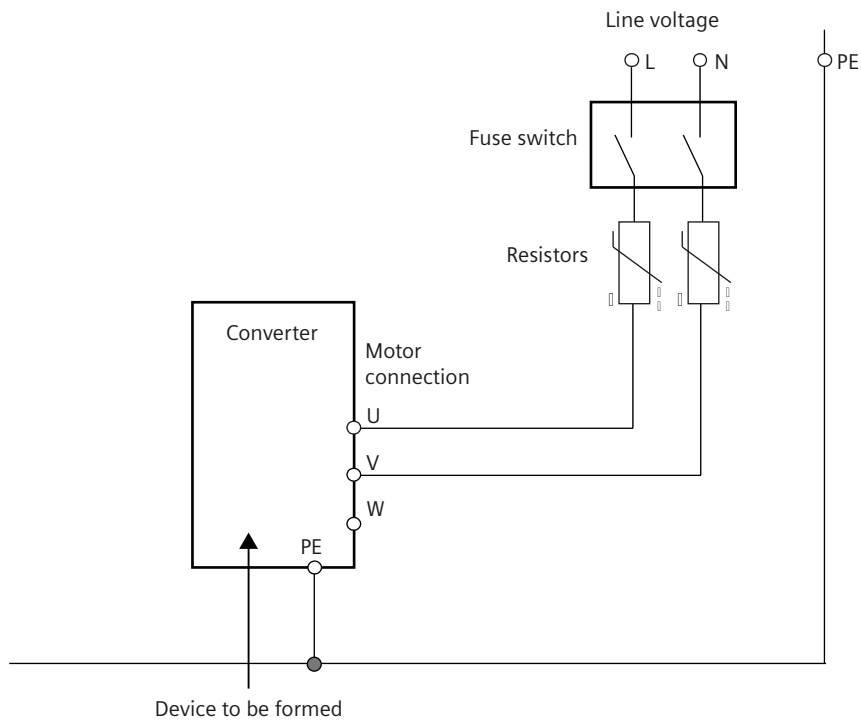


Figure 12-1 Forming circuit for converters with 1 AC line connection

**Forming circuit for converters with 3 AC line connection**

Components required for forming outside the drive line-up:

- 1 fuse switch 3-pole 400 V
- Cable 1.5 mm<sup>2</sup> (AWG 16)
- 3 resistors 1 kΩ each / 100 W (e.g. GWK150J1001KLX000, Vishay company)

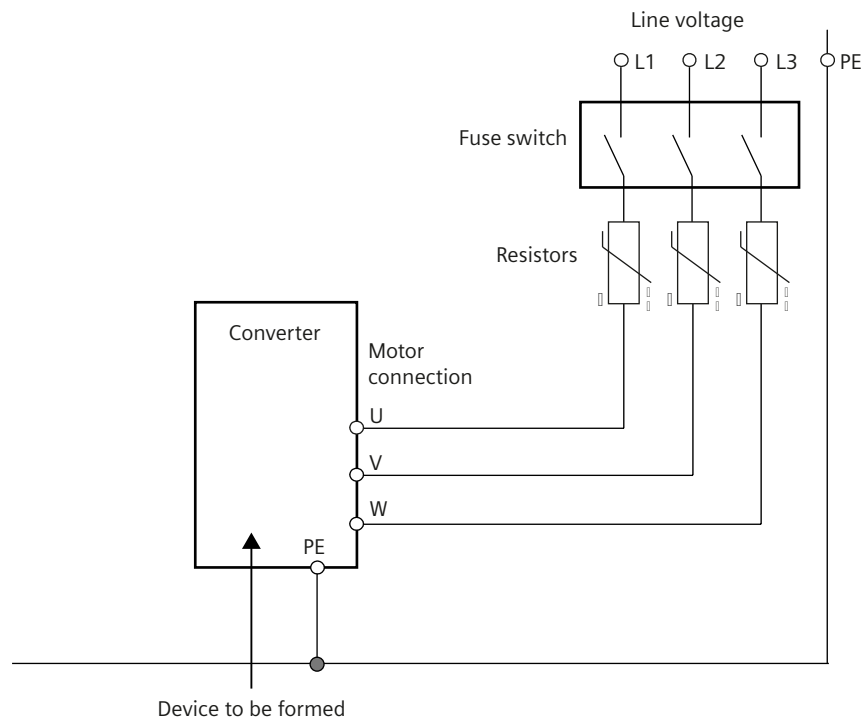


Figure 12-2 Forming circuit for converters with 3 AC line connection

## Procedure

Proceed as follows to reform DC link capacitors:

1. Ensure that the device does **not** receive a power-on command (e.g. from the keyboard or terminal block).
2. Connect the forming circuit.
3. For forming using resistors, the converter must remain in the circuit for approx. 1 h. The resistors will become very hot if there is a fault in the unit (surface temperature > 80 °C).

### CAUTION

#### Burns resulting from high resistor surface temperatures

The resistors can reach a high temperature if there is a fault in the converter (surface temperature > 80 °C). You can get seriously burnt when touching the surface.

- Mount the resistors so that contact is not possible. If this is not possible, attach clearly visible and understandable warning notices at hazardous positions.

## 12.2.6 Replacing the converter in a spare part scenario

### Requirement

The new converter must have the same converter type and power as the converter being replaced.

### Operation with memory card

If the converter being replaced was operated with a memory card, you have the following options in a spare part scenario:

- If the memory card contains the configuration data and the firmware of the converter, proceed as described in Chapter "Replacing a converter using a memory card with firmware (Page 360)".
- If the memory card only contains the configuration data, proceed as described in Chapter "Replacing a converter using a memory card without firmware (Page 361)".

### Operation without memory card

If the converter being replaced was operated without a memory card, you have the following options in a spare part scenario:

- If you have a backup file, proceed as described in Chapter "Replacing a converter using a backup file (no memory card) (Page 363)".
- If there is no backup file, proceed as described in Chapter "Replacing a converter without data backup (no memory card, no backup file) (Page 366)".

### Operation with Safety Integrated Functions

If the converter being replaced was operated with Safety Integrated Functions, an acceptance test must be carried out after the replacement. You can find more information in Chapter "Information pertaining to component replacements (Page 134)".

## 12.2.6.1 Replacing a converter using a memory card with firmware

### Overview

If you retentively saved the configuration of the converter being replaced after commissioning, all configuration data are stored in the "USER" folder on the memory card.

### Requirement

- The converter being replaced was operated with a memory card.
- The memory card contains the firmware files and the configuration data of the converter being replaced.

- The rated power of the replacement device is the same as the rated power of the converter being replaced.
- The replacement device is unused or has been reset to the factory setting.

## Procedure

1. Switch off the supply voltage to the converter.
2. Remove the memory card from the converter.
3. Check that all parts of the device are in a no-voltage condition.
4. Release all of the connections at the converter, replace the converter and re-establish the connections.
5. Insert the memory card into the new converter.
6. Switch on the supply voltage to the converter.  
If the firmware version in the replacement device differs from the firmware version in the converter being replaced, the converter performs a firmware update. Switch the supply voltage to the converter off and on again after the update.

## More information

There is more information about installation in the following chapters:

- "Installing the converter (Page 153)"
- "Connecting the converter (Page 162)"

## See also

Firmware update via memory card (Page 353)

### 12.2.6.2 Replacing a converter using a memory card without firmware

#### Overview

If you retentively saved the configuration of the converter being replaced after commissioning, all configuration data are stored in the "USER" folder on the memory card.

The procedure is described below using the web server as an example.

#### Requirement

- The converter being replaced was operated with a memory card.
- The memory card contains the configuration data of the converter being replaced.
- The rated power of the replacement device is the same as the rated power of the converter being replaced.
- The replacement device is unused or has been reset to the factory setting.

### Procedure

1. Switch off the supply voltage to the converter.
2. Remove the memory card from the converter.
3. Check that all parts of the device are in a no-voltage condition.
4. Release all of the connections at the converter, replace the converter and re-establish the connections.
5. Switch on the supply voltage to the converter.
6. Connect your operating unit to the converter via the service interface X127.
7. Enter the IP address of the converter, e.g. <https://169.254.11.22>, in the browser.  
When the web server is called for the first time, the function view appears with the basic settings.
8. Make the following basic settings:
  - Preferred language of the user interface
  - Converter date and time; either manually or via NTP
9. Click on the "Next" button.  
You are taken to the Security Wizard.
10. Select the option "Exit the Security Wizard and continue with low security settings".  
User management and access control (UMAC) is not activated.  
You can configure the security settings at a later time, see Chapter "Protection & Security (Page 234)".
11. Check the installed firmware version on the home page of the web server.
  - If the firmware in the replacement device < the firmware in the replaced converter, proceed as described in the next step.


---

#### Note

##### Loss of configuration data

If you skip the next step, the converter will be reset to factory settings at the next ramp-up. The configuration data will be lost.

---

- If the firmware in the replacement device  $\geq$  the firmware in the replaced converter, continue with step 13.
12. Perform a firmware update to a firmware  $\geq$  the firmware in the replaced converter.  
You can find more information on updating the firmware using the web server in Chapter "Firmware update (Page 237)".
  13. Switch off the supply voltage to the converter.
  14. Insert the memory card into the converter.
  15. Switch on the supply voltage to the converter.
    - The converter imports the settings from the memory card during ramp-up.
    - Following ramp-up, commissioning is completed.
  16. Log in to the web server via the IP address of the converter, e.g. <https://169.254.11.22>.
  17. Save the settings retentively using the Save button .



## More information

- There is more information about installation in the following chapters:
  - "Installing the converter (Page 153)"
  - "Connecting the converter (Page 162)"
- You can find information about all options in the firmware update in Chapter "Converter firmware update (Page 353)".
- Information about available firmware versions can be found on this website (<https://support.industry.siemens.com/cs/ww/en/view/109812303>).

### 12.2.6.3 Replacing a converter using a backup file (no memory card)

#### Overview

If you retentively saved the configuration of the converter being replaced after commissioning, and created a backup file, all configuration data are stored in the backup file.

The procedure is described below using the web server as an example.

#### Requirement

- The backup file was created in the web server with the function "Save drive data to backup file".
- The backup file is in the file directory of your operating unit.
- The rated power of the replacement device is the same as the rated power of the converter being replaced.
- The replacement device is unused or has been reset to the factory setting.

#### Procedure

1. Switch off the supply voltage to the converter.
2. Check that all parts of the device are in a no-voltage condition.
3. Release all of the connections at the converter, replace the converter and re-establish the connections.
4. Switch on the supply voltage to the converter.
5. Connect your operating unit to the converter via the service interface X127.
6. Enter the IP address of the converter, e.g. <https://169.254.11.22>, in the browser. When the web server is called for the first time, the function view appears with the basic settings.
7. Make the following basic settings:
  - Preferred language of the user interface
  - Converter date and time; either manually or via NTP

8. Click on the "Next" button.  
You are taken to the Security Wizard.
9. Select the option "Exit the Security Wizard and continue with low security settings".  
User management and access control (UMAC) is not activated.  
You can configure the security settings at a later time, see Chapter "Protection & Security (Page 234)".
10. Check the installed firmware version on the home page of the web server.
  - If the firmware in the replacement device < the firmware in the replaced converter, proceed as described in the next step.


---

**Note**

**Loss of configuration data**

If you skip the next step, the converter will be reset to factory settings at the next ramp-up. The configuration data will be lost.

---

- If the firmware in the replacement device  $\geq$  the firmware in the replaced converter, continue with step 12.
11. Perform a firmware update to a firmware  $\geq$  the firmware in the replaced converter.  
You can find more information on updating the firmware using the web server in Chapter "Firmware update (Page 237)".
  12. Call the function view "Backup and restore".
  13. In the area "Restore drive data from backup file", click on the "Click to select file, or drag and drop file here" button.  
A dialog window opens.
  14. In your file directory, select the backup file.
  15. Click "Restore".
    - The backup file is checked and loading begins.
    - To load the settings to the converter, a ramp-up (reset) is initiated.  
When the process has been completed successfully, a corresponding message is displayed.
    - The current settings are displayed after the ramp-up (reset).
  16. If the UMAC settings are changed through loading of the backup file, you may be logged out of the web server. Now log back in to the web server.
  17. Save the settings retentively using the Save button .

### More information

- Information about installation can be found in the following chapters:
  - "Installing the converter (Page 153)"
  - "Connecting the converter (Page 162)"
- You can find information about all options in the firmware update in Chapter "Converter firmware update (Page 353)".
- Information about available firmware versions can be found on this website (<https://support.industry.siemens.com/cs/ww/en/view/109812303>).

#### 12.2.6.4 Replacing a converter without data backup (no memory card, no backup file)

##### Requirement

The replacement device is unused or has been reset to the factory setting.

##### Procedure

1. Switch off the supply voltage to the converter.
2. Check that all parts of the device are in a no-voltage condition.
3. Release all of the connections at the converter, replace the converter and re-establish the connections.
4. Switch on the supply voltage to the converter.
5. Carry out a complete commissioning procedure with a commissioning tool.

##### More information

- Information about installation can be found in the following chapters:
  - "Installing the converter (Page 153)"
  - "Connecting the converter (Page 162)"
- Information about performing commissioning can be found in the following chapters:
  - "Commissioning (web server) (Page 187)"
  - "Commissioning (Startdrive) (Page 241)"

## Technical specifications

### 13.1 Line connection conditions for the S210 converter system with 1FS2 motors

#### Description

The drive system is designed for connection to grounded TN/TT and non-grounded IT line systems.

Depending on the motor/converter combination and the planned installation altitude, the following constraints must be taken into account regarding the line connection.

Motor	Converter	Converter input voltage	Permissible line system configurations for installation altitude 0 ... 2000 m	Permissible line system configurations for installation altitude 2001 ... 4000 m
240 V	1 AC	1 AC 200 ... 240 V $\pm 10\%$	<ul style="list-style-type: none"> <li>TN and TT line systems with grounding at any potential</li> <li>IT line systems <sup>1)</sup></li> </ul>	Install an isolation transformer and ground the secondary side at any potential.
240 V 400 V	3 AC	3 AC 200 ... 240 V $\pm 10\%$	<ul style="list-style-type: none"> <li>TN and TT line systems with grounded neutral point or line conductor</li> <li>IT line systems Install an isolation transformer and ground the secondary side at the neutral point.</li> </ul>	<ul style="list-style-type: none"> <li>TN and TT line systems with grounded neutral point</li> <li>IT line systems Install an isolation transformer and ground the secondary side at the neutral point.</li> </ul>
400 V	3 AC	3 AC 380 ... 480 V $\pm 10\%$	<ul style="list-style-type: none"> <li>TN and TT line systems with grounded neutral point</li> <li>IT line systems Install an isolation transformer and ground the secondary side at the neutral point.</li> </ul>	Install an isolation transformer and ground the secondary side at the neutral point.

<sup>1)</sup> With the grounding screw removed, see Chapter "Converters with 3 AC line connection (Page 58)".

NOTICE
<p><b>Damage to motor insulation due to excessive voltages</b></p> <p>In the event of a ground fault in the IT supply system, the motor insulation can be damaged by the higher voltage to ground.</p> <ul style="list-style-type: none"> <li>Use a ground fault monitor.</li> <li>Eliminate the ground fault as quickly as possible.</li> </ul>

## 13.2 Technical data and properties of the motor

### 13.2.1 Technical features

Property	Version
Type of motor	Permanent-magnet synchronous motor
Rotor inertia	1FS21 - High Dynamic - motor with low rotor inertia 1FS22 - Compact - motor with medium rotor inertia
Cooling	Natural cooling
Stator winding insulation according to EN 60034-1 (IEC 60034-1)	1FS2□04, 1FS2□05, 1FS2□06, 1FS2□08 Temperature class 155 (F) for a winding temperature of $\Delta T = 100$ K at an ambient temperature of +40 °C
Impulse voltage-insulation class according to EN 60034-18-41 (IEC 60034-18-41)	IVIC: C
Operating range	-15 to +40 °C, derating at higher temperatures
Installation altitude (acc. to EN 60034-1 and IEC 60034-1)	≤ 1000 m above sea level, otherwise power derating
Type of construction according to EN60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP66/IP67
Degree of protection according to ISO 20653	IP69K, excluding shaft outlet
Temperature monitoring	Thermal motor model
Shaft extension according to DIN 748-3 (IEC 60072-1)	Plain shaft, optionally with feather key and half-key balancing
Radial eccentricity, concentricity and axial eccentricity acc. to DIN 42955 (IEC 60072-1) <sup>1)</sup>	Tolerance N (normal)
Vibration severity grade according to EN 60034-14 (IEC 60034-14)	Grade A is complied with up to the rated speed
Sound pressure level $L_{pA}$ (1 m) according to DIN EN ISO 1680, max. tolerance + 3 dB(A)	< 70 dB(A)
Encoder systems, built-in with DRIVE-CLiQ interface	AM22DQC, absolute encoder 22 bit + 12 bit multiturn (code letter: M)
Connection	One cable connection (OCC) system, cable brought out
Holding brake	Optional integrated holding brake

<sup>1)</sup> Shaft extension run-out, concentricity of centering edge, and perpendicularity of the mounting flange to the axis of the shaft extension.

### 13.2.2 Materials

The outer parts of the enclosure of the 1FS2 motor are made of the following materials:

Parts	Materials
Motor enclosure	Stainless steel 1.4404, surface roughness < 0.8 µm
Gasket	70 EPDM 291 FDA21 CFR §177.2600
Shaft	Stainless steel 1.4404
Shaft sealing ring	PTFE FDA 21 CFR § 177.2600
Bearing grease	Food-grade grease with NSF H1 approval, FDA 21 CFR § 178.3570
Nameplate	Enclosure laser-inscribed
Cable gland	Enclosure: Stainless steel 1.4404, surface roughness < 0.8 µm Gasket: Silicone
Cable	Sheath material: Fluorinated ethylene propylene (FEP)
Cover screws	Enclosure: Stainless steel 1.4404, surface roughness < 0.8 µm Gasket: EPDM

### 13.2.3 Permissible environmental conditions for the motor

Environmental conditions for transport in the transport packaging according to Class 2K3 to DIN EN IEC 60721-3-2, except for the "air temperature" and "condensation" environmental factors	
Climatic environmental conditions	-15 °C ... +70 °C
Highest relative humidity	< 95% at 40 °C, condensation not permissible
Mechanical environmental conditions	Shock and vibration permissible according to 3M8 to EN 60721-3-3: Single shocks (6 ms) max. 250 m/s <sup>2</sup>
Protection against chemical substances	Protected according to Class 2C2
Biological environmental conditions	Suitable according to Class 2B2

Environmental conditions for long-term storage in the product packaging according to Class 1K3 to DIN EN IEC 60721-3-1, except for environmental variables "air temperature", "highest relative humidity" and "condensation"	
Climatic environmental conditions	-15 °C ... +55 °C
Highest relative humidity	< 60%, condensation not permissible
Mechanical environmental conditions	Vibration-free storage space, $v_{rms} < 0.2$ mm/s
Protection against chemical substances	Protected according to Class 1C2

13.2 Technical data and properties of the motor

Environmental conditions for long-term storage in the product packaging according to Class 1K3 to DIN EN IEC 60721-3-1, except for environmental variables "air temperature", "highest relative humidity" and "condensation"	
Biological environmental conditions	Suitable according to Class 1B2
Duration	<ul style="list-style-type: none"> <li>• Six months for the above-mentioned conditions.</li> <li>• Special preservation measures are required for storage periods of 6 months up to a maximum of two years. For more information, please contact your local sales partner.</li> </ul>

Environmental conditions during operation according to 3K4 to DIN EN IEC 60721-3-3, except for environmental variables "low air temperature", "condensation" and "low air pressure"	
Installation altitude	Up to 1000 m above sea level without limitations You can find more information in Chapter "Derating factors (Page 372)".
Climatic environmental conditions <sup>1)</sup>	<ul style="list-style-type: none"> <li>• Temperature range: -15 °C<sup>1)</sup> ... +40 °C</li> <li>• Recommended relative humidity: 5 ... 95%, condensation not permitted</li> <li>• Permissible relative humidity from 0.25% at 20 °C, dew point: - 50 °C</li> <li>• Absolute air humidity: 1 ... 29 g/m<sup>3</sup></li> <li>• Rate of temperature change<sup>2)</sup>: 0.5°/min</li> <li>• Atmospheric pressure: 89<sup>1), 3)</sup> ... 106 kPa<sup>4)</sup></li> <li>• Solar radiation: 700 W/m<sup>2</sup> <sup>2)</sup></li> <li>• Movement of the air: 1.0 m/s</li> <li>• Water (other than rain): See protection class</li> </ul>
Mechanical environmental conditions	<ul style="list-style-type: none"> <li>• Vibration levels permissible according to Class 3M8 to EN 60721-3-3: Max. 50 m/s<sup>2</sup></li> <li>• Shocks permissible according to Class 3M8 to EN 60721-3-3</li> </ul>
Protection against chemical substances	Protected according to 3C2 to DIN EN IEC 60721-3-3
Biological environmental conditions	Suitable according to 3B2 to DIN EN IEC 60721-3-3
Pollution	Suitable for environments with degree of pollution 2 acc. to IEC 61800-5-1
Cooling air	Clean and dry air
<p>The motors are not suitable for operation:</p> <ul style="list-style-type: none"> <li>• In a vacuum<sup>5)</sup></li> <li>• In salt-laden or aggressive atmospheres</li> <li>• Outdoors</li> </ul>	

<sup>1)</sup> Increased ruggedness with regard to low air temperature and low atmospheric pressure better than 3K3 according to DIN EN IEC 60721-3-3

<sup>2)</sup> Averaged over a period of 5 min

<sup>3)</sup> The limit value of 89 kPa covers applications at altitudes up to 1000 m.


<sup>4)</sup> Conditions in mines are not considered.

<sup>5)</sup> Operation in a vacuum is not permissible because of the low dielectric strength and poor heat dissipation.



### 13.2.4 Protection against electromagnetic fields (motor)

#### Active implant malfunctions due to electromagnetic fields

 <b>WARNING</b>
<p><b>Malfunction of active implants due to magnetic and electrical fields</b></p> <p>Electric motors pose a danger to people with active medical implants, e.g. heart pacemakers, who come close to these motors.</p> <ul style="list-style-type: none"> <li>• If you are affected, stay a minimum distance of 30 cm away from the motors (tripping threshold for static magnetic fields of 0.5 mT according to Directive 2013/35/EU).</li> </ul>

### 13.2.5 Cooling

#### Description

The 1FS2 is a non-ventilated motor.

To ensure sufficient heat dissipation when installed, the motor requires a minimum clearance of 100 mm from adjacent components on three sides.

- Maintain these clearances irrespective of the following mounting variants.

#### Non-thermally insulated mounting

Some of the motor power loss is dissipated through the flange when the motor is connected to the mounting surface.

- Observe the following mounting conditions for the specified motor data:

Shaft height	Steel plate, width x height x thickness (in mm)
1FS2104	250 x 250 x 6
1FS2105	300 x 300 x 12
1FS2106 1FS2208	450 x 370 x 30

The data in the table refers to an ambient temperature of 40 °C and an installation altitude up to 1000 m above sea level.

If the environmental conditions are different, derating may be required. You will find information on this in section "Derating factors (Page 372)".

For larger mounting surfaces, the heat dissipation conditions improve.

#### Thermally insulated mounting without additional mounted components

The following description only applies to motors with frame sizes 1FS2104 ... 1FS2208.

### 13.2 Technical data and properties of the motor

For naturally cooled motors, you must reduce the S1/characteristic as follows:

- Reduce the motor static torque by 20 % to 30 %.
- Reduce the torque at 3000 r/min by 40 % to 50 %.

#### Thermal motor protection

The converter monitors the motor temperature based on a thermal motor model and issues the alarm "Motor overtemperature" before the maximum temperature is reached. If the motor exceeds the maximum temperature, the converter switches off the motor with the error message "Motor overtemperature".

If the ambient temperature exceeds 40 °C, you need to set the ambient temperature at the converter so that the motor is reliably protected.

- To do this, select parameter p0613 at the converter.
- Set the maximum ambient temperature that occurs.

Parameter r0034 indicates the thermal load of the motor as a percentage. The reading is influenced by the ambient temperature selected in parameter p0613.

---

#### Note

##### Adapting the power in cooled environments

In cooled environments (ambient temperature < 20 °C), the power can be adapted in parameter p0613. See characteristics in Chapters Technical specifications and characteristics of 1FS2 connected to 1 AC 230 V, 3 AC 240 V (Page 389) and Technical specifications and characteristics of 1FS2 connected to 3 AC 400 V, 3 AC 480 V (Page 394).

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You can find more information in the parameter lists, see Chapter "Parameters (Page 463)".

#### Motor overload protection according to IEC 61800-5-1 Ed.3 / UL 61800-5-1 Ed.2

The converter complies with the motor overload protection according to IEC 61800-5-1 Ed.3 or UL 61800-5-1 Ed.2; to achieve this, you must make the following settings after commissioning.

##### Procedure

Proceed as follows, to activate motor overload protection according to IEC 61800-5-1 Ed.3 / UL 61800-5-1 Ed.2:

1. Set p5375.0 = 1
2. Set p5375.1 = 1

### 13.2.6 Derating factors

#### Description

Due to the decreasing air pressure in higher installation altitudes, the cooling of the motor deteriorates. Therefore, reduce the power of the motor as the installation altitude increases.

Multiply the permissible torques and speeds by the factors from the following table.

Reduce the torques and speeds according to the values determined.

### Factors for power derating depending on the installation altitude and the ambient temperature

Table 13-1 Factors for power derating depending on the installation altitude and the ambient temperature

Installation altitude above sea level in m	Ambient temperature in °C				
	30	40	45	50	55
1000	1.05	1	0.95	0.89	0.84
2000	1	0.95	0.86	0.8	0.73
3000	0.95	0.89	0.76	0.69	0.62
4000	0.89	0.84	0.65	0.57	0.47

Calculate the derating factor for ambient temperatures that are not shown here and installation altitudes below the maximum values by interpolating. For example: 40 °C at 1500 m above sea level = derating factor 0.965.

### Calculating the reduced characteristic curve

$$M_{S1 \text{ red}}(n) = x_d \cdot M_{S1}(n / x_d)$$

$M_{S1 \text{ red}}$  Reduced motor torque for S1 operation at the required installation altitude and ambient temperature

$M_{S1}$  Motor torque for S1 operation at an ambient temperature of 40 °C and 1000 m above sea level (see Chapter "Technical specifications and characteristics")

$n$  Motor speed

$x_d$  Derating factor from the table "Factors for reducing the power..." above

---

#### Note

##### Reduced motor operation to 80 °C

With reduced speed and reduced torque, you can operate the motor up to an ambient temperature of 80°C.

You cannot apply the simplified conversion algorithm above.

- Calculate the reduced characteristic with the TIA selection tool (<https://www.siemens.com/tst>).
-

Graphic representation of the derating factors

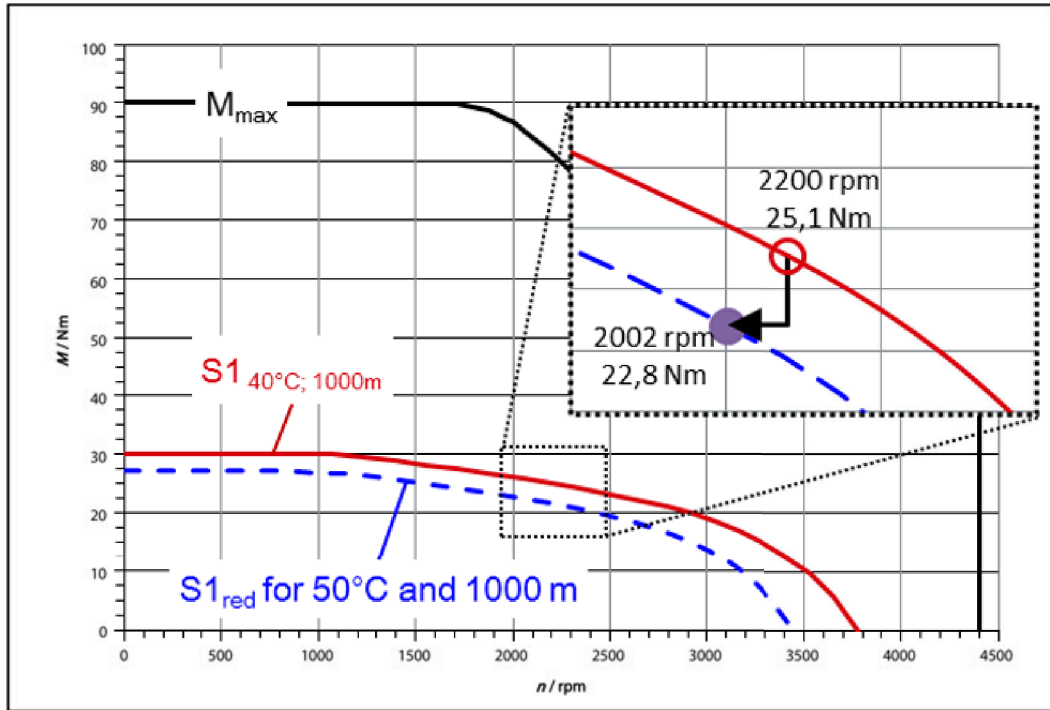


Figure 13-1 Example of a derating factor

Factors for reducing the DC link voltage depending on the installation altitude

The voltage strength of the motor insulation is reduced for installation altitudes exceeding 2000 m above sea level. Check whether it is necessary to limit the DC link voltage.

Reduce the permissible DC link voltage with increasing installation altitude due to the decreasing air pressure.

Table 13-2 Limit values for the DC link voltage for motors of the 1FK2/1FS2/1FT2 series at installation altitudes below 2000 m mean sea level

Motors with the following rated speed in the article number (part number) 1F□2□□□-□□X□□..., X =	Max. permissible converter DC link voltage in V
G	375
B, C, F, H, K	720

Table 13-3 Typical DC link voltage of the SINAMICS converters

Network	Infeed	DC link voltage in V
1 AC 230 V	Non-regulated	248
3 AC 240 V	Non-regulated	307

Network	Infeed	DC link voltage in V
3 AC 400 V	Non-regulated	528
3 AC 480 V	Non-regulated	634

As the DC link voltage is reduced, the converter output voltage also decreases. This reduces the operating range in the M-n diagram.

The M-n diagrams are provided in the following chapters:

- "Technical specifications and characteristics of 1FS2 connected to 1 AC 230 V, 3 AC 240 V (Page 389)"
- "Technical specifications and characteristics of 1FS2 connected to 3 AC 400 V, 3 AC 480 V (Page 394)"

### 13.2.7 Degree of protection

#### Description

The degree of protection of a motor is marked, for example, using "IP66".

The motor degree of protection is classified according to DIN EN 60034-5 (IEC 60034-5)

The combination of "IP" + 2 numbers means the following:

IP = International Protection

1st digit = protection against the ingress of foreign bodies

2nd digit = protection against water

DIN EN 60034-5 is valid for water as medium that potentially ingresses, not for oil or other creeping fluids.

Configure the motor in the required degree of protection.

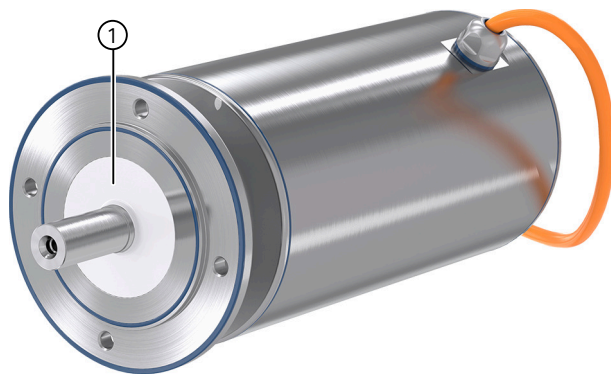
#### Degrees of protection available for the 1FS2

The 1FS2 motors have the following degrees of protection:

- at shaft exit: IP66/67
- the motor enclosure: IP66/67 or IP69K according to ISO 20653

The degree of protection is specified on the rating plate.

The motors have a rotary shaft sealing ring.



① Radial shaft sealing ring

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**Note**

It is permissible that the radial shaft sealing ring runs dry.

It is not permissible for liquid to collect in the flange.

The service life of the radial shaft sealing ring is approximately 25000 operating hours.

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You can find more information in Chapter "Shaft extension (Page 379)".

### 13.2.8 Connection system

The motor connection cable of the 1FS2 enables pressure equalization in the motor.

#### Purpose of the pressure equalization

If the motor with protection class IP67 or IP69K cools down after operation, underpressure can build up in the motor. This may result in moisture ingress.

You can prevent the ingress of moisture in this way by supplying air through the connected motor cable to achieve pressure equalization.

**Connection variant Q0□: Pressure equalization via the motor connection cable with free cable ends**

The MC400 motor connection cable contains a thin flexible tube that ensures pressure equalization in the motor.

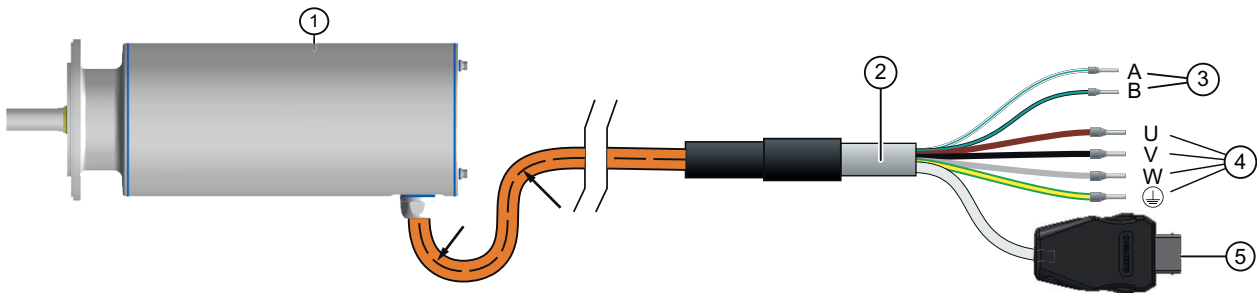


Figure 13-2 Direct connection

**Connection type Q1□: Pressure equalization via the motor connection cable with SPEED-CONNECT coupling M17 or M23**

The MC400 motor connection cable contains a thin flexible tube that ensures pressure equalization in the motor.

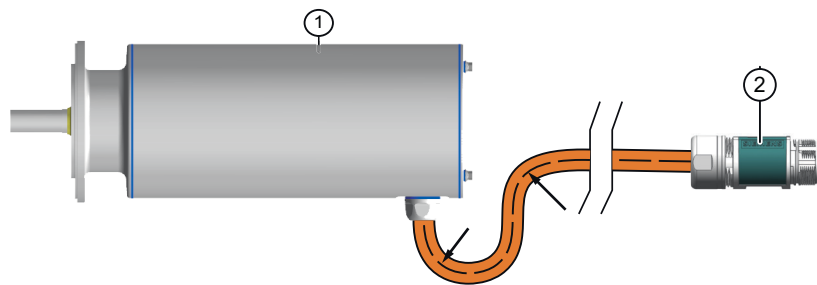


Figure 13-3 Connection cable on the 1FS2 with a SPEED-CONNECT coupling

**Note**

**MC400 connection cable for connection type Q1□**

To ensure pressure equalization use only MC400 connection cables to connect the converter with connection type Q1□.

**Available lengths of the motor connection cable**

The □ with order code Q0□ or Q1□ defines the available length of the motor connection cable.

The length code can be found in section "Ordering data of the connection system (Page 458)".

### 13.2.9 Balancing

The motors are balanced according to EN 60034-14.

Motors with featherkey in the shaft are half-key balanced.

A mass equalization for the protruding half key must be taken into account for the output elements.

### 13.2.10 Vibration response

#### Vibration severity grade

Motors with keyway are balanced by the manufacturer using a half-key.

The vibration response of the system at the location of use is influenced by output elements, any built-on parts, the alignment, the installation, and external vibrations. This can change the vibration values of the motor.

The motors conform to vibration severity grade A according to EN 60034-14 (IEC 60034-14).

The specified values refer only to the motor. The installation-dependent system vibration behavior can increase these values at the motor.

The vibration severity grade is maintained up to the rated speed ( $n_N$ )

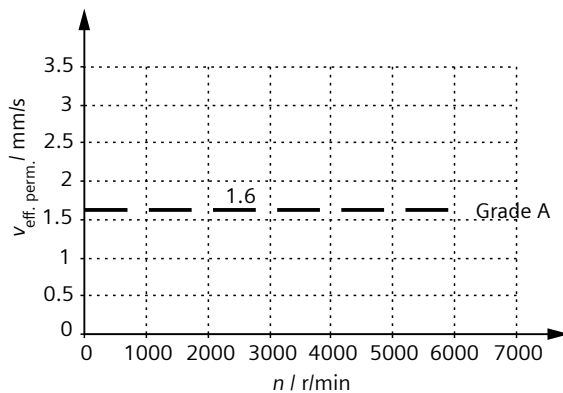


Figure 13-4 Vibration severity levels



### Permissible vibration during operation

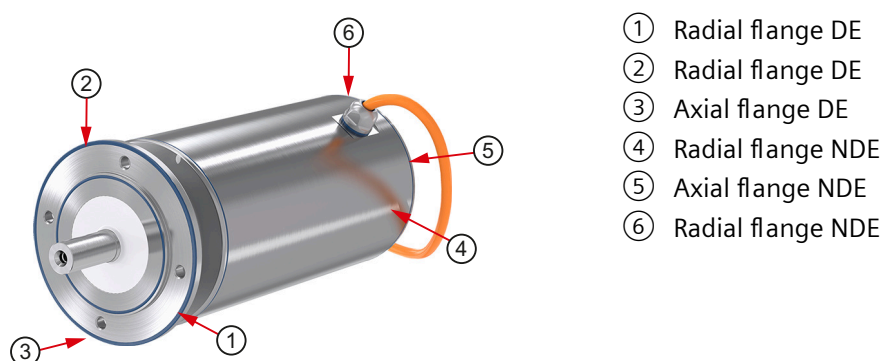
In order to guarantee the proper function of the motor and not to impair the lifetime of the bearing, the following vibration values must be observed during operation.

- Vibration velocity<sup>1)</sup>  $V_{rms}$  according to ISO 10816 Max. 4.5 mm/s
- Vibration acceleration  $a_{peak}$  axial<sup>2)</sup> 50 m/s<sup>2</sup>
- Vibration acceleration  $a_{peak}$  radial<sup>2)</sup> 50 m/s<sup>2</sup>

<sup>1)</sup> To assess the vibration velocity, the measuring equipment must fulfill the requirements of ISO 2954.

<sup>2)</sup> The vibration acceleration is evaluated in the frequency range of 10 Hz to 2000 Hz. The maximum peak in the measurement time range is considered.

Select the measuring points according to ISO 10816-1 section 3.2. The vibration values must not exceed the specified limits at any measuring point.



### 13.2.11 Shaft extension

The motors are supplied with cylindrical shaft extensions. The shaft end usually has a centering thread according to DIN 332, form DR.

Optionally, a shaft extension with keyway and fitted key is available.

With motors 1F□2□02 ... 1F□2□04, the usable shaft end is reduced by the radial shaft sealing ring with IP65 degree of protection.

### Dimensions of shaft ends

Motor	Shaft extension with IP64 Diameter x length in mm	Shaft extension with IP65 Diameter x length in mm	Feather key Width x height x length in mm	Centering thread
1F□2□02	8 (h6) × 25	8 (h6) × 18	2 × 2 × 10	M3
1F□2□03	14 (h6) × 30	14 (h6) × 21.5	5 × 5 × 16	M5
	11 (k6) × 23 <sup>1)</sup>	-	-	M4
1F□2□04	19 (k6) × 40	19 (k6) × 32	6 × 6 × 22	M6
	14 (k6) × 30	-	-	M5
1F□2□05	19 (k6) × 40		6 × 6 × 32	M6

13.2 Technical data and properties of the motor

Motor	Shaft extension with IP64 Diameter x length in mm	Shaft extension with IP65 Diameter x length in mm	Feather key Width x height x length in mm	Centering thread
1F□2□06	24 (k6) × 50		8 × 7 × 40	M8
1F□2□08	32 (k6) × 58		10 × 8 × 45	M12
1F□2□10	38 (k6) × 80		10 × 8 × 70	M12

1) The optional 11 mm x 23 mm shaft extension is only available without a keyway and without a shaft sealing ring (IP65).

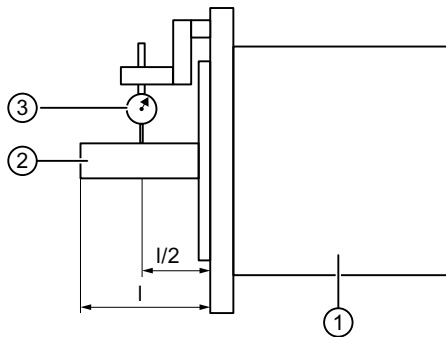
13.2.12 Radial eccentricity, concentricity and axial eccentricity

Description

The shaft and flange accuracies for 1F□2 motors are implemented according to DIN 42955 (IEC 60072-1) as standard (Normal class).

Radial eccentricity tolerance of the shaft to the frame axis (referred to cylindrical shaft ends)

Motor	Standard (Normal class)
1F□2□02	0.03 mm
1F□2□03	0.035 mm
1F□2□04 1F□2□05 1F□2□06	0.04 mm
1F□2□08 1F□2□10	0.05 mm



- ① Motor
- ② Motor shaft
- ③ Dial gauge

Figure 13-5 Checking the radial eccentricity (diagram with example)

**Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis (referred to the centering diameter of the mounting flange)**

Motor	Standard (Normal class)
1F□2□02 1F□2□03 1F□2□04 1F□2□05	0.08 mm
1F□2□06 1F□2□08 1F□2□10	0.1 mm

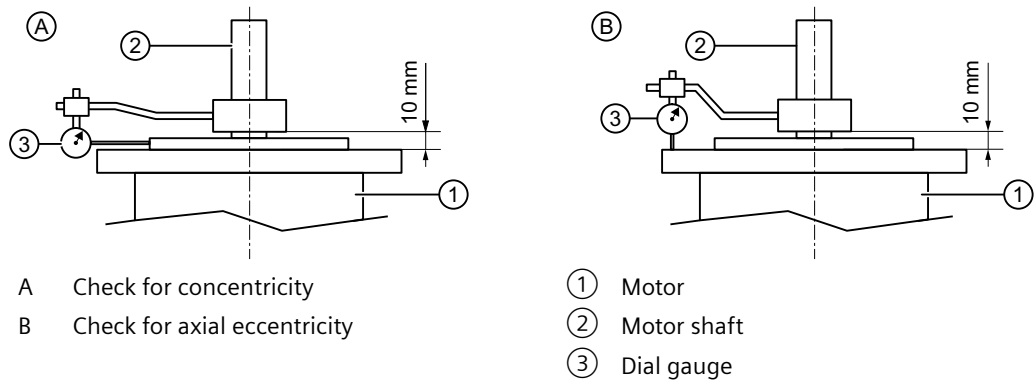


Figure 13-6 Checking the concentricity and axial eccentricity (diagram with example)

**13.2.13 Axial and radial forces**

**Permissible axial forces**

Motor type	Axial force <sup>1)</sup> $F_{A\ Stat} / N$
1FS2104-6	60
1FS2105-6	75
1FS2106-6	125
1FS2208-5	250

<sup>1)</sup> The specified axial forces are determined by the spring loading and also apply for motors with holding brake.

**Note**

If the permissible axial forces are exceeded, applications with an angular toothed pinion directly on the motor shaft are not permitted.

### Permissible radial forces

As a result of the bearing arrangement, the 1F□2 is designed for aligned forces. Forces such as these occur for belt drives, for example.

All radial forces always refer to aligned forces.

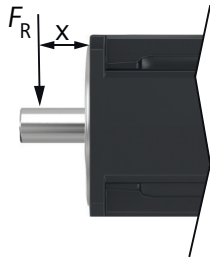
**NOTICE**

**Motor damage caused by circulating forces**

Circulating forces can cause bearing motion, and therefore damage the motor.

- Avoid rotating forces.

### Point of application of radial forces $F_R$ at the shaft extension



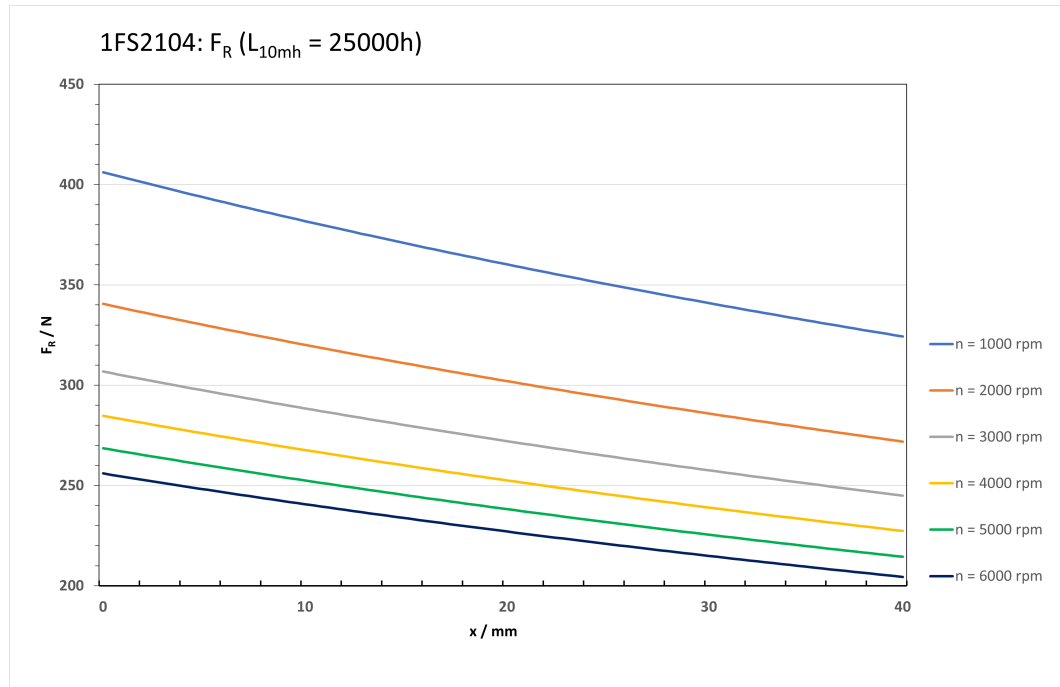
$F_R$  Point of application of the radial force

$x$  Distance between where the radial force is applied and the shaft shoulder in mm

Figure 13-7 Force application point at the shaft extension

The following diagrams indicate the maximum permissible radial force for the corresponding motor frame size. It depends on the force application point and the average speed for a nominal bearing lifetime (L10h) of 25000 h.

Radial force diagram 1FS2104-6

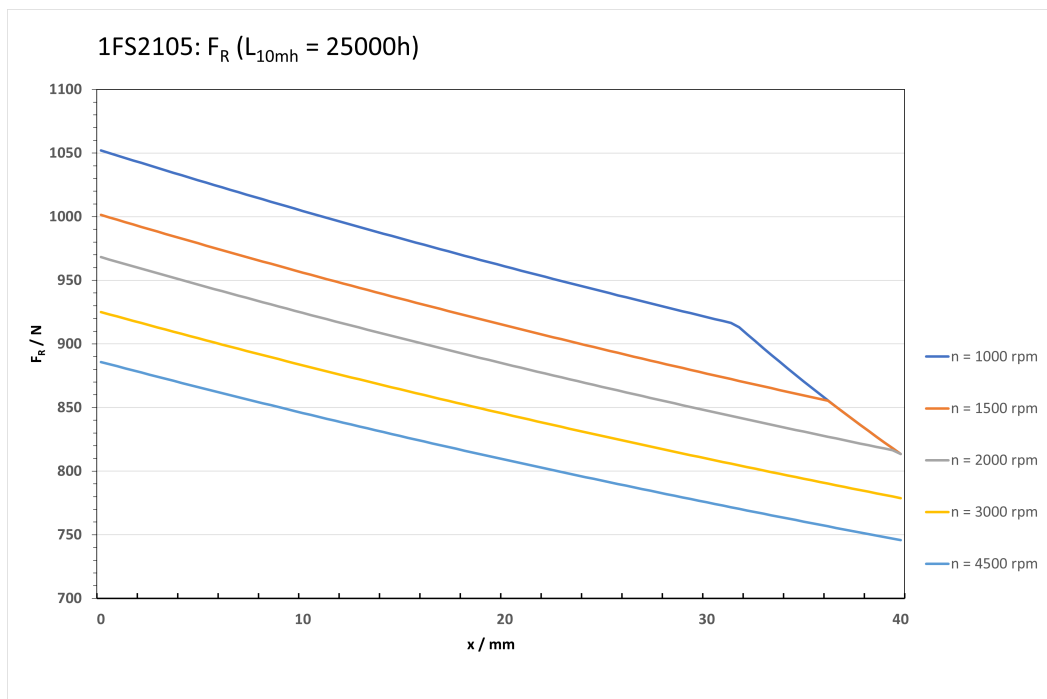


$F_R$  Radial force

$x$  Distance from the point of application of the radial force to the shaft shoulder

Figure 13-8 Radial force, 1FS2104-6

Radial force diagram 1FS2105-6

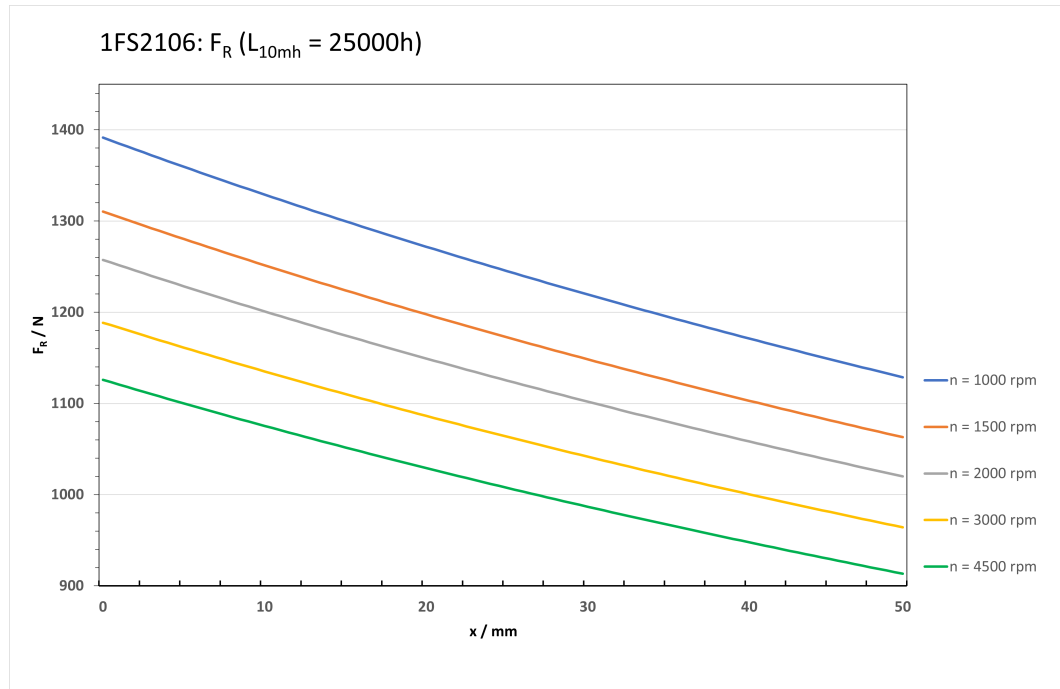


$F_R$  Radial force

x Distance from the point of application of the radial force to the shaft shoulder

Figure 13-9 Radial force 1FS2105-6

Radial force diagram, 1FS2106-6

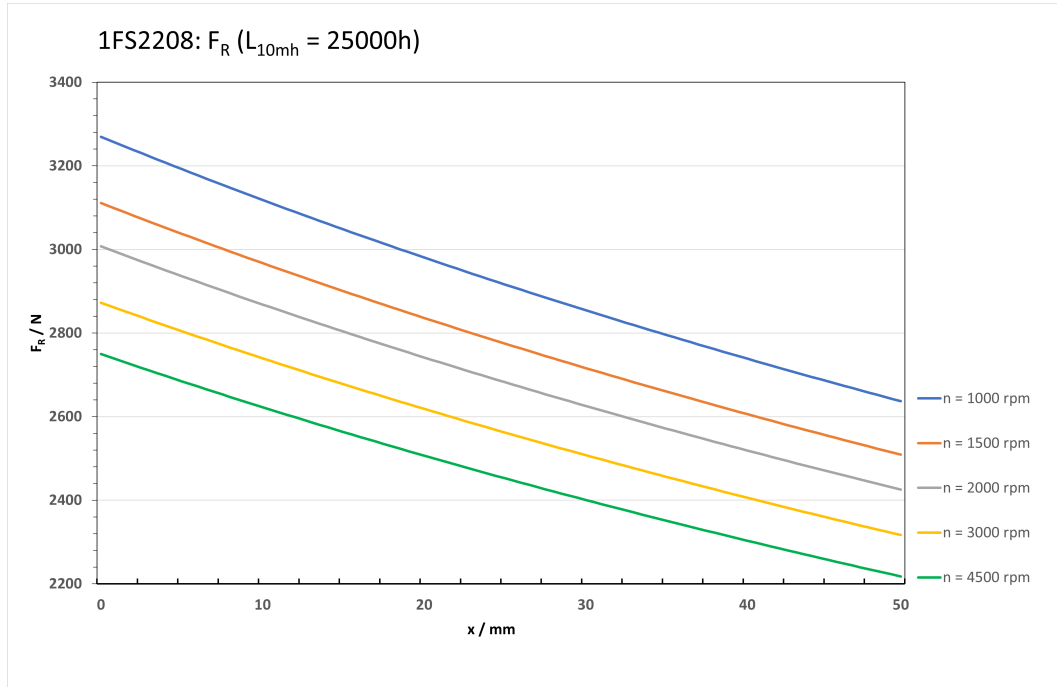


$F_R$  Radial force

$x$  Distance from the point of application of the radial force to the shaft shoulder

Figure 13-10 Radial force, 1FS2106-6

**Radial force diagram 1FS2208-5**



$F_R$  Radial force

$x$  Distance from the point of application of the radial force to the shaft shoulder

Figure 13-11 Radial force 1FS2208-5

**13.2.14 Available encoders**

The motors have an integrated absolute encoder with a resolution of 22 bits per revolution that enable absolute position sensing over 4096 revolutions.


	Encoders that can be ordered for the 1FS2
	Absolute encoder 22 bit +12 bit multiturn
<b>Encoder designation</b>	<b>AM22DQC</b>
Identification in the article number	M
Resolution	4,194,304 = 22 bit
Absolute position	Yes, 4096 revolutions (12 bits)
Angular error	$\pm 100''$

**13.2.15 Data of the holding brake**

The holding brake is used to clamp the motor shaft when the motor is at a standstill. The holding brake is not a working brake for braking the rotating motor. When the motor is at a standstill, the holding brake is designed for at least 5 million switching cycles.



Limited EMERGENCY STOP operation is permissible. Take into account the maximum permissible single operating energy as well as service life, total operating energy of the brake.

 <b>WARNING</b>
<p><b>Unintentional movements through inadequate braking effect</b></p> <p>If you use the holding brake incorrectly, e.g. as an operating brake or you ignore the permissible operating energy of the brake, then the brake will be subject to excessive and impermissible wear. As a consequence, there may be no brake effect. Unintentional movements of the machine or system can result in death or serious injury.</p> <ul style="list-style-type: none"> <li>• Observe the permissible number of operating cycles and EMERGENCY STOP properties.</li> <li>• Operate the motor only in conjunction with an intact brake.</li> <li>• Avoid repeated brief acceleration of the motor against a holding brake that is still closed.</li> </ul>

The holding brakes of the 1FS2 have a torsional backlash of less than 1.5°.

### Technical specifications of the holding brake

The following table lists technical specifications regarding the holding brakes for operation with a SINAMICS S210 converter.

Motor type	①	②	③	④	⑤	⑥ <sup>1)</sup>	⑦	⑧	⑨	
	$M_4$ / Nm	$M_{1m}$ / Nm	$M_{1max}$ / Nm	$t_{open\_f}$ / ms	$t_{close\_f}$ / ms	$W_{max}$ / J	$W_{Tot}$ / kJ	$I_h$ / A	$I_{o\_n}$ / A	$t_{oex}$ / ms
For spring-loaded brake										
1FS2104	3.3	3.3	9	50	40	270	120	0.2	1.2	80
For permanent-magnet brake										
1FS2105	8	5	18	35	20	570	284	0.3	1.1	120
1FS2106	16	9	35	70	35	1065	774	0.35		
1FS2208	32	17	70	120	40	4800	2400	0.5	1.4	180

<sup>1)</sup> Maximum of three consecutive EMERGENCY STOP procedures. Maximum 25% of all EMERGENCY STOP procedures as high-energy stops with  $W_{max}$ .

#### ① Holding torque $M_4$

The holding torque  $M_4$  is the highest permissible torque for the closed brake in steady-state operation without slip (holding function when motor is at standstill). The data applies for the state at operating temperature (120 °C).

#### ② Dynamic braking torque $M_{1m}$

The dynamic braking torque  $M_{1m}$  is the smallest mean dynamic braking torque that can occur for an EMERGENCY STOP.

#### ③ Maximum dynamic braking torque $M_{1max}$

The maximum dynamic braking torque  $M_{1max}$  is the greatest dynamic braking torque that can occur for an EMERGENCY STOP.

Based on  $M_{1max}$ , you can assess whether mounted mechanical elements, e.g. a gearbox, can withstand the maximum possible peak torques occurring on EMERGENCY STOP.

**④ Opening time  $t_o$  and ⑤ closing time  $t_{c1}$**

The delay times that occur when switching the brake  $t_o$  and  $t_{c1}$  are saved in the motor and are automatically taken into consideration.

After activation of the holding brake (opening), the speed/velocity setpoint remains at "Zero" during the opening time  $t_o$ . The speed/velocity setpoint is only enabled after the opening time  $t_o$  has elapsed.

After OFF1 or OFF3 and activation of the holding brake (closing), the drive still remains in closed-loop control with speed/velocity setpoint "Zero" during closing time  $t_{c1}$ . The pulses are only deleted after this.

**⑥ Maximum permissible single operating energy  $W_{max}$**

The maximum permissible single operating energy of an individual EMERGENCY STOP operation.

After an EMERGENCY STOP with the maximum single operating energy, allow a cooling time of at least 3 minutes before you operate the motor again.

**⑦ Total operating energy (service life)  $W_{total}$**

The total operating energy is the sum of the single operating energy (operating energy for each EMERGENCY STOP procedure). If you exceed the total operating energy, problem-free functioning of the brake can no longer be guaranteed.

- Refurbish the motor.

**⑧ Holding current  $I_h$**

The holding current  $I_h$  keeps the holding brake open. The holding current  $I_h$  continues to load the 24-V power supply of the converter after time  $t_{oex}$  until the brake is released.

**⑨ Typical opening current  $I_o$  for overexcitation time  $t_{oex}$**

After activation of the holding brake (opening), the break-induced current  $I_o$  places a load on the 24 V power supply of the converter for the specified overexcitation time  $t_{oex}$ . This break-induced current applies to a brake temperature of approx. 20 °C.

At a brake temperature of -15 °C, the break-induced current can increase by up to 30%.

**Formula to calculate the operating energy per braking operation**

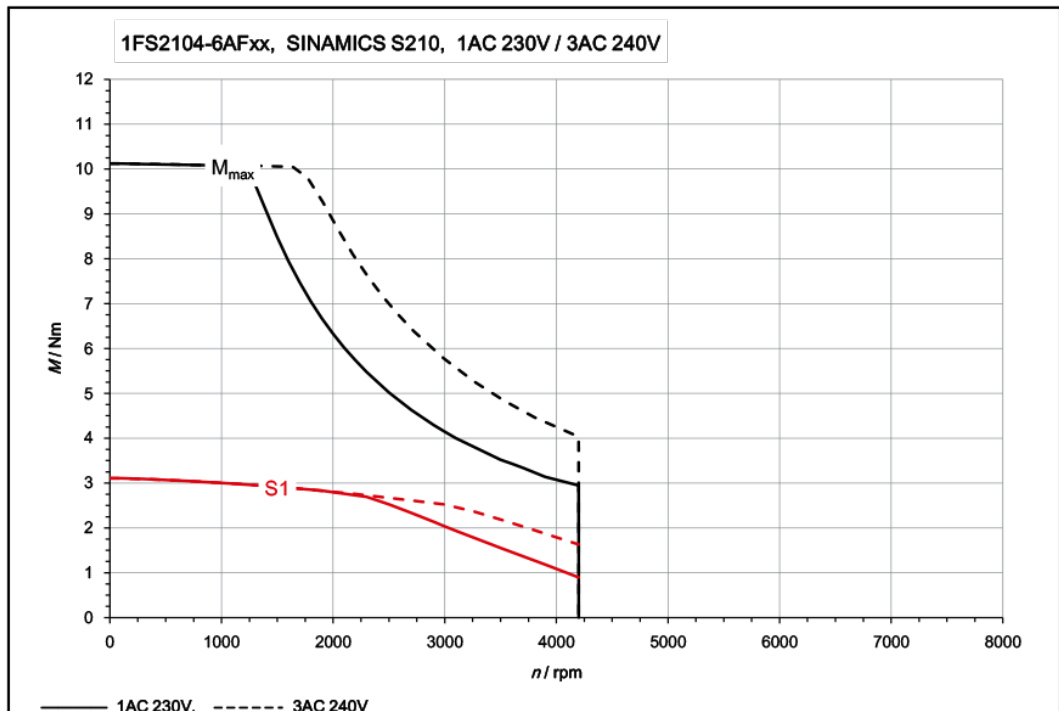
$$W_{BR} = (J_{Mot Br} + J_{load}) \cdot n_{mot}^2 / 182.4$$

$W_{Br} / J$	Operating energy per braking operation
$n_{Mot} / r/min$	Speed at which the brake is engaged
$J_{Mot Br} / kgm^2$	Rotor moment of inertia of the motor with brake
	This information is provided in Chapter
	<ul style="list-style-type: none"> <li>• "Technical specifications and characteristics of 1FS2 connected to 1 AC 230 V, 3 AC 240 V (Page 389)"</li> <li>• "Technical specifications and characteristics of 1FS2 connected to 3 AC 400 V, 3 AC 480 V (Page 394)"</li> </ul>
$J_{load} / kgm^2$	Load moment of inertia of the mounting part on the motor with brake (kgm <sup>2</sup> )
182.4	Constant for calculating the circular frequency and SI units

**13.2.16 Technical specifications and characteristics of 1FS2 connected to 1 AC 230 V, 3 AC 240 V**

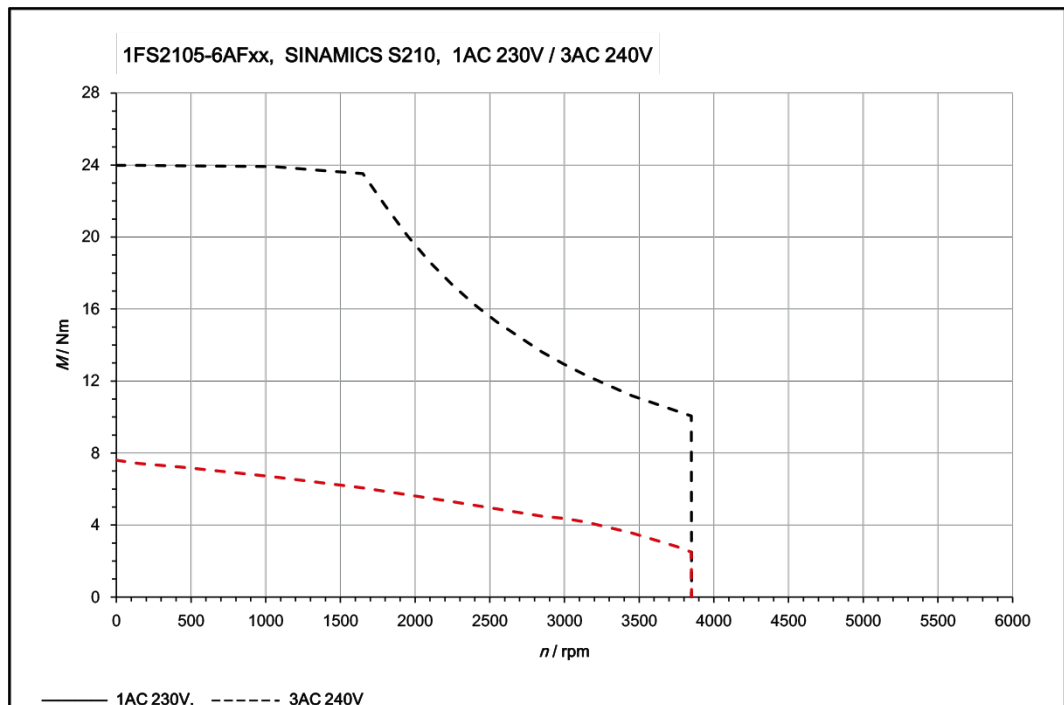
**13.2.16.1 1FS2104-6AF connected to 1 AC 230 V / 3 AC 240 V**

1FS2104-6AF□□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	3.1
Stall current	$I_0$	A	2.75
Max. permissible speed	$n_{max}$	r/min	4200
Maximum torque	$M_{max}$	Nm	10
Maximum current	$I_{max}$	A	10.9
Thermal time constant	$T_{th}$	min	38
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	0.72
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	0.8
Weight	$m_{mot}$	kg	7.2
Weight (with brake)	$m_{mot\ withBr}$	kg	8.7
Rated data for S210 connected to 230 V, 1 AC 240 V 3 AC			
Rated speed	$n_{rated}$	r/min	1500
Rated torque	$M_{rated}$	Nm	2.85
Rated current	$I_{rated}$	A	2.7
Rated power	$P_{rated}$	kW	0.45



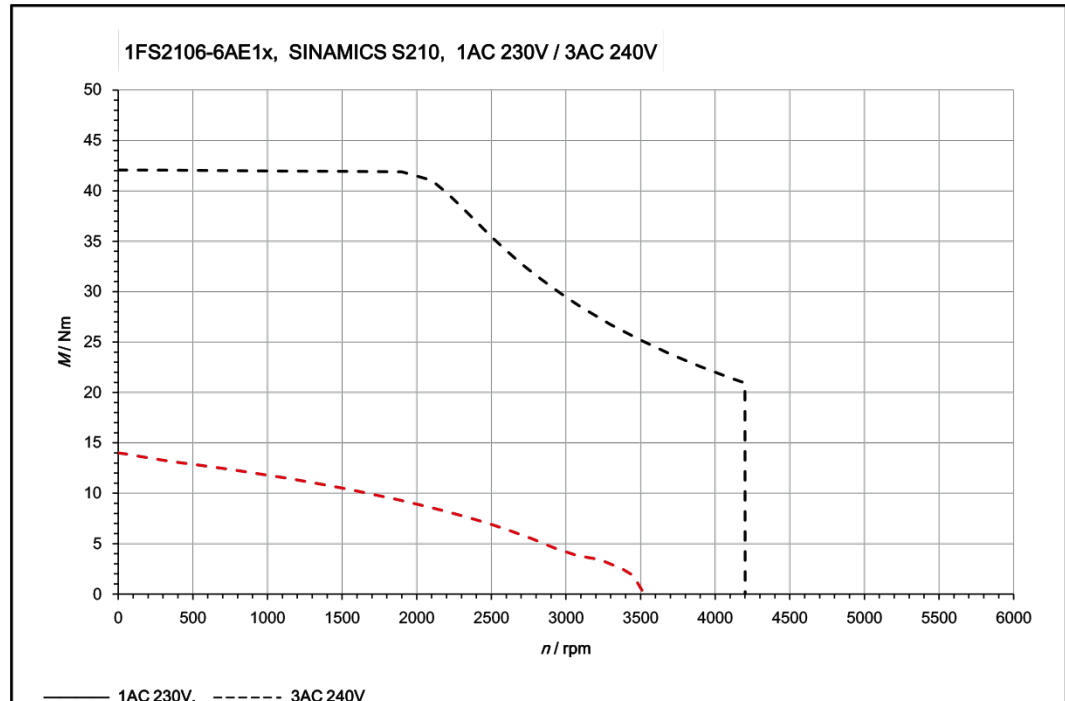
13.2.16.2 1FS2105-6AF connected to 3 AC 240 V

1FS2105-6AF□□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	7.6
Stall current	$I_0$	A	6.2
Max. permissible speed	$n_{max}$	r/min	3850
Maximum torque	$M_{max}$	Nm	24
Maximum current	$I_{max}$	A	24
Thermal time constant	$T_{th}$	min	45
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	2.75
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	3.58
Weight	$m_{mot}$	kg	13.3
Weight (with brake)	$m_{mot\ withBr}$	kg	14.6
Rated data for S210 connected to 240 V 3 AC			
Rated speed	$n_{rated}$	r/min	1500
Rated torque	$M_{rated}$	Nm	6.2
Rated current	$I_{rated}$	A	5.5
Rated power	$P_{rated}$	kW	0.974



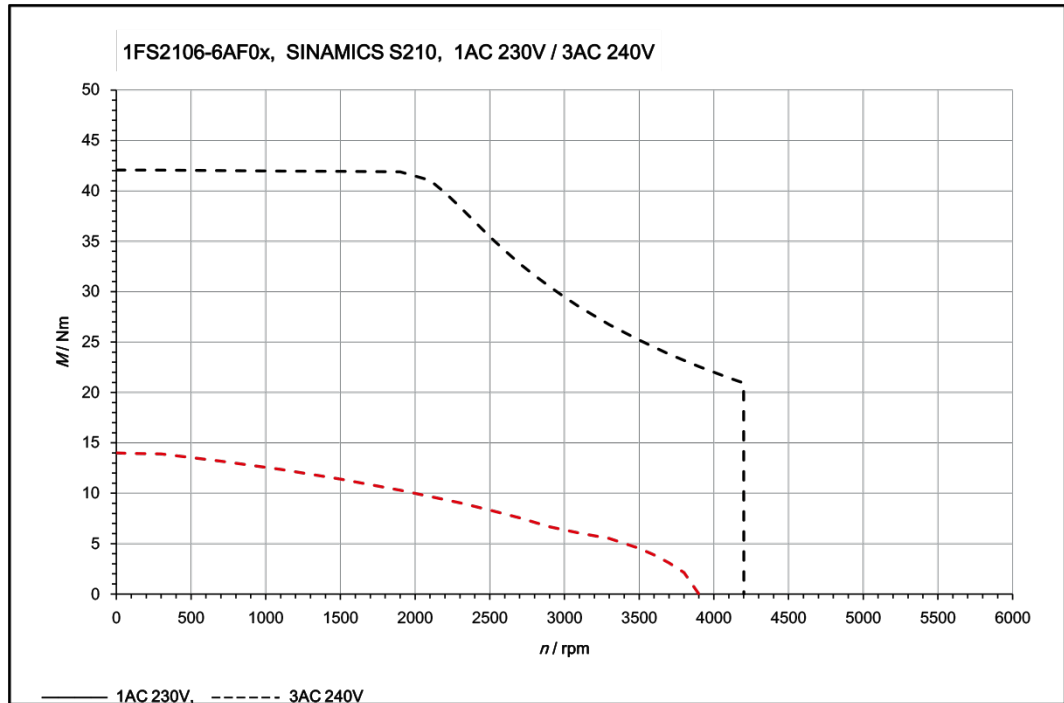
13.2.16.3 1FS2106-6AE connected to 240 V 3 AC

1FS2106-6AE1□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	14
Stall current	$I_0$	A	12.4
Max. permissible speed	$n_{max}$	r/min	4200
Maximum torque	$M_{max}$	Nm	42
Maximum current	$I_{max}$	A	44
Thermal time constant	$T_{th}$	min	50
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	-
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	10.6
Weight	$m_{mot}$	kg	-
Weight (with brake)	$m_{mot\ withBr}$	kg	21
Rated data for S210 connected to 240 V 3 AC			
Rated speed	$n_{rated}$	r/min	1250
Rated torque	$M_{rated}$	Nm	11.2
Rated current	$I_{rated}$	A	10
Rated power	$P_{rated}$	kW	1.47



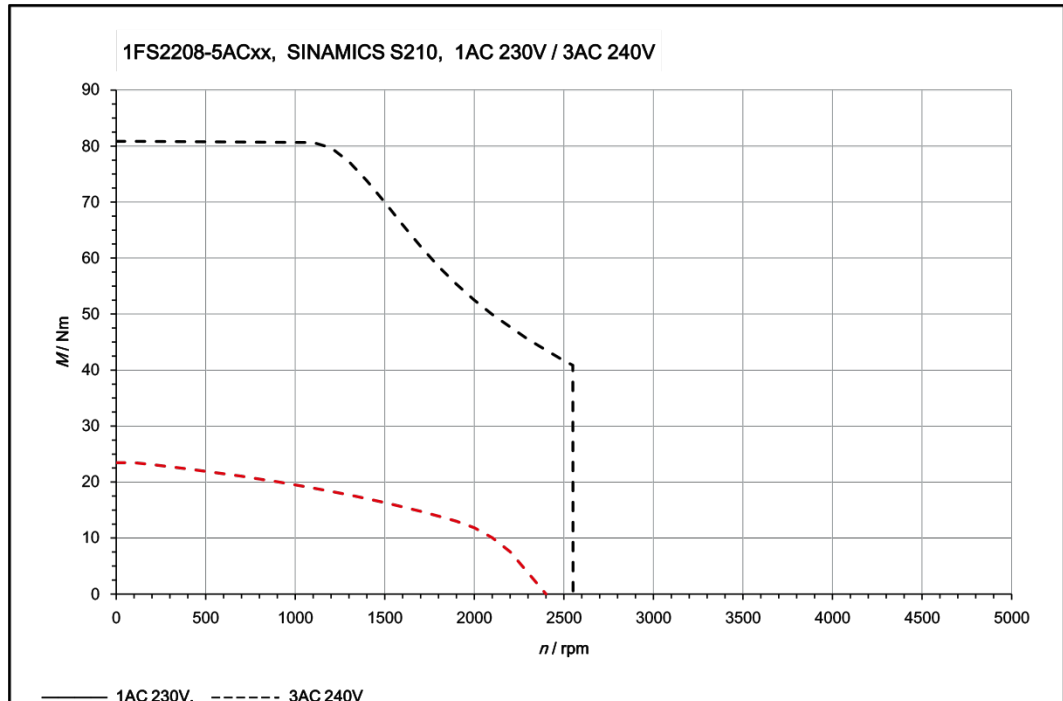
13.2.16.4 1FS2106-6AF connected to 3 AC 240 V

1FS2106-6AF0□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	14
Stall current	$I_0$	A	12.4
Max. permissible speed	$n_{max}$	r/min	4200
Maximum torque	$M_{max}$	Nm	42
Maximum current	$I_{max}$	A	44
Thermal time constant	$T_{th}$	min	50
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	9.03
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	-
Weight	$m_{mot}$	kg	18.6
Weight (with brake)	$m_{mot\ withBr}$	kg	-
Rated data for S210 connected to 240 V 3 AC			
Rated speed	$n_{rated}$	r/min	1500
Rated torque	$M_{rated}$	Nm	11
Rated current	$I_{rated}$	A	10.3
Rated power	$P_{rated}$	kW	1.73



13.2.16.5 1FS2208-5AC to 240 V 3 AC

1FS2208-5AC□□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	23.5
Stall current	$I_0$	A	12.8
Max. permissible speed	$n_{max}$	r/min	2550
Maximum torque	$M_{max}$	Nm	80
Maximum current	$I_{max}$	A	51.5
Thermal time constant	$T_{th}$	min	60
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	49.1
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	54.7
Weight	$m_{mot}$	kg	28
Weight (with brake)	$m_{mot\ withBr}$	kg	32
Rated data for S210 connected to 3 AC 240 V			
Rated speed	$n_{rated}$	r/min	1000
Rated torque	$M_{rated}$	Nm	19.5
Rated current	$I_{rated}$	A	11.1
Rated power	$P_{rated}$	kW	2.04

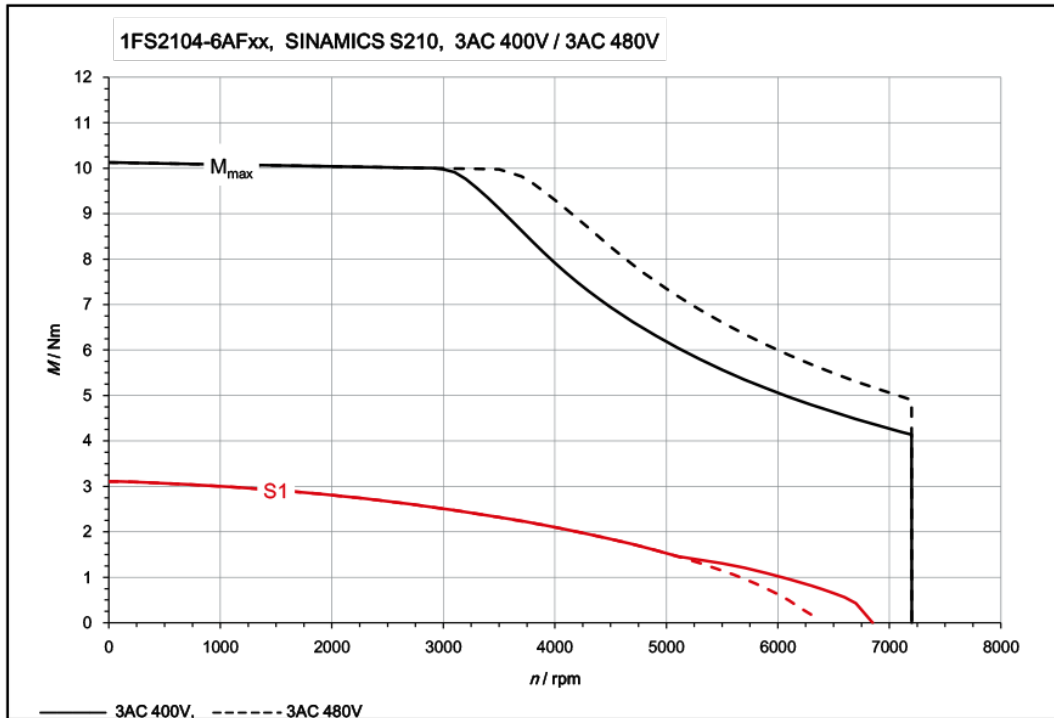


13.2 Technical data and properties of the motor

13.2.17 Technical specifications and characteristics of 1FS2 connected to 3 AC 400 V, 3 AC 480 V

13.2.17.1 1FS2104-6AF connected to 400 V 3 AC / 480 V 3 AC

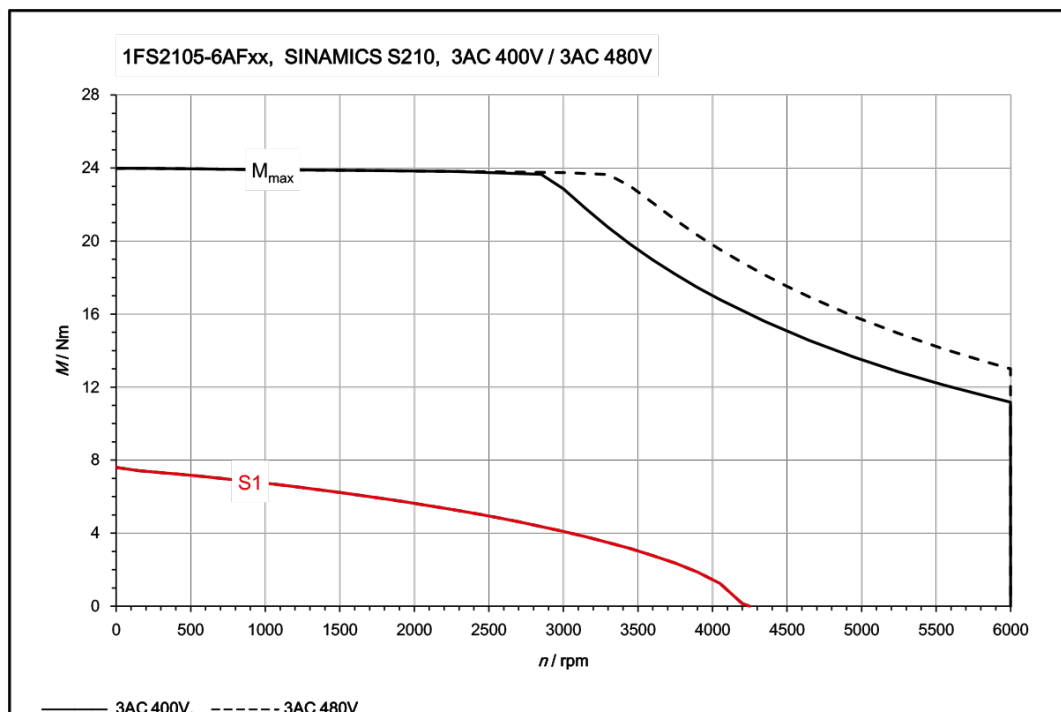
1FS2104-6AF□□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	3.1
Stall current	$I_0$	A	2.75
Max. permissible speed	$n_{max}$	r/min	7200
Maximum torque	$M_{max}$	Nm	10
Maximum current	$I_{max}$	A	10.9
Thermal time constant	$T_{th}$	min	38
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	0.72
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	0.8
Weight	$m_{mot}$	kg	7.2
Weight (with brake)	$m_{mot\ withBr}$	kg	8.7
Rated data for S210 connected to 400 V 3 AC, 480 V 3 AC			
Rated speed	$n_{rated}$	r/min	3000
Rated torque	$M_{rated}$	Nm	2.55
Rated current	$I_{rated}$	A	2.4
Rated power	$P_{rated}$	kW	0.8





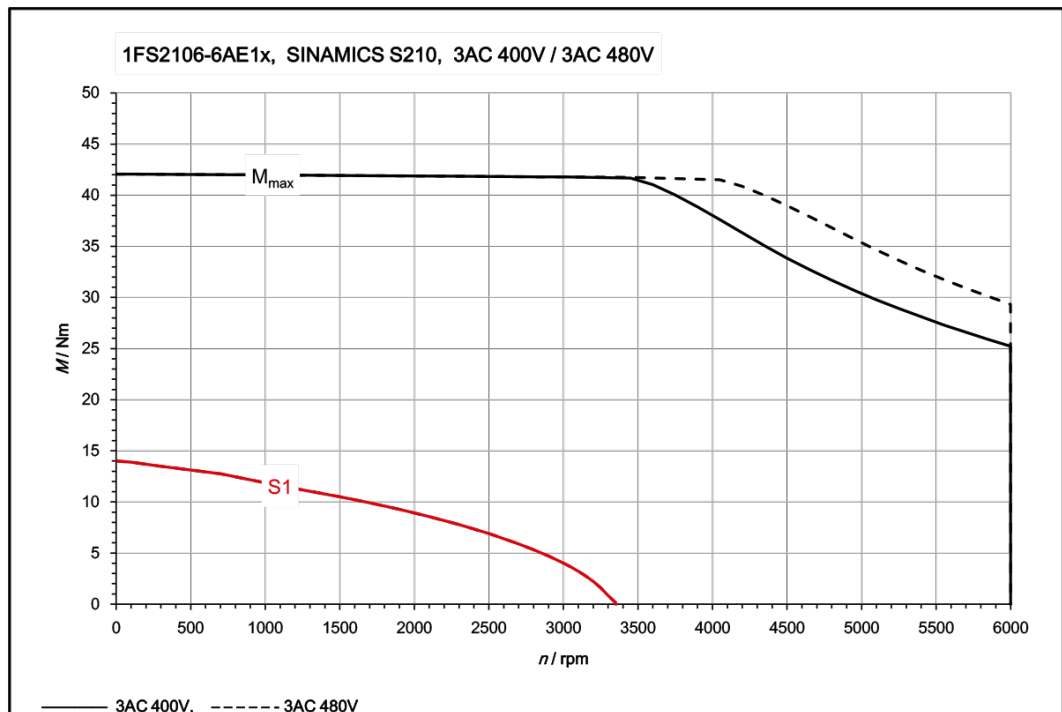
13.2.17.2 1FS2105-6AF connected to 3 AC 400 V / 3 AC 480 V

1FS2105-6AF□□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	7.6
Stall current	$I_0$	A	6.2
Max. permissible speed	$n_{max}$	r/min	6000
Maximum torque	$M_{max}$	Nm	24
Maximum current	$I_{max}$	A	24
Thermal time constant	$T_{th}$	min	45
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	2.75
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	3.58
Weight	$m_{mot}$	kg	13.3
Weight (with brake)	$m_{mot\ withBr}$	kg	14.6
Rated data for S210 connected to 400 V 3 AC, 480 V 3 AC			
Rated speed	$n_{rated}$	r/min	3000
Rated torque	$M_{rated}$	Nm	4.1
Rated current	$I_{rated}$	A	3.7
Rated power	$P_{rated}$	kW	1.29



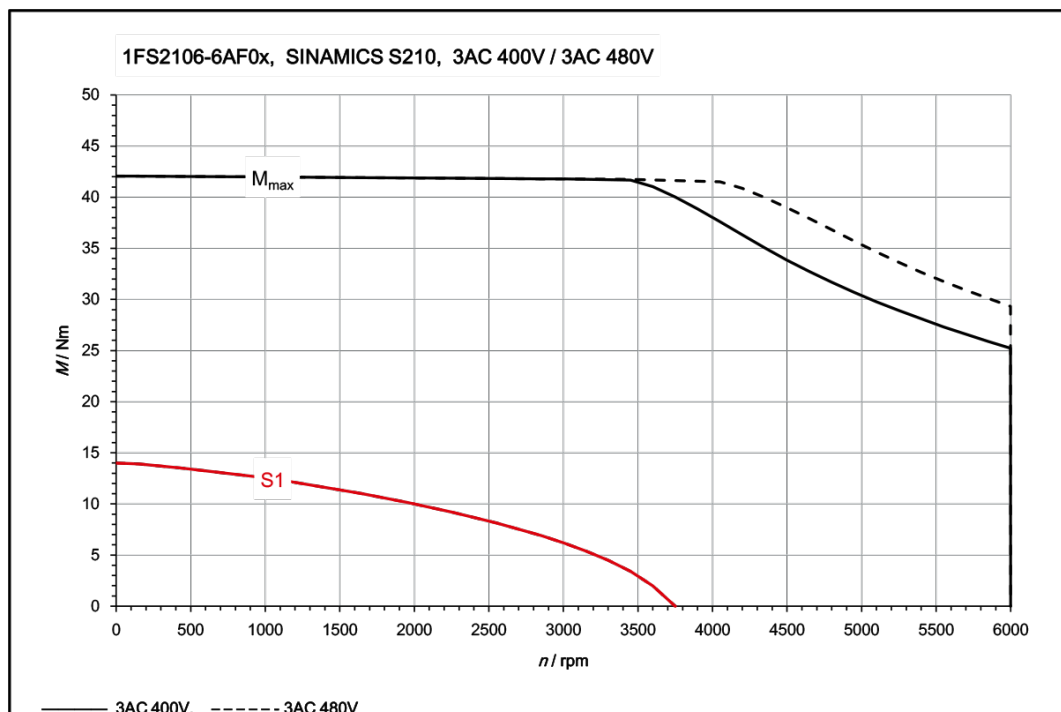
13.2.17.3 1FS2106-6AE connected to 3 AC 400 V / 3 AC 480 V

1FS2106-6AE1□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	14
Stall current	$I_0$	A	12.4
Max. permissible speed	$n_{max}$	r/min	6000
Maximum torque	$M_{max}$	Nm	42
Maximum current	$I_{max}$	A	44
Thermal time constant	$T_{th}$	min	50
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	-
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	10.6
Weight	$m_{mot}$	kg	-
Weight (with brake)	$m_{mot\ withBr}$	kg	21
Rated data for S210 connected to 400 V 3 AC, 480 V 3 AC			
Rated speed	$n_{rated}$	r/min	2500
Rated torque	$M_{rated}$	Nm	6.9
Rated current	$I_{rated}$	A	6.5
Rated power	$P_{rated}$	kW	1.81



13.2.17.4 1FS2106-6AF connected to 400 V 3 AC / 480 V 3 AC

1FS2106-6AF0□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	14
Stall current	$I_0$	A	12.4
Max. permissible speed	$n_{max}$	r/min	6000
Maximum torque	$M_{max}$	Nm	42
Maximum current	$I_{max}$	A	44
Thermal time constant	$T_{th}$	min	50
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	9.03
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	-
Weight	$m_{mot}$	kg	18.6
Weight (with brake)	$m_{mot\ withBr}$	kg	-
Rated data for S210 connected to 400 V 3 AC, 480 V 3 AC			
Rated speed	$n_{rated}$	r/min	3000
Rated torque	$M_{rated}$	Nm	6.2
Rated current	$I_{rated}$	A	6
Rated power	$P_{rated}$	kW	1.95



13.2.17.5 1FS2208-5AC to 400 V 3 AC / 480 V 3 AC

1FS2208-5AC□□			
Technical specifications in the SINAMICS S210 system	Symbol	Unit	Value
Static torque	$M_0$	Nm	23.5
Stall current	$I_0$	A	12.8
Max. permissible speed	$n_{max}$	r/min	4750
Maximum torque	$M_{max}$	Nm	80
Maximum current	$I_{max}$	A	51.5
Thermal time constant	$T_{th}$	min	60
Moment of inertia	$J_{mot}$	kg cm <sup>2</sup>	49.1
Moment of inertia (with brake)	$J_{mot\ withBr}$	kg cm <sup>2</sup>	54.7
Weight	$m_{mot}$	kg	28
Weight (with brake)	$m_{mot\ withBr}$	kg	32
Rated data for S210 connected to 400 V 3 AC, 480 V 3 AC			
Rated speed	$n_{rated}$	r/min	2000
Rated torque	$M_{rated}$	Nm	12
Rated current	$I_{rated}$	A	7.1
Rated power	$P_{rated}$	kW	2.51

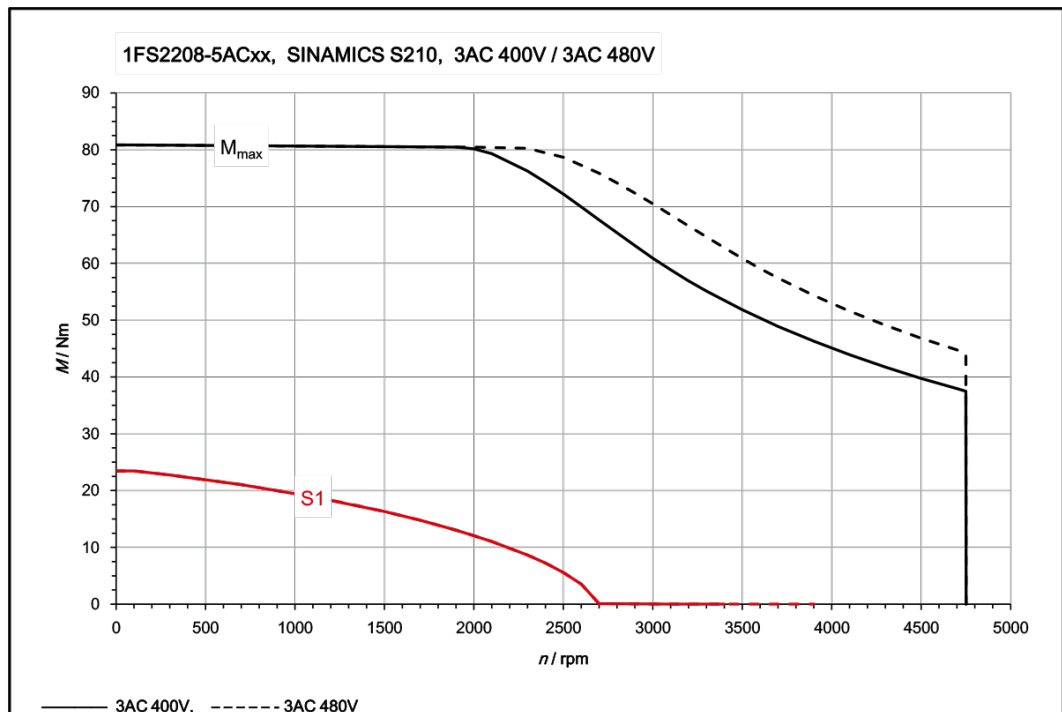


Figure 13-12 1FS2208-5AC\_400V

## 13.3 Technical specifications of the converter

### 13.3.1 Overload capability

#### Overload capability and shutdown behavior of the converter

The converter has integrated overload protection for the connected motor.

When delivered, the tripping threshold is 115% of the parameterized motor current. Brief overloads of up to 300% of the motor current are possible.

When the load exceeds the rated motor current, the thermal protection in the converter starts and switches off the motor in accordance with the overload characteristics shown below.

The following diagrams show the general characteristic for the converter. The maximum current of each converter is given in the technical data. It must not be exceeded irrespective of the overload characteristics.

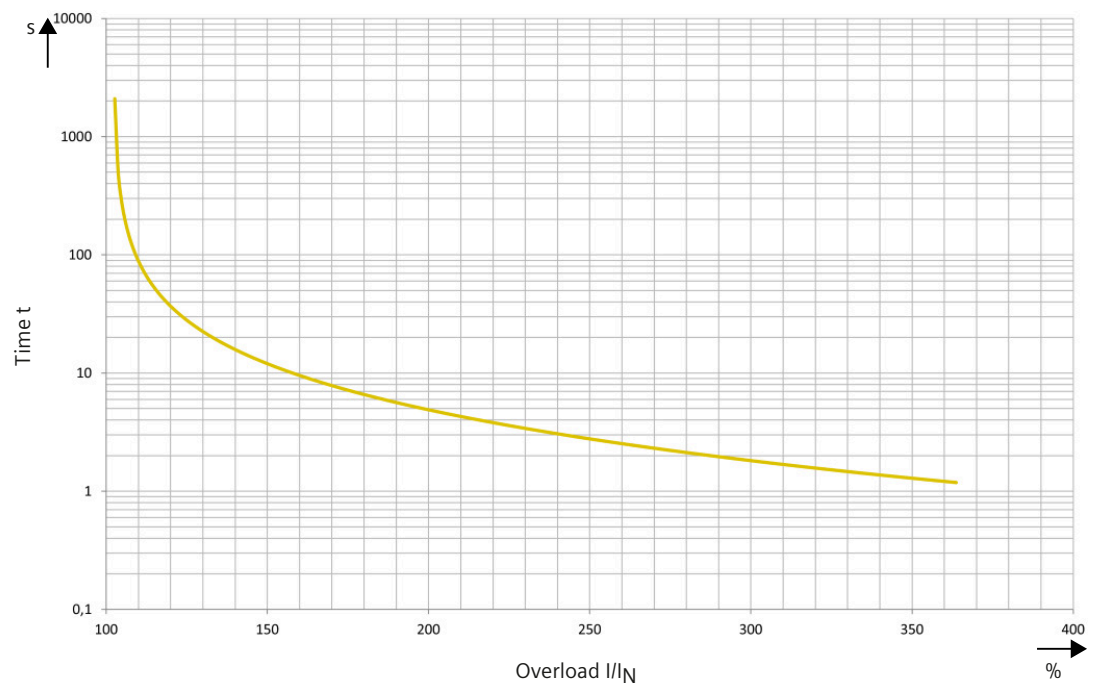


Figure 13-13 Overload characteristic for shutting down the converter with 1 AC line connection

13.3 Technical specifications of the converter

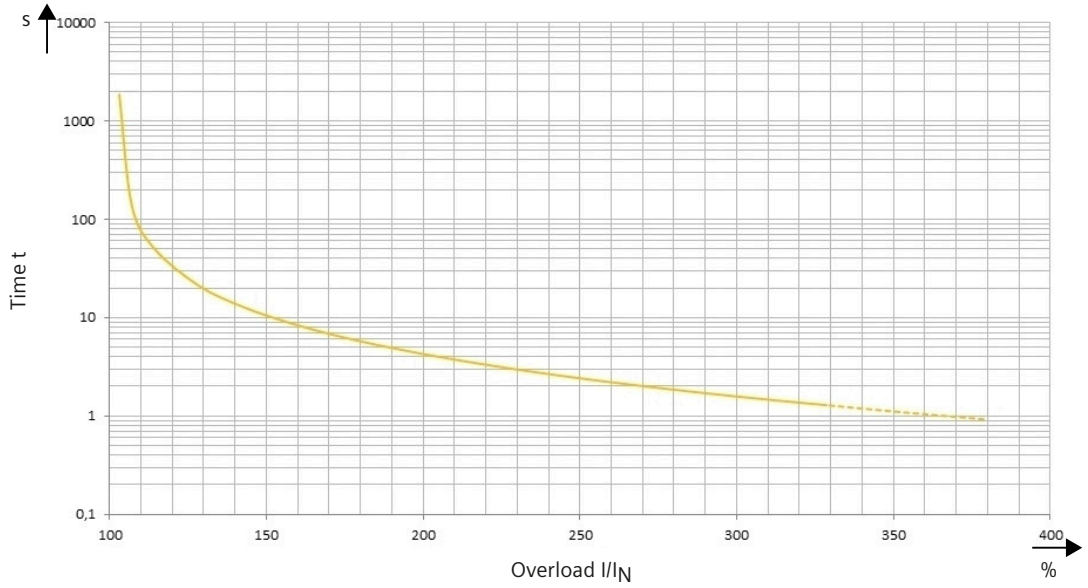


Figure 13-14 Overload characteristic for shutting down the converter with 3 AC line connection

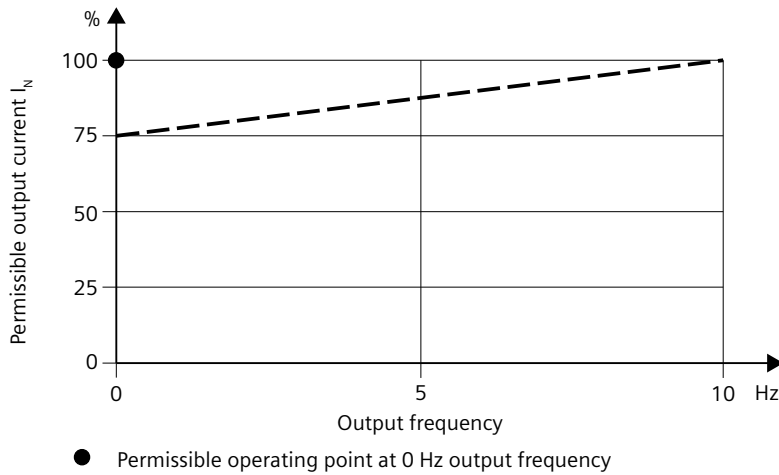


Figure 13-15 Permitted output current at low frequencies

**Note**

**Using the TIA Selection Tool (TST)**

As a result of the combination possibilities (smaller motor connected to a larger converter and vice versa), the response cannot be covered solely by the diagram. The TIA Selection Tool is required for this purpose.

### TIA selection tool (TST)

Use the TIA Selection Tool (TST) to configure a converter-motor combination, adapted to your specific machine. This allows the load profile to be more precisely checked for a selected drive configuration - even with more complex profiles.

- "TIA selection tool (<https://www.siemens.com/tst>)"

### 13.3.2 Electromagnetic compatibility according to IEC 61800-3

The intended and proper use of the converter is specified in the introduction to these operating instructions.

The converters described there are intended for operation in the second environment. In this environment, they meet all requirements relating to interference immunity.

For an EMC-compliant installation, observe the information provided in the Configuration Manual: EMC installation guideline (<https://support.industry.siemens.com/cs/ww/en/view/60612658>).

#### Maximum permissible cable lengths for the respective EMC categories

Table 13-4 Converters with 1 AC line connection

	Converters with internal line filter	Converters with additional external line filter
EMC category C2	10 m	25 m
EMC category C3	25 m	50 m

Table 13-5 Converters with 3 AC line connection

	Converters with internal line filter	Converters with additional external line filter
	<b>without line/DC link coupling</b>	
EMC category C2	---	25 m
EMC category C3	25 m	50 m
	<b>with line or DC link coupling ≤ 6 converters<sup>1)</sup></b>	
EMC category C2	---	100 m
EMC category C3	100 m	250 m

<sup>1)</sup> The data is applicable for the complete cable length of the motors whose converters are coupled with one another through an AC coupling or a DC link coupling.  
 The maximum cable length per motor is 25 m when using the internal line filter to achieve EMC Category C3 or an external line filter to achieve EMC Category C2.  
 When using an external line filter to achieve EMC category C3, the maximum cable length per motor is 50 m.

**Note**

**To be observed for devices used in Category C2**

In a residential environment this product may cause radio-frequency interference, which may make interference suppression measures necessary.

- Have qualified personnel carry out the installation and commissioning with suitable interference suppression measures.



**Note****To be observed for devices used in Category C3**

In a residential environment this product may cause radio-frequency interference.

- Do not use this device in the first environment (residential area).
- 

**Note****Behavior regarding flicker**

The flicker behavior can only be evaluated in a combination of the drive with an application (see IEC 61800-3, Section 6.2.4.2). The drive behaves passively in this regard, i.e. load fluctuations of the application will be visible without changes on the line side.

---

### 13.3.3 Protection from electromagnetic fields

#### Overview

Protection of workers from electromagnetic fields is specified in the European EMF Directive 2013/35/EU. This directive is implemented in national law in the European Economic Area (EEA). Employers are obligated to design workplaces in such a way that workers are protected from impermissibly strong electromagnetic fields.

To this end, assessments and/or measurements must be performed for workplaces.

#### General conditions

The following general conditions apply for the evaluations and measurements:

1. The laws for protection from electromagnetic fields in force in individual EU member states can go beyond the minimum requirements of the EMF Directive 2013/35/EU and always take precedence.
2. The ICNIRP 2010 limits for the workplace are the basis for the assessment.
3. The 26th BImSchV (German Federal Emission Protection Regulation) defines 100  $\mu\text{T}$  (RMS) for the assessment of active implants.  
According to Directive 2013/35/EU, 500  $\mu\text{T}$  (RMS) at 50 Hz is applicable here.
4. The routing of power cables has a significant impact on the electromagnetic fields that occur. Install and operate the components inside metallic cabinets in compliance with the documentation and use shielded motor cables (see "EMC Installation Guideline (<https://support.industry.siemens.com/cs/ww/en/view/60612658>)").

#### Evaluation of the converter

The converters are normally used in machines. The assessment and testing is based on DIN EN 12198-1 and IEC 62311.

13.3 Technical specifications of the converter

Compliance with the limit values was assessed for the following frequencies:

- Line frequency 47 ... 63 Hz
- 8 kHz pulse frequency

The indicated minimum distances apply to the head and complete torso of the human body. Shorter distances are possible for extremities.

Table 13-6 Minimum distances to the converter

Individuals without active implants		Individuals with active implants	
Control cabinet closed	Control cabinet open	Control cabinet closed	Control cabinet open
0 cm	Forearm length (approx. 35 cm)	Must be separately assessed depending on the active implant.	

### 13.3.4 Permissible environmental conditions for the converter

Property	Version
<b>Ambient conditions for transport in the transport packaging</b>	
Climatic ambient conditions	-40 °C ... +70 °C, according to Class 2K4 to IEC 60721-3-2:1997 maximum humidity 95% at 40 °C
Mechanical ambient conditions	Shocks and vibrations permissible according to 3M2 to IEC 60721-3-2:1997
Protection against chemical substances	Protected according to Class 2C2 to IEC 60721-3-2:1997
Biological environmental conditions	Suitable according to Class 2B2 to IEC 60721-3-2:1997
<b>Ambient conditions for long-term storage in the product packaging</b>	
Climatic ambient conditions	-25 °C ... +55 °C, according to Class 1K4 to IEC 60721-3-1:1997
Protection against chemical substances	Protected according to Class 1C2 to IEC 60721-3-1:1997
Biological environmental conditions	Suitable according to Class 1B2 to IEC 60721-3-1:1997
<b>Ambient conditions in operation</b>	
Installation altitude	<ul style="list-style-type: none"> <li>up to 1000 m above sea level without derating</li> <li>up to 4000 m, derating, see the following table</li> </ul>
Climatic ambient conditions	<ul style="list-style-type: none"> <li>Temperature range: 0 °C ... +50 °C</li> <li>Relative humidity: 5 ... 95%, condensation not permitted</li> <li>Oil mist, salt mist, ice formation, condensation, dripping water, spraying water, splashing water and water jets are not permitted</li> </ul> <p>Increased ruggedness regarding temperature range and relative humidity; therefore better than 3K3 according to IEC 60721-3-3:2002</p>
Mechanical ambient conditions	<ul style="list-style-type: none"> <li>Vibration levels permissible according to Class 3M2 to IEC 60721-3-3:2002 Vibration test in operation according to IEC 60068-2-6 Test Fc (sinusoidal) <ul style="list-style-type: none"> <li>2 Hz ... 9 Hz: 1.5 mm deflection amplitude</li> <li>9 Hz ... 200 Hz: 0.5 g acceleration amplitude</li> <li>10 frequency cycles per axis</li> </ul> </li> <li>Shocks permissible according to Class 3M2 to IEC 60721-3-3:2002 Shock test in operation according to IEC 60068-2-27 Test Ea (semi sinusoidal) <ul style="list-style-type: none"> <li>5 g peak acceleration</li> <li>30 ms duration</li> <li>3 shocks in all three axes in both directions</li> </ul> </li> </ul>
Protection against chemical substances	<ul style="list-style-type: none"> <li>Protected according to Class 3C2 to IEC 60721-3-3:2002</li> <li>Protected according to Class 3C3 for H<sub>2</sub>S and SO<sub>2</sub> to IEC 60721-3-3:2002</li> <li>Protected according to Class G3 to ANSI/ISA 71.04:2013</li> </ul>
Biological environmental conditions	Suitable according to Class 3B2 to IEC 60721-3-3:2002
Pollution	Suitable for environments with degree of pollution 2 acc. to IEC 61800-5-1

13.3 Technical specifications of the converter

Table 13-7 Maximum permissible output current depending on the installation altitude and ambient temperature

Installation altitude	Ambient temperature in °C		
	50	45	40
	Output current as a %		
Up to 1000 m	100		
Up to 2000 m	90	100	
Up to 3000 m	80	90	100
Up to 4000 m	70	80	90

A maximum of 2000 m is permissible for CSA compliance.

### 13.3.5 General data

Property	Version
Line voltage	<p>200 V 1 AC ... 240 V 1 AC, ±10%</p> <p>Line system configuration: Grounded TN/TT line systems and non-grounded IT line systems</p> <hr/> <p>3 AC 200 V ... 240 V, ±10%</p> <p>380 V ... 480 V 3 AC, ±10%</p> <p>Line system configuration: Grounded TN/TT line systems. Non-grounded IT line systems only with an isolation transformer.</p> <p>You can find more information in Chapter "Line connection conditions for the S210 converter system with 1FS2 motors (Page 367)".</p>
Mains buffering concept	<p>The converter is dimensioned so that there is no functional restriction at rated power (3 ms power dip or interruption according to IEC 61800-3 (2017)<sup>1)</sup>).</p> <p>The specified times can be several times longer depending on the drive constellation and the operating conditions. In particular in 3 AC devices in groups with DC link coupling in which some converters operate in the motor mode while others operate in generator mode, the time can be substantially longer. Based on these influencing factors, no generally valid statements can be made about the S210 system, however, so that each drive constellation must be assessed individually.</p>
Output voltage	3 AC 0 V ... 0.95 x input voltage
Input frequency	50 Hz / 60 Hz, ±10 Hz
Output frequency	0 ... 550 Hz
Overvoltage category according to IEC/EN 61800-5-1	The converter insulation is designed for surge voltages of overvoltage category III.
Pulse frequency	8 kHz
Short-circuit current rating (SCCR) and branch protection	<p>≤ 65 kA rms</p> <p>Branch protection and short-circuit strength according to UL and IEC Protective Devices for SINAMICS S210 (<a href="https://support.industry.siemens.com/cs/ww/en/view/109815356">https://support.industry.siemens.com/cs/ww/en/view/109815356</a>)</p>
Minimum prospective short-circuit current	To prevent fire in the event of a fault, a minimum value must be ensured for the prospective short-circuit current so that the upstream protective device trips quickly enough. A typical value when dimensioning is 20 to 25 x <sup>2)</sup> the rated current of the protection device used.
Braking resistor	Integrated in the device <sup>3)</sup> , when required, a larger resistor can be externally connected.
Service life of fan (3 AC only)	40000 h
Degree of protection according to IEC 60529	IP20      Must be installed in a control cabinet

13.3 Technical specifications of the converter

Property	Version													
Electronics power supply	24 V DC, -15% ... +20%, (PELV or SELV) For PELV systems, grounding must be carried out via the external power supply.													
<b>Current requirements from electronic power supply at 24 V DC (motor without brake)</b>														
	<table border="1"> <thead> <tr> <th></th> <th>Frame size</th> <th>Current requirements [A]</th> </tr> </thead> <tbody> <tr> <td>1 AC devices</td> <td>FSA - FSC</td> <td>0.8</td> </tr> <tr> <td rowspan="3">3 AC devices</td> <td>FSA</td> <td>0.9</td> </tr> <tr> <td>FSB</td> <td>1.0</td> </tr> <tr> <td>FSC</td> <td>1.2</td> </tr> </tbody> </table>		Frame size	Current requirements [A]	1 AC devices	FSA - FSC	0.8	3 AC devices	FSA	0.9	FSB	1.0	FSC	1.2
	Frame size	Current requirements [A]												
1 AC devices	FSA - FSC	0.8												
3 AC devices	FSA	0.9												
	FSB	1.0												
	FSC	1.2												
<b>Additional current requirements for 1F□2 servomotor with brake (at 24 V DC)</b>														
Motor type	Current when opening, typical <sup>4)</sup> (to open the brake)	Duration of the current when opening After expiration of $t_{\text{dex}}$ , the holding current takes effect	Holding current (with open brake)											
	$I_o$ / A	$t_{\text{dex}}$ / ms	$I_h$ / A											
1F□2102	0.6	50	0.1											
1F□2□03	0.8	60	0.15											
1F□2□04	1.2	80	0.2											
1F□2□05	1.1	120	0.3											
1F□2□06	1.1	120	0.35											
1F□2208-3	1.2	120	0.4											
1F□2208-4	1.4	180	0.5											
1F□2208-5	1.4	180	0.5											
1F□2210-3	1.4	180	0.5											
1F□2210-4	1.5	200	0.5											
The brake output voltage is controlled internally. Therefore, with a deviating input voltage at terminal X124, the brake currents must be converted accordingly (constant power). It is not necessary to adjust the input voltage to the cable length. For more information on the motor brake, refer to the technical specifications in Chapter "Data of the holding brake (Page 386)".														
Control mode	Servo control													
Switch-on frequency minimum precharging cycle	120 s <sup>5)</sup>													
Protection functions	Ground fault protection, output short-circuit protection, overvoltage/undervoltage protection, I <sup>2</sup> t detection, IGBT overtemperature protection													

- <sup>1)</sup> When operating 3 AC devices on a voltage of 3 AC 200 V ... 240 V, the 3 ms may possibly not be reached depending on the operating conditions.
- <sup>2)</sup> To comply with permissible line harmonics, depending on the line connection conditions, different values may be required.
- <sup>3)</sup> The 1 AC 200 ... 240 V 100 W device does not have an internal braking resistor. An internal braking resistor is not required for normal operation as a result of the available DC link capacitance.
- <sup>4)</sup> Typical value for 20 °C ambient temperature. At -15 °C, the break-induced currents can increase by up to 30%.
- <sup>5)</sup> Shorter precharging cycles may result in a shorter service life.

Table 13-8 Technical data of the digital inputs

Type	High-speed digital inputs for probe or homing marks	Failsafe Digital Input (F-DI)	Digital input for monitoring the temperature of an external braking resistor
Number	2 (DI 0, DI 1)	1 (DI 2 and DI 3)	1 (DI 4)
• Low level	-30 V ... +5 V and $\leq 2$ mA	-30 V ... +5 V and $\leq 2$ mA	-30 V ... +5 V and $\leq 2$ mA
• High level	15 V ... 30 V	15 V ... 30 V	15 V ... 30 V
• Current consumption	6 mA	5 mA	6 mA
• Delay time, typ. L $\rightarrow$ H	5 $\mu$ s	50 $\mu$ s	5 $\mu$ s
• Delay time, typ. H $\rightarrow$ L	50 $\mu$ s	100 $\mu$ s	50 $\mu$ s
• Electrical isolation	No	Yes	No
Conductor cross section, max.	1.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>

The inputs correspond to Type 1 according to EN 61131-2.

### 13.3.6 Specific data of the converter with 1 AC line connection

Table 13-9 Frame size FSA, 1 AC

Article number	6SL5310-1BB10-1CF0	6SL5310-1BB10-2CF0
Rated output current	0.8 A	1.4 A
Maximum output current	3.1 A	4.8 A
Rated power	100 W	200 W
Rated input current	1.4 A	2.7 A
Inrush current <sup>1)</sup>	10 A	2.6 A
Maximum braking current at connector X1	2 A	2 A
Power loss	15.7 W	23.2 W
Fuse according to IEC	3NA3 801 (6 A)	3NA3 801 (6 A)
Fuse according to UL, Class J	6 A	6 A
Cooling	Convection cooling without fan	Convection cooling without fan
Weight	1.1 kg	1.1 kg

Table 13-10 Frame size FSB 1 AC

Article number	6SL5310-1BB10-4CF0
Rated output current	2.4 A
Maximum output current	8.7 A
Rated power	400 W
Rated input current	5 A
Inrush current <sup>1)</sup>	3.9 A
Maximum braking current at connector X1	4 A
Power loss	38.5 W
Fuse according to IEC	3NA3 803 (10 A)
Fuse according to UL, Class J	10 A
Cooling	Convection cooling without fan
Weight	1.2 kg

Table 13-11 Frame size FSC 1 AC

Article number	6SL5310-1BB10-8CF0
Rated output current	4.4 A
Maximum output current	16 A
Rated power	750 W
Rated input current	9.3 A
Inrush current <sup>1)</sup>	7.9 A
Maximum braking current at connector X1	6 A
Power loss	71.1 W



<b>Article number</b>	<b>6SL5310-1BB10-8CF0</b>
Fuse according to IEC	3NA3 805 (16 A)
Fuse according to UL, Class J	20 A
Cooling	Convection cooling without fan
Weight	1.9 kg

<sup>1)</sup> The inrush currents may differ significantly if external braking resistors are used: Inrush current = (connection voltage ×  $\sqrt{2}$ )/R<sub>ext</sub>

### 13.3.7 Specific data of the converter with 3 AC line connection

Table 13-12 Frame size FSA, 3 AC

Article number	6SL5310-1BE10-4DF0	6SL5310-1BE10-8DF0
Rated output current	1.2 A	2.3 A
Maximum output current	4.2 A	7.6 A
Rated power	0.4 kW	0.75 kW
Rated input current	1.6 A	2.8 A
Inrush current <sup>1)</sup>	4.3 A	4.3 A
Maximum braking current at connector X4	5 A	5 A
Power loss	69 W	81 W
Fuse according to IEC	3NA3 805 (16 A)	3NA3 805 (16 A)
Fuse according to UL, Class J	15 A	15 A
Cooling	Integrated fan	Integrated fan
Weight	2.1 kg	2.1 kg

Table 13-13 Frame size FSA, 3 AC

Article number	6SL5310-1BE11-0DF0
Rated output current	3 A
Maximum output current	10.9 A
Rated power	1 kW
Rated input current	3.8 A
Inrush current <sup>1)</sup>	4.3 A
Maximum braking current at connector X4	5 A
Power loss	94 W
Fuse according to IEC	3NA3 805 (16 A)
Fuse according to UL, Class J	15 A
Cooling	Integrated fan
Weight	2.1 kg

Table 13-14 Frame size FSB 3 AC

Article number	6SL5310-1BE11-5DF0	6SL5310-1BE12-0DF0
Rated output current	5 A	7 A
Maximum output current	19 A	24 A
Rated power	1.5 kW	2 kW
Rated input current	6.0 A	7.5 A
Inrush current <sup>1)</sup>	8.6 A	8.6 A
Maximum braking current at connector X4	10 A	10 A
Power loss	114 W	131 W

13.3 Technical specifications of the converter

Article number	6SL5310-1BE11-5DF0	6SL5310-1BE12-0DF0
Fuse according to IEC	3NA3 812 (32 A)	3NA3 812 (32 A)
Fuse according to UL, Class J	30 A	30 A
Cooling	Integrated fan	Integrated fan
Weight	3.3 kg	3.3 kg

Table 13-15 Frame size FSC 3 AC

Article number	6SL5310-1BE13-5DF0	6SL5310-1BE15-0DF0
Rated output current	9 A	12 A
Maximum output current	33 A	44 A
Rated power	3.5 kW	5 kW
Rated input current	12.5 A	15.0 A
Inrush current <sup>1)</sup>	27.7 A	27.7 A
Maximum braking current at connector X4	32 A	32 A
Power loss	167 W	191 W
Fuse according to IEC	3NA3 822 (63 A)	3NA3 822 (63 A)
Fuse according to UL, Class J	70 A	70 A
Cooling	Integrated fan	Integrated fan
Weight	5 kg	5 kg

Table 13-16 Frame size FSC 3 AC

Article number	6SL5310-1BE17-0DF0
Rated output current	15 A
Maximum output current	55 A
Rated power	7 kW
Rated input current	17.9 A
Inrush current <sup>1)</sup>	27.7 A
Maximum braking current at connector X4	32 A
Power loss	204 W
Fuse according to IEC	3NA3 822 (63 A)
Fuse according to UL, Class J	70 A
Cooling	Integrated fan
Weight	5 kg


<sup>1)</sup> The inrush currents may differ significantly if external braking resistors are used: Inrush current = (connection voltage × √2)/R<sub>ext</sub>

## 13.4 Technical data and properties of the connection system


### MOTION-CONNECT connection cables between the motor and the converter

The following technical data applies to the MOTION-CONNECT OCC cables.

Table 13-17 MOTION-CONNECT OCC cable with SPEED-CONNECT connector

	Designation and use	Connector size	Outer diameter	Minimum bending radius		For connection to motor	Article number <sup>1)</sup>
				static	dynam-ic		
				$D_{max}$ / mm	R / mm		
	Motor connection cable MC400 for use in the food processing industry, incl. pressure equalization, not suitable for cable drag	M17	10.5	48.5 / 97 <sup>2)</sup>	-	1FS2□04 1FS2□05	6FX4002-8QN08-□□□□
		M23	12.7	57 / 114 <sup>2)</sup>	-	1FS2□06 1FS2□08	6FX4002-8QN11-□□□□
	Motor connection cable MC500 OCC for predominantly fixed installation	M17	10.5	25.5	195	1FS2□04 1FS2□05	6FX5002-8QN08-□□□□
		M23	12.7	31	195	1FS2□06 1FS2□08	6FX5002-8QN11-□□□□
	Motor connection cable MC800 OCC for use in a cable carrier	M17	10.5	30.6	38	1FS2□04 1FS2□05	6FX8002-8QN08-□□□□
		M23	12.7	37.2	92.2	1FS2□06 1FS2□08	6FX8002-8QN11-□□□□

## 13.4 Technical data and properties of the connection system

	Designation and use	Connector size	Outer diameter	Minimum bending radius		For connection to motor	Article number <sup>1)</sup>
				static	dynam-ic		
				$D_{max}$ / mm	R / mm		
	Motor connection cable MC400 for use in the food processing industry, incl. pressure equalization, not suitable for cable drag	M17	10.5	48.5 / 97 <sup>2)</sup>	-	1FS2□04 1FS2□05	6FX4002-8QN08-□□□□
		M23	12.7	57 / 114 <sup>2)</sup>	-	1FS2□06 1FS2□08	6FX4002-8QN11-□□□□
	Extension cable MC500 OCC for predominantly fixed installation	M17	10.5	25.5	195	1FS2□04 1FS2□05	6FX5002-8QE08-□□□□
		M23	12.7	31	195	1FS2□06 1FS2□08	6FX5002-8QE11-□□□□
	Extension cable MC800 OCC for use in a cable carrier	M17	10.5	30.6	38	1FS2□04 1FS2□05	6FX8002-8QE08-□□□□
		M23	12.7	37.2	92.2	1FS2□06 1FS2□08	6FX8002-8QE11-□□□□

<sup>1)</sup> The last 4 digits (□□□□) define the cable length corresponding to the length code

<sup>2)</sup> The larger bending radius applies to bends during repeated installation and removal of the motor

The length code can be found in section "Ordering data of the connection system (Page 458)".

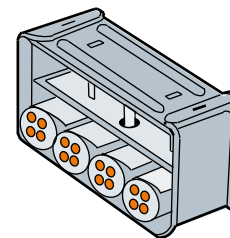
You will find information on pressure equalization in section "Ordering data of the connection system (Page 458)".

#### Technical data and notes for cable carrier use with MC800 PLUS

##### Note

An MC800 PLUS cable is required for connecting the motor using a cable carrier.

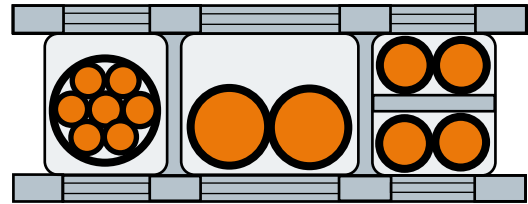
- When inserting prefabricated cables in the cable carrier, do not pull the connector, as this may damage the strain relief or cable clamping.



Strain relief in a cable carrier

13.4 Technical data and properties of the connection system

- Lay the cables loosely in the carrier. They must be free to move. The cables must be free to move in particular in the bending radii of the carrier. Observe the specified minimal bending radii.
- The cable fixings must be attached at both ends at an appropriate distance away from the end points of the moving parts in a dead zone.



Cable routed in a cable carrier

When laying cables, comply with the instructions given by the cable carrier manufacturer.

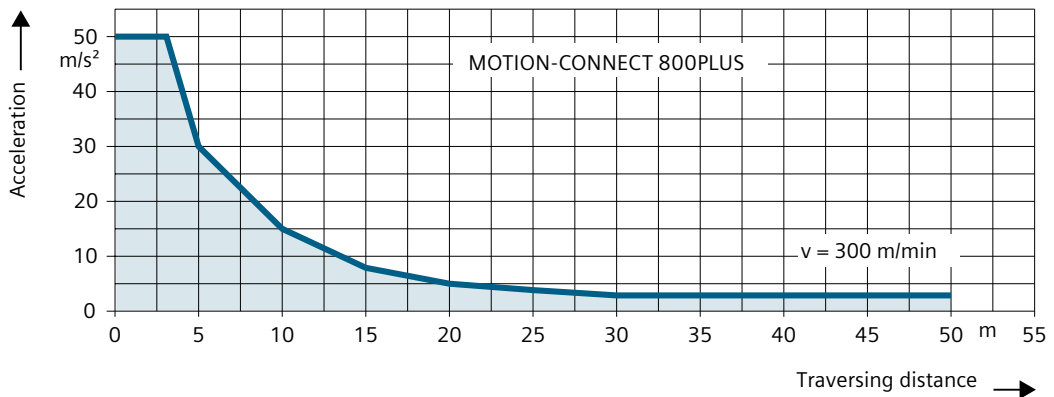


Figure 13-16 Permissible acceleration levels for MOTION-CONNECT 800 PLUS cables

**Note**

**Additional fixing of the cable**

If between the cable strain relief on the cable carrier and the terminal at the motor, part of the cable is hanging loose or is not routed, we recommend that the cable is additionally fixed for vibration load and with horizontal or vertical cable entries.

- Also fix the cable where the motor is fixed so that machine vibrations are not transferred to the connector.

**See also**

Connection system (Page 376)

## Dimension drawings

### 14.1 Motor dimension drawing

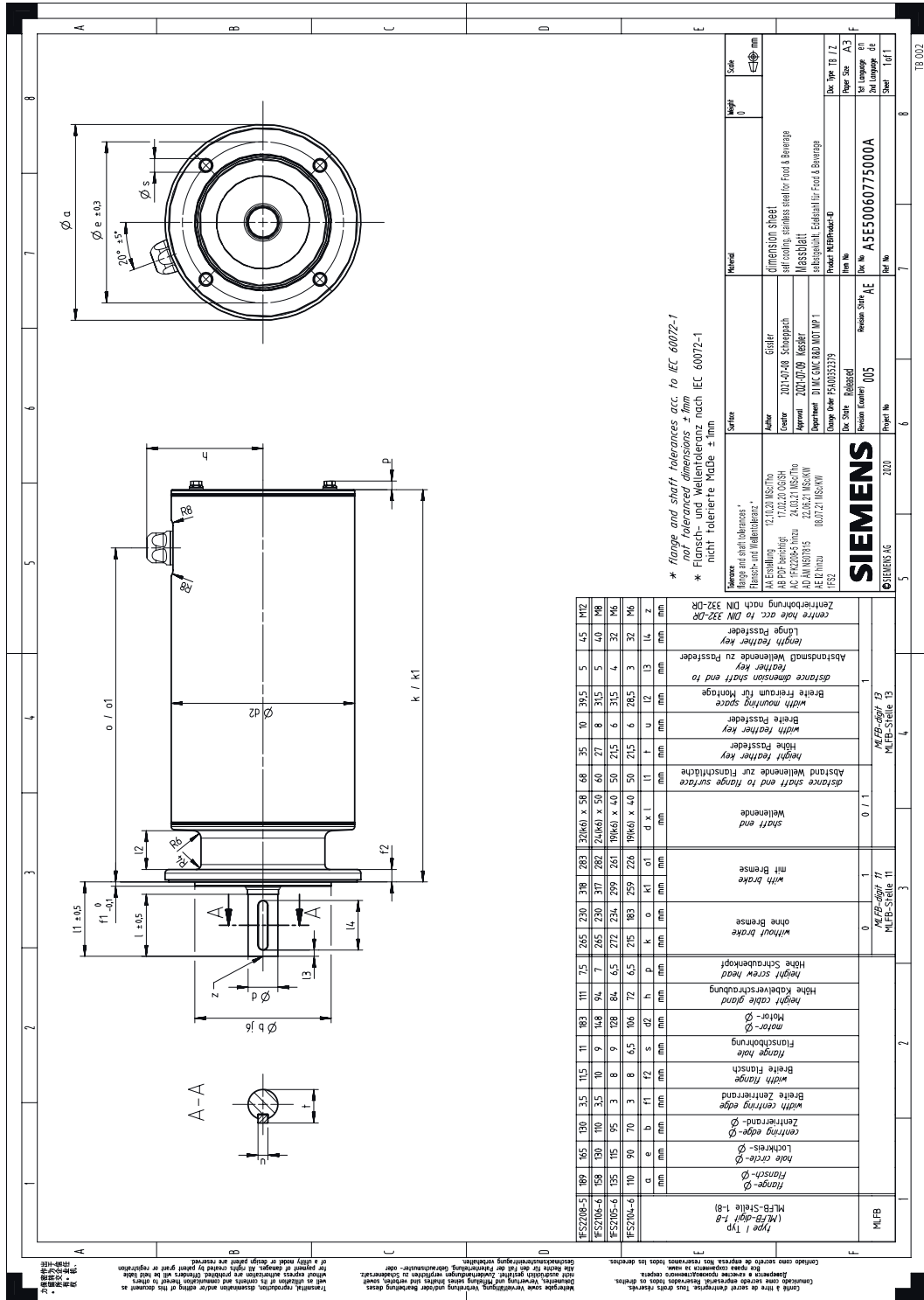


Figure 14-1 Dimension drawing, SIMOTICS S-1FS2



## 14.2 Dimension drawings, converter

### 14.2.1 FSA with 1 AC line connection

#### FSA with 1 AC line connection

6SL5310-1BB10-1CF0 (100 W)

6SL5310-1BB10-2CF0 (200 W)

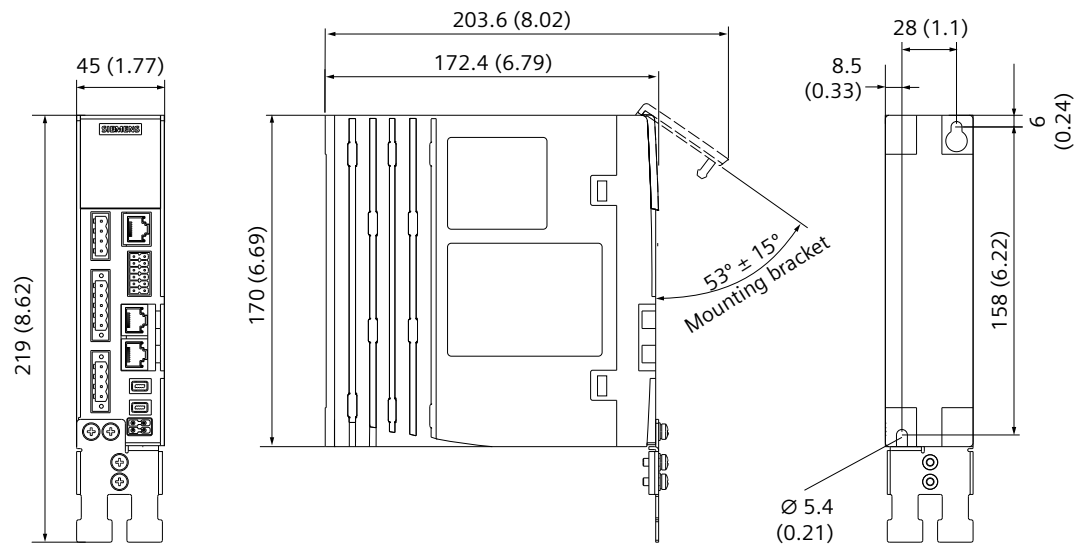


Figure 14-2 Dimension drawing SINAMICS S210 FSA, 1 AC, dimensions in mm (inch)

### 14.2.2 FSB with 1 AC line connection

#### FSB with 1 AC line connection

6SL5310-1BB10-4CF0 (400 W)

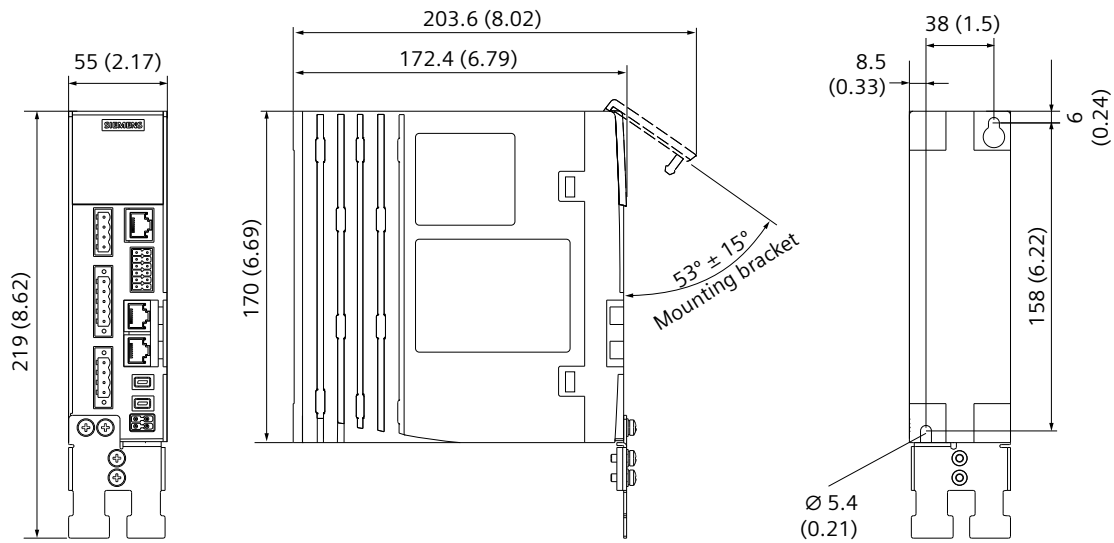


Figure 14-3 Dimension drawing SINAMICS S210 FSB, 1 AC, dimensions in mm (inch)

### 14.2.3 FSC with 1 AC line connection

#### FSC with 1 AC line connection

6SL5310-1BB10-8CF0 (750 W)

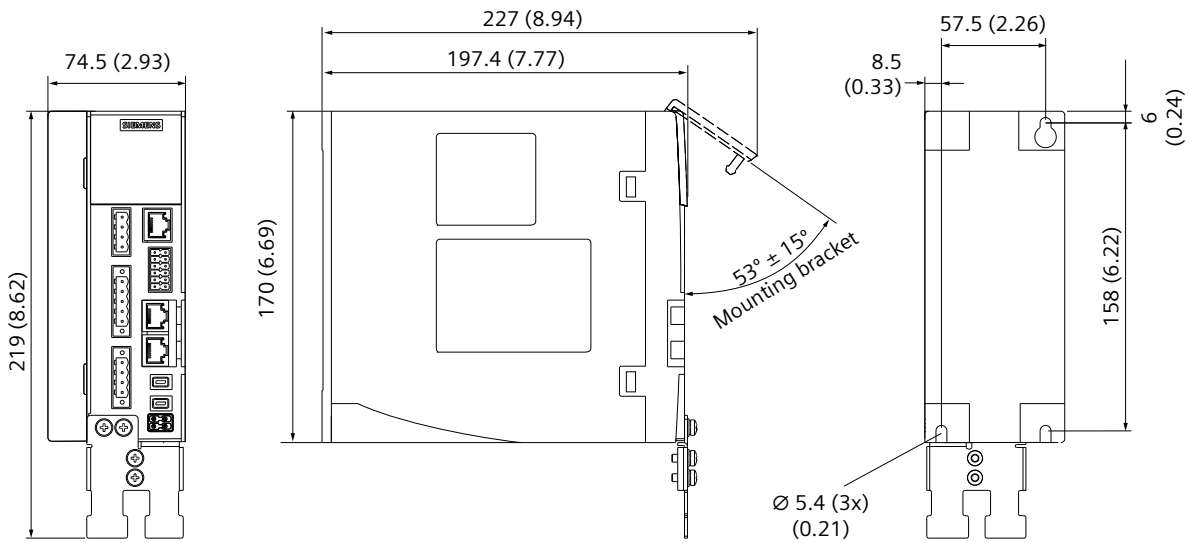


Figure 14-4 Dimension drawing SINAMICS S210 FSC, 1 AC, dimensions in mm (inch)

### 14.2.4 FSA with 3 AC line connection

#### FSA with 3 AC line connection

6SL5310-1BE10-4DF0 (0.4 kW)

6SL5310-1BE10-8DF0 (0.75 kW)

6SL5310-1BE11-0DF0 (1 kW)

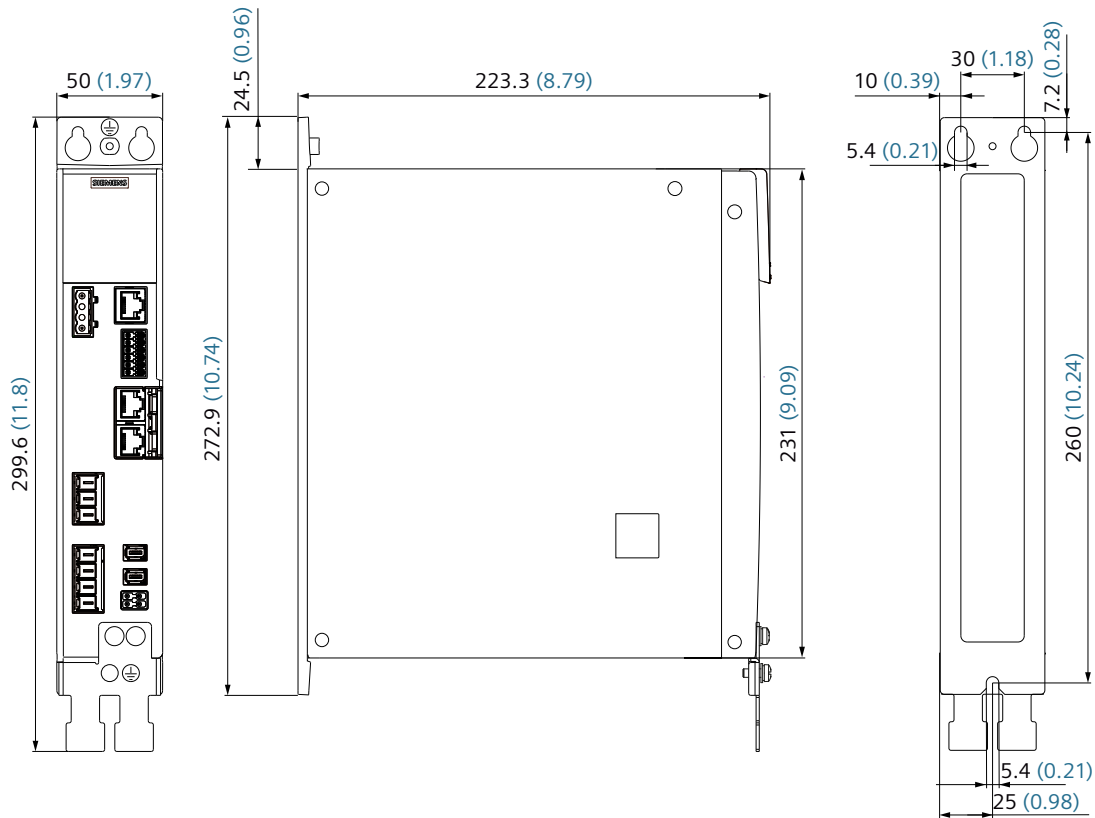


Figure 14-5 Dimension drawing SINAMICS S210 FSA, 3 AC, dimensions in mm (inch)

### 14.2.5 FSB with 3 AC line connection

#### FSB with 3 AC line connection

6SL5310-1BE11-5DF0 (1.5 kW)

6SL5310-1BE12-0DF0 (2 kW)

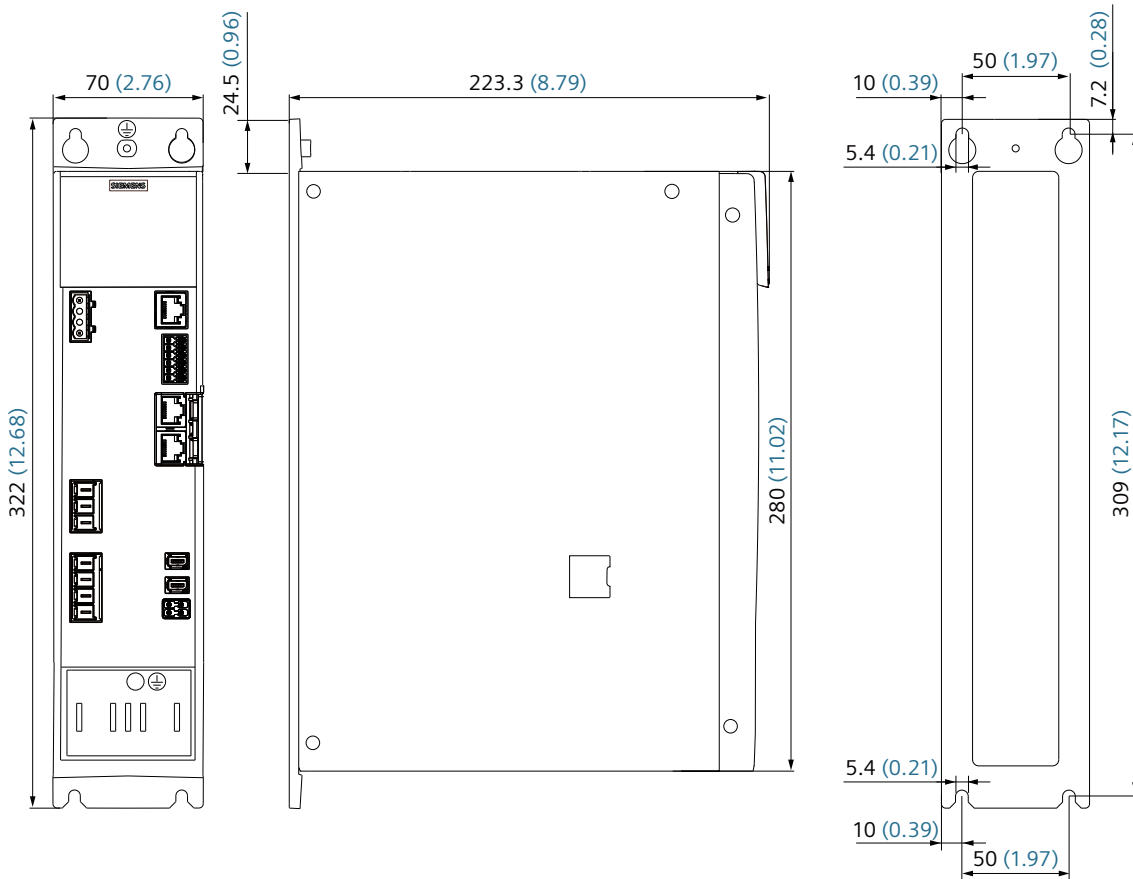


Figure 14-6 Dimension drawing SINAMICS S210 FSB, 3 AC, dimensions in mm (inch)

### 14.2.6 FSC with 3 AC line connection

#### FSC with 3 AC line connection

6SL5310-1BE13-5DF0 (3.5 kW)

6SL5310-1BE15-0DF0 (5 kW)

6SL5310-1BE17-0DF0 (7 kW)

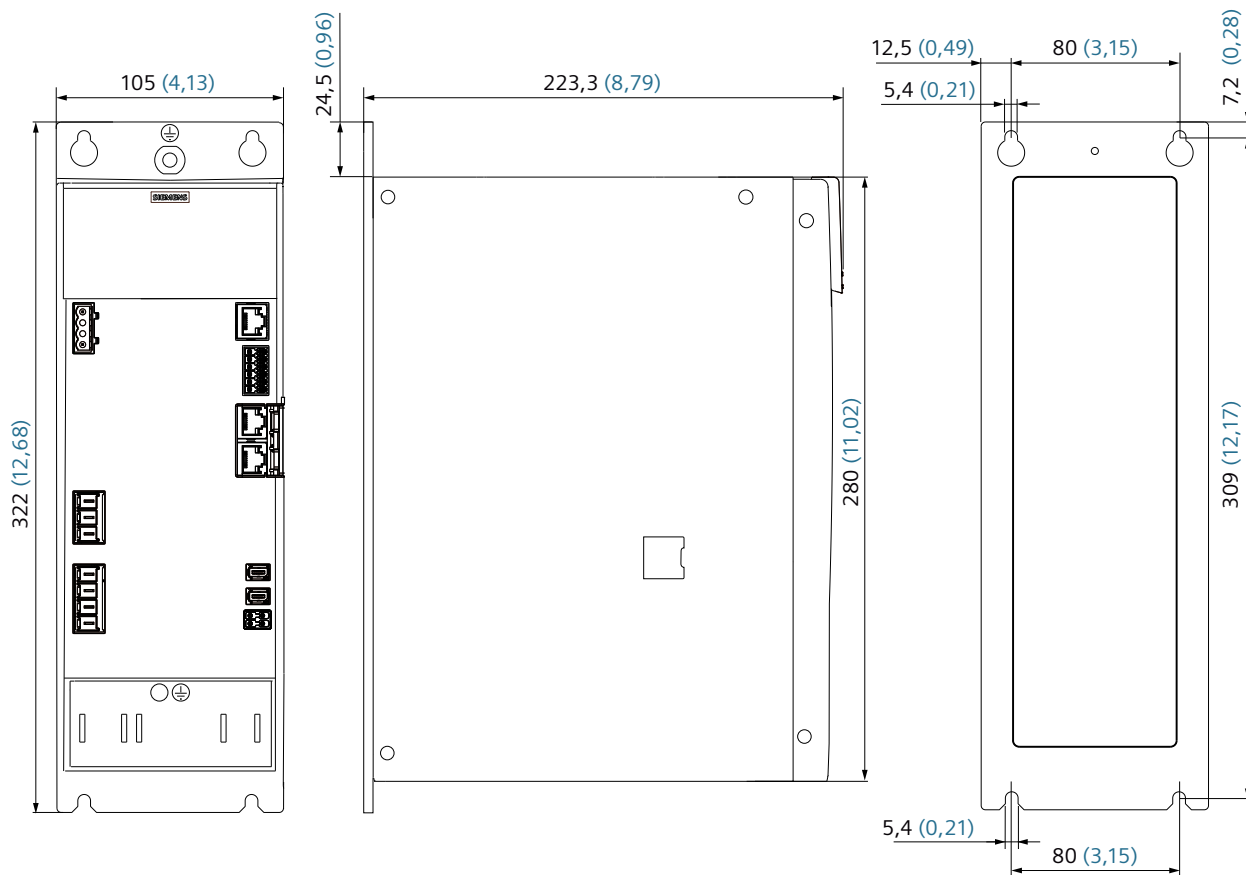


Figure 14-7 Dimension drawing SINAMICS S210 FSC, 3 AC, dimensions in mm (inch)

## Decommissioning and disposal

### WARNING

#### Risk of injury through falling motors or machine components

Motors and machine components can fall when being dismantled from the machine. They can cause serious injury or property damage.

- Secure the machine components being dismantled to prevent them falling.

### NOTICE

#### Damage caused by data misuse

If the memory card or converter is disposed of in a non-secure manner, misuse of data may occur resulting in damage or malfunctions in the systems.

- Therefore, delete the configuration of the converter: see Chapter "Manual reset to factory settings with memory card (Page 351)".
- Make sure you securely remove all custom certificates.

You can find more information in the "Industrial Security (<https://support.industry.siemens.com/cs/ww/en/view/109810578>)" configuration manual.

### Removing the device from the machine

1. Check that all parts of the device are in a no voltage condition.
2. Let the device cool down enough so that you are not burnt.
3. Disconnect all electrical connections.
4. Remove the fixing elements.
5. Transport the device to a suitable location for disposal.

## 15.1 Device disposal

### Description



*15.1 Device disposal*

For environmentally-friendly recycling and disposal of your old device, contact a company certified for the disposal of waste electrical and electronic equipment, and dispose of the old device as prescribed in the respective country of use.



## Accessories and spare parts

### 16.1 Accessories

#### 16.1.1 Memory cards

The memory card is only required for data backup, series commissioning and for functions that require a license. The converter can also be operated without a memory card.

#### Memory card for data backup and series commissioning

Use the following memory cards to back up data, for licensing and series commissioning.

If you are using functions that require a license, a memory card is absolutely necessary for converter operation. The memory card must then be permanently inserted.

The license key can only be assigned to a SINAMICS memory card.

The integrated card reader does not support the exFAT format. Large memory cards must therefore be formatted with FAT32.

Memory cards with up to 32 GB are supported.

Card type	Article number
Empty SD card	6SL5970-0AA00-0AA0
SD card with firmware V6.1	6SL5370-0GB00-0AA0
SD card with firmware V6.1 and license for Extended Safety Functions	6SL5370-0GB00-0AA0-Z F01
License for Extended Safety Functions "Certificate of License" without SD card, to subsequently license an existing SD card	6SL5977-0AA00-2HA0

## 16.1.2 SINAMICS Smart Adapter

### 16.1.2.1 SINAMICS Smart Adapter

#### Description

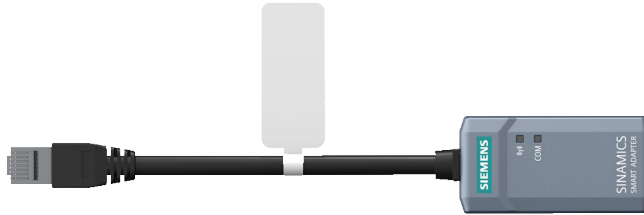


Figure 16-1 SINAMICS Smart Adapter

The SINAMICS Smart Adapter establishes a WLAN connection between the converter's X127 service interface and an operating unit, for example a tablet, smartphone, panel or PC.

Once plugged into the converter, the SINAMICS Smart Adapter is ready to use. No battery is required.

The SINAMICS Smart Adapter may only be installed temporarily for commissioning and service activities. It may not be used permanently with the converter.

The SINAMICS Smart Adapter supports WPA3 WLAN encryption.

### 16.1.2.2 SINAMICS Smart Adapter ordering data

Component	Article number
SINAMICS Smart Adapter	6SL4950-0AJ00-0AA0

### 16.1.3 Connectors and cables for the AC coupling and DC link coupling

The following packages are available for the connectors:

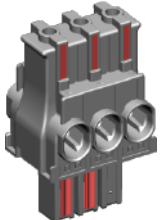
Article number	Spare part
6SL3260-2DC00-0AA0	Connector package for AC coupling and DC link coupling
6SL3260-2DC10-0AA0	Connector kit for the AC coupling

Content	6SL3260-2DC00-0AA0	6SL3260-2DC10-0AA0
Connectors for the AC coupling	1	1
Connector for the DC link coupling	1	-
End cap	2	1
Description/data sheet	1	1

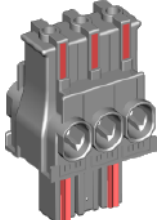
The connectors are designed so that they cannot be accidentally interchanged.

The cables required for the AC coupling and DC link coupling are standard cables, and therefore not included in the scope of delivery. Permissible connecting cables are listed in section "Establishing the AC coupling and the DC link coupling (Page 177)".

#### X1: Connectors for the AC coupling

	Pin	Pin assignment	Explanation
	L1	Phase L1 line system	The terminals are Torx screw terminals. Permissible conductor cross-sections: • 16 mm <sup>2</sup> • AWG: 6 Tightening torque: 3 Nm
	L2	Phase L2 line system	
	L3	Phase L3 line system	

#### X3: Connector for the DC link coupling

	Pin	Pin assignment	Explanation
	DCP	DC link, positive	The terminals are Torx screw terminals. Permissible conductor cross-sections: • 16 mm <sup>2</sup> • AWG: 6 Tightening torque: 3 Nm
	--	not assigned	
	DCN	DC link, negative	

#### End cap for AC coupling and DC link coupling



### 16.1.4 PROFINET patch cable

Use the following patch cable to network converters located adjacent one another via PROFINET:

Cable type	Length	Article number
Industrial Ethernet TP cord, CAT 6A, TP cable 4 x 2 insulated conductors, prefabricated with 2 RJ45 connectors	0.3 m	6XV1870-3QE30
	0.5 m	6XV1870-3QE50

### 16.1.5 External line filters

Line filters limit the electromagnetic interference emissions from converters to permissible limit values according to IEC 61800-3 or the requirements of Class A laid down in EN 55011.

The SINAMICS S210 line filters are passive components used to expand the EMC properties of the S210 system. With them, EMC categories C2 or C3 with longer cable lengths are possible (see Chapter "Electromagnetic compatibility according to IEC 61800-3 (Page 402)").

The following line filter is used depending on the converter:

- Converter with 1 AC line connection: 1 AC line filter
- Converter with 3 AC line connection: 3 AC line filter



Figure 16-2 3 AC line filter and converter

In a 3 AC drive line-up, the associated line filter must always be mounted to the left of the converters.

The sum of the rated currents of the converters connected to a common AC coupling must not exceed the rated line filter current.

### 16.1.5.1 Safety instructions

<b>NOTICE</b>
<b>Destruction or damage of components by incorrectly connecting the line filter</b>
When incorrectly connecting the line filter, components can be destroyed or damaged.
<ul style="list-style-type: none"><li>• Connect the line filter in accordance with the instructions in the technical documentation.</li><li>• Do not connect any additional loads downstream of the line filter.</li></ul>

<b>NOTICE</b>
<b>Line filter damage due to interchanged connections</b>
The line filter might be damaged if the input and output connections are interchanged.
<ul style="list-style-type: none"><li>• Connect the incoming line supply cable to "Line" or X5.</li><li>• Connect the outgoing cable to "Load" or X6.</li></ul>

<b>NOTICE</b>
<b>Damage to the system caused by a line filter that is not permissible</b>
A line filter that is not permissible can damage the system.
<ul style="list-style-type: none"><li>• Only use the line filter with the components that are compatible with it.</li></ul>

<b>NOTICE</b>
<b>Damage caused by using third party filters</b>
According to product standard IEC 61800-3, radio interference suppression commensurate with the relevant rated conditions must be provided and is a legal requirement in the EU (EMC Directive). Line filters and line reactors are required in order to comply with this standard. The use of filters of other filter types can lead to limit value violations, resonance effects, overvoltages, and irreparable damage to motors and other equipment.
<ul style="list-style-type: none"><li>• The machine manufacturer must provide verification that the machine equipped with the drive products and the installed suppression elements, e.g. line filters, is EMC-compliant before the machines are placed in the market.</li></ul>

<b>NOTICE</b>
<b>Destruction of the line filter when used with an unsuitable protective element</b>
Use of an incorrectly dimensioned protective element can result in thermal overload or destruction of the line filter.
<ul style="list-style-type: none"><li>• Use the protective elements provided, (see Product Information "Protective devices for SINAMICS S210 (<a href="https://support.industry.siemens.com/cs/ww/en/view/109815356">https://support.industry.siemens.com/cs/ww/en/view/109815356</a>)").</li></ul>

**Note**

**Disconnect the line filter for a high-voltage test**

If a high-voltage test is conducted with alternating voltage in the system, the existing line filters must be disconnected in order to obtain accurate measurements.

**Safety instructions for 1 AC line filter**



**⚠ WARNING**

**Electric shock caused by PEN conductor overload**

In TN-C supply networks, the protective function of the PEN conductor can be adversely affected by exposure to harmonic currents.

- Consider the harmonic currents when dimensioning the PEN conductor.

**⚠ WARNING**

**Fire caused by neutral conductor (N) overload**

The neutral conductor can heat up due to the load from harmonic currents and cause a fire.

- Consider the harmonic currents when dimensioning the neutral conductor.

**Safety instructions for 3 AC line filter**

**NOTICE**

**Line filter damage by connecting to impermissible line supply**

The line filters are only suitable for direct connection to line supplies with grounded neutral point. Connecting the line filter to another line supply will damage the line filter.

- Only connect the line filter to a line supply with grounded neutral point.

### 16.1.5.2 Interfaces

#### Line filter for converters with 1 AC line connection



Figure 16-3 Interfaces of the line filter for converters with 1 AC line connection

Terminals for line filters for converters with 1 AC line connection:

- Line: Line connection
- Load: Load connection

### Line filter for converters with 3 AC line connection

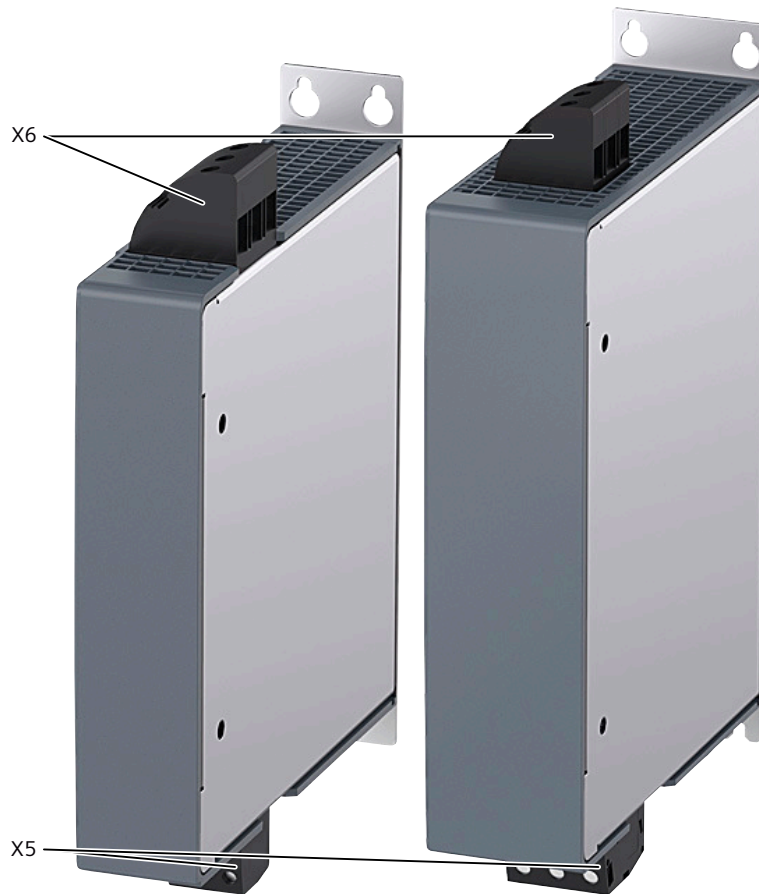


Figure 16-4 Interfaces of the line filter for converters with 3 AC line connection, 35 A and 65 A

Terminals for line filters for converters with 3 AC line connection:

- X5: Line connection
- X6: Load connection

### Date of manufacture



The date of manufacturer of the filter ① is stated on the nameplate in the following form:

- CY: Calendar year (two digit)
- CW: Calendar week (01 ... 53)
- D: Day (Mon ... Sun)

In the example provided here, "20131" means: 2020, KW 13, Monday = March 23, 2020



### 16.1.5.3 Dimension drawings

#### Line filter for converters with 1 AC line connection

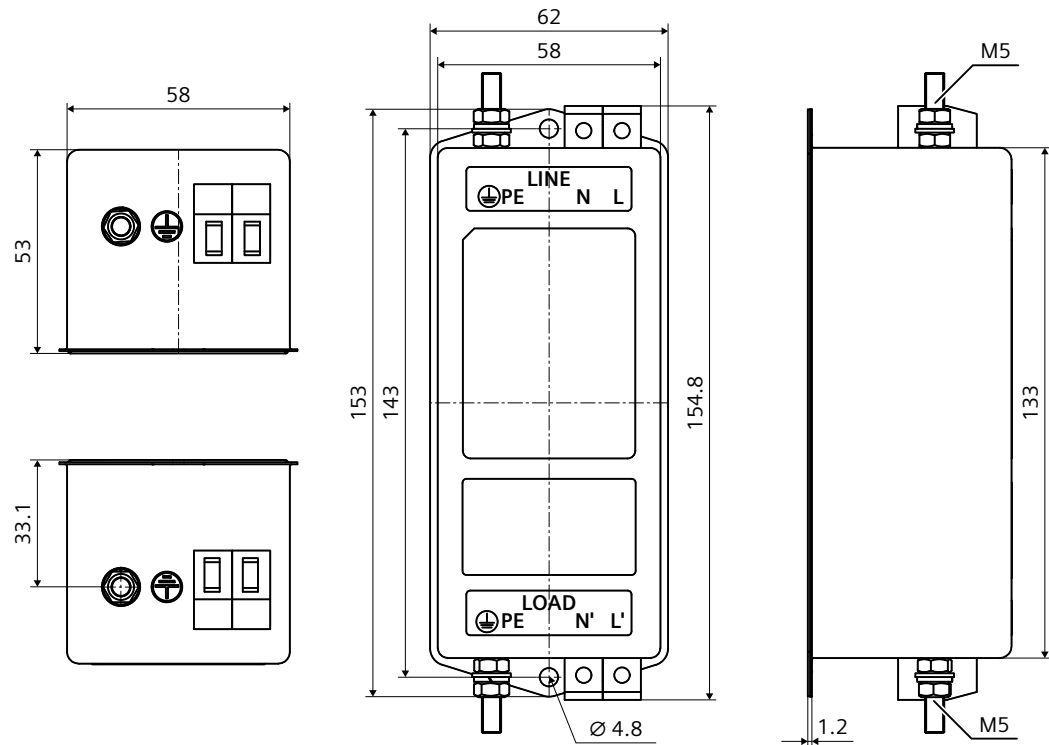
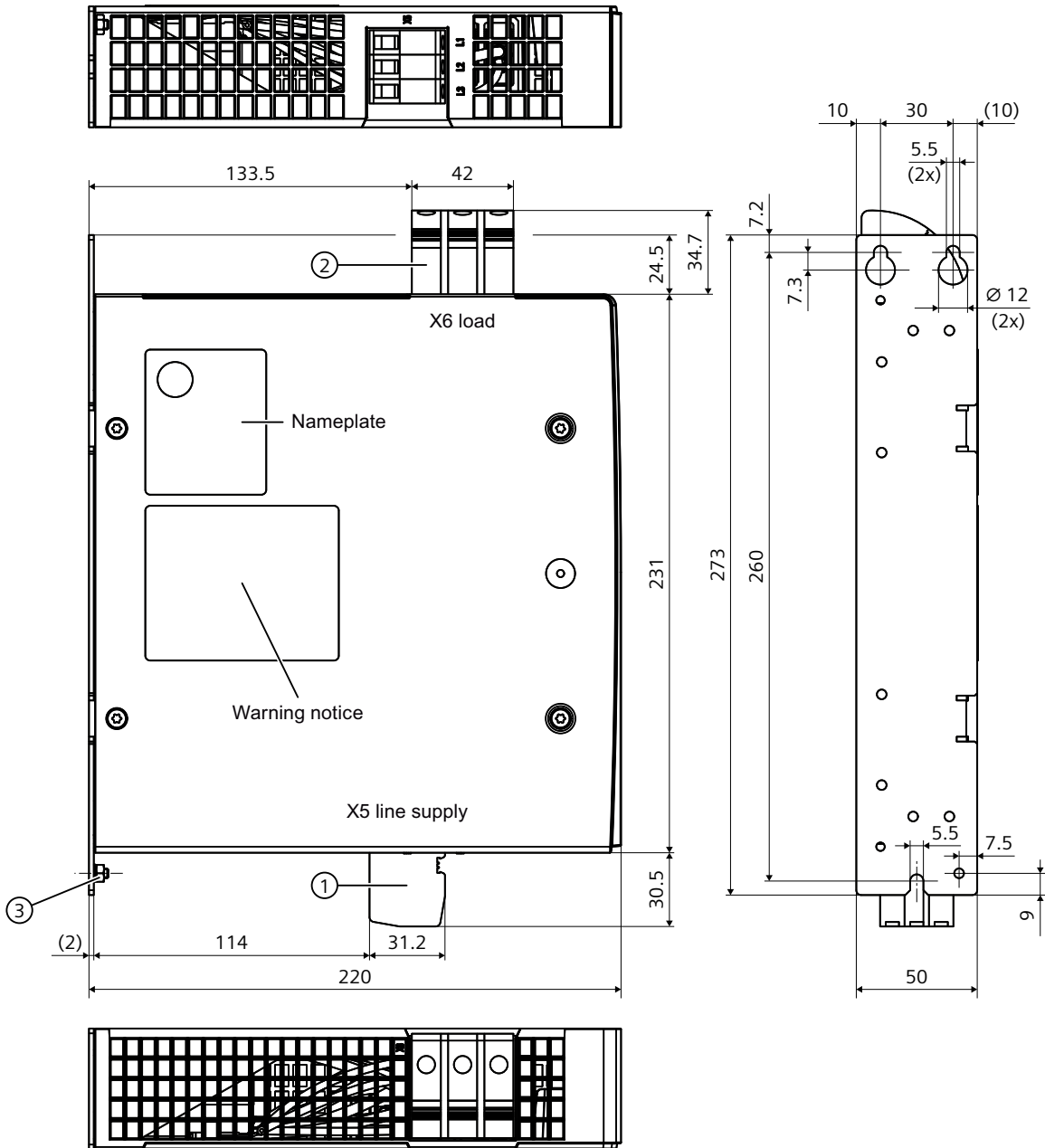


Figure 16-5 Dimension drawing for the line filter for converters with 1 AC line connection

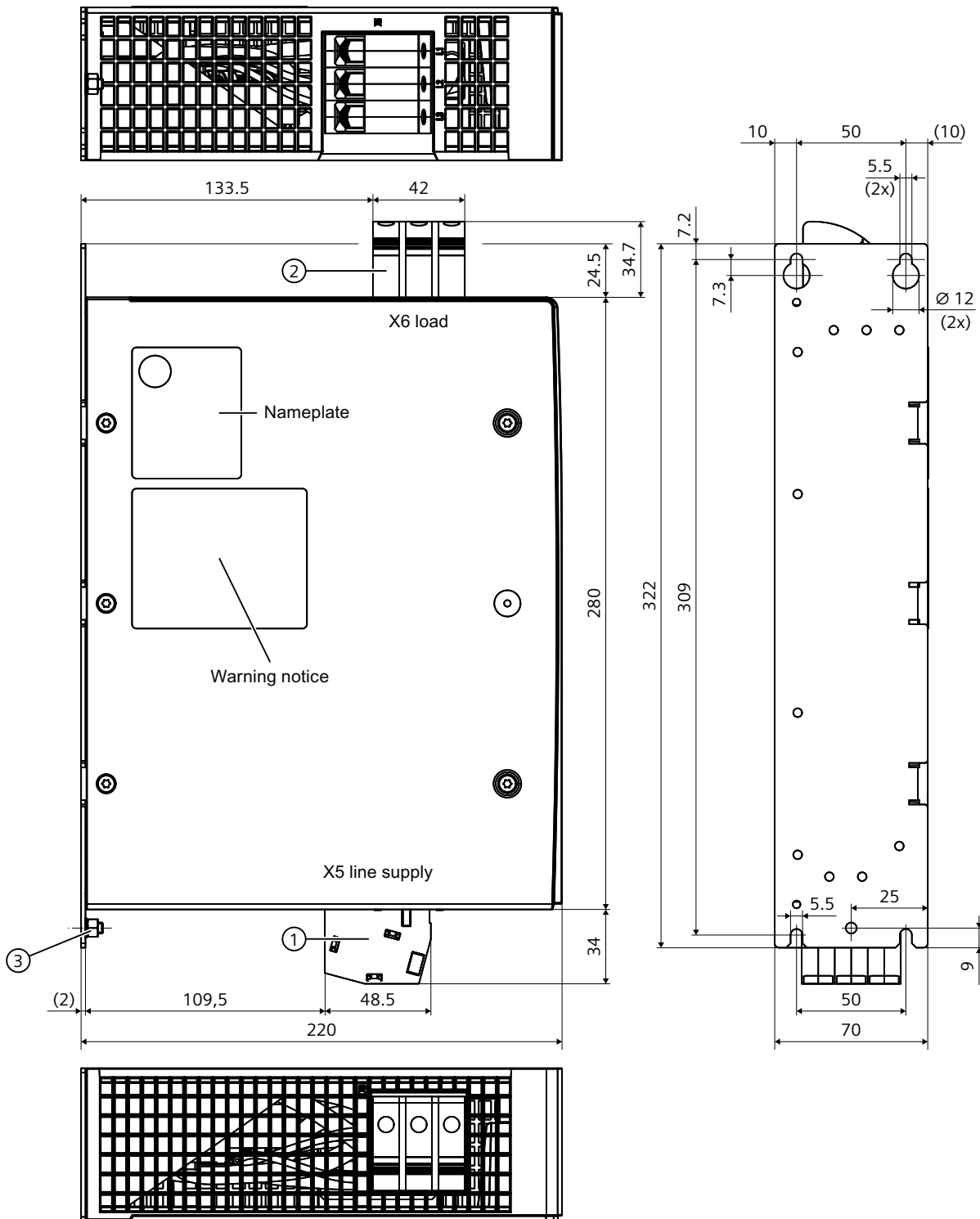
- Tightening torque for fixing screws (M4): 1.2 ... 1.8 Nm
- Tightening torque for the protective conductor fixing bolt (M5): 2.0 ... 2.2 Nm
- Tightening torque of the line-side and load-side screw connection: 0.7 ... 0.8 Nm

Line filter for converters with 3 AC line connection



- ① Connecting terminal 10 mm<sup>2</sup>, tightening torque 1.5 ... 1.8 Nm
- ② Connecting terminal 16 mm<sup>2</sup>, tightening torque 2.5 ... 3 Nm
- ③ Protective conductor M4x6, tightening torque 1.8 Nm

Figure 16-6 Dimension drawing for the line filter for converters with 3 AC line connection, 35 A



- ① Connecting terminal 25 mm<sup>2</sup>, tightening torque 4 ... 4.5 Nm
- ② Connecting terminal 16 mm<sup>2</sup>, tightening torque 2.5 ... 3 Nm
- ③ Protective conductor M5x8, tightening torque 3 Nm

Figure 16-7 Dimension drawing for the line filter for converters with 3 AC line connection, 65 A

### 16.1.5.4 Mounting

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**Note**

When you mount external line filters, consider the specifications for routing cables in the electrical cabinet according to the EMC Directive.

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#### Line filter for converters with 1 AC line connection

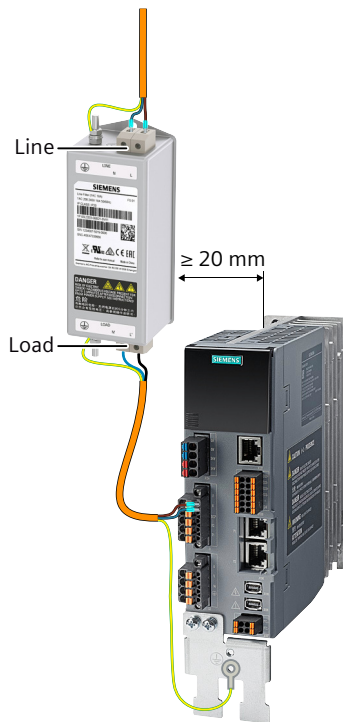


Figure 16-8 Mounting the line filter for converters with 1 AC line connection

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**Note**

When installing a line filter, maintain a minimum lateral clearance of 20 mm (0.79 inches) from the converter.

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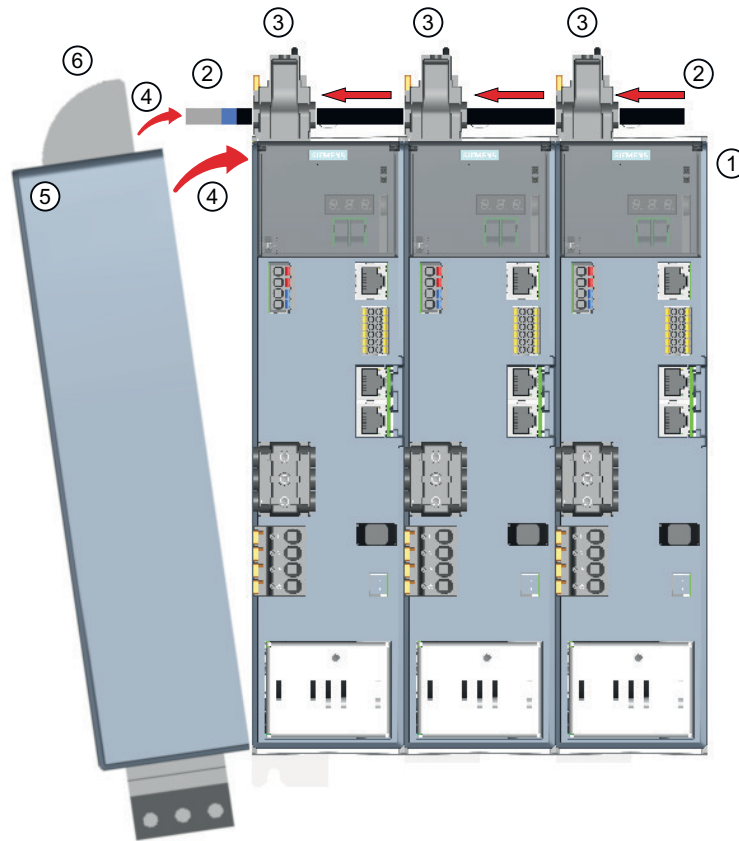
#### Line filter for converters with 3 AC line connection

There are basically 2 ways of mounting and connecting 3 AC line filters:

**Variant 1: The converter group is mounted and wired**

The converter group is already mounted and the AC coupling is wired and prepared for the line filter, i.e. insulation stripped and end sleeves attached.

The line filter then only has to be "threaded on" from the left and screwed tight. This simpler variant requires sufficient mounting space to the left of the converters.



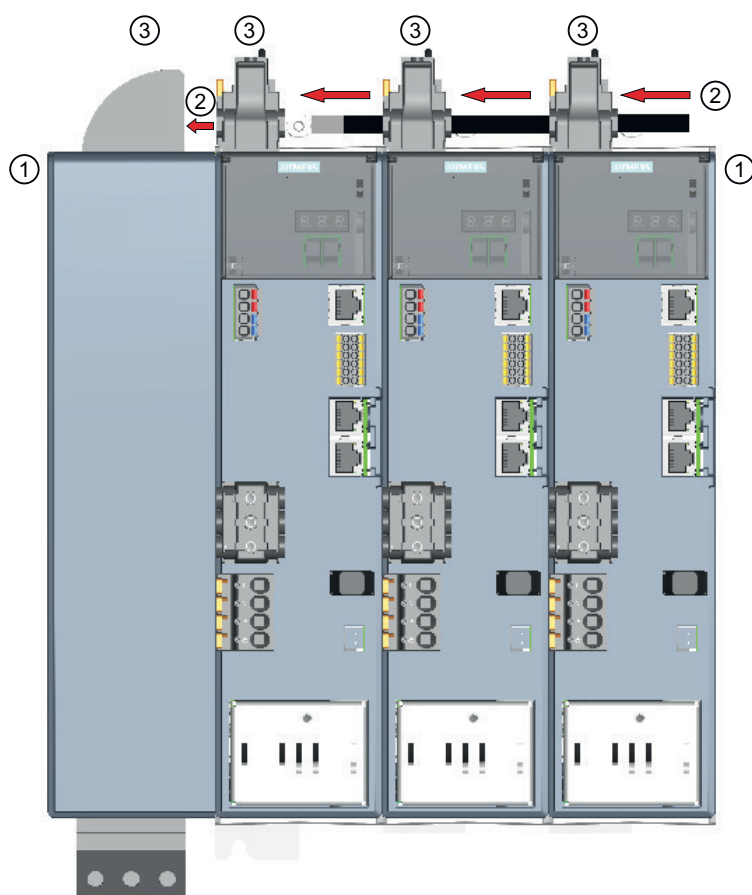
- ① Screw the converters tight in the cabinet.
- ② Push the cable for the AC coupling through the AC connector and provide it with end sleeves (with or without protective collar).
- ③ Screw the cable into the AC connectors.
- ④ Swing the line filter with load connection X6 from the side over the cable/end sleeves.
- ⑤ Screw the line filter tight in the cabinet.
- ⑥ Screw the cable into load connection X6 of the line filter.

Figure 16-9 Mounting the line filter for converters with 3 AC line connection - variant 1

#### **Variant 2: The converter group and 3 AC line filter are mounted, but not wired**

For wiring, each conductor must be individually pulled through the connector for the AC coupling up to load connection X6 of the line filter and screwed into the control cabinet.

You can only insert end sleeves without a protective collar, as otherwise the conductor no longer fits through the connector for the AC coupling.



- ① Screw the devices tight on the cabinet wall or on the mounting plate.
- ② Attach end sleeves without protective collars to the cables for the AC coupling, and push them through the AC connectors into load connection X6 of the line filter.
- ③ Screw the cables into the AC connectors and into load connection X6 of the line filter.

Figure 16-10 Mounting the line filter for converters with 3 AC line connection - variant 2

### 16.1.5.5 Technical data

#### Line filter for converters with 1 AC line connection

Table 16-1 Technical data

Article number		6SL3203-0BB21-8VA1
Line voltage		200 ... 240 V 1 AC
Rated current	A	18
Power loss	W	< 1.2
Type of connection		Screw terminals
Conductor cross-section - for single-conductor connection - for flexible cables	mm <sup>2</sup> mm <sup>2</sup>	0.25 ... 6 (AWG 24 ... 10) 0.25 ... 4 (AWG 24 ... 12)
Insulation stripping length	mm	8 ... 9
Protective conductor connection		M5 studs
Degree of protection		IP20
Dimensions (W x H x D)	mm	62 x 155 x 53
Weight	kg	0.7

#### Line filter for converters with 3 AC line connection

Table 16-2 Technical data

Article number		6SL3203-0BE23-5HA0	6SL3203-0BE26-5HA0
Line voltage		200 ... 480 V 3 AC	
Rated current	A	35	65
Power loss	W	12	18
Type of connection		Screw terminals	
Conductor cross-section - Line-side connection - Load-side connection	mm <sup>2</sup> mm <sup>2</sup>	0.5 ... 10 (AWG 24 ... 6) 16 (AWG 6)	4 ... 25 (AWG 10 ... 3) 16 (AWG 6)
Stripped length - Line side - Load side	mm mm	10 16	18 16
Protective conductor connection		M4 studs	M5 studs
Degree of protection		IP20	
Dimensions (W x H x D)	mm	50 x 296 x 220	70 x 349 x 220
Weight	kg	2.3	3.5

### 16.1.6 External braking resistors for 1/3 AC 200 ... 240 V

The following Michael Koch GmbH braking resistors can be purchased directly through Siemens with the article numbers below.

The correct product (with 1/3 AC 200 ... 240 V) can be found in the table "Examples of suitable braking resistors from a third-party supplier".

- GXK:BWG250047TS-190: 100 W, 47 Ohm
  - GXK:BWG600014TS-190: 240 W, 14 Ohm
- For UL, the resistor has only a 240 W braking power. According to CE, 400 W braking power is also possible.



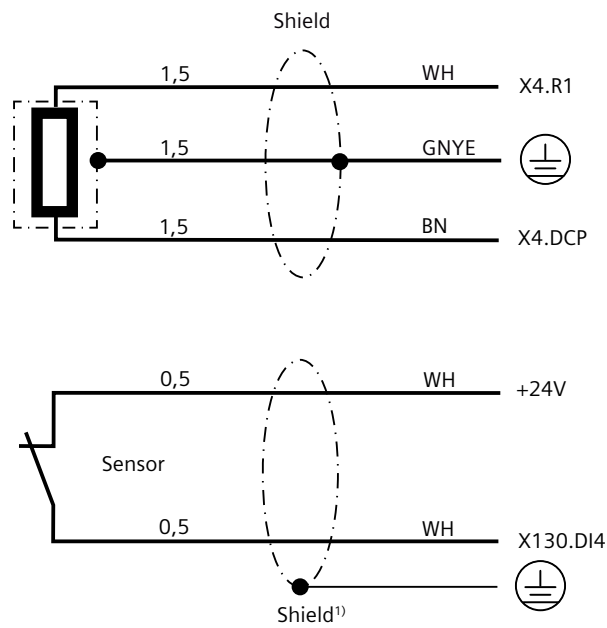
Figure 16-11 External braking resistor (example)

The resistors have approvals for the North American market (cURus and CSA).

The temperature sensor of the resistor can be connected at digital input DI4 on the converter for temperature monitoring. This switches the converter off when the braking resistor is overloaded.

We recommend that sensor cables are also shielded.



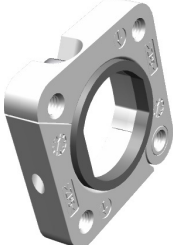


¹) Not included in the scope of delivery of the braking resistor

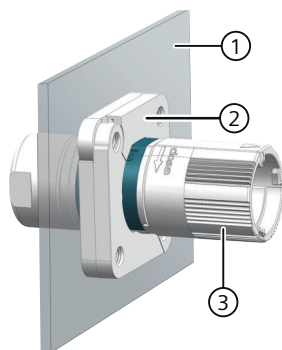
Figure 16-12 Braking resistor connection

### 16.1.7 Cabinet bushing via mounting flange

#### Mounting accessories for connection system

Accessories	Diagram	For connector size	For motor	Article number
Mounting flange as cabinet bushing (with installation instructions) Packing unit: 1 item		M12	1F□2□02 1F□2□03	6FX2003-7JX00
		M17	1F□2□04 1F□2□05	6FX2003-7HX00
		M23	1F□2□06 1F□2□08 1F□2□10	6FX2003-7BX00

The mounting flange is installed on the external wall of the control cabinet. It ensures the degree of protection of the control cabinet.



- ① Wall of the control cabinet
- ② Mounting flange
- ③ Connectors

Install the mounting flange as specified in the enclosed installation instructions.


### 16.1.8 Extensions for connecting cables between the motor and the converter

You can order OCC MOTION-CONNECT cables as preassembled cables or as kits that you can assemble yourself.

#### Note

A maximum of three separating points are allowed without reducing the total permitted length.

## OCC MOTION-CONNECT cable with SPEED-CONNECT connector

	Designation and use	For connection to motor	Connector size	Article number <sup>1)</sup>
	Extension for motor connection cable OCC MC 500 for predominantly fixed installation	1F□2□02	M12	6FX5002-8QE04-□□□□
		1F□2□03		
		1F□2□03	M17	6FX5002-8QE08-□□□□
		1F□2□04		
		1F□2□05		
		1F□2□06	M23	1.5 mm <sup>2</sup> : 6FX5002-8QE11-□□□□
	1F□2□08	2.5 mm <sup>2</sup> : 6FX5002-8QE21-□□□□		
	1F□2□10			
	Extension for motor connection cable OCC MC 800PLUS for use in cable carriers	1F□2□02	M12	6FX8002-8QE04-□□□□ <sup>2)</sup>
		1F□2□03		
		1F□2□03	M17	6FX8002-8QE08-□□□□
		1F□2□04		
1F□2□05				
1F□2□06		M23	1.5 mm <sup>2</sup> : 6FX8002-8QE11-□□□□	
1F□2□08	2.5 mm <sup>2</sup> : 6FX8002-8QE21-□□□□			
1F□2□10				

1) The last 4 digits (□□□□) define the cable length corresponding to the length code

2) For IEC applications

3) For UL applications

## Determining the article number of a prefabricated OCC MOTION-CONNECT cable

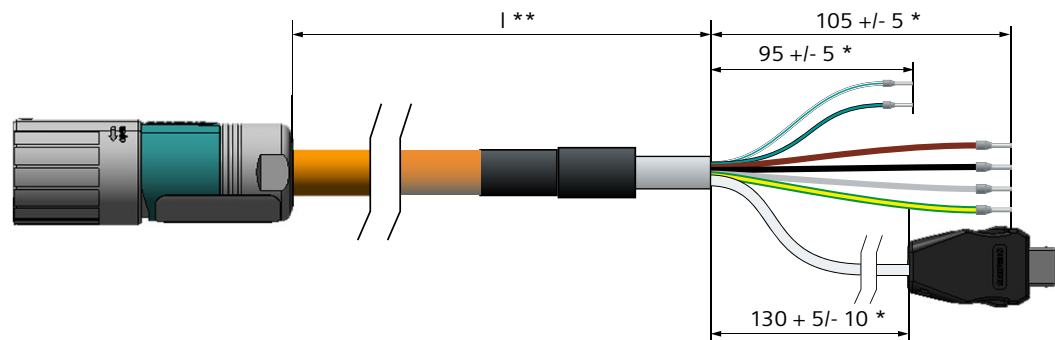


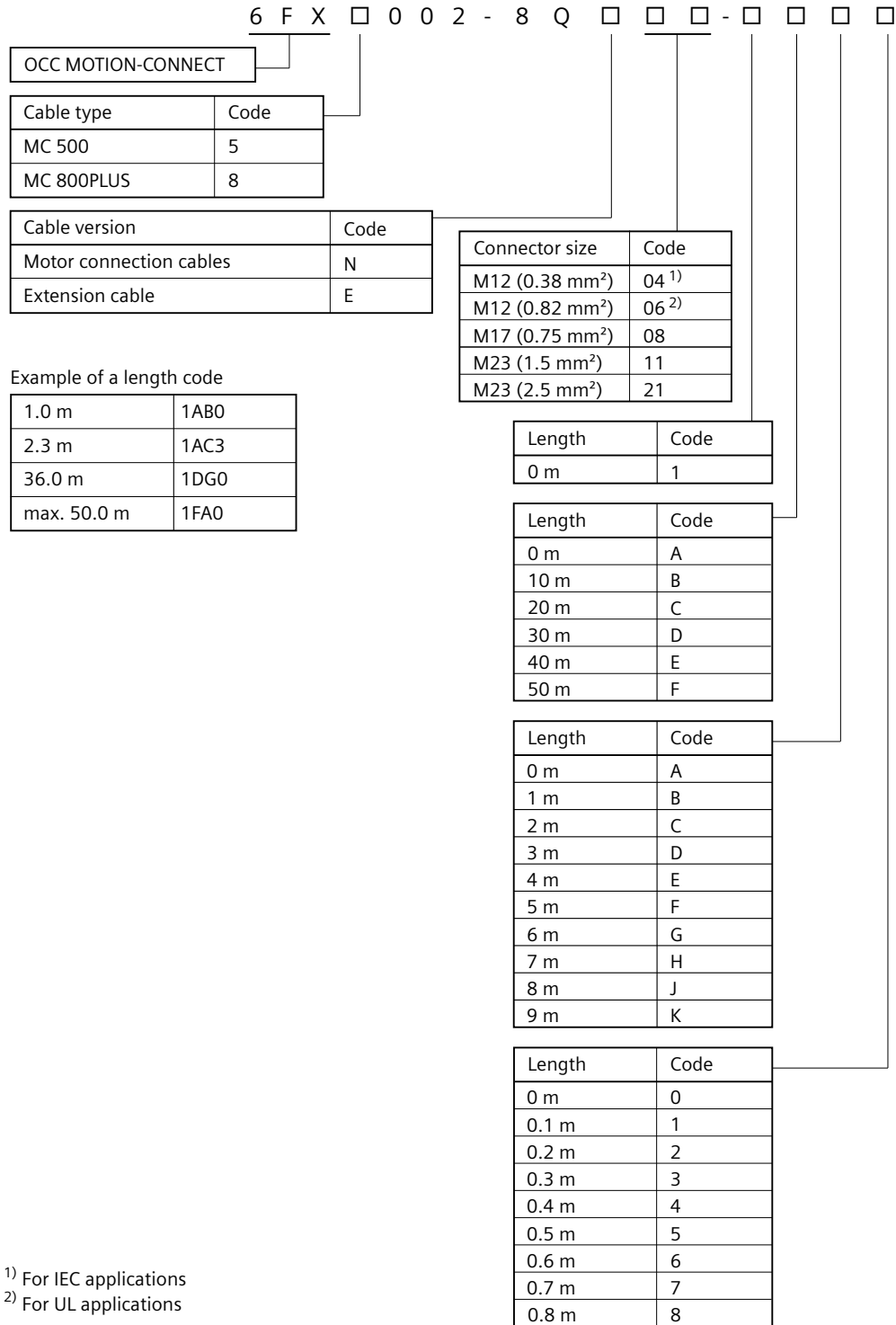
Figure 16-13 Lengths of an OCC MOTION-CONNECT cable

### Procedure

1. Determine the required cable length  $l^{**}$ . Consider having cable in reserve for strain-free routing.
2. Determine the length code for the required length  $l^{**}$  corresponding to the following overview. The stretched lengths (\*) are added automatically for the prefabricated cables.

16.1 Accessories

3. Also select the cable type, the desired cable version, and the required connectors for the article number.



<sup>1)</sup> For IEC applications

<sup>2)</sup> For UL applications

Figure 16-14 Structure of the article number with length code for an OCC MOTION-CONNECT cable

4. Order the required cable with the article number thus determined.

## 16.2 Spare parts

### Spare parts for the converter

The following components are available as spare parts for the converter:


- Connector set for converters with 1 AC line connection 6SL3260-2DB00-0AA0
- Connector set for converters with 3 AC line connection 6SL3260-2DB10-0AA0
- Siemens IX connector for the encoder connection 6FX2003-0DE01  
for converters with 1 AC / 3 AC line connection
- Fan for converters with 3 AC line connection, FSA 6SL3260-0AA00-0AA0
- Fan for converters with 3 AC line connection, FSB 6SL3260-0AB00-0AA0
- Fan for converters with 3 AC line connection, FSC 6SL3260-0AC00-0AA0

### 16.2.1 Connector set for converters with 1 AC line connection - 6SL3260-2DB00-0AA0

Under this article number, you will receive a spare parts package for the frame sizes FSA, FSB and FSC with the following content:

- Connectors
  - X1: Connector for the line connection and the external braking resistor (jumper for using the internal braking resistor is provided)
  - X2: Connector for the motor connection
  - X107: Connector for the motor holding brake
  - X124: Connector for the external 24 V DC power supply
  - X130: Connector for the digital inputs
- Shield plate for FSA, FSB and FSC

#### X1: Connector for the line connection and the external braking resistor

	Pin	Pin assignment	Explanation
	L1	Phase L1 line system	
	N	Neutral conductor	
	DCP	Braking resistor, external Braking resistor, internal	<ul style="list-style-type: none"> <li>• If you are using the internal braking resistor, DCP and R2 must be jumpered.</li> <li>• If you are using an external braking resistor, then do not insert the jumper between DCP and R2. Connect the external braking resistor via the DCP and R1 terminals.</li> </ul>
	R2	Internal braking resistor	
	R1	External braking resistor	
Weidmüller: BLF 5.08HC/05/180F SN BK BX, article number 1012670000 As daisy chain: BLDF 5.08/05/180F SN BK BX, article number 1000970000			


The terminals are spring-loaded terminals.

16.2 Spare parts

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

**X2: Connector for the motor connection**


	Pin	Pin assignment	Color coding for Siemens OCC cables
	U	Motor phase U	Brown
	V	Motor phase V	Black
	W	Motor phase W	Gray
	PE	Protective ground	Green-yellow
Weidmüller: BLF 5.08HC/04/180F SN BK BX, article number 1012660000			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

**X107: Connector for the motor holding brake (PTC has no function, for use in the future)**

	Pin	Pin assignment	Pin assignment	Pin
	BR+	B+: Voltage for motor holding brake, 24 V (black-turquoise)	Reserved, do not use	PTC+
	BR-	B-: Voltage for motor holding brake, 0 V (white-turquoise)	Reserved, do not use	PTC-
Phoenix DFMC 1.5/ 2-ST-3.81 BK, Article number 1864707				


The terminals are spring-loaded terminals.

Permissible conductor cross-sections:

- For single-core cables or for flexible cable with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 0.75 mm<sup>2</sup>
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

Also connect the insulated conductors for the motor holding brake to the connector at X107, even when you are using a motor without holding brake.

### X124: Connector for the external 24 V DC control voltage


	Pin	Pin assignment	Explanation
	0V	0 V	Power supply for the converter electronics
	0V	0 V	Maximum current for looping through via the internal jumper (blue-blue, red-red): 24 A
	24 V	+24 V	
	24 V	+24 V	
Dinkle article number 2ESS-6621-04P			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 24 ... 12
- Insulation stripping length: 10 mm

### X130: Connector for the digital inputs

	Pin	Pin assignment	Pin assignment	Pin
	+	+24 V output	Failsafe digital input	DI2+
	DI0	High-speed DI, measuring probe		DI2-
	M	Ground		DI3+
	+	+24 V output		DI3-
	DI1	High-speed DI, measuring probe	+24 V output	VS+
	M	Ground	Digital input	DI4
Phoenix DFMC 1.5/ 6-ST-3.5, Article No. 1790140				

The terminals are spring-loaded terminals.

The three terminals marked with "+" and "VS+" are provided as power supply for external sensors. They are short-circuit-proof and provide a max. of 50 mA per sensor. A sensor short-circuit interrupts the power supply for all three sensors.

For more information about the digital inputs, see Chapter "Connecting digital inputs and the external 24 V supply (Page 180)".

## 16.2 Spare parts

Permissible conductor cross-sections:

- For single-conductor connection:
  - 0.2 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves:
  - 0.25 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 0.75 mm<sup>2</sup>
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm



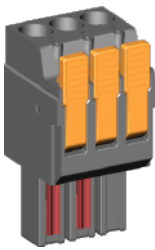
## 16.2.2 Connector set for converters with 3 AC line connection - 6SL3260-2DB10-0AA0

Under this article number, you will receive a spare parts package for the frame sizes FSA, FSB and FSC with the following content:

- Connectors
  - X1: Standard connector for the line connection
  - X2: Connector for the motor connection
  - X4: Connector for the external braking resistor (jumper for using the internal braking resistor is provided)
  - X107: Connector for the motor holding brake
  - X124: Connector for the external 24 V DC power supply
  - X130: Connector for the digital inputs
- Shield plate with two fixing screws M4 x 10 for FSA

### X1: Connector for the line connection

#### Standard connector


	Pin	Pin assignment	Explanation
	L1	Phase L1 line system	
	L2	Phase L2 line system	
	L3	Phase L3 line system	
Phoenix, article number 1060224			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm<sup>2</sup> ... 6 mm<sup>2</sup>
- AWG: 18 ... 8
- Insulation stripping length: 18 mm

**X2: Connector for the motor connection**

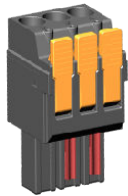
	Pin	Pin assignment	Color coding for Siemens OCC cables
	U	Motor phase U	Brown
	V	Motor phase V	Black
	W	Motor phase W	Gray
	PE	Protective ground	Green-yellow
Phoenix, article number 1060242			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm<sup>2</sup> ... 6 mm<sup>2</sup>
- AWG: 18 ... 8
- Insulation stripping length: 18 mm

**X4: Connector for the external braking resistor**


	Pin	Pin assignment	Explanation
	DCP	External braking resistor Internal braking resistor	<ul style="list-style-type: none"> <li>• If you are using the internal braking resistor, DCP and R2 must be jumpered.</li> <li>• If you are using an external braking resistor, then do not insert the jumper between DCP and R2. Connect the external braking resistor via the DCP and R1 terminals.</li> </ul>
	R1	Internal braking resistor	
	R2	External braking resistor	
Phoenix, article number 1060241			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm<sup>2</sup> ... 6 mm<sup>2</sup>
- AWG: 18 ... 8
- Insulation stripping length: 18 mm

**X107: Connector for the motor holding brake (PTC has no function, for use in the future)**

	Pin	Pin assignment	Pin assignment	Pin
	BR+	B+: Voltage for motor holding brake, 24 V (black-turquoise)	Reserved, do not use	PTC+
	BR-	B-: Voltage for motor holding brake, 0 V (white-turquoise)	Reserved, do not use	PTC-
Phoenix DFMC 1.5/ 2-ST-3.81 BK, Article number 1864707				


The terminals are spring-loaded terminals.

Permissible conductor cross-sections:

- For single-core cables or for flexible cable with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 0.75 mm<sup>2</sup>
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

Also connect the insulated conductors for the motor holding brake to the connector at X107, even when you are using a motor without holding brake.

**X124: Connector for the external 24 V DC control voltage**


	Pin	Pin assignment	Explanation
	24 V	+24 V	Power supply for the converter electronics Maximum current for looping through via the internal jumper (blue-blue, red-red): 24 A
	24 V	+24 V	
	0V	0 V	
	0V	0 V	
Dinkle article number 2ESS-6621-04P			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.2 mm<sup>2</sup> ... 2.5 mm<sup>2</sup>
- AWG: 24 ... 12
- Insulation stripping length: 10 mm

**X130: Connector for the digital inputs**

	Pin	Pin assignment	Pin assignment	Pin
	+	+24 V output	Failsafe digital input	DI2+
	DI0	High-speed DI, measuring probe		DI2-
	M	Ground		DI3+
	+	+24 V output		DI3-
	DI1	High-speed DI, measuring probe	+24 V output	VS+
	M	Ground	Digital input	DI4
Phoenix DFMC 1.5/ 6-ST-3.5, Article No. 1790140				

The terminals are spring-loaded terminals.

The three terminals marked with "+" and "VS+" are provided as power supply for external sensors. They are short-circuit-proof and provide a max. of 50 mA per sensor. A sensor short-circuit interrupts the power supply for all three sensors.

For more information about the digital inputs, see Chapter "Connecting digital inputs and the external 24 V supply (Page 180)".

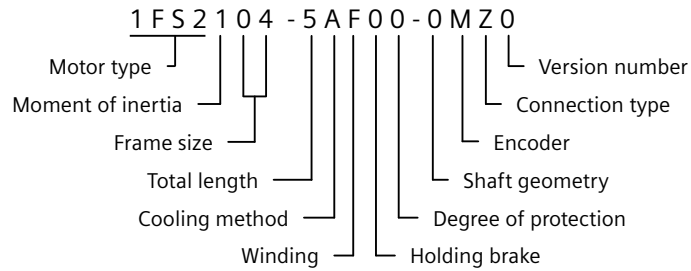
Permissible conductor cross-sections:

- For single-conductor connection:
  - 0.2 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves:
  - 0.25 mm<sup>2</sup> ... 1.5 mm<sup>2</sup>
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm<sup>2</sup> ... 0.75 mm<sup>2</sup>
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

## Ordering data

### 17.1 Ordering data of the motor

The article number comprises a combination of digits and letters. It is divided into three hyphenated blocks.



#### Structure of the article number

Note that not every theoretical combination is possible in practice.

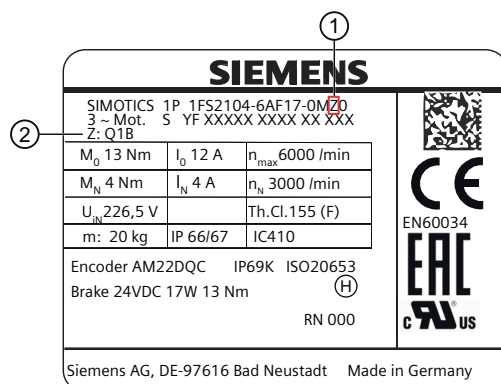
Ordering data

17.1 Ordering data of the motor

You can find permissible combinations in Chapter "Motor-converter combinations (Page 49)", in Catalog "D 32 SINAMICS S210 and SIMOTICS S-1FS2" or SIEMENS Product Configurator ([www.siemens.com/SPC](http://www.siemens.com/SPC)).

Description	Position of the article number																			
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16		
<b>SIMOTICS S-1FS2 synchronous servo motors</b>	1	F	S	2																
<b>Moment of inertia</b>	High Dynamic				1															
	Compact				2															
<b>Frame size</b>	40					0	4													
	52					0	5													
	63					0	6													
	80					0	8													
<b>Total length</b>	40								6											
	52								6											
	63								6											
	80								5											
<b>Self-cooling</b>										A										
<b>Winding, rated speed</b>	<b>max. 3 AC 480 V</b>																			
	2000 r/min @ 400V																			C
	2500 r/min @ 400V																			E
	3000 r/min @ 400V																			F
<b>Holding brake</b>	Without																		0	
	With																		1	
<b>Degree of protection</b>	IP66/67/69K												7							
<b>Shaft geometry</b>	Plain shaft																		0	
	Shaft with feather key																		1	
<b>Encoder</b>	Multiturn absolute encoder, 22 bit (AM22DQC)																		M	
<b>Connection type</b>	Connection variants for cable connection (see also Section "Position of the order codes on the rating plate"). You can find more information in Chapter "Connection system (Page 376)".																			
	Q0A	Connection cable with free cable ends and signal connector IX for direct connection to the converter and integrated pressure equalization																		
	Q1A	Connection cable OCC MOTION-CONNECT with SPEED-CONNECT coupling M17 or M23 and integrated pressure equalization																		
<b>Version number</b>	Start																			0

## Position of the order codes on the rating plate



- ① Position of the identification letter Z for the order codes
- ② Order code for the connection system

Figure 17-1 Rating plate with positions of the order codes

## Length codes for the motor connection cable of the 1FS2

With the  in the order code Q0 or Q1, you select the available length of the motor connection cable.

<input type="checkbox"/>	Length / m	<input type="checkbox"/>	Length / m
A	0.5	M	6
B	1	N	6.5
C	1.5	P	7
D	2	Q	7.5
E	2.5	R	8
F	3	S	8.5
G	3.5	T	9
H	4	U	9.5
J	4.5	V	10
K	5	W	10.5
L	5.5	X	11

### Ordering examples

- Q1F: Motor connection cable with SPEED-CONNECT coupling, 3 m long
- Q0S: Motor connection cable with free cable ends, 8.5 m long

## 17.2 Ordering data of the converter

### 17.2.1 Order data for converters with 1 AC line connection

Converters with 1 AC line connection		
Article number	Frame size	Rated power
6SL5310-1BB10-1CF0	FSA	100 W
6SL5310-1BB10-2CF0	FSA	200 W
6SL5310-1BB10-4CF0	FSB	400 W
6SL5310-1BB10-8CF0	FSC	750 W

### 17.2.2 Order data for converters with 3 AC line connection

Converters with 3 AC line connection		
Article number	Frame size	Rated power
6SL5310-1BE10-4DF0	FSA	0.4 kW
6SL5310-1BE10-8DF0	FSA	0.75 kW
6SL5310-1BE11-0DF0	FSA	1 kW
6SL5310-1BE11-5DF0	FSB	1.5 kW
6SL5310-1BE12-0DF0	FSB	2 kW
6SL5310-1BE13-5DF0	FSC	3.5 kW
6SL5310-1BE15-0DF0	FSC	5 kW
6SL5310-1BE17-0DF0	FSC	7 kW


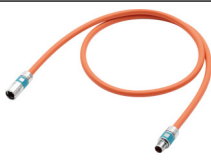
## 17.3 Ordering data of the connection system

### 17.3.1 Order data for OCC MOTION-CONNECT cables

You can order OCC MOTION-CONNECT cables as preassembled cables or as kits that you can assemble yourself.



A maximum of 3 disconnection points are allowed without reducing the total permitted length.

OCC MOTION-CONNECT cable with SPEED-CONNECT connector				
	Designation and use	For connection to motor	Connector size	Article number <sup>1)</sup>
	Motor connection cable MC400 for use in the food processing industry, incl. pressure equalization, not suitable for cable drag	1FS2□04	M17	6FX4002-8QN08-□□□□
		1FS2□05		
	Motor connection cable OCC MC 500 for predominantly fixed installation	1FS2□06	M23	6FX4002-8QN11-□□□□
		1FS2□08		
	Motor connection cable OCC MC 800PLUS for use in cable carriers	1FS2□04	M17	6FX5002-8QN08-□□□□
		1FS2□05		
		1FS2□06	M23	1.5 mm <sup>2</sup> : 6FX5002-8QN11-□□□□
	Extension for motor connection cable MC400 for use in the food processing industry, incl. Pressure equalization, not suitable for drag chains	1FS2□04	M17	6FX4002-8QN08-□□□□
		1FS2□05		
	Extension for motor connection cable OCC MC 500 for predominantly fixed installation	1FS2□06	M23	6FX4002-8QN11-□□□□
		1FS2□08		
	Extension for motor connection cable OCC MC 800PLUS for use in cable carriers	1FS2□04	M17	6FX5002-8QE08-□□□□
		1FS2□05		
		1FS2□06	M23	1.5 mm <sup>2</sup> : 6FX5002-8QE11-□□□□
		1FS2□08		

<sup>1)</sup> The last 4 digits (□□□□) define the cable length corresponding to the length code

### 17.3.2 Determining the article number of a prefabricated OCC MOTION-CONNECT cable

#### Overview

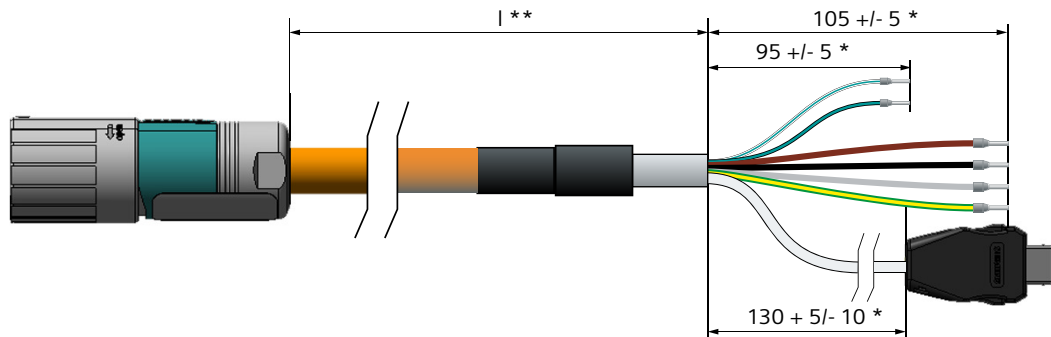


Figure 17-2 Lengths of an OCC MOTION-CONNECT cable

#### Procedure

1. Determine the required cable length  $l^{**}$ . Consider having cable in reserve for strain-free routing.
2. Determine the length code for the required length  $l^{**}$  corresponding to the following overview. The stretched lengths (\*) are added automatically for the prefabricated cables.

3. Also select the cable type, the desired cable version, and the required connectors for the article number.

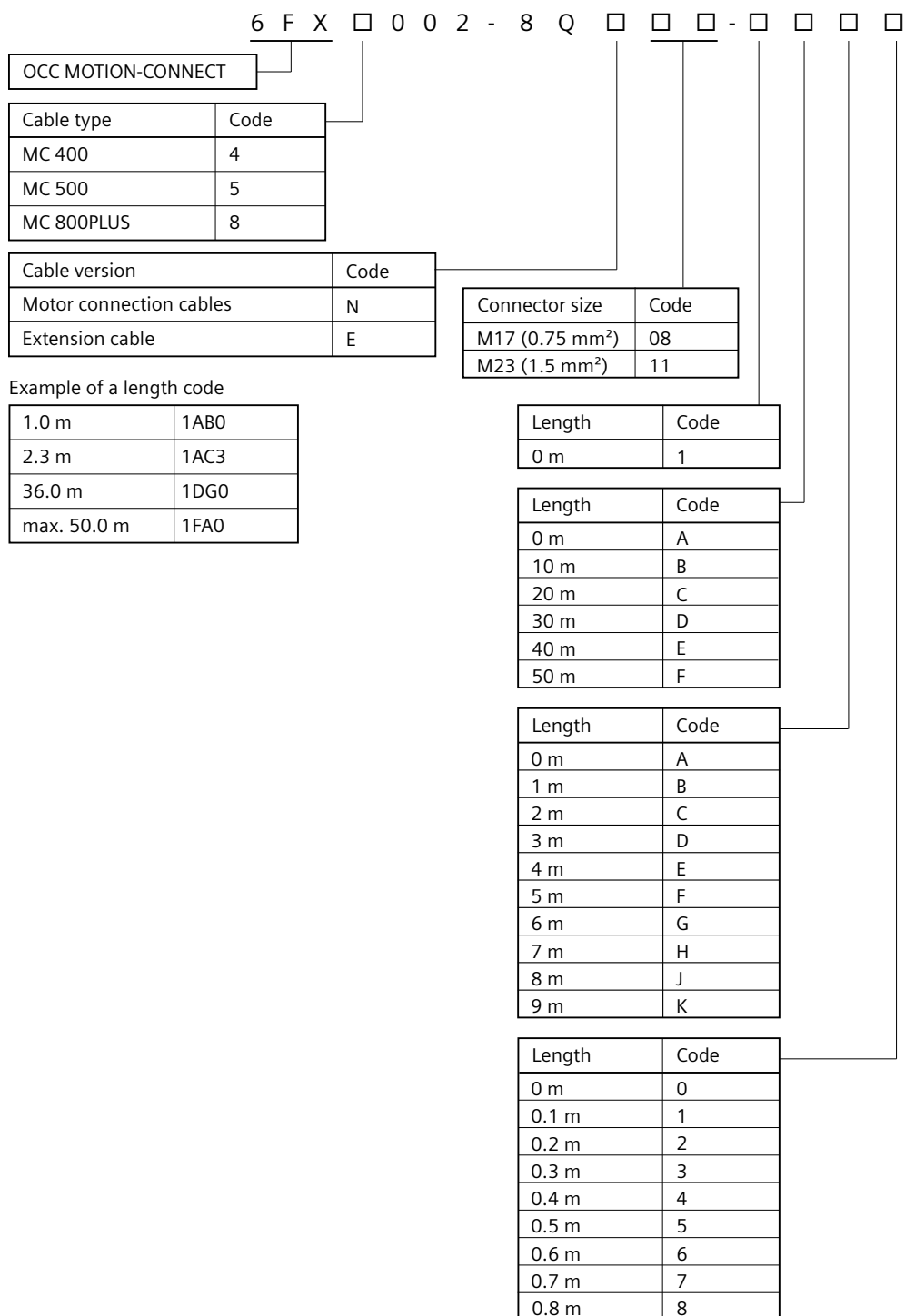


Figure 17-3 Length codes OCC

4. Order the required cable with the article number thus determined.





## Parameters

### 18.1 Explanation of the list of parameters

#### Description

The parameters are displayed according to the following pattern.

---

<b>rxxxx</b>	<b>Parameter name / short parameter name</b>			
Variant	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display		
	<b>Read rights:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Can be changed in operating state</b>	Ready for operation		
	<b>Parameter group:</b>	Name of the group(s)		
	<b>Unit:</b> -			
	<b>Min:</b> -	<b>Max:</b> -	<b>Factory setting:</b> -	
<b>Description:</b>	Text			
<b>Value:</b>	0: Name of value 0 10: Name of value 10			
<b>Recommendation:</b>	Text			
<b>Index:</b>	[0] = Name and meaning of index 0 [1] = Name and meaning of index 1			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Name of bit 0	Yes	No
	01	Name of bit 1	Yes	No
<b>Dependency:</b>	Text			
	<b>See also:</b>	pxxx, rxxx		
	<b>See also:</b>	Fxxxx, Axxxx, Cxxxx		
<b>Danger / Caution / Warning / Notice:</b>	Safety-related note corresponding to the warning note concept			
<b>Note:</b>	Text			

## 18.1 Explanation of the list of parameters

The representation of a parameter includes as a maximum the information listed below. Depending on the specific parameter, some of the listed information is not applicable.

- **Parameter number (rxxxx)**

The parameter number is made up of a "p", "r" or "c", followed by several numbers and optionally an index and bit array.

The parameter number has the following syntax: pxxxx[0...n], rxxxx[0...n], cxxxx[0...n], pxxxx.0...15 or rxxxx.0...15, cxxxx.0...15, pxxxx[0...n].0...15 or rxxxx[0...n].0...15, cxxxx[0...n].0...15.

Examples of representation in the parameter list:

• p...	Setting parameters (read and write)
• r...	Display parameters (read-only)
• c...	Display parameters (read-only)
• p0972	Setting parameter 972
• p0489[0...2]	Setting parameter 489 index 0 to 2
• r0945	Display parameter 945
• r0196[0...255].4...15	Display parameter with index 0 to 255 and bit array, bit 4 to bit 15
• r5613.0...1	Display parameter 5613 with bit array from bit 0 to bit 1
• c8997[0...2]	Display parameter 8997 index 0 to 2
Other examples of the notation in the documentation:	
• p9563[1]	Setting parameter 9563, index 1
• r0196[1].5	Display parameter 196, index 1, bit 5
• r0964[2]	Display parameter 964, index 2
• p5611.1	Setting parameter 5611, bit 1

- **Parameter name / short parameter name**

Shows the parameter name in the long form and separated by a slash in the short form.

- **Variant**

Specifies the product variant for which the parameter is valid. This information is not applicable if a parameter is the same for all product variants used in the parameter list.

- **Data type**

Each parameter is assigned one of the following data types:

• Integer8	I8	8-bit integer
• Integer16	I16	16-bit integer
• Integer32	I32	32-bit integer
• Unsigned8	U8	8-bit without sign
• Unsigned16	U16	16-bit without sign
• Unsigned32	U32	32-bit without sign
• FloatingPoint32	Float	32-bit floating-point number

- **Visible in**  
You change the number of parameters displayed in the commissioning tool via:
  - Standard display  
Only the basic parameters are displayed.
  - Extended display  
The full scope of parameters is displayed.
- **Rights**  
The user and rights management (UMAC) controls access to the parameters. You require runtime function rights to read and set parameters. The following read rights are available:
  - Read drive data or acknowledge messagesThe following write permissions are available:
  - Control drive in manual mode
  - Perform drive diagnostics
  - Perform firmware update
  - Create backup or load drive data to Startdrive
  - Edit device settings or drive application
  - Edit Safety Integrated application
  - Edit web server settings
  - Manage users and rolesRuntime function rights depend on user roles, which are assigned in the commissioning tool being used (Startdrive, web server). As a consequence, setting parameters can be write-protected.  
The commissioning tool provides additional support.
- **Can be changed in operating state**  
A parameter can only be changed in this operating state. The change only becomes active after exiting the state. The following states exist:
  - Operation  
The pulses have been enabled.
  - Ready for operation  
The pulses are not enabled and state "Commissioning" is not active.
  - Commissioning  
Commissioning takes place.  
The pulses cannot be enabled.
- **Parameter group**  
A parameter group contains parameters that are functionally associated with one another.
- **Unit**  
Shows the default unit of the parameter. For setting parameters, the unit is additionally specified according to the values (Min, Max, Factory setting) in square brackets.

## 18.1 Explanation of the list of parameters

- **Min, Max, Factory setting**

The parameter value "when shipped" is specified under "Factory setting" with the relevant unit in square parentheses.

The value can be adjusted within the range defined by "Min" and "Max".

This information is not applicable for display parameters.

Min	Minimum value of the parameter [unit]
Max	Maximum value of the parameter [unit]
Factory setting	Value when delivered [unit]

- **Description**

Explanation of the function of a parameter.

- **Values**

List of the possible values of a parameter.

- **Recommendation**

Information about recommended settings.

- **Index**

Indexed parameters represent the name and its significance for each individual index.

The following applies to the values (Min, Max, Factory setting) of indexed setting parameters:

- Min, Max:

The adjustment range and the unit apply to all indices.

- Factory setting:

When all indices have the same factory setting, index 0 is specified with the unit to represent all indices.

When the indices have different factory settings, they are all listed individually with the unit.

- **Bit array**

For parameters with bit arrays, the following information is provided for each bit:

- Bit number and signal name

- Meaning for signal states 0 and 1

- Function diagram (optional)

The signal is shown in this function diagram.

- **Dependency**

Specification of interactions that this parameter can potentially have:

- Effect on other parameters

- Dependent on other parameter settings (dependent on the selected functions)

- List of other parameters to be considered

- List of faults and alarms to be considered



- **Danger / Caution / Warning / Notice**

The safety-relevant notes correspond to the warning notice concept and contain the following information:

- Important information that must be observed to avoid the risk of physical injury or material damage.
- Information that must be observed to avoid any problems.
- Information that the user may find useful.

- **Note**

Additional explanations about parameters

## 18.2 List of parameters

### Parameters

The following list contains parameters of the S210 product.

Product: SINAMICS S210, Version: 601122000, Language: eng  
 Objects: S210

<b>r0002</b>	<p><b>Operating display</b></p> <p><b>Data type:</b> Integer16                      <b>Visible in:</b> Standard display</p> <p><b>Read permission:</b>                      Read drive data or acknowledge messages</p> <p><b>Write permission:</b>                      Edit device configuration or drive applications</p> <p><b>Parameter group:</b>                      Status parameters, Diagnostics general, Drive enable signals</p> <p><b>Unit:</b> -</p> <p><b>Description:</b>                      Operating display for the drive.</p> <p><b>Value:</b></p> <p>0:                      Operation - everything enabled</p> <p>10:                      Operation - Set "Enable setpoint" = "1"</p> <p>11:                      Operation - Set "Enable speed controller" = "1"</p> <p>12:                      Operation - RFG frozen, set "RFG start" = "1"</p> <p>13:                      Operation - Set "Enable ramp-function generator" = "1"</p> <p>14:                      Operation - speed setpoint not enabled</p> <p>15:                      Operation - open brake (p1215)</p> <p>16:                      Operation - Withdraw braking with OFF1 using "ON/OFF1" = "1"</p> <p>17:                      Operation - braking with OFF3 can only be interrupted with OFF2</p> <p>18:                      Operation - brake on fault, remove fault, acknowledge</p> <p>21:                      Ready for operation - Set "Enable operation" = "1"</p> <p>31:                      Ready for switching on - Set "ON/OFF1" = "0/1"</p> <p>35:                      Switching on inhibited - Commissioning not possible, check motor</p> <p>41:                      Switching on inhibited - Set "ON/OFF1" = "0"</p> <p>42:                      Switching on inhibited - Set "Operating condition/OFF2" = "1"</p> <p>43:                      Switching on inhibited - Set "Operating condition/OFF3" = "1"</p> <p>44:                      Switching on inhibited - Supply STO terminal w/ 24 V (hardware)</p> <p>45:                      Switching on inhibited - rectify fault, acknowledge fault, STO</p> <p>46:                      Switching on inhibited - exit commissioning mode</p> <p>60:                      Drive deactivated/not operational</p> <p>70:                      Initialization</p> <p>200:                      Wait for booting/partial booting</p> <p>250:                      Device signals a topology error</p>
<b>Dependency:</b>	See also: r0046

<p><b>NOTICE</b></p> <p>For a display not equal to 0, the drive is either powering up or an enable signal is missing. The control sends these enable signals.</p> <p>For several missing enable signals, the corresponding value with the highest number is displayed.</p>
--

**Note**

The drive only controls the motor speed in the "Operation" state (r0002 = 0).

OC: Operating condition

EP: Enable Pulses (pulse enable)

RFG: Ramp-function generator

COM: Commissioning

MotID: Motor data identification

SS2: Safe Stop 2

STO: Safe Torque Off

---

<b>r0020</b>	<b>Speed setpoint smoothed</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Mode signals / displays
	<b>Unit:</b> rpm
<b>Description:</b>	Displays the smoothed speed setpoint at the speed controller input.

---

<b>r0021</b>	<b>Speed actual value smoothed</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Diagnostics, Mode signals / displays
	<b>Unit:</b> rpm
<b>Description:</b>	Displays the smoothed actual value of the motor speed.
<b>Dependency:</b>	See also: r0063

---

<b>r0026</b>	<b>DC link voltage smoothed</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Brake control, Mode signals / displays
	<b>Unit:</b> V
<b>Description:</b>	Displays the smoothed actual value of the DC link voltage.
<b>Dependency:</b>	See also: r0070

---

<b>r0027</b>	<b>Absolute actual current smoothed</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Mode signals / displays
	<b>Unit:</b> Arms
<b>Description:</b>	Displays the smoothed absolute current actual value.
<b>Dependency:</b>	See also: r0068

---

<b>r0031</b>	<b>Actual torque smoothed</b>
<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Brake control, Mode signals / displays
<b>Unit:</b> Nm	
<b>Description:</b>	Displays the smoothed torque actual value.
<b>Dependency:</b>	See also: r0080

---

<b>r0032</b>	<b>Active power actual value smoothed</b>
<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Mode signals / displays
<b>Unit:</b> kW	
<b>Description:</b>	Display for the smoothed actual value of the active power.
<b>Dependency:</b>	See also: r0082

---

<b>r0034</b>	<b>Motor utilization thermal</b>
<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Motor temperature, Mode signals / displays
<b>Unit:</b> %	
<b>Description:</b>	Displays the thermal motor utilization taking into account the ambient temperature set in p0613.
<b>Dependency:</b>	See also: p0613 See also: F07011, A07012

**NOTICE**

After the drive is switched on, the system starts to determine the motor temperature with an assumed model value. This means that the value for the motor utilization is only valid after a stabilization time.

---

<b>r0037[0...10]</b>	<b>Drive temperatures</b>
<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Mode signals / displays
<b>Unit:</b> °C	
<b>Description:</b>	Displays the temperatures of the drive components.
<b>Index:</b>	[0] = Inverter maximum value [1] = Depletion layer maximum value [2] = Rectifier maximum value [3] = Air intake [4] = Interior of power unit [5] = Cooling unit liquid intake [6] = Capacitor air discharge [7] = Depletion layer maximum value 1 [8] = Depletion layer maximum value 2 [9] = Depletion layer maximum value 3 [10] = Depletion layer maximum value 4

**Note**

The value of -200 indicates that there is no measuring signal.  
 For index [0]:  
 Maximum value of the inverter temperatures (r0037[5...10]).  
 For index [1]:  
 Maximum value of the depletion layer temperatures (r0037[13...18]).  
 The maximum value is the temperature of the hottest inverter or depletion layer.  
 In the case of a fault, the particular shutdown threshold depends on the power unit, and cannot be read out.

**r0039[0...2]****Energy display**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Mode signals / displays, Power loss optimization  
**Unit:** kWh

**Description:** Display for the energy values at the drive output terminals.

**Index:**  
 [0] = Energy balance (sum)  
 [1] = Energy drawn  
 [2] = Energy fed back

**Note**

For index [0]:  
 Difference between the energy drawn and energy that is fed back.

**r0044****Thermal converter utilization**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Mode signals / displays, Power unit  
**Unit:** %

**Description:** Displays the thermal converter utilization as a percentage.  
 With this value, various thermal monitoring functions are taken into account.

**Dependency:** See also: r0034

**Note**

The thermal motor utilization is displayed in parameter r0034.

**r0046.0...30****Missing enable signal**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Control/status words, Drive enable signals  
**Unit:** -

**Description:** Displays the missing enable signals.  
 All enable signals are required to operate the drive. The enable signals are set by the control.

<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	OFF1 enable missing	Yes	No
	01	OFF2 enable missing	Yes	No
	02	OFF3 enable missing	Yes	No
	03	Operation enable missing	Yes	No
	08	Safety enable missing	Yes	No

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10	Ramp-function generator enable missing	Yes	No
12	Setpoint enable missing	Yes	No
16	OFF1 enable internal missing	Yes	No
17	OFF2 enable internal missing	Yes	No
18	OFF3 enable internal missing	Yes	No
19	Pulse enable internal missing	Yes	No
21	STOP2 enable internal missing	Yes	No
26	Drive inactive or not operational	Yes	No
28	Brake open missing	Yes	No
30	Speed controller inhibited	Yes	No

**Dependency:** See also: r0002

**Note**

The value r0046 = 0 indicates that all enable signals for this drive are present.

Bit 00 = 1 (enable signal missing), if:

- OFF1 from the PROFINET interface missing.
- There is a "switching on inhibited".

Bit 01 = 1 (enable signal missing), if:

- OFF2 from the PROFINET interface missing.

Bit 02 = 1 (enable signal missing), if:

- OFF3 from the PROFINET interface missing.

Bit 03 = 1 (enable signal missing), if:

- "Enable operation" from the PROFINET interface missing.

Bit 08 = 1 (enable signal missing), if:

- Safety functions have been enabled and STO is active.
- A safety-relevant message with STO as response is active.

STO enabled via terminals:

- Pulse enable via the STO terminals has a 0 signal.

STO enabled via PROFIsafe:

- STO is selected via PROFIsafe.
- Additional details relating to the reason that STO was selected, see parameter r10352.

Bit 10 = 1 (enable signal missing), if:

- "Enable ramp-function generator" from the PROFINET interface missing.

Bit 12 = 1 (enable signal missing), if:

- "Enable setpoint" from the PROFINET interface missing.

Bit 16 = 1 (enable signal missing), if:

- There is an OFF1 fault response. The system is only enabled if the fault is removed and was acknowledged and the "switching on inhibited" withdrawn with OFF1 = 0.

Bit 17 = 1 (enable signal missing), if:

- The commissioning mode is selected.
- There is an OFF2 fault response.
- The drive is inactive or not capable of operation.

Bit 18 = 1 (enable signal missing), if:

- OFF3 has still not been completed or an OFF3 fault response is present.

Bit 19 = 1 (internal pulse enable missing), if:

- Synchronization is running between the basic clock cycle, DRIVE-CLiQ clock cycle and application clock cycle.

Bit 21 = 1 (enable signal missing), if:

The pulses have been enabled and the speed setpoint has still not been enabled, because:

- The holding brake opening time (r1216) has still not elapsed.
- The motor has still not been magnetized (induction motor).
- The encoder has not been calibrated (U/f vector and synchronous motor)

Bit 26 = 1 (enable signal missing), if:

- The drive is inactive or not capable of operation.
- The drive device is in the "PROFenergy energy-saving mode" (r5600, CU-specific).

Bit 28 = 1 (enable signal missing), if:

- The holding brake is closed or has still not been opened.

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Bit 30 = 1 (speed controller inhibited), if one of the following reasons is present:

- Pulse enable missing
- The function generator with current input is active.
- The measuring function "current controller reference frequency characteristic" is active.
- The pole position identification is active.
- Motor data identification is active (only certain steps).

**r0061[0...1]****Actual speed unsmoothed**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**                      Read drive data or acknowledge messages  
**Write permission:**                      Edit device configuration or drive applications  
**Parameter group:**                      Motor encoder, Mode signals / displays  
**Unit:** rpm

**Description:** Displays the unsmoothed speed actual value sensed by the encoder.

**Index:** [0] = Motor encoder  
[1] = Reserved

**r0062****Speed setpoint after the filter**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**                      Read drive data or acknowledge messages  
**Write permission:**                      Edit device configuration or drive applications  
**Parameter group:**                      Mode signals / displays  
**Unit:** rpm

**Description:** Display for the speed setpoint after the setpoint filters.

**r0063****Speed actual value smoothed**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**                      Read drive data or acknowledge messages  
**Write permission:**                      Edit device configuration or drive applications  
**Parameter group:**                      Mode signals / displays  
**Unit:** rpm

**Description:** Display for the speed actual value.

**Dependency:** See also: r0021, r0061, p1441

**r0068****Absolute current actual value**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**                      Read drive data or acknowledge messages  
**Write permission:**                      Edit device configuration or drive applications  
**Parameter group:**                      Mode signals / displays  
**Unit:** Arms

**Description:** Displays actual absolute current.

**Dependency:** See also: r0027

**NOTICE**

The value is updated with a sampling time of 1 ms.

**Note**

Absolute current value =  $\sqrt{I_q^2 + I_d^2}$

The absolute current actual value is available smoothed (r0027) and unsmoothed (r0068).



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<b>r0070</b>	<p><b>Actual DC link voltage</b></p> <p><b>Data type:</b> FloatingPoint32      <b>Visible in:</b> Extended display</p> <p><b>Read permission:</b> Read drive data or acknowledge messages</p> <p><b>Write permission:</b> Edit device configuration or drive applications</p> <p><b>Parameter group:</b> Mode signals / displays</p> <p><b>Unit:</b> V</p> <p><b>Description:</b> Display for the measured actual value of the DC link voltage.</p> <p><b>Dependency:</b> See also: r0026</p> <hr/> <p><b>Note</b> The DC link voltage is available smoothed (r0026) and unsmoothed (r0070).</p>
<b>r0076</b>	<p><b>Current actual value field-generating</b></p> <p><b>Data type:</b> FloatingPoint32      <b>Visible in:</b> Extended display</p> <p><b>Read permission:</b> Read drive data or acknowledge messages</p> <p><b>Write permission:</b> Edit device configuration or drive applications</p> <p><b>Parameter group:</b> Mode signals / displays</p> <p><b>Unit:</b> Arms</p> <p><b>Description:</b> Display for the actual value of the field-generating current Id.</p>
<b>r0077</b>	<p><b>Current setpoint torque-generating</b></p> <p><b>Data type:</b> FloatingPoint32      <b>Visible in:</b> Extended display</p> <p><b>Read permission:</b> Read drive data or acknowledge messages</p> <p><b>Write permission:</b> Edit device configuration or drive applications</p> <p><b>Parameter group:</b> Current controller, Mode signals / displays</p> <p><b>Unit:</b> Arms</p> <p><b>Description:</b> Displays the torque/force-generating current setpoint.</p>
<b>r0078[0...1]</b>	<p><b>Current actual value torque-generating</b></p> <p><b>Data type:</b> FloatingPoint32      <b>Visible in:</b> Extended display</p> <p><b>Read permission:</b> Read drive data or acknowledge messages</p> <p><b>Write permission:</b> Edit device configuration or drive applications</p> <p><b>Parameter group:</b> Mode signals / displays</p> <p><b>Unit:</b> Arms</p> <p><b>Description:</b> Display for the actual value of the torque-generating current Iq.</p> <p><b>Index:</b> [0] = Unsmoothed [1] = Smoothed</p>
<b>r0079[0...1]</b>	<p><b>Torque setpoint total</b></p> <p><b>Data type:</b> FloatingPoint32      <b>Visible in:</b> Extended display</p> <p><b>Read permission:</b> Read drive data or acknowledge messages</p> <p><b>Write permission:</b> Edit device configuration or drive applications</p> <p><b>Parameter group:</b> Torque limiting, Mode signals / displays</p> <p><b>Unit:</b> Nm</p> <p><b>Description:</b> Display for the torque setpoint at the output of the speed controller.</p> <p><b>Index:</b> [0] = Unsmoothed [1] = Smoothed</p>

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<b>r0080</b>	<b>Torque actual value</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Mode signals / displays
	<b>Unit:</b> Nm	
<b>Description:</b>	Display for the actual torque.	
<b>Dependency:</b>	See also: r0031	
<hr/>		
<b>Note</b>		
The value is available smoothed (r0031) and unsmoothed (r0080).		

---

<b>r0082[0...3]</b>	<b>Active power actual value</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Mode signals / displays
	<b>Unit:</b> kW	
<b>Description:</b>	Displays the actual active power.	
<b>Index:</b>	[0] = Unsmoothed [1] = Smoothed [2] = Power drawn [3] = Power drawn smoothed	
<b>Dependency:</b>	See also: r0032	
<hr/>		
<b>Note</b>		
The mechanical active power is available smoothed (r0032 with 100 ms, r0082[1] with 1 ms) and unsmoothed (r0082[0]). For index [3]: Smoothing time constant = 0.25 ms		

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<b>r0196[0...255].4...15</b>	<b>Topology component status</b>			
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>	Diagnostics general		
	<b>Unit:</b> -			
<b>Description:</b>	Displays the status of the components. r0196[0]: Group status of all components r0196[1]: Status of component with component number 1 ... r0196[255]: Status of component with component number 255			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	04	Component state	Active	Inactive/parking
	06	Topology problem active	Yes	No
	07	Part of the target topology	Yes	No only act topo
	08	Alarm present	Yes	No
	10	Fault present	Yes	No
	13	Maintenance required	Yes	No
	14	Maintenance urgently required	Yes	No
	15	Fault gone/can be acknowledged	Yes	No

**Note**

For bits 12 ... 11:

These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.

**p0201[0]****Power unit code number****Data type:** Unsigned16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Commissioning**Parameter group:**

Power unit

**Unit:** -**Min:****Max:****Factory setting:**

0

65535

0

**Description:**

Sets the actual code number of the power unit being used.

**r0208****Rated power unit line supply voltage****Data type:** FloatingPoint32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

System identification, Power unit

**Unit:** Vrms**Description:**

Displays the rated line supply voltage of the power unit.

r0208 = 230: 200 - 240 V (line voltage tolerance: +/-10 %)

r0208 = 400: 380 - 480 V (line voltage tolerance: +/-10 %)

**p0210****Device supply voltage****Data type:** Unsigned16**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Ready for operation**Parameter group:**

Power unit, Quick commissioning

**Unit:** V**Min:****Max:****Factory setting:**

1 [V]

63000 [V]

400 [V]

**Description:**

Sets the device supply voltage.

The voltage between two phases should be entered as the device supply voltage.

This setting is important for operating with voltages that are less than the voltage range for which the drive is designed.

**Note**

Setting ranges for p0210 as a function of the rated power unit voltage:

U<sub>rated</sub> = 230 V:

- p0210 = 200 ... 240 V

U<sub>rated</sub> = 400 V:

- p0210 = 380 ... 480 V (wide voltage range, in addition to 200 ... 240 V)

---

<b>p0251[0]</b>	<b>Power unit heat sink fan operating hours counter</b>
	<b>Data type:</b> Unsigned32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Ready for operation
	<b>Parameter group:</b> System identification, Power unit
	<b>Unit:</b> h
	<b>Min:</b> <b>Max:</b> <b>Factory setting:</b>
	0 [h]      4294967295 [h]      0 [h]
<b>Description:</b>	Displays the operating hours of the heat sink fan in the power unit. The number of hours operated can only be reset to 0 in this parameter (e.g. after a fan has been replaced).
<b>Dependency:</b>	See also: r0277 See also: A30042
	<b>Note</b> This parameter is only available/included in the customer interface for compatibility reasons. In the future, use parameter r0277 (power unit heat sink-fan wear counter).

---

<b>r0277[0]</b>	<b>Power unit heat sink fan wear counter</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Power unit
	<b>Unit:</b> %
<b>Description:</b>	Displays the wear counter of the heat sink fan in the power unit. After a fan has been replaced, using an appropriate button, the value can be reset in the commissioning tool to 0.
<b>Dependency:</b>	See also: A30042

---

<b>p0300[0]</b>	<b>Motor type selection</b>
	<b>Data type:</b> Integer16 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Commissioning
	<b>Parameter group:</b> Motor data, Quick commissioning
	<b>Unit:</b> -
	<b>Min:</b> <b>Max:</b> <b>Factory setting:</b>
	0      10000      0
<b>Description:</b>	Selects the motor type or start to read in the motor parameters for a motor with DRIVE-CLiQ (p0300 = 10000). For p0300 < 10000 the following applies: The first digit of the parameter value always defines the general motor type and corresponds to the third-party motor belonging to a motor list: 2 = rotating synchronous motor
<b>Value:</b>	0:      No motor 2:      Synchronous motor 203:      1FT2 synchronous motor 237:      1FK7 synchronous motor 272:      1FK2 synchronous motor 295:      1FS2 synchronous motor 2024:      1FK7 synchronous motor

2030: 1FT2 synchronous motor  
 2031: 1FK2 synchronous motor  
 2032: 1FS2 synchronous motor  
 10000: Motor with DRIVE-CLiQ

**Dependency:** See also: p0301

### p0301[0] **Motor code number selection**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Can be changed in the operating state:** Commissioning  
**Parameter group:** Motor data, Quick commissioning

**Unit:** -

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0	99999999	0

**Description:** Code number of the connected motor, whose data was accepted when commissioning.

**Dependency:** Code numbers can only be selected for motor types that correspond to the motor type selected in p0300.  
 See also: p0300

#### **Note**

For a motor with DRIVE-CLiQ, p0301 cannot be changed. p0301 is automatically written to the code number of the motor parameter read in (r0302) if p0300 is set to 10000. For other values, the commissioning routine cannot be exited.

### r0302[0] **Motor code (identified)**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Motor data, Quick commissioning  
**Unit:** -

**Description:** Displays the identified motor code number.  
 When the drive powers up, the motor code is read out the motor. For r0302 = 0, the motor data were not identified.

### r0304[0] **Rated motor voltage**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Motor data, Quick commissioning  
**Unit:** Vrms

**Description:** Displays the rated motor voltage.

### r0305[0] **Rated motor current**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Motor data, Quick commissioning  
**Unit:** Arms

**Description:** Displays the rated motor current.

<b>r0307[0]</b>	<b>Rated motor power</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Motor data, Quick commissioning
	<b>Unit:</b> kW	
<b>Description:</b>	Displays the rated motor power.	

---

<b>r0311[0]</b>	<b>Rated motor speed</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Motor data, Quick commissioning
	<b>Unit:</b> rpm	
<b>Description:</b>	Displays the rated motor speed.	

---

<b>r0312[0]</b>	<b>Rated motor torque</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Motor data
	<b>Unit:</b> Nm	
<b>Description:</b>	Displays the rated motor torque.	

---

<b>r0316[0]</b>	<b>Motor torque constant</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Motor data, Quick commissioning
	<b>Unit:</b> Nm/A	
<b>Description:</b>	Sets the torque constant of the synchronous motor.	
	r0316 = 0: The torque constant is calculated from the motor data.	
	r0316 > 0: The selected value is used as torque constant.	

---

<b>r0318[0]</b>	<b>Motor stall current</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Motor data
	<b>Unit:</b> Arms	
<b>Description:</b>	Displays the rated motor stall current.	

<b>r0319[0]</b>	<b>Motor stall torque</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit device configuration or drive applications
	<b>Parameter group:</b>		Motor data
	<b>Unit:</b> Nm		
<b>Description:</b>	Displays the motor standstill/stall torque.		
<b>r0322[0]</b>	<b>Maximum motor speed</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit device configuration or drive applications
	<b>Parameter group:</b>		Motor data, Quick commissioning
	<b>Unit:</b> rpm		
<b>Description:</b>	Displays the maximum motor speed.		
<b>Dependency:</b>	See also: p1082		
<b>r0323[0]</b>	<b>Maximum motor current</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit device configuration or drive applications
	<b>Parameter group:</b>		Motor data, Quick commissioning
	<b>Unit:</b> Arms		
<b>Description:</b>	Displays the maximum permissible motor current.		
<b>r0341[0]</b>	<b>Motor moment of inertia</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display
	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit device configuration or drive applications
	<b>Parameter group:</b>		Motor data, Speed controller
	<b>Unit:</b> kgm <sup>2</sup>		
<b>Description:</b>	Displays the motor moment of inertia (without load).		
<b>p0400[0]</b>	<b>Encoder type selection</b>	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display
	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b>		Commissioning
	<b>Parameter group:</b>		Motor encoder, Quick commissioning
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	10100	0
<b>Description:</b>	Selects the encoder from the list of encoder types supported.		
<b>Value:</b>	0:	No encoder	
	202:	DRIVE-CLiQ encoder AS20, singleturn	
	204:	DRIVE-CLiQ encoder AM20, multiturn 4096	
	222:	DRIVE-CLiQ encoder AS22, singleturn	

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- 224: DRIVE-CLiQ encoder AM22, multiturn 4096
- 242: DRIVE-CLiQ encoder AS24, singleturn
- 244: DRIVE-CLiQ encoder AM24, multiturn 4096
- 262: DRIVE-CLiQ encoder AS26, singleturn
- 264: DRIVE-CLiQ encoder AM26, multiturn 4096
- 10100: Identify encoder (waiting)

**NOTICE**  
 An encoder type with p0400 < 9999 defines an encoder for which there is an encoder parameter list. When selecting a catalog encoder (p0400 < 9999) the parameters from the encoder parameter list cannot be changed (write protection).

**Note**  
 The connected encoder can be identified using p0400 = 10100. This means that the encoder must support this, and is possible in the following cases:  
 - Motor with DRIVE-CLiQ  
 - Encoder with EnDat interface  
 - DRIVE-CLiQ encoder  
 For p0400 = 10100 the following applies:  
 The connected encoder is identified. If identification is not possible, then p0400 remains set = 10100, and the system waits until identification is possible.

**p0404[0].1...10 Encoder configuration effective**

**Data type:** Unsigned32                      **Visible in:** Standard display  
**Read permission:**                              Read drive data or acknowledge messages  
**Write permission:**                              Edit device configuration or drive applications  
**Can be changed in the operating state:** Commissioning  
**Parameter group:**                              Motor encoder  
**Unit:** -  
**Min:**    **Max:**    **Factory setting:**  
 -    -    0000 0000 0000 0000 bin

**Description:** Settings for the basic encoder properties.

**Bit array:**

Bit	Signal name	1 signal	0 signal
01	Absolute encoder	Yes	No
02	Multiturn encoder	Yes	No
10	DRIVE-CLiQ encoder	Yes	No

**NOTICE**  
 This parameter is automatically pre-assigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection). Information in p0400 should be carefully observed when removing write protection.

**Note**  
 For bit 01, 02 (absolute encoder, multiturn encoder):  
 These bits can only be selected for a DRIVE-CLiQ encoder.  
 For bit 10 (DRIVE-CLiQ encoder):  
 This bit is only used for the large-scale integrated DRIVE-CLiQ encoders that provide their encoder data directly in DRIVE-CLiQ format without converting this data. This bit is not, therefore, set for first-generation DRIVE-CLiQ encoders.



<b>p0408[0]</b>	<b>Rotary encoder pulse number</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Commissioning	
	<b>Parameter group:</b>	Motor encoder	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	16777215	2048
<b>Description:</b>	Sets the number of pulses for a rotary encoder. In conjunction with the fine resolution, the pulse number defines the transfer format for position actual values Gn_XIST1 (r0479).		
<b>NOTICE</b>			
This parameter is automatically pre-assigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).			
<b>Note</b>			
The smallest permissible value is 1 pulse. This value does not always correspond to the pulse number of the measuring device. For a DRIVE-CLiQ encoder, a value is entered here that facilitates optimum transfer of the resolution (p0423).			

<b>p0421[0]</b>	<b>Absolute encoder rotary multiturn resolution</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Commissioning	
	<b>Parameter group:</b>	Motor encoder	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	4294967295	4096
<b>Description:</b>	Maximum number of revolutions that can be resolved for a rotary absolute encoder to determine the position. The value of p0421 is read out when the drive powers up and cannot be changed.		


<b>p0423[0]</b>	<b>Absolute encoder rotary singleturn resolution</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Commissioning	
	<b>Parameter group:</b>	Motor encoder	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	1073741823	8192
<b>Description:</b>	Sets the number of measuring steps per revolution for a rotary absolute encoder. The resolution refers to the absolute position.		
<b>NOTICE</b>			
This parameter is automatically pre-assigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection). Information in p0400 should be carefully observed when removing write protection.			

---

<b>r0479[0...2]</b>	<b>Diagnostics encoder position actual value Gn_XIST1</b>
	<b>Data type:</b> Integer32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Motor encoder
	<b>Unit:</b> -
<b>Description:</b>	Display for the encoder position actual value Gn_XIST1 according to PROFIdrive for diagnostics. The value of r0479 is updated in each DRIVE-CLiQ basic clock cycle and displayed with sign.
<b>Index:</b>	[0] = Motor encoder [1] = Reserved [2] = Reserved

---

<b>p0488[0...2]</b>	<b>Activate measuring probe 1</b>
	<b>Data type:</b> Integer16 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Operation, Ready for operation
	<b>Parameter group:</b> Measuring probe
	<b>Unit:</b> -
	<b>Min:</b> <b>Max:</b> <b>Factory setting:</b>
	0    210    210
<b>Description:</b>	Setting to activate/deactivate measuring probe 1. The inversion of probe 1 is set in p0490.0.
<b>Value:</b>	0:                      No measuring probe 210:                      DI 0 (X130 / 1.2)
<b>Index:</b>	[0] = Motor encoder [1] = Reserved [2] = Reserved
<b>Dependency:</b>	See also: p0489, p0490


 <b>CAUTION</b>
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

**Note**  
DI: Digital Input  
Refer to the encoder interface for PROFIdrive.

---

<b>p0489[0...2]</b>	<b>Activate measuring probe 2</b>
	<b>Data type:</b> Integer16 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Operation, Ready for operation
	<b>Parameter group:</b> Measuring probe
	<b>Unit:</b> -
	<b>Min:</b> <b>Max:</b> <b>Factory setting:</b>
	0    211    211
<b>Description:</b>	Setting to activate/deactivate measuring probe 2. The inversion of probe 2 is set in p0490.1.
<b>Value:</b>	0:                      No measuring probe

211: DI 1 (X130 / 1.5)  
**Index:** [0] = Motor encoder  
 [1] = Reserved  
 [2] = Reserved  
**Dependency:** See also: p0488, p0490

 <b>CAUTION</b>
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

**Note**

DI: Digital Input  
 Refer to the encoder interface for PROFIdrive.

**p0490.0...1****Invert measuring probe**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:** Measuring probe  
**Unit:** -  
**Min:** -      **Max:** -      **Factory setting:** 0000 bin

**Description:** Setting to invert digital input 0 or 1 (probe 1, 2).

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130 / 1.2)	Inverted	Not inverted
01	DI 1 (X130 / 1.5)	Inverted	Not inverted

**Dependency:** See also: p0488, p0489

**Note**

DI: Digital Input  
 The inversion has no effect on the status display of the digital inputs (r0722).


**p0494[0]****Equivalent zero mark input terminal**

**Data type:** Integer16      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:** Motor encoder  
**Unit:** -  
**Min:** 0      **Max:** 211      **Factory setting:** 0

**Description:** Selects the input terminal for connecting an equivalent zero mark (external encoder zero mark).

**Value:** 0: No equivalent zero mark (evaluation of the encoder zero mark)  
 210: DI 0 (X130 / 1.2)  
 211: DI 1 (X130 / 1.5)

**Dependency:** See also: p0490

 <b>CAUTION</b>
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

## 18.2 List of parameters

**Note**

Refer to the encoder interface for PROFIdrive.

**r0550[0]****Brake status****Data type:** Integer16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Motor holding brake, Quick commissioning

**Unit:** -**Description:**

Displays the status of the brake.

The value of r0550 is read when the drive runs up.

**Value:**

0: No data

1: Holding brake

2: High performance holding brake

**Dependency:**

See also: p1215, r1216, r1217

**Note**

For value = 1:

The default value for opening time/closing time applies.

For value = 2:

A shorter opening time/closing time is realized if the drive satisfies the preconditions.

**p0551[0]****Brake code number****Data type:** Unsigned32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Commissioning**Parameter group:**

Motor holding brake, Quick commissioning

**Unit:** -**Min:**

0

**Max:**

4294967295

**Factory setting:**

1

**Description:**

Display and setting the code number for the brake.

0 = No data

1 = Manual entry

&gt; 1 = valid code number

For value = 0:

- Parameters listed under Dependent are set to a value of zero and are write protected.

- Parameters r1216, r1217 are set to a value of zero.

For value = 1:

- Write protection for the parameters listed under Dependent is withdrawn.

For value &gt; 1:

- Parameters listed under Dependent are automatically pre-assigned and are write protected.

- Parameters r1216, r1217 are automatically appropriately pre-assigned.

**Dependency:**

See also: r0550

**Note**

Only code numbers can be set that are permitted for the selected motor code (p0301).

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<b>p0613[0]</b>	<b>Motor temperature model ambient temperature</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Motor temperature	
	<b>Unit:</b> °C		
	<b>Min:</b> -40 [°C]	<b>Max:</b> 100 [°C]	<b>Factory setting:</b> 40 [°C]
<b>Description:</b>	Sets the motor ambient temperature. Based on this value, the motor temperature model calculates the thermal motor utilization (r0034).		
<b>Dependency:</b>	See also: r0034 See also: F07011, A07012		
	<b>Note</b> If the thermal motor model is activated for permanent-magnet synchronous motors, p0613 is incorporated in the model calculation if a temperature sensor is not being used.		

---

<b>r0722.0...4</b>	<b>Digital inputs status</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Digital inputs	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the status of the digital inputs.		
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>
	00	DI 0 (X130 / 1.2)	High
	01	DI 1 (X130 / 1.5)	High
	02	DI 2 (X130 / 2.1-2)	High
	03	DI 3 (X130 / 2.3-4)	High
	04	DI 4 (X130 / 2.6)	High
			Low
<b>Dependency:</b>	See also: p0488, p0489		
	<b>Note</b> DI: Digital Input For bit 00, 01: DI 0 and DI 1 are fast digital inputs and can be used to connect a measuring probe (p0488, p0489). For bits 02, 03: DI 2 and DI 3 form a failsafe digital input. For bit 04: DI 4 is intended to monitor the temperature of the external brake resistor.		

---

<b>r0898.0...14</b>	<b>Control word sequence control</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Control/status words	
	<b>Unit:</b> -		
<b>Description:</b>	Display for the control word of the sequence control. The higher-level control cyclically sends the control word to the drive.		
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>
			Low
			High

---

## 18.2 List of parameters

00	ON/OFF1	Yes	No
01	Operating condition / OFF2	Yes	No
02	Operating condition / OFF3	Yes	No
03	Enable operation	Yes	No
04	Enable ramp-function generator	Yes	No
05	Continue ramp-function generator	Yes	No
06	Enable speed setpoint	Yes	No
07	Command open brake	Yes	No
08	Jog 1	Yes	No
09	Jog 2	Yes	No
10	Master control by PLC	Yes	No
12	Speed controller enable	Yes	No
14	Command close brake	Yes	No

**r0899.0...13 Status word sequence control**

<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Control/status words
<b>Unit:</b> -	

**Description:** Display for the status word of the sequence control.  
The status word is cyclically sent from the drive to the higher-level control.

<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Ready for switching on	Yes	No
	01	Ready	Yes	No
	02	Operation enabled	Yes	No
	03	Jog active	Yes	No
	04	No coasting active	OFF2 inactive	OFF2 active
	05	No Quick Stop active	OFF3 inactive	OFF3 active
	06	Switching on inhibited active	Yes	No
	07	Drive ready	Yes	No
	08	Controller enable	Yes	No
	09	Control request	Yes	No
	11	Pulses enabled	Yes	No
	12	Open holding brake	Yes	No
	13	Command close holding brake	Yes	No

**Note**

For bits 00, 01, 02, 04, 05, 06, 09:

For PROFIdrive, these signals are used for status word 1.

For bit 13:

When function "SBC (Safe Brake Control)" is activated and selected, the brake is no longer controlled using this signal.

**r0922 PROFIdrive PZD telegram selection**

<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Quick commissioning, Configuration
<b>Unit:</b> -	

**Description:** Displays the PROFIdrive telegram.

<b>Value:</b>	3:	Standard telegram 3, PZD-5/9
	5:	Standard telegram 5, PZD-9/9
	102:	SIEMENS telegram 102, PZD-6/10
	105:	SIEMENS telegram 105, PZD-10/10

**Note**

The telegram is set in the commissioning tool or by the control.

**r0924[0...1]****ZSW bit pulses enabled**

<b>Data type:</b>	Unsigned16	<b>Visible in:</b>	Extended display
<b>Read permission:</b>			Read drive data or acknowledge messages
<b>Write permission:</b>			Edit device configuration or drive applications
<b>Parameter group:</b>			Configuration
<b>Unit:</b>	-		

**Description:** Displays the position of the "Pulses enabled" status signal in the PROFIdrive telegram.

**Index:**  
[0] = Signal number  
[1] = Bit position

**p0925****PROFIdrive clock synchronous sign-of-life tolerance**

<b>Data type:</b>	Unsigned16	<b>Visible in:</b>	Extended display
<b>Read permission:</b>			Read drive data or acknowledge messages
<b>Write permission:</b>			Edit device configuration or drive applications
<b>Can be changed in the operating state:</b>	Operation, Ready for operation		
<b>Parameter group:</b>	Configuration		
<b>Unit:</b>	-		
<b>Min:</b>	0	<b>Max:</b>	65535
		<b>Factory setting:</b>	1

**Description:** Sets the number of tolerated consecutive sign-of-life errors of the isochronous controller. The sign-of-life signal is normally received in PZD4 (control word 2) from the controller.

**Dependency:** See also: F01912

**Note**

The sign-of-life monitoring is disabled for p0925 = 65535.

**r0930****PROFIdrive operating mode**

<b>Data type:</b>	Unsigned16	<b>Visible in:</b>	Extended display
<b>Read permission:</b>			Read drive data or acknowledge messages
<b>Write permission:</b>			Edit device configuration or drive applications
<b>Parameter group:</b>	Configuration		
<b>Unit:</b>	-		

**Description:** Displays the operating mode.  
3: Closed-loop speed controlled operation without ramp-function generator

**r0944****Fault buffer counter**

<b>Data type:</b>	Unsigned16	<b>Visible in:</b>	Extended display
<b>Read permission:</b>			Read drive data or acknowledge messages
<b>Write permission:</b>			Edit device configuration or drive applications
<b>Parameter group:</b>	Faults / alarms		
<b>Unit:</b>	-		

18.2 List of parameters

**Description:** Display for the fault buffer counter  
This counter is incremented every time that a fault occurs.

**Recommendation:** This is used to check whether an additional fault has occurred while reading out the fault buffer.

**Dependency:** See also: r0945, r0947, r0948, r0949, r2109

**r0945[0...63]**

**Fault code**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:** Displays the codes of faults that have occurred.  
**Dependency:** See also: r0947, r0948, r0949, r2109, r2130, r2133, r2136

<b>NOTICE</b>
The properties of the fault buffer should be taken from the corresponding product documentation.

**Note**  
The buffer parameters are cyclically updated (states are indicated in r2139).  
Fault buffer structure (general principle):  
r0945[0], r0949[0] or r2133[0], r2130[0], r0948[0], r2136[0], r2109[0] --> fault 1 (oldest active fault) of the active incident  
...  
r0945[7], r0949[7] or r2133[7], r2130[7], r0948[7], r2136[7], r2109[7] --> fault 8 (latest active fault) of the active incident  
For more than 8 active faults, only the entries are overwritten at the eighth position (index 7).  
  
History of acknowledged faults:  
If a fault incident is acknowledged, then all alarms of the 1st fault incident are transferred into the 2nd fault incident, this becomes the 1st acknowledged fault incident.  
The 2nd incident is transferred into the 3rd, the 3rd into the 4th etc. The last incident is rejected.  
  
r0945[8], r0949[8] or r2133[8], r2130[0], r0948[8], r2136[8], r2109[8] --> fault 1 of the 1st acknowledged incident  
...  
r0945[16], r0949[16] or r2133[16], r2130[16], r0948[16], r2136[16], r2109[16] --> fault 1 of the 2nd acknowledged incident  
...  
r0945[56], r0949[56] or r2133[56], r2130[56], r0948[56], r2136[56], r2109[56] --> fault 1 of the 7th acknowledged incident  
...  
r0945[63], r0949[63] or r2133[63], r2130[63], r0948[63], r2136[63], r2109[63] --> fault 8 (oldest fault that has gone) of the 7th acknowledged incident

**r0947[0...63]**

**Fault number**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:** Displays the numbers of faults that have occurred.  
**Dependency:** See also: r0945

<b>NOTICE</b>
The properties of the fault buffer should be taken from the corresponding product documentation.



**Note**

The buffer parameters are cyclically updated (states are indicated in r2139).

Fault buffer structure (general principle):

r0945[0], r0949[0] or r2133[0], r2130[0], r0948[0], r2136[0], r2109[0] --> fault 1 (oldest active fault) of the active incident

...

r0945[7], r0949[7] or r2133[7], r2130[7], r0948[7], r2136[7], r2109[7] --> fault 8 (latest active fault) of the active incident

For more than 8 active faults, only the entries are overwritten at the eighth position (index 7).

History of acknowledged faults:

If a fault incident is acknowledged, then all alarms of the 1st fault incident are transferred into the 2nd fault incident, this becomes the 1st acknowledged fault incident.

The 2nd incident is transferred into the 3rd, the 3rd into the 4th etc. The last incident is rejected.

r0945[8], r0949[8] or r2133[8], r2130[0], r0948[8], r2136[8], r2109[8] --> fault 1 of the 1st acknowledged incident

...

r0945[16], r0949[16] or r2133[16], r2130[16], r0948[16], r2136[16], r2109[16] --> fault 1 of the 2nd acknowledged incident

...

r0945[56], r0949[56] or r2133[56], r2130[56], r0948[56], r2136[56], r2109[56] --> fault 1 of the 7th acknowledged incident

...

r0945[63], r0949[63] or r2133[63], r2130[63], r0948[63], r2136[63], r2109[63] --> fault 8 (oldest fault that has gone) of the 7th acknowledged incident

**r0948[0...63]****Fault received in milliseconds**

**Data type:** Unsigned32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Faults / alarms

**Unit:** ms

**Description:**

Displays the system runtime in milliseconds referred to the day that the fault occurred.

**Dependency:**

See also: r0945, r0947, r0949, r2109, r2114, r2130, r2133, r2136

**NOTICE**

The time comprises r2130 (complete days) and r0948 (milliseconds, incomplete day).

**r0949[0...63]****Fault value**

**Data type:** Integer32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Faults / alarms

**Unit:** -

**Description:**

Displays additional information about the fault that occurred (as integer number).

The fault causes can be found under the fault values of the particular fault number.

**Dependency:**

See also: r0945, r0947, r0948, r2109, r2130, r2133, r2136

**Note**

The buffer parameters are cyclically updated in the background.

The structure of the fault buffer and the assignment of the indices is shown in r0945.

## 18.2 List of parameters

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<b>p0952</b>	<b>Fault cases counter</b>
<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Can be changed in the operating state:</b>	Operation, Ready for operation
<b>Parameter group:</b>	Faults / alarms
<b>Unit:</b> -	
<b>Min:</b> 0	<b>Max:</b> 65535
	<b>Factory setting:</b> 0
<b>Description:</b>	Number of fault situations since the last reset.
<b>Dependency:</b>	The counter is reset with p0952 = 0. See also: r0945, r0947, r0948, r0949, r2109, r2130, r2133, r2136


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<b>r0964[0...6]</b>	<b>Device identification</b>
<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	System identification
<b>Unit:</b> -	
<b>Description:</b>	Displays the device identification.
<b>Index:</b>	[0] = Company (Siemens = 42) [1] = Device type [2] = Firmware version [3] = Firmware date (year) [4] = Firmware date (day/month) [5] = Number of drive objects [6] = Firmware patch/hot fix
	<b>Note</b> Example: r0964[0] = 42 --> SIEMENS r0964[1] = device type, see below r0964[2] = 601 --> first part firmware version V06.01 (second part, refer to index 6) r0964[3] = 2020 --> year 2020 r0964[4] = 1706 --> June 17 r0964[5] = 1 --> 1 drive object r0964[6] = 0 --> second part firmware version (complete version: V06.01.00.00)

---

<b>r0965</b>	<b>PROFdrive profile number profile version</b>
<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Configuration
<b>Unit:</b> -	
<b>Description:</b>	Displays the PROFdrive profile number and profile version. Constant value = 032A hex. Byte 1: Profile number = 03 hex = PROFdrive profile Byte 2: profile version = 2A hex = 42 dec = version 4.2
	<b>Note</b> When the parameter is read via PROFdrive, the Octet String 2 data type applies.

---

<b>p0972</b>	<b>Drive unit reset</b>
	<b>Data type:</b> Unsigned16 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Ready for operation
	<b>Parameter group:</b> Save & reset
	<b>Unit:</b> -
	<b>Min:</b> 0 <b>Max:</b> 3 <b>Factory setting:</b> 0
<b>Description:</b>	Sets the required procedure to execute a hardware reset for the drive unit.
<b>Value:</b>	0:      Inactive 1:      Hardware-Reset immediate 2:      Hardware reset preparation 3:      Hardware reset after cyclic communication has failed
 <b>DANGER</b> It must be absolutely ensured that the system is in a safe condition. The memory card/device memory of the converter must not be accessed.	
<b>Note</b>	
For value = 1:	
Reset is immediately executed and communications interrupted.	
After communications have been established, check the reset operation (refer below).	
This value cannot be set in operation.	
For value = 2:	
Help to check the reset operation.	
Firstly, set p0972 = 2 and then read back. Secondly, set p0972 = 1 (it is possible that this request is possibly no longer acknowledged). The communication is then interrupted.	
After communications have been established, check the reset operation (refer below).	
For value = 3:	
The reset is executed after interrupting cyclic communication. This setting is used to implement a synchronized reset by a control for several drive units.	
If cyclic communication is not active, then the reset is immediately executed.	
After communications have been established, check the reset operation (refer below).	
To check the reset operation:	
After the drive unit has been restarted and communications have been established, read p0972 and check the following:	
p0972 = 0 --> the reset was successfully executed.	
p0972 > 0 --> the reset was not executed.	

<b>r0975[0...10]</b>	<b>Drive object identification</b>
	<b>Data type:</b> Unsigned16 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> System identification
	<b>Unit:</b> -
<b>Description:</b>	Displays the identification of the drive object. The drive internally comprises components, device and drive object. Both components require their own identification parameters according to PROFIdrive.

18.2 List of parameters

- Index:**
- [0] = Company (Siemens = 42)
  - [1] = Drive object type
  - [2] = Firmware version
  - [3] = Firmware date (year)
  - [4] = Firmware date (day/month)
  - [5] = PROFIdrive drive object type class
  - [6] = PROFIdrive drive object subtype class
  - [7] = Drive object number
  - [8] = Reserved
  - [9] = Reserved
  - [10] = Firmware patch/hot fix

**Dependency:** See also: r0964

**Note**

Example:  
 r0975[0] = 42 --> SIEMENS  
 r0975[1] = 312 --> drive object type VECTOR  
 r0975[2] = 601 --> first part firmware version V06.01 (second part refer to index 10)  
 r0975[3] = 2023 --> year 2023  
 r0975[4] = 1706 --> 17th of June  
 r0975[5] = 1 --> PROFIdrive type class = 1 (axis)  
 r0975[6] = 9 --> PROFIdrive subtype class = 1 and 4 (application classes)  
 r0975[7] = 1 -> drive object number = 1  
 r0975[8] = 0 (reserved)  
 r0975[9] = 0 (reserved)  
 r0975[10] = 0 --> second part firmware version (complete version: V06.01.00.00)

**p0976**

**Reset all parameters**

**Data type:** Unsigned16                      **Visible in:** Extended display  
**Read permission:**                              Read drive data or acknowledge messages  
**Write permission:**                              Edit device configuration or drive applications  
**Can be changed in the operating state:** Ready for operation  
**Parameter group:**                              Save & reset  
**Unit:** -  
**Min:**    **Max:**    **Factory setting:**  
 0    1    0

**Description:** Resets all parameters of the drive system.

**Value:**  
 0:              Inactive  
 1:              Start to reset all parameters

**NOTICE**  
 Writing to parameters is inhibited during the reset operation.

**p0977**

**Save all parameters**

**Data type:** Unsigned16                      **Visible in:** Extended display  
**Read permission:**                              Read drive data or acknowledge messages  
**Write permission:**                              Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:**                              Save & reset  
**Unit:** -

	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	1	0
<b>Description:</b>	Saves all parameters of the drive system to the non-volatile memory. When saving, only the adjustable parameters intended to be saved are taken into account.		
<b>Value:</b>	0: Inactive 1: Save in non-volatile memory - Loaded at POWER ON		
<b>Dependency:</b>	See also: p0976		

**NOTICE**

The drive power supply may only be switched off after data has been saved (i.e. after data save has been started, wait until the parameter again has the value 0).  
Writing to parameters is inhibited while saving.

**r0979[0...30]****PROFIdrive encoder format**

<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	System identification, Configuration
<b>Unit:</b> -	

**Description:** Displays the actual position encoder used according to PROFIdrive.

**Index:**  
 [0] = Header  
 [1] = Motor encoder type  
 [2] = Motor encoder resolution  
 [3] = Shift factor G1\_XIST1  
 [4] = Shift factor G1\_XIST2  
 [5] = Distinguishable revolutions motor encoder  
 [6...30] = Reserved

**Note**

Information about the individual indices can be taken from the following literature:  
PROFIdrive Profile Drive Technology

**r0981[0...299]****List of existing parameters 2**

<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	System identification
<b>Unit:</b> -	

**Description:** Displays the parameters that exist for this drive.

**Dependency:** See also: r0989

**Note**

Modified parameters are displayed in indices 0 to 298. If an index contains the value 0, then the list ends here. In a long list, index 299 contains the parameter number at which position the list continues.

This list consists solely of the following parameters:

r0980[0...299], r0981[0...299] ... r0989[0...299]

The parameters in this list are not displayed in the expert list of the commissioning tool. However, they can be read from a higher-level control system.

**r0989[0...299] List of existing parameters 10**

<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	System identification
<b>Unit:</b> -	

**Description:** Displays the parameters that exist for this drive.

**Dependency:** See also: r0981

**Note**

Modified parameters are displayed in indices 0 to 298. If an index contains the value 0, then the list ends here.

This list consists solely of the following parameters:

r0980[0...299], r0981[0...299] ... r0989[0...299]

The parameters in this list are not displayed in the parameter lists of the commissioning tool. However, they can be read from a higher-level control system (e.g. PROFIBUS master).

**p1082[0] Maximum speed**

<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Can be changed in the operating state:</b>	Commissioning, Ready for operation
<b>Parameter group:</b>	Speed controller, Quick commissioning
<b>Unit:</b> rpm	

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.000 [rpm]	210000.000 [rpm]	1500.000 [rpm]

**Description:** Sets the maximum speed of the motor to a value less than or equal to the maximum motor speed (r0322). The set value is valid for both directions of rotation.

**Dependency:** See also: r0322

**p1083[0] Speed limit positive**

<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Can be changed in the operating state:</b>	Operation, Ready for operation
<b>Parameter group:</b>	Speed controller
<b>Unit:</b> rpm	

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]

**Description:** Sets the maximum speed for the positive direction. The set value must be less than or equal to the maximum speed (p1082).

**p1086[0] Speed limit negative**

<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Can be changed in the operating state:</b>	Operation, Ready for operation
<b>Parameter group:</b>	Speed controller
<b>Unit:</b> rpm	

	<b>Min:</b> -210000.000 [rpm]	<b>Max:</b> 0.000 [rpm]	<b>Factory setting:</b> -210000.000 [rpm]
<b>Description:</b>	Sets the maximum speed for the negative direction. The set value must be less than or equal to the maximum speed (p1082).		
<b>p1121[0]</b>	<b>OFF1 ramp-down time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Commissioning, Operation, Ready for operation	
	<b>Parameter group:</b>	Quick commissioning	
	<b>Unit:</b> s		
	<b>Min:</b> 0.000 [s]	<b>Max:</b> 999999.000 [s]	<b>Factory setting:</b> 1.000 [s]
<b>Description:</b>	Sets the ramp-down time after an OFF1 command. The value is referred to the maximum speed (p1082). After an OFF1 command, within this time, the speed setpoint is ramped down from the maximum speed (p1082) to standstill.		
<b>Dependency:</b>	See also: p1082		
<b>p1135[0]</b>	<b>OFF3 ramp-down time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Commissioning, Operation, Ready for operation	
	<b>Parameter group:</b>	Shutdown functions, Safety Integrated, Quick commissioning	
	<b>Unit:</b> s		
	<b>Min:</b> 0.000 [s]	<b>Max:</b> 600.000 [s]	<b>Factory setting:</b> 0.000 [s]
<b>Description:</b>	Sets the ramp-down time for Quick Stop. In this time, after an OFF3, the speed setpoint is reduced from the maximum speed (p1082) down to standstill.		
	<b>Note</b> This time can be exceeded if the DC link voltage reaches its maximum value.		
<b>r1196</b>	<b>DSC position setpoint</b>		
	<b>Data type:</b> Integer32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>		
	<b>Unit:</b> -		
<b>Description:</b>	Displays the position setpoint of Dynamic Servo Control in fine pulses.		
	<b>Note</b> DSC: Dynamic Servo Control		

**p1215[0]****Motor holding brake configuration****Data type:** Integer16**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Ready for operation**Parameter group:**

Motor holding brake

**Unit:** -**Min:**

0

**Max:**

2

**Factory setting:**

0

**Description:**

Sets the configuration for the motor holding brake.

For value 2:

This setting allows the motor shaft to be rotated for installation purposes.

**Value:**

0: No motor holding brake available

1: Motor holding brake acc. to sequence control

2: Motor holding brake always open

**Dependency:**

See also: r1216, r1217, p1226, p1227, p1228, p1278

**CAUTION**

For the setting p1215 = 0, if a brake is used, it remains closed. If the motor moves, this will destroy the brake. Setting p1215 = 2 is not permissible if the brake is used to hold loads.

**r1216[0]****Motor holding brake opening time****Data type:** FloatingPoint32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Motor holding brake

**Unit:** ms**Description:**

Displays the opening time for the motor holding brake.

The speed setpoint is kept at 0 for this time. The speed setpoint is then enabled.

**Dependency:**

See also: p1215, r1217

**r1217[0]****Motor holding brake closing time****Data type:** FloatingPoint32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Motor holding brake

**Unit:** ms**Description:**

Displays the time to close the motor holding brake.

If the drive signals that the motor is at a standstill, if the holding brake is activated, after the closing time has expired, the pulses are canceled. This prevents the load from sagging, for example.

**Dependency:**

See also: p1215, r1216



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<b>p1226[0]</b>	<b>Threshold for zero speed detection</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Motor holding brake, Shutdown functions	
	<b>Unit:</b> rpm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.00 [rpm]	210000.00 [rpm]	20.00 [rpm]
<b>Description:</b>	Sets the speed threshold for the standstill identification. The following applies when the motor holding brake is activated: The motor is shut down and held by the brake after the closing time for the brake in r1217 has elapsed. The following applies when the motor holding brake is not activated: The motor is shut down and it then coasts down.		
<b>Dependency:</b>	See also: p1215, r1216, r1217, p1227		
	<b>Note</b> In order that standstill is identified, the speed threshold in p1226 must be somewhat higher than the noise on the speed actual value signal.		

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<b>p1227[0]</b>	<b>Zero speed detection monitoring time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Motor holding brake, Shutdown functions	
	<b>Unit:</b> s		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.000 [s]	300.000 [s]	4.000 [s]
<b>Description:</b>	Sets the monitoring time for the standstill identification. When braking with OFF1 or OFF3, standstill is detected after the monitoring time has expired, after the setpoint speed has fallen below p1226. After this, the brake control is started, the system waits for the closing time in r1217 and then the pulses are canceled.		
<b>Dependency:</b>	See also: p1215, r1216, r1217, p1226		
	<b>Note</b> Standstill is detected if at least one of the following conditions is satisfied: - The speed actual value falls below the speed threshold in p1226 and the time started after this in p1228 has expired. - The speed setpoint falls below the speed threshold in p1226 and the time started after this in p1227 has expired.  For p1227 = 300.000 s the following applies: Monitoring is deactivated. For p1227 = 0.000 s, the following applies: With OFF1 or OFF3 and a ramp-down time = 0, the pulses are immediately suppressed and the motor "coasts" down.		

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<b>p1228[0]</b>	<b>Pulse cancellation delay time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Motor holding brake, Shutdown functions	
	<b>Unit:</b> s		
	<b>Min:</b> 0.000 [s]	<b>Max:</b> 299.000 [s]	<b>Factory setting:</b> 0.000 [s]
<b>Description:</b>	Sets the delay time for pulse cancellation. After OFF1 or OFF3, the pulses are canceled, if at least one of the following conditions is fulfilled: - The speed actual value falls below the threshold in p1226 and the time started after this in p1228 has expired. - The speed setpoint falls below the threshold in p1226 and the time started after this in p1227 has expired.		
<b>Dependency:</b>	See also: p1226, p1227		

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<b>p1278[0]</b>	<b>Brake control diagnostics evaluation</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Motor holding brake	
	<b>Unit:</b> -		
	<b>Min:</b> 0	<b>Max:</b> 1	<b>Factory setting:</b> 0
<b>Description:</b>	Sets the brake control type (with or without diagnostics evaluation). Example for brake control with diagnostics evaluation. - brake control in the Motor Modules in booksize format - Safe Brake Relay for AC Drive Example for brake control without diagnostics evaluation. - Brake Relay for AC Drive		
<b>Value:</b>	0: Brake control with diagnostics evaluation 1: Brake control without diagnostics evaluation		

**Note**

If the configuration of the motor holding brake (p1215) is set to "no holding brake present" when booting, then an automatic identification of the motor holding brake will be carried out. If a brake control is detected without diagnostics evaluation (e.g. Brake Relay for AC Drive), then the parameter is set to "brake control without diagnostics evaluation". It is not permissible to parameterize "Brake control without diagnostic evaluation" and enable "SBC (Safe Brake Control)" (p1278 = 1, p9603 > 0, p9604 bit1 = 1).

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<b>p1414[0].0...1</b>	<b>Speed setpoint filter activation</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed setpoint filter	
	<b>Unit:</b> -		

	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>	
	-	-	0001 bin	
<b>Description:</b>	Setting for activating/deactivating the speed setpoint filter.			
<b>Recommendation:</b>	If only one filter is required, filter 1 should be activated and filter 2 deactivated, to avoid excessive processing time.			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Activate filter 1	Yes	No
	01	Activate filter 2	Yes	No
<b>Dependency:</b>	The individual speed setpoint filters are parameterized from p1415.			

---

<b>p1415[0]</b>	<b>Speed setpoint filter 1 type</b>			
	<b>Data type:</b> Integer16	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation		
	<b>Parameter group:</b>	Speed setpoint filter		
	<b>Unit:</b> -			
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>	
	0	2	0	
<b>Description:</b>	Sets the type for speed setpoint filter 1.			
<b>Value:</b>	0:	Low pass: PT1		
	1:	Low pass: PT2		
	2:	General 2nd order filter		
<b>Dependency:</b>	PT1 low pass: p1416 PT2 low pass: p1417, p1418 General filter: p1417 ... p1420			

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<b>p1416[0]</b>	<b>Speed setpoint filter 1 time constant</b>			
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation		
	<b>Parameter group:</b>	Speed setpoint filter		
	<b>Unit:</b> ms			
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>	
	0.00 [ms]	5000.00 [ms]	0.00 [ms]	
<b>Description:</b>	Sets the time constant for the speed setpoint filter (PT1).			
<b>Dependency:</b>	See also: p1414, p1415			

**Note**

The speed setpoint filter is activated with a time constant greater than zero.

**p1417[0] Speed setpoint filter 1 denominator natural frequency**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:** Speed setpoint filter

**Unit:** Hz

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

**Description:** Sets the denominator natural frequency for speed setpoint filter 1 (PT2, general filter).

**Dependency:** See also: p1414, p1415

**Note**

This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.  
The filter is only effective if the natural frequency is less than half of the sampling frequency.

**p1418[0] Speed setpoint filter 1 denominator damping**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:** Speed setpoint filter

**Unit:** -

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.001	10.000	0.700

**Description:** Sets the denominator damping for speed setpoint filter 1 (PT2, general filter).

**Dependency:** See also: p1414, p1415

**Note**

This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.

**p1419[0] Speed setpoint filter 1 numerator natural frequency**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:** Speed setpoint filter

**Unit:** Hz

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

**Description:** Sets the numerator natural frequency for speed setpoint filter 1 (general filter).

**Dependency:** See also: p1414, p1415

**Note**

This parameter is only effective if the speed filter is set as a general filter.  
The filter is only effective if the natural frequency is less than half of the sampling frequency.

<b>p1420[0]</b>	<b>Speed setpoint filter 1 numerator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b> 0.000	<b>Max:</b> 10.000	<b>Factory setting:</b> 0.700
<b>Description:</b>	Sets the numerator damping for speed setpoint filter 1 (general filter).		
<b>Dependency:</b>	See also: p1414, p1415		
	<b>Note</b> This parameter is only effective if the speed filter is set as a general filter.		
<b>p1421[0]</b>	<b>Speed setpoint filter 2 type</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b> 0	<b>Max:</b> 2	<b>Factory setting:</b> 0
<b>Description:</b>	Sets the type for speed setpoint filter 2.		
<b>Value:</b>	0: Low pass: PT1 1: Low pass: PT2 2: General 2nd order filter		
<b>Dependency:</b>	PT1 low pass: p1422 PT2 low pass: p1423, p1424 General filter: p1423 ... p1426		
<b>p1422[0]</b>	<b>Speed setpoint filter 2 time constant</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed setpoint filter	
	<b>Unit:</b> ms		
	<b>Min:</b> 0.00 [ms]	<b>Max:</b> 5000.00 [ms]	<b>Factory setting:</b> 0.00 [ms]
<b>Description:</b>	Sets the time constant for the speed setpoint filter 2 (PT1).		
<b>Dependency:</b>	See also: p1414, p1421		
	<b>Note</b> This parameter is only effective if the speed filter is set as a PT1 low pass.		

## 18.2 List of parameters

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<b>p1423[0]</b>	<b>Speed setpoint filter 2 denominator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed setpoint filter	
	<b>Unit:</b> Hz		
	<b>Min:</b> 0.5 [Hz]	<b>Max:</b> 16000.0 [Hz]	<b>Factory setting:</b> 2000.0 [Hz]
<b>Description:</b>	Sets the denominator natural frequency for speed setpoint filter 2 (PT2, general filter).		
<b>Dependency:</b>	See also: p1414, p1421		
	<b>Note</b>		
	This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter. The filter is only effective if the natural frequency is less than half of the sampling frequency.		

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<b>p1424[0]</b>	<b>Speed setpoint filter 2 denominator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b> 0.001	<b>Max:</b> 10.000	<b>Factory setting:</b> 0.700
<b>Description:</b>	Sets the denominator damping for speed setpoint filter 2 (PT2, general filter).		
<b>Dependency:</b>	See also: p1414, p1421		
	<b>Note</b>		
	This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.		

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<b>p1425[0]</b>	<b>Speed setpoint filter 2 numerator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed setpoint filter	
	<b>Unit:</b> Hz		
	<b>Min:</b> 0.5 [Hz]	<b>Max:</b> 16000.0 [Hz]	<b>Factory setting:</b> 2000.0 [Hz]
<b>Description:</b>	Sets the numerator natural frequency for speed setpoint filter 2 (general filter).		
<b>Dependency:</b>	See also: p1414, p1421		
	<b>Note</b>		
	This parameter is only effective if the speed filter is set as a general filter. The filter is only effective if the natural frequency is less than half of the sampling frequency.		

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<b>p1426[0]</b>	<b>Speed setpoint filter 2 numerator damping</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Operation, Ready for operation
	<b>Parameter group:</b> Speed setpoint filter
	<b>Unit:</b> -
	<b>Min:</b> 0.000 <b>Max:</b> 10.000 <b>Factory setting:</b> 0.700
<b>Description:</b>	Sets the numerator damping for speed setpoint filter 2 (general filter).
<b>Dependency:</b>	See also: p1414, p1421
	<b>Note</b> This parameter is only effective if the speed filter is set as a general filter.
<b>p1433[0]</b>	<b>Speed controller reference model natural frequency</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Operation, Ready for operation
	<b>Parameter group:</b> Speed controller
	<b>Unit:</b> Hz
	<b>Min:</b> 0.0 [Hz] <b>Max:</b> 8000.0 [Hz] <b>Factory setting:</b> 0.0 [Hz]
<b>Description:</b>	Sets the natural frequency of a PT2 element for the reference model of the speed controller.
<b>Recommendation:</b>	The reference model is finely set using p1433.
<b>r1438</b>	<b>Speed controller speed setpoint</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> U/f control, Speed controller
	<b>Unit:</b> rpm
<b>Description:</b>	Displays the speed setpoint after setpoint limiting for the P component of the speed controller.
<b>p1441[0]</b>	<b>Actual speed smoothing time</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Can be changed in the operating state:</b> Operation, Ready for operation
	<b>Parameter group:</b> Speed controller
	<b>Unit:</b> ms
	<b>Min:</b> 0.00 [ms] <b>Max:</b> 50.00 [ms] <b>Factory setting:</b> 0.00 [ms]
<b>Description:</b>	Sets the smoothing time constant (PT1) for the speed actual value.
<b>Dependency:</b>	See also: r0063

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<b>p1460[0]</b>	<b>Speed controller P gain</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed controller	
	<b>Unit:</b> Nms/rad		
	<b>Min:</b> 0.0000 [Nms/rad]	<b>Max:</b> 500000000.0000 [Nms/rad]	<b>Factory setting:</b> 0.3000 [Nms/rad]
<b>Description:</b>	Sets the P gain of the speed controller. The drive determines the P gain for One Button Tuning and writes the value to p1460. The value can be changed.		
<b>Dependency:</b>	See also: p1462		
	<b>Note</b> The higher the set P gain, the faster and more unstable the control.		


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<b>p1462[0]</b>	<b>Speed controller integral time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed controller	
	<b>Unit:</b> ms		
	<b>Min:</b> 0.00 [ms]	<b>Max:</b> 100000.00 [ms]	<b>Factory setting:</b> 10.00 [ms]
<b>Description:</b>	Sets the integral time for the speed controller The drive determines the integral time for One Button Tuning - and writes the value to p1462.		
<b>Dependency:</b>	See also: p1460		
	<b>Note</b> The shorter the integral time, the faster and more unstable the control.		

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<b>p1498[0]</b>	<b>Load moment of inertia</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Speed controller	
	<b>Unit:</b> kgm <sup>2</sup>		
	<b>Min:</b> - [kgm <sup>2</sup> ]	<b>Max:</b> - [kgm <sup>2</sup> ]	<b>Factory setting:</b> - [kgm <sup>2</sup> ]
<b>Description:</b>	Sets the load moment of inertia. The setting is made during commissioning while the One Button Tuning is being performed.		



<b>p1520[0]</b>	<b>Torque limit upper</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Torque limiting	
	<b>Unit:</b> Nm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	-1000000.00 [Nm]	20000000.00 [Nm]	0.00 [Nm]
<b>Description:</b>	Setting the upper torque limit. This setting is made as part of the basic commissioning.		
<b>Dependency:</b>	See also: p1521, p1532, r1538, r1539		
<b>p1521[0]</b>	<b>Torque limit lower</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Torque limiting	
	<b>Unit:</b> Nm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	-20000000.00 [Nm]	1000000.00 [Nm]	0.00 [Nm]
<b>Description:</b>	Sets the lower torque limit This setting is made as part of the basic commissioning.		
<b>Dependency:</b>	See also: p1520, p1532, r1538, r1539		
<b>p1532[0]</b>	<b>Torque limit offset</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Torque limiting	
	<b>Unit:</b> Nm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	-100000.00 [Nm]	100000.00 [Nm]	0.00 [Nm]
<b>Description:</b>	Sets the offset for the torque limit. The setting allows electronic weight equalization to be used for vertical axes. Parameters p1520 and p1521 are offset by the set value in the same direction.		
<b>Dependency:</b>	See also: p1520, p1521		
	 <b>DANGER</b> If the offset is set higher/lower than the lower/upper torque limit, then the unloaded drive can accelerate up to the maximum speed.		

## 18.2 List of parameters

<b>r1538</b>	<b>Upper effective torque limit</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Torque limiting	
	<b>Unit:</b> Nm		
<b>Description:</b>	Displays the currently effective upper torque limit.		
	<b>Note</b>		
	The value in r1538 may not exceed the value in p1520.		
<b>r1539</b>	<b>Lower effective torque limit</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Torque limiting	
	<b>Unit:</b> Nm		
<b>Description:</b>	Displays the currently effective lower torque limit.		
	<b>Note</b>		
	The value in r1539 may not exceed the value in p1521.		
<b>p1558</b>	<b>Measure/precontrol hanging/suspended axis force due to weight</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Motor data identification routine	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	-1	1	0
<b>Description:</b>	Setting to start/reset the measurement of the force due to weight for a hanging/suspended axis. The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If it was started when the pulses were inhibited, then it is only executed after the pulses have been enabled. In both cases, alarm A07991 is output after starting. For the measurement, the torque to hold the axis is determined and entered into p1532. Further, this value is used internally for the precontrol.		
<b>Value:</b>	-1: Reset values 0: Inactive 1: Start measurement and activate precontrol		
<b>Dependency:</b>	The pulse enable is withdrawn at the end of the measurement. See also: p1532		
	<b>Note</b>		
	For master control with speed setpoint input from the commissioning tool, the torque precontrol channels are deactivated, so that the weight equalization entered here is not active.		

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<b>r1651</b>	<b>Torque setpoint function generator</b>			
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>	Current setpoint filter		
	<b>Unit:</b> Nm			
<b>Description:</b>	Displays the torque setpoint of the function generator.			

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<b>p1656[0].0...3</b>	<b>Activates current setpoint filter</b>			
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation		
	<b>Parameter group:</b>	Current setpoint filter		
	<b>Unit:</b> -			
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>	
	-	-	0001 bin	
<b>Description:</b>	Setting for activating/de-activating the current setpoint filter.			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Filter 1	Active	Inactive
	01	Filter 2	Active	Inactive
	02	Filter 3	Active	Inactive
	03	Filter 4	Active	Inactive
<b>Dependency:</b>	The individual current setpoint filters are parameterized as of p1657.			
	<b>Note</b>			
	If not all of the filters are required, then the filters should be used consecutively starting from filter 1.			

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<b>p1657[0]</b>	<b>Current setpoint filter 1 type</b>			
	<b>Data type:</b> Integer16	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation		
	<b>Parameter group:</b>	Current setpoint filter		
	<b>Unit:</b> -			
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>	
	1	2	1	
<b>Description:</b>	Sets the current setpoint filter 1 as low pass (PT2) or general 2nd-order filter.			
<b>Value:</b>	1:	PT2 low pass		
	2:	General 2nd order filter		
<b>Dependency:</b>	The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.			
	<b>Note</b>			
	For a general 2nd order filter, by inserting the same natural frequency in both the numerator and in the denominator, i.e. bandstop frequency, a bandstop filter is implemented. If the numerator damping of zero is selected, the bandstop frequency is completely suppressed.			
	The denominator damping can be determined from the equation for the 3 dB bandwidth:			
	$f_{3dB} \text{ bandwidth} = 2 * D_{denominator} * f_{bandstop} \text{ frequency}$			

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<b>p1658[0]</b>	<b>Current setpoint filter 1 denominator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> Hz		
	<b>Min:</b> 0.5 [Hz]	<b>Max:</b> 16000.0 [Hz]	<b>Factory setting:</b> 1999.0 [Hz]
<b>Description:</b>	Sets the denominator natural frequency for current setpoint filter 1 (PT2, general filter).		
<b>Dependency:</b>	The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.		

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<b>p1659[0]</b>	<b>Current setpoint filter 1 denominator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b> 0.001	<b>Max:</b> 10.000	<b>Factory setting:</b> 0.700
<b>Description:</b>	Sets the denominator damping for current setpoint filter 1.		
<b>Dependency:</b>	The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.		

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<b>p1660[0]</b>	<b>Current setpoint filter 1 numerator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> Hz		
	<b>Min:</b> 0.5 [Hz]	<b>Max:</b> 16000.0 [Hz]	<b>Factory setting:</b> 1999.0 [Hz]
<b>Description:</b>	Sets the numerator natural frequency for current setpoint filter 1 (general filter).		
<b>Dependency:</b>	The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.		

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<b>p1661[0]</b>	<b>Current setpoint filter 1 numerator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b> 0.000	<b>Max:</b> 10.000	<b>Factory setting:</b> 0.700

**Description:** Sets the numerator damping for current setpoint filter 1.  
**Dependency:** The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

**p1662[0]****Current setpoint filter 2 type**

**Data type:** Integer16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:**      Current setpoint filter  
**Unit:** -  
**Min:**      **Max:**      **Factory setting:**  
1      2      1

**Description:** Sets current setpoint filter 2 as lowpass filter (PT2) or general 2nd order filter.

**Value:**  
1:      PT2 low pass  
2:      General 2nd order filter

**Dependency:** Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

**Note**

For a general 2nd order filter, by inserting the same natural frequency in both the numerator and in the denominator, i.e. bandstop frequency, a bandstop filter is implemented. If the numerator damping of zero is selected, the bandstop frequency is completely suppressed.

The denominator damping can be determined from the equation for the 3 dB bandwidth:

$$f_{3dB} \text{ bandwidth} = 2 * D_{denominator} * f_{bandstop} \text{ frequency}$$

**p1663[0]****Current setpoint filter 2 denominator natural frequency**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:**      Current setpoint filter  
**Unit:** Hz  
**Min:**      **Max:**      **Factory setting:**  
0.5 [Hz]      16000.0 [Hz]      1999.0 [Hz]

**Description:** Sets the denominator natural frequency for current setpoint filter 2 (PT2, general filter).

**Dependency:** Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

**p1664[0]****Current setpoint filter 2 denominator damping**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Can be changed in the operating state:** Operation, Ready for operation  
**Parameter group:**      Current setpoint filter  
**Unit:** -  
**Min:**      **Max:**      **Factory setting:**  
0.001      10.000      0.700

**Description:** Sets the denominator damping for current setpoint filter 2.

**Dependency:** Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

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<b>p1665[0]</b>	<b>Current setpoint filter 2 numerator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> Hz		
	<b>Min:</b> 0.5 [Hz]	<b>Max:</b> 16000.0 [Hz]	<b>Factory setting:</b> 1999.0 [Hz]
<b>Description:</b>	Sets the numerator natural frequency for current setpoint filter 2 (general filter).		
<b>Dependency:</b>	Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.		

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<b>p1666[0]</b>	<b>Current setpoint filter 2 numerator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b> 0.000	<b>Max:</b> 10.000	<b>Factory setting:</b> 0.700
<b>Description:</b>	Sets the numerator damping for current setpoint filter 2.		
<b>Dependency:</b>	Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.		

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<b>p1667[0]</b>	<b>Current setpoint filter 3 type</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b> 1	<b>Max:</b> 2	<b>Factory setting:</b> 1
<b>Description:</b>	Sets current setpoint filter 3 as lowpass filter (PT2) or general 2nd order filter.		
<b>Value:</b>	1: PT2 low pass 2: General 2nd order filter		
<b>Dependency:</b>	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.		

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<b>p1668[0]</b>	<b>Current setpoint filter 3 denominator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> Hz		

	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]
<b>Description:</b>	Sets the denominator natural frequency for current setpoint filter 3 (PT2, general filter).		
<b>Dependency:</b>	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.		

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<b>p1669[0]</b>	<b>Current setpoint filter 3 denominator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.001	10.000	0.700
<b>Description:</b>	Sets the denominator damping for current setpoint filter 3.		
<b>Dependency:</b>	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.		

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<b>p1670[0]</b>	<b>Current setpoint filter 3 numerator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> Hz		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]
<b>Description:</b>	Sets the numerator natural frequency for current setpoint filter 3 (general filter).		
<b>Dependency:</b>	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.		

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<b>p1671[0]</b>	<b>Current setpoint filter 3 numerator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.000	10.000	0.700
<b>Description:</b>	Sets the numerator damping for current setpoint filter 3.		
<b>Dependency:</b>	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.		

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<b>p1672[0]</b>	<b>Current setpoint filter 4 type</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	1	2	1
<b>Description:</b>	Sets current setpoint filter 4 as lowpass filter (PT2) or general 2nd order filter.		
<b>Value:</b>	1: PT2 low pass		
	2: General 2nd order filter		
<b>Dependency:</b>	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

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<b>p1673[0]</b>	<b>Current setpoint filter 4 denominator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> Hz		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]
<b>Description:</b>	Sets the denominator natural frequency for current setpoint filter 4 (PT2, general filter).		
<b>Dependency:</b>	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

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<b>p1674[0]</b>	<b>Current setpoint filter 4 denominator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.001	10.000	0.700
<b>Description:</b>	Sets the denominator damping for current setpoint filter 4.		
<b>Dependency:</b>	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

---

<b>p1675[0]</b>	<b>Current setpoint filter 4 numerator natural frequency</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> Hz		



	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]
<b>Description:</b>	Sets the numerator natural frequency for current setpoint filter 4 (general filter).		
<b>Dependency:</b>	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

---

<b>p1676[0]</b>	<b>Current setpoint filter 4 numerator damping</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current setpoint filter	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.000	10.000	0.700
<b>Description:</b>	Sets the numerator damping for current setpoint filter 4.		
<b>Dependency:</b>	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

---

<b>p1703[0]</b>	<b>Isq current controller precontrol scaling</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Current controller	
	<b>Unit:</b> %		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.0 [%]	200.0 [%]	0.0 [%]
<b>Description:</b>	Sets the scaling of the dynamic current controller precontrol for the torque-generating current component Isq.		

---

<b>p1821[0]</b>	<b>Direction of rotation</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Commissioning	
	<b>Parameter group:</b>	Motor data	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	1	0
<b>Description:</b>	Setting to change the direction of rotation. If the parameter is changed, it reverses the direction of rotation of the motor and the encoder actual value without changing the setpoint.		
<b>Value:</b>	0: Clockwise 1: Counterclockwise		
<b>Dependency:</b>	See also: F07434		

**NOTICE**

After changing parameter p1821, the direction of rotation is not automatically adapted in the safety area.

## 18.2 List of parameters

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<b>p2000</b>	<b>Reference speed</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Ready for operation	
	<b>Parameter group:</b>	Reference variables	
	<b>Unit:</b> rpm		
	<b>Min:</b> 6.00 [rpm]	<b>Max:</b> 210000.00 [rpm]	<b>Factory setting:</b> 3000.00 [rpm]
<b>Description:</b>	Sets the reference quantity for the speed values. All speeds specified as relative values refer to this reference quantity. The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).		
<b>Dependency:</b>	See also: p2003		

---

<b>p2002</b>	<b>Reference current</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Ready for operation	
	<b>Parameter group:</b>	Reference variables	
	<b>Unit:</b> Arms		
	<b>Min:</b> 0.10 [Arms]	<b>Max:</b> 100000.00 [Arms]	<b>Factory setting:</b> 100.00 [Arms]
<b>Description:</b>	Sets the reference quantity for currents. All currents specified as relative value are referred to this reference quantity. The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).		
	<b>Note</b> Default value is 2 * r0305 or the motor current limit.		

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<b>p2003</b>	<b>Reference torque</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Ready for operation	
	<b>Parameter group:</b>	Reference variables	
	<b>Unit:</b> Nm		
	<b>Min:</b> 0.01 [Nm]	<b>Max:</b> 20000000.00 [Nm]	<b>Factory setting:</b> 1.00 [Nm]
<b>Description:</b>	Sets the reference quantity for the torque values. All torques specified as relative value are referred to this reference quantity. The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).		

<b>r2043.0...2</b>	<b>PROFIdrive PZD state</b>		
	<b>Data type:</b> Unsigned8	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Configuration	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the PROFIdrive PZD state.		
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>
	00	Setpoint failure	Yes
	01	Isochronous operation active	Yes
	02	Fieldbus running	Yes
			<b>0 signal</b>
			No
			No
			No
	<b>Note</b>		
	When using the "setpoint failure" signal, the bus can be monitored and an application-specific response triggered when the setpoint fails.		
<b>r2050[0...21]</b>	<b>PROFIdrive PZD receive word</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Receive direction	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the PZD (setpoints) in the word format received from the fieldbus controller.		
<b>Index:</b>	[0] = PZD 1		
	[1] = PZD 2		
	[2] = PZD 3		
	[3] = PZD 4		
	[4] = PZD 5		
	[5] = PZD 6		
	[6] = PZD 7		
	[7] = PZD 8		
	[8] = PZD 9		
	[9] = PZD 10		
	[10] = PZD 11		
	[11] = PZD 12		
	[12] = PZD 13		
	[13] = PZD 14		
	[14] = PZD 15		
	[15] = PZD 16		
	[16] = PZD 17		
	[17] = PZD 18		
	[18] = PZD 19		
	[19] = PZD 20		
	[20] = PZD 21		
	[21] = PZD 22		
<b>Dependency:</b>	See also: r2060		

<b>r2053[0...27]</b>	<b>PROFIdrive PZD send word</b>
	<b>Data type:</b> Unsigned16 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Send direction
	<b>Unit:</b> -
<b>Description:</b>	Displays the PZD (actual values) in the word format that are sent to the fieldbus controller.
<b>Index:</b>	[0] = PZD 1 [1] = PZD 2 [2] = PZD 3 [3] = PZD 4 [4] = PZD 5 [5] = PZD 6 [6] = PZD 7 [7] = PZD 8 [8] = PZD 9 [9] = PZD 10 [10] = PZD 11 [11] = PZD 12 [12] = PZD 13 [13] = PZD 14 [14] = PZD 15 [15] = PZD 16 [16] = PZD 17 [17] = PZD 18 [18] = PZD 19 [19] = PZD 20 [20] = PZD 21 [21] = PZD 22 [22] = PZD 23 [23] = PZD 24 [24] = PZD 25 [25] = PZD 26 [26] = PZD 27 [27] = PZD 28

<b>r2060[0...20]</b>	<b>PROFIdrive PZD receive double word</b>
	<b>Data type:</b> Integer32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Receive direction
	<b>Unit:</b> -
<b>Description:</b>	Displays the PZD (setpoints) in the double word format received from the fieldbus controller.

<b>Index:</b>	[0] = PZD 1 + 2
	[1] = PZD 2 + 3
	[2] = PZD 3 + 4
	[3] = PZD 4 + 5
	[4] = PZD 5 + 6
	[5] = PZD 6 + 7
	[6] = PZD 7 + 8
	[7] = PZD 8 + 9
	[8] = PZD 9 + 10
	[9] = PZD 10 + 11
	[10] = PZD 11 + 12
	[11] = PZD 12 + 13
	[12] = PZD 13 + 14
	[13] = PZD 14 + 15
	[14] = PZD 15 + 16
	[15] = PZD 16 + 17
	[16] = PZD 17 + 18
	[17] = PZD 18 + 19
	[18] = PZD 19 + 20
	[19] = PZD 20 + 21
	[20] = PZD 21 + 22

**Dependency:** See also: r2050

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<b>r2063[0...26]</b>	<b>PROFIdrive PZD send double word</b>
	<b>Data type:</b> Unsigned32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Send direction
	<b>Unit:</b> -
<b>Description:</b>	Displays the PZD (actual values) in the double word format that are sent to the fieldbus controller.

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- Index:**
- [0] = PZD 1 + 2
  - [1] = PZD 2 + 3
  - [2] = PZD 3 + 4
  - [3] = PZD 4 + 5
  - [4] = PZD 5 + 6
  - [5] = PZD 6 + 7
  - [6] = PZD 7 + 8
  - [7] = PZD 8 + 9
  - [8] = PZD 9 + 10
  - [9] = PZD 10 + 11
  - [10] = PZD 11 + 12
  - [11] = PZD 12 + 13
  - [12] = PZD 13 + 14
  - [13] = PZD 14 + 15
  - [14] = PZD 15 + 16
  - [15] = PZD 16 + 17
  - [16] = PZD 17 + 18
  - [17] = PZD 18 + 19
  - [18] = PZD 19 + 20
  - [19] = PZD 20 + 21
  - [20] = PZD 21 + 22
  - [21] = PZD 22 + 23
  - [22] = PZD 23 + 24
  - [23] = PZD 24 + 25
  - [24] = PZD 25 + 26
  - [25] = PZD 26 + 27
  - [26] = PZD 27 + 28

<b>NOTICE</b>
A maximum of 4 indices of the "trace" function can be used.

**r2109[0...63]      Fault removed in milliseconds**

**Data type:** Unsigned32                      **Visible in:** Extended display  
**Read permission:**                              Read drive data or acknowledge messages  
**Write permission:**                              Edit device configuration or drive applications  
**Parameter group:**                              Faults / alarms  
**Unit:** ms

**Description:**                                      Displays the time in milliseconds referred to the day that the fault was removed.

**Dependency:**                                      See also: r0945, r0947, r0948, r0949, r2114, r2130, r2133, r2136

<b>NOTICE</b>
The time comprises r2136 (days) and r2109 (milliseconds).

**Note**  
The buffer parameters are cyclically updated in the background.  
The structure of the fault buffer and the assignment of the indices is shown in r0945.

<b>r2111</b>	<b>Alarm counter</b>	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display
		<b>Read permission:</b>	Read drive data or acknowledge messages
		<b>Write permission:</b>	Edit device configuration or drive applications
		<b>Parameter group:</b>	Faults / alarms
		<b>Unit:</b> -	
<b>Description:</b>	Number of alarms that have occurred.		
<b>Dependency:</b>	See also: r2122, r2123, r2124, r2125		
	<b>Note</b>	The parameter is reset to 0 at POWER ON.	
<b>r2114[0...1]</b>	<b>System runtime total</b>	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display
		<b>Read permission:</b>	Read drive data or acknowledge messages
		<b>Write permission:</b>	Edit device configuration or drive applications
		<b>Parameter group:</b>	Diagnostics general
		<b>Unit:</b> -	
<b>Description:</b>	Displays the total system runtime of the converter. The time comprises r2114[0] (milliseconds) and r2114[1] (days). After r2114[0] has reached a value of 86.400.000 ms (24 hours) this value is reset and r2114[1] is incremented.		
<b>Index:</b>	[0] = Milliseconds [1] = Days		
	<b>Note</b>	The counter values are saved when the power supply is switched off. After the converter is switched on, the counter continues to run with the last value that was saved.	
<b>r2121</b>	<b>Counter alarm buffer changes</b>	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display
		<b>Read permission:</b>	Read drive data or acknowledge messages
		<b>Write permission:</b>	Edit device configuration or drive applications
		<b>Parameter group:</b>	Faults / alarms
		<b>Unit:</b> -	
<b>Description:</b>	This counter is incremented every time the alarm buffer changes.		
<b>Dependency:</b>	See also: r2122, r2123, r2124, r2125		
<b>r2122[0...63]</b>	<b>Alarm number</b>	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display
		<b>Read permission:</b>	Read drive data or acknowledge messages
		<b>Write permission:</b>	Edit device configuration or drive applications
		<b>Parameter group:</b>	Faults / alarms
		<b>Unit:</b> -	
<b>Description:</b>	Displays the numbers of the last 64 alarms.		
<b>Dependency:</b>	See also: r2123, r2124, r2125, r2134, r2145, r2146		
	<b>NOTICE</b>		
	The properties of the alarm buffer should be taken from the corresponding product documentation.		

18.2 List of parameters

---

**Note**

The buffer parameters are cyclically updated in the background.

Alarm buffer structure (general principle):

Currently active alarms (not gone):

r2122[0], r2124[0], r2123[0], r2125[0] --> alarm 1 (the oldest)

...

r2122[7], r2124[7], r2123[7], r2125[7] --> Alarm 8 (the latest)

History of alarms that have gone:

r2122[8], r2124[8], r2123[8], r2125[8] --> Alarm 1 (the latest)

...

r2122[63], r2124[63], r2123[63], r2125[63] --> alarm 56 (the oldest)

---

**r2123[0...63]**

**Alarm received in milliseconds**

**Data type:** Unsigned32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Faults / alarms

**Unit:** ms

**Description:**

Displays the time in milliseconds referred to the day that the alarm occurred.

**Dependency:**

See also: r2114, r2122, r2124, r2125, r2134, r2145, r2146

<b>NOTICE</b>
---------------

The time comprises r2145 (days) and r2123 (milliseconds).
---

---

**Note**

The buffer parameters are cyclically updated in the background.

The structure of the alarm buffer and the assignment of the indices is shown in r2122.

---

**r2124[0...63]**

**Alarm value**

**Data type:** Integer32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Faults / alarms

**Unit:** -

**Description:**

Displays additional information about the active alarm (as integer number).

**Dependency:**

See also: r2122, r2123, r2125, r2134, r2145, r2146

---

**Note**

The buffer parameters are cyclically updated in the background.

The structure of the alarm buffer and the assignment of the indices are shown in r2122.

---

**r2125[0...63]**

**Alarm removed in milliseconds**

**Data type:** Unsigned32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Faults / alarms

**Unit:** ms

**Description:**

Displays the time in milliseconds referred to the day that the alarm was removed.

**Dependency:**

See also: r2114, r2122, r2123, r2124, r2134, r2145, r2146

<b>NOTICE</b>
---------------

The time comprises r2146 (days) and r2125 (milliseconds).
---



**Note**

The buffer parameters are cyclically updated in the background.  
The structure of the alarm buffer and the assignment of the indices is shown in r2122.

**r2130[0...63]****Fault received in days**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:** Displays the time in days referred to the day that the fault occurred.

**Dependency:** See also: r0945, r0947, r0948, r0949, r2109, r2114, r2133, r2136

<b>NOTICE</b>
The time comprises r2130 (days) and r0948 (milliseconds).

**Note**

The buffer parameters are cyclically updated in the background.

**r2131****Actual fault number**

**Data type:** Unsigned16      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:** Displays the number of the active fault that last occurred.

**Note**

0: No fault present.

**r2132****Actual alarm number**

**Data type:** Unsigned16      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:** Displays the number of the alarm that last occurred.

**Note**

0: No alarm present.

**r2133[0...63]****Fault value for float values**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:** Displays the additional information about the fault that occurred for float values.  
Refer to the fault for the interpretation of the fault value.

**Dependency:** See also: r0945, r0947, r0948, r0949, r2109, r2130, r2136

18.2 List of parameters

---

**Note**  
The buffer parameters are cyclically updated in the background.

---

**r2134[0...63]**      **Alarm value for float values**

**Data type:** FloatingPoint32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:**      Displays the additional information about the alarm that occurred for float values.  
Refer to the alarm for an interpretation of the alarm value.

**Dependency:**      See also: r2122, r2123, r2124, r2125, r2145, r2146

---

**Note**  
The buffer parameters are cyclically updated in the background.

---

**r2136[0...63]**      **Fault removed in days**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:**      Displays the time in days referred to the day when the fault was removed.

**Dependency:**      See also: r0945, r0947, r0948, r0949, r2109, r2114, r2130, r2133

<b>NOTICE</b>
The time comprises r2136 (days) and r2109 (milliseconds).

---

**Note**  
The buffer parameters are cyclically updated in the background.

---

**r2139.0...15**      **Status word faults/alarms**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Faults / alarms  
**Unit:** -

**Description:**      Display and signal source for status word 1 of faults and alarms.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Being acknowledged	Yes	No
	01	Acknowledgment required	Yes	No
	03	Fault present	Yes	No
	05	Safety message present	Yes	No
	07	Alarm present	Yes	No
	11	Alarm class bit 0	High	Low
	12	Alarm class bit 1	High	Low
	13	Maintenance required	Yes	No
	14	Maintenance urgently required	Yes	No
	15	Fault gone/can be acknowledged	Yes	No

**Note**

For bit 03, 05, 07:

These bits are set if at least one fault/alarm or safety message occurs. The entry in the fault/alarm buffer or safety message buffer is delayed. This is the reason that the fault/alarm buffer or safety message buffer should only be read if, after "Fault active", "Alarm active" or "Safety message active" occurs, a change is also identified in the buffer (r0944, r2121, r60044).

For bits 11, 12:

These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.

**r2145[0...63]****Alarm received in days**

**Data type:** Unsigned16

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Faults / alarms

**Unit:** -

**Description:**

Displays the time in days referred to the day that the alarm occurred.

**Dependency:**

See also: r2114, r2122, r2123, r2124, r2125, r2134, r2146

**NOTICE**

The time comprises r2145 (days) and r2123 (milliseconds).

**Note**

The buffer parameters are cyclically updated in the background.

**r2146[0...63]****Alarm removed in days**

**Data type:** Unsigned16

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Faults / alarms

**Unit:** -

**Description:**

Displays the time in days referred to the day when the alarm was removed.

**Dependency:**

See also: r2114, r2122, r2123, r2124, r2125, r2134, r2145

**NOTICE**

The time comprises r2146 (days) and r2125 (milliseconds).

**Note**

The buffer parameters are cyclically updated in the background.

**p2175[0]****Motor blocked speed threshold**

**Data type:** FloatingPoint32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:**

Operation, Ready for operation

**Parameter group:**

Speed messages

**Unit:** rpm

**Min:**

0.00 [rpm]

**Max:**

210000.00 [rpm]

**Factory setting:**

120.00 [rpm]

**Description:**

Sets the speed threshold for message "Motor blocked".  
Monitoring is deactivated with p2175 = 0.

**Dependency:**

See also: F07900

**Note**

If the motor speed is less than the threshold value set in p2175 - and the motor is operated for longer than 200 ms at the torque limit - then the motor is shut down and a fault is output.

**p3117****Change safety message type****Data type:** Unsigned32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Commissioning state, device**Parameter group:**

Safety Integrated, Faults / alarms

**Unit:** -**Min:****Max:****Factory setting:**

0

1

0

**Description:**

Sets the re-parameterization of all safety messages for faults and alarms. The relevant message type during changeover is selected by the firmware.  
0: Safety messages are not reparameterized (safety message buffer)  
1: Safety messages are reparameterized (no safety message buffer)

**Note**

When online safety commissioning has been completed, a change results in an automatic restart.

**p3941[0]****Motor code number 2****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Commissioning**Parameter group:**

Motor data, Quick commissioning

**Unit:** -**Min:****Max:****Factory setting:**

0

99999999

0

**Description:**

Second motor code number.

**Dependency:**

See also: p0301

**r3988****Final boot state****Data type:** Integer16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

System identification

**Unit:** -**Description:**

Displays the final boot states.  
001 - Software error  
200 - Carry out first commissioning  
250 - topology error (check the connected hardware)  
800 - Ready  
The following options are available to reach the "Ready" state:  
- Check the project and load again.  
- Restore factory setting.  
- Check the hardware.  
- Carry out a POWER ON (switch-off/switch-on).

---

<b>p5271[0].3...7</b>	<b>One Button Tuning configuration 1</b>			
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Can be changed in the operating state:</b>	Ready for operation		
	<b>Parameter group:</b>			
	<b>Unit:</b> -			
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>	
	-	-	0001 1100 bin	
<b>Description:</b>	Sets the configuration for One Button Tuning.			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	03	Setting the speed precontrol	Yes	No
	04	Setting the torque precontrol	Yes	No
	07	Setting the voltage precontrol	Yes	No
<b>Dependency:</b>	See also: r5274			
	<b>Note</b>			
	For bit 03: Activation of speed precontrol.			
	For bit 04: Activation of speed/torque precontrol in the drive.			
	For bit 07: Activation of the voltage precontrol.			

---

<b>r5274</b>	<b>One Button Tuning dynamic response estimated</b>			
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>			
	<b>Unit:</b> ms			
<b>Description:</b>	Displays the estimated dynamic response of the speed control loop as PT1 time constant for One Button Tuning. The lower the time constant, the higher the dynamic performance.			
<b>Dependency:</b>	See also: p5271			

---

<b>r5276[0]</b>	<b>One Button Tuning Kv factor estimated</b>			
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>			
	<b>Unit:</b> 1000 rpm			
<b>Description:</b>	Displays the estimated position controller gain (Kv factor) for One Button Tuning.			
<b>Dependency:</b>	See also: p5271			
	<b>Note</b>			
	The value for the closed-loop position control is required by a higher-level control system.			

---

---

<b>r5277[0]</b>	<b>One Button Tuning precontrol symmetrizing time estimated</b>
<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	
<b>Unit:</b> ms	
<b>Description:</b>	Displays the estimated precontrol symmetrizing time for One Button Tuning. This is required to symmetrize the position controller if the closed-loop position control is in an external control system.
<b>Dependency:</b>	See also: p5271

---

<b>p5291.0...16</b>	<b>FFT tuning configuration</b>																																																																				
<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display																																																																				
<b>Read permission:</b>	Read drive data or acknowledge messages																																																																				
<b>Write permission:</b>	Edit device configuration or drive applications																																																																				
<b>Can be changed in the operating state:</b>	Operation, Ready for operation																																																																				
<b>Parameter group:</b>																																																																					
<b>Unit:</b> -																																																																					
<b>Min:</b>	<b>Max:</b>																																																																				
-	-																																																																				
	<b>Factory setting:</b>																																																																				
	0000 0000 0000 0000 0000 0000 0011 1001 bin																																																																				
<b>Description:</b>	Sets the configuration for the "FFT tuning" function. This function is used for One Button Tuning (p5300 = 1).																																																																				
<b>Bit array:</b>	<table> <thead> <tr> <th>Bit</th> <th>Signal name</th> <th>1 signal</th> <th>0 signal</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Noise excitation after pulse enable</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>01</td> <td>Set current setpoint filter (HF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>02</td> <td>Set speed controller gain (HF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>03</td> <td>Length of FFT window bit 0 (LF, HF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>04</td> <td>Length of FFT window bit 1 (LF, HF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>05</td> <td>Windowing the time signals using a Hamming window (LF, HF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>06</td> <td>Measure current controller</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>07</td> <td>Bandwidth bit 0 (LF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>08</td> <td>Bandwidth bit 1 (LF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>09</td> <td>Bandwidth bit 2 (LF)</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>10</td> <td>Measuring periods bit 0</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>11</td> <td>Measuring periods bit 1</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>12</td> <td>Inject noise onto speed setpoint</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>13</td> <td>Do not reduce Kp for measurement</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>14</td> <td>Set the current setpoint filter with loop compensation</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>16</td> <td>Torque in front of the current setpoint filter</td> <td>Yes</td> <td>No</td> </tr> </tbody> </table>	Bit	Signal name	1 signal	0 signal	00	Noise excitation after pulse enable	Yes	No	01	Set current setpoint filter (HF)	Yes	No	02	Set speed controller gain (HF)	Yes	No	03	Length of FFT window bit 0 (LF, HF)	Yes	No	04	Length of FFT window bit 1 (LF, HF)	Yes	No	05	Windowing the time signals using a Hamming window (LF, HF)	Yes	No	06	Measure current controller	Yes	No	07	Bandwidth bit 0 (LF)	Yes	No	08	Bandwidth bit 1 (LF)	Yes	No	09	Bandwidth bit 2 (LF)	Yes	No	10	Measuring periods bit 0	Yes	No	11	Measuring periods bit 1	Yes	No	12	Inject noise onto speed setpoint	Yes	No	13	Do not reduce Kp for measurement	Yes	No	14	Set the current setpoint filter with loop compensation	Yes	No	16	Torque in front of the current setpoint filter	Yes	No
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<b>Dependency:</b>	See also: r5293, p5296																																																																				

**Note**

HF: high frequency

LF: low frequency

For bit 00:

A PRBS signal (pseudo random binary signal) is superimposed on the current setpoint to be able to better identify the mechanical controlled system.

For bit 01:

The identified mechanical resonance points are suppressed using current setpoint filters.

For bit 02:

The maximum speed controller gain is determined from the identified mechanical controlled system.

For bits 03, 04:

The measured value buffer length is set using these bits:

Bit 04 = 0 and bit 03 = 0 -> buffer length = 256

Bit 04 = 0 and bit 03 = 1 -> buffer length = 512

Bit 04 = 1 and bit 03 = 0 -> buffer length = 1024

Bit 04 = 1 and bit 03 = 1 -> buffer length = 2048

For bit 05:

A Hamming window is used to filter the measured time signals.

For bit 06:

The measurement checks the current controller frequency response and this is taken into account in the speed controller loop.

For bits 07, 08, 09:

The measurement bandwidth is set using these bits:

Bit 09 = 0, bit 08 = 0, bit 07 = 0 -> bandwidth = 50 Hz

Bit 09 = 0, bit 08 = 0, bit 07 = 1 -> bandwidth = 100 Hz

Bit 09 = 0, bit 08 = 1, bit 07 = 0 -> bandwidth = 200 Hz

Bit 09 = 0, bit 08 = 1, bit 07 = 1 -> bandwidth = 400 Hz

Bit 09 = 1, bit 08 = 0, bit 07 = 0 -> bandwidth = 800 Hz

Bit 09 = 1, bit 08 = 0, bit 07 = 1 -> bandwidth = 1600 Hz

For bits 10, 11:

Number of measuring periods.

Bit 11 = 0 and bit 10 = 0 -> number of measurements = 1

Bit 11 = 0 and bit 10 = 1 -> number of measurements = 2

Bit 11 = 1 and bit 10 = 0 -> number of measurements = 4

Bit 11 = 1 and bit 10 = 1 -> number of measurements = 8

For bit 12:

The PRBS signal is switched to the speed setpoint (in front of the filter).

For bit 13:

The input signal for the torque actual value is taken from in front of the current setpoints filters.

For bit 14:

When the bit is set, a current setpoint filter is used to partially compensate the mechanical system.

This is recommended for the following machine attributes:

- The load moment of inertia is significantly higher than the motor moment of inertia (e.g. > 6x).

- The coupling between the machine elements has almost no backlash (no play).

- The stiffness of the mechanical transmission elements does not change significantly in the traversing range.

**p5292****Controller optimization dynamic factor**

**Data type:** FloatingPoint32

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Operation, Ready for operation

**Parameter group:**

**Unit:** %

## 18.2 List of parameters

	<b>Min:</b> 25.0 [%]	<b>Max:</b> 125.0 [%]	<b>Factory setting:</b> 80.0 [%]
<b>Description:</b>	Sets the dynamic factor for optimizing the speed controller when One Button Tuning is activated (p5300 = 1).		
<b>Dependency:</b>	The higher the value in p5292, the lower the value in r5274. See also: p5291		

**Note**

The higher the dynamic factor, the faster and more unstable the control.

**r5293****FFT tuning speed controller P gain identified**

<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	
<b>Unit:</b> Nms/rad	

<b>Description:</b>	Displays the determined proportional gain Kp of the speed controller before FFT tuning. This function is used for One Button Tuning (p5300 = 1).
<b>Dependency:</b>	See also: p5291

**p5296[0...2]****Controller optimization noise amplitude**

<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
<b>Read permission:</b>	Read drive data or acknowledge messages	
<b>Write permission:</b>	Edit device configuration or drive applications	
<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
<b>Parameter group:</b>		
<b>Unit:</b> %		
<b>Min:</b> 1.0 [%]	<b>Max:</b> 300.0 [%]	<b>Factory setting:</b> [0] 10.0 [%] [1] 30.0 [%] [2] 5.0 [%]

<b>Description:</b>	The drive determines the noise amplitude for One Button Tuning and writes the value to p5296.
<b>Dependency:</b>	See also: p5291

**p5300[0]****One Button Tuning selection**

<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
<b>Read permission:</b>	Read drive data or acknowledge messages	
<b>Write permission:</b>	Edit device configuration or drive applications	
<b>Can be changed in the operating state:</b>	Ready for operation	
<b>Parameter group:</b>		
<b>Unit:</b> -		
<b>Min:</b> -1	<b>Max:</b> 1	<b>Factory setting:</b> 0

<b>Description:</b>	Setting to activate/deactivate the One Button Tuning function. For p5300 = 1: The One Button Tuning function is configured using p5271 and p5301.
---------------------	---

<b>Value:</b>	-1: Reset controller parameters
	0: Inactive
	1: One Button Tuning



**Dependency:** The motor must have already been commissioned so that One Button Tuning functions perfectly.  
 The One Button Tuning function is configured using p5271 and p5301.  
 The required dynamic performance of the control loop is set in p5292.  
 The traversing path for the test signal is parameterized in p5308.  
 See also: p5271, r5274, p5292, r5293, p5296, p5301, p5308, p5309

**Note**

For p5300 = -1:

One Button Tuning is deactivated and p5300 is automatically set = 0. Further, the presetting values for the speed controller are restored.

For p5300 = 0:

To permanently save the values for the speed controller that have been determined, the parameters must be saved in a non-volatile memory.

For p5300 = 1:

One Button Tuning is active.

The moment of inertia is determined once using a test signal. The controller parameters and current setpoint filters are additionally determined once using a noise signal as excitation source. The steps to be executed can be configured using p5301.

**p5301[0].0...8****One Button Tuning configuration 2**

**Data type:** Unsigned32

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Operation, Ready for operation

**Parameter group:**

**Unit:** -

**Min:**

**Max:**

**Factory setting:**

-

-

0000 0000 0000 0111 bin

**Description:** Setting the functions for One Button Tuning (p5300 = 1).

A test signal is required for some functions. To do this, observe parameters p5308 and p5309.

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	Setting the proportional gain Kp	Yes	No
01	Setting current setpoint filter	Yes	No
02	Estimate moment of inertia	Yes	No
08	Moment of inertia determination from frequency response	Yes	No

**Dependency:** It is only possible to change the configuration if One Button Tuning is not active (p5300 = 0).

See also: p5292, r5293, p5296, p5300, p5308, p5309

**Note**

For bit 00:

The speed controller gain is determined and set using a noise signal.

For bit 01:

Possibly required current setpoint filters are determined and set using a noise signal.

As a consequence, a higher dynamic performance can be achieved in the speed control loop.

For bit 02:

Using this bit, the moment of inertia is determined using a test signal. If this bit is not set, then the load moment of inertia must be manually set using parameter p1498. The test signal must have been previously set using parameters p5308 and p5309.

For bit 08:

Using this bit, the moment of inertia is determined from the frequency characteristic using a test signal, and is transferred to p1498. The traversing path must first be set using parameter p5308.

**r5306[0].0...14 One Button Tuning status**

**Data type:** Unsigned16      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications

**Parameter group:**

**Unit:** -

**Description:** Displays the status of the functions performed using One Button Tuning.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Proportional gain Kp set	Yes	No
	01	Current setpoint filter set	Yes	No
	02	Moment of inertia estimation carried out	Yes	No
	07	EPOS set	Yes	No
	13	One Button Tuning successfully completed	Yes	No
	14	Controller parameters reset due to fault	Yes	No

**Dependency:** See also: p5300, p5301

**Note**

For bit 00 = 1: The speed controller gain was set using One Button Tuning.  
For bit 01 = 1: The current setpoint filter was set using One Button Tuning  
For bit 02 = 1: The moment of inertia was determined.

**p5308[0] One Button Tuning distance limiting**

**Data type:** Integer32      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Can be changed in the operating state:** Ready for operation

**Parameter group:**

**Unit:** °

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
-30000 [°]	30000 [°]	0 [°]

**Description:** Setting the distance limiting (permissible traversing range of the motor).  
The traversing range is limited in the positive and negative directions.

**Note**

A value of 360 degrees corresponds to one motor revolution.  
The position before the pulse enable is used as zero point.

**p5309[0] One Button Tuning duration**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Can be changed in the operating state:** Ready for operation

**Parameter group:**

**Unit:** ms

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0 [ms]	5000 [ms]	2000 [ms]

**Description:** Sets the duration for One Button Tuning (several acceleration operations)  
This function is used for One Button Tuning (p5300 = 1) to identify the total moment of inertia of the drive train.

**Dependency:** See also: F07093

**Note**

If, within this time, no setting values can be determined, then the drive is shut down with the corresponding fault.

**p5375[0].0...1****Additional motor overload protection configuration**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Can be changed in the operating state:**      Operation, Ready for operation

**Parameter group:**      Motor temperature

**Unit:** -

**Min:**      **Max:**      **Factory setting:**  
-      -      0000 bin

**Description:** Sets the configuration for additional motor overload protection.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Activation of monitoring	Yes	No
	01	Activation of speed dependency	Yes	No

**Note**

To comply with standard UL 61800-5-1 Ed. 2, bit 0 and bit 1 must be set.

These bits activate electronic motor overload protection according to IEC 61800-5-1 Ed. 3 / UL 61800-5-1 Ed. 2, with the emulation of an electronic overload relay, Class 20 and the speed sensitivity.

For bit 00:

This bit activates electronic motor overload protection with emulation of an electronic overload relay, Class 20.

For bit 01:

This bit activates the speed dependency of the electronic motor overload protection. Not active, if bit 00 is also set.

**r5600****PROFenergy energy-saving mode ID**

**Data type:** Integer16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**  
**Unit:** -

**Description:** Displays the PROFenergy mode ID of the effective energy-saving mode.

**Value:**

0:	POWER OFF
2:	Energy-saving mode
240:	Operation
255:	Ready

**p5611.0...2****PROFenergy energy-saving properties general**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Can be changed in the operating state:**      Ready for operation

**Parameter group:**

**Unit:** -

**Min:**      **Max:**      **Factory setting:**  
-      -      0000 bin

**Description:** Sets the general properties for energy-saving.

Bit array:	Bit	Signal name	1 signal	0 signal
------------	-----	-------------	----------	----------

## 18.2 List of parameters

00	Inhibit PROFlenergy control commands	Yes	No
01	Drive initiates OFF1 when transitioning to energy-saving mode	Yes	No
02	Trans to energy-saving mode from PROFIdrive state S3/4 poss	Yes	No

**Note**

PROFlenergy is a profile for energy management in production systems.

PROFIdrive state S3: ready

PROFIdrive state S4: operation

**r5613.0...1****PROFlenergy energy saving active/inactive**

**Data type:** Unsigned8

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

**Unit:** -

**Description:**

Display and binary signal source for the state display PROFlenergy energy saving active or inactive.

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	PROFlenergy active	Yes	No
01	PROFlenergy inactive	Yes	No

**Note**

Bit 0 and bit 1 are inverse of one another.

**r8400[0...2]****Date**

**Data type:** Unsigned16

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Diagnostics general

**Unit:** -

**Description:**

Displays the actual date in year, month and day.

**Index:**

[0] = Year (YYYY)

[1] = Month (1 ... 12)

[2] = Day (1 ... 31)

**Note**

The time in r8400 and r8401 is used to display the fault and alarm times.

Possible date/time setting:

- Web server (manually)

- NTP (Network Time Protocol)

When the converter is switched off, date/time are not updated. After power on the instant of the previous power off is valid.

**r8401[0...2]****Time**

**Data type:** Unsigned16

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Diagnostics general

**Unit:** -

**Description:**

Displays the current time in hours, minutes and seconds.

**Index:**

[0] = Hour (0 ... 23)

[1] = Minute (0 ... 59)

[2] = Second (0 ... 59)

**Note**

The time in r8400 and r8401 is used to display the fault and alarm times.

The time is displayed in the 24-hour format.

Possible date/time setting:

- Web server (manually)
- NTP (Network Time Protocol)

When the converter is switched off, date/time are not updated. After power on the instant of the previous power off is valid.

**r8936[0...1]****PN cyclic connection state**

**Data type:** Integer16

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

**Unit:** -

**Description:**

Displays the status of the cyclic PROFINET connection.

**Value:**

- 0: Interrupted
- 1: Not connected
- 2: Connection starts to be established
- 3: Module information expected
- 4: Module information received
- 5: Module address expected
- 6: Module address received
- 7: Parameterization data expected
- 8: Parameterization data received
- 9: Evaluate parameterization data
- 10: Connection being established completion expected
- 11: Reserved
- 12: Configured controller STOP
- 13: Configured controller RUN

**Index:**

- [0] = Controller 1
- [1] = Controller 2

**Dependency:**

See also: r8961

**Note**

The parameter is active when the "PROFINET Device" protocol is selected.

For two connections (shared device) the display in the index depends on the sequence in which the connections are established.

For value = 10:

If the connection remains in this state, then when using PROFINET IRT the following can apply:

- topology error (incorrect port assignment).
- Synchronization missing.

**r8937[0...5]****PN cyclic connection diagnostics**

**Data type:** Unsigned32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

**Unit:** -

**Description:**

Display to diagnose the cyclic PROFINET connection.

## 18.2 List of parameters

**Index:**

- [0] = Number of cyclic connections
- [1] = Number of send subslots of all connections
- [2] = Number of send net data (bytes) of all connections
- [3] = Number of receive subslots of all connections
- [4] = Number of receive net data (bytes) of all connections
- [5] = Connection type (RT, IRT)

**Note**

For index [5]:

Bit 0 = 1: there is at least one RT connection.

Bit 1 = 1: there is an IRT connection.

**r8961[0...3]****PN controller IP address**

**Data type:** Unsigned8

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Configuration

**Unit:** -

**Description:**

Displays the IP address of the PROFINET controller.

**Note**

For a shared device, the IP address of the automation controller is displayed.

**c8995[0...3]****Ethernet X127 enable**

**Data type:** Unsigned8

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Configuration

**Unit:** -

**Description:**

Signal to enable the Ethernet interface X127 for applications.

**Index:**

[0] = Secure S7 Protocol Startdrive

[1] = Web server HTTPS

[2] = S7 Protocol PCS 7

[3] = Web server HTTP

**Note**

The parameter influences the access from applications.

1 signal:

Ethernet interface X127 is enabled for access.

0 signal:

Ethernet interface X127 is blocked and cannot be accessed.

The signal is not influenced by setting the factory setting.

**c8997[0...2]****PROFINET X150 enable**

**Data type:** Unsigned8

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Configuration

**Unit:** -

**Description:**

Signal to enable PROFINET interface X150 for applications.

**Index:**

[0] = Secure S7 Protocol Startdrive

[1] = Web server HTTPS

[2] = S7 Protocol PCS 7

**Note**

The parameter influences the access from applications.

1 signal:

PROFINET interface X150 is enabled for access.

0 signal:

PROFINET interface X150 is inhibited for access.

The signal is not influenced by setting the factory setting.

**p9500****SI monitoring clock cycle**

**Data type:** FloatingPoint32

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit Safety Integrated application

**Can be changed in the operating state:**

Commissioning state, device

**Parameter group:**

Extended functions

**Unit:** ms

**Min:**

4.00000 [ms]

**Max:**

4.00000 [ms]

**Factory setting:**

4.00000 [ms]

**Description:**

Sets the monitoring clock cycle for safe motion monitoring.

**Dependency:**

See also: p9511

See also: C01652

**Note**

When online safety commissioning has been completed, a change results in an automatic restart.

The monitoring cycle must be a multiple of the actual value sensing cycle (p9511).

**r9502****SI axis type**

**Data type:** Integer16

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit Safety Integrated application

**Parameter group:**

Extended functions

**Unit:** -

**Description:**

Displays the axis type (linear axis or rotary axis/spindle).

**Value:**

0: Linear axis

1: Rotary axis/spindle

**Note**

The axis type is set in the commissioning tool.

Safety parameters with units that are dependent on the axis type change after switching over the axis type.

**p9511****SI actual value sensing cycle**

**Data type:** FloatingPoint32

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit Safety Integrated application

**Can be changed in the operating state:**

Commissioning state, device

**Parameter group:**

Extended functions

**Unit:** ms

**Min:**

1.00000 [ms]

**Max:**

1.00000 [ms]

**Factory setting:**

1.00000 [ms]

18.2 List of parameters

**Description:** Sets the clock cycle time of the actual value sensing for safe motion monitoring. Setting criteria if the motion monitoring functions are executed with an encoder.  
- A slower cycle time reduces the maximum permissible speed; however, it ensures a lower system utilization level.  
- The maximum permissible velocity which, when exceeded, can mean that errors occur during safe actual value sensing, is displayed in r9730.

**Dependency:** See also: C01652

**Note**

The monitoring clock cycle from p9500 must be an integer multiple of this parameter.  
For motion monitoring functions with encoder, the cycle time of the actual value sensing must be an integer multiple of the current controller cycle.  
When online safety commissioning has been completed, a change results in an automatic restart.

**p9520**

**SI leadscrew pitch**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning (Safety Integrated)  
**Parameter group:** Extended functions  
**Unit:** mm  
**Min:** 0.1000 [mm]      **Max:** 8388.0000 [mm]      **Factory setting:** 10.0000 [mm]

**Description:** Sets the gear ratio between SI encoder 1 and load in mm/revolution for a linear axis with rotary encoder.

<b>NOTICE</b>
The fourth decimal point can be rounded-off depending on the size of the entered number (from 3 places before the decimal point).

**p9521[0...7]**

**SI gearbox encoder (motor)/load denominator**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning (Safety Integrated)  
**Parameter group:** Extended functions  
**Unit:** -  
**Min:** 1      **Max:** 2147000000      **Factory setting:** 1

**Description:** Sets the denominator for the gearbox between the SI encoder 1 and the load.

**Index:** [0] = Gearbox 1  
[1...7] = Reserved

**Dependency:** See also: p9522

**p9522[0...7]**

**SI gearbox encoder (motor)/load numerator**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning (Safety Integrated)  
**Parameter group:** Extended functions  
**Unit:** -



	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	1	2147000000	1
<b>Description:</b>	Sets the numerator for the gearbox between the SI encoder 1 and the load.		
<b>Index:</b>	[0] = Gearbox 1 [1...7] = Reserved		
<b>Dependency:</b>	See also: p9521		

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<b>p9531[0...3]</b>	<b>SI SLS limit values</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> mm/min		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.00 [mm/min]	1000000.00 [mm/min]	2000.00 [mm/min]
<b>Description:</b>	Sets the limit values for function SLS (Safely-Limited Speed).		
<b>Index:</b>	[0] = Limit value SLS1 [1] = Limit value SLS2 [2] = Limit value SLS3 [3] = Limit value SLS4		
<b>Dependency:</b>	See also: p9563 See also: C01714		

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<b>p9531[0...3]</b>	<b>SI SLS limit values</b>		
S210 (Safety rot)	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> rpm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.00 [rpm]	1000000.00 [rpm]	2000.00 [rpm]
<b>Description:</b>	Sets the limit values for function SLS (Safely-Limited Speed).		
<b>Index:</b>	[0] = Limit value SLS1 [1] = Limit value SLS2 [2] = Limit value SLS3 [3] = Limit value SLS4		
<b>Dependency:</b>	See also: p9563 See also: C01714		

<b>p9533</b>	<b>SI SLS setpoint speed limiting</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Operation, Ready for operation	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> %		
	<b>Min:</b> 0.000 [%]	<b>Max:</b> 100.000 [%]	<b>Factory setting:</b> 80.000 [%]
<b>Description:</b>	This is an evaluation factor to define the setpoint limit from the selected actual speed limit. The active SLS (Safely-Limited Speed) limit value is evaluated with this factor and is made available as setpoint limit in r9733. A value of 0 signifies that the setpoint speed limiting is not active.		
<b>Dependency:</b>	r9733[0] = p9531[x] x p9533 (converted from the load side to the encoder side) r9733[1] = p9531[x] x p9533 (converted from the load side to the encoder side) [x] = Selected SLS stage Conversion factor from the encoder side to the load side: - Motor type = rotary and axis type = linear: p9522 / (p9521 x p9520) - Otherwise: p9522 / p9521 See also: p9531		
	<b>Note</b> The active actual speed limit is selected via safety-relevant inputs (SGE). When selecting a safety function, where standstill is reached or required (e.g. STO, SS1), then setpoint 0 is entered in r9733.		

<b>p9539[0...7]</b>	<b>SI gearbox rotation reversal</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> -		
	<b>Min:</b> 0	<b>Max:</b> 1	<b>Factory setting:</b> 0
<b>Description:</b>	Sets the direction of rotation reversal for the gearbox. 0: No direction of rotation reversal 1: Direction of rotation reversal		
<b>Value:</b>	0: No direction of rotation reversal 1: Direction of rotation reversal		
<b>Index:</b>	[0] = Gearbox 1 [1...7] = Reserved		
<b>Dependency:</b>	See also: p9521		

<b>p9545</b>	<b>SI SSM filter time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
<b>Description:</b>	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> ms		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.00 [ms]	500.00 [ms]	0.00 [ms]
	Sets the filter time for the SSM feedback signal to detect standstill.		
	<b>Note</b>		
	The filter time is only active if the function is enabled (p9604.12 = 1). SSM: Safe Speed Monitor (safety-relevant feedback signal from the speed monitoring)		
<b>p9546</b>	<b>SI SSM speed limit</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
<b>Description:</b>	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> mm/min		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.002 [mm/min]	1000000.000 [mm/min]	60.000 [mm/min]
	Sets the velocity limit for the SSM feedback signal to detect standstill. When this limit value is undershot, the signal "SSM feedback signal active" is set.		
	<b>Note</b>		
	SSM: Safe Speed Monitor (safety-relevant feedback signal from the speed monitoring)		
<b>p9546</b>	<b>SI SSM speed limit</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
<b>Description:</b>	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> rpm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.002 [rpm]	1000000.000 [rpm]	60.000 [rpm]
	Sets the velocity limit for the SSM feedback signal to detect standstill. When this limit value is undershot, the signal "SSM feedback signal active" is set.		
	<b>Note</b>		
	SSM: Safe Speed Monitor (safety-relevant feedback signal from the speed monitoring)		

## 18.2 List of parameters

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<b>p9547</b>	<b>SI SSM speed hysteresis</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> mm/min		
	<b>Min:</b> 0.0010 [mm/min]	<b>Max:</b> 500.0000 [mm/min]	<b>Factory setting:</b> 30.0000 [mm/min]
<b>Description:</b>	Sets the velocity hysteresis for the SSM feedback signal to detect standstill ( $n < nx$ ).		
<b>Dependency:</b>	See also: C01711		

---

**Note**  
The velocity hysteresis is active only if the function is enabled ( $p9604.12 = 1$ ).

The following applies when parameterizing the hysteresis:  
- Set parameters p9546 and p9547 according to the following rule:  $p9546 * 0.75 \geq p9547$

SSM: Safe Speed Monitor (safety-relevant feedback signal from the speed monitoring)

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<b>p9547</b> S210 (Safety rot)	<b>SI SSM speed hysteresis</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> rpm		
	<b>Min:</b> 0.0010 [rpm]	<b>Max:</b> 500.0000 [rpm]	<b>Factory setting:</b> 30.0000 [rpm]
<b>Description:</b>	Sets the velocity hysteresis for the SSM feedback signal to detect standstill ( $n < nx$ ).		
<b>Dependency:</b>	See also: C01711		

---

**Note**  
The velocity hysteresis is active only if the function is enabled ( $p9604.12 = 1$ ).

The following applies when parameterizing the hysteresis:  
- Set parameters p9546 and p9547 according to the following rule:  $p9546 * 0.75 \geq p9547$

SSM: Safe Speed Monitor (safety-relevant feedback signal from the speed monitoring)

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<b>p9548</b>	<b>SI SAM speed tolerance</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> mm/min		
	<b>Min:</b> 0.00 [mm/min]	<b>Max:</b> 120000.00 [mm/min]	<b>Factory setting:</b> 300.00 [mm/min]

<b>Description:</b>	Sets the speed tolerance for function "SAM (Safe Acceleration Monitor)". If the drive velocity increases during the down ramp by more than this tolerance, then SAM identifies this and STO (Safe Torque Off) is initiated.
<b>Dependency:</b>	See also: C01706

---

<b>p9548</b>	<b>SI SAM speed tolerance</b>
S210 (Safety rot)	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit Safety Integrated application
	<b>Can be changed in the operating state:</b> Commissioning (Safety Integrated)
	<b>Parameter group:</b> Extended functions
	<b>Unit:</b> rpm
	<b>Min:</b> 0.00 [rpm] <b>Max:</b> 120000.00 [rpm] <b>Factory setting:</b> 300.00 [rpm]
<b>Description:</b>	Sets the speed tolerance for function "SAM (Safe Acceleration Monitor)". If the drive velocity increases during the down ramp by more than this tolerance, then SAM identifies this and STO (Safe Torque Off) is initiated.
<b>Dependency:</b>	See also: C01706

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<b>p9551</b>	<b>SI SLS delay time for limit value change</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit Safety Integrated application
	<b>Can be changed in the operating state:</b> Commissioning (Safety Integrated)
	<b>Parameter group:</b> Extended functions
	<b>Unit:</b> ms
	<b>Min:</b> 0.00 [ms] <b>Max:</b> 600000.00 [ms] <b>Factory setting:</b> 100.00 [ms]
<b>Description:</b>	Sets the delay time for the limit value change for function SLS (Safely-Limited Speed). When transitioning from a higher to a lower safely-limited velocity/speed stage, within this delay time, the "old" velocity stage remains active. Even if SLS is activated from the state "SLS inactive", then this delay time is still applied.
	<b>Note</b> The set time is rounded internally to an integer multiple of the monitoring clock cycle.

---

<b>p9555</b>	<b>SI transition time SCF to SS1</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit Safety Integrated application
	<b>Can be changed in the operating state:</b> Commissioning (Safety Integrated)
	<b>Parameter group:</b> Extended functions
	<b>Unit:</b> ms
	<b>Min:</b> 0.00 [ms] <b>Max:</b> 600000.00 [ms] <b>Factory setting:</b> 0.00 [ms]
<b>Description:</b>	Sets the transition time from SCF (Safety Channel Failure) to SS1 (Safe Stop 1).
<b>Dependency:</b>	See also: C01711

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**Note**

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

**p9556****SI transition time SS1 to STO**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:**                      Read drive data or acknowledge messages  
**Write permission:**                      Edit Safety Integrated application  
**Can be changed in the operating state:**      Commissioning (Safety Integrated)  
**Parameter group:**                      Extended functions

**Unit:** ms

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.00 [ms]	3600000.00 [ms]	100.00 [ms]

**Description:** Sets the transition time from SS1 (Safe Stop 1) to STO (Safe Torque Off).  
The parameter has no effect for motion monitoring functions with safe brake ramp monitoring (p9606 = 2).

**Dependency:** See also: p9560  
See also: C01701

**Note**

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

**p9560****SI STO shutdown velocity**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:**                      Read drive data or acknowledge messages  
**Write permission:**                      Edit Safety Integrated application  
**Can be changed in the operating state:**      Commissioning (Safety Integrated)  
**Parameter group:**                      Extended functions

**Unit:** mm/min

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.00 [mm/min]	6000.00 [mm/min]	0.00 [mm/min]

**Description:** Sets the shutdown velocity for activating STO (Safe Torque Off).  
Below this speed "standstill" is assumed, and for SS1 (Safe Stop 1) STO is initiated.  
For motion monitoring functions with safe brake ramp monitoring (p9606 = 2), the parameter must be > 0, as it is the only cancel criterion for SBR (Safe Brake Ramp).

**Dependency:** See also: p9556

**Note**

The shutdown velocity has no effect for a value = 0.

**p9560****SI STO shutdown velocity**

S210 (Safety rot)

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:**                      Read drive data or acknowledge messages  
**Write permission:**                      Edit Safety Integrated application  
**Can be changed in the operating state:**      Commissioning (Safety Integrated)  
**Parameter group:**                      Extended functions

**Unit:** rpm

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0.00 [rpm]	6000.00 [rpm]	0.00 [rpm]

**Description:** Sets the shutdown velocity for activating STO (Safe Torque Off).  
Below this speed "standstill" is assumed, and for SS1 (Safe Stop 1) STO is initiated.  
For motion monitoring functions with safe brake ramp monitoring (p9606 = 2), the parameter must be > 0, as it is the only cancel criterion for SBR (Safe Brake Ramp).

**Dependency:** See also: p9556

**Note**

The shutdown velocity has no effect for a value = 0.

**p9563[0...3]****SI SLS stop response**

**Data type:** Integer16

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit Safety Integrated application

**Can be changed in the operating state:** Commissioning (Safety Integrated)

**Parameter group:**

Extended functions

**Unit:** -

**Min:**

0

**Max:**

1

**Factory setting:**

1

**Description:** Sets the specific stop response for the SLS function.  
These settings apply to the individual limit values for SLS.

**Value:** 0: STO (Safe Torque Off)

1: SS1 (Safe Stop 1)

**Index:**

[0] = Limit value SLS1

[1] = Limit value SLS2

[2] = Limit value SLS3

[3] = Limit value SLS4

**Dependency:** See also: p9531

**Note**

SI: Safety Integrated

SLS: Safely-Limited Speed

SS1: Safe Stop 1

STO: Safe Torque Off

**p9564****SI SDI tolerance**

**Data type:** FloatingPoint32

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit Safety Integrated application

**Can be changed in the operating state:** Commissioning (Safety Integrated)

**Parameter group:**

Extended functions

**Unit:** mm

**Min:**

0.001 [mm]

**Max:**

360.000 [mm]

**Factory setting:**

12.000 [mm]

**Description:** Sets the tolerance for function SDI (Safe Direction).  
This motion in the monitored direction is still permissible without a stop response occurring and safety message C01716 being output.

**Dependency:** See also: p9565, p9566

See also: C01716

## 18.2 List of parameters

<b>p9564</b>	<b>SI SDI tolerance</b>		
S210 (Safety rot)	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> °		
	<b>Min:</b> 0.001 [°]	<b>Max:</b> 360.000 [°]	<b>Factory setting:</b> 12.000 [°]
<b>Description:</b>	Sets the tolerance for function SDI (Safe Direction). This motion in the monitored direction is still permissible without a stop response occurring and safety message C01716 being output.		
<b>Dependency:</b>	See also: p9565, p9566 See also: C01716		
<b>p9565</b>	<b>SI SDI delay time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> ms		
	<b>Min:</b> 0.00 [ms]	<b>Max:</b> 600000.00 [ms]	<b>Factory setting:</b> 100.00 [ms]
<b>Description:</b>	Sets the delay time for function SDI (Safe Direction). After selecting the SDI function, then for a maximum of this time, motion in the monitored direction is permissible. This time can therefore be used for braking any motion.		
<b>Dependency:</b>	See also: p9564, p9566 See also: C01716		
	<b>Note</b> The set time is rounded internally to an integer multiple of the monitoring clock cycle.		
<b>p9566</b>	<b>SI SDI stop response</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> -		
	<b>Min:</b> 0	<b>Max:</b> 1	<b>Factory setting:</b> 1
<b>Description:</b>	Sets the limit value violation response function or stop response for function SDI (Safe Direction). This setting applies to both directions of motion.		
<b>Value:</b>	0: STO (Safe Torque Off) 1: SS1 (Safe Stop 1)		
<b>Dependency:</b>	See also: p9564, p9565 See also: C01716		



<b>p9568</b>	<b>SI SAM velocity limit</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit Safety Integrated application
	<b>Can be changed in the operating state:</b>		Commissioning (Safety Integrated)
	<b>Parameter group:</b>		Extended functions
	<b>Unit:</b> mm/min		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.00 [mm/min]	1000.00 [mm/min]	0.00 [mm/min]
<b>Description:</b>	Sets the velocity limit for the "SAM (Safe Acceleration Monitor)" function. The SAM limit value is limited downward to this value.		
<b>p9568</b>	<b>SI SAM velocity limit</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
S210 (Safety rot)	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit Safety Integrated application
	<b>Can be changed in the operating state:</b>		Commissioning (Safety Integrated)
	<b>Parameter group:</b>		Extended functions
	<b>Unit:</b> rpm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.00 [rpm]	1000.00 [rpm]	0.00 [rpm]
<b>Description:</b>	Sets the velocity limit for the "SAM (Safe Acceleration Monitor)" function. The SAM limit value is limited downward to this value.		
<b>p9581</b>	<b>SI SBR reference velocity</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit Safety Integrated application
	<b>Can be changed in the operating state:</b>		Commissioning (Safety Integrated)
	<b>Parameter group:</b>		Extended functions
	<b>Unit:</b> mm/min		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	600.0000 [mm/min]	1000000.0000 [mm/min]	1500.0000 [mm/min]
<b>Description:</b>	Sets the reference velocity for monitoring SBR (Safe Brake Ramp). The SBR brake ramp gradient depends on p9581 (reference velocity ) and p9583 (reference time).		
<b>Dependency:</b>	See also: p9582, p9583		
<b>p9581</b>	<b>SI SBR reference velocity</b>	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
S210 (Safety rot)	<b>Read permission:</b>		Read drive data or acknowledge messages
	<b>Write permission:</b>		Edit Safety Integrated application
	<b>Can be changed in the operating state:</b>		Commissioning (Safety Integrated)
	<b>Parameter group:</b>		Extended functions
	<b>Unit:</b> rpm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	600.0000 [rpm]	1000000.0000 [rpm]	1500.0000 [rpm]

18.2 List of parameters

**Description:** Sets the reference velocity for monitoring SBR (Safe Brake Ramp).  
The SBR brake ramp gradient depends on p9581 (reference velocity ) and p9583 (reference time).  
**Dependency:** See also: p9582, p9583

**p9582**      **SI SAM/SBR delay time**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning (Safety Integrated)  
**Parameter group:** Extended functions  
**Unit:** ms  
**Min:** 10.00 [ms]      **Max:** 99000.00 [ms]      **Factory setting:** 50.00 [ms]

**Description:** Sets the delay time for monitoring SAM (Safe Acceleration Monitor) / SBR (Safe Brake Ramp).  
The SAM/SBR monitoring is started once the delay time has expired.  
**Dependency:** See also: p9581, p9583

**Note**  
The set time is rounded internally to an integer multiple of the monitoring clock cycle.  
Internally, the set time is limited downwards (lower limit) to 2 safety monitoring clock cycles (2 \* p9500).

**p9583**      **SI SBR reference time**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning (Safety Integrated)  
**Parameter group:** Extended functions  
**Unit:** s  
**Min:** 0.50 [s]      **Max:** 3600.00 [s]      **Factory setting:** 10.00 [s]

**Description:** Sets the reference time for monitoring SBR (Safe Brake Ramp).  
The SBR brake ramp gradient depends on p9581 (reference velocity ) and p9583 (reference time).  
**Dependency:** See also: p9581, p9582

**Note**  
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

**p9603.0...1**      **SI control**

**Data type:** Unsigned32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning state, device  
**Parameter group:** Safety Integrated  
**Unit:** -  
**Min:** -      **Max:** -      **Factory setting:** 0000 bin

**Description:** Sets the type of control for the safety functions integrated in the drive.  
**Bit array:**

Bit	Signal name	1 signal	0 signal

00	Control via F-DI	Enable	Inhibit
01	Control via PROFIsafe	Enable	Inhibit

**Note**

When online safety commissioning has been completed, a change results in an automatic restart.  
 When simultaneously controlled via terminal (bit 0 = 1) and PROFIsafe (bit 1 = 1), the following applies:  
 - It is only permissible that F-DI 0 is used  
 - Only STO / SS1 may be interconnected

**p9604.0...30****SI enable**

<b>Data type:</b>	Unsigned32	<b>Visible in:</b>	Standard display
<b>Read permission:</b>			Read drive data or acknowledge messages
<b>Write permission:</b>			Edit Safety Integrated application
<b>Can be changed in the operating state:</b>			Commissioning (Safety Integrated)
<b>Parameter group:</b>			Safety Integrated
<b>Unit:</b>	-		
<b>Min:</b>	-	<b>Max:</b>	-
		<b>Factory setting:</b>	0000 0000 0000 0000 0000 0000 0000 0000 bin

**Description:** Sets the enable signal for the safety functions integrated in the drive.

<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Enable STO	Enable	Inhibit
	01	Enable SBC	Enable	Inhibit
	02	Enable SS1	Enable	Inhibit
	08	Enable SLS	Enable	Inhibit
	09	Enable SLS dynamic	Enable	Inhibit
	11	Enable SDI	Enable	Inhibit
	12	Enable SSM	Enable	Inhibit
	30	Enable F-DI in PROFIsafe telegram	Enable	Inhibit

**p9606****SI SS1 function specification**

<b>Data type:</b>	Integer16	<b>Visible in:</b>	Standard display
<b>Read permission:</b>			Read drive data or acknowledge messages
<b>Write permission:</b>			Edit Safety Integrated application
<b>Can be changed in the operating state:</b>			Commissioning (Safety Integrated)
<b>Parameter group:</b>			Safety Integrated
<b>Unit:</b>	-		
<b>Min:</b>	0	<b>Max:</b>	2
		<b>Factory setting:</b>	0

**Description:** Sets the function specification of the SS1 (Safe Stop 1) safety function integrated in the drive.

<b>Value:</b>	0:	SS1-t time-controlled
	1:	SS1-a acceleration-monitored
	2:	SS1-r ramp-monitored

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<b>p9610</b>	<b>SI PROFIsafe destination address</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	65534	0
<b>Description:</b>	Sets the PROFIsafe destination address (F_Dest_Add).		
	<b>Note</b>		
	When online safety commissioning has been completed, a change results in an automatic restart.		
<b>p9611</b>	<b>SI PROFIsafe telegram selection</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	901	0
<b>Description:</b>	Sets the PROFIsafe telegram number.		
<b>Value:</b>	0: No PROFIsafe telegram selected		
	30: PROFIsafe standard telegram 30, PZD-1/1		
	901: PROFIsafe SIEMENS telegram 901, PZD-3/5		
<b>Dependency:</b>	See also: r60022		
<b>p9612</b>	<b>SI stop response for failure or control fault</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	1	0
<b>Description:</b>	Sets the stop response for failure or control fault (e.g. PROFIsafe communication).		
<b>Value:</b>	0: STO		
	1: SS1		
	<b>Note</b>		
	For p9612 = 0 (STO):		
	The drive safely switches off the motor, the motor coasts down.		
	For p9612 = 1 (SS1):		
	The drive brakes the motor with OFF3 ramp-down time until standstill is detected. A switchover is then made to STO.		

<b>p9613</b>	<b>SI PROFIsafe source address</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	65534	0
<b>Description:</b>	Sets the PROFIsafe source address (F_Source_Add).		
	<b>Note</b>		
	When online safety commissioning has been completed, a change results in an automatic restart.		
<b>p9614</b>	<b>SI PROFIsafe F_watchdog time</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> ms		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0 [ms]	65535 [ms]	0 [ms]
<b>Description:</b>	Sets the PROFIsafe monitoring time (F_WD_Time).		
<b>p9630</b>	<b>SI safe maximum speed encoder (rotary)</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> rpm		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0 [rpm]	300000000 [rpm]	0 [rpm]
<b>Description:</b>	Sets the safe maximum speed for the rotary encoder (encoder side).		
<b>p9631</b>	<b>SI safe position accuracy encoder (rotary)</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> °		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0.000 [°]	360.000 [°]	0.000 [°]
<b>Description:</b>	Sets the safe position accuracy for the rotary encoder (encoder side).		

<b>r9634</b>	<b>SI safe maximum speed encoder detected (rotary)</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> rpm		
<b>Description:</b>	Displays the safe maximum speed for the rotary encoder (encoder side) that was detected.		
<b>r9635</b>	<b>SI safe position accuracy encoder detected (rotary)</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> °		
<b>Description:</b>	Displays the safe position accuracy for the rotary encoder (encoder side) that was detected.		
<b>p9659</b>	<b>SI brake output test timer</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> h		
	<b>Min:</b> 0.00 [h]	<b>Max:</b> 9000.00 [h]	<b>Factory setting:</b> 2160.00 [h]
<b>Description:</b>	Sets the time interval for carrying out the forced checking procedure and testing the safety brake control. Within the parameterized time, when the SBC function is enabled, the brake must have been closed or opened at least once. The monitoring time is reset each time the brake is opened or closed.		
	<b>Note</b> SBC: Safe Brake Control		
<b>r9660</b>	<b>SI forced checking procedure remaining time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> h		
<b>Description:</b>	Displays the time remaining before performing the dynamization and testing the brake output.		
<b>p9674</b>	<b>SI module identifier Sensor Module</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Ready for operation	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		

	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	4294967295	0
<b>Description:</b>	Module identifier of the Sensor Module.		

**p9675****SI module identifier encoder**

<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit Safety Integrated application
<b>Can be changed in the operating state:</b>	Ready for operation
<b>Parameter group:</b>	Safety Integrated
<b>Unit:</b> -	

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0	4294967295	0

**Description:** Module identifier of the encoder,

**Note**

The value = 0 when using an encoder without its own serial number.

**p9676****SI identifier encoder properties**

<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit Safety Integrated application
<b>Can be changed in the operating state:</b>	Ready for operation
<b>Parameter group:</b>	Safety Integrated
<b>Unit:</b> -	

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
0	4294967295	0

**Description:** Identifier for the encoder properties

**p9677****SI offset POS1 POS2 encoder**

<b>Data type:</b> Integer32	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit Safety Integrated application
<b>Can be changed in the operating state:</b>	Ready for operation
<b>Parameter group:</b>	Extended functions
<b>Unit:</b> -	

<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
-2147483648	2147483647	0

**Description:** Sets the offset between encoder positions POS1 and POS2.  
This value is used only once to perform a check after running up.

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<b>p9699</b>	<b>SI configuration alarm filtering</b>		
	<b>Data type:</b> Integer16	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Can be changed in the operating state:</b>	Ready for operation	
	<b>Parameter group:</b>	Basic functions	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0	1	1
<b>Description:</b>	Sets the enable for the "Alarm filtering" function.		
<b>Value:</b>	0: Deactivate alarm filtering		
	1: Activate alarm filtering		
	<b>Note</b>		
	Parameter is active after a POWER ON		

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<b>r9708</b>	<b>SI diagnostics safe position</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> mm		
<b>Description:</b>	Displays the actual load-side actual value.		
	<b>Note</b>		
	The display of the load-side position actual value is updated in the monitoring clock cycle.		

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<b>r9708</b>	<b>SI diagnostics safe position</b>		
S210 (Safety rot)	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> °		
<b>Description:</b>	Displays the actual load-side actual value.		
	<b>Note</b>		
	The display of the load-side position actual value is updated in the monitoring clock cycle.		

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<b>r9714[0...4]</b>	<b>SI diagnostics velocity</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> mm/min		
<b>Description:</b>	Displays the velocity actual values for motion monitoring functions on the drive object.		
<b>Index:</b>	[0] = Load side velocity actual value		
	[1] = Actual SAM/SBR velocity limit		
	[2] = Actual SLS speed limit		
	[3] = Reserved		
	[4] = Load side filtered velocity actual value		



**Dependency:** See also: r9732

NOTICE
For index [1]: If several SAM and/or SBR monitoring functions are simultaneously active, then the lowest of the limit values is indicated here.
For index [2]: This SLS velocity limit can, as a result of conversion into the internal monitoring format, deviate from the specified SLS velocity limit (see r9732).

**Note**

The display is updated in the safety monitoring clock cycle.

**r9714[0...4] SI diagnostics velocity**

S210 (Safety rot)

**Data type:** FloatingPoint32

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Extended functions

**Unit:** rpm

**Description:**

Displays the velocity actual values for motion monitoring functions on the drive object.

**Index:**

[0] = Load side velocity actual value

[1] = Actual SAM/SBR velocity limit

[2] = Actual SLS speed limit

[3] = Reserved

[4] = Load side filtered velocity actual value

**Dependency:**

See also: r9732

NOTICE
For index [1]: If several SAM and/or SBR monitoring functions are simultaneously active, then the lowest of the limit values is indicated here.
For index [2]: This SLS velocity limit can, as a result of conversion into the internal monitoring format, deviate from the specified SLS velocity limit (see r9732).

**Note**

The display is updated in the safety monitoring clock cycle.

**r9720.0...15 SI control word**

**Data type:** Unsigned32

**Visible in:** Standard display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Extended functions

**Unit:** -

**Description:**

Control signals for safety functions integrated in the drive.

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	Deselect STO	Yes	No
01	Deselect SS1	Yes	No
04	Deselect SLS	Yes	No
07	Acknowledgment	Signal edge active	No
09	Select SLS bit 0	Set	Not set
10	Select SLS bit 1	Set	Not set
12	Deselect SDI positive	Yes	No

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13	Deselect SDI negative	Yes	No
15	Deselect SSM	Yes	No

**Note**

Note: only the control signals of the available and enabled functions (see p9604) are updated. All others are 1 across the board.

**r9722.0...15****SI status signals**

<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Extended functions

**Unit:** -

**Description:** Display for the status signals of the safety functions (synchronized signal).

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	STO or safe pulse cancellation active	Yes	No
01	SS1 active	Yes	No
04	SLS active	Yes	No
07	Internal event	No	Yes
09	Active SLS stage bit 0	Set	Not set
10	Active SLS stage bit 1	Set	Not set
12	SDI positive active	Yes	No
13	SDI negative active	Yes	No
15	SSM (speed below limit value)	Yes	No

**NOTICE**

For bit 07:

An internal event is displayed if a stop function is active.

The signal state behaves in an opposite way to the PROFIsafe Standard.

**Note**

Only the status signals of the enabled functions (see p9604) are updated, all others are 0 across the board.

**r9725[0...2]****SI diagnostics data cross-check**

<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display
<b>Read permission:</b>	Read drive data or acknowledge messages
<b>Write permission:</b>	Edit device configuration or drive applications
<b>Parameter group:</b>	Extended functions

**Unit:** -

**Description:** Displays the diagnostics of the data cross-check.

For index [0]

Number of the data, which, for the data cross-check between the two monitoring channels, led to the SCF (Safety Channel Failure) on the drive.

For index [1]:

Displays the value from channel A for a KDV error.

For index [2]:

Displays the value from channel B for a KDV error.

**Index:**

[0] = Message value for KDV

[1] = KDV actual value channel A

[2] = KDV actual value channel B

**Dependency:**

See also: C01769

**Note**

KDV: Data cross-check

<b>r9728</b>	<b>SI actual checksum configuration of the safety functions</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the checksum over the checked parameters used to configure safety functions (actual checksum).		
<b>Dependency:</b>	See also: p9729		
<b>p9729</b>	<b>SI reference checksum configuration of the safety functions</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> -		
	<b>Min:</b> 0000 hex	<b>Max:</b> FFFF FFFF hex	<b>Factory setting:</b> A1A1 A1A1 hex
<b>Description:</b>	Sets the checksum over the checked parameters used to configure safety functions (reference checksum).		
<b>Dependency:</b>	See also: r9728		
<b>r9730</b>	<b>SI Safe maximum velocity</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> mm/min		
<b>Description:</b>	Displays the safe maximum velocity (on the load side) that is permissible for the safe motion monitoring functions as a result of the actual value sensing. This parameter indicates up to which load velocity the safe encoder actual values (redundant encoder coarse position) can still be correctly detected as a result of the particular encoder parameterization. This parameter is only of significance for enabled safety with encoder (otherwise "0").		
<b>r9730</b>	<b>SI Safe maximum velocity</b>		
S210 (Safety rot)	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> rpm		
<b>Description:</b>	Displays the safe maximum velocity (on the load side) that is permissible for the safe motion monitoring functions as a result of the actual value sensing. This parameter indicates up to which load velocity the safe encoder actual values (redundant encoder coarse position) can still be correctly detected as a result of the particular encoder parameterization. This parameter is only of significance for enabled safety with encoder (otherwise "0").		

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<b>r9731</b>	<b>SI safe position accuracy</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display <b>Read permission:</b> Read drive data or acknowledge messages <b>Write permission:</b> Edit device configuration or drive applications <b>Parameter group:</b> Extended functions <b>Unit:</b> mm
<b>Description:</b>	Displays the safe position accuracy (load side). As a result of the actual value sensing for safe motion monitoring functions, this accuracy can be achieved as the maximum.
	<b>Note</b> The parameter is only of significance for enabled safety with encoder (otherwise "0").
<b>r9731</b> S210 (Safety rot)	<b>SI safe position accuracy</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display <b>Read permission:</b> Read drive data or acknowledge messages <b>Write permission:</b> Edit device configuration or drive applications <b>Parameter group:</b> Extended functions <b>Unit:</b> °
<b>Description:</b>	Displays the safe position accuracy (load side). As a result of the actual value sensing for safe motion monitoring functions, this accuracy can be achieved as the maximum.
	<b>Note</b> The parameter is only of significance for enabled safety with encoder (otherwise "0").
<b>r9732[0...1]</b>	<b>SI velocity resolution</b>
	<b>Data type:</b> FloatingPoint32 <b>Visible in:</b> Standard display <b>Read permission:</b> Read drive data or acknowledge messages <b>Write permission:</b> Edit device configuration or drive applications <b>Parameter group:</b> Extended functions <b>Unit:</b> mm/min
<b>Description:</b>	Displays the velocity resolution for safety-relevant motion monitoring functions. For index [0]: Displays the safe velocity resolution (load side). Setpoints for velocity limits or parameter changes for velocities below this threshold have no effect. For index [1]: Displays the safe velocity accuracy based on the safe encoder accuracy
<b>Index:</b>	[0] = Actual velocity resolution [1] = Minimum velocity resolution
	<b>Note</b> For index [0]: This parameter does not provide any information about the actual accuracy of the velocity sensing. This depends on the type of actual value sensing, the gear factors as well as the quality of the encoder being used. Conversion of: (internal fixed value / Tsi) to mm/min (linear) or rpm (rotary) with Tsi = p9500 (SI monitoring cycle). Example: For Tsi = 4 ms, r9732[0] = 15 mm/min (linear) or 1/24 rpm (rotary) is obtained.  For index [1]: - Only takes into account the coarse encoder resolution and is an internal calculation, which also incorporates the factor for the motor-load side conversion, the gear ratio and the safety monitoring clock cycle.

<b>r9732[0...1]</b>	<b>SI velocity resolution</b>	
S210 (Safety rot)	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Extended functions
	<b>Unit:</b> rpm	
<b>Description:</b>	Displays the velocity resolution for safety-relevant motion monitoring functions. For index [0]: Displays the safe velocity resolution (load side). Setpoints for velocity limits or parameter changes for velocities below this threshold have no effect. For index [1]: Displays the safe velocity accuracy based on the safe encoder accuracy	
<b>Index:</b>	[0] = Actual velocity resolution [1] = Minimum velocity resolution	
	<b>Note</b>	
	For index [0]: This parameter does not provide any information about the actual accuracy of the velocity sensing. This depends on the type of actual value sensing, the gear factors as well as the quality of the encoder being used. Conversion of: (internal fixed value / Tsi) to mm/min (linear) or rpm (rotary) with Tsi = p9500 (SI monitoring cycle). Example: For Tsi = 4 ms, r9732[0] = 15 mm/min (linear) or 1/24 rpm (rotary) is obtained.	
	For index [1]: - Only takes into account the coarse encoder resolution and is an internal calculation, which also incorporates the factor for the motor-load side conversion, the gear ratio and the safety monitoring clock cycle.	
<b>r9733[0...2]</b>	<b>SI effective setpoint velocity limiting</b>	
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display
	<b>Read permission:</b>	Read drive data or acknowledge messages
	<b>Write permission:</b>	Edit device configuration or drive applications
	<b>Parameter group:</b>	Extended functions
	<b>Unit:</b> rpm	
<b>Description:</b>	Displays the necessary setpoint velocity limit as a result of the selected motion monitoring functions. Contrary to the parameterization of the SI limit values, this parameter specifies the motor-side limit value and not the load-side limit value.	
<b>Index:</b>	[0] = Setpoint limiting positive [1] = Setpoint limiting negative [2] = Setpoint limit absolute	
<b>Dependency:</b>	For SLS: r9733[0] = p9531[x] x p9533 (converted from the load side to the motor side) For SDI negative: r9733[0] = 0 For SLS: r9733[1] = - p9531[x] x p9533 (converted from the load side to the motor side) For SDI positive: r9733[1] = 0 [x] = Selected SLS stage Conversion factor from the load side to the motor side: - Motor type = rotary and axis type = linear: p9522 / (p9521 x p9520) - Otherwise: p9522 / p9521 See also: p9531, p9533	
	<b>NOTICE</b>	
	If only the absolute value of the setpoint velocity limiting is required, r9733[2] must be interconnected.	

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**Note**

The unit changeover between linear and rotary axis is not implemented via the safety changeover (r9502) but by the linear motor changeover.

If the "SLS" or "SDI" function is not selected, r9733[0] shows p1082 and r9733[1] shows -p1082.

The display in r9733 can be delayed by up to one safety monitoring clock cycle as compared to the display in r9720 and r9722.

When selecting a safety function, where standstill is reached or required (e.g. STO, SS1), then setpoint 0 is entered in r9733.

**r9734.0...15**

**SI Safety Information Channel status word S\_ZSW1B**

**Data type:** Unsigned16                      **Visible in:** Standard display  
**Read permission:**                              Read drive data or acknowledge messages  
**Write permission:**                              Edit device configuration or drive applications  
**Parameter group:**                              Safety Integrated

**Unit:** -

**Description:** Display for status word S\_ZSW1B of the Safety Information Channel.

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	STO selected or active	Yes	No
01	SS1 active	Yes	No
04	SLS active	Yes	No
06	SLS selected	Yes	No
07	Internal event	Yes	No
09	Select SLS bit0	Yes	No
10	Select SLS bit1	Yes	No
12	SDI positive selected	Yes	No
13	SDI negative selected	Yes	No
14	ESR retract requested	Yes	No
15	Safety message present	Yes	No

**Note**

SIC: Safety Information Channel

For bit 07:

An internal event is displayed if a stop function is active.

**r9753[0...63]**

**SI message value for float values**

**Data type:** FloatingPoint32                      **Visible in:** Extended display  
**Read permission:**                              Read drive data or acknowledge messages  
**Write permission:**                              Edit device configuration or drive applications  
**Parameter group:**                              Extended functions

**Unit:** -

**Description:** Displays additional information about the safety message that has occurred for float values.

**Dependency:** See also: r9754, r9755, r9756, r60044, r60045, r60048, r60049, p60052

**r9754[0...63]**

**SI message time received in days**

**Data type:** Unsigned16                      **Visible in:** Extended display  
**Read permission:**                              Read drive data or acknowledge messages  
**Write permission:**                              Edit device configuration or drive applications  
**Parameter group:**                              Extended functions

**Unit:** -

**Description:** Displays the relative system runtime in days when the safety message occurred.

**Dependency:** See also: r9753, r9755, r9756, r60044, r60045, r60048, r60049, p60052

---

### r9755[0...63] SI message time removed in milliseconds

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Extended functions  
**Unit:** ms

**Description:** Displays the relative system runtime in milliseconds when the safety message was removed.

**Dependency:** See also: r9753, r9754, r9755, r60044, r60045, r60048, r60049, p60052

---

### r9756[0...63] SI message time removed in days

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Extended functions  
**Unit:** -

**Description:** Displays the relative system runtime in days when the safety message was removed.

**Dependency:** See also: r9753, r9754, r9755, r60044, r60045, r60048, r60049, p60052

---

### r9768[0...8] Receive SI PROFIsafe control words

**Data type:** Unsigned16      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Safety Integrated  
**Unit:** -

**Description:** Displays the received PROFIsafe telegram.

**Index:**  
[0] = PZD 1  
[1] = PZD 2  
[2] = PZD 3  
[3] = PZD 4  
[4] = PZD 5  
[5] = PZD 6  
[6] = PZD 7  
[7] = PZD 8  
[8] = PZD 9

**Dependency:** See also: r9769

---

**Note**

The PROFIsafe trailer at the end of the telegram is also displayed (5 bytes).

---

### r9769[0...8] Send SI PROFIsafe status words

**Data type:** Unsigned16      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Safety Integrated  
**Unit:** -

**Description:** Displays the PROFIsafe telegram to be sent.

## 18.2 List of parameters

**Index:**

- [0] = PZD 1
- [1] = PZD 2
- [2] = PZD 3
- [3] = PZD 4
- [4] = PZD 5
- [5] = PZD 6
- [6] = PZD 7
- [7] = PZD 8
- [8] = PZD 9

**Dependency:** See also: r9768

**Note**

The PROFIsafe trailer at the end of the telegram is also displayed (5 bytes).

**r9770[0...7]****SI PROFIsafe configuration of the F-PLC**

**Data type:** Unsigned16      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Displays the configuration data received from the F-PLC (when control via PROFIsafe is enabled).

**Index:**

- [0] = Telegram number
- [1] = Control telegram length from the F-PLC in bytes
- [2] = Status telegram length to the F-PLC in bytes
- [3] = F\_PRM\_FLAG1, F\_PRM\_FLAG2
- [4] = F\_Source\_Add
- [5] = F\_Dest\_Add
- [6] = F\_WD\_Time
- [7] = F\_Par\_CRC

**r9771[0...43]****SI PROFIsafe diagnostics information CRC error**

**Data type:** Unsigned8      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Diagnostics data for CRC error in the cyclic PROFIsafe communication. The information regarding the last signaled CRC error is always displayed.

Structure of the diagnostic information:

- Bytes 0 to 1: diagnostic data structure version
- Bytes 2 to 9: IncNo\_1: used in the V2.6.1 mode
- Bytes 10 to 17: IncNo\_2: used in the V2.6.1 mode
- Bytes 18 to 21: received telegram CRC
- Bytes 22 to 25: expected telegram CRC
- Bytes 26 to 29: VirtualConsecutiveNo: used in the V2.4 mode
- Bytes 30 to 33: Code name: used in the V2.6.1 mode
- Bytes 34 to 37: Modifier: used in the V2.6.1 mode
- Bytes 38 to 41: CRC of the iParameters (not used)
- Bytes 42 to 43: CRC of the F-parameters



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<b>r9776.0...4</b>	<b>SI diagnostics</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the operating state, referred to the safety functions. The parameter is used for diagnostics.		
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b> <b>0 signal</b>
	00	Safety parameter changed	Yes      No
	01	Safety functions enabled	Yes      No
	02	Safety component replaced and data save required	Yes      No
	04	Safety commissioning mode active	Yes      No
	<b>Note</b>		
	For bit 00 = 1: At least one safety parameter was changed. The change only becomes effective after a restart, which is automatically performed after exiting safety commissioning.		
	For bit 01 = 1: Safety functions have been enabled and are active.		
	For bit 02 = 1: A safety-relevant component has been replaced. Saving required (p0977 = 1 or retentively save).		
	For bit 04 = 1: The safety commissioning mode is selected.		

---

<b>r9780[0...1]</b>	<b>SI checksum to check changes</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the checksum to track changes for Safety Integrated. These are additional checksums that are created to track changes (fingerprint for the "safety logbook" functionality) to safety parameters (that are relevant for checksums).		
<b>Index:</b>	[0] = SI checksum to track functional changes [1] = SI checksum to track hardware-specific changes		
<b>Dependency:</b>	See also: p9729, p9797		

---

<b>r9781[0...1]</b>	<b>SI change control time stamp days</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the time stamps for the checksums for tracking changes for Safety Integrated. The time stamps for the checksums for tracking changes (fingerprint for the "safety logbook" functionality) made to safety parameters are saved in parameters r9780[0] and r9780[1].		
<b>Index:</b>	[0] = SI time stamp for checksum to track functional changes [1] = SI time stamp for checksum to track hardware-specific changes		
<b>Dependency:</b>	See also: p9729, p9797, p9799 See also: C01690		

## 18.2 List of parameters

**NOTICE**

The time comprises r9781 (days) and r9782 (milliseconds).

**r9782[0...1]****SI change control time stamp milliseconds****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Safety Integrated

**Unit:** ms**Description:**

Displays the time stamps for the checksums for tracking changes for Safety Integrated.

The time stamps for the checksums for tracking changes (fingerprint for the "safety logbook" functionality) made to safety parameters are saved in parameters r9780[0] and r9780[1].

**Index:**

[0] = SI time stamp for checksum to track functional changes

[1] = SI time stamp for checksum to track hardware-specific changes

**Dependency:**

See also: p9729, p9797, p9799

See also: C01690

**NOTICE**

The time comprises r9781 (days) and r9782 (milliseconds).

**r9794****SI actual checksum safety enable****Data type:** Unsigned32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Basic functions

**Unit:** -**Description:**

Displays the checksum over the parameters to enable the safety functions (actual checksum).

**Dependency:**

See also: p9795

**p9795****SI reference checksum safety enable****Data type:** Unsigned32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit Safety Integrated application

**Can be changed in the operating state:**

Commissioning (Safety Integrated)

**Parameter group:**

Basic functions

**Unit:** -**Min:**

0000 hex

**Max:**

FFFF FFFF hex

**Factory setting:**

A1A1 A1A1 hex

**Description:**

Displays the checksum over the parameters to enable the safety functions (reference checksum).

**Dependency:**

See also: r9794

**r9796****SI actual checksum PROFIsafe addresses****Data type:** Unsigned32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Extended functions

**Unit:** -**Description:**

Displays the checksum over the parameters for the PROFIsafe addresses (actual checksum).

**Dependency:** See also: p9797

**p9797****SI reference checksum PROFIsafe addresses**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning (Safety Integrated)  
**Parameter group:** Extended functions  
**Unit:** -  
**Min:** 0000 hex      **Max:** FFFF FFFF hex      **Factory setting:** A1A1 A1A1 hex

**Description:** Sets the checksum over the parameters for the PROFIsafe addresses (reference checksum).

**Dependency:** See also: r9796

**r9798****SI actual checksum over the configuration of the drive object**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Basic functions  
**Unit:** -

**Description:** Displays the checksum over the checksum-checked parameters to configure the drive object (actual checksum).

**Dependency:** See also: p9799

**p9799****SI reference checksum over the configuration of the drive object**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning (Safety Integrated)  
**Parameter group:** Basic functions  
**Unit:** -  
**Min:** 0000 hex      **Max:** FFFF FFFF hex      **Factory setting:** A1A1 A1A1 hex

**Description:** Sets the checksum over the checksum-checked parameters to configure the drive object (reference checksum).

**Dependency:** See also: r9798

**r9828****SI actual checksum configuration of safety functions channel B**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Extended functions  
**Unit:** -

**Description:** Displays the checksum over the checksum-checked parameters to configure safety functions (actual checksum) channel B.

**Dependency:** See also: p9829

<b>p9829</b>	<b>SI reference checksum configuration of safety functions chan. B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> -		
	<b>Min:</b> 0000 hex	<b>Max:</b> FFFF FFFF hex	<b>Factory setting:</b> B2B2 B2B2 hex
<b>Description:</b>	Sets the checksum over the checked parameters used to configure safety functions (reference checksum).		
<b>Dependency:</b>	See also: r9828		

<b>r9894</b>	<b>SI actual checksum safety enable channel B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>		
	<b>Unit:</b> -		
<b>Description:</b>	Displays the checksum over the parameters to enable the safety functions (actual checksum) channel B.		
<b>Dependency:</b>	See also: p9895		

<b>p9895</b>	<b>SI reference checksum safety enable channel B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>		
	<b>Unit:</b> -		
	<b>Min:</b> 0000 hex	<b>Max:</b> FFFF FFFF hex	<b>Factory setting:</b> B2B2 B2B2 hex
<b>Description:</b>	Displays the checksum over the parameters to enable the safety functions (reference checksum) channel B.		
<b>Dependency:</b>	See also: r9894		

<b>r9896</b>	<b>SI actual checksum PROFIsafe addresses channel B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Extended functions	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the checksum over the parameters for the PROFIsafe addresses (act checksum) chan B.		
<b>Dependency:</b>	See also: p9897		

<b>p9897</b>	<b>SI reference checksum PROFIsafe addresses channel B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>		
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0000 hex	FFFF FFFF hex	B2B2 B2B2 hex
<b>Description:</b>	Sets the checksum over the parameters for the PROFIsafe addresses (reference checksum) channel B		
<b>Dependency:</b>	See also: r9896		
<b>r9898</b>	<b>SI actual checksum configuration of the drive object, channel B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Basic functions	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the checksum over the checksum-checked parameters to configure the drive object (actual checksum) channel B.		
<b>Dependency:</b>	See also: p9899		
<b>p9899</b>	<b>SI reference checksum over configuration of drive object chan B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning (Safety Integrated)	
	<b>Parameter group:</b>	Basic functions	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	0000 hex	FFFF FFFF hex	B2B2 B2B2 hex
<b>Description:</b>	Sets the checksum over the checksum-checked parameters to configure the drive object (reference checksum) channel B.		
<b>Dependency:</b>	See also: r9898		
<b>p10000.0</b>	<b>SI F-DI enable</b>		
	<b>Data type:</b> Unsigned8	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning state, device	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
	<b>Min:</b>	<b>Max:</b>	<b>Factory setting:</b>
	-	-	0000 bin
<b>Description:</b>	Sets the enable signal for the failsafe digital inputs.		
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b> <b>0 signal</b>
	00	F-DI 0 (X130/2.1, X130/2.3)	Enabled      Not enabled

## 18.2 List of parameters

**Note**

- Digital inputs of F-DI that have not been enabled can be used as binary signal sources for non-safety-related functions.  
 - Only F-DI that have been enabled are monitored in a safety-relevant way. It is neither permissible that the associated DI are set to simulation nor used as non-safety relevant functions, as they can be subject to test pulses.

**p10002****SI F-DI changeover discrepancy time**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning state, device  
**Parameter group:** Safety Integrated  
**Unit:** ms  
**Min:** 1.00 [ms]      **Max:** 2000.00 [ms]      **Factory setting:** 500.00 [ms]

**Description:**

Sets the discrepancy time for digital inputs.  
 The signal states at the two associated digital inputs (F-DI) must assume the same state within this discrepancy time.

**Note**

The time must be set longer than the safety monitoring clock cycle (p9500).

**p10017[0...2]****SI digital inputs input filter**

**Data type:** FloatingPoint32      **Visible in:** Standard display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning state, device  
**Parameter group:** Safety Integrated  
**Unit:** ms  
**Min:** 1.00 [ms]      **Max:** 100.00 [ms]      **Factory setting:** 4.00 [ms]

**Description:**

Setting of the input filter for the digital inputs.  
 The input filter is rounded off to whole milliseconds and accepted.  
 The input filter acts on the following digital inputs:  
 - Failsafe digital inputs (F-DI).

**Example:**

Input filter = 1 ms: Fault pulses of 1 ms are filtered; only pulses longer than 2 ms are processed.

Input filter = 3 ms: Fault pulses of 3 ms are filtered; only pulses longer than 4 ms are processed.

The input filtering result can be read in r10051 and r10151.

The set input filter impacts the response time of the safety function.

**Index:**

[0] = F-DI 0

[1] = Reserved

[2] = Reserved

**NOTICE**

If the cable connected at the digital input is longer than 30 m, to maintain the functional safety, the minimum debounce time must be set to 20 ms.

**Note**

If the self-test is enabled using an externally entered dark pulse (p10041) for at least one F-DI, then p10017 must be set longer than the maximum duration of the dark pulse + 2 ms. If the test pulses are entered using the switchable power supply, then this means  $p10017 > p10018 + 2$  ms.

<b>p10018</b>	<b>SI F-DI self-test dark pulse length VS+</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning state, device	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> ms		
	<b>Min:</b> 0 [ms]	<b>Max:</b> 50 [ms]	<b>Factory setting:</b> 0 [ms]
<b>Description:</b>	Sets the dark pulse length of the switchable power supply for the self-test (p10041) of the F-DI. Value = 0: switchable power supply, permanently switched on. Value > 0: dark pulse length for the switchable power supply. The test cycle is fixed at 5 s.		
	<b>Note</b> This switchable power supply must be permanently switched on if the self test using internal test pulses was selected (p10041),		
<b>p10019</b>	<b>SI F-DI self test external dark pulse wait time</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Can be changed in the operating state:</b>	Commissioning state, device	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> s		
	<b>Min:</b> 10 [s]	<b>Max:</b> 3600 [s]	<b>Factory setting:</b> 1020 [s]
<b>Description:</b>	Sets the maximum wait time for the dark pulse for the F-DI self test using an externally entered test pulse.		
	<b>Note</b> This parameter is only active for F-DIs that are tested using external test pulses (p10041[x] = 2).		
<b>c10022</b>	<b>SI STO input terminal</b>		
	<b>Data type:</b> Unsigned8	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
<b>Description:</b>	Signal for the axis-specific selection of function "STO (Safe Torque Off)" (control via F-DI).		
	<b>Note</b> F-DI: Failsafe Digital Input		
<b>c10023</b>	<b>SI SS1 input terminal</b>		
	<b>Data type:</b> Unsigned8	<b>Visible in:</b> Standard display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit Safety Integrated application	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
<b>Description:</b>	Signal for selecting function "SS1 (Safe Stop 1)".		

## 18.2 List of parameters

**Note**

F-DI: Failsafe Digital Input

**p10040.0****SI F-DI input mode**

**Data type:** Unsigned8      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning state, device  
**Parameter group:**      Safety Integrated

**Unit:** -

**Min:**      **Max:**      **Factory setting:**  
-      -      0000 bin

**Description:** Sets the input mode for the safety digital inputs (F-DI).

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	F-DI 0, DI 3+ (X130/2.3)	NO contact	NC contact

**Note**

Only an NC contact can be connected for the safety digital inputs not listed.

**p10041[0...2]****SI F-DI self test mode selection**

**Data type:** Integer16      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit Safety Integrated application  
**Can be changed in the operating state:** Commissioning state, device  
**Parameter group:**      Safety Integrated

**Unit:** -

**Min:**      **Max:**      **Factory setting:**  
0      3      0

**Description:** Enable for the F-DI self test.

**Value:**

- 0: Self test using internal test signals
- 1: Self-test using entered dark pulses (VS+)
- 3: Self test using externally entered dark pulses

**Index:**

- [0] = F-DI 0
- [1] = Reserved
- [2] = Reserved

**Note**

Mode 0:

The power supply must be permanently switched on.

Mode 1:

A check is made whether p10017 is &gt; p10018 + 2 ms and whether p10018 is set &gt; 0.

**c10050[0...2]****SI status F-DI via PROFIsafe**

**Data type:** Unsigned8      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit Safety Integrated application  
**Parameter group:**      Safety Integrated

**Unit:** -**Description:** The state of the selected failsafe digital inputs F-DIs is transferred to the F-control via PROFIsafe.



**Index:** [0] = F-DI via Profisafe status 1  
[1] = Reserved  
[2] = Reserved

**Note**

F-DI: Failsafe Digital Input

**r10051.0 SI digital inputs status channel A**

**Data type:** Unsigned8      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Display for the single-channel, logical and debounced status of the failsafe digital inputs of channel A.

Bit	Signal name	1 signal	0 signal
00	Status of DI 2+ (X130/2.1)	Logical 1	Logical 0

**Dependency:** See also: p10017

**Note**

The relationship between the logic level and the external voltage level at the input is intended for the use of a safety function:

With 24 V at the input, NC contacts have a logical "1" level, for 0 V at the input, a logical "0" level.

This means that an NC/NC contact parameterization for 0 V at both inputs of the F-DI leads to a status of the F-DI equal to "0" (safety function selected), for 24 V at both inputs of the F-DI, to a status of the F-DI equal to "1" (safety function deselected).

F-DI: Failsafe Digital Input

NC contact:

24V at the input -&gt; logical "1"

0V at the input -&gt; logical "0"

**r10071.0 SI F-DI status**

**Data type:** Unsigned8      **Visible in:** Standard display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Display for the status of the failsafe digital inputs.

Bit	Signal name	1 signal	0 signal
00	Status of the F-DI 0	Logical 1	Logical 0

**Note**

The following applies:

- Logical "0": Safety function is selected

- Logical "1": safety function is deselected

F-DI: Failsafe Digital Input

**r10075.0...15 SI PROFIsafe control word**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Extended functions  
**Unit:** -

18.2 List of parameters

**Description:** Displays the control signals for safety functions integrated in the drive only via PROFIsafe.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Deselect STO	Yes	No
	01	Deselect SS1	Yes	No
	04	Deselect SLS	Yes	No
	07	Acknowledgment	Signal edge active	No
	09	Select SLS bit 0	Set	Not set
	10	Select SLS bit 1	Set	Not set
	12	Deselect SDI positive	Yes	No
	13	Deselect SDI negative	Yes	No
	15	Deselect SSM	Yes	No

**r10076 SI PROFIsafe SLS-LIMIT**

**Data type:** Integer16      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Extended functions  
**Unit:** -

**Description:** Dynamic limit value input for SLS (Safely-Limited Speed) via PROFIsafe.

**r10080.0...15 SI status signals channel A**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:**  
**Unit:** -

**Description:** Status signals (channel A) for safety-relevant motion monitoring functions integrated in the drive.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	STO or safe pulse cancellation active	Yes	No
	01	SS1 active	Yes	No
	04	SLS active	Yes	No
	07	Internal event	No	Yes
	09	Active SLS stage bit 0	Set	Not set
	10	Active SLS stage bit 1	Set	Not set
	12	SDI positive active	Yes	No
	13	SDI negative active	Yes	No
	15	SSM (speed below limit value)	Yes	No

**NOTICE**  
 For bit 07:  
 An internal event is displayed if a stop function is active.  
 The signal state behaves in an opposite way to the PROFIsafe Standard.

**Note**  
 Only the status signals of the available and enabled functions (see p9604) are updated. All others are 0 across the board.

---

<b>r10098</b>	<b>SI actual checksum across device-specific parameters</b>
	<b>Data type:</b> Unsigned32 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit device configuration or drive applications
	<b>Parameter group:</b> Basic functions
	<b>Unit:</b> -
<b>Description:</b>	Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (actual checksum).
<b>Dependency:</b>	See also: p10099

---

<b>p10099</b>	<b>SI reference checksum across device-specific parameters</b>
	<b>Data type:</b> Unsigned32 <b>Visible in:</b> Extended display
	<b>Read permission:</b> Read drive data or acknowledge messages
	<b>Write permission:</b> Edit Safety Integrated application
	<b>Can be changed in the operating state:</b> Commissioning state, device
	<b>Parameter group:</b> Basic functions
	<b>Unit:</b> -
	<b>Min:</b> <b>Max:</b> <b>Factory setting:</b>
	0000 hex      FFFF FFFF hex      A1A1 A1A1 hex
<b>Description:</b>	Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (reference checksum).
<b>Dependency:</b>	See also: r10098

---

<b>r10151.0</b>	<b>SI digital inputs status channel B</b>								
	<b>Data type:</b> Unsigned8 <b>Visible in:</b> Standard display								
	<b>Read permission:</b> Read drive data or acknowledge messages								
	<b>Write permission:</b> Edit device configuration or drive applications								
	<b>Parameter group:</b>								
	<b>Unit:</b> -								
<b>Description:</b>	Display for the single-channel, logical and debounced status of the failsafe digital inputs of channel B.								
<b>Bit array:</b>	<table> <thead> <tr> <th>Bit</th> <th>Signal name</th> <th>1 signal</th> <th>0 signal</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Status of the DI 3+ (X130/2.3)</td> <td>Logical 1</td> <td>Logical 0</td> </tr> </tbody> </table>	Bit	Signal name	1 signal	0 signal	00	Status of the DI 3+ (X130/2.3)	Logical 1	Logical 0
Bit	Signal name	1 signal	0 signal						
00	Status of the DI 3+ (X130/2.3)	Logical 1	Logical 0						
<b>Dependency:</b>	See also: p10017, p10040								

---

**Note**

The relationship between the logic level and the external voltage level at the input depends on the parameterization (see p10040) of the input as NC contact or NO contact, and is aligned to the use of a safety function:

With 24 V at the input, NC contacts have a logical "1" level, for 0 V at the input, a logical "0" level.

This means that an NC/NC contact parameterization of 0 V at both inputs of the F-DI leads to a status of the F-DI equal to "0" (safety function selected), for 24 V at both inputs of the F-DI, to a status of the F-DI equal to "1" (safety function deselected).

With 24 V at the input, NO contacts have a logical "0" level, for 0 V at the input, a logical "1" level. This means that for an NC/NO contact parameterization, the level 0 V/24 V leads to a status of the F-DI equal to "0" (safety function selected), the level 24 V/0 V leads to status of the F-DI equal to "1" (safety function deselected).

F-DI: Failsafe Digital Input

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## 18.2 List of parameters

**r10171.0 SI F-DI status channel B**

**Data type:** Unsigned8      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Display for the status of the failsafe digital inputs.

Bit	Signal name	1 signal	0 signal
00	Status of the F-DI 0	Logical 1	Logical 0

**Note**

If a safety function (e.g. via c10022) is controlled via an F-DI, then the following applies:

- Logical "0": Safety function is selected
  - Logical "1": safety function is deselected
- F-DI: Failsafe Digital Input

**r10175.0...15 SI PROFIsafe control word channel B**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Extended functions  
**Unit:** -

**Description:** Displays the control signals for safety-related motion monitoring functions integrated in the drive via PROFIsafe.

Bit	Signal name	1 signal	0 signal
00	Deselect STO	Yes	No
01	Deselect SS1	Yes	No
04	Deselect SLS	Yes	No
07	Acknowledgment	Signal edge active	No
09	Select SLS bit 0	Set	Not set
10	Select SLS bit 1	Set	Not set
12	Deselect SDI positive	Yes	No
13	Deselect SDI negative	Yes	No
15	Deselect SSM	Yes	No

**r10176 SI PROFIsafe S\_SLS\_LIMIT\_A channel B**

**Data type:** Integer16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Extended functions  
**Unit:** -

**Description:** Dynamic limit value input for SLS (Safely-Limited Speed) via PROFIsafe.

**r10180.0...15 SI status signals channel B**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Extended functions  
**Unit:** -

**Description:** Status signals (channel B) for safety-relevant motion monitoring functions integrated in the drive.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	STO or safe pulse cancellation active	Yes	No
	01	SS1 active	Yes	No
	04	SLS active	Yes	No
	07	Internal event	No	Yes
	09	Active SLS stage bit 0	Set	Not set
	10	Active SLS stage bit 1	Set	Not set
	12	SDI positive active	Yes	No
	13	SDI negative active	Yes	No
	15	SSM (speed below limit value)	Yes	No

**NOTICE**

For bit 07:

An internal event is displayed if a stop function is active.

The signal state behaves in an opposite way to the PROFIsafe Standard.

**Note**

Only the function status signals of the available and enabled functions (see p9604) are updated. All others are 0 across the board.

**r10198 SI actual checksum across device-specific parameters channel B****Data type:** Unsigned32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Basic functions

**Unit:** -**Description:**

Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (actual checksum) channel B.

**Dependency:**

See also: p10199

**p10199 SI reference checksum across device-specific parameters chan B****Data type:** Unsigned32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit Safety Integrated application

**Can be changed in the operating state:**

Commissioning state, device

**Parameter group:**

Basic functions

**Unit:** -**Min:**

0000 hex

**Max:**

FFFF FFFF hex

**Factory setting:**

B2B2 B2B2 hex

**Description:**

Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (reference checksum) channel B.

**Dependency:**

See also: r10198

**r10352.0...17 SI STO select cause****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Safety Integrated

**Unit:** -**Description:**

Reason that STO (Safe Torque Off) function was selected.

## 18.2 List of parameters

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low
	04	Safety commissioning mode active	High	Low
	05	Axis parking active / missing actual value	High	Low
	07	Response to SS1	High	Low
	12	Stop response	High	Low
	14	Response to parameterizing error	High	Low
	15	Response to internal software error	High	Low
	17	No communication via PROFIsafe	High	Low

**r10353.0...17****SI SS1 select cause****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Safety Integrated

**Unit:** -**Description:**

Reason for the selection of function SS1 (Safe Stop 1).

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low
17	No communication via PROFIsafe	High	Low

**r10356.0...1****SI SLS select cause****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Safety Integrated

**Unit:** -**Description:**

Reason for the selection of function SLS (Safely-Limited Speed).

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

**r10360.0...1****SI SDI positive select cause****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Safety Integrated

**Unit:** -**Description:**

Displays the reason why SDI (Safe Direction) positive was selected.

**Bit array:**

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

---

<b>r10361.0...1</b>	<b>SI SDI negative select cause</b>			
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>	Safety Integrated		
	<b>Unit:</b> -			
<b>Description:</b>	Displays the reason why SDI (Safe Direction) negative was selected.			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low

---

<b>r10365.0...1</b>	<b>SI SSM select cause</b>			
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>	Safety Integrated		
	<b>Unit:</b> -			
<b>Description:</b>	Displays the reason why function SSM (Safe Speed Monitor) was selected.			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low

---

<b>r10369.6</b>	<b>SI SBC selection cause</b>			
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Standard display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>	Safety Integrated		
	<b>Unit:</b> -			
<b>Description:</b>	Reason for the selection of function SBC (Safe Brake Control)			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	06	Response to STO	High	Low

---

<b>r10452.0...15</b>	<b>SI STO select cause channel B</b>			
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display		
	<b>Read permission:</b>	Read drive data or acknowledge messages		
	<b>Write permission:</b>	Edit device configuration or drive applications		
	<b>Parameter group:</b>	Safety Integrated		
	<b>Unit:</b> -			
<b>Description:</b>	Reason for the selection of function STO (Safe Torque Off) on channel B.			
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b>	<b>0 signal</b>
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low
	04	Safety commissioning mode active	High	Low
	05	Axis parking active / missing actual value	High	Low
	07	Response to SS1	High	Low
	12	Stop response	High	Low
	14	Response to parameterizing error	High	Low
	15	Response to internal software error	High	Low

**r10453.0...13****SI SS1 select cause channel B**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Reason for the selection of function SS1 (Safe Stop 1) on channel B.

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

**r10456.0...1****SI SLS select cause channel B**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Reason for the selection of function SLS (Safely-Limited Speed) on channel B.

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

**r10460.0...1****SI SDI positive select cause channel B**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Displays the reason why SDI (Safe Direction) positive was selected on channel B.

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

**r10461.0...1****SI SDI negative select cause channel B**

**Data type:** Unsigned32      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Safety Integrated  
**Unit:** -

**Description:** Displays the reason why SDI (Safe Direction) negative was selected on channel B.

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low



---

<b>r10465.0...1</b>	<b>SI SSM select cause channel B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the reason why SI function SSM (Safe Speed Monitor) was selected on channel B.		
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b> <b>0 signal</b>
	00	Selection via F-DI	High      Low
	01	Selection via PROFIsafe	High      Low

---

<b>r10469.6</b>	<b>SI SBC selection cause channel B</b>		
	<b>Data type:</b> Unsigned32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Safety Integrated	
	<b>Unit:</b> -		
<b>Description:</b>	Reason for the selection of function SBC (Safe Brake Control) on Channel B.		
<b>Bit array:</b>	<b>Bit</b>	<b>Signal name</b>	<b>1 signal</b> <b>0 signal</b>
	06	Response to STO	High      Low

---

<b>r60000</b>	<b>PROFIdrive reference speed</b>		
	<b>Data type:</b> FloatingPoint32	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>		
	<b>Unit:</b> rpm		
<b>Description:</b>	Sets the reference quantity for the speed values. All speeds specified as relative values refer to this reference quantity. The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).		
<b>Dependency:</b>	See also: p2000		
	<b>Note</b> Parameter r60000 is an image of parameter p2000 in conformance with PROFIdrive.		

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<b>r60022</b>	<b>PROFIsafe telegram</b>		
	<b>Data type:</b> Unsigned16	<b>Visible in:</b> Extended display	
	<b>Read permission:</b>	Read drive data or acknowledge messages	
	<b>Write permission:</b>	Edit device configuration or drive applications	
	<b>Parameter group:</b>	Safety Integrated, Configuration	
	<b>Unit:</b> -		
<b>Description:</b>	Displays the PROFIsafe telegram.		
<b>Value:</b>	0:	No PROFIsafe telegram selected	
	30:	PROFIsafe standard telegram 30, PZD-1/1	
	901:	PROFIsafe SIEMENS telegram 901, PZD-3/5	
<b>Dependency:</b>	See also: p9611		

**r60044 SI message buffer counter changes**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Extended functions  
**Unit:** -

**Description:** Displays the changes of the safety message buffer.  
This counter is incremented every time that the safety message buffer changes.

**Recommendation:** This is used to check whether the safety message buffer has been read out consistently.

**Dependency:** See also: r9753, r9754, r9755, r9756, r60045, r60048, r60049, p60052

**r60045[0...63] SI message code**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Extended functions  
**Unit:** -

**Description:** Displays the numbers of safety messages that have occurred.

**Dependency:** See also: r9753, r9754, r9755, r9756, r60044, r60048, r60049, p60052

**Note**

The messages type "safety message" (Cxxxxx) are entered in the message fault buffer.

Message buffer structure (principle):

r60045[0], r60048[0], r60049[0], r9753[0], r9754[0], r9755[0], r9756[0] --> safety message 1 (oldest active message) of the actual message case.

...

r60045[7], r60048[7], r60049[7], r9753[7], r9754[7], r9755[7], r9756[7] --> safety message 8 (latest active message) of the actual message case,

Safety messages that have gone are automatically acknowledged.

History of acknowledged messages:

r60045[8], r60048[8], r60049[8], r9753[8], r9754[8], r9755[8], r9756[8] --> safety message 1 of the 1st acknowledged message case,

...

r60045[16], r60048[16], r60049[16], r9753[16], r9754[16], r9755[16], r9756[16] --> safety message 1 of the 2nd acknowledged message case,

...

r60045[56], r60048[56], r60049[56], r9753[56], r9754[56], r9755[56], r9756[56] --> safety message 1 of the 7th acknowledged message case,

...

r60045[63], r60048[63], r60049[63], r9753[63], r9754[63], r9755[63], r9756[63] --> safety message 8 (oldest gone message) of the 7th acknowledged message case,

**r60047[0...63] SI message number**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:**      Read drive data or acknowledge messages  
**Write permission:**      Edit device configuration or drive applications  
**Parameter group:**      Extended functions  
**Unit:** -

**Description:** Displays the numbers of safety messages that have occurred.

**Dependency:** See also: r9753, r9754, r9755, r9756, r60044, r60048, r60049, p60052

**Note**

The messages type "safety message" (Cxxxx) are entered in the message fault buffer.

Message buffer structure (principle):

r60045[0], r60048[0], r60049[0], r9753[0], r9754[0], r9755[0], r9756[0] --> safety message 1 (oldest active message) of the actual message case.

...

r60045[7], r60048[7], r60049[7], r9753[7], r9754[7], r9755[7], r9756[7] --> safety message 8 (latest active message) of the actual message case,

Safety messages that have gone are automatically acknowledged.

History of acknowledged messages:

r60045[8], r60048[8], r60049[8], r9753[8], r9754[8], r9755[8], r9756[8] --> safety message 1 of the 1st acknowledged message case,

...

r60045[16], r60048[16], r60049[16], r9753[16], r9754[16], r9755[16], r9756[16] --> safety message 1 of the 2nd acknowledged message case,

...

r60045[56], r60048[56], r60049[56], r9753[56], r9754[56], r9755[56], r9756[56] --> safety message 1 of the 7th acknowledged message case,

...

r60045[63], r60048[63], r60049[63], r9753[63], r9754[63], r9755[63], r9756[63] --> safety message 8 (oldest gone message) of the 7th acknowledged message case,

**r60048[0...63]****SI message time received in milliseconds**

**Data type:** Unsigned32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Extended functions

**Unit:** ms

**Description:**

Displays the relative system runtime in milliseconds when the safety message occurred.

**Dependency:**

See also: r9753, r9754, r9755, r9756, r60044, r60045, r60049, p60052

**r60049[0...63]****SI message value**

**Data type:** Integer32

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Parameter group:**

Extended functions

**Unit:** -

**Description:**

Displays the additional information about the safety message that occurred (as integer number).

**Dependency:**

See also: r9753, r9754, r9755, r9756, r60044, r60045, r60048, p60052

**p60052****SI message cases counter**

**Data type:** Unsigned16

**Visible in:** Extended display

**Read permission:**

Read drive data or acknowledge messages

**Write permission:**

Edit device configuration or drive applications

**Can be changed in the operating state:** Operation, Ready for operation

**Parameter group:**

Extended functions

**Unit:** -

**Min:**

0

**Max:**

65535

**Factory setting:**

0

**Description:**

Number of safety message cases that have occurred since the last reset.

## 18.2 List of parameters

**Dependency:** The safety message buffer is cleared by resetting the parameter to 0.  
See also: r9753, r9754, r9755, r9756, r60044, r60045, r60048, r60049

**r60100[0...4] PROFIdrive telegram display total**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Configuration  
**Unit:** -

**Description:** Displays the send and receive telegrams.

**Index:** [0] = Subslot 1: MAP  
[1] = Subslot 2: PROFIsafe  
[2] = Subslot 3: standard/SIEMENS  
[3] = Subslot 4: supplementary telegram  
[4] = Subslot 5: supplementary telegram

**Dependency:** See also: r0922, r60022, r60122

**Note**

Value = 65534: No telegram  
Value = 65535: MAP "Module Access Point"

**r60122 PROFIdrive SIC/SCC telegram**

**Data type:** Unsigned16      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Safety Integrated, Configuration  
**Unit:** -

**Description:** Displays the telegram for the Safety Information Channel (SIC) / Safety Control Channel (SCC).

**Value:** 700: Supplementary telegram 700, PZD-0/3  
32766: No telegram

**r61000[0...239] PROFINET Name of Station**

**Data type:** Unsigned8      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Configuration  
**Unit:** -

**Description:** Displays PROFINET Name of Station.

**r61001[0...3] PROFINET IP of Station**

**Data type:** Unsigned8      **Visible in:** Extended display  
**Read permission:** Read drive data or acknowledge messages  
**Write permission:** Edit device configuration or drive applications  
**Parameter group:** Configuration  
**Unit:** -

**Description:** Displays PROFINET IP of Station.

## Faults and alarms

### 19.1 Overview of faults and alarms

#### 19.1.1 Display of faults/alarms (messages)

##### Description

In the case of a fault, the converter signals the corresponding fault(s) and/or alarm(s).

The texts about faults and alarms are displayed via the following interfaces:

- Output of messages via the fault and alarm buffer with a fieldbus connection to the higher-level controller.
- Output of messages via the commissioning interface.

#### 19.1.2 Differences between faults and alarms

##### Overview

An alarm reports an operating state which is non-critical at present. A fault means that it is normally no longer possible to run the motor. The converter therefore responds to alarms and faults differently.

## Description of function

The differences between faults and alarms are as follows:

Message type	Response to a message and removal of the message
Fault	<p>How does a converter respond when a fault occurs?</p> <ul style="list-style-type: none"> <li>• Initiate the appropriate fault response</li> <li>• Set the status signal ZSW1.3</li> <li>• Enter the fault into the fault buffer</li> </ul> <p>How are faults eliminated?</p> <ul style="list-style-type: none"> <li>• Remove the cause of the fault</li> <li>• Acknowledge fault</li> </ul>
Alarm	<p>How does a converter respond when an alarm occurs?</p> <ul style="list-style-type: none"> <li>• Set the status signal ZSW1.7</li> <li>• Enter the alarm into the alarm buffer</li> </ul> <p>How are alarms eliminated?</p> <ul style="list-style-type: none"> <li>• Alarms are self-acknowledging. If the cause of the alarm is no longer present, the converter resets the alarm.</li> </ul>

### 19.1.3 Explanation of the list of faults and alarms

#### Description

The messages are displayed according to the following pattern.

---

<b>Fxxxxx</b>	<b>Fault location (optional): Name</b>									
<b>Message class:</b>	Text of the message class (number according to PROFIdrive)									
<b>Message value:</b>	Component number: %1, fault cause: %2									
<b>Variant:</b>	Product variant									
<b>Component:</b>	Hardware component									
<b>Response:</b>	NONE									
<b>Acknowledgment:</b>	POWER ON									
<b>Explanation of the message value:</b>	For %2									
	<table> <thead> <tr> <th>Value</th> <th>Cause</th> <th>Remedy</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>Fault cause for value = 11</td> <td>Remedy for value = 11</td> </tr> <tr> <td>15</td> <td>Fault cause for value = 15</td> <td>Remedy for value = 15</td> </tr> </tbody> </table>	Value	Cause	Remedy	11	Fault cause for value = 11	Remedy for value = 11	15	Fault cause for value = 15	Remedy for value = 15
Value	Cause	Remedy								
11	Fault cause for value = 11	Remedy for value = 11								
15	Fault cause for value = 15	Remedy for value = 15								
<b>Cause</b>	<p>Description of possible causes.</p> <p>Fault value (r0949, interpret &lt;format&gt;): or alarm value (r2124, interpret &lt;format&gt;): (optional)</p> <p>Information about fault and alarm values (optional).</p>									
<b>Remedy</b>	Description of possible remedies.									

The representation of a message includes as a maximum the information listed below. Depending on the message, some information can be omitted.

- **Fxxxxx**  
A message comprises a letter followed by the relevant number.  
The meaning of the letters is as follows:
  - A means "Alarm"
  - F means "Fault"
  - N means "No message" ("No Report")
  - C means "Safety message" (dedicated message buffer)
- **Fault location (optional): Name**  
The fault location (optional), the name of the fault or alarm and the message number are all used to identify the message (e.g. with the commissioning software).

19.1 Overview of faults and alarms

- **Message class**

Every message is assigned a message class using the following structure:

Text of the message class (number according to PROFIdrive)

The message classes are transferred at different interfaces to the higher-level controller and their associated display and operating units.

The message classes that are available are listed in the following table. In addition to the text of the message class and its number according to PROFIdrive – as well as a brief help text regarding the cause and remedy – they also include information about the various diagnostic interfaces:

- PN (hex)  
Specifies the "Channel error type" of the PROFINET channel diagnostics.  
When activating the channel diagnostics, using the GSDML file, the texts listed in the table can be displayed.
- DS1 (dec)  
Specifies the bit number in data set DS1 of the diagnostic alarm for SIMATIC S7.  
When the diagnostic alarms are activated, the texts listed in the table can be displayed.

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
		PN (hex)	DS1 (dec)
<b>Cause and remedy</b>			
<b>Hardware fault/software error</b> A hardware or software malfunction has been identified. <ul style="list-style-type: none"> <li>• Carry out a POWER ON for the relevant component.</li> <li>• If it occurs again, contact the hotline.</li> <li>• Replace device.</li> </ul>	1	9000	0
<b>Line fault</b> A line supply fault has occurred (phase failure, voltage level, etc.). <ul style="list-style-type: none"> <li>• Check the line supply/fuses.</li> <li>• Check the supply voltage.</li> <li>• Check the wiring.</li> </ul>	2	9001	1
<b>Supply voltage fault</b> An electronics supply voltage fault (48 V, 24 V, 5 V...) was detected. <ul style="list-style-type: none"> <li>• Check the wiring.</li> <li>• Check the voltage level.</li> </ul>	3	9002	2
<b>DC link overvoltage</b> The DC link voltage has assumed an inadmissibly high value. <ul style="list-style-type: none"> <li>• Check the dimensioning of the system (line supply, reactor, voltages).</li> <li>• Check the infeed settings.</li> </ul>	4	9003	3



Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy	PN (hex)	DS1 (dec)	
<b>Power electronics fault</b> An inadmissible operating state of the power electronics has been identified (overcurrent, overtemperature, IGBT failure, ...). <ul style="list-style-type: none"> <li>• Check that the permissible duty cycles are complied with.</li> <li>• Check the ambient temperatures (fan).</li> </ul>	5	9004	4
<b>Electronic component overload</b> The temperature in the component has exceeded the highest permissible limit. <ul style="list-style-type: none"> <li>• Check the ambient temperature /control cabinet cooling.</li> </ul>	6	9005	5
<b>Ground fault / inter-phase short-circuit detected</b> A ground fault/interphase short-circuit was detected in the power cables or in the motor windings. <ul style="list-style-type: none"> <li>• Check the power cables (connection).</li> <li>• Check the motor.</li> </ul>	7	9006	6
<b>Motor overload</b> The motor was operated outside the permissible limits (temperature, current, torque, ...). <ul style="list-style-type: none"> <li>• Check the duty cycles and set limits.</li> <li>• Check the ambient temperature / motor cooling.</li> </ul>	8	9007	7
<b>Communication error to the higher-level controller</b> The communication to the higher-level controller (internal coupling, PROFIBUS, PROFINET, ...) is faulted or interrupted. <ul style="list-style-type: none"> <li>• Check the state of the higher-level controller.</li> <li>• Check the communication connection/wiring.</li> <li>• Check the bus configuration/clock cycles.</li> </ul>	9	9008	8
<b>Safety monitoring channel has identified an error</b> A safe operation monitoring function (Safety) has identified an error.	10	9009	9
<b>Actual position value / actual speed value incorrect or not available</b> An illegal signal state was detected while evaluating the encoder signals (track signals, zero marks, absolute values, ...). <ul style="list-style-type: none"> <li>• Check the encoder / status of the encoder signals.</li> <li>• Observe the maximum permissible frequencies.</li> </ul>	11	900A	10
<b>Internal (DRIVE-CLiQ) communication error</b> The internal communication between the SINAMICS components is faulted or interrupted. <ul style="list-style-type: none"> <li>• Check the DRIVE-CLiQ wiring.</li> <li>• Ensure an EMC-compliant design.</li> <li>• Observe the maximum quantity structure/cycles.</li> </ul>	12	900B	11

19.1 Overview of faults and alarms

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		PN (hex)	DS1 (dec)
<p><b>Infeed fault</b> The infeed is faulted or has failed.</p> <ul style="list-style-type: none"> <li>• Check the infeed and its environment (line supply, filters, reactors, fuses...).</li> <li>• Check the infeed control.</li> </ul>	13	900C	12
<p><b>Braking controller / Braking Module faulted</b> The internal or external Braking Module is faulted or overloaded (temperature).</p> <ul style="list-style-type: none"> <li>• Check the connection/state of the Braking Module.</li> <li>• Comply with the permissible number of braking operations and their duration.</li> </ul>	14	900D	13
<p><b>Line filter faulted</b> The line filter monitoring has identified an excessively high temperature or other inadmissible state.</p> <ul style="list-style-type: none"> <li>• Check the temperature / temperature monitoring.</li> <li>• Check the configuration to ensure that it is permissible (filter type, infeed, thresholds).</li> </ul>	15	900E	14
<p><b>External measured value / signal state outside of the permissible range</b> A measured value / signal state read in via the input area (digital/analog/temperature) has assumed an inadmissible value/state.</p> <ul style="list-style-type: none"> <li>• Determine and check the relevant signal.</li> <li>• Check the set thresholds.</li> </ul>	16	900F	15
<p><b>Application / technology function faulted</b> The application / technological function has exceeded a (set) limit (position, speed, torque, ...).</p> <ul style="list-style-type: none"> <li>• Determine and check the relevant limit.</li> <li>• Check the setpoint specified by the higher-level controller.</li> </ul>	17	9010	16
<p><b>Error in the parameterization/configuration/commissioning sequence</b> An error has been identified in the parameterization or in a commissioning procedure, or the parameterization does not match the existing device configuration.</p> <ul style="list-style-type: none"> <li>• Determine the precise cause of the fault using the commissioning tool.</li> <li>• Adapt the parameterization or device configuration.</li> </ul>	18	9011	17
<p><b>General drive fault</b> Group fault.</p> <ul style="list-style-type: none"> <li>• Determine the precise cause of the fault using the commissioning tool.</li> </ul>	19	9012	18

- Message value**  
 Provides information about the composition of the fault/alarm value.  
 Example:  
 Message value: Component number: %1, fault cause: %2  
 In this example, the message value contains information about the component number and cause of the fault. Entries %1 and %2 are placeholders. If the commissioning software is connected to the converter, then these placeholders are populated with the appropriate values.
- Variant**  
 Specifies the product variant in which the message exists. This information is not applicable if an alarm is the same for all product variants.
- Component**  
 Type of hardware component that has triggered the fault or alarm. For "None", it is not possible to assign the message to a hardware component.
- Explanation of the message value**  
 Explains the possible values of the variables (%n) in the message value. In this case, detailed information can be specified regarding the cause and remedy for specific values.
- Response**  
 Specifies the response in the event of a fault.  
 The following table lists all fault responses and their meanings used for the entire SINAMICS drive family.

List	PROFI-drive	Response	Description
NONE	–	None	No response when a fault occurs.
OFF1	ON/OFF	Brake along the ramp-function generator deceleration ramp followed by pulse inhibit	<ul style="list-style-type: none"> <li>The motor is braked by immediately specifying <math>n\_set = 0</math> at the ramp-function generator deceleration ramp (p1121).</li> <li>The pulses are suppressed when standstill has been identified.</li> <li>"Switching on inhibited" is activated.</li> </ul>
OFF2	COAST-STOP	Internal/external pulse inhibit	<ul style="list-style-type: none"> <li>Immediate pulse cancellation, the motor "coasts down" to a standstill.</li> <li>"Switching on inhibited" is activated.</li> </ul>
OFF3	QUICK-STOP	Braking along the OFF3 deceleration ramp followed by pulse inhibit	<ul style="list-style-type: none"> <li>The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering <math>n\_set = 0</math>.</li> <li>The pulses are suppressed when standstill has been identified.</li> <li>"Switching on inhibited" is activated.</li> </ul>
STOP2	–	STOP2	<ul style="list-style-type: none"> <li>The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering <math>n\_set = 0</math>.</li> <li>The drive remains in closed-loop speed control.</li> </ul>
ENCODER	–	Internal/external pulse inhibit	The ENCODER fault response occurs because of a sensor error and results in OFF2.

19.1 Overview of faults and alarms

- **Acknowledgment**

A fault can only be acknowledged if the cause has been resolved.  
 The acknowledgment specifies when the fault can be acknowledged.  
 An alarm is self-acknowledging.

Acknowledgment	Description
IMMEDIATELY	Acknowledgment can be immediately realized after the cause has been resolved.
PULSE INHIBIT	Once the cause has been resolved, the fault can only be acknowledged when the pulses are inhibited ( $r0899.11 = 0$ ).
POWER ON	The fault can only be acknowledged using POWER ON (the converter is switched-off/switched-on).
NONE	For alarms (type "A"), an acknowledgment is not required.

- **Cause**

Describes the possible causes of the fault or alarm. Optionally, a message value, fault value or alarm value can be additionally specified.

- **Remedy**

Generally explains possible procedures to resolve the cause of this active fault or alarm.

## 19.2 List of faults and alarms

### Faults and alarms

The following list contains the faults and alarms of the S210 product.

Product: SINAMICS S210, Version: 601122000, Language: eng  
Objects: S210

---

#### F01000 Internal software error

**Message class:** Hardware/software error (1)

**Message value:** Module: %1, line: %2

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** POWER ON

**Cause:** An internal software error has occurred.  
Fault value (r0949, interpret hexadecimal):  
Only for internal Siemens troubleshooting.

**Remedy:**

- Evaluate fault buffer (r0945).
- Carry out a POWER ON (switch-off/switch-on) for all components.
- If required, check the data on the non-volatile memory (e.g. memory card).
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the Control Unit.

---

#### F01001 FloatingPoint exception

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** POWER ON

**Cause:** An exception occurred for an operation with the FloatingPoint data type.  
The error can be caused by the basic system or a technology function.  
Fault value (r0949, interpret hexadecimal):  
Only for internal Siemens troubleshooting.

**Remedy:**

- Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version.
- Contact Technical Support.

---

#### F01002 Internal software error

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** An internal software error has occurred.  
Fault value (r0949, interpret hexadecimal):  
Only for internal Siemens troubleshooting.

19.2 List of faults and alarms

**Remedy:**

- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

---

**F01003 Acknowledgment delay when accessing the memory**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** A memory area was accessed that does not return a "READY".

Fault value (r0949, interpret hexadecimal):

Only for internal Siemens troubleshooting.

**Remedy:**

- Carry out a POWER ON (switch-off/switch-on) for all components.
- Contact Technical Support.

---

**N01004 Internal software error**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** An internal software error has occurred.

Fault value (r0949, hexadecimal):

Only for internal Siemens troubleshooting.

**Remedy:**

- Contact Technical Support.

---

**F01005 Firmware download for DRIVE-CLiQ component unsuccessful**

**Message class:** Hardware/software error (1)

**Message value:** Component number: %1, fault cause: %2

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Explanation of the message value:** For %2

Value	Cause	Remedy
11	DRIVE-CLiQ component has detected a checksum error.	After POWER ON has been carried out again for the DRIVE-CLiQ component, download firmware again.
15	The selected DRIVE-CLiQ component did not accept the contents of the firmware file.	Use a suitable firmware version
18	Firmware version is too old and is not accepted by the component.	Use a suitable firmware version
19	Firmware version is not suitable for the hardware release of the component.	Use a suitable firmware version
101	After several communication attempts, no response from the DRIVE-CLiQ component.	Check the DRIVE-CLiQ wiring.
139	Initially, only one new boot loader was loaded.	After POWER ON has been carried out again for the DRIVE-CLiQ component, download firmware again.
140	Firmware file for the DRIVE-CLiQ component not available on the memory card.	Use a suitable firmware version
141	An inconsistent length of the firmware file was signaled.	Use a suitable firmware version
142	Component has not changed to the mode for firmware download.	After POWER ON has been carried out again for the DRIVE-CLiQ component, download firmware again.
156	Component with the specified component number is not available (p7828).	Check the selected component number.

**Cause:** It was not possible to download the firmware to a DRIVE-CLiQ component.

Fault value (r0949, interpret hexadecimal):

yyxxxx hex: yy = component number, xxxx = fault cause

Example: xxxx = 000B hex = 11 dec:

xxxx = 008D hex = 141 dec:

An inconsistent length of the firmware file was signaled.

The firmware download may have been caused by a loss of connection to the firmware file.

This can occur during a project download/reset in the case of a SINAMICS Integrated Control Unit, for example.

xxxx = 008F hex = 143 dec:

Component has not changed to the mode for firmware download. It was not possible to delete the existing firmware.

xxxx = 0090 hex = 144 dec:

When checking the firmware that was downloaded (checksum), the component detected a fault. It is possible that the file on the memory card is defective.

xxxx = 0091 hex = 145 dec:

Checking the loaded firmware (checksum) was not completed by the component in the appropriate time.

**Remedy:**

- Check the selected component number.
- Check the DRIVE-CLiQ wiring.
- Use a component with a suitable hardware version.
- After warm restart has been carried out again for the DRIVE-CLiQ component, download the firmware again.

---

## A01006 Firmware update for DRIVE-CLiQ component required

**Message class:** General drive fault (19)

**Message value:** Component number: %1

**Component:** None

19.2 List of faults and alarms

**Response:** NONE  
**Acknowledgment:** NONE  
**Explanation of the message value:** For %1  
Component in target topology  
**Cause:** The firmware of a DRIVE-CLiQ component must be updated as there is no suitable firmware or firmware version in the component for operation with the converter.  
Alarm value (r2124, interpret decimal):  
Component number of the DRIVE-CLiQ component.  
**Remedy:** Repeat the firmware update by switching off the device and switching on again.

---

**A01007 POWER ON for DRIVE-CLiQ component required**

**Message class:** General drive fault (19)  
**Message value:** Component number: %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Explanation of the message value:** For %1  
Component in target topology  
**Cause:** A DRIVE-CLiQ component must be switched on again (POWER ON) (e.g. due to a firmware update).  
Alarm value (r2124, interpret decimal):  
Component number of the DRIVE-CLiQ component.  
Note:  
For a component number = 1, a POWER ON of the Control Unit is required.  
**Remedy:**  
- Switch off the power supply of the specified DRIVE-CLiQ component and switch it on again.  
- For SINUMERIK, auto commissioning is prevented. In this case, a POWER ON is required for all components and the auto commissioning must be restarted.

---

**A01009 CU: Control module overtemperature**

**Message class:** Overtemperature of the electronic components (6)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The temperature (r0037[0]) of the control module (Control Unit) has exceeded the specified limit value.  
**Remedy:**  
- Check the air intake for the Control Unit.  
- Check the Control Unit fan.  
Note:  
The alarm is automatically withdrawn once the limit value has been fallen below.

---

**F01011 Download interrupted**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY



**Cause:** The project download was interrupted.  
 Fault value (r0949, interpret decimal):  
 1: The user prematurely interrupted the project download.  
 2: The communication cable was interrupted (e.g. cable breakage, cable withdrawn).  
 3: The project download was prematurely exited by the commissioning tool.  
 100: Different versions between the firmware version and project files which were loaded by loading into the file system "Download from memory card".  
**Note:**  
 The response to an interrupted download is the state "first commissioning".

**Remedy:**

- Check the communication cable.
- Download the project again.
- Boot from previously saved files (switch-off/switch-on or p0976).
- When loading into the file system (download from memory card), use the matching version.

**A01012 Update file invalid or corrupted**

**Message class:** Hardware/software error (1)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The converter has identified an invalid or corrupted update file.  
**Remedy:** Replace update file with a valid update file provided by Siemens.

**F01015 Internal software error**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** OFF2  
**Acknowledgment:** POWER ON  
**Cause:** An internal software error has occurred.  
 Fault value (r0949, interpret decimal):  
 Only for internal Siemens troubleshooting.

**Remedy:**

- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

**A01016 Firmware changed**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** At least one firmware file in the directory was illegally changed on the non-volatile memory (memory card/device memory) with respect to the version when shipped from the factory.  
 Alarm value (r2124, interpret decimal):  
 0: Checksum of one file is incorrect.  
 1: File missing.  
 2: File too many.  
 3: Incorrect firmware version.  
 4: Incorrect checksum of the backup file.

19.2 List of faults and alarms

---

**Remedy:** For the non-volatile memory for the firmware (memory card/device memory), restore the delivery condition.

---

**F01018 Runup has been interrupted several times**

**Message class:** Hardware/software error (1)

**Message value:** -

**Component:** None

**Response:** NONE

**Acknowledgment:** POWER ON

**Cause:** Module booting was interrupted several times. As a consequence, the module boots with the factory setting.

Possible reasons for booting being interrupted:

- Power supply interrupted.
- CPU crashed.
- Parameterization invalid.

**Remedy:** - Carry out a POWER ON (switch-off/switch-on). After switching on, the module reboots from the valid parameterization (if available).

- Restore the valid parameterization.

Examples:

a) Carry out a first commissioning, save, carry out a POWER ON (switch-off/switch-on).

b) Load another valid parameter backup (e.g. from the memory card), save, carry out a POWER ON (switch-off/switch-on).

Note:

If the fault situation is repeated, then this fault is again output after several interrupted boots.

---

**A01019 Writing to the removable data medium unsuccessful**

**Message class:** Hardware/software error (1)

**Message value:** -

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The write access to the removable data medium was unsuccessful.

**Remedy:** - Check the removable data medium and if required replace.

- Repeat the data backup.

---

**A01020 Writing to RAM disk unsuccessful**

**Message class:** Hardware/software error (1)

**Message value:** -

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** A write access to the internal RAM disk was unsuccessful.

**Remedy:** Adapt the file size for the system logbook to the internal RAM disk (p9930).

---

**F01023 Software timeout (internal)**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

---

**Cause:** An internal software timeout has occurred.  
 Fault value (r0949, interpret decimal):  
 Only for internal Siemens troubleshooting.

**Remedy:** - Carry out a POWER ON (switch-off/switch-on) for all components.  
 - Upgrade firmware to later version.  
 - Contact Technical Support.

**F01030 Sign-of-life failure for master control**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None  
**Response:** OFF3  
**Acknowledgment:** IMMEDIATELY

**Cause:** For active PC master control of the PC, no sign-of-life was received within the monitoring time.  
 The master control was returned to the drive.

**Remedy:** Set the monitoring time higher at the PC or, if required, completely disable the monitoring function.  
 The monitoring time is set as follows using the commissioning tool:  
 <Drive> -> Commissioning -> Control panel -> Button "Fetch master control" -> A window is displayed to set the monitoring time in milliseconds.  
 Notice:  
 The monitoring time should be set as short as possible. A long monitoring time means a late response when the communication fails!

**F01033 Units changeover: Reference parameter value invalid**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** Parameter: %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** When changing over the units to the referred representation type, it is not permissible for any of the required reference parameters to be equal to 0.0  
 Fault value (r0949, parameter):  
 Reference parameter whose value is 0.0.

**Remedy:** Set the value of the reference parameter to a number different than 0.0.  
 See also: r0304 (Rated motor voltage), r0305 (Rated motor current), p2000 (Reference speed), p2002 (Reference current), p2003 (Reference torque)

**F01034 Units changeover: Calculation parameter values after reference value change unsuccessful**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** Parameter: %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The change of a reference parameter meant that for an involved parameter the selected value was not able to be re-calculated in the per unit representation. The change was rejected and the original parameter value restored.  
 Fault value (r0949, parameter):  
 Parameter whose value was not able to be re-calculated.  
 See also: r0304 (Rated motor voltage), r0305 (Rated motor current), p2000 (Reference speed), p2002 (Reference current), p2003 (Reference torque)

**Remedy:** - Select the value of the reference parameter such that the parameter involved can be calculated in the per unit representation.

---

**A01035 ACX: Parameter backup file corrupted**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** When the Control Unit is booted, no complete data set was found from the parameter backup files. The last time that the parameterization was saved, it was not completely carried out.

It is possible that the backup was interrupted by switching off or withdrawing the memory card.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

aa = 01 hex:

Power up was realized without data backup. The drive is in the factory setting.

aa = 02 hex:

The last available backup data record was loaded. The parameterization must be checked. It is recommended that the parameterization is downloaded again.

dd, cc, bb:

Only for internal Siemens troubleshooting.

See also: p0977 (Save all parameters)

**Remedy:** - Download the project again using the commissioning tool.

- Save all parameters (p0977 = 1 or retentively save).

See also: p0977 (Save all parameters)

---

**F01036 Parameter backup file missing**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** When loading the device parameterization, a parameter backup file cannot be found.

**Remedy:** If you have saved your project data using the commissioning tool, carry-out a new download for your project.

Save parameters (p0977 = 1 or retentively save).

This means that the parameter files are again completely written into the non-volatile memory.

Note:

If the project data have not been backed up, then a new first commissioning is required.

---

**F01039 ACX: Writing to the parameter backup file was unsuccessful**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

- Cause:** Writing to at least one parameter backup file PSxxxxxyy.\*\*\* in the non-volatile memory was unsuccessful.
- A parameter backup file PSxxxxxyy.\*\*\* has the "read only" file attribute and cannot be overwritten.
  - There is not sufficient free memory space available.
  - The non-volatile memory is defective and cannot be written to.
- Fault value (r0949, interpret hexadecimal):  
 dcba hex  
 a = yyy in the file names PSxxxxxyy.\*\*\*  
 a = 000 --> consistency backup file  
 a = 001 ... 062 --> drive object number  
 a = 070 --> FEPROM.BIN  
 a = 080 --> DEL4BOOT.TXT  
 a = 099 --> PROFIBUS parameter backup file  
 b = xxx in the file names PSxxxxxyy.\*\*\*  
 b = 000 --> data save started with p0977 = 1  
 b = 010 --> data save started with p0977 = 10  
 b = 011 --> data save started with p0977 = 11  
 b = 012 --> data save started with p0977 = 12  
 d, c:  
 Only for internal Siemens troubleshooting.
- Remedy:**
- Check the file attribute of the files (PSxxxxxyy.\*\*\*, CAxxxxxyy.\*\*\*, CCxxxxxyy.\*\*\*) and, if required, change from "read only" to "writeable".
  - Check the free memory space in the non-volatile memory. Approx. 80 kbyte of free memory space is required for every drive object in the system.
  - Replace the memory card or Control Unit.

**F01040 Save parameter settings and carry out a POWER ON**

- Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** POWER ON  
**Cause:** A parameter was changed, which means that it is necessary to save the parameters and reboot.  
**Remedy:**
- Save parameters (p0977).
  - Carry out a POWER ON (switch-off/switch-on).
- Then:
- Upload the data to the converter (commissioning tool).

**F01041 Parameter save necessary**

- Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

- Cause:** Defective or missing files were detected on the memory card when booting.  
Fault value (r0949, interpret decimal):  
1: Source file cannot be opened.  
2: Source file cannot be read.  
3: Target directory cannot be set up.  
4. Target file cannot be set up/opened.  
5. Target file cannot be written to.  
Additional values:  
Only for internal Siemens troubleshooting.
- Remedy:**
- Save the parameters.
  - Download the project again to the drive unit.
  - Update the firmware
  - If required, replace the Control Unit and/or memory card.

---

**F01042      Parameter error during project download**

- Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** Parameter: %1, index: %2, fault cause: %3  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

<b>Cause:</b>	<p>An error was detected when downloading a project using the commissioning software (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters. The detailed cause of the fault can be determined using the fault value. Fault value (r0949, interpret hexadecimal): ccbbaaaa hex aaaa = Parameter bb = Index cc = fault cause 0: Parameter number illegal. 1: Parameter value cannot be changed. 2: Lower or upper value limit exceeded. 3: Sub-index incorrect. 4: No array, no sub-index. 5: Data type incorrect. 6: Setting not permitted (only resetting). 7: Descriptive element cannot be changed. 9: Descriptive data not available. 11: No master control. 15: No text array available. 17: Task cannot be executed due to operating state. 20: Illegal value. 21: Response too long. 22: Parameter address illegal. 23: Format illegal. 24: Number of values not consistent. 25: Drive object does not exist. 101: Presently deactivated. 104: Illegal value. 107: Write access not permitted when controller enabled. 108: Unit unknown. 109: Write access only in the commissioning status, encoder. 110: Write access only in the commissioning status, motor. 111: Write access only in the commissioning status, power unit. 112: Write access only in the quick commissioning mode. 113: Write access only in the ready mode. 114: Write access only in the commissioning status, parameter reset. 115: Write access only in the Safety Integrated commissioning status. 116: Write access only in the commissioning status, technological application/units. 117: Write access only in the commissioning status. 118: Write access only in the commissioning status, download. 119: Parameter may not be written in download. 120: Write access only in the commissioning status, drive basis configuration. 121: Write access only in the commissioning status, define drive type. 122: Write access only in the commissioning status, data set basis configuration. 123: Write access only in the commissioning status, device configuration. 124: Write access only in the commissioning status, device download. 125: Write access only in the commissioning status, device parameter reset. 126: Write access only in the commissioning status, device ready. 127: Write access only in the commissioning status, device. 129: Parameter may not be written in download. 131: Requested signal interconnection not possible as the signal source does not supply float value. 132: Free signal interconnection via PROFIdrive telegram setting inhibited.</p>
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19.2 List of faults and alarms

- 133: Access method not defined.
- 200: Below the valid values.
- 201: Above the valid values.
- 202: Cannot be accessed from the Basic Operator Panel (BOP).
- 203: Cannot be read from the Basic Operator Panel (BOP).
- 204: Write access not permitted.

**Remedy:**

- Correct the parameterization in the commissioning tool and download the project again.
- Enter the correct value in the specified parameter.
- Identify the parameter that restricts the limits of the specified parameter.

---

**F01043 Fatal error at project download**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** Fault cause: %1

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** A fatal error was detected when downloading a project using the commissioning tool.

Fault value (r0949, interpret decimal):

- 1: Device status cannot be changed to Device Download (drive object ON?).
- 2: Incorrect drive object number.
- 3: A drive object that has already been deleted is deleted again.
- 4: Deleting a drive object that has already been registered for generation.
- 5: Deleting a drive object that does not exist.
- 6: Generating an undeleted drive object that already existed.
- 7: Regenerating a drive object already registered for generation.
- 8: Maximum number of drive objects that can be generated exceeded.
- 9: Error while generating a device drive object.
- 10: Error when generating the target topology parameter.
- 11: Error when generating a drive object (global component).
- 12: Error when generating a drive object (drive component).
- 13: Unknown drive object type.
- 14: Drive status cannot be changed to "ready for operation" (r0947 and r0949).
- 15: Drive status cannot be changed to drive download.
- 16: Device status cannot be changed to "ready for operation".
- 17: It is not possible to download the topology. The component wiring should be checked, taking into account the various messages/signals.
- 18: A new download is only possible if the factory settings are restored for the drive unit.
- 20: The configuration is inconsistent.
- 21: Error when accepting the download parameters.
- 22: Software-internal download error.
- 24: Download not possible during a partial power up after inserting a component.

Additional values:

Only for internal Siemens troubleshooting.

**Remedy:**

- Use the current version of the commissioning tool.
- Modify the offline project and carry out a new download (e.g. compare the number of drive objects, motor, encoder, power unit in the offline project and at the drive).
- Change the drive state (is a drive rotating or is there a message/signal?).
- Observe additional active messages/signals and remove their cause (e.g. correct any incorrectly set parameters).
- Automatically calculate the control parameters.
- Boot from previously saved files (switch-off/switch-on or p0976).
- Before a new download, restore the factory setting.



---

**F01044 CU: Descriptive data error**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** OFF2  
**Acknowledgment:** POWER ON  
**Cause:** An error was detected when loading the descriptive data saved in the non-volatile memory.  
**Remedy:** Replace the memory card or Control Unit.

---

**A01045 CU: Configuring data invalid**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** An error was detected when evaluating the parameter files PSxxxxxyy.ACX, PTxxxxxyy.ACX, CAxxxxxyy.ACX, or CCxxxxxyy.ACX saved in the non-volatile memory. Because of this, under certain circumstances, several of the saved parameter values were not able to be accepted.  
Alarm value (r2124, interpret hexadecimal):  
Only for internal Siemens troubleshooting.  
**Remedy:** - Restore the factory setting (p0976 = 1) and reload the project into the converter.  
Then save the parameterization using the "Copy RAM to ROM" or with p0977 = 1. This overwrites the incorrect parameter files in the non-volatile memory – and this alarm is withdrawn.

---

**A01049 CU: It is not possible to write to file**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** It is not possible to write to a write-protected parameter backup file. The write request was interrupted.  
Alarm value (r2124, interpret decimal):  
Drive object number.  
**Remedy:** Check whether the "write protected" attribute has been set for the files in the non-volatile memory.  
When required, remove write protection and repeat the save operation (e.g. set p0977 = 1).

---

**F01050 Memory card and device incompatible**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The memory card and the device type do not match (e.g. a memory card for SINAMICS S is inserted in SINAMICS G).  
**Remedy:** - Insert the matching memory card.  
- Use the matching Control Unit or power unit.

---

**A01069 Parameter backup and device incompatible**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -

19.2 List of faults and alarms

---

**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The parameter backup on the memory card and the drive unit do not match.  
The module boots with the factory settings.  
Example:  
Devices A and B. are not compatible and a memory card with the parameter backup for device A is inserted in device B.  
**Remedy:**  
- Insert a memory card with compatible parameter backup and carry out a POWER ON.  
- Insert a memory card without parameter backup and carry out a POWER ON.  
- Save the parameters (p0977 = 1).

---

**F01070 Project/firmware is being downloaded to the memory card**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** An upgrade (project/firmware download) was initiated on the memory card.  
While this fault is active, the corresponding update takes place with plausibility and consistency checks. After this, depending on the command option, a new boot (reset) for the Control Unit is initiated.  
Caution:  
It is not permissible to switch off the Control Unit during the upgrade and while this fault is active.  
If the operation is interrupted, this can destroy the file system on the memory card. The memory card will then no longer work properly and must be repaired.  
**Remedy:** Not necessary.  
The fault is automatically withdrawn after the upgrade has been completed.

---

**F01072 Memory card restored from the backup copy**

**Message class:** General drive fault (19)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The Control Unit was switched-off while writing to the memory card. This is why the visible partition became defective.  
After switching on, the data from the non-visible partition (backup copy) were written to the visible partition.  
**Remedy:** Check that the firmware and parameterization is up-to-date.

---

**A01073 POWER ON required for backup copy on memory card**

**Message class:** General drive fault (19)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The parameter assignment on the visible partition of the memory card has changed.  
In order that the backup copy on the memory card is updated on the non-visible partition, it is necessary to carry out a POWER ON or hardware reset (p0972) of the converter.  
Note:  
It is possible that a new POWER ON is requested via this alarm.  
**Remedy:**  
- Carry out a POWER ON for the converter (switch off/switch on).  
- Carry out a hardware reset (RESET button, p0972).

<b>F01082</b>	<b>Parameter error when running up from data backup</b>
<b>Message class:</b>	Error in the parameterization / configuration / commissioning procedure (18)
<b>Message value:</b>	Parameter: %1, index: %2, fault cause: %3
<b>Component:</b>	None
<b>Response:</b>	OFF2
<b>Acknowledgment:</b>	IMMEDIATELY

### 19.2 List of faults and alarms

---

- Cause:** Parameterizing errors have been detected (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters.
- The detailed cause of the fault can be determined using the fault value.
- Fault value (r0949, interpret hexadecimal):
- ccbbaaaa hex
- aaaa = Parameter
- bb = Index
- cc = fault cause
- 0: Parameter number illegal.
  - 1: Parameter value cannot be changed.
  - 2: Lower or upper value limit exceeded.
  - 3: Sub-index incorrect.
  - 4: No array, no sub-index.
  - 5: Data type incorrect.
  - 6: Setting not permitted (only resetting).
  - 7: Descriptive element cannot be changed.
  - 9: Descriptive data not available.
  - 11: No master control.
  - 15: No text array available.
  - 17: Task cannot be executed due to operating state.
  - 20: Illegal value.
  - 21: Response too long.
  - 22: Parameter address illegal.
  - 23: Format illegal.
  - 24: Number of values not consistent.
  - 25: Drive object does not exist.
  - 101: Presently deactivated.
  - 104: Illegal value.
  - 107: Write access not permitted when controller enabled.
  - 108: Unit unknown.
  - 109: Write access only in the commissioning status, encoder.
  - 110: Write access only in the commissioning status, motor.
  - 111: Write access only in the commissioning status, power unit.
  - 112: Write access only in the quick commissioning mode.
  - 113: Write access only in the ready mode.
  - 114: Write access only in the commissioning status, parameter reset.
  - 115: Write access only in the Safety Integrated commissioning status.
  - 116: Write access only in the commissioning status, technological application/units.
  - 117: Write access only in the commissioning status.
  - 118: Write access only in the commissioning status, download.
  - 119: Parameter may not be written in download.
  - 120: Write access only in the commissioning status, drive basis configuration.
  - 121: Write access only in the commissioning status, define drive type.
  - 122: Write access only in the commissioning status, data set basis configuration.
  - 123: Write access only in the commissioning status, device configuration.
  - 124: Write access only in the commissioning status, device download.
  - 125: Write access only in the commissioning status, device parameter reset.
  - 126: Write access only in the commissioning status, device ready.
  - 127: Write access only in the commissioning status, device.
  - 129: Parameter may not be written in download.
  - 131: Requested signal interconnection not possible as the signal source supplies non-float value.
  - 132: Free signal interconnection via PROFIdrive telegram setting inhibited.

- 133: Access method not defined.
- 200: Below the valid values.
- 201: Above the valid values.
- 202: Cannot be accessed from the Basic Operator Panel (BOP).
- 203: Cannot be read from the Basic Operator Panel (BOP).
- 204: Write access not permitted.

**Remedy:**

- Correct the parameterization in the commissioning tool and download the project again.
- Enter the correct value in the specified parameter.
- Identify the parameter that restricts the limits of the specified parameter.

---

**F01122 Frequency at the measuring probe input too high**

**Message class:** Application/technological function faulted (17)  
**Message value:** %1  
**Component:** None  
**Response:** OFF1  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The frequency of the pulses at the measuring probe input is too high.  
Fault value (r0949, interpret decimal):  
1: DI/DO 9 (X122.8)  
2: DI/DO 10 (X122.10)  
4: DI/DO 11 (X122.11)  
8: DI/DO 13 (X132.8)  
16: DI/DO 14 (X132.10)  
32: DI/DO 15 (X132.11)  
64: DI/DO 8 (X122.7)  
128: DI/DO 12 (X132.7)  
**Remedy:** Reduce the frequency of the pulses at the measuring probe input.

---

**F01250 CU: CU-EEPROM incorrect read-only data**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** POWER ON  
**Cause:** Error when reading the read-only data of the EEPROM in the Control Unit.  
Fault value (r0949, interpret decimal):  
Only for internal Siemens troubleshooting.  
**Remedy:**  
- Carry out a POWER ON (switch-off/switch-on).  
- Replace the Control Unit.

---

**A01251 EEPROM incorrect read-write data**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** Error when reading the read-write data of the EEPROM in the converter.  
Alarm value (r2124, interpret decimal):  
Only for internal Siemens troubleshooting.

19.2 List of faults and alarms

**Remedy:** For alarm value < 256, the following applies:  
- Carry out a POWER ON (switch-off/switch-on).  
- Replace the converter.  
For alarm value >= 256, the following applies:  
- For the drive object with this alarm, clear the fault memory (p0952 = 0).  
- Replace the converter.

---

**A01304 Firmware version of DRIVE-CLiQ component is not up-to-date**

**Message class:** General drive fault (19)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The non-volatile memory has a more recent firmware version than the one in the connected DRIVE-CLiQ component.  
Alarm value (r2124, interpret decimal):  
Component number of the DRIVE-CLiQ component involved.  
**Remedy:** Repeat the firmware update by switching off the device and switching on again.

---

**A01306 Firmware of the DRIVE-CLiQ component being updated**

**Message class:** General drive fault (19)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** Firmware update is active for at least one DRIVE-CLiQ component.  
Alarm value (r2124, interpret decimal):  
Component number of the DRIVE-CLiQ component.  
**Remedy:** Not necessary.  
This alarm is automatically withdrawn after the firmware update has been completed.

---

**A01330 Topology: Commissioning not possible**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** Unable to carry out commissioning. The actual topology does not fulfill the requirements.  
**Remedy:** - Check the OCC cable between the converter and motor/encoder.  
- Carry out a POWER ON (switch-off/switch-on).  
- Check that the connected hardware is supported.  
**Note:**  
OCC: One Cable Connection (one cable system)

---

**F01357 Topology: Two converters identified on the DRIVE-CLiQ line**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** component number: %1, connection number: %2  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** In the actual topology, 2 converters are connected with one another through DRIVE-CLiQ.  
 As standard, this is not permitted.  
 Fault value (r0949, interpret hexadecimal):  
 yyxx hex:  
 yy = connection number of the converter to which the second converter is connected  
 xx = component number of the converter to which the second converter is connected  
 Note:  
 Pulse enable is withdrawn and prevented.

**Remedy:** - Remove the connection to the second converter and restart.

---

**A01489**      **Topology: motor with DRIVE-CLiQ not connected**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** Component: %1, to %2, %3, connection: %4

**Component:** None

**Response:** NONE

19.2 List of faults and alarms

**Acknowledgment:** NONE

**Explanation of the message value:** For %1, %3

Component in target topology

**Explanation of the message value:** For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

**Explanation of the message value:** For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	



- 25 X205
- 40 X400
- 41 X401
- 42 X402
- 50 X500
- 51 X501
- 52 X502
- 53 X503
- 54 X504
- 55 X505
- 56 X506
- 57 X507

**Cause:** The topology comparison has detected a motor with DRIVE-CLiQ missing in the actual topology with respect to the target topology.  
 Alarm value (r2124, interpret hexadecimal):  
 ddcbbaa hex:  
 dd = connection number (%4)  
 cc = component number (%3)  
 bb = component class (% 2)  
 aa = component number of the component that has not been inserted (% 1)  
 Note:  
 The component is described in dd, cc and bb, where the component has not been inserted.  
 Component class and connection number are described in F01375.

**Remedy:** Adapting topologies:  
 - Insert the components involved at the right connection (correct the actual topology).  
 - Adapt the project/parameterizing in the commissioning tool (correct the target topology).  
 Check the hardware:  
 - Check the 24 V supply voltage.  
 - Check DRIVE-CLiQ cables for interruption and contact problems.  
 - Check that the component is working properly.  
 Note:  
 Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

**A01590 Drive: Motor maintenance interval expired**

**Message class:** General drive fault (19)  
**Message value:** Fault cause: %1 bin  
**Component:** Motor  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The selected service/maintenance interval for this motor was reached.  
 Alarm value (r2124, interpret decimal):  
 Motor data set number.  
**Remedy:** carry out service/maintenance and reset the service/maintenance interval (p0651).

**C01600 SI: STO self test failed**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** None  
**Response:** OFF2

19.2 List of faults and alarms

---

**Acknowledgment:** IMMEDIATELY

**Cause:** The "Safety Integrated" function integrated in the drive has identified a fault in the self-test of the switch-off signal path, and has initiated an STO (Safe Torque Off).

Fault value (r60049, interpret decimal):

1005: STO active, although STO not selected and there is no internal STO active.

1010: STO inactive, although STO is selected or an internal STO is active.

1015: The self-test was unsuccessful in operation.

1016: Error in the communication path for brake/FDI/FDO/STO

**Remedy:**

- Select STO and then deselect again.
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade software to a later version.
- Ensure that the drive and all of its connected components are connected up in compliance with EMC regulations. Inadequately fixed motor phases or a non-compliant grounding concept can result in this fault.
- Contact Technical Support.

---

**C01603 SI: Module temperature - limit value exceeded**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** -

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** A safe monitoring function has detected that the module temperature has exceeded a limit value. STO (Safe Torque Off) was initiated to maintain the safe state.

**Remedy:**

- Check the ambient temperature.
- Check the module fan.
- Operate the module in the permissible range.

---

**F01604 SI: Safety EEPROM data error**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** POWER ON

**Cause:** Safety relevant EEPROM data are not correct.  
This message results in an STO (Safe Torque Off).

Message value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.

**Remedy:** Replace the module.

---

**A01605 SI: Checksum error has occurred**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** A checksum error (CRC error) has occurred in the converter program memory.  
Alarm value (r2124, interpret decimal):  
Only for internal Siemens troubleshooting.

- Remedy:**
- Carry out a POWER ON (switch-off/switch-on).
  - Upgrade firmware to later version.
  - Contact Technical Support.

---

**C01630 SI: Brake control error**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The "Safety Integrated" function integrated in the drive has identified a brake control fault, and has initiated an STO.

Fault value (r0949, interpret decimal):

1, 2:

- Motor cable is not shielded correctly.
- Defect in the brake control circuit of the Control Unit.
- Ground fault in brake cable.

3:

Hardware is defective or does not support the brake control.

- Communication with the brake control has failed.
- SBC is enabled on a module that does not support brake control.

4:

- Brake is not connected or interrupted cable.

- Remedy:**
- Check the motor holding brake connection.
  - Check the function of the motor holding brake.
  - Check whether the brake control is supported.
  - Check whether there is a DRIVE-CLiQ communication error, and if required, carry out a diagnostics routine for the faults involved.
  - Check that the electrical cabinet design and cable routing are in compliance with EMC regulations (e.g. shield of the motor cable and brake conductors are connected with the shield connecting plate and the motor connectors are tightly screwed to the housing).
  - Replace the Control Unit.

Note:

SBC: Safe Brake Control

SI: Safety Integrated

---

**A01631 SI: Motor holding brake/SBC configuration not practical**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** A configuration of motor holding brake and SBC was detected that is not practical.

The following configurations can result in this message:

- "No motor holding brake available" (p1215 = 0) and "SBC" enabled (p9604 bit 1 = 1 and p9603>0).
- "Motor holding brake just like the sequence control, connection via signal interconnection" (p1215 = 3) and "SBC" enabled (p9604 Bit 1 = 1 and p9603>0).

**Remedy:** Check the parameterization of the motor holding brake and SBC and correct.

Note:

SBC: Safe Brake Control

See also: p1215 (Motor holding brake configuration), p9603 (SI control), p9604 (SI enable)

19.2 List of faults and alarms

---

**A01637 SI: Safety configuration not protected**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** Safety configuration is not protected using UMAC (User Management and Access Control).  
**Remedy:** Activate UMAC and assign rights for changing the safety configuration (EditDriveSafetyApplication), exclusively for a role with a password.

---

**A01641 SI: Component exchange identified and save necessary**

**Message class:** General drive fault (19)  
**Message value:** Fault cause: %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Explanation of the message value:** For %1

Bit	Cause	Remedy
3	It was identified that OM-SMT has been replaced	
4	It was identified that the Sensor Module has been replaced	
5	It was identified that the sensor has been replaced	

**Cause:** "Safety Integrated" has identified that a component has been replaced.  
 No additional stop response is initiated, and therefore the operation of the specific drive is not restricted.  
 When safety functions are active, after a component has been replaced it is necessary to carry out a partial acceptance test.  
 Alarm value (r2124, interpret binary).  
**Remedy:** - Save all parameters (p0977 = 1 or retentively save).  
 - Acknowledge fault.  
 See also: r9776 (SI diagnostics)

---

**F01646 SI: Change logbook**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The saved functional safety checksum (r9780[0]) or hardware-related safety checksum (r9780[1]) differs from the safety checksum calculated when running up or a previously calculated safety checksum was not found.  
 An acceptance test is required as changes have been made to a safety parameter or the safety hardware.  
 Fault value (r0949, interpret decimal):  
 1: The safety logbook has identified that a functional safety checksum has changed. An acceptance test is required.  
 2: The safety logbook has identified that a hardware-related safety checksum has changed. An acceptance test is required.

**Remedy:** For fault value = 1:  
- Carry out an acceptance test and generate an acceptance report.  
For fault value = 2:  
- Carry out the function checks for the modified hardware and generate an acceptance report.  
**Note:**  
The procedure when carrying out an acceptance test as well as an example of the acceptance report are provided in the following literature:  
SINAMICS Function Manual Safety Integrated

---

**C01647 SI: PROFIsafe PLC configuring not the same as the parameterization**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The drive has identified a difference between the PROFIsafe configuring in the F-PLC and the parameterization in SINAMICS.

**Note:**

This message results in an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

1: The PROFIsafe telegram number in the F-PLC configuration is not identical with the value in p9611.

2: The PROFIsafe monitoring time F\_WD\_Time in the F-PLC configuration is not identical with the value in p9614.

**Remedy:** - Change the configuring in the F-PLC and load to the drive.  
- Adapt the parameterization in the drive to the configuration in the F-PLC.

---

**C01648 SI: PROFIsafe communication error**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

### 19.2 List of faults and alarms

---

**Cause:** The drive has identified a PROFIsafe communication error.

Note:

This message leads to STO, if p9612 = 0 and leads to SS1, if p9612 = 1.

Message value (r60049, interpret decimal):

6000 ... 6166:

PROFIsafe message values (PROFIsafe driver for PROFIBUS DP V1/V2 and PROFINET).

For these message values, the failsafe control signals (Failsafe Values) are transferred to the safety functions. If "SS1 after failure of PROFIsafe communication" is parameterized (p9612), then transfer of the Failsafe Values is delayed.

6064 ... 6076: Error when evaluating F parameters. The values of the transferred F parameters do not match the expected values.

6064: Destination address and PROFIsafe address are different (F\_Dest\_Add != p9610).

6065: Destination address not valid (F\_Dest\_Add == 0 or 0xFFFF).

6066: Source address not valid (F\_Source\_Add == 0 or 0xFFFF) or source address and PROFIsafe source address different (F\_Source\_Add != p9613).

6067: Watchdog time not valid (F\_WD\_Time == 0).

6068: Incorrect SIL level (F\_SIL).

6069: Incorrect F-CRC length (F\_CRC\_Length).

6070: Incorrect F parameter version (F\_Par\_Version).

6071: CRC error for the F parameters (CRC1). The transferred CRC value of the F parameters does not match the value calculated in the PROFIsafe driver.

6072: F parameterization is inconsistent.

6076: Incorrect F\_block\_ID.

6165: A communications error was identified when receiving the PROFIsafe telegram. The error can also occur if an inconsistent or out-of-date PROFIsafe telegram was received after switching the system off and on, or after inserting the PROFIBUS/PROFINET cable.

6166: A time monitoring error (timeout) was identified when receiving the PROFIsafe telegram.

>65535: A fatal PROFIsafe communication error has occurred (only for internal Siemens error diagnostics).

- Remedy:**
- For message value = 6064:
    - Check the setting of the value in the F parameter F\_Dest\_Add at the PROFIsafe device.
    - Check the setting of the PROFIsafe address (p9610).
  - For message value = 6065:
    - Check the setting of the value in the F parameter F\_Dest\_Add at the PROFIsafe device. It is not permissible that the destination address is 0 or FFFF.
  - For message value = 6066:
    - Check the setting of the value in the F parameter F\_Source\_Add at the PROFIsafe device. It is not permissible that the source address is 0 or FFFF.
    - Check the setting of the PROFIsafe source address (p9613).
  - For message value = 6067:
    - Check the setting of the value in the F parameter F\_WD\_Time at the PROFIsafe device. It is not permissible for the watchdog time to be 0.
  - For message value = 6068:
    - Check the setting of the value in F parameter F\_SIL at the PROFIsafe device.
  - For message value = 6069:
    - Check the setting of the value in the F parameter F\_CRC\_Length at the PROFIsafe device.
  - For message value = 6070:
    - Check the setting of the value in the F parameter F\_Par\_Version at the PROFIsafe device. The value for the F parameter version is 0 in the V1 mode and 1 in the V2 mode.
  - For message value = 6071:
    - Check the setting of the values of the F parameters and the F parameter CRC (CRC1) calculated from these at the PROFIsafe device and update if necessary.
  - For message value = 6072:
    - Check the settings of the values for the F parameters and, if required, correct.

The following combinations are permissible for F parameters F\_CRC\_Length and F\_Par\_Version:

    - F\_CRC\_Length = 3-byte CRC and F\_Par\_Version = 1
    - F\_CRC\_Length = 4-byte CRC and F\_Par\_Version = 1
  - For message value = 6076:
    - Check the settings of the values for the F parameters and, if required, correct.
  - For message value = 6165:
    - If the fault occurs after powering up or after inserting the PROFIBUS/PROFINET cable, acknowledge the fault.
    - Check the configuration and communication at the PROFIsafe device.
    - Check the setting of the value for F parameter F\_WD\_Time at the PROFIsafe device and increase if necessary.
    - Check whether all F parameters of the drive match the F parameters of the F host.
  - For message value = 6166:
    - Check the configuration and communication at the PROFIsafe device.
    - Check the setting of the value for F parameter F\_WD\_Time at the PROFIsafe device and increase if necessary.
    - Evaluate diagnostic information in the F host.
    - Check PROFIsafe connection.
    - Check whether all F parameters of the drive match the F parameters of the F host.
  - For message value > 65535:
    - Carry out a POWER ON (switch-off/switch-on) for all components.
    - Check whether other faults are active - and when necessary, diagnose the faults involved.
    - Increase the monitoring cycle clock settings (p9500, p9511).
    - Upgrade firmware to later version.
    - Contact Technical Support.
    - Replace hardware relevant for the communication.

---

**C01649 SI: Internal software error**

**Message class:** Hardware/software error (1)

**Message value:** Module: %1, line: %2

**Component:** Control Unit (CU)

19.2 List of faults and alarms

---

**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** An internal error has occurred in the Safety Integrated software.  
Note:  
This message results in an STO (Safe Torque Off) that cannot be acknowledged.  
Message value (r60049, interpret hexadecimal): Only for internal Siemens fault diagnostics.  
**Remedy:**  
- Carry out a POWER ON (switch-off/switch-on) for all components.  
- Re-commission the "Safety Integrated" function and carry out a POWER ON.  
- Upgrade firmware to later version.  
- Ensure that the drive and all of its connected components are connected up in compliance with EMC regulations. Inadequately fixed motor phases or a non-compliant grounding concept can result in this fault.  
- Contact Technical Support.  
- Replace hardware component.

---

**F01650 SI: Acceptance test required**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The drive-integrated "Safety Integrated" function requires an acceptance test.  
Message value (r0949, interpret decimal):  
2003: Acceptance test is required as a safety parameter has been changed.  
**Remedy:** For message value = 2003:  
- Carry out an acceptance test and generate an acceptance report.  
The procedure when carrying out an acceptance test as well as an example of the acceptance report are provided in the product operating instructions.

---

**C01652 SI: Monitoring clock cycle not permissible**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** One of the Safety Integrated monitoring clock cycles is not permissible.  
- The monitoring clock cycle for safe motion monitoring functions is not permissible (p9500).  
- The actual value sensing clock cycle for safe motion monitoring functions is not permissible (p9511).  
- The sampling time for the current controller cannot be supported.  
Message value (r60049, interpret decimal):  
When motion monitoring is enabled (p9603 > 0), the following applies:  
100: No matching monitoring clock cycle was able to be found.  
107: The actual value sensing clock cycle (p9511) is not an integer multiple of the sampling time of the current controller.  
108: The parameterized actual value sensing clock cycle cannot be set on this component.  
111: The monitoring clock cycle is not an integer multiple of the sampling time of the current controller.



**Remedy:** When motion monitoring is enabled (p9603 > 0):

- Upgrade firmware to later version.
- Correct the monitoring clock cycle (p9500) and carry out POWER ON.

For message value = 107, 108:

Set the actual value sensing clock cycle in p9511 as an integer multiple of the current controller sampling time ( $p9511 = n * \text{current controller clock cycle}$ ), and at the same time as an integer divisor of the monitoring clock cycle ( $p9511 = p9500 / m$ ).

For message value = 111:

Set the monitoring clock cycle in p9500 as an integer multiple of the sampling time of the current controller.

**C01653 SI: PROFINET configuration error**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** There is a PROFINET configuration error for using Safety Integrated monitoring functions with a higher-level control (F-PLC).

**Note:**

When the safety functions are enabled, this fault results in an STO that cannot be acknowledged.

Fault value (r0949, interpret decimal):

- 200: A safety slot for receive data from the control has not been configured.
- 210, 220: The configured safety slot for the receive data from the control has an unknown format.
- 230: The configured safety slot for the receive data from the F-PLC has the incorrect length.
- 231: The configured safety slot for the receive data from the F-PLC has the incorrect length.
- 250: A PROFIsafe slot is configured in the higher-level F control, however PROFIsafe is not enabled in the drive.
- 300: A safety slot for the send data to the control has not been configured.
- 310, 320: The configured safety slot for the send data to the control has an unknown format.
- 330: The configured safety slot for the send data to the F-PLC has the incorrect length.
- 331: The configured safety slot for the send data to the F-PLC has the incorrect length.
- 400: The telegram number in the F-PLC does not match the parameterization in the drive.

**Remedy:** The following generally applies:

- Check and, if necessary, correct the PROFINET configuration of the safety slot on the controller side.
- Upgrade the drive firmware to a later version.

For fault value = 250:

- Remove the PROFIsafe configuring in the higher-level F control or enable PROFIsafe in the drive.

For fault value = 231, 331:

- In the drive, parameterize the appropriate PROFIsafe telegram (p9611) to be set on the F-PLC.
- Configure the PROFIsafe telegram matching the parameterization (p9611) in the F-PLC.

**A01654 SI: PROFIsafe configuration different**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

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**Cause:** The configuration of a PROFIsafe telegram in the higher-level control (F-PLC) does not match the parameterization in the drive.  
**Note:**  
This message does not result in a safety stop response.  
Alarm value (r2124, interpret decimal):  
1:  
A PROFIsafe telegram is configured in the higher-level control; however, PROFIsafe is not enabled in the drive (p9603.1).  
2:  
PROFIsafe is parameterized in the drive; however, a PROFIsafe telegram has not been configured in the higher-level control.

**Remedy:** The following generally applies:  
- Check and, if necessary, correct the PROFIsafe configuration in the higher-level control.  
For alarm value = 1:  
- Remove the PROFIsafe configuring in the higher-level F control or enable PROFIsafe in the drive.  
For alarm value = 2:  
- Configure the PROFIsafe telegram to match the parameterization in the higher-level F-control.

---

**C01657 SI: PROFIsafe telegram number invalid**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** OFF2

**Acknowledgment:** POWER ON

**Cause:** The PROFIsafe telegram number set in p9611 is not valid.  
When PROFIsafe is enabled (p9603.1 = 1), then a telegram number greater than zero must be entered in p9611.  
**Note:**

This fault does not result in a safety stop response.  
See also: p9611 (SI PROFIsafe telegram selection), r60022 (PROFIsafe telegram)

**Remedy:** Check the telegram number setting (p9611).

---

**C01658 SI: PROFIsafe telegram number not equal**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The PROFIsafe telegram number is set differently in p9611 and r60022.  
The telegram number must be identically set in both parameters.

**Note:**  
This fault does not result in a safety stop response.  
See also: p9611 (SI PROFIsafe telegram selection)

**Remedy:** Align the telegram number in both parameters so that they are the same (p9611, r60022).

---

**C01668 SI: Checksum error safety monitoring functions on the device**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

<b>Cause:</b>	The actual checksum calculated by the drive and entered in r10098 via the safety-relevant parameters does not match the reference checksum saved in p10099 at the last machine acceptance. Safety-relevant parameters have been changed or a fault is present. Note: This message results in an STO (Safe Torque Off). Message value (r60049, only for internal Siemens diagnostics)
<b>Remedy:</b>	- Carry out safety commissioning. - Carry out an acceptance test.

---

### **C01670**      **SI: invalid Sensor Module configuration**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The configuration of a Sensor Module used for Safety Integrated is not permissible.

Note:

This message results in an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

1: The encoder data set selected for Safety Integrated is not valid or the encoder is not assigned to an encoder data set.

2: No encoder was parameterized for Safety Integrated or the encoder is not suitable for safety-related applications.

4: A communication error with the encoder has occurred.

5: Number of relevant bits in the encoder coarse position invalid.

6: DRIVE-CLiQ encoder configuration invalid.

7: Non-safety relevant component of the encoder coarse position for the linear DRIVE-CLiQ encoder not valid.

8: Safety comparison algorithm not supported.

9: Relationship between the grid division and measuring step for linear DRIVE-CLiQ encoder is not binary.

15: Pulses per revolution of a rotary encoder is not valid.

16: Grid division of a linear encoder is not valid.

17: Encoder is not compatible. The safe positioning accuracy of the encoder is not equal to the setpoint parameterized in p9631 - or the safe maximum speed/velocity of the encoder is not equal to the setpoint parameterized in p9630.

18: Encoder has still not been configured for Safety Integrated. The safe positioning accuracy of the encoder has still not been parameterized in p9631 - and the safe maximum velocity of the encoder has still not been parameterized in p9630 (parameter values are 0).

19: The encoder parameterization or the module identifier of the encoder/encoder module has changed or the encoder parameterization is corrupt.

20: For a DQi encoder, the offset between POS1 and POS2 has changed since the last run up.

21: The timer for the effectivity test for a DQi encoder is not equal to 4 hours.

22: In the current firmware version, the encoder type is not permitted for Safety Integrated.

19.2 List of faults and alarms

---

- Remedy:** For message value = 1:  
Carefully ensure that a safety-relevant encoder is connected and repeat the drive commissioning.
- For message value = 2:  
Use an encoder that supports safety functions.
- For message value = 4:  
Check whether there is a DRIVE-CLiQ communication error to the Sensor Module involved and, if required, carry out a diagnostics routine for the faults identified.
- For message value =8:  
Use an encoder that implements an algorithm supported by Safety Integrated.  
Supported encoder types are listed in the product documentation for Safety Integrated.
- For message value = 5, 6, 7, 9, 15, 16, 19, 20, 21:  
Replace the encoder if it is defective.
- For message value = 17, 18:  
Select and deselect the safety commissioning mode (during safety commissioning, the quality of the connected encoder is transferred into the encoder quality parameter p9630 ff.).
- For message value = 22:  
Use an encoder type that is supported in the current firmware version.  
Supported encoder types are listed in the product documentation for Safety Integrated.

---

**C01671 SI: Parameterization actual value acquisition incorrect**

- Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The parameterization of the actual value sensing for Safety Integrated is incorrect.  
Note:  
This message results in an STO (Safe Torque Off).  
Message value (r60049, interpret decimal):  
yyyyxxx dec: yyyy = supplementary information, xxxx = parameter  
yyyy = 0:  
No additional supplementary information  
xxxx = 9522:  
The gear stage was set too high.
- Remedy:** Check the parameterization of the actual value sensing for Safety Integrated and if required correct.  
For message value 9522:  
- Set the gearbox stage lower.

---

**C01674 SI: Safety function not supported by PROFIsafe telegram**

- Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** The monitoring function enabled in p9604 is not supported by the currently set PROFIsafe telegram (p9611).  
**Note:**  
 Message value (r60049, interpret bitwise binary):  
 Bit 3 = 1:  
 SS1E (Safe Stop 1 External) via PROFIsafe is not supported (p9604.3).  
 Bit 5 = 1:  
 SS2E (Safe Stop 2 External) via PROFIsafe is not supported (p9604.5).  
 Bit 6 = 1:  
 SS2ESR: (Safe Stop 2 Extended Stop and Retract) via PROFIsafe is not supported (p9604.6).  
 Bit 9 = 1:  
 Transfer of SLS (Safely-Limited Speed) limit value via PROFIsafe is not supported (p9604.9).  
 Bit 15 = 1:  
 Gearbox stage switchover via PROFIsafe is not supported (p9604.15).  
 Bit 19 = 1:  
 SCA via PROFIsafe is not supported (p9604.19).  
 Bit 20 = 1:  
 Transfer of safe position (SP) via PROFIsafe is not supported (p9604.20).  
 Bit 30 = 1:  
 Transfer of F-DI via PROFIsafe is not supported (p9604.30).

**Remedy:**

- Deselect the monitoring function involved (p9604).
- Set the matching PROFIsafe telegram (p9611).

---

**C01676 SI: Parameterization of the failsafe inputs not permissible**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** When simultaneously controlled via terminal (p9603.0 = 1) and PROFIsafe (p9603.1 = 1)

- Only the failsafe digital input F-DI 0 (r10071.0) may be selected
- Only STO (c10022) / SS1 (c10023) may be interconnected

**Note:**  
 This message results in an STO (Safe Torque Off).  
 Message value (r60049, interpret decimal):  
 xxxx = parameter number

**Remedy:** Correct parameters:

- Interconnect with a valid signal source.
- Inhibit control via terminal (p9603.0 = 0).
- Inhibit control via PROFIsafe (p9603.1 = 0).

---

**C01677 SI: Incorrect onboard F-I/O parameter value**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** Parameter: %1, supplementary information: %2  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

<b>Cause:</b>	<p>The parameter cannot be parameterized with this value.</p> <p>Note:</p> <p>This message does not result in a safety stop response.</p> <p>Message value (r60049, interpret decimal):</p> <p>yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter.</p> <p>yyyy = 0:</p> <p>No additional information available.</p> <p>xxxx = 10000 and yyyy = F-DI number:</p> <p>A non-existent F-DI was enabled.</p> <p>xxxx = 10002:</p> <p>The F-DI discrepancy time (p10002) is less than or equal to the SI monitoring clock cycle (p9500).</p> <p>xxxx = 10017 and yyyy = F-DI number:</p> <p>The input filter (p10017) is less than or equal to (p10018 + 2ms) when simultaneously selecting "Self test using specified dark pulses" (p10041[y] = 1).</p> <p>xxxx = 10018 and yyyy = F-DI number:</p> <p>Setting "F-DI self test long dark pulses" (p10018) is zero when simultaneously selecting "Self test using specified dark pulses" (p10041[y] = 1).</p> <p>xxxx = 10041 and yyyy = F-DI number:</p> <p>An invalid value was set in "F-DI self-test mode selection" (p10041[y]).</p> <p>xxxx = 10071 and yyyy = F-DI number:</p> <p>An F-DI status r10071[y], which was not enabled in p10000, has been wired.</p>
<b>Remedy:</b>	<p>Correct the parameter value.</p> <p>For xxxx = 10000 and yyyy = F-DI number:</p> <ul style="list-style-type: none"> <li>- Correct p10000 "SI F-DI enable".</li> </ul> <p>For xxxx = 10002:</p> <ul style="list-style-type: none"> <li>- Set p10002 "SI F-DI switchover discrepancy time" longer than p9500 "SI monitoring clock cycle".</li> </ul> <p>For xxxx = 10017 and yyyy = F-DI number:</p> <ul style="list-style-type: none"> <li>- Set p10017 "SI Digital inputs input filter" greater than (p10018 + 2 ms)</li> <li>- Change p10041[y] "SI F-DI self-test mode selection".</li> </ul> <p>For xxxx = 10018 and yyyy = F-DI number:</p> <ul style="list-style-type: none"> <li>- Set p10018 "SI F-DI self-test dark pulse length" greater than zero.</li> <li>- Change p10041[y] "SI F-DI self-test mode selection".</li> </ul> <p>For xxxx = 10041 and yyyy = F-DI number:</p> <ul style="list-style-type: none"> <li>- Change p10041[y] "SI F-DI self-test mode selection".</li> </ul> <p>For xxxx = 10071 and yyyy = F-DI number:</p> <ul style="list-style-type: none"> <li>- Correct p10000 "SI F-DI enable".</li> </ul>

---

**C01680 SI: Checksum error safety monitoring functions**

<b>Message class:</b>	Safety monitoring channel has identified an error (10)
<b>Message value:</b>	%1
<b>Component:</b>	Control Unit (CU)
<b>Response:</b>	OFF2
<b>Acknowledgment:</b>	IMMEDIATELY
<b>Cause:</b>	<p>The actual checksum over the safety-relevant parameters, calculated by the drive, does not match the reference checksum last saved for the last machine acceptance test.</p> <p>Safety-relevant parameters have been changed or a fault is present.</p> <p>Note:</p> <p>This message results in an STO (Safe Torque Off).</p> <p>Message value (r60049, only for internal Siemens diagnostics)</p>

- Remedy:**
- Check the safety-relevant parameters and if required, correct.
  - Retentively save parameters.
  - Perform a POWER ON if safety parameters requiring a POWER ON have been modified.
  - Carry out an acceptance test.

**C01681 SI: Incorrect parameter value**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** Parameter: %1, supplementary information: %2

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The parameter cannot be parameterized with this value.

**Note:**

This fault results in STO.

Fault value (r60049, interpret decimal):

yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter

yyyy = 0:

No additional information available.

xxxx = 9560:

The parameter must be > 0 when SS1 is activated (p9604.2 = 1) with SBR (p9606 = 2).

xxxx = 10006 or 10022 to 10036:

An inadmissible signal source for the control via F-DI was set

xxxx = 10050:

An inadmissible signal source for the F-DI via PROFIsafe was set. yyyy contains the incorrect index of c10050[.].

**Remedy:** Correct parameters:

For xxxx = 9560:

- Set the parameter value not equal to 0.

For xxxx = 10006 or 10022 to 10036:

- Set a valid signal source in pxxxx.

For xxxx = 10050 and yyyy = 0, 1 or 2:

- Set a valid signal source in c10050[yyyy].

**Note:**

SS1: Safe Stop 1

SBR: Safe Brake Ramp (safe brake ramp monitoring)

**C01682 SI: Monitoring function not supported**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** At least one of the monitoring functions enabled in p9604 is not supported with this firmware version on this device.

**Note:**

The message value (r60049, interpret binary) indicates the bits of the monitoring functions, which form this firmware version on this device, are not supported. If several, non-supported monitoring functions are simultaneously enabled, then these are all displayed in the message value.

This message results in an STO (Safe Torque Off).

See also: p9604 (SI enable)

**Remedy:** Correct parameter p9604 so that monitoring functions only permitted for this firmware version and for this device are enabled.

See also: p9612 (SI stop response for failure or control fault)

---

**C01690**      **SI: Data backup problem for the NVRAM**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** POWER ON

**Cause:** When saving parameters r9780, r9781 and r9782 (Safety logbook) says, an error has occurred in conjunction with the NVRAM.

**Note:**  
 This fault does not result in a safety stop response.  
 Fault value (r60049, interpret decimal):  
 1: There is no physical NVRAM in the drive.  
 2: There is no longer any free memory space in the NVRAM.

**Remedy:** For fault value = 1:  
 - Replace the hardware.  
 For fault value = 2:  
 - De-select functions that are not required and that take up memory space in the NVRAM.  
 - Contact Technical Support.

**Note:**  
 NVRAM: Non-Volatile Random Access Memory (non-volatile read and write memory)

---

**A01698**      **SI: Commissioning mode active**

**Message class:** General drive fault (19)

**Message value:** -

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The commissioning of the "Safety Integrated" function is selected.  
 This message is withdrawn after the safety functions have been commissioned.

**Note:**  
 - This message does not result in a safety stop response.  
 - In the safety commissioning mode, function STO (Safe Torque Off) is internally selected.

**Remedy:** Not necessary.

---

**C01700**      **SI: STO (Safe Torque Off) initiated**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** -

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The drive is stopped using STO (Safe Torque Off).  
 Possible causes:  
 Subsequent response, following messages: C01706, C01714, C01715, C01716.

**Remedy:** Carry out diagnostics for the active messages (C01706, C01714, C01715, C01716).

---

**C01701**      **SI: SS1 (Safe Stop 1) initiated**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** -

**Component:** None

**Response:** OFF3



**Acknowledgment:** IMMEDIATELY

**Cause:** The drive is stopped using SS1 (Safe Stop 1) (braked along the OFF3 down ramp).  
As a result of this fault, after the time parameterized in p9556 has expired, or the speed threshold parameterized in p9560 has been fallen below, STO (Safe Torque Off) is initiated.

Possible causes:

Subsequent response, following messages: C01707, C01711, C01714, C01715, C01716.

**Remedy:** Perform diagnostics for active messages (C01707, C01711, C01714, C01715, C01716).

**C01706 SI: SAM/SBR limit exceeded**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The safety functions with parameterized motion monitoring SAM (Safe Acceleration Monitor) / SBR (Safe Brake Ramp) have identified an error.

After initiating SS1 (Safe Stop 1) or SLS (Safely-Limited Speed), the speed has exceeded the set tolerance.

The drive is shut down by message C01700 (STO (Safe Torque Off) initiated).

Message value (r60049, interpret decimal):

0: SAM has detected a fault.

1: SBR has detected a fault.

**Remedy:** Check the braking behavior and, if necessary, adapt the parameterization of the SAM or SBR monitoring.

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

See also: p9548 (SI SAM speed tolerance), p9581 (SI SBR reference velocity), p9582 (SI SAM/SBR delay time), p9583 (SI SBR reference time)

**C01711 SI: SCF (Safety Channel Failure) initiated**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** -

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** The drive has detected an error in a safe monitoring function and has initiated SCF (Safety Channel Failure).

Monitoring functions are no longer reliable. Safe operation not possible.

Possible causes:

Subsequent response, following messages: C01648, C01750, C01751, C01753, C01754, C01769.

Note:

This fault results in an SS1 (Safe Stop 1), and as a consequence, after the time parameterized in p9556 has expired, or the speed threshold parameterized in p9560 has been fallen below, STO (Safe Torque Off) is initiated.

See also: p9555 (SI transition time SCF to SS1)

**Remedy:** Carry out diagnostics for the active messages (C01648, C01750, C01751, C01753, C01754, C01769).

**C01714 SI: Safely-Limited Speed exceeded**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

**Cause:** The drive has moved faster than that specified by the velocity limit value (p9531). The drive is stopped by the configured stop response (p9563).  
Message value (r60049, interpret decimal):  
100: SLS1 exceeded.  
200: SLS2 exceeded.  
300: SLS3 exceeded.  
400: SLS4 exceeded.

**Remedy:** - Check the traversing/motion program in the control.  
- Check the limits for SLS (Safely-Limited Speed) and if required adapt accordingly (p9531).  
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).  
See also: p9531 (SI SLS limit values), p9563 (SI SLS stop response)

---

**C01716 SI: Tolerance for Safe Direction exceeded**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The tolerance for function SDI (Safe Direction) was exceeded. The drive is stopped by the configured stop response (p9566).  
Message value (r60049, interpret decimal):  
0: Tolerance for function "SDI positive" exceeded.  
1: The tolerance for function "SDI negative" exceeded.

**Remedy:** - Check the traversing/motion program in the control.  
- Check the tolerance for function SDI and if required, adapt (p9564).  
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).  
Prerequisite:  
- Deselect function SDI function and if required select again.  
See also: p9564 (SI SDI tolerance), p9565 (SI SDI delay time), p9566 (SI SDI stop response)

---

**C01730 SI: Reference block for dynamic Safely-Limited Speed invalid**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The reference block transferred via PROFIsafe is negative.  
A reference block is used to generate a referred velocity limit value based on the reference quantity in p9531[0].  
The drive is stopped by the configured stop response (p9563[0]).  
Message value (r60049, interpret decimal):  
Requested, invalid reference block.

**Remedy:** In the PROFIsafe telegram, input data S\_SLS\_LIMIT\_IJT must be corrected.  
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

---

**C01750 SI: Hardware fault safety-related encoder**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Encoder 1  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The encoder that is used for the safety-relevant motion monitoring functions signals a hardware fault.  
**Note:**  
 This fault results in STO (Safe Torque Off).  
 Message value (r60049, interpret decimal):  
 Encoder status word 1, encoder status word 2 that resulted in the message.

**Remedy:**

- Check the encoder connection.
- Replace encoder.

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

---

**C01751 SI: Effectivity test error safety-related encoder**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** Encoder 1  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The DRIVE-CLiQ encoder for safe motion monitoring signals an error for the internal encoder effectivity tests; the safety software cyclically monitors the sequence.  
**Note:**  
 This message results in an SCF (Safety Channel Failure).  
 Message value (r60049, interpret decimal):  
 Only for internal Siemens troubleshooting.

**Remedy:**

- Check the encoder connection.
- Replace encoder.

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

---

**C01753 SI: Fault safety-relevant encoder**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The encoder that is used for the safety-relevant motion monitoring functions signals a fault.  
 Message value (r60049, interpret decimal):  
 1012: Plausibility violation of the encoder actual value.  
 1021: Cyclic communication failure between the monitoring channel and Sensor Module.  
 1022: Sign-of-life error for DRIVE-CLiQ encoders.  
 1024: Sign-of-life error for HTL/TTL encoders.  
 1031: Data transfer error between the monitoring channel and the Sensor Module (CRC error).  
 1033: Fault when checking offset between POS1 and POS2

**Remedy:**

- Check the encoder connection.
- Replace encoder.

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

For message value = 1021, 1024: - Check the communication connection.

- Set the monitoring clock cycle higher (p9500, p9511).
- Carry out a POWER ON (switch off/switch on) for all components.
- Replace the hardware.

For message value = 1035, if one of the safety encoders was replaced:

- Acknowledge hardware replacement.
- Save all parameters (p0977 = 1 or retentively save).
- Acknowledge fault.

---

**C01754 SI: Fault safety-relevant actual value acquisition**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The actual value sensing for safe motion monitoring signals an error.  
 Message value (r60049, interpret decimal):  
 1039: Converting the position on the load side exceeds data format.  
**Remedy:** For message value = 1039: Check the parameterization of the gearbox (p9520, p9521, p9522).

---

**C01755 SI: Encoder limit frequency exceeded**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Message value (r60049, interpret decimal):  
 1: Motion monitoring functions with encoder: the actual velocity exceeds the encoder limit frequency of 500 kHz.  
 Note:  
 This fault results in an SS1 (Safe Stop 1).  
**Remedy:** Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

---

**C01769 SI: Error for data cross-check**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** When carrying out a data cross-check between the two monitoring channels, the drive detected a difference between parameters or results and initiated an SCF (Safety Channel Failure). One of the monitoring functions no longer functions reliably, i.e. safe operation is no longer possible.  
 Safety message C01711 is also displayed as SCF (Safety Channel Failure) has been initiated.  
 If at least one monitoring function is active, then after the parameterized timer has expired, message C01701 is output.  
 Message value (r60049, interpret hexadecimal): Only for internal Siemens fault diagnostics.  
**Remedy:**

- Carry out a POWER ON (switch-off/switch-on) for all components.
- Re-commission the "Safety Integrated" function and carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the hardware.

---

**C01770 SI: Fault of the failsafe inputs**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** Fault cause: %1, F-DI number: %2  
**Component:** Control Unit (CU)  
**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Explanation of the message value:** For %1

Value	Cause	Remedy
1	Discrepancy error (state between two monitoring channels different for too long)	Check the F-DI wiring
2	Too many switching operations	Reduce the switching frequency
3	Test pulse error	Check the F-DI wiring
4	Internal software error	

**Cause:** The failsafe digital inputs (F-DI) have a fault condition.  
 Message value (r60049, interpret hexadecimal):  
 yyyyxxxx hex  
 xxxx: number of the failsafe digital input (F-DI).  
 yyyy: fault cause

**Note:**  
 If several faults occur consecutively, then this message is only signaled for the first fault that occurs.

**Remedy:**

- Check the wiring of the F-DI (contact problems).
- If the wiring is correct, and for example there is no wire breakage, then a check must be made as to whether the switching frequency at F-DI is too high and must therefore be reduced (switching pulses must have a longer time between them). The time interval between each signal edge at an F-DI must be at least equal to the discrepancy time before the input is switched again.

**Note:**  
 This message can be acknowledged via F-DI or PROFIsafe (safe acknowledgment).  
 Discrepancy errors of an F-DI can only be acknowledged if safe acknowledgment was carried out after the cause of the error was resolved (acknowledgment via PROFIsafe, extended message acknowledgment, self acknowledgment). As long as safety acknowledgment was not carried out, the corresponding F-DI stays in the safe state internally.  
 A self acknowledgment for an F-DI can be realized using a positive edge at the corresponding F-DI.  
 Sets the discrepancy time for fast switching operations at the F-DIs:  
 For fast switching operations at the failsafe digital inputs (F-DI), it may be necessary to adapt the discrepancy time to the switching frequency:

- The period of a cyclic switching pulse must be less than half of the discrepancy time (if necessary, round down).
- The time between two fast switching pulses should be longer than the discrepancy time (if necessary, round up).
- The discrepancy time must be at least p9500 (it must always be rounded up or down to be an integer multiple of the SI sampling time p9500).

If an input filter has been parameterized (p10017 > 0), then the shortest possible discrepancy time is directly specified by the input filter.

- The period of a cyclic switching pulse must be less than half of the discrepancy time p10017 (if necessary, round down).
- The time between two fast switching pulses should be longer than the discrepancy time+p10017 (if necessary, round up).
- The discrepancy time must be at least p9500 The input filter must always be set less than the discrepancy time.

Self test with specified dark pulses (p10041 > 0) for long cable lengths:

- Increase the dark pulse length (p10018 or p10019).
- Increase the input filter (p10017).

**Note:**  
 F-DI: Failsafe Digital Input

---

**C01793**      **SI: Internal safety message buffer is full**  
**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

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**Cause:** Too many safety messages have occurred within a short time so that some have not been able to be displayed.

**Remedy:** No remedy required

---

**A01796 SI: Wait for communication**

**Message class:** Communication error to the higher-level control system (9)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The drive waits for communication to be established to execute the safety-relevant motion monitoring functions.  
Note:

STO is active in this state.

Alarm value (r2124, interpret decimal):

3: Wait for communication to be established to PROFIsafe F-Host.

**Remedy:** If the message is not automatically withdrawn after a longer period of time, then carry out the following checks:

- Evaluate any other active PROFIsafe communication messages/signals.

- Check the operating state of the F-Host.

- Check the communication connection to the F Host.

Note:

STO: Safe Torque Off

---

**C01799 SI: Acceptance test mode active**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** -

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** The acceptance test mode is active.

This means the following:

- the setpoint velocity limiting is deactivated (r9733).

**Remedy:** Not necessary.

The message is withdrawn when exiting the acceptance test mode.

---

**F01800 DRIVE-CLiQ: Hardware/configuration error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

<b>Cause:</b>	<p>A DRIVE-CLiQ connection fault has occurred.</p> <p>Fault value (r0949, interpret decimal):</p> <p>100 ... 107:</p> <p>Communication via DRIVE-CLiQ socket X100 ... X107 has not been switched to cyclic operation. The cause may be an incorrect structure or a configuration that results in an impossible bus timing.</p> <p>10:</p> <p>Loss of the DRIVE-CLiQ connection. The cause may be, for example, that the DRIVE-CLiQ cable was withdrawn from the Control Unit or as a result of a short-circuit for motors with DRIVE-CLiQ. This fault can only be acknowledged in cyclic communication.</p> <p>11:</p> <p>Repeated faults when detecting the connection. This fault can only be acknowledged in cyclic communication.</p> <p>12:</p> <p>A connection was detected but the node ID exchange mechanism does not function. The reason is probably that the component is defective. This fault can only be acknowledged in cyclic communication.</p>
<b>Remedy:</b>	<p>For fault value = 100 ... 107:</p> <ul style="list-style-type: none"> <li>- Ensure that the DRIVE-CLiQ components have the same firmware versions.</li> <li>- Avoid longer topologies for short current controller sampling times.</li> </ul> <p>For fault value = 10:</p> <ul style="list-style-type: none"> <li>- Check the DRIVE-CLiQ cables at the Control Unit.</li> <li>- Remove any short-circuit for motors with DRIVE-CLiQ.</li> <li>- Carry out a POWER ON.</li> </ul> <p>For fault value = 11:</p> <ul style="list-style-type: none"> <li>- Check the electrical cabinet design and cable routing for EMC compliance.</li> </ul> <p>For fault value = 12:</p> <ul style="list-style-type: none"> <li>- Replace the component involved.</li> </ul>

**A01839 DRIVE-CLiQ diagnostics: cable fault to the component**

<b>Message class:</b>	General drive fault (19)
<b>Message value:</b>	Component number: %1
<b>Component:</b>	Control Unit (CU)
<b>Response:</b>	NONE
<b>Acknowledgment:</b>	NONE
<b>Cause:</b>	<p>The fault counter to monitor the DRIVE-CLiQ connections/cables has been incremented.</p> <p>Alarm value (r2124, interpret decimal):</p> <p>Component number.</p> <p>Note:</p> <p>The component number specifies the component whose feeder cable from the direction of the converter is faulted.</p> <p>The alarm is automatically withdrawn after 5 seconds, assuming that no other data transfer error has occurred.</p>
<b>Remedy:</b>	<ul style="list-style-type: none"> <li>- Check the corresponding DRIVE-CLiQ cables.</li> <li>- Check the electrical cabinet design and cable routing for EMC compliance.</li> </ul>

**A01900 PN: Configuration telegram error**

<b>Message class:</b>	Error in the parameterization / configuration / commissioning procedure (18)
<b>Message value:</b>	%1
<b>Component:</b>	None
<b>Response:</b>	NONE
<b>Acknowledgment:</b>	NONE

19.2 List of faults and alarms

**Cause:** A controller attempts to establish a connection using an incorrect configuring telegram.  
 Alarm value (r2124, interpret decimal):  
 2:  
 Too many PZD data words for output or input. The number of possible PZD items in a drive object is determined by the number of indices in r2050/r2053.  
 3:  
 Uneven number of bytes for input or output.  
 4:  
 Setting data for synchronization not accepted. For more information, see A01902.  
 211:  
 Unknown parameterizing block.  
 253:  
 PN Shared Device: Illegal mixed configuration of PROFIsafe and PZD.  
 254:  
 PN Shared Device: Illegal double assignment of a slot/subslot.  
 257:  
 PN Shared Device: Too many PZD data words for the output or input in the overall device.  
 501:  
 PROFIsafe parameter error (e.g. F\_Source\_Add, F\_Dest\_Add).  
 502:  
 PROFIsafe telegram does not match.  
 Additional values:  
 Only for internal Siemens troubleshooting.

**Remedy:** Check the bus configuration on the controller and device sides.

---

**A01902 PN: Isochronous operation parameterization not permissible**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** Parameterization for isochronous operation is not permissible.  
 Alarm value (r2124, interpret decimal):  
 0: Bus cycle time Tdp < 0.5 ms.  
 1: Bus cycle time Tdp > 32 ms.  
 2: Bus cycle time Tdp is not an integer multiple of the current controller sampling time.  
 3: Instant of the actual value sensing Ti > Bus cycle time Tdp or Ti = 0.  
 4: Instant of the actual value sensing Ti is not an integer multiple of the current controller sampling time.  
 5: Instant of the setpoint acceptance To >= Bus cycle time Tdp or To = 0.  
 6: Instant of the setpoint acceptance To is not an integer multiple of the current controller sampling time.  
 7: Controller application cycle time Tmapc is not an integer multiple of the speed controller sampling time.  
 8: Bus reserve bus cycle time Tdp - Data exchange time Tdx less than two current controller sampling times.  
 10: Instant of the setpoint acceptance To <= data exchange time Tdx + current controller sampling time  
 11: Controller application cycle time Tmapc > 14 x Tdp or Tmapc = 0.  
 12: PLL tolerance window Tpll\_w > Tpll\_w\_max  
 13: Bus cycle time Tdp is not a multiple of all basic clock cycles.



**Remedy:**

- Adapt the bus parameterization Tdp, Ti, To.
- Adapt the sampling time for the current controller or speed controller.

For alarm value = 10:

- Reduce Tdx by using fewer bus participants or shorter telegrams.

Note:

PB: PROFIBUS  
PN: PROFINET

---

**A01904 PN: Controller setting of the PZD telegram rejected**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** A controller attempts to set a PZD telegram. The setting is not applied.  
Alarm value (r2124, interpret decimal):  
3: Controllers have no function rights for making changes.  
4: Telegram cannot be set as a result of the drive configuration.  
See also: r0922 (PROFIdrive PZD telegram selection)  
**Remedy:** Check and align the telegram settings in the drive project and in the controller.

---

**A01905 PN: Controller setting to activate the channel diagnostics rejected**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** A controller attempted to change the activation of the channel diagnostics. The setting is not applied as the controller does not have the function rights to make a change.  
Alarm value (r2124, interpret decimal):  
1: Channel diagnostics are activated. Controller attempts to deactivate them.  
2: Channel diagnostics are not activated. Controller attempts to activate them.  
**Remedy:** Activate channel diagnostics in the bus configuration and check and align function rights in the drive.

---

**F01910 Fieldbus: setpoint timeout**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None  
**Response:** OFF3  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The reception of setpoints from the fieldbus interface (PROFINET) is interrupted.  
- Bus connection interrupted.  
- Controller switched off.  
- Controller set into the STOP state.  
**Remedy:** Restore the bus connection and set the controller to RUN.

---

**F01911 PN: Isochronous operation, clock cycle failure**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None

19.2 List of faults and alarms

---

**Response:** OFF1  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The telegram to synchronize the clock cycles has failed for several bus clock cycles or in several bus clock cycles has consecutively violated the specified time grid (see bus cycle time, Tdp and Tpllw).  
**Remedy:**  
- Check the physical bus configuration (cable, connector, terminating resistor, shielding, etc.).  
- Check whether communication was briefly or permanently interrupted.  
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).  
**Note:**  
PN: PROFINET

---

**F01912 PN: Isochronous operation sign-of-life missing**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None  
**Response:** OFF1  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The maximum permissible number of errors in the controller sign-of-life (isochronous operation) has been exceeded in cyclic operation.  
**Remedy:**  
- Check the physical bus configuration (cables, connectors, etc.).  
- Check whether the controller correctly sends the sign-of-life (e.g. create a trace with STW2.12 ... STW2.15 and trigger signal ZSW1.3).  
- Check the permissible telegram failure rate (p0925).  
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).  
**Note:**  
PN: PROFINET

---

**A01932 PN: Clock cycle synchronization missing for DSC**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** There is no clock synchronization or clock synchronous sign of life and DSC is selected.  
**Note:**  
DSC: Dynamic Servo Control  
See also: r0922 (PROFIdrive PZD telegram selection)  
**Remedy:** Set clock synchronization across the bus configuration and transfer clock synchronous sign-of-life.

---

**A01940 PN: Clock cycle synchronism not reached**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. Synchronization with the clock cycle specified by the controller was still not able to be performed.  
- The controller does not send an isochronous global control telegram, although isochronous operation was selected when configuring the bus.  
- The controller uses another isochronous DP cycle than was transferred to the device in the parameterizing telegram.  
- At least one drive object has a pulse enable (also not controlled from PROFINET).

**Remedy:**

- Check the controller application and bus configuration.
- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.
- Check that no drive object has a pulse enable. Only enable the pulses after synchronizing the PROFINET drives.

Note:  
PN: PROFINET

**A01941 PN: Clock cycle signal missing when the bus is being established**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. The synchronization telegram is not received.  
**Remedy:** Check the controller application and bus configuration.  
 Note:  
 PN: PROFINET

**A01943 PN: Clock cycle signal error when the bus is being established**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.  
 The synchronization telegram is irregularly received.  

- The controller sends an irregular synchronization telegram.
- The controller uses another isochronous bus clock cycle than was transferred to the device in the parameterizing telegram.

**Remedy:**

- Check the controller application and bus configuration.
- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.

 Note:  
 PN: PROFINET

**A01944 PN: Sign-of-life synchronism not reached**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.  
 Synchronization with the controller sign-of-life (STW2.12 ... STW2.15) could not be completed because the sign-of-life changes differently to how it was configured in the Tmapc time grid.  
**Remedy:**

- Ensure that the controller correctly increments the sign-of-life in the controller application clock cycle Tmapc.

 Note:  
 PN: PROFINET

**F01950 PN: Isochronous operation, synchronization unsuccessful**

**Message class:** Communication error to the higher-level control system (9)

19.2 List of faults and alarms

---

**Message value:** -  
**Component:** None  
**Response:** OFF1  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Synchronization of the internal clock cycle to the controller clock cycle has failed. The internal clock cycle exhibits an unexpected shift.  
**Remedy:** Only for internal Siemens troubleshooting.  
Note:  
PN: PROFINET

---

**A01980 PN: cyclic connection interrupted**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The cyclic connection to the PROFINET controller is interrupted.  
See also: r8936 (PN cyclic connection state)  
**Remedy:** Establish the PROFINET connection and activate the PROFINET controller in the cyclic mode.

---

**A01981 PN: Maximum number of controllers exceeded**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** Info 1: %1, Info 2: %2  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** A controller attempts to establish a connection to the drive, and as a consequence exceeds the permitted number of PROFINET connections.  
The alarm is automatically withdrawn after approx. 30 seconds.  
Alarm value (r2124, interpret hexadecimal):  
yyyyxxxx hex: yyyy = info. 1, xxxx = info. 2  
Info 1 = 0: number of RT connections exceeded  
Info 1 > 0: number of IRT connections exceeded  
Info 2: permitted number of connections  
**Remedy:** Check the configuration of the PROFINET controllers.

---

**A01989 PN: internal cyclic data transfer error**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The cyclic actual values and/or setpoints were not transferred within the specified times.  
Alarm value (r2124, interpret hexadecimal):  
Only for internal Siemens troubleshooting.  
**Remedy:** Correctly set T\_io\_input or T\_io\_output.

---

**A02007 Function generator: Drive not SERVO / VECTOR / DC\_CTRL**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The drive object specified for connection is not a SERVO, VECTOR or DC\_CTRL.  
**Remedy:** Use a SERVO / VECTOR or DC\_CTRL drive object with the corresponding number.  
**Note:**  
The alarm is reset as follows:  
- Remove the cause of this alarm.  
- Restart the function generator.

---

**F03001 NVRAM checksum incorrect**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** A checksum error occurred when evaluating the non-volatile data (NVRAM) on the Control Unit.  
The NVRAM data affected was deleted.  
**Remedy:** Carry out a POWER ON (switch-off/switch-on) for all components.

---

**F06310 Supply voltage (p0210) incorrectly parameterized**

**Message class:** Network fault (2)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** For AC/AC drive units, the measured DC voltage lies outside the tolerance range after precharging has been completed.  
The following applies for the tolerance range:  $1.16 * p0210 < r0070 < 1.6 * p0210$   
**Note:**  
The fault can only be acknowledged when the drive is switched off.  
See also: p0210 (Device supply voltage)  
**Remedy:** - Check the parameterized supply voltage and if required change (p0210).  
- Check the line supply voltage.  
See also: p0210 (Device supply voltage)

---

**F07011 Drive: Motor overtemperature**

**Message class:** Motor overload (8)  
**Message value:** %1  
**Component:** Motor  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

---

**Cause:** The calculated motor temperature is too high.  
Possible causes:  
- Motor overloaded.  
- Motor ambient temperature too high.  
- Sensor wire breakage.  
Fault value (r0949, interpret decimal):  
200:  
Motor temperature model 1 (I2t): temperature too high.  
300:  
Motor temperature model 3: after the monitoring time has expired, the temperature is still higher than the alarm threshold.  
301:  
Motor temperature model 3: temperature is too high, or the model has not been parameterized.  
302:  
Motor temperature model 3: Encoder temperature is not within the valid range.  
400:  
Additional motor overload protection: the load is too high.

**Remedy:**

- Reduce the motor load.
- Check the ambient temperature and the motor ventilation.
- Check the wiring and temperature sensor connection.
- Check monitoring limits.
- Check activation of the additional motor overload protection (5375).

---

**A07012 Drive: Motor temperature model overtemperature**

**Message class:** Motor overload (8)

**Message value:** %1

**Component:** Motor

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** Motor temperature model 1/3 or the additional motor overload protection identified that the alarm threshold was exceeded.  
Hysteresis:2K  
Alarm value (r2124, interpret decimal):  
200:  
Motor temperature model 1 (I2t): temperature too high.  
300:  
Motor temperature model 3: temperature too high.  
400:  
Additional motor overload protection: the load is too high. If the load remains at this level, the drive is shut down with fault F07011.  
See also: r0034 (Motor utilization thermal), p0613 (Motor temperature model ambient temperature)

**Remedy:**

- Check the motor load and if required, reduce.
- Check the motor ambient temperature.
- Check activation of the additional motor overload protection (5375).

See also: r0034 (Motor utilization thermal)

---

**F07085 Drive: Open-loop/closed-loop control parameters changed**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** Parameter: %1

**Component:** None

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** Open-loop/closed-loop control parameters have had to be changed.  
Possible causes:  
1. As a result of other parameters, they have exceeded the dynamic limits.  
2. They cannot be used due to the fact that the hardware detected not having certain features.  
3. The value is estimated as the thermal time constant is missing.  
4. Motor temperature model 1 is activated as thermal motor protection is missing.  
See also: p1082 (Maximum speed)

**Remedy:** Not necessary.  
It is not necessary to change the parameters as they have already been correctly limited.

---

**F07090 Drive: Upper torque limit less than the lower torque limit**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The upper torque limit is lower than the lower torque limit.  
**Remedy:** When setting the torque limits via telegram 750, the positive torque limit must be  $\geq$  the negative torque.

---

**A07091 Drive: determined current controller dynamic response invalid**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** When One Button Tuning is activated (p5300 = 1), the current controller is measured after the pulses have been enabled. Evaluation has indicated that the current control loop was not appropriately set.  
Possible causes:  
- Incorrectly set current controller.  
- PRBS amplitude set too high (p5296).  
Alarm value (r2124, interpret hexadecimal):  
1: Dynamic response too low.  
2: Current controller unstable.  
Note:  
PRBS: Pseudo Random Binary Signal (binary noise)  
**Remedy:** - The measurement can be repeated with a smaller excitation amplitude (p5296).  
- If required, adapt the current controller proportional gain (p1715).

---

**A07092 Drive: moment of inertia estimator still not ready**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The moment of inertia estimator has still not determined any valid values.  
The acceleration cannot be calculated.  
The moment of inertia estimator has stabilized, if the frictional values as well as the moment of inertia were determined and the corresponding status signal is set.  
**Remedy:** Traverse the axis until the moment of inertia estimator has stabilized.  
This alarm is automatically withdrawn after the moment of inertia estimator has stabilized.

---

**F07093 Drive: Test signal error**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF3

**Acknowledgment:** IMMEDIATELY

**Cause:** An error was identified when executing the "Test signal" function.  
The function was not executed or was canceled.  
Fault value (r0949, interpret decimal):  
1: No distance limit has been defined (p5308 = 0).  
2: The moment of inertia estimator has not stabilized in the parameterized time (p5309).  
3: The parameterized distance (p5308) was exceeded.  
4: No motor encoder parameterized (closed-loop speed control without encoder).  
6: Pulse enable was withdrawn while traversing.  
7: speed setpoint not equal to zero.  
See also: p5308 (One Button Tuning distance limiting), p5309 (One Button Tuning duration)

**Remedy:** For fault value = 1:  
- Define distance limiting (p5308).  
For fault value = 2:  
- Increase the duration, distance limit or speed limit (p5309, p5308, p1082, p1083, p1086).  
For fault value = 3:  
- Check distance limiting (p5308).  
For fault value = 4:  
- Configure speed control with encoder.  
For fault value = 6:  
- Keep the drive switched on until the "Test signal" function has been completely exited.  
For fault value = 7:  
- Set the speed setpoint to zero. It is possible that the setpoint was entered from the control panel.

---

**A07094 General parameter limit violation**

**Message class:** Hardware/software error (1)

**Message value:** Parameter: %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** As a result of the violation of a parameter limit, the parameter value was automatically corrected.  
Minimum limit violated --> parameter is set to the minimum value.  
Maximum limit violated --> parameter is set to the maximum value.  
Alarm value (r2124, interpret decimal):  
Parameter number, whose value had to be adapted.

**Remedy:** Check the adapted parameter values and if required correct.

---

**A07095 Drive: One Button Tuning activated**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE



**Cause:** The One Button Tuning function is active.  
 One Button Tuning is performed at the next switch-on command.  
 See also: p5300 (One Button Tuning selection)

**Remedy:** Not necessary.  
 The alarm is automatically withdrawn after One Button Tuning has been exited (p5300 = 0).

**F07097 Drive: Test signal error distance limiting**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** Fault cause: %1, traversing distance: %2

**Component:** Control Unit (CU)

**Response:** OFF3

**Acknowledgment:** IMMEDIATELY

**Cause:** An error was identified when executing function "Test signal" or One Button Tuning selection (p5300 = 1).  
 The function was not executed or was canceled.  
 Fault value (r0949, interpret decimal):  
 yyyyxxxx hex: yyyy = error cause, xxxx = traversing distance  
 Fault cause = 4:  
 - Travel distance to the EPOS software limit switch is not sufficient.  
 See also: p5308 (One Button Tuning distance limiting), p5309 (One Button Tuning duration)

**Remedy:** - Enter the traversing path in parameter p5308 - or deselect the function involved in p5301.  
 - For fault cause = 1, 2, shorter traversing paths may be possible.  
 For fault cause = 1:  
 - Deselect bit 0 and bit 1 in parameter p5301.  
 For fault cause = 2:  
 - Deselect bit 2 in parameter p5301.  
 For fault cause = 3:  
 - Deselect bit 4 and bit 5 in parameter p5301.  
 For fault cause = 4:  
 - Change the travel direction of One Button Tuning via p5308.  
 - Increase the clearance to the EPOS software limit switch by manually traversing.

**A07200 Drive: Master control ON command present**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The ON/OFF1 command is present (no 0 signal).  
 The command is either influenced via binary signal sink r0840 (actual CDS) or control word bit 0 via the master control.

**Remedy:** Switch the signal to 0 via binary signal sink r0840 (actual CDS) or control word bit 0 via the master control.

**F07220 Drive: Master control by PLC missing**

**Message class:** Communication error to the higher-level control system (9)

**Message value:** -

**Component:** None

**Response:** OFF1

**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

---

**Cause:** The "master control by PLC" signal was missing in operation.

- Interconnection of the binary signal sink for "Master control by PLC" is incorrect (r0854).
- The higher-level control has withdrawn the "master control by PLC" signal.
- Data transfer via the fieldbus (controller/drive) was interrupted.

**Remedy:**

- Check the interconnection of the binary signal sink for "Master control by PLC" (r0854).
- Check the "master control by PLC" signal and, if required, switch in.
- Check data transfer via the fieldbus (controller/drive).

**Note:**  
If the drive should continue to operate after withdrawing "master control by PLC" then fault response must be parameterized to NONE or the message type should be parameterized as alarm.

---

**F07334 Function not possible**

**Message class:** Application/technological function faulted (17)  
**Message value:** %1  
**Component:** Motor  
**Response:** OFF1  
**Acknowledgment:** IMMEDIATELY

**Cause:** The selected function is not possible for this configuration.  
Fault value (r0949, interpret decimal):  
0:  
Function "Travel to fixed stop" (c1545) was selected via the associated binary signal source, although encoderless operation or U/f operation is active.

**Remedy:** For fault value = 0:

- Operate the closed-loop speed control with an encoder.
- If necessary, deselect function "Travel to fixed stop".

---

**F07410 Drive: Current controller output limited**

**Message class:** Application/technological function faulted (17)  
**Message value:** -  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** The condition " $I_{act} = 0$  and  $U_{q\_set\_1}$  longer than 16 ms at its limit" is present and can be caused by the following:

- Motor not connected or motor contactor open.
- No DC link voltage present.
- Power unit defective.

**Remedy:**

- Connect the motor or check the motor contactor.
- Check the DC link voltage (r0070).
- Check the power unit.

---

**F07412 Drive: Commutation angle incorrect (motor model)**

**Message class:** Position/speed actual value incorrect or not available (11)  
**Message value:** %1  
**Component:** None  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY

- Cause:** An incorrect commutation angle was detected, which can result in a positive coupling in the speed controller.  
Possible causes:
- The phase sequence of the output phases for the motor is incorrect (e.g. the phases are interchanged).
  - The motor encoder is incorrectly adjusted with respect to the magnet position.
  - The motor encoder is damaged.
  - The motor encoder speed signal is faulted.
  - The control loop is instable due to incorrect parameterization.
- Remedy:**
- Check the phase sequence for the motor, and if required, correct.
  - If the encoder mounting was changed - Re-adjust the encoder.
  - Replace the defective motor and/or motor encoder.

**F07414 Drive: Encoder serial number changed**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

**Cause:** The serial number of the motor encoder of a synchronous motor has changed. The change was only checked for encoders with serial number (e.g. EnDat encoders) and build-in motors (e.g. p0300 = 401) or third-party motors (p0300 = 2).

The encoder was replaced.

**Remedy:** The encoder must be adjusted after replacement.  
Contact the service department.

**F07432 Drive: Motor without overvoltage protection**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** In the case of a fault at maximum speed, the motor can generate an overvoltage that can destroy the converter.

**Remedy:** Limit the maximum speed (p1082) without any additional protection.

Note:

The maximum speed is calculated as follows:

$p1082 \leq 11.695 * DC \text{ link voltage overvoltage threshold} / r0316$

DC link voltage overvoltage threshold:

- Line connection 1 AC: 410 V

- Line connection 3 AC: 820 V

See also: r0316 (Motor torque constant), p1082 (Maximum speed)

**F07434 Drive: It is not possible to change the direction of rotation with the pulses enabled**

**Message class:** Application/technological function faulted (17)

**Message value:** -

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** With the pulses enabled, a drive data set that has a different parameterized direction of rotation was selected (p1821).  
It is only possible to change the motor direction of rotation using p1821 when the pulses are inhibited.

19.2 List of faults and alarms

---

**Remedy:**

- Change over the drive data set with the pulses inhibited.
- Ensure that the changeover to a drive data set does not result in the motor direction of rotation being changed (i.e. for these drive data sets, the same value must be in p1821).

See also: p1821 (Direction of rotation)

---

**A07440 EPOS: Jerk time is limited**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The calculation of the jerk time  $T_r = \max(p2572, p2573) / p2574$  resulted in an excessively high value so that the jerk time is internally limited to 1000 ms.

**Note:**

The alarm is also output if jerk limiting is not active.

**Remedy:**

- Increase the jerk limiting (p2574).
- Reduce maximum acceleration or maximum deceleration (p2572, p2573).

---

**A07441 LR: Save the position offset of the absolute encoder adjustment**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The status of the absolute encoder adjustment has changed.

In order to permanently save the determined position offset (p2525) and the determined number of the drive data set (p2733), they must be saved in a non-volatile fashion (p0971, p0977).

Possible causes:

- Motor or encoder were replaced (applies to EQN and DQI).
- Position-relevant parameters were changed.
- An encoder that was not adjusted was adjusted (save the project in a non-volatile fashion using "Copy RAM to ROM").

**Note:**

This message is not output when switching-on the axis after having first moved it in the switched-off state, as long as the parameterizable monitoring window was not exited.

**Remedy:** Readjust the encoder.

---

**F07443 LR: Home position not in the permissible range**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** None

**Response:** OFF1

**Acknowledgment:** IMMEDIATELY

**Cause:** The home position received when adjusting the encoder via numerical signal sink r2599 lies outside the half of the encoder range and cannot be set as actual axis position.

Fault value (r0949, interpret decimal):

Maximum permissible value for the home position

**Remedy:** Set the home position to a lower value than specified in the fault value.

---

**A07557 Motor encoder: Home position not in the permissible range**

**Message class:** Application/technological function faulted (17)

**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The home position received when adjusting the encoder via numerical signal sink c2599 lies outside the half of the encoder range and cannot be set as actual axis position. The maximum permissible value is displayed in the supplementary information.  
**Remedy:** Set the home position less than the value from the supplementary information.

**A07558 Encoder 2: Home position not in the permissible range**

**Message class:** Application/technological function faulted (17)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The home position received when adjusting the encoder via numerical signal sink c2599 lies outside the half of the encoder range and cannot be set as actual axis position. The maximum permissible value is displayed in the supplementary information.  
**Remedy:** Set the home position less than the value from the supplementary information.

**A07559 Encoder 3: Home position not in the permissible range**

**Message class:** Application/technological function faulted (17)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The home position received when adjusting the encoder via numerical signal sink c2599 lies outside the half of the encoder range and cannot be set as actual axis position. The maximum permissible value is displayed in the supplementary information.  
**Remedy:** Set the home position less than the value from the supplementary information.

**A07565 Drive: Encoder error in PROFIdrive encoder interface 1**

**Message class:** Position/speed actual value incorrect or not available (11)  
**Message value:** %1  
**Component:** Sensor Module Encoder 1  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** An encoder error was signaled for encoder 1 via the PROFIdrive encoder interface (G1\_ZSW.15).  
 Alarm value (r2124, interpret decimal):  
 Error code from G1\_XIST2.  
**Remedy:** Acknowledge the encoder error using the encoder control word (G1\_STW.15 = 1).

**F07575 Drive: Motor encoder not ready**

**Message class:** Position/speed actual value incorrect or not available (11)  
**Message value:** -  
**Component:** Sensor Module Encoder 1  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

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---

**Cause:** The motor encoder signals that it is not ready.  
- Initialization of encoder 1 (motor encoder) was unsuccessful.  
- The function "parking encoder" is active (encoder control word G1\_STW.14 = 1).  
- The Sensor Module is defective.

**Remedy:** Evaluate other active faults via the motor encoder.

---

**A07577 Motor encoder: Measuring probe evaluation not possible**

**Message class:** Application/technological function faulted (17)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** When evaluating the measuring probe, an error occurred.  
Alarm value (r2124, interpret decimal):  
6: The input terminal for the measuring probe is not set.  
4098: Error when initializing the probe.  
4100: The measuring pulse frequency is too high.  
4200: The PROFIBUS clock cycle is not a multiple of integer of the position controller clock cycle.

**Remedy:** Deactivate the measuring probe evaluation (BI: p2509 = 0 signal).  
For alarm value = 6:  
Set the input terminal for the measuring probe (p0488, p0489).  
For alarm value = 4098:  
Check the converter hardware.  
For alarm value = 4100:  
Reduce the frequency of the measuring pulses at the measuring probe.  
For alarm value = 4200:  
Set the clock cycle ratio between the PROFIBUS clock cycle and the position controller clock cycle to an integer multiple.

---

**A07578 Encoder 2: Measuring probe evaluation not possible**

**Message class:** Application/technological function faulted (17)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** When evaluating the measuring probe, an error occurred.  
Alarm value (r2124, interpret decimal):  
6: The input terminal for the measuring probe is not set.  
4098: Error when initializing the probe.  
4100: The measuring pulse frequency is too high.  
4200: The PROFIBUS clock cycle is not a multiple of integer of the position controller clock cycle.

**Remedy:** Deactivate the measuring probe evaluation (BI: p2509 = 0 signal).  
For alarm value = 6:  
Set the input terminal for the measuring probe (p0488, p0489).  
For alarm value = 4098:  
Check the converter hardware.  
For alarm value = 4100:  
Reduce the frequency of the measuring pulses at the measuring probe.  
For alarm value = 4200:  
Set the clock cycle ratio between the PROFIBUS clock cycle and the position controller clock cycle to an integer multiple.

---

**A07579 Encoder 3: Measuring probe evaluation not possible**

**Message class:** Application/technological function faulted (17)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** When evaluating the measuring probe, an error occurred.

Alarm value (r2124, interpret decimal):

6: The input terminal for the measuring probe is not set.

4098: Error when initializing the probe.

4100: The measuring pulse frequency is too high.

4200: The PROFIBUS clock cycle is not a multiple of integer of the position controller clock cycle.

**Remedy:** Deactivate the measuring probe evaluation (BI: p2509 = 0 signal).

For alarm value = 6:

Set the input terminal for the measuring probe (p0488, p0489).

For alarm value = 4098:

Check the converter hardware.

For alarm value = 4100:

Reduce the frequency of the measuring pulses at the measuring probe.

For alarm value = 4200:

Set the clock cycle ratio between the PROFIBUS clock cycle and the position controller clock cycle to an integer multiple.

---

**A07581 Motor encoder: Position actual value preprocessing error**

**Message class:** Position/speed actual value incorrect or not available (11)

**Message value:** -

**Component:** Encoder 1

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** An error has occurred during the position actual value preprocessing.

**Remedy:** Check the encoder for the position actual value preprocessing.

---

**A07582 Encoder 2: Position actual value preprocessing error**

**Message class:** Position/speed actual value incorrect or not available (11)

**Message value:** -

**Component:** Encoder 2

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** An error has occurred during the position actual value preprocessing.

**Remedy:** Check the encoder for the position actual value preprocessing.

---

**A07583 Encoder 3: Position actual value preprocessing error**

**Message class:** Position/speed actual value incorrect or not available (11)

**Message value:** -

**Component:** Encoder 3

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** An error has occurred during the position actual value preprocessing.

**Remedy:** Check the encoder for the position actual value preprocessing.

---

**A07587 Motor encoder: Position actual value preprocessing has no valid encoder**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** Encoder 1

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The following problem has occurred during the position actual value preprocessing:  
- An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).

**Remedy:** Check the drive data sets, encoder data sets.  
See also: p0400 (Encoder type selection)

---

**A07588 Encoder 2: Position actual value preprocessing does not have a valid encoder**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** Encoder 2

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The following problem has occurred during the position actual value preprocessing:  
- An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).

**Remedy:** Check the drive data sets, encoder data sets.  
See also: p0400 (Encoder type selection)

---

**A07589 Encoder 3: Position actual value preprocessing does not have a valid encoder**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** Encoder 3

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The following problem has occurred during the position actual value preprocessing:  
- An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).

**Remedy:** Check the drive data sets, encoder data sets.  
See also: p0400 (Encoder type selection)

---

**F07801 Drive: Motor overcurrent**

**Message class:** Motor overload (8)

**Message value:** -

**Component:** Motor

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The permissible motor limit current was exceeded.  
- Active current limit too low.  
- Current controller not correctly set.  
- Load is too high.  
- Short-circuit in the motor cable or ground fault.  
- Motor current does not match the drive current.



- Remedy:**
- Reduce the load.
  - Check the motor and motor cables for short-circuit and ground fault.
  - Check the drive and motor combination.

---

**F07802 Drive: Infeed not ready**

- Message class:** Infeed faulted (13)  
**Message value:** -  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The drive does not signal a ready state after an internal switch-on command.  
  - DC link voltage is not present.
  - Defective drive.
  - Supply voltage incorrectly set.**Remedy:**
  - Check the enable signals for the drive.
  - Replace the drive.
  - Check the line supply voltage setting (p0210).

---

**F07815 Drive: Power unit has been changed**

- Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** Parameter: %1  
**Component:** Power Unit  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The code number of the actual power unit does not match the saved number. This occurs if a saved configuration (SD card, backup file) of a converter with another power rating is used.  
Fault value only for internal Siemens diagnostics.  
See also: p0201 (Power unit code number)  
**Remedy:**
  - Carry-out a reset to the factory settings, which corresponds to recommissioning the converter.
  - Use an SD card or backup file with the configuration correct for the drive being used and switch-off/switch-on the drive.
  - In case of doubt, before using an SD card, delete the existing configuration of the USER folder.
  - For a series commissioning, only use the same converter types (order number, power class).

---

**F07860 External braking resistor signals an overtemperature**

- Message class:** External measured value / signal state outside the permissible range (16)  
**Message value:** -  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The temperature monitoring of the external braking resistor, connected via digital input 4 (DI 4, X130/2.6), responded.  
Note:  
This signal is triggered for a 1/0 edge at digital input 4.  
**Remedy:**
  - Check the dimensioning of the external braking resistor for the application.
  - Check the external braking resistor and temperature monitoring.
  - Check the temperature monitoring connection (X130/2.6).

---

**F07900 Drive: Motor blocked/speed controller at its limit**

- Message class:** Application/technological function faulted (17)  
**Message value:** -  
**Component:** Motor

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---

**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The motor operates longer than 0.2 seconds at the torque limit and below the speed threshold in p2175.  
This signal can also be initiated if the speed actual value is oscillating and the speed controller output repeatedly goes to its limit.  
See also: p2175 (Motor blocked speed threshold)  
**Remedy:** - Check that the motor can freely move.  
- Check the effective torque limit (r1538, r1539).  
- Check the parameter of the "Motor blocked" signal and possibly correct (p2175).

---

**F07901 Drive: Motor overspeed**

**Message class:** Application/technological function faulted (17)  
**Message value:** -  
**Component:** Motor  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The maximum permissible speed was either positively or negatively exceeded (p1082).  
**Remedy:** - Check the speed controller.  
- Check the maximum speed (p1082).

---

**F07930 Drive: Brake control error**

**Message class:** Application/technological function faulted (17)  
**Message value:** %1  
**Component:** Motor  
**Response:** OFF1  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The Control Unit has detected a brake control fault.  
Fault value (r0949, interpret decimal):  
1, 2:  
- Motor cable is not shielded correctly.  
- Defect in the brake control circuit of the Control Unit.  
- Ground fault in brake cable.  
4:  
Brake is not connected or cable is interrupted.  
See also: p1278 (Brake control diagnostics evaluation)  
**Remedy:** - Check the motor holding brake connection.  
- Check the function of the motor holding brake.  
- Check whether there is a DRIVE-CLiQ communication error, and if required, carry out a diagnostics routine for the faults involved.  
- Check that the electrical cabinet design and cable routing are in compliance with EMC regulations (e.g. shield of the motor cable and brake conductors are connected with the shield connecting plate and the motor connectors are tightly screwed to the housing).  
- Replace the affected Control Unit.  
- Set p1278 to 1 if brake diagnostics is not required.  
See also: p1215 (Motor holding brake configuration), p1278 (Brake control diagnostics evaluation)

---

**F07933 Drive: Brake voltage incorrect**

**Message class:** Application/technological function faulted (17)  
**Message value:** -  
**Component:** Motor  
**Response:** OFF2

**Acknowledgment:** IMMEDIATELY  
**Cause:** A brake voltage fault was detected.  
**Remedy:** - Carry out a POWER ON (switch-off/switch-on) for all components.  
- Contact Technical Support.  
- Replace the converter.

---

**F07935 Drive: Incorrect motor holding brake configuration**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** An incorrect motor holding brake configuration was detected.  
Fault value (r0949, interpret decimal):  
0:  
A motor holding brake was detected where the brake control has not been configured (p1215 = 0).  
1:  
A motor holding brake was detected where the brake control has not been configured (p1215 = 0).  
The brake control configuration was left at "No motor holding brake available" (p1215 = 0).  
**Remedy:** For fault value = 0:  
- No remedy required.  
For fault value = 1:  
- If required change the motor holding brake configuration (p1215 = 1, 2).  
- If this fault value unexpectedly occurs, then the motor connections should be checked in order to rule out that they have been interchanged.  
See also: p1215 (Motor holding brake configuration)

---

**F07955 Drive: Motor has been changed**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** Motor  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The code number of the actual motor with DRIVE-CLiQ does not match the saved number.  
If available:  
The code numbers of the bearings, gearbox and brake do not match the saved numbers.  
**Remedy:** Connect the original motor and switch on the converter again (POWER ON) - or restore the factory settings.  
**Note:**  
The data for bearings, gearbox and brake are reloaded.

---

**A08561 IE: Consistency error affecting adjustable parameters**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE

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**Cause:** A consistency error was detected when activating the configuration for the Industrial Ethernet interface (X127).  
Alarm value (r2124, interpret decimal):  
0: General consistency error  
1: Error in the IP configuration (IP address, subnet mask or standard gateway).  
2: Error in the station names.  
5: Standard gateway is also set at the PROFINET interface.  
6: The station name is also set at the PROFINET interface.  
7: The IP address is located in the same subnet as the IP address of the PROFINET interface.  
Note:  
For alarm value = 0, 1, 2, 5, 7 the following applies: the configuration was not changed.  
For alarm value = 6 the following applies: The new configuration was however activated.  
IE: Industrial Ethernet

**Remedy:** Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

---

**A08563 PROFINET: Consistency error affecting adjustable parameters**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE

**Cause:** A consistency error was detected when activating the configuration for the PROFINET interface (X150).  
Alarm value (r2124, interpret decimal):  
0: General consistency error  
1: Error in the IP configuration (IP address, subnet mask or standard gateway).  
2: Error in the station names.  
3: DHCP was not able to be activated, as a cyclic PROFINET connection already exists.  
4: A cyclic PROFINET connection is not possible as DHCP is activated.  
5: Standard gateway is also set at the Industrial Ethernet interface (X127).  
6: Standard station name is also set at the Industrial Ethernet interface (X127).  
7: IP address is located in the same subnet as the IP address of the Industrial Ethernet interface (X127).  
Note:  
For alarm value = 0, 1, 2, 3, 4, 5, 7, the following applies: the configuration was not changed.  
For alarm value = 6 the following applies: The new configuration was however activated.  
DHCP: Dynamic Host Configuration Protocol

**Remedy:** Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

---

**A08800 PROFlenergy energy-saving mode active**

**Message class:** Communication error to the higher-level control system (9)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE

**Cause:** The PROFlenergy energy-saving mode is active  
Alarm value (r2124, interpret decimal):  
Mode ID of the active PROFlenergy energy-saving mode.  
See also: r5600 (PROFlenergy energy-saving mode ID)

**Remedy:** The alarm is automatically withdrawn when the energy-saving mode is exited.  
Note:  
The energy-saving mode is exited after the following events:  
- The PROFInergy command end\_pause is received from the higher-level control.  
- The higher-level control has changed into the STOP operating state.  
- The PROFINET connection to the higher-level control has been disconnected.

---

**F13000 License not adequate**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** %1

**Component:** Control Unit (CU)

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:**

- The converter uses options that require a license and the licenses are not sufficient.
- An error has occurred when checking the licensing.

Fault value (r0949, interpret decimal):

0: Adequate licensing was not able to be determined as there is no licensing data available on the memory card.  
1: Adequate licensing was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card is defective.  
2: Adequate licensing was not able to be determined as there is no licensing data available on the memory card.  
3: Adequate licensing was not able to be determined as the licensing data does not match the serial number of the memory card being used.  
4, 5, 6, 7: Adequate licensing was not able to be determined as the licensing data were manipulated and are therefore invalid.  
8, 9: An internal error occurred when checking the license.

**Remedy:**

For fault value = 0:  
Transfer a license file with the required licenses to the converter.

For fault value = 1:  
Reinsert the memory card into the converter. If you have to replace a defective memory card, contact Technical Support.

For fault value = 2:  
Transfer a license file with the required licenses to the converter.

For fault value = 3:  
Compare the license file name (after "LK\_" to ".ZIP") with the serial number of the memory card.  
Transfer the appropriate license file to the converter.

For fault value = 4, 5, 6, 7, 8, 9:  
- Carry out a POWER ON.  
- Upgrade firmware to later version.  
- Contact Technical Support.

Note:

An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

---

**A13002 Licensing not sufficient in operation**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

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**Cause:**

- For the converter, the options that require a license are being used but the licenses are not sufficient.
- An error occurred when checking the existing licenses.

Alarm value (r2124, interpret decimal):

0: The existing license is not sufficient.

1: An adequate license was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card has developed a defect.

2: An adequate license was not able to be determined as there is no licensing data available on the memory card.

3: An adequate license was not able to be determined as there is no licensing data available on the memory card.

4, 5, 6, 7: An adequate license was not able to be determined as the licensing data were manipulated and are therefore invalid.

8,9: An internal error occurred when checking the license.

**Remedy:**

For alarm value = 0:  
Additional licenses are required and must be activated.

For alarm value = 1:  
Reinsert or replace the memory card that matches the system.

For alarm value = 2:  
Transfer the license file to the converter.

For alarm value = 3:  
Compare the license file name (after "LK\_" to ".ZIP") with the serial number of the memory card.  
Transfer the appropriate license file to the converter.

For alarm value = 4, 5, 6, 7, 8, 9:  
- Carry out a POWER ON.  
- Upgrade firmware to later version.  
- Contact Technical Support.

Note:  
An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

---

**A13030 Trial License activated**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The "Trial License" function was activated. One of the available periods is expiring.

**Remedy:** Not necessary.  
The alarm is automatically withdrawn after the periods have expired.

---

**A13031 Trial License period expired**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** -

**Component:** Control Unit (CU)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** One of the available periods of the "Trial License" function has expired.

**Remedy:**

- If required, start an additional period.
- Deactivate functions requiring a license.
- Appropriately license the drive unit.

Note:  
A license that is not adequate will only become evident after the next time the system runs up.

---

**A13032 Trial License last period activated**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The "Trial License" function was activated. The last of the available periods is expiring.  
**Remedy:** Not necessary.  
The alarm is automatically withdrawn after the last period has expired.

---

**A13033 Trial License last period expired**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The last period of the "Trial License" function has expired. No additional periods available.  
**Remedy:** - Deactivate functions requiring a license.  
- Appropriately license the drive unit.  
**Note:**  
A license that is not adequate will only become evident after the next time the system runs up.

---

**F30001 Drive: overcurrent**

**Message class:** Power electronics faulted (5)  
**Message value:** Fault cause: %1 bin  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The drive has detected an overcurrent condition.  
- Closed-loop control is incorrectly parameterized.  
- Motor has a short-circuit or fault to ground (frame).  
- The rated motor current is significantly higher than that of the drive.  
- Infeed: High discharge and post-charging currents for line voltage dip.  
- Infeed: High post-charging currents for overload when motoring and DC link voltage dip.  
- Infeed: Short-circuit currents at switch-on as there is no line commutating reactor.  
- Power cables are not correctly connected.  
- The power cables exceed the maximum permissible length.  
- Defective drive.  
- Line phase interrupted.  
**Fault value (r0949, interpret bit-serial):**  
Bit 0: Phase U.  
Bit 1: Phase V.  
Bit 2: Phase W.

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---

- Remedy:**
- Check the motor data - If required, carry out commissioning.
  - Check the assignment of the rated motor and drive currents.
  - Infeed: Check the line supply quality.
  - Infeed: Reduce the motor load.
  - Infeed: Check the correct connection of the line filter and the line commutating reactor.
  - Check the power cable connections.
  - Check the power cables for short-circuit or ground fault.
  - Check the length of the power cables.
  - Replace drive.
  - Check the line supply phases.

---

**F30002 Drive: DC link overvoltage**

**Message class:** DC link overvoltage (4)

**Message value:** %1

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The drive has detected an overvoltage condition in the DC link.

- Motor regenerates too much energy.
- Device supply voltage too high.
- Line phase interrupted.

Fault value (r0949, interpret decimal):  
DC link voltage at the time of trip [0.1 V].

- Remedy:**
- Increase the ramp-down time.
  - Use a braking resistor.
  - Use a drive with a higher power rating.
  - Check the device supply voltage (p0210).
  - Check the line supply phases.
- See also: p0210 (Device supply voltage)

---

**F30003 Drive: DC link undervoltage**

**Message class:** Infeed faulted (13)

**Message value:** -

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The power unit has detected an undervoltage condition in the DC link.

- Line supply failure.
- Line supply voltage below the permissible value.
- Line supply infeed failed or interrupted.
- Line phase interrupted.

- Remedy:**
- Check the line supply voltage.
  - Check the line supply infeed and observe the fault messages relating to it (if there are any).
  - Check the line supply phases.
  - Check the line supply voltage setting (p0210).
- See also: p0210 (Device supply voltage)

---

**F30004 Power unit: Overtemperature heat sink inverter**

**Message class:** Power electronics faulted (5)

**Message value:** %1



**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The temperature of the power unit heat sink has exceeded the permissible limit value.  
- Insufficient cooling, fan failure.  
- Overload.  
- Ambient temperature too high.  
- Pulse frequency too high.  
Fault value (r0949, interpret decimal):  
Temperature [0.01 °C].  
**Remedy:**  
- Check whether the fan is running.  
- Check the fan elements.  
- Check whether the ambient temperature is in the permissible range.  
- Check the motor load.  
- Reduce the pulse frequency if this is higher than the rated pulse frequency.  
Notice:  
This fault can only be acknowledged after the alarm threshold for alarm A30250 has been fallen below.

---

**F30005 Power unit: Overload I2t**

**Message class:** Power electronics faulted (5)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The power unit was overloaded.  
- The permissible rated power unit current was exceeded for an inadmissibly long time.  
- The permissible load duty cycle was not maintained.  
Fault value (r0949, interpret decimal):  
I2t [100 % = 16384].  
**Remedy:**  
- Reduce the continuous load.  
- Adapt the load duty cycle.  
- Check the motor and power unit rated currents.  
See also: r0307 (Rated motor power)

---

**F30011 Power unit: Line phase failure in main circuit**

**Message class:** Network fault (2)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** At the power unit, the DC link voltage ripple has exceeded the permissible limit value.  
Possible causes:  
- A line phase has failed.  
- The 3 line phases are inadmissibly asymmetrical.  
- The capacitance of the DC link capacitor forms a resonance frequency with the line inductance and the reactor integrated in the power unit.  
- The fuse of a phase of a main circuit has ruptured.  
- A motor phase has failed.  
- For power units operated on a single phase, the permissible active power was exceeded.  
Fault value (r0949, interpret decimal):  
Only for internal Siemens troubleshooting.

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---

- Remedy:**
- Check the main circuit fuses.
  - Check whether a single-phase load is distorting the line voltages.
  - Detune the resonant frequency with the line inductance by using an upstream line reactor.
  - Dampen the resonant frequency with the line inductance by switching over the DC link voltage compensation in the software or increase the smoothing. However, this can have a negative impact on the torque ripple at the motor output.
  - Check the motor feeder cables.

---

**F30015 Drive: phase failure motor cable**

**Message class:** Application/technological function faulted (17)

**Message value:** -

**Component:** Motor

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** A phase failure in the motor feeder cable was detected.  
The signal can also be output in the following case:  
The motor is correctly connected, however the closed-speed control is instable and therefore an oscillating torque is generated.

- Remedy:**
- Check the motor feeder cables.
  - Check the speed controller settings.

---

**A30016 Power unit: Load supply switched off**

**Message class:** Network fault (2)

**Message value:** %1

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The DC link voltage is too low.  
Alarm value (r2124, interpret decimal):  
DC link voltage at the time of the trip [V].

- Remedy:**
- Switch on load supply.
  - Check the line supply if necessary.
  - If necessary, insert the jumper for the internal braking resistor.
  - For a 3 AC line connection, connect an internal or external braking resistor (X4).

---

**F30017 Power unit: Hardware current limit has responded too often**

**Message class:** Power electronics faulted (5)

**Message value:** Fault cause: %1 bin

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The hardware current limitation in the relevant phase (see A30031, A30032, A30033) has responded too often. The number of times the limit has been exceeded depends on the design and type of power unit.

- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Fault value (r0949, interpret binary):  
 Bit 3: phase U  
 Bit 4: phase V  
 Bit 5: phase W  
 Additional bits:  
 Only for internal Siemens troubleshooting.  
 Note:  
 Fault value = 0 means that the phase with current limiting is not recognized (e.g. for blocksize device).

**Remedy:**

- Check the motor data.
- Check the motor circuit configuration (star-delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace power unit.

---

**F30020 Power unit: Configuration not supported**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)

**Message value:** Fault cause: %1, additional information: %2

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** A configuration is requested that is not supported by the power unit.  
 Fault value (r0949, interpret hexadecimal):  
 yyyyxxxx hex: xxxx = fault cause, yyyy = additional information (internal Siemens)  
 xxxx = 1: The requested DRIVE-CLiQ timing is not permissible.  
 xxxx = 3: Initialization was not able to be successfully completed. It is possible that the Control Unit was withdrawn from the Power Module before or during power up.  
 xxxx = 4: The combination of power unit and Control Unit or Control Unit Adapter is not supported.  
 xxxx = 8: The version of the ASIC installed in the power unit is no longer supported.

**Remedy:**

For fault cause = 1:  
 Update the Control Unit firmware or change the DRIVE-CLiQ topology.

For fault cause = 3, 4:  
 Insert a Control Unit or Control Unit Adapter (CUAxx) on an appropriate Power Module and perform a POWER ON for the Control Unit or the Control Unit Adapter.

For fault cause = 8:  
 Replace the power unit by one which has a newer ASIC version.

---

**F30021 Drive: Ground fault**

**Message class:** Ground fault / inter-phase short-circuit detected (7)

**Message value:** %1

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

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---

**Cause:** The drive has detected a ground fault.  
Possible causes:  
- Ground fault in the power cables.  
- Ground fault at the motor.  
- When the brake closes, this causes the hardware DC current monitoring to respond.  
- Short-circuit at the braking resistor.  
Fault value (r0949, interpret decimal):  
0:  
- The hardware DC current monitoring has responded.  
- Short-circuit at the braking resistor.  
> 0:  
Absolute value summation current amplitude.

**Remedy:**

- Check the power cable connections.
- Check the motor.
- Check the cables and contacts of the brake connection (a wire is possibly broken).
- Check the braking resistor.

---

**F30024 Power unit: Overtemperature thermal model**

**Message class:** Power electronics faulted (5)  
**Message value:** Power semiconductor: %1, temperature: [0.01 degrees C] %2  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible fault threshold.  
- The permissible load duty cycle was not maintained.  
- Insufficient cooling, fan failure.  
- Overload.  
- Ambient temperature too high.  
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):  
yyyyxxx hex: yyyy= Power semiconductor, xxx = Temperature in 0.01°C  
See also: r0037 (Drive temperatures)

**Remedy:**

- Adapt the load duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

---

**F30025 Power unit: Chip overtemperature**

**Message class:** Power electronics faulted (5)  
**Message value:** Power semiconductor: %1, temperature: [0.01 degrees C] %2  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** The chip temperature of the power semiconductor involved has exceeded the permissible fault threshold.

- The permissible load duty cycle was not maintained.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):

yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

**Remedy:**

- Adapt the load duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

Note:

This fault can only be acknowledged after the alarm threshold for alarm A030252 has been fallen below.

See also: r0037 (Drive temperatures)

---

**F30027 Power unit: Precharging DC link time monitoring**

**Message class:** Infeed faulted (13)

**Message value:** Enable signals: %1, Status: %2

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

### 19.2 List of faults and alarms

---

**Cause:** The power unit DC link was not able to be precharged within the expected time.

Possible causes:

- 1) There is no line supply voltage connected.
- 2) The line contactor/line side switch has not been closed.
- 3) The line supply voltage is too low.
- 4) Line supply voltage incorrectly set (p0210).
- 5) The precharging resistors are overheated as there were too many precharging operations per time unit.
- 6) The precharging resistors are overheated as the DC link capacitance is too high.
- 7) The precharging resistors have overheated as power was drawn from the DC link without the infeed being ready for operation.
- 8) The precharging resistors are overheated as the line contactor was closed during the DC link fast discharge through the Braking Module.
- 9) The DC link has either a ground fault or a short-circuit.
- 10) Connector X4 is not correctly configured.

Fault value (r0949, interpret binary):

yyyyxxxx hex:

yyyy = power unit state

0: Fault status (wait for OFF and fault acknowledgment).

1: Restart inhibit (wait for OFF).

2: Overvoltage condition detected -> change into the fault state.

3: Undervoltage condition detected -> change into the fault state.

4: Wait for bridging contactor to open -> change into the fault state.

5: Wait for bridging contactor to open -> change into restart inhibit.

6: Wait for bypass contactor to open

7: Commissioning.

8: Ready for precharging.

9: Precharging started, DC link voltage lower than the minimum switch-on voltage.

10: Precharging, DC link voltage end of precharging still not detected.

11: Wait for the end of the de-bounce time of the main contactor after precharging has been completed.

12: Precharging completed, ready for pulse enable.

13: It was detected that the STO terminal was energized at the power unit.

xxxx = Missing internal enable signals, power unit (inverted bit-coded, FFFF hex -> all internal enable signals available)

Bit 0: Power supply of the IGBT gating shut down.

Bit 1: Ground fault detected.

Bit 2: Peak current intervention.

Bit 3: I2t exceeded.

Bit 4: Thermal model overtemperature calculated.

Bit 5: (heat sink, gating module, power unit) overtemperature measured.

Bit 6: Reserved.

Bit 7: Overvoltage detected.

Bit 8: Power unit has completed precharging, ready for pulse enable.

Bit 9: STO terminal missing.

Bit 10: Overcurrent detected.

Bit 11: Armature short-circuit active.

Bit 12: DRIVE-CLiQ fault active.

Bit 13: Vce fault detected, transistor de-saturated due to overcurrent/short-circuit.

Bit 14: Undervoltage detected.

See also: p0210 (Device supply voltage)

- Remedy:**
- In general:
    - Check the line supply voltage at the input terminals.
    - Check the line supply voltage setting (p0210).
  - For 5):
    - Carefully observe the permissible precharging frequency (refer to the product documentation).
  - For 6):
    - Check the total capacitance of the DC link and reduce in accordance with the maximum permissible DC link capacitance if necessary (refer to the product documentation).
  - For 7):
    - Interconnect the ready-for-operation signal from the infeed unit in the enable logic of the drives connected to this DC link.
  - For 8):
    - Check the connections of the external line contactor. The line contactor must be open during DC link fast discharge.
  - For 9):
    - Check the DC link for ground faults or short-circuits.
  - For 10):
    - When using the internal braking resistor, terminals DCP and R2 of connector X4 must be bridged.
    - When using an external braking resistor, this must be connected between DCP and R1 of connector X4.
- See also: p0210 (Device supply voltage)

---

**A30031 Power unit: Hardware current limiting in phase U**

**Message class:** Power electronics faulted (5)

**Message value:** -

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** Hardware current limit for phase U responded. The pulsing in this phase is inhibited for one pulse period.

- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

**Note:**

Alarm A30031 is always output if the hardware current limitation of phase U, V or W for the inverter responds.

- Remedy:**
- Check the motor data.
  - Check the motor circuit configuration (star/delta).
  - Check the motor load.
  - Check the power cable connections.
  - Check the power cables for short-circuit or ground fault.
  - Check the length of the power cables.

---

**A30034 Power unit: Internal overtemperature**

**Message class:** Power electronics faulted (5)

**Message value:** %1

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

19.2 List of faults and alarms

---

**Cause:** The alarm threshold for internal overtemperature has been reached.  
If the temperature inside the power unit increases up to the fault threshold, then fault F30036 is triggered.  
- Ambient temperature might be too high.  
- Insufficient cooling, fan failure.  
Alarm value (r2124, interpret binary):  
Bit 0 = 1: Overtemperature in the control electronics area.  
Bit 1 = 1: Overtemperature in the power electronics area.  
Bit 2 = 1: Overtemperature in the processor area.  
Bit 3 = 1: Overtemperature in the processor area.  
Bit 4 = 1: Overtemperature when the internal fan is defective.  
Bit 5 = 1: Intake air overtemperature.

**Remedy:** - Check the ambient temperature.  
- Check the fan for the inside of the unit.

---

**F30036 Power unit: Internal overtemperature**

**Message class:** Power electronics faulted (5)

**Message value:** %1

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The temperature inside the converter has exceeded the permissible limit value.

- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.

Fault value (r0949, interpret binary):

- Bit 0 = 1: Overtemperature in the control electronics area.
- Bit 1 = 1: Overtemperature in the power electronics area.
- Bit 2 = 1: Overtemperature in the processor area.
- Bit 3 = 1: Overtemperature in the processor area.
- Bit 4 = 1: Overtemperature when the internal fan is defective.
- Bit 5 = 1: Intake air overtemperature.

**Remedy:** - Check the internal fan.  
- Check the fan elements.  
- Check whether the ambient temperature is in the permissible range.

Notice:

This fault can only be acknowledged once the permissible temperature limit minus 5 K has been fallen below.

---

**F30040 Drive: 24/48 V undervoltage**

**Message class:** Supply voltage fault (undervoltage) (3)

**Message value:** Channel: %1, voltage: %2 [0.1 V]

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The undervoltage threshold of the 24 V power supply for the drive was fallen below for longer than 3 ms.

Fault value (r0949, interpret hexadecimal):

yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]

yy = 0: 24 V power supply

yy = 1: 48 V power supply

**Remedy:** - Check the drive power supply.  
- Carry out a POWER ON (switch-off/switch-on).



---

**A30041**      **Power unit: Undervolt 24/48 V alarm**

**Message class:** Supply voltage fault (undervoltage) (3)

**Message value:** Channel: %1, voltage: %2 [0.1 V]

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** For the power unit power supply, the lower threshold has been violated.  
 Alarm value (r2124, interpret hexadecimal):  
 yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]  
 yy = 0: 24 V power supply  
 yy = 1: 48 V power supply

**Remedy:** - Check the power supply of the power unit.  
 - Carry out a POWER ON (switch-off/switch-on) for the component.

---

**A30042**      **Power unit: Fan has reached the maximum operating hours**

**Message class:** Power electronics faulted (5)

**Message value:** %1

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The maximum operating time of at least one fan will soon be reached, or has already been exceeded.  
 Alarm value (r2124, interpret binary):  
 Bit 0 = 1:  
 The wear counter of the heat sink fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 0 is cleared and bit 2 is set in the alarm value.  
 Bit 2 = 1:  
 The wear counter of the heat sink fan has exceeded 100 %.  
 Bit 8 = 1:  
 The wear counter of the 1st internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 8 is cleared and bit 10 is set in the alarm value.  
 Bit 10 = 1:  
 The wear counter of the 1st internal fan has exceeded 100 %.  
 Bit 16 = 1:  
 The wear counter of the 2nd internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 16 is cleared and bit 18 is set in the alarm value.  
 Bit 18 = 1:  
 The wear counter of the 2nd internal fan has exceeded 100 %.

**Remedy:** For the fan involved, carry out the following:  
 - Replace the fan.  
 - Reset the wear counter using the appropriate button in Startdrive or the web server.  
 See also: p0251 (Power unit heat sink fan operating hours counter), r0277 (Power unit heat sink fan wear counter)

---

**F30043**      **Power unit: Overvolt 24/48 V**

**Message class:** Supply voltage fault (overvoltage) (3)

**Message value:** Channel: %1, voltage: %2 [0.1 V]

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** POWER ON

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**Cause:** For the power unit power supply, the upper threshold has been violated.  
Fault value (r0949, interpret hexadecimal):  
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]  
yy = 0: 24 V power supply  
yy = 1: 48 V power supply

**Remedy:** Check the power supply of the power unit.

---

**A30044 Power unit: Overvolt 24/48 V alarm**

**Message class:** Supply voltage fault (overvoltage) (3)  
**Message value:** Channel: %1, voltage: %2 [0.1 V]  
**Component:** Power Unit  
**Response:** NONE  
**Acknowledgment:** NONE

**Cause:** For the power unit power supply, the upper threshold has been violated.  
Alarm value (r2124, interpret hexadecimal):  
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]  
yy = 0: 24 V power supply  
yy = 1: 48 V power supply

**Remedy:** Check the power supply of the power unit.

---

**F30050 Power unit: 24 V supply overvoltage**

**Message class:** Supply voltage fault (overvoltage) (3)  
**Message value:** -  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** POWER ON

**Cause:** The voltage monitor signals an overvoltage fault on the module.

**Remedy:** - Check the 24 V power supply.  
- Replace the module if necessary.

---

**F30051 Power unit: Motor holding brake short-circuit detected**

**Message class:** External measured value / signal state outside the permissible range (16)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** A short-circuit at the motor holding brake terminals has been detected.  
Fault value (r0949, interpret decimal):  
Only for internal Siemens troubleshooting.

**Remedy:** - Check the motor holding brake for a short-circuit.  
- Check the connection and cable for the motor holding brake.

---

**F30052 EEPROM data error**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** POWER ON

**Cause:** The EEPROM data of the power unit module are incorrect.  
Fault value (r0949, interpret hexadecimal):  
Only for internal Siemens troubleshooting.

**Remedy:** Replace the power unit module or update the EEPROM data.

---

**F30055 Power unit: Braking chopper overcurrent**

**Message class:** Braking Module faulted (14)  
**Message value:** -  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** An overcurrent condition has occurred in the braking chopper.

**Remedy:** - Check whether the braking resistor has a short-circuit.  
- For an external braking resistor, check whether the resistor may have been dimensioned too small.

**Note:**  
The braking chopper is only enabled again at pulse enable after the fault has been acknowledged.

---

**F30062 Bypass contactor opened under current**

**Message class:** Infeed faulted (13)  
**Message value:** -  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** The bypass contactor of the precharging unit has been opened under current.  
Possible causes:  
- A defect at the bypass contactor

**Remedy:** It is urgently recommended that the components involved are replaced to prevent serious damage to the entire converter line-up.

---

**F30068 Power unit: undertemperature inverter heat sink**

**Message class:** Power electronics faulted (5)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

**Cause:** The actual inverter heat sink temperature is below the permissible minimum value.  
Possible causes:  
- The power unit is being operated at an ambient temperature that lies below the permissible range.  
- The temperature sensor evaluation is defective.

**Fault value (r0949, interpret decimal):**  
Inverter heat sink temperature [0.1 °C].

**Remedy:** - Ensure that higher ambient temperatures prevail.  
- Replace the power unit.

---

**A30076 Power unit: Thermal overload braking resistor alarm**

**Message class:** Braking Module faulted (14)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** NONE

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---

**Acknowledgment:** NONE

**Cause:** The energy absorbed by the braking resistor has exceeded the alarm threshold of 80 %. If the power unit is still operated in the generator mode, then this can reach the shutdown threshold. To avoid overheating of the braking resistor, use of the braking resistor is inhibited and alarm A30077 is output.

Alarm value (r2124, interpret decimal):

Energy absorbed by the braking resistor [Ws].

**Remedy:** Reduce the power when generating.

Note:

For a DC link coupling, the generating power of all of the coupled power units must be taken into consideration.

---

**A30077 Power unit: Thermal overload braking resistor**

**Message class:** Braking Module faulted (14)

**Message value:** %1

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The braking resistor is thermally overloaded. This is the reason that its use was inhibited.

Alarm value (r2124, interpret decimal):

Energy absorbed by the braking resistor [Ws].

**Remedy:** Reduce the power when generating.

Note:

- Once the braking resistor has thermally recovered, it is enabled for further use.

- For a DC link coupling, the generating power of all the coupled power units must be taken into consideration.

---

**F30078 Power unit: Line reactor overheated**

**Message class:** Overtemperature of the electronic components (6)

**Message value:** -

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** The temperature monitoring of the line reactor has responded. In addition to the OFF2 response, the use of the braking resistor was inhibited.

Note:

- An overtemperature condition of the line reactor can occur when a DC link coupling is used – and if the power when motoring, which is fed into the DC link - Is not evenly distributed across the rectifiers of the power units.

**Remedy:** - Check the converter fan and replace if necessary.

- Reduce the motoring power.

---

**A30250 Power unit: Overtemperature heat sink inverter**

**Message class:** Power electronics faulted (5)

**Message value:** -

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** The alarm threshold for overtemperature at the inverter heat sink has been reached.

Fault F30004 is initiated if the temperature of the heat sink increases by 5 K.

**Remedy:** Check the following:

- Is the ambient temperature within the defined limit values?

- Have the load conditions and the load duty cycle been appropriately dimensioned?

- Has the cooling failed?

---

---

**A30252 Power unit: Chip overtemperature alarm**

**Message class:** Power electronics faulted (5)  
**Message value:** Power semiconductor: %1, temperature: [0.01 degrees C] %2  
**Component:** Power Unit  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The chip temperature of the power semiconductor involved has exceeded the permissible alarm threshold.  
 Note:  
 - If the chip temperature of the power semiconductor involved increases by 5K, then fault F30025 is initiated.

Alarm value (r2124, interpret hexadecimal):  
 yyyyxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

**Remedy:** Check the following:  
 - Is the ambient temperature within the defined limit values?  
 - Have the load conditions and the load duty cycle been appropriately dimensioned?  
 - Has the cooling failed?  
 - Pulse frequency too high?

---

**A30253 Power unit: Overtemperature thermal model alarm**

**Message class:** Power electronics faulted (5)  
**Message value:** Power semiconductor: %1, temperature: [0.01 degrees C] %2  
**Component:** Power Unit  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible alarm threshold.  
 The maximum output current is reduced as overload response.

Alarm value (r2124, interpret hexadecimal):  
 yyyyxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

**Remedy:** Not necessary.  
 The alarm is automatically withdrawn once the alarm threshold has been fallen below.  
 Note:  
 If the temperature continues to increase, this can result in fault F30024.

---

**A30256 Power unit: Overload I2t**

**Message class:** Power electronics faulted (5)  
**Message value:** -  
**Component:** Power Unit  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The alarm threshold for the I2t overload of the power unit has been exceeded.  
 The output current and therefore the output frequency is reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for I2t overload is reached, the drive switches off the power unit.

**Remedy:**  
 - Reduce the continuous load.  
 - Adapt the load duty cycle.  
 - Check the assignment of the motor and power unit rated currents.

---

**F30260 Power unit: Fault in the driver supply for the power semiconductor**

**Message class:** Hardware/software error (1)

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---

**Message value:** -  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** A fault has occurred in the driver supply of the power semiconductor.  
**Remedy:** There is a hardware defect. The device must be replaced.

---

**F30262 Power unit: Braking chopper defective**

**Message class:** Power electronics faulted (5)  
**Message value:** -  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The braking chopper is defective.  
**Remedy:** Replace the converter.

---

**F30263 Power unit: Braking chopper upper defective**

**Message class:** Power electronics faulted (5)  
**Message value:** -  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The upper braking chopper is defective.  
**Remedy:** Replace the converter.

---

**F30265 Power unit: Line voltage failure detected**

**Message class:** Power electronics faulted (5)  
**Message value:** -  
**Component:** Power Unit  
**Response:** OFF3  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Line voltage failure was detected  
**Remedy:** - Switch on the line voltage.  
- To increase the degree of ruggedness, the delay time can be increased.

---

**A30502 Power unit: DC link overvoltage**

**Message class:** DC link overvoltage (4)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The power unit has detected overvoltage in the DC link on a pulse inhibit.  
- Device supply voltage too high.  
- Line reactor incorrectly dimensioned.  
Alarm value (r2124, interpret decimal):  
DC link voltage [1 bit = 100 mV].  
See also: r0070 (Actual DC link voltage)

**Remedy:**

- Check the device supply voltage (p0210).
- Check the dimensioning of the line reactor.

See also: p0210 (Device supply voltage)

---

**C30603 SI: Module temperature - limit value exceeded**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** -

**Component:** None

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Cause:** A safe monitoring function has detected that the module temperature has exceeded a limit value. STO (Safe Torque Off) was initiated to maintain the safe state.

**Remedy:**

- Check the ambient temperature.
- Check the module fan.
- Operate the module in the permissible range.

---

**F30604 SI: Safety EEPROM data error**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** POWER ON

**Cause:** Safety relevant EEPROM data are not correct.  
This message results in an STO (Safe Torque Off).

Message value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.

**Remedy:** Replace the module

---

**A30605 SI: Checksum error has occurred**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** %1

**Component:** None

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** A checksum error (CRC error) has occurred in the converter program memory.

**Remedy:**

- Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version.
- Contact Technical Support.

---

**C30649 SI: Internal software error**

**Message class:** Hardware/software error (1)

**Message value:** Module: %1, line: %2

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

---

**Cause:** An internal error has occurred in the Safety Integrated software.  
Note:  
This message results in an STO (Safe Torque Off) that cannot be acknowledged.  
Message value (r60049, interpret hexadecimal):  
Only for internal Siemens troubleshooting.

**Remedy:**

- Carry out a POWER ON (switch-off/switch-on) for all components.
- Re-commission the "Safety Integrated" function and carry out a POWER ON.
- Upgrade the firmware of the Control Unit to a later version.
- Ensure that the drive and all of its connected components are connected up in compliance with EMC regulations. Inadequately fixed motor phases or a non-compliant grounding concept can result in this fault.
- Contact Technical Support.
- Replace the Control Unit.

Note:  
SI: Safety Integrated

---

**C30680 SI: Checksum error safety monitoring functions**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Review the message on channel A for information  
**Remedy:**

---

**C30681 SI: Incorrect parameter value**

**Message class:** Error in the parameterization / configuration / commissioning procedure (18)  
**Message value:** Parameter: %1, supplementary information: %2  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Review the message on channel A for information  
**Remedy:**

---

**C30700 SI Motion P2: STO initiated**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** -  
**Component:** None  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The drive is stopped using STO.  
Possible causes:

- Stop request from another monitoring channel.
- STO not active after parameterized time after test stop selection.
- Subsequent response, following messages: A30706, A30714, F30701, A30716



**Remedy:**

- Remove the cause of the fault on the first monitoring channel.
- Check the switch-off signal path of the first of monitoring channel (check DRIVE-CLiQ communication).
- Carry out diagnostics for the active messages (A30706, A30714, F30701, A30716).
- Replace drive.

Note:

SAM: Safe Acceleration Monitor (safe acceleration monitoring)  
 SI: Safety Integrated  
 STO: Safe Torque Off

**C30701 SI Motion P2: SS1 initiated**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** -  
**Component:** None  
**Response:** OFF3  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The drive is stopped using SS1.  
 As a result of this fault, after the time parameterized in p9556 has expired, or the speed threshold parameterized in p9560 has been fallen below, message F30700 "SI Motion P2: STO initiated" is output.  
 Possible causes:

- Stop request from another monitoring channel.
- Subsequent response, following messages: A30714, A30711, A30707, A30716

**Remedy:**

- Remove the cause of the fault on the first monitoring channel.
- Carry out diagnostics for the active messages (A30714, A30711, A30707, A30716).

Note:

SI: Safety Integrated  
 SS1: Safe Stop 1

**C30706 SI: SAM/SBR limit exceeded**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Review the message on channel A for information  
**Remedy:** See also: p9548 (SI SAM speed tolerance)

**C30711 SI: SCF (Safety Channel Failure) initiated**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Review the message on channel A for information  
**Remedy:**

**C30714 SI: Safely-Limited Speed exceeded**

**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** None

19.2 List of faults and alarms

---

**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The drive had moved faster than that specified by the velocity limit value. The drive is stopped by the configured stop response.  
Message value (r2124, interpret decimal):  
100: SLS1 exceeded.  
200: SLS2 exceeded.  
300: SLS3 exceeded.  
400: SLS4 exceeded.  
1000: Encoder limit frequency exceeded.  
**Remedy:** - Check the traversing/motion program in the control.  
- Check the limits for the "SLS" function and if required adapt.  
Note:  
SI: Safety Integrated  
SLS: Safely-Limited Speed

---

**C30716**      **SI: Tolerance for Safe Direction exceeded**  
**Message class:** Safety monitoring channel has identified an error (10)  
**Message value:** %1  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Review the message on channel A for information  
**Remedy:**

---

**N30800**      **Power unit: Group signal**  
**Message class:** Power electronics faulted (5)  
**Message value:** -  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** NONE  
**Cause:** The power unit has detected at least one fault.  
**Remedy:** Evaluate the other messages that are presently available.

---

**F30805**      **Power unit: EEPROM checksum error**  
**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Internal parameter data is corrupted.  
Fault value (r0949, interpret hexadecimal):  
01: EEPROM access error.  
02: Too many blocks in the EEPROM.  
**Remedy:** Replace the module.

---

**F30810**      **Power unit: Watchdog timer expired**  
**Message class:** Hardware/software error (1)  
**Message value:** -

**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The watchdog timer has expired. This can only be caused by a fatal software error.  
**Remedy:**  
- Carry out a POWER ON (switch-off/switch-on) for all components.  
- Upgrade firmware to later version.  
- Contact Technical Support.

---

**F30815 Power unit: Processor clock signal error**

**Message class:** Hardware/software error (1)  
**Message value:** -  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** POWER ON  
**Cause:** The processor clock signal monitoring has signaled an error. This can involve the signal itself or its PLL.  
**Remedy:**  
- Replace the hardware.  
- Contact Technical Support.

---

**A30853 Power unit: Sign-of-life error cyclic data**

**Message class:** General drive fault (19)  
**Message value:** -  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE  
**Cause:** The cyclic setpoint telegrams of the power unit were not refreshed on time.  
**Remedy:** - Check the power unit and if required replace.

---

**F30860 Power unit DRIVE-CLiQ (CU): Telegram error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Power Unit  
**Response:** OFF2  
**Acknowledgment:** IMMEDIATELY

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<b>Cause:</b>	<p>There is an internal communication error in the power unit.</p> <p>Error cause:</p> <p>1 (= 01 hex): Checksum error (CRC error).</p> <p>2 (= 02 hex): Telegram is shorter than specified in the length byte or in the receive list.</p> <p>3 (= 03 hex): Telegram is longer than specified in the length byte or in the receive list.</p> <p>4 (= 04 hex): The length of the receive telegram does not match the receive list.</p> <p>5 (= 05 hex): The type of the receive telegram does not match the receive list.</p> <p>6 (= 06 hex): The address of the power unit in the telegram and in the receive list do not match.</p> <p>9 (= 09 hex): Failure of the supply voltage.</p> <p>16 (= 10 hex): The receive telegram is too early.</p> <p>17 (= 11 hex): CRC error and the receive telegram is too early.</p> <p>18 (= 12 hex): The telegram is shorter than that specified in the length byte or in the receive list and the receive telegram is too early.</p> <p>19 (= 13 hex): The telegram is longer than that specified in the length byte or in the receive list and the receive telegram is too early.</p> <p>20 (= 14 hex): The length of the receive telegram does not match the receive list and the receive telegram is too early.</p> <p>21 (= 15 hex): The type of the receive telegram does not match the receive list and the receive telegram is too early.</p> <p>22 (= 16 hex): The address of the power unit in the telegram and in the receive list does not match and the receive telegram is too early.</p> <p>25 (= 19 hex): The error bit in the receive telegram is set and the receive telegram is too early.</p> <p>Note regarding the message value: The individual information is coded as follows in the message value (r0949/r2124): 0000yyxx hex: yy = component number, xx = error cause</p>
<b>Remedy:</b>	<ul style="list-style-type: none"> <li>- Carry out a POWER ON (switch-off/switch-on).</li> <li>- Check the electrical cabinet design and cable routing for EMC compliance.</li> </ul>

---

**F30895 Power unit DRIVE-CLiQ: Alternating cyclic data transfer error**

<b>Message class:</b>	Internal (DRIVE-CLiQ) communication error (12)
<b>Message value:</b>	Component number: %1, fault cause: %2
<b>Component:</b>	Power Unit
<b>Response:</b>	OFF2
<b>Acknowledgment:</b>	IMMEDIATELY
<b>Cause:</b>	<p>A DRIVE-CLiQ communication error has occurred from the power unit to the Control Unit involved.</p> <p>Error cause:</p> <p>11 (= 0B hex): Synchronization error during alternating cyclic data transfer.</p> <p>Note regarding the message value: The individual information is coded as follows in the message value (r0949/r2124): 0000yyxx hex: yy = component number, xx = error cause</p>

**Remedy:** Carry out a POWER ON (switch-off/switch-on).

---

**F30899 Power unit: Unknown fault**

**Message class:** Power electronics faulted (5)

**Message value:** New message: %1

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** A fault occurred on the power unit that cannot be interpreted by the Control Unit firmware.  
This can occur if the firmware on this component is more recent than the firmware on the Control Unit.  
Fault value (r0949, interpret decimal):  
Fault number.  
Note:  
If required, the significance of this new fault can be read about in a more recent description of the Control Unit.

**Remedy:** - Replace the firmware on the power unit by an older firmware version.  
- Upgrade the firmware on the Control Unit.

---

**F30950 Power unit: Internal software error**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Power Unit

**Response:** OFF2

**Acknowledgment:** POWER ON

**Cause:** An internal software error has occurred.  
Fault value (r0949, interpret decimal):  
Information about the fault source.  
Only for internal Siemens troubleshooting.

**Remedy:** - If necessary, upgrade the firmware in the power unit to a later version.  
- Contact Technical Support.

---

**A30999 Power unit: Unknown alarm**

**Message class:** Power electronics faulted (5)

**Message value:** New message: %1

**Component:** Power Unit

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** An alarm occurred on the power unit that cannot be interpreted by the Control Unit firmware.  
This can occur if the firmware on this component is more recent than the firmware on the Control Unit.  
Alarm value (r2124, interpret decimal):  
Alarm number.  
Note:  
If required, the significance of this new alarm can be read about in a more recent description of the Control Unit.

**Remedy:** - Replace the firmware on the power unit by an older firmware version.  
- Upgrade the firmware on the Control Unit.

---

**F31120 Motor encoder: Encoder power supply fault**

**Message class:** Position/speed actual value incorrect or not available (11)

**Message value:** Fault cause: %1 bin

**Component:** Encoder 1

19.2 List of faults and alarms

**Response:** ENCODER

**Acknowledgment:** PULSE INHIBIT

**Cause:** An encoder power supply fault was detected.

Fault value (r0949, interpret binary):

Bit 0: Undervoltage condition on the sense line.

Bit 1: Overcurrent condition for the encoder power supply.

Bit 2: Overcurrent condition for encoder power supply on cable resolver excitation negative.

Bit 3: Overcurrent condition for encoder power supply on cable resolver excitation positive.

Bit 4: The 24 V power supply via the inverter is overloaded.

Bit 5: Overcurrent at the EnDat connection of the converter.

Bit 6: Overvoltage at the EnDat connection of the converter.

Bit 7: Hardware fault at the EnDat connection of the converter.

Note:

If the encoder cables 6FX2002-2EQ00-.... and 6FX2002-2CH00-.... are interchanged, this can result in the encoder being destroyed because the pins of the operating voltage are reversed.

**Remedy:** For fault value, bit 0 = 1:

- Correct encoder cable connected?
- Check the plug connections of the encoder cable.
- SMC30: Check the parameterization (p0404.22).

For fault value, bit 1 = 1:

- Correct encoder cable connected?
- Replace the encoder or encoder cable.

For fault value, bit 2 = 1:

- Correct encoder cable connected?
- Replace the encoder or encoder cable.

For fault value, bit 3 = 1:

- Correct encoder cable connected?
- Replace the encoder or encoder cable.

For fault value, bit 5 = 1:

- Measuring unit correctly connected at the converter?
- Replace the measuring unit or the cable to the measuring unit.

For fault value, bit 6, 7 = 1:

- Replace the defective EnDat 2.2 converter.

---

**F31135 Motor encoder: Fault when determining the position (singleturn)**

**Message class:** Position/speed actual value incorrect or not available (11)

**Message value:** Fault cause: %1 bin

**Component:** Encoder 1

**Response:** ENCODER

**Acknowledgment:** PULSE INHIBIT

- Cause:** The encoder has identified a position determination fault (singleturn) and supplies status information bit by bit in an internal status/fault word.  
Some of these bits cause this fault to be triggered. Other bits are status displays. The status/fault word is displayed in the fault value.  
Note regarding the bit designation:  
The first designation is valid for DRIVE-CLiQ encoders, the second for EnDat 2.2 encoders.  
Fault value (r0949, interpret binary):  
Bit 0: F1 (safety status display).  
Bit 1: F2 (safety status display).  
Bit 2: Reserved (lighting).  
Bit 3: Reserved (signal amplitude).  
Bit 4: Reserved (position value).  
Bit 5: Reserved (overvoltage).  
Bit 6: Reserved (undervoltage)/hardware fault EnDat supply (--> F3x110, x = 1, 2, 3).  
Bit 7: Reserved (overcurrent)/EnDat encoder withdrawn when not in the parked state (--> F3x110, x = 1, 2, 3).  
Bit 8: Reserved (battery)/overcurrent EnDat supply (--> F3x110, x = 1, 2, 3).  
Bit 9: Reserved/overvoltage EnDat supply (--> F3x110, x = 1, 2, 3).  
Bit 11: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
Bit 12: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
Bit 13: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
Bit 14: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
Bit 15: Internal communication error (--> F3x110, x = 1, 2, 3).  
Bit 16: Lighting (--> F3x135, x = 1, 2, 3).  
Bit 17: Signal amplitude (--> F3x135, x = 1, 2, 3).  
Bit 18: Singleturn position 1 (--> F3x135, x = 1, 2, 3).  
Bit 19: Overvoltage (--> F3x135, x = 1, 2, 3).  
Bit 20: Undervoltage (--> F3x135, x = 1, 2, 3).  
Bit 21: Overcurrent (--> F3x135, x = 1, 2, 3).  
Bit 22: Temperature exceeded (--> F3x405, x = 1, 2, 3).  
Bit 23: Singleturn position 2 (safety status display).  
Bit 24: Singleturn system (--> F3x135, x = 1, 2, 3).  
Bit 25: Singleturn power down (--> F3x135, x = 1, 2, 3).  
Bit 26: Multiturn position 1 (--> F3x136, x = 1, 2, 3).  
Bit 27: Multiturn position 2 (--> F3x136, x = 1, 2, 3).  
Bit 28: Multiturn system (--> F3x136, x = 1, 2, 3).  
Bit 29: Multiturn power down (--> F3x136, x = 1, 2, 3).  
Bit 30: Multiturn overflow/underflow (--> F3x136, x = 1, 2, 3).  
Bit 31: Multiturn battery (reserved).
- Remedy:** - Determine the detailed cause of the fault using the fault value.  
- Replace the encoder if necessary.  
Note:  
An EnDat 2.2 encoder may only be removed and inserted in the "Park" state.  
If an EnDat 2.2 encoder was removed when not in the "Park" state, then after inserting the encoder, a POWER ON (switch-off/switch-on) is necessary to acknowledge the fault.

---

<b>F31136</b>	<b>Motor encoder: Fault when determining the position (multiturn)</b>
<b>Message class:</b>	Position/speed actual value incorrect or not available (11)
<b>Message value:</b>	Fault cause: %1 bin
<b>Component:</b>	Encoder 1
<b>Response:</b>	ENCODER
<b>Acknowledgment:</b>	PULSE INHIBIT

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**Cause:** The encoder has identified a position determination fault (multiturn) and supplies status information bit by bit in an internal status/fault word.  
 Some of these bits cause this fault to be triggered. Other bits are status displays. The status/fault word is displayed in the fault value.  
 Note regarding the bit designation:  
 The first designation is valid for DRIVE-CLiQ encoders, the second for EnDat 2.2 encoders.  
 Fault value (r0949, interpret binary):  
 Bit 0: F1 (safety status display).  
 Bit 1: F2 (safety status display).  
 Bit 2: Reserved (lighting).  
 Bit 3: Reserved (signal amplitude).  
 Bit 4: Reserved (position value).  
 Bit 5: Reserved (overvoltage).  
 Bit 6: Reserved (undervoltage)/hardware fault EnDat supply (--> F3x110, x = 1, 2, 3).  
 Bit 7: Reserved (overcurrent)/EnDat encoder withdrawn when not in the parked state (--> F3x110, x = 1, 2, 3).  
 Bit 8: Reserved (battery)/overcurrent EnDat supply (--> F3x110, x = 1, 2, 3).  
 Bit 9: Reserved/overvoltage EnDat supply (--> F3x110, x = 1, 2, 3).  
 Bit 11: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
 Bit 12: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
 Bit 13: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
 Bit 14: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).  
 Bit 15: Internal communication error (--> F3x110, x = 1, 2, 3).  
 Bit 16: Lighting (--> F3x135, x = 1, 2, 3).  
 Bit 17: Signal amplitude (--> F3x135, x = 1, 2, 3).  
 Bit 18: Singleturn position 1 (--> F3x135, x = 1, 2, 3).  
 Bit 19: Overvoltage (--> F3x135, x = 1, 2, 3).  
 Bit 20: Undervoltage (--> F3x135, x = 1, 2, 3).  
 Bit 21: Overcurrent (--> F3x135, x = 1, 2, 3).  
 Bit 22: Temperature exceeded (--> F3x405, x = 1, 2, 3).  
 Bit 23: Singleturn position 2 (safety status display).  
 Bit 24: Singleturn system (--> F3x135, x = 1, 2, 3).  
 Bit 25: Singleturn power down (--> F3x135, x = 1, 2, 3).  
 Bit 26: Multiturn position 1 (--> F3x136, x = 1, 2, 3).  
 Bit 27: Multiturn position 2 (--> F3x136, x = 1, 2, 3).  
 Bit 28: Multiturn system (--> F3x136, x = 1, 2, 3).  
 Bit 29: Multiturn power down (--> F3x136, x = 1, 2, 3).  
 Bit 30: Multiturn overflow/underflow (--> F3x136, x = 1, 2, 3).  
 Bit 31: Multiturn battery (reserved).

**Remedy:** - Determine the detailed cause of the fault using the fault value.  
 - Replace the encoder if necessary.  
 Note:  
 An EnDat 2.2 encoder may only be removed and inserted in the "Park" state.  
 If an EnDat 2.2 encoder was removed when not in the "Park" state, then after inserting the encoder, a POWER ON (switch-off/switch-on) is necessary to acknowledge the fault.

---

**F31137**      **Motor encoder: Fault when determining the position (singleturn)**  
**Message class:** Hardware/software error (1)  
**Message value:** Fault cause: %1 bin  
**Component:** Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** PULSE INHIBIT



**Cause:** A position determination fault has occurred in the DRIVE-CLiQ encoder.  
Fault value (r0949, interpret binary):  
yyxxxxx hex: yy = encoder version, xxxxxx = bit coding of the fault cause

-----

For yy = 8 (0000 1000 bin), the following applies:

- Bit 1: Signal monitoring (sin/cos).
- Bit 8: F1 (safety status display) error position word 1.
- Bit 9: F2 (safety status display) error position word 2.
- Bit 16: LED monitoring.
- Bit 17: Fault when determining the position (multiturn).
- Bit 18: Single-step capability monitoring singleturn from the Safety channel.
- Bit 19: ECRC, configuration error in the safety channel.
- Bit 23: Temperature outside the limit values.

-----

For yy = 11 (0000 1011 bin), the following applies:

- Bit 0: Position word 1 difference between rotation counter and software counter (XC\_ERR).
- Bit 1: Position word 1 track error of the incremental signals (LIS\_ERR).
- Bit 2: Position word 1 error when aligning between incremental track signals and absolute value (ST\_ERR).
- Bit 3: Maximum permissible temperature exceeded (TEMP\_ERR).
- Bit 4: Power supply overvoltage (MON\_OVR\_VOLT).
- Bit 5: Power supply overcurrent (MON\_OVR\_CUR).
- Bit 6: Power supply undervoltage (MON\_UND\_VOLT).
- Bit 7: Rotation error counter (MT\_ERR).
- Bit 8: F1 (safety status display) error position word 1.
- Bit 9: F2 (safety status display) error position word 2.
- Bit 11: Position word 1 status bit: singleturn position OK (ADC\_ready).
- Bit 12: Position word 1 status bit: rotation counter OK (MT\_ready).
- Bit 13: Position word 1 memory error (MEM\_ERR).
- Bit 14: Position word 1 absolute position error (MLS\_ERR).
- Bit 15: position word 1 LED error, lighting unit error (LED\_ERR).
- Bit 18: Position word 2 error when aligning between incremental track signals and absolute value (ST\_ERR).
- Bit 21: Position word 2 memory error (MEM\_ERR).
- Bit 22: Position word 2 absolute position error (MLS\_ERR).
- Bit 23: position word 2 LED error, lighting unit error (LED\_ERR).

-----

For yy = 12 (0000 1100 bin), the following applies:

- Bit 8: encoder fault.
- Bit 10: error in the internal position data transport.

-----

For yy = 14 (0000 1110 bin), the following applies:

- Bit 0: Position word 1 temperature outside limit value.
- Bit 1: Position word 1 position determination error (multiturn).
- Bit 2: Position word 1 FPGA error.
- Bit 3: Position word 1 velocity error.
- Bit 4: Position word 1 communication error between FPGAs/error in the incremental signal.
- Bit 5: Position word 1 timeout absolute value/error when determining the position (singleturn).
- Bit 6: Position word 1 internal hardware fault (clock/power monitor IC/power).
- Bit 7: Position word 1 internal error (FPGA communication/FPGA parameterization/self-test/software).
- Bit 8: F1 (safety status display) error position word 1.
- Bit 9: F2 (safety status display) error position word 2.
- Bit 16: Position word 2 temperature outside limit value.
- Bit 17: Position word 2 position determination error (multiturn).

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- Bit 18: Position word 2 FPGA error.
- Bit 19: Position word 2 velocity error.
- Bit 20: Position word 2 communication error between FPGAs.
- Bit 21: Position word 2 position determination error (singleturn).
- Bit 22: Position word 2 internal hardware fault (clock/power monitor IC/power).
- Bit 23: Position word 2 internal error (self-test/software).

-----

Note:

For an encoder version that is not described here, please contact the encoder manufacturer for more detailed information on the bit coding.

- Remedy:**
- Determine the detailed cause of the fault using the fault value.
  - If required, replace the DRIVE-CLiQ encoder.

---

**F31138      Motor encoder: Fault when determining the position (multiturn)**

**Message class:** Hardware/software error (1)

**Message value:** Fault cause: %1 bin

**Component:** Encoder 1

**Response:** ENCODER

**Acknowledgment:** PULSE INHIBIT

**Cause:** A position determination fault has occurred in the DRIVE-CLiQ encoder.  
Fault value (r0949, interpret binary):  
yyxxxxxx hex: yy = encoder version, xxxxxx = bit coding of the fault cause  
-----

For yy = 8 (0000 1000 bin), the following applies:  
Bit 1: Signal monitoring (sin/cos).  
Bit 8: F1 (safety status display) error position word 1.  
Bit 9: F2 (safety status display) error position word 2.  
Bit 16: LED monitoring.  
Bit 17: Fault when determining the position (multiturn).  
Bit 19: ECRC, configuration error in the safety channel.  
Bit 23: Temperature outside the limit values.  
-----

For yy = 11 (0000 1011 bin), the following applies:  
Bit 0: Position word 1 difference between rotation counter and software counter (XC\_ERR).  
Bit 1: Position word 1 track error of the incremental signals (LIS\_ERR).  
Bit 2: Position word 1 error when aligning between incremental track signals and absolute value (ST\_ERR).  
Bit 3: Maximum permissible temperature exceeded (TEMP\_ERR).  
Bit 4: Power supply overvoltage (MON\_OVR\_VOLT).  
Bit 5: Power supply overcurrent (MON\_OVR\_CUR).  
Bit 6: Power supply undervoltage (MON\_UND\_VOLT).  
Bit 7: Rotation error counter (MT\_ERR).  
Bit 8: F1 (safety status display) error position word 1.  
Bit 9: F2 (safety status display) error position word 2.  
Bit 11: Position word 1 status bit: singleturn position OK (ADC\_ready).  
Bit 12: Position word 1 status bit: rotation counter OK (MT\_ready).  
Bit 13: Position word 1 memory error (MEM\_ERR).  
Bit 14: Position word 1 absolute position error (MLS\_ERR).  
Bit 15: position word 1 LED error, lighting unit error (LED\_ERR).  
Bit 18: Position word 2 error when aligning between incremental track signals and absolute value (ST\_ERR).  
Bit 21: Position word 2 memory error (MEM\_ERR).  
Bit 22: Position word 2 absolute position error (MLS\_ERR).  
Bit 23: position word 2 LED error, lighting unit error (LED\_ERR).  
-----

For yy = 14 (0000 1110 bin), the following applies:  
Bit 0: Position word 1 temperature outside limit value.  
Bit 1: Position word 1 position determination error (multiturn).  
Bit 2: Position word 1 FPGA error.  
Bit 3: Position word 1 velocity error.  
Bit 4: Position word 1 communication error between FPGAs/error in the incremental signal.  
Bit 5: Position word 1 timeout absolute value/error when determining the position (singleturn).  
Bit 6: Position word 1 internal hardware fault (clock/power monitor IC/power).  
Bit 7: Position word 1 internal error (FPGA communication/FPGA parameterization/self-test/software).  
Bit 8: F1 (safety status display) error position word 1.  
Bit 9: F2 (safety status display) error position word 2.  
Bit 16: Position word 2 temperature outside limit value.  
Bit 17: Position word 2 position determination error (multiturn).  
Bit 18: Position word 2 FPGA error.  
Bit 19: Position word 2 velocity error.  
Bit 20: Position word 2 communication error between FPGAs.  
Bit 21: Position word 2 position determination error (singleturn).  
Bit 22: Position word 2 internal hardware fault (clock/power monitor IC/power).

19.2 List of faults and alarms

---

Bit 23: Position word 2 internal error (self-test/software).

-----

Note:

For an encoder version that is not described here, please contact the encoder manufacturer for more detailed information on the bit coding.

**Remedy:** - Determine the detailed cause of the fault using the fault value.  
- If required, replace the DRIVE-CLiQ encoder.

---

**F31405 Motor encoder: Temperature in the encoder evaluation exceeded**

**Message class:** Overtemperature of the electronic components (6)

**Message value:** temperature: [0.1 degrees C] %1, temperature sensor number: %2

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

**Cause:** An inadmissibly high temperature was detected in the encoder electronics or the encoder evaluation.

Fault value (r0949, interpret hexadecimal):

yyxxxx hex: yy = temperature sensor number, xxxx = measured module temperature in 0.1 °C.

**Remedy:** When using a Sensor Module: Reduce the ambient temperature of the Sensor Module.  
Otherwise: Reduce the encoder ambient temperature.

---

**A31700 Motor encoder: Functional safety monitoring initiated**

**Message class:** Safety monitoring channel has identified an error (10)

**Message value:** Fault cause: %1 bin

**Component:** Sensor Module Encoder 1

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** Functional safety was activated. Self-test of the DRIVE-CLiQ encoder has detected a fault.

Alarm value (r2124, interpret binary):

Bit x = 1: Effectivity test x unsuccessful.

**Remedy:** Replace encoder.

---

**F31801 Motor encoder DRIVE-CLiQ: Sign-of-life missing**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1, fault cause: %2

**Component:** Control Unit (CU)

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

**Cause:** A DRIVE-CLiQ communication error has occurred from the Control Unit to the encoder involved.

Error cause:

10 (= 0A hex):

The sign-of-life bit in the receive telegram is not set.

Note regarding the message value:

The individual information is coded as follows in the message value (r0949/r2124):

0000yyxx hex: yy = component number, xx = error cause

**Remedy:** - Check the electrical cabinet design and cable routing for EMC compliance.  
- Replace the component involved.

---

**F31802 Motor encoder: Time slice overflow**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY  
**Cause:** A time slice overflow for the motor encoder has occurred.  
Fault value (r0949, interpret hexadecimal):  
yx hex: y = function involved (Siemens-internal fault diagnostics), x = time slice involved  
x = 9:  
Time slice overflow of the fast (current controller clock cycle) time slice.  
x = A:  
Time slice overflow of the average time slice.  
x = C:  
Time slice overflow of the slow time slice.  
yx = 3E7:  
Timeout when waiting for SYNO (e.g. unexpected return to non-cyclic operation).  
**Remedy:** Increase the current controller sampling time  
Note:  
For a current controller sampling time = 31.25 µs, use an SMx20 with Article No. 6SL3055-0AA00-5xA3.

---

**F31804 Motor encoder: Sensor Module checksum error**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** POWER ON  
**Cause:** A checksum error has occurred when reading-out the program memory on the Sensor Module.  
Fault value (r0949, interpret hexadecimal):  
yyyyxxxx hex  
yyyy: Memory area involved.  
xxxx: Difference between the checksum at POWER ON and the actual checksum.  
**Remedy:** - Carry out a POWER ON (switch-off/switch-on).  
- Upgrade firmware to later version.  
- Check whether the permissible ambient temperature for the component is maintained.

---

**F31805 Motor encoder: EEPROM checksum error**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Data in the EEPROM corrupted .  
Fault value (r0949, interpret hexadecimal):  
01: EEPROM access error.  
02: Too many blocks in the EEPROM.  
**Remedy:** Replace the module.

---

**F31806 Motor encoder: Initialization error**

**Message class:** Position/speed actual value incorrect or not available (11)  
**Message value:** %1  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER

19.2 List of faults and alarms

**Acknowledgment:** PULSE INHIBIT

**Cause:** The encoder was not successfully initialized.  
 Fault value (r0949, interpret binary):  
 Bit 0, 1: Encoder initialization with the motor rotating has failed (deviation involving coarse and fine position in encoder pulses/4).  
 Bit 2: Mid-voltage matching for track A unsuccessful.  
 Bit 3: Mid-voltage matching for track B unsuccessful.  
 Bit 4: Mid-voltage matching for acceleration input unsuccessful.  
 Bit 5: Mid-voltage matching for track safety A unsuccessful.  
 Bit 6: Mid-voltage matching for track safety B unsuccessful.  
 Bit 7: Mid-voltage matching for track C unsuccessful.  
 Bit 8: Mid-voltage matching for track D unsuccessful.  
 Bit 9: Mid-voltage matching for track R unsuccessful.  
 Bit 10: The difference in mid-voltages between A and B is too great (> 0.5 V)  
 Bit 11: The difference in mid-voltages between C and D is too great (> 0.5 V)  
 Bit 12: The difference in mid-voltages between safety A and safety B is too great (> 0.5 V)  
 Bit 13: The difference in mid-voltages between A and safety B is too great (> 0.5 V)  
 Bit 14: The difference in mid-voltages between B and safety A is too great (> 0.5 V)  
 Bit 15: The standard deviation of the calculated mid-voltages is too great (> 0.3 V)  
 Bit 16: Internal fault - Fault when reading a register (CAFE)  
 Bit 17: Internal fault - Fault when writing a register (CAFE)  
 Bit 18: Internal fault: No mid-voltage matching available  
 Bit 19: Internal error - ADC access error.  
 Bit 20: Internal error - No zero crossover found.  
 Bit 28: Error while initializing the EnDat 2.2 measuring unit.  
 Bit 29: Error when reading out the data from the EnDat 2.2 measuring unit.  
 Bit 30: EEPROM checksum of the EnDat 2.2 measuring unit incorrect.  
 Bit 31: Data of the EnDat 2.2 measuring unit inconsistent.  
 Note:  
 Bit 0, 1: Up to 6SL3055-0AA00-5\*A0  
 Bits 2 ... 20: 6SL3055-0AA00-5\*A1 and higher

**Remedy:** Acknowledge fault.  
 If the fault cannot be acknowledged:  
 Bits 2 ... 9: Check encoder power supply.  
 Bits 2 ... 14: Check the corresponding cable.  
 Bit 15 with no other bits: Check track R, check settings in p0404.  
 Bit 28: Check the cable between the EnDat 2.2 converter and the measuring unit.  
 Bit 29 ... 31: Replace the defective measuring unit.

---

**F31813 Motor encoder: Hardware logic unit failed**

**Message class:** Hardware/software error (1)  
**Message value:** Fault cause: %1 bin  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** PULSE INHIBIT  
**Cause:** The logic unit of the DRIVE-CLiQ encoder has failed.  
 Fault value (r0949, interpret binary):  
 Bit 0: ALU watchdog has responded.  
 Bit 1: ALU has detected a sign-of-life error.  
**Remedy:** When the error reoccurs, replace the encoder.

---

**F31820 Motor encoder DRIVE-CLiQ: Telegram error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY  
**Cause:** A DRIVE-CLiQ communication error has occurred from the Control Unit to the encoder concerned.  
Error cause:  
1 (= 01 hex):  
Checksum error (CRC error).  
2 (= 02 hex):  
Telegram is shorter than specified in the length byte or in the receive list.  
3 (= 03 hex):  
Telegram is longer than specified in the length byte or in the receive list.  
4 (= 04 hex):  
The length of the receive telegram does not match the receive list.  
5 (= 05 hex):  
The type of the receive telegram does not match the receive list.  
6 (= 06 hex):  
The address of the component in the telegram and in the receive list do not match.  
7 (= 07 hex):  
A SYNC telegram is expected - but the received telegram is not a SYNC telegram.  
8 (= 08 hex):  
No SYNC telegram is expected - but the received telegram is one.  
9 (= 09 hex):  
The error bit in the receive telegram is set.  
16 (= 10 hex):  
The receive telegram is too early.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause  
**Remedy:**  
- Carry out a POWER ON (switch-off/switch-on).  
- Check the electrical cabinet design and cable routing for EMC compliance.  
- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).

---

**F31835 Motor encoder DRIVE-CLiQ: Cyclic data transfer error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

**Cause:** A DRIVE-CLiQ communication error has occurred from the Control Unit to the encoder concerned. The nodes do not send and receive in synchronism.  
Error cause:  
33 (= 21 hex):  
The cyclic telegram has not been received.  
34 (= 22 hex):  
Timeout in the telegram receive list.  
64 (= 40 hex):  
Timeout in the telegram send list.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:**

- Carry out a POWER ON.
- Replace the component involved.

---

**F31836 Motor encoder DRIVE-CLiQ: Send error for DRIVE-CLiQ data**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY

**Cause:** A DRIVE-CLiQ communication error has occurred from the Control Unit to the encoder involved. Data were not able to be sent.  
Error cause:  
65 (= 41 hex):  
Telegram type does not match send list.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:** Carry out a POWER ON.

---

**F31837 Motor encoder DRIVE-CLiQ: Component fault**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY



**Cause:** Fault detected on the DRIVE-CLiQ component concerned. Faulty hardware cannot be excluded.

Fault value (r0949, interpret hexadecimal):

0000yyxx hex:

yy = component number,

xx = fault cause

Error cause:

32 (= 20 hex):

Error in the telegram header.

35 (= 23 hex):

Receive error: The telegram buffer memory contains an error.

66 (= 42 hex):

Send error: The telegram buffer memory contains an error.

67 (= 43 hex):

Send error: The telegram buffer memory contains an error.

**Remedy:**

- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).
- Check the electrical cabinet design and cable routing for EMC compliance.
- Replace the component involved.

---

**F31845 Motor encoder DRIVE-CLiQ: Cyclic data transfer error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1, fault cause: %2

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

**Cause:** A DRIVE-CLiQ communication error has occurred from the Control Unit to the encoder involved.

Error cause:

11 (= 0B hex):

Synchronization error during alternating cyclic data transfer.

Note regarding the message value:

The individual information is coded as follows in the message value (r0949/r2124):

0000yyxx hex: yy = component number, xx = error cause

**Remedy:** Carry out a POWER ON (switch-off/switch-on).

---

**F31850 Motor encoder: Encoder evaluation internal software error**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** POWER ON

19.2 List of faults and alarms

---

**Cause:** An internal software error has occurred in the Sensor Module of the motor encoder.  
Fault value (r0949, interpret decimal):  
1: Background time slice is blocked.  
2: Checksum over the code memory is not correct.  
10000: OEM memory of the EnDat encoder contains data that cannot be interpreted.  
11000 ... 11499: Descriptive data from EEPROM incorrect.  
11500 ... 11899: Calibration data from EEPROM incorrect.  
11900 ... 11999: Configuration data from EEPROM incorrect.  
12000 ... 12008: communication with analog/digital converter faulted.  
16000: DRIVE-CLiQ encoder initialization application error.  
16001: DRIVE-CLiQ encoder initialization ALU error.  
16002: DRIVE-CLiQ encoder HISI / SISI initialization error.  
16003: DRIVE-CLiQ encoder safety initialization error.  
16004: DRIVE-CLiQ encoder internal system error.

**Remedy:**

- Replace the Sensor Module.
- If required, upgrade the firmware.
- Contact Technical Support.

---

**F31851 Motor encoder DRIVE-CLiQ (CU): Sign-of-life missing**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1, fault cause: %2

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

**Cause:** There is a DRIVE-CLiQ communication error between the Sensor Module (motor encoder) involved and the Control Unit. The DRIVE-CLiQ component did not set the sign-of-life to the Control Unit.  
Error cause:  
10 (= 0A hex):  
The sign-of-life bit in the receive telegram is not set.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:**

- Upgrade the firmware of the component involved.
- Carry out a POWER ON (switch-off/switch-on) for the component involved.

---

**F31860 Motor encoder DRIVE-CLiQ (CU): Telegram error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1, fault cause: %2

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

<b>Cause:</b>	<p>There is a DRIVE-CLiQ communication error between the Sensor Module (motor encoder) involved and the Control Unit.</p> <p>Error cause:</p> <p>1 (= 01 hex): Checksum error (CRC error).</p> <p>2 (= 02 hex): Telegram is shorter than specified in the length byte or in the receive list.</p> <p>3 (= 03 hex): Telegram is longer than specified in the length byte or in the receive list.</p> <p>4 (= 04 hex): The length of the receive telegram does not match the receive list.</p> <p>5 (= 05 hex): The type of the receive telegram does not match the receive list.</p> <p>6 (= 06 hex): The address of the power unit in the telegram and in the receive list do not match.</p> <p>9 (= 09 hex): The DRIVE-CLiQ communication from the DRIVE-CLiQ component involved to the Control Unit signals that the supply voltage has failed.</p> <p>16 (= 10 hex): The receive telegram is too early.</p> <p>17 (= 11 hex): CRC error and the receive telegram is too early.</p> <p>18 (= 12 hex): The telegram is shorter than that specified in the length byte or in the receive list and the receive telegram is too early.</p> <p>19 (= 13 hex): The telegram is longer than that specified in the length byte or in the receive list and the receive telegram is too early.</p> <p>20 (= 14 hex): The length of the receive telegram does not match the receive list and the receive telegram is too early.</p> <p>21 (= 15 hex): The type of the receive telegram does not match the receive list and the receive telegram is too early.</p> <p>22 (= 16 hex): The address of the power unit in the telegram and in the receive list does not match and the receive telegram is too early.</p> <p>25 (= 19 hex): The error bit in the receive telegram is set and the receive telegram is too early.</p> <p>Note regarding the message value: The individual information is coded as follows in the message value (r0949/r2124): 0000yyxx hex: yy = component number, xx = error cause</p>
<b>Remedy:</b>	<ul style="list-style-type: none"><li>- Carry out a POWER ON (switch-off/switch-on).</li><li>- Check the electrical cabinet design and cable routing for EMC compliance.</li><li>- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).</li></ul>

---

**F31875      Motor encoder: Supply voltage failed**

<b>Message class:</b>	Supply voltage fault (undervoltage) (3)
<b>Message value:</b>	Component number: %1, fault cause: %2
<b>Component:</b>	Sensor Module Encoder 1
<b>Response:</b>	ENCODER
<b>Acknowledgment:</b>	IMMEDIATELY

19.2 List of faults and alarms

---

**Cause:** The component involved has signaled that the 24 V supply has failed.  
Error cause:  
9 (= 09 hex):  
The power supply voltage for the components has failed.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:**

- Check the supply voltage wiring (interrupted cable, contacts, ...).
- Check the dimensioning of the 24 V supply, check cable lengths.

---

**F31885 Encoder 1 DRIVE-CLiQ: Cyclic data transfer error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY

**Cause:** There is a DRIVE-CLiQ communication error between the converter and motor.  
The nodes do not send and receive in synchronism.  
Error cause:  
26 (= 1A hex):  
Sign-of-life bit in the receive telegram not set and the receive telegram is too early.  
33 (= 21 hex):  
The cyclic telegram has not been received.  
34 (= 22 hex):  
Timeout in the telegram receive list.  
64 (= 40 hex):  
Timeout in the telegram send list.  
98 (= 62 hex):  
Error at the transition to cyclic operation.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:**

- Check the OCC cable between the converter and motor.
- Check the power supply voltage of the component involved.
- Carry out a POWER ON (switch-off/switch-on).
- Replace the component involved.

Note:  
OCC: One Cable Connection (one cable system)

---

**F31886 Motor encoder DRIVE-CLiQ (CU): Error when sending DRIVE-CLiQ data**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Sensor Module Encoder 1  
**Response:** ENCODER  
**Acknowledgment:** IMMEDIATELY

**Cause:** There is a DRIVE-CLiQ communication error from the Sensor Module involved (encoder 1) to the converter. Data were not able to be sent.

Fault value (r0949, interpret hexadecimal):

0000yyxx hex:

yy = component number,

xx = fault cause

Error cause:

65 (= 41 hex):

Telegram type does not match send list.

**Remedy:** - Carry out a POWER ON.

---

**F31887 Motor encoder DRIVE-CLiQ (CU): Component fault**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1, fault cause: %2

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

**Cause:** A fault has been detected on the DRIVE-CLiQ component involved (Sensor Module for the motor encoder). Faulty hardware cannot be excluded.

Fault value (r0949, interpret hexadecimal):

0000yyxx hex:

yy = component number,

xx = fault cause

Error cause:

32 (= 20 hex):

Error in the telegram header.

35 (= 23 hex):

Receive error: The telegram buffer memory contains an error.

66 (= 42 hex):

Send error: The telegram buffer memory contains an error.

67 (= 43 hex):

Send error: The telegram buffer memory contains an error.

96 (= 60 hex):

Response received too late during runtime measurement.

97 (= 61 hex):

Time taken to exchange characteristic data too long.

**Remedy:**

- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).
- Check the electrical cabinet design and cable routing for EMC compliance.
- Replace the component involved.

---

**F31895 Motor encoder DRIVE-CLiQ (CU): Alternating cyclic data transfer error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1, fault cause: %2

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

**Cause:** There is a DRIVE-CLiQ communication error between the Sensor Module (motor encoder) involved and the Control Unit.

Fault value (r0949, interpret hexadecimal):

0000yyxx hex:

yy = component number,

xx = fault cause

Error cause:

11 (= 0B hex):

Synchronization error during alternating cyclic data transfer.

**Remedy:** Carry out a POWER ON.

---

**F31896 Motor encoder DRIVE-CLiQ (CU): Inconsistent component properties**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1

**Component:** Sensor Module Encoder 1

**Response:** OFF2

**Acknowledgment:** IMMEDIATELY

**Explanation of the message value:** For %1

Component in target topology

**Cause:** The properties of the DRIVE-CLiQ component (Sensor Module for the motor encoder), specified by the fault value, have changed in an incompatible fashion with respect to the properties when running up. One cause can be, e.g. that a DRIVE-CLiQ cable or DRIVE-CLiQ component has been replaced.

Fault value (r0949, interpret decimal):

Component number.

**Remedy:** - Carry out a POWER ON.

- When a component is replaced, the same component type and if possible the same firmware version should be used.

- When a cable is replaced, only cables whose length is the same as or as close as possible to the length of the original cables should be used (ensure compliance with the maximum cable length).

---

**F31950 Motor encoder: Internal software error**

**Message class:** Hardware/software error (1)

**Message value:** %1

**Component:** Sensor Module Encoder 1

**Response:** ENCODER

**Acknowledgment:** POWER ON

**Cause:** An internal software error has occurred.

Fault value (r0949, interpret decimal):

The fault value contains information regarding the fault source.

Only for internal Siemens troubleshooting.

**Remedy:** - If necessary, upgrade the firmware in the Sensor Module to a later version.

- Contact Technical Support.

---

**F36207 Hub: Overtemperature component**

**Message class:** Overtemperature of the electronic components (6)

**Message value:** %1

**Component:** Terminal Board (TB)

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** The temperature on the DRIVE-CLiQ Hub Module has exceeded the fault threshold.  
 Fault value (r0949, interpret decimal):  
 Actual temperature in 0.1 °C resolution.

**Remedy:** - Check ambient temperature at component installation location.  
 - Replace the component involved.

**A36211 Hub: Overtemperature alarm component**

**Message class:** Overtemperature of the electronic components (6)  
**Message value:** %1  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** NONE

**Cause:** The temperature on the DRIVE-CLiQ Hub Module has exceeded the alarm threshold.  
 Alarm value (r2124, interpret decimal):  
 Actual temperature in 0.1 °C resolution.

**Remedy:** - Check ambient temperature at component installation location.  
 - Replace the component involved.

**F36214 Hub: overvoltage fault 24 V supply**

**Message class:** Supply voltage fault (overvoltage) (3)  
**Message value:** %1  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The 24 V power supply on the DRIVE-CLiQ Hub Module has exceeded the fault threshold.  
 Fault value (r0949, interpret decimal):  
 Actual operating voltage in 0.1 °C resolution

**Remedy:** - Check the supply voltage of the component involved.  
 - Replace the component involved.

**F36216 Hub: undervoltage fault 24 V supply**

**Message class:** Supply voltage fault (undervoltage) (3)  
**Message value:** %1  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

**Cause:** The 24 V power supply on the DRIVE-CLiQ Hub Module has undershot the fault threshold.  
 Fault value (r0949, interpret decimal):  
 Actual operating voltage in 0.1 °C resolution

**Remedy:** - Check the supply voltage of the component involved.  
 - Replace the component involved.

**A36217 Hub: undervoltage alarm 24 V supply**

**Message class:** Supply voltage fault (undervoltage) (3)  
**Message value:** %1  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** NONE

19.2 List of faults and alarms

**Cause:** The 24 V power supply on the DRIVE-CLiQ Hub Module has undershot the alarm threshold.  
Alarm value (r2124, interpret decimal):  
Actual operating voltage in 0.1 °C resolution

**Remedy:** - Check the supply voltage of the component involved.  
- Replace the component involved.

---

**N36800 Hub: Group signal**

**Message class:** General drive fault (19)  
**Message value:** -  
**Component:** None  
**Response:** NONE  
**Acknowledgment:** NONE

**Cause:** The DRIVE-CLiQ Hub Module has detected at least one fault.  
**Remedy:** Evaluates other actual messages.

---

**A36801 Hub DRIVE-CLiQ: Sign-of-life missing**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Control Unit (CU)  
**Response:** NONE  
**Acknowledgment:** NONE

**Cause:** A DRIVE-CLiQ communications error has occurred from the Control Unit to the DRIVE-CLiQ Hub Module involved.  
Error cause:  
10 (= 0A hex):  
The sign-of-life bit in the receive telegram is not set.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:** - Check the DRIVE-CLiQ connection.  
- Replace the component involved.

---

**A36802 Hub: Time slice overflow**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** NONE

**Cause:** A time slice overflow has occurred on the DRIVE-CLiQ Hub Module.  
Fault value (r0949, interpret decimal):  
xx: Time slice number xx

**Remedy:** - Reduce the current controller frequency.  
- Carry out a POWER ON (switch-off/switch-on) for all components.  
- Upgrade firmware to later version.  
- Contact Technical Support.

---

**F36804 Hub: Checksum error has occurred**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Terminal Board (TB)



**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** A checksum error occurred when reading out the program memory on the DRIVE-CLiQ Hub Module.  
Fault value (r0949, interpret hexadecimal):  
Difference between the checksum at POWER ON and the actual checksum.  
**Remedy:** - Check whether the permissible ambient temperature for the component is maintained.  
- Replace the DRIVE-CLiQ Hub Module.

---

**F36805 Hub: EEPROM checksum incorrect**

**Message class:** Hardware/software error (1)  
**Message value:** %1  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** The internal parameter data on the DRIVE-CLiQ Hub Module is incorrect.  
Alarm value (r2124, interpret hexadecimal):  
01: EEPROM access error.  
02: Too many blocks in the EEPROM.  
**Remedy:** - Check whether the permissible ambient temperature for the component is maintained.  
- Replace the DRIVE-CLiQ Hub Module.

---

**F36820 Hub DRIVE-CLiQ: Telegram error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

**Cause:** A DRIVE-CLiQ communications error has occurred from the Control Unit to the DRIVE-CLiQ Hub Module involved.

Error cause:

1 (= 01 hex):  
Checksum error (CRC error).

2 (= 02 hex):  
Telegram is shorter than specified in the length byte or in the receive list.

3 (= 03 hex):  
Telegram is longer than specified in the length byte or in the receive list.

4 (= 04 hex):  
The length of the receive telegram does not match the receive list.

5 (= 05 hex):  
The type of the receive telegram does not match the receive list.

6 (= 06 hex):  
The address of the component in the telegram and in the receive list do not match.

7 (= 07 hex):  
A SYNC telegram is expected - but the received telegram is not a SYNC telegram.

8 (= 08 hex):  
No SYNC telegram is expected - but the received telegram is one.

9 (= 09 hex):  
The error bit in the receive telegram is set.

16 (= 10 hex):  
The receive telegram is too early.

Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:**

- Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.
- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).

---

**F36835 Hub DRIVE-CLiQ: Cyclic data transfer error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)

**Message value:** Component number: %1, fault cause: %2

**Component:** Terminal Board (TB)

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** A DRIVE-CLiQ communications error has occurred from the Control Unit to the DRIVE-CLiQ Hub Module involved. The nodes do not send and receive in synchronism.

Error cause:

33 (= 21 hex):

The cyclic telegram has not been received.

34 (= 22 hex):

Timeout in the telegram receive list.

64 (= 40 hex):

Timeout in the telegram send list.

Note regarding the message value:

The individual information is coded as follows in the message value (r0949/r2124):

0000yyxx hex: yy = component number, xx = error cause

**Remedy:**

- Carry out a POWER ON.

- Replace the component involved.

---

**F36836 Hub DRIVE-CLiQ: Send error for DRIVE-CLiQ data**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** A DRIVE-CLiQ communications error has occurred from the Control Unit to the DRIVE-CLiQ Hub Module involved. Data were not able to be sent.  
Error cause:  
65 (= 41 hex):  
Telegram type does not match send list.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause  
**Remedy:** Carry out a POWER ON.

---

**F36837 Hub DRIVE-CLiQ: Component fault**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY  
**Cause:** Fault detected on the DRIVE-CLiQ component concerned. Faulty hardware cannot be excluded.  
Error cause:  
32 (= 20 hex):  
Error in the telegram header.  
35 (= 23 hex):  
Receive error: The telegram buffer memory contains an error.  
66 (= 42 hex):  
Send error: The telegram buffer memory contains an error.  
67 (= 43 hex):  
Send error: The telegram buffer memory contains an error.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause  
**Remedy:**  
- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).  
- Check the electrical cabinet design and cable routing for EMC compliance.  
- If required, use another DRIVE-CLiQ socket.  
- Replace the component involved.

---

**F36845 Hub DRIVE-CLiQ: Cyclic data transfer error**

**Message class:** Internal (DRIVE-CLiQ) communication error (12)  
**Message value:** Component number: %1, fault cause: %2  
**Component:** Terminal Board (TB)  
**Response:** NONE  
**Acknowledgment:** IMMEDIATELY

19.2 List of faults and alarms

---

**Cause:** A DRIVE-CLiQ communications error has occurred from the Control Unit to the DRIVE-CLiQ Hub Module involved.  
Error cause:  
11 (= 0B hex):  
Synchronization error during alternating cyclic data transfer.  
Note regarding the message value:  
The individual information is coded as follows in the message value (r0949/r2124):  
0000yyxx hex: yy = component number, xx = error cause

**Remedy:** Carry out a POWER ON.

---

**F36899 Hub: Unknown fault**

**Message class:** General drive fault (19)

**Message value:** New message: %1

**Component:** Terminal Board (TB)

**Response:** NONE

**Acknowledgment:** IMMEDIATELY

**Cause:** A fault occurred on the DRIVE-CLiQ Hub Module that cannot be interpreted by the Control Unit firmware. This can occur if the firmware on this component is more recent than the firmware on the Control Unit.  
Fault value (r0949, interpret decimal):  
Fault number.  
Note:  
If required, the significance of this new fault can be read about in a more recent description of the Control Unit.

**Remedy:** - Replace the firmware on the DRIVE-CLiQ Hub Module with older firmware.  
- Upgrade the firmware on the Control Unit.

---

**A36999 Hub: Unknown alarm**

**Message class:** General drive fault (19)

**Message value:** New message: %1

**Component:** Terminal Board (TB)

**Response:** NONE

**Acknowledgment:** NONE

**Cause:** An alarm has occurred on the DRIVE-CLiQ Hub Module, which cannot be interpreted by the converter firmware. This can occur if the firmware on this component is more recent than the firmware on the converter.  
Alarm value (r2124, interpret decimal):  
Alarm number.  
Note:  
If required, the significance of this new alarm can be read about in a more recent description of the converter.

**Remedy:** - Replace the firmware on the DRIVE-CLiQ Hub Module with older firmware.  
- Upgrade the converter firmware.

---

## 19.3 Motor faults

### Description

Information about identifying motor faults and how they are resolved is provided in Chapter "Cleaning the motor (Page 345)".



## Appendix

### A.1 Communication telegrams

#### A.1.1 Standard telegrams

##### A.1.1.1 Telegram 3

#### Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 1 position encoder.

#### Description of function

Process data	Telegram 3			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD06	---	Not assigned	G1_XIST1	Position actual value 1 from encoder 1
PZD07	---			
PZD08	---		G1_XIST2	Position actual value 2 from encoder 1
PZD09	---			

##### A.1.1.2 Telegram 5

#### Overview

The telegram is suitable for the closed-loop speed control and closed-loop position control of a drive and to control 1 position encoder.

#### Requirement

PROFINET with IRT (Isochronous Real-Time)

## Description of function

Process data	Telegram 5			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD06	XERR	Position controller deviation	G1_XIST1	Position actual value 1 from encoder 1
PZD07				
PZD08	KPC	Gain factor for the position controller	G1_XIST2	Position actual value 2 from encoder 1
PZD09				

## A.1.1.3 Telegram 102

## Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 1 position encoder.

## Description of function

Process data	Telegram 102			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD07	---	Not assigned	G1_XIST1	Position actual value 1 from encoder 1
PZD08	---			
PZD09	---		G1_XIST2	Position actual value 2 from encoder 1
PZD10	---			



### A.1.1.4 Telegram 105

#### Overview

The telegram is suitable for the closed-loop speed control and closed-loop position control of a drive and to control 1 position encoder.

#### Requirement

PROFINET with IRT (Isochronous Real-Time)

#### Description of function

Process data	Telegram 105			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD07	XERR	Position controller deviation	G1_XIST1	Position actual value 1 from encoder 1
PZD08				
PZD09	KPC	Gain factor for the position controller	G1_XIST2	Position actual value 2 from encoder 1
PZD10				

## A.1.2 Supplementary telegrams

### A.1.2.1 Telegram 700

#### Overview

Supplementary telegram 700 transfers the status of Safety Integrated Functions.

## Description of function

Process data	Telegram 700			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZDn+1	---	Not assigned	S_ZSW1B	Status word of the Safety Integrated Functions
PZDn+2	---		S_V_LIMIT_B	Actual limitation to the set-point speed
PZDn+3	---			

Transfer of telegram 700 is not failsafe. A PROFIsafe telegram is required for failsafe transfer.

### A.1.2.2 Telegram 750

#### Overview

Telegram 750 is suitable to control the drive torque, e.g. for an electronic counterweight of a vertical axis.

## Description of function

Process data	Telegram 750			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZDn+1	M_ADD1	Acceleration compensation	M_ACT	Current torque
PZDn+2	M_LIMIT_POS	Positive torque limit	---	Not assigned
PZDn+3	M_LIMIT_NEG	Negative torque limit	---	

## A.1.3 PROFIsafe telegrams

### A.1.3.1 Telegram 30

#### Overview

Via a PROFIsafe telegram, the higher-level failsafe control activates the Safety Integrated Functions of the converter and receives feedback on the status of the Safety Integrated Functions.

## Description of function

The converter receives data cyclically from the higher-level failsafe control and sends its send data cyclically back to the failsafe control.

Process data	Telegram 30			
	Failsafe control → Converter		Converter → Failsafe control	
	Signal	Explanation	Signal	Explanation
PZD01	S_STW1	Safety control word 1	S_ZSW1	Safety status word 1

### A.1.3.2 Telegram 901

#### Overview

Via the PROFIsafe telegram, the higher-level failsafe control activates the Safety Integrated Functions of the converter and receives feedback on the status of the Safety Integrated Functions.

## Description of function

The converter receives data cyclically from the higher-level failsafe control and sends its send data cyclically back to the failsafe control.

Process data	Telegram 901			
	Failsafe control → Converter		Converter → Failsafe control	
	Signal	Explanation	Signal	Explanation
PZD01	S_STW2	Safety control word 2	S_ZSW2	Safety status word 2
PZD02				
PZD03	S_SLS_LIMIT_A	Variable limit value for SLS	S_SLS_LIMIT_A_ACTIVE	Variable limit value for SLS
PZD04	---	Not assigned	reserved	---
PZD05	---		reserved	---

## A.1.4 Control words, status words and message word

### A.1.4.1 Control word 1 and status word 1

#### Overview

Control word 1 (STW1) activates the converter drive functions.

Status word 1 (ZSW1) signals the status of the converter to the higher-level control.

## Description of function

Control word 1 (STW1)		
Control → Converter		
Bit	Drive function	Explanation
00	0 = OFF1	The motor brakes with the ramp-down time p1121 of the ramp-function generator. The converter switches off the motor at standstill.
	0 → 1 = ON	The converter goes into the "ready" state. If, in addition, bit 3 = 1, the converter switches on the motor.
01	0 = OFF2	Switch off the motor immediately, the motor then coasts down to a standstill.
	1 = No OFF2	The motor can be switched on (ON command).
02	0 = Quick stop (OFF3)	Quick stop: The motor brakes to a standstill with the OFF3 ramp-down time p1135.
	1 = No quick stop (OFF3)	The motor can be switched on (ON command).
03	0 = Inhibit operation	Immediately switch off motor (cancel pulses).
	1 = Enable operation	Switch on motor (pulses can be enabled).
04	0 = Inhibit RFG	The converter immediately sets its ramp-function generator output to 0.
	1 = Do not inhibit RFG	The ramp-function generator can be enabled.
05	0 = Stop RFG	The output of the ramp-function generator stops at the current value.
	1 = Enable RFG	The output of the ramp-function generator follows the setpoint.
06	0 = Inhibit setpoint	The converter brakes the motor with the ramp-down time p1121 of the ramp-function generator.
	1 = Enable setpoint	Motor accelerates to the setpoint with the ramp-up time p1120.
07	0 → 1 = Acknowledge faults	Acknowledge fault. If the ON command is still active, the converter switches to the "switching on inhibited" state.
08	Reserved	
09	Reserved	
10	0 = No control by PLC	Converter ignores the process data from the fieldbus.
	1 = Control via PLC	Control via fieldbus, converter accepts the process data from the fieldbus.
11	Reserved	

Control word 1 (STW1)				
Control → Converter				
Bit	Drive function		Explanation	
12	Telegrams 102, 105	Telegrams 3, 5	Unconditionally open motor holding brake	--
	1 = Open holding brake	Reserved		
13	Reserved			
14	Telegrams 102, 105	Telegrams 3, 5	Switch-over from speed to torque control	--
	1 = Torque control active 0 = Closed-loop speed control active	Reserved		
15	Reserved			

Status word 1 (ZSW1)				
Converter → Control				
Bit	Status		Explanation	
00	1 = Ready for switching on		Power supply switched on; electronics initialized; pulses inhibited.	
01	1 = Ready for operation		Motor is switched on (ON/OFF1 = 1), no fault is active. With the command "Enable operation" (STW1.3), the converter switches on the motor.	
02	1 = Operation enabled		Motor follows setpoint. See control word 1, bit 3.	
03	1 = Fault present		The converter has a fault. Acknowledge fault using STW1.7.	
04	1 = OFF2 inactive		Coast down to standstill is not active.	
05	1 = OFF3 inactive		Quick stop is not active.	
06	1 = "Switching on inhibited" active		It is only possible to switch on the motor after an OFF1 followed by ON.	
07	1 = Alarm active		Motor remains switched on; no acknowledgement is necessary.	
08	1 = Speed deviation within the tolerance range		Setpoint / actual value deviation within the tolerance range.	
09	1 = Control requested		The automation system has been requested to take over control of the converter.	
10	1 = Comparison speed reached or exceeded		Speed is greater than or equal to the corresponding maximum speed.	
11	Telegrams 102, 103	Telegrams 3, 5	Internal diagnostics for automation systems with integrated SINAMICS functionality	Comparison value for current or torque has been reached or exceeded.
	1 = Alarm class bit 0	1 = Torque limit reached		
12	1 = Alarm class bit 1	1 = Holding brake open		Signal to open and close a motor holding brake.

Status word 1 (ZSW1)				
Converter → Control				
Bit	Status		Explanation	
13	Reserved	0 = Alarm, motor over-temperature	--	Motor temperature alarm threshold reached
14	1 = Torque control active	1 = Motor rotates clockwise	Switched over from speed to torque control	Internal converter actual value > 0.
		0 = Motor rotates counter-clockwise		Internal converter actual value < 0.
15	Reserved	0 = Alarm, converter thermal overload	--	Converter temperature alarm threshold reached

### A.1.4.2 Control word 2 and status word 2

#### Overview

Control word 2 (STW2) activates the converter drive functions.

Status word 2 (ZSW2) signals the status of the converter to the higher-level control.

#### Description of function

Control word 2 (STW2)		
Control → Converter		
Bit	Drive function	
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	Reserved	
06	Telegrams 102, 105	Telegrams 3, 5
	1 = Speed controller integrator disable	Reserved
07	Reserved	
08	1 = Travel to fixed stop	
09	Reserved	
10	Reserved	
11	Reserved	
12	Controller sign-of-life bit 0	
13	Controller sign-of-life bit 1	
14	Controller sign-of-life bit 2	
15	Controller sign-of-life bit 3	

Status word 2 (ZSW2)		
Converter → Control		
Bit	Status	
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	1 = Open holding brake	1 = Alarm class bit 0
	1 = Speed controller integrator disable	1 = Alarm class bit 1
07	Reserved	
08	1 = Travel to fixed stop active	
09	Reserved	

Status word 2 (ZSW2)		
Converter → Control		
Bit	Status	
10	Telegrams 102, 105	Telegrams 3, 5
	Reserved	1 = Pulses enabled
11	Reserved	
12	Device sign-of-life bit 0	
13	Device sign-of-life bit 1	
14	Device sign-of-life bit 2	
15	Device sign-of-life bit 3	

### A.1.4.3 Encoder-1 control word and encoder-1 status word

#### Overview

The encoder control word (G1\_STW) activates encoder functions.

The encoder status word (G1\_ZSW) signals the status of the encoder to the higher-level control.

#### Description of function

Control word 1 (G1_STW)		Status word 1 (G1_ZSW)	
Control → Converter		Converter → Control	
Bit	Encoder function	Bit	Encoder status
00	Request function 1	00	Function 1 active
01	Request function 2	01	Function 2 active
02	Request function 3	02	Function 3 active
03	Request function 4	03	Function 4 active
04	Request command bit 0	04	Value 1
05	Request command bit 1	05	Value 2
06	Request command bit 2	06	Value 3
07	Mode	07	Value 4
08	Reserved	08	Measuring probe 1 deflected
09	Reserved	09	Measuring probe 2 deflected
10	Reserved	10	Reserved
11	Reserved	11	Acknowledge encoder fault active
12	Reserved	12	Reserved
13	Request absolute value cyclically	13	Cyclic absolute value
14	Request parking encoder	14	Parking encoder active
15	Acknowledge encoder fault	15	Encoder fault



#### A.1.4.4 Safety control word 1 and safety status word 1

##### Overview

The higher-level control activates the Safety Integrated Functions of the converter using safety control word 1 (S\_STW1).

The converter signals the status of the Safety Integrated Functions to the higher-level control using safety status word 1 (S\_ZSW1).

##### Description of function

Safety control word 1 (S_STW1)					
Failsafe control → Converter					
Bit	Safety Integrated Function	Explanation			
00	STO	1	Deselect STO		
		0	Select STO		
01	SS1	1	Deselect SS1		
		0	Select SS1		
02, 03	Reserved				
04	SLS	1	Deselect SLS		
		0	Select SLS		
05, 06	Reserved				
07	Failsafe acknowledgment	0	-		
		1 → 0	Acknowledge "Internal event" for a 1 → 0 signal change		
08	Reserved				
09	SLS limit value bit 0	Select SLS limit value		Bit 1	Bit 0
10	SLS limit value bit 1		SLS1	0	0
			SLS2	0	1
			SLS3	1	0
		SLS4	1	1	
11	Reserved				
12	SDI positive	1	Deselect SDI with positive direction of rotation		
		0	Select SDI with positive direction of rotation		
13	SDI negative	1	Deselect SDI with negative direction of rotation		
		0	Select SDI with negative direction of rotation		
14	Reserved				
15	SSM	1	Deselect SSM		
		0	Select SSM		

Safety status word 1 (S_ZSW1)				
Converter → Failsafe control				
Bit	Safety status	Explanation		
00	STO active	1	STO is active	
		0	STO is not active	
01	SS1 active	1	SS1 is active	
		0	SS1 is not active	
02, 03	<i>Reserved</i>			
04	SLS active	1	SLS is active	
		0	SLS is not active	
05, 06	<i>Reserved</i>			
07	Internal event	1	The converter signals an "internal event"	
		0	Fault-free operation	
08	<i>Reserved</i>			
09	Active SLS limit value bit 0		Bit 1	Bit 0
10		SLS1	0	0
	Active SLS limit value bit 1	SLS2	0	1
		SLS3	1	0
		SLS4	1	1
11	<i>Reserved</i>			
12	SDI positive active	1	SDI positive direction of rotation is active	
		0	SDI positive direction of rotation is not active	
13	SDI negative active	1	SDI negative direction of rotation is active	
		0	SDI negative direction of rotation is not active	
14	<i>Reserved</i>			
15	Status SSM	1	The absolute value of the speed is less than the SSM limit	
		0	The absolute value of the speed is equal to or greater than the SSM limit	

#### A.1.4.5 Safety control word 2 and safety status word 2

##### Overview

The higher-level control activates the Safety Integrated Functions of the converter using safety control word 2 (S\_STW2).

The converter signals the status of the Safety Integrated Functions to the higher-level control using safety status word 2 (S\_ZSW2).

## Description of function

Safety control word 2 (S_STW2)				
Failsafe control → Converter				
Bit	Safety Function	Explanation		
00	STO	1	Deselect STO	
		0	Select STO	
01	SS1	1	Deselect SS1	
		0	Select SS1	
02, 03	Reserved	–	–	
04	SLS	1	Deselect SLS	
		0	Select SLS	
05, 06	Reserved	–	–	
07	Failsafe acknowledgment	0	–	
		1 → 0	Acknowledge "Internal event" for a 1 → 0 signal change	
08	Reserved	–	–	
09	SLS level bit 0	Select SLS level	Bit 1	
10	SLS level bit 1		Level 1	0
			Level 2	0
			Level 3	1
		Level 4	1	
11	Reserved	–	–	
12	SDI positive active	1	Deselect SDI with positive direction of rotation	
		0	Select SDI with positive direction of rotation	
13	SDI negative active	1	Deselect SDI with negative direction of rotation	
		0	Select SDI with negative direction of rotation	
14 ... 31	Reserved	–	–	

Safety status word 2 (S_ZSW2)			
Converter → Failsafe control			
Bit	Safety status	Explanation	
00	STO active	1	STO is active
		0	STO is not active
01	SS1 active	1	SS1 is active
		0	SS1 is not active
02, 03	Reserved	–	–
04	SLS active	1	SLS is active
		0	SLS is not active
05, 06	Reserved	–	–
07	Internal event	1	The converter signals an "internal event"
		0	Fault-free operation
08	Reserved	–	–

Safety status word 2 (S_ZSW2)				
Converter → Failsafe control				
Bit	Safety status	Explanation		
09	Active SLS level bit 0		Bit 1	Bit 0
10	Active SLS level bit 1	Level 1	0	0
		Level 2	0	1
		Level 3	1	0
		Level 4	1	1
11	Reserved	–	–	–
12	SDI positive active	1	SDI positive direction of rotation is active	
		0	SDI positive direction of rotation is not active	
13	SDI negative active	1	SDI negative direction of rotation is active	
		0	SDI negative direction of rotation is not active	
14	Reserved	–	–	–
15	Status SSM	1	The absolute value of the speed is less than the SSM limit	
		0	The absolute value of the speed is equal to or greater than the SSM limit	
16 ... 23	Reserved	–	–	–
24	F-DI 0	1	F-DI 0 has 1 signal	
		0	F-DI 0 has 0 signal	
25 ... 31	Reserved	–	–	–

### A.1.4.6 Safety status word 1B

#### Overview

The converter signals the status of the Safety Integrated Functions to the higher-level control using safety status word 1B (S\_ZSW1B).

#### Description of function

Safety status word 1B (S_ZSW1B)	
Converter → Control	
Bit	Safety status
00	STO active
01	SS1 active
02	Reserved
03	Reserved
04	SLS active
05	Reserved
06	SLS selected
07	Internal event
08	Reserved
09	Select SLS Bit 0
10	Select SLS Bit 1
11	Reserved
12	SDI positive selected
13	SDI negative selected
14	Reserved
15	Safety message active

### A.1.4.7 Message word

#### Overview

The message word (MELDW) signals the status of the converter to the higher-level control.

#### Description of function

Message word (MELDW)	
Converter → Control	
Bit	Status
00	Reserved
01	Torque utilization < threshold 2
02	n_actual  < speed threshold 3

Message word (MELDW)	
Converter → Control	
Bit	Status
03	$ n\_actual  < \text{speed threshold } 2$
04	Reserved
05	Reserved
06	No warning motor overtemperature
07	No warning converter overtemperature
08	n-target/actual deviation within tolerance
09	Reserved
10	Reserved
11	Servo enable
12	Drive ready
13	"Pulses enabled"
14	Reserved
15	Reserved

## A.2 Directives and standards

### A.2.1 Directives, standards and certificates for the converter

#### Directives and standards that are complied with

The converters comply with the following directives and standards:



#### European Low-Voltage Directive

The converter fulfills the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if they are covered by the field of application of this directive.

#### European Machinery Directive

The converter fulfills the requirements stipulated in the Machinery Directive 2006/42/EC, if they are covered by the field of application of this directive.

However, the use of the converter in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

#### European EMC Directive

The compliance of the converters with the regulations of the Directive 2014/30/EU has been verified through full compliance with IEC 61800-3.

**Safety Integrated**

The converters comply with the requirements relating to functional safety/safety of machinery.

**RoHS**

The converters comply with directive 2011/65/EU regarding limiting the use of certain hazardous substances.

**Underwriters Laboratories (North American market)**

Converters provided with one of the test symbols on the nameplate displayed fulfill the requirements stipulated for the North American market as a component of drive applications, and are appropriately listed.

UL file number for converters with 1 AC and 3 AC line connection: E192450

**UKCA certification**

The converter complies with the requirements for the British market (England, Wales and Scotland).

**Australia and New Zealand (RCM formerly C-Tick)**

The converters showing the test symbols on the nameplate fulfill the EMC requirements for Australia and New Zealand.

**Under development: EMC requirements for South Korea**

The converters with the KC marking on the nameplate satisfy the EMC requirements for South Korea.

**Certificates for download**

- EC Declaration of Conformity: (<https://support.industry.siemens.com/cs/ww/en/view/109755363>)
- Certificates for the relevant directives, prototype test certificates, manufacturer declarations and test certificates for functions relating to functional safety ("Safety Integrated"): (<https://support.industry.siemens.com/cs/ww/en/ps/24672/cert>)
- Certificates for UL-certified products: (<https://iq.ulprospector.com>)

**Standards that are not relevant****China Compulsory Certification**

The converter does not fall in the area of validity of the China Compulsory Certification (CCC).

**A.2.2****Directives, standards and certificates for the motor**

The chapter lists the standards and directives that are applicable for the motor and which the motor complies with.

## Standards that are complied with

### Note

The standards listed in this manual are not dated.

You can take the currently relevant and valid dates from the Declaration of Conformity.

The motors of the type series SIMOTICS S, SIMOTICS M, SIMOTICS L, SIMOTICS T, SIMOTICS A, called "SIMOTICS motor series" below, fulfill the requirements of the following directives and standards:

- EN 60034-1 - Rotating electrical machines – Dimensioning and operating behavior
- EN 60204-1 - Safety of machinery – Electrical equipment of machines; general requirements

Where applicable, the SIMOTICS motor series are in conformance with the following parts of EN 60034:

Feature	Standard
Degree of protection	EN 60034-5
Cooling <sup>1)</sup>	EN 60034-6
Type of construction	EN 60034-7
Connection designations	EN 60034-8
Noise levels <sup>1)</sup>	EN 60034-9
Temperature monitoring	EN 60034-11
Vibration severity grades <sup>1)</sup>	EN 60034-14

<sup>1)</sup> Standard part, e.g. cannot be used for built-in motors.

## Relevant directives

The following directives are relevant for SIMOTICS motors.

### European Low-Voltage Directive

SIMOTICS motors comply with the Low-Voltage Directive 2014/35/EU.

### European Machinery Directive

SIMOTICS motors do not fall within the scope covered by the Machinery Directive.

However, the use of the products in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

### European EMC Directive

SIMOTICS motors do not fall within the scope covered by the EMC Directive. The products are not considered as devices in the sense of the directive. Installed and operated with a converter, the motor - together with the Power Drive System - must comply with the requirements laid down in the applicable EMC Directive.

### European RoHS Directive

The SIMOTICS motor series complies with the Directive 2011/65/EU regarding limiting the use of certain hazardous substances.



**European Directive on Waste Electrical and Electronic Equipment (WEEE)**

SIMOTICS motors comply with the 2012/19/EU directive on taking back and recycling waste electrical and electronic equipment.

**European Directive 2005/32/EC defining requirements for environmentally friendly design of electric motors**

The SIMOTICS motor series is not subject to Regulation (EC) No. 640/2009 for implementation of this directive.

**European Directive 2009/125/EC defining ecodesign requirements of electric motors and speed controls**

The SIMOTICS motor series is not subject to (EU) Regulation 2019/1781 for implementation of this directive.

**Eurasian conformity**

SIMOTICS motors comply with the requirements of the Russia/Belarus/Kazakhstan (EAC) customs union.

**China Compulsory Certification**

SIMOTICS motors do not fall within the scope covered by the China Compulsory Certification (CCC).



CCC negative certification (<https://support.industry.siemens.com/cs/de/de/view/109769143>)

**Underwriters Laboratories**

SIMOTICS motors are generally in compliance with UL and cUL as components of motor applications, and are appropriately listed.



Specifically developed motors and functions are the exceptions in this case. Here, it is crucial that you carefully observe the content of the quotation and that there is a UL or cUL mark on the rating plate!

**UKCA certification**

The converter complies with the requirements for the British market (England, Wales and Scotland).

**Quality systems**

Siemens employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Certificates for SIMOTICS motors can be downloaded from the Internet at the following link:

Certificates for SIMOTICS motors (<https://support.industry.siemens.com/cs/ww/de/ps/133471/cert>)

**China RoHS**

SIMOTICS motors comply with the China RoHS.

You will find more information at:

China RoHS for 1FS2 (<https://support.industry.siemens.com/cs/ww/de/view/109793981/en>)

### A.2.3 EHEDG guidelines

#### EHEDG guidelines

The 1FS2 is certified as type "EL Class I AUX" according to "hygienic equipment" requirements.

You can find more information in Chapter "Mounting instructions when using the motor in food processing machinery (compliance with EHEDG) (Page 148)".

You can find the certificate at EHEDG (<https://support.industry.siemens.com/cs/ww/en/view/109805184>).

### China Energy Label

Name of the standard	Minimum allowable values for energy efficiency and energy efficiency class of permanent-magnet synchronous motors (GB30253).
Date of entry into force	July 1, 2020
Affected motors	Permanent-magnet synchronous motors (without incorporated brake) with a rated power of 0.55 kW to 90 kW and a rated speed of 500 r/min to 3000 r/min driven by frequency converter with variable frequency on a power supply below 1000 V.
Motor requirements	As of the implementation date of the guideline, all motors involved must have the "China Energy Label".
Affected Siemens products	The SIEMENS motors involved are subject to the requirements of Guideline GB30253: SIMOTICS S-1FK2, SIMOTICS S-1FT2, SIMOTICS S-1FS2

Examples of the "China Energy Label" and the motor rating plate:

#### China Energy Label



Figure A-1 ① Article number (diagram showing a typical 1FK2)

### Motor rating plate

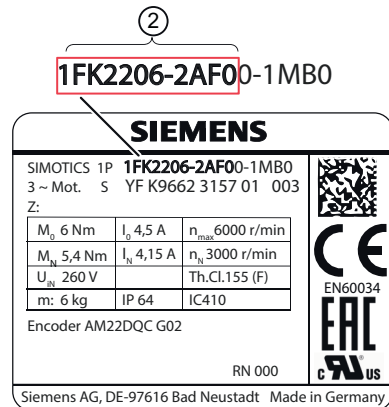


Figure A-2 ② Article number of the basic motor type (example illustration for 1FK2)

### Note

The article number ① stated on the China Energy Label corresponds to the article number of the basic motor type ② (boldface type) in the motor article number.

## A.3 UL Markings

### Converters with 1 AC line connection

#### Underwriters Laboratories

For US/Canadian installations (UL/cUL): The products are cULus-listed under File E192450.

- Suitable for use in a circuit that cannot provide more than 65 kA rms (symmetrical), max. 240 V.
- Protection of the branch circuit for individual drives must be guaranteed using Class J fuses in accordance with the technical data.  
Protection of the branch circuit for the group installation must be guaranteed using fuses of Class J with up to 30 amps.  
For other protection equipment and SCCRs (Short Circuit Current Rating) for individual drives and group installations, see:  
Protective Devices for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109815356>)
- This device must be installed in an enclosure that provides an environment with degree of pollution 2 (controlled).
- Maximum ambient air temperature 50 °C.
- The device provides overtemperature and overload protection.
- Use copper wires with a permissible temperature of 75 °C for all power cables. You can also use cables with a higher rated temperature value. It is not permissible to reduce the conductor cross-section.

## Converters with 3 AC line connection

### Underwriters Laboratories

- For US/Canadian installations (UL/cUL): The products are cULus-listed under File E192450.
- Only for use in 200 ... 240 V or 380 ... 480 V line supplies with grounded neutral point (solidly grounded wye).
- Solid-state motor overload protection: 300% of the FLA motor.
- Suitable for use in a circuit that cannot provide more than 65 kA rms (symmetrical), max. 480 V.
- Protection of the branch circuit for individual drives must be guaranteed using Class J fuses in accordance with the technical data.  
Protection of the branch circuit for the group installation must be guaranteed using fuses of Class J with up to 100 amps.  
For other protection equipment and SCCRs (Short Circuit Current Rating) for individual drives and group installations, see:  
Protective Devices for SINAMICS S210 (<https://support.industry.siemens.com/cs/ww/en/view/109815356>)
- This device must be installed in an enclosure that provides an environment with degree of pollution 2 (controlled).
- Maximum ambient air temperature 50 °C. Maximum height 4000 m.
- The device provides overtemperature and overload protection.
- Use copper wires with a permissible temperature of 60/75 °C for all power cables. You can also use cables with a higher rated temperature value. It is not permissible to reduce the conductor cross-section.

### Additional requirements relating to CSA compliance:

- Maximum height for CSA: 2000 m.

## Motor overload protection according to IEC 61800-5-1 Ed.3 / UL 61800-5-1 Ed.2

The settings required to activate the motor overload protection according to IEC 61800-5-1 Ed.3 or UL 61800-5-1 Ed.2, see Chapter "Cooling (Page 371)".

## MOTION-CONNECT connection system (OCC cable)

The recommended assignment of motors and cables is provided in Chapter: "Motor-converter combinations (Page 49)".

Other assignments are not possible.

The technical parameters of the cables are tailored to the requirements of the motors and verified by system tests.

The following cables should be used for UL applications.

- Cables with connector size M12 (6FX8002-8QN05-□□□□, 6FX8002-8QE06-□□□□) have a cable conductor cross-section of 0.82 mm<sup>2</sup> (AWG18).
- Cables with connector size M17 have a cable conductor cross-section of 0.82 mm<sup>2</sup> (AWG18).
- Cables with connector size M23 have a cable conductor cross-section of 1.5 mm<sup>2</sup> (AWG16) or 2.5 mm<sup>2</sup> (AWG14).

## A.4 EMERGENCY OFF and EMERGENCY STOP

### Overview

In plants, systems and machines a distinction must be made between EMERGENCY OFF and EMERGENCY STOP.

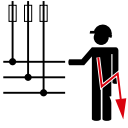
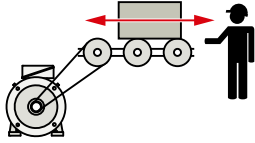
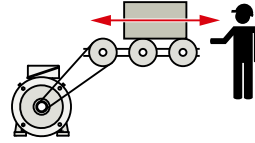
The Safe Torque Off (STO) and Safe Stop 1 (SS1) Safety Integrated Functions are suitable for implementing an EMERGENCY STOP, but are not suitable for implementing an EMERGENCY OFF.

### Description of function

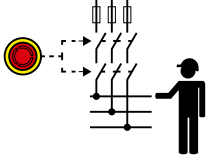
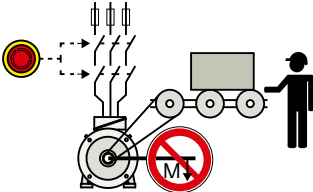
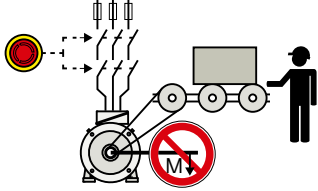
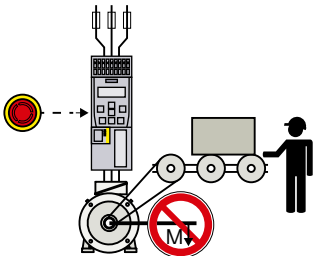
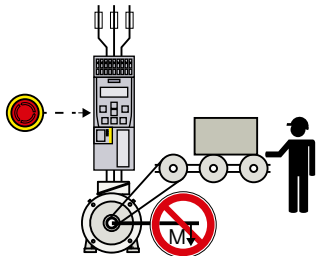
IEC 60204-1 defines EMERGENCY OFF and EMERGENCY STOP:

- EMERGENCY OFF and EMERGENCY STOP are actions taken in an emergency.
- EMERGENCY OFF and EMERGENCY STOP reduce different risks in a system or machine:
  - EMERGENCY OFF reduces the risk of electric shock.
  - EMERGENCY STOP reduces the risk of unexpected movement.

Table A-1 The distinction between EMERGENCY OFF and EMERGENCY STOP

Action:	EMERGENCY OFF	EMERGENCY STOP	EMERGENCY STOP
		Stop category 0 according to IEC 60204-1	Stop category 1 according to IEC 60204-1
Risk:	 Electric shock	 Unexpected motion	 Motion
Measure to minimize risk:	<b>Switch off voltage</b> Switch off hazardous voltages completely or in part	<b>Prevent movement</b> Prevent any hazardous movement	<b>Stop movement</b> Stop hazardous movement and prevent any restart.

A.5 List of abbreviations

Action:	EMERGENCY OFF	EMERGENCY STOP	EMERGENCY STOP
		Stop category 0 according to IEC 60204-1	Stop category 1 according to IEC 60204-1
Classic solution:	<p>Switch off the voltage:</p> 	<p>Switch off the power supply of the drive:</p> 	 <p>Brake the motor and switch off the drive power supply</p>
Solution with the STO or SS1 Safety Integrated Function integrated in the drive:	<p>STO and SS1 are not suitable for switching off an electric voltage.</p>	<p>Select STO:</p> 	<p>Select SS1:</p> 
		<p>It is permissible that you switch off the converter power supply as well. However, switching off the voltage is not required as a risk-reduction measurement.</p>	

## A.5 List of abbreviations

**Note**

The following list of abbreviations includes the abbreviations and meanings used.

Abbreviation	Derivation of abbreviation	Meaning
A...	Alarm	Alarm
AC	Alternating Current	Alternating current
C...	-	Safety message
eCoL	Electronic Certificate of License	Electronic certificate for the licensee of the software verifying that the licensed software can be used
COM	Communication LED	Status display of the communication
COMM	Commissioning	Commissioning
CU	Control Unit	Control Unit
DC	Direct Current	Direct current
DI	Digital Input	Digital input
DO	Drive Object	Drive Object

Abbreviation	Derivation of abbreviation	Meaning
DP	Decentralized Peripherals	Distributed I/O
DSC	Dynamic Servo Control	Dynamic servo control
EEPROM	Electrically Erasable Programmable Read-Only Memory	Electrically Erasable Programmable Read-Only Memory
EMV	Elektromagnetische Verträglichkeit	Electromagnetic compatibility
EN	Europäische Norm	European standard
F...	Fault	Fault
F-DI	Failsafe Digital Input	Failsafe digital input
FAQ	Frequently Asked Questions	Frequently asked questions
GB	Gigabyte	Gigabyte
GSD	Gerätstammdatei	Generic station description file: Describes the features of a PROFIBUS device
HW	Hardware	Hardware
IBN	Inbetriebnahme	Commissioning
ID	Identifier	Identification
IEC	International Electrotechnical Commission	International Electrotechnical Commission
IP	Internet Protocol	Internet protocol
K <sub>p</sub>	-	Proportional gain
LED	Light Emitting Diode	Light emitting diode
M	Masse	Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as GND)
MB	Megabyte	Megabyte
MT	Messtaster	Measuring probe
N...	No Report	No message or internal message (only as part of the alarm list)
NTP	Network Time Protocol	Synchronizes the clocks in computer systems and networks
NVRAM	Non-Volatile Random Access Memory	Non-volatile read/write memory
OBT	One Button Tuning	Function for automatic optimization of drive settings
OCC	One Cable Connection	One cable technology
OEM	Original Equipment Manufacturer	Original Equipment Manufacturer
OSS	Open Source Software	Software with freely available source code
p...	-	Setting parameters
PDS	Power Drive System	Drive system
PE	Protective Earth	Protective ground
PELV	Protective Extra Low Voltage	Safety extra-low voltage
PFH	Probability of dangerous failure per hour	Probability of dangerous failure per hour
PLC	Programmable Logical Controller	Programmable logic controller
PN	PROFINET	PROFINET
PZD	Prozessdaten	Process data
r...	-	Display parameters (read-only)

Abbreviation	Derivation of abbreviation	Meaning
RAM	Random Access Memory	Memory for reading and writing
RJ45	Registered Jack 45	Term for an 8-pin socket system for data transmission with shielded or non-shielded multi-wire copper cables
ROM	Read-Only Memory	Read-only memory
S1	-	Continuous operation
SAM	Safe Acceleration Monitor	Safe acceleration monitoring
SBC	Safe Brake Control	Safe brake control
SBR	Safe Brake Ramp	Safe brake ramp monitoring
SD-Card	SecureDigital Card	Secure digital memory card
SCC	Safety Control Channel	Safety Control Channel
SDI	Safe Direction	Safe motion direction
SI	Safety Integrated	Safety Integrated
SIC	Safety Info Channel	Safety Info Channel
SIL	Safety Integrity Level	Safety integrity level
SLS	Safely-Limited Speed	Safely-limited speed
SP	Service Pack	Service pack
SPS	Speicherprogrammierbare Steuerung	Programmable logic controller
SS1	Safe Stop 1	Safe Stop 1 (time-monitored, ramp-monitored)
SSM	Safe Speed Monitor	Safe feedback from speed monitor
STO	Safe Torque Off	Safe torque off
STW	Steuerwort	Control word
TIA	Totally Integrated Automation	Totally Integrated Automation
Tn	-	Integral time
UL	Underwriters Laboratories Inc.	Underwriters Laboratories Inc.
UMAC	User Management and Access Control	User management and access control
UTC	Universal Time Coordinated	Universal time coordinated
Vdc	-	DC link voltage
VDE	Verband Deutscher Elektrotechniker	Association of German Electrical Engineers
ZSW	Zustandswort	Status word





## More information

SINAMICS:  
[www.siemens.com/sinamics](http://www.siemens.com/sinamics)

SIMOTICS:  
[www.siemens.com/simotics](http://www.siemens.com/simotics)

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