



Edition

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OPERATING INSTRUCTIONS

SINAMICS SIMOTICS

S200 servo drive system

PROFINET version (PN)
www.siemens.com

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SINAMICS S200 PROFINET servo drive system with SIMOTICS S-1FL2

Operating Instructions

PROFINET version (PN), FW V6.7

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury will result if proper precautions are not taken.
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WARNING
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indicates that death or severe personal injury may result if proper precautions are not taken.

CAUTION
--

indicates that minor personal injury can result if proper precautions are not taken.
--

NOTICE

indicates that property damage can result if proper precautions are not taken.
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If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified persons are those who, because of their training and experience, are familiar with the installation, assembly, commissioning, operation, decommissioning and disassembly of the product and can recognize risks and avoid possible hazards.

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WARNING
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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

SINAMICS converters are the optimum solution for all drive applications extending from low voltage through to DC. All Siemens drive components, such as converters, motors, and controls, are matched to each other and can be integrated into your existing automation systems.

More information



You can find more information via the SINAMICS YouTube playlist:

YouTube playlist (<https://www.youtube.com/playlist?list=PLw7lLwXw4H53rtHeTeifKtVMr2aXTYt0X>)

1.2 About this manual

1.2.1 Content

Description

This manual provides a summary of all of the information required to operate the converter under safe conditions.

The manual enables the target groups being addressed to mount, install, connect, and commission the converter 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 applicable constraints of the respective product provided in the product documentation.

1.2.2 Target group

Description

This manual addresses the following target groups:

- Planning engineers
- Project engineers
- Technologists
- Installation personnel
- Programmers
- Commissioning engineers
- Machine operators
- Service and maintenance personnel

1.2.3 What's new?

Description

The most important supplements with respect to Edition 02/2026

- Supported SINUMERIK CNCs (Page 58)
- New 1FL2 SH65 and SH90 motors rated at 1500 r/min
Information about the new motors is provided in the following sections:
400 V servo drive system (Page 56)
Dimension drawing for the 1FL2 motor, shaft height 65, rated at 1500 r/min (Page 126)
Dimension drawing for the 1FL2 motor, shaft height 90, rated at 1500 r/min (Page 128)
Connecting the motor (Page 142)
1FL2306-3AB connected to 3 AC 380 V/3 AC 400 V (Page 675)
1FL2306-5AB connected to 3 AC 380 V/3 AC 400 V (Page 676)
1FL2310-3AB connected to 3 AC 380 V/3 AC 400 V (Page 681)
- New MOTION-CONNECT 350 and 380 cables used for motors rated at 1500 r/min
Information about the new cables is provided in the following section:
MOTION-CONNECT cables and connectors (Page 61)
- New functions of the web server:
Basic positioner (EPOS) commissioning (Page 193)
Manual operation (Page 205)
Trace (Page 215)

The most important updates with respect to Edition 02/2026

- Added descriptions about S9 operation
Updated descriptions are provided in the following section:
Intended use (Page 20)
- Added an option at the initial setup via the web server: Loading the existing converter settings from a backup file
Updated descriptions are provided in the following section:
Basic settings (Page 177)
- Added options for restoring converter settings via the web server:
 - Restoring drive data with/without communications settings
 - Automatic saving after restoringUpdated descriptions are provided in the following section:
Backup and restore (Page 223)
- Added an option in the function view "Settings" of the web server: Custom pages
Updated descriptions are provided in the following section:
Settings (Page 225)
- Added an option for using functions that require a license: Directly in the SINAMICS converter
Updated descriptions are provided in the following section:
Functions that require licensing (Page 380)
Licenses (Page 230)
- Updated descriptions about discrepancy time of Safety Integrated
Discrepancy time (Page 371)

1.2.4 Standard scope

The functions of the system as delivered can only be found in the order documents.

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.

1.2.5 Use of third-party products in this documentation

Siemens does not accept any warranty for the use of third-party products. Suppliers recommended by Siemens are listed on the following Internet page (<https://www.siemens.com/global/en/company/partners/product-partners-industry.html>).

1.2.6 Websites of third-party companies

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 Product documentation

Description

The product documentation for the servo drive system can be found on the Internet:

SiePortal SINAMICS (<https://support.industry.siemens.com/cs/ww/en/view/109807358>)

You can display documents or download them in PDF and HTML5 formats.

The product documentation for the servo drive system comprises the following documents:

Table 1-1 Product documentation

Information	Document	Content
Information about the servo drive system	Operating Instructions for SINAMICS S200	Installing, commissioning, and maintaining the servo drive system
	Compact Operating Instructions for SINAMICS S200	Essential contents of the Operating Instructions in reduced and compressed form
	Protective Devices for SINAMICS S200	Suitable components for overcurrent protection of the servo drive system Expansion of components contained in the Operating Instructions
General information	Industrial Cybersecurity Configuration Manual	Industrial Cybersecurity functions and safe operation of the SINAMICS product
Information about the optional components	Operating Instructions for SINAMICS SDI Pro 5.5"	Commissioning and performing diagnostics of the servo drive system using the SINAMICS SDI Pro 5.5" Operator Panel
	Operating Instructions for SINAMICS Smart Adapter	Installing a local wireless network with the SINAMICS Smart Adapter to commission and diagnose the servo drive system using an operating unit

1.4 Service and Support

1.4.1 ID link and Siemens Online Support

You can find additional information about the product:

- via ID link
- using the Siemens Industry Online Support
 - Website: SiePortal (<https://support.industry.siemens.com/cs/ww/en/>)
 - App Industry Online Support (for Apple iOS and Android)

Product-specific information via ID link

There is a QR code on your product and the product packaging which contains an identification link (ID link).

The ID link serves as a Digital Nameplate (DNP) and is a globally unique identifier in accordance with IEC 61406-1. It links the product to the associated information from the Digital Product Passport (DPP).

Scan the QR code on the product or the packaging label with a smartphone camera, barcode scanner, or suitable app.

The ID link gives you access to relevant product information such as:

- Product data
- Manuals
- Declarations of Conformity
- Certificates



Figure 1-1 QR code with ID link

The ID link is characterized by a frame with a black corner at the bottom right.

Content of Siemens Online Support

- Product support
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via the contact person database (→ Contact)
- Product information

- FAQs (frequently asked questions)
- Application examples
- Manuals
- Downloads
- Compatibility tool
- Newsletter with product selection
- Catalogs/brochures
- Certificates

1.4.2 Spare parts services

The "Spares on Web (<https://www.sow.siemens.com/>)" online spare parts service offers spare parts for specific products.

1.4.3 Extended Warranty – Service Protect

Service Protect provides an extended warranty period for your registered hardware product, covering repair or replacement. The specific duration(s) of the extended warranty offering and the terms for repair or replacement are determined by the product type. Product registration @ myReg (<https://myregistration.siemens.com/>) is required.

1.5 Important product information

1.5.1 Intended use

Requirement

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

**WARNING****Incorrect use of the motor**

Incorrect use of the motor may cause death, serious injury (crushing) and/or property damage.

- Carefully observe the description of intended use.
- 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.
- Make sure that the conditions at the location of use comply with all the rating plate data.
- 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.

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 manual, together with software, accessories and options, form an electric drive to supply low-voltage AC motors.

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

The products must be properly transported and stored and must be installed, commissioned and maintained by professionals who have adequate knowledge to implement the safety, cybersecurity and EMC measures in accordance with the specifications described in this manual and with 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 data, safety information and cybersecurity information contained in this document and other supporting documentation.

The products are part of a machine or system. When designing the system, apply suitable measures to ensure that the products can provide intended safety to persons and material assets and achieve intended electromagnetic compatibility.

Perform a risk assessment of the complete application, including third-party products and implement adequate safety and cybersecurity 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.

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

The motors are intended for converter control and may not be connected directly to the line supply. The motors are not approved for use in explosive atmospheres.

S9 operation

The motor is designed for operation on the converter with non-periodic load and speed variations.

Typical applications include machine tools or production machines with non-periodic speed and duty cycles. This complies with IEC 60034-1 operating mode S9.

1.5.2 Firmware updates and constraints

Description

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

Updates and constraints for SINAMICS S200 (<https://sieportal.siemens.com/su/bk8ZQ>)

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 is 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 this data is created, the author must give thought to data protection consent for this optional data. Siemens takes no responsibility for this data.

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

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

The personal data is 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 it serves 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_{cc}) of the protective device used.



WARNING

Electric shock in the absence of grounding

For products with protection class I, a faulty protective conductor connection means that the product is not grounded in conformance with the applicable regulations. In the absence of grounding, high voltages may be present in open, exposed parts, which can result in serious injury or death if touched.

- Ground the product in conformance 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 from a damaged product

Improper handling can damage the product. If a product is damaged, hazardous voltages may be present on the housing or exposed components, which can result in serious injury or death if touched.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Never use a damaged product.



! 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

Product damage caused by an unsuitable screw-tightening tool

Unsuitable screw-tightening tools or tightening methods can damage the product screws.

- Use a screw-tightening tool that fits the screw head exactly.
- 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.
- Regularly calibrate the screw-tightening tool used.

! 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

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 a 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 this affects you, maintain the minimum distances specified in the Information for use.
- 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.



WARNING

Improper lifting and transportation operations

Improper lifting and transportation of the motor may cause death, severe bodily injury, or damage to property.

- When disassembling the motor, watch out for imminent movements when the motor is released.
- Use all lifting equipment, industrial trucks, and load handling devices in accordance with the regulations.
- Only use lifting equipment and load handling devices with maximum capacities which match the weight of the motor.
- Do not attach any additional loads to the lifting equipment.
- To hoist the motor, use suitable cable-guidance or spreading equipment, particularly if the motor is equipped with built-on assemblies.
- Do not attach lifting equipment to the power connector or signal connector of the motor.
- Do not stand in the slewing range of hoisting gear or under suspended loads.
- When placing down the motor, ensure that it cannot roll away.
- If anything is unclear, please contact the machine manufacturer, stating the machine type and serial number.

NOTICE**Shaft sealing rings damaged by solvent**

Solvents can damage the shaft sealing rings of the motor.

- When removing preservation agents or when carrying out cleaning work, avoid that any solvent comes into contact with the shaft sealing rings.

**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 motion caused by radio devices or cell phones**

Radio devices, cell phones, or mobile WLAN devices in the immediate vicinity of the product can cause the product to malfunction or damage the product. The malfunction may impair the functional safety of machines and can therefore endanger persons or result in material damage.

- Avoid operating radio devices, cell phones, and mobile WLAN devices in the direct vicinity of converters and operating units.
- Scan the machine readable code, e.g. a QR code at least 0.4 m away from the converter, or switch off the converter power supply before scanning.
- Only operate built-in devices with the control cabinet doors closed.
- When the control cabinet doors are open, only qualified personnel may perform service and maintenance work.



CAUTION

Radio frequency interference in residential areas

When you operate products with EMC category C2 in residential areas, the products may cause radio frequency interference.

When you operate products with EMC category C3 or C4 in residential areas, it is to be expected that the devices will cause radio frequency interference.

- Do not operate products with EMC category C2 in residential areas.
- Do not operate products with EMC category C3 or C4 in public low-voltage grids that supply residential buildings.

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 the product to overheat and result in fire and smoke. A fire with smoke development can result in serious injury or death. Overheating increases the probability of failure and shortens product service life.

- Observe the minimum distances specified for the product as ventilation clearances.

NOTICE

Overheating due to inadmissible mounting position

The product can overheat and therefore be damaged if mounted in an incorrect position.

- Only operate the product in approved 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**Product damage caused by improper insulation resistance testing**

High test voltages can damage the product.

- Measure the insulation resistance of low voltage circuits of machines or systems only with ≤ 500 V DC.
- Measure the insulation resistance of SELV circuits of machines or systems only with ≤ 250 V DC.

NOTICE**Product damage caused by improper voltage testing**

High test voltages can damage the product. Capacitive leakage currents can distort the test results.

- Disconnect the products before carrying out voltage testing on the machine. ¹⁾

¹⁾ The products are subject to a voltage test in accordance with the IEC 61800-5-1 product standard and must be disconnected during testing in accordance with IEC 60204-1:2021 Section 18.4.

** 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.

 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

Danger to life caused by machine movement and loose objects

Machine movement and loose objects that can fall out or be ejected can cause death or severe bodily injury.

- Be sure to complete all assembly and adjustment work on the machine.
- Ensure that there are no people in the danger zone of the machine before it is switched on.
- Before switching on, check that there are no loose objects in or on the motor that can fall or be flung off.
- Before switching on, check that all safety guard covers for touch protection are installed and all safety equipment functions correctly.

 WARNING

Uncovered rotating or live parts

Covers over rotating or live parts and covers that ensure the motor degree of protection or are required for air guidance, and thus for cooling, must be closed during operation.

Death, serious bodily injury, or material damage may result if the required covers are removed.

- Do not remove covers while the motor is running.

** WARNING****Danger to life due to a changed operating behavior of the machine**

Changes in the operating behavior of the machine compared with normal operation indicate that the function of the machine is impaired. Changes in the operating behavior of the machine can be seen, for example, in one or more of the following effects:

- An increased power consumption
- Higher temperatures
- Vibration
- Unusual noises
- Unusual smells
- The monitoring devices respond

Impaired machine functioning can cause faults that may result directly or indirectly in death, serious bodily injury, or property damage.

- Immediately inform the maintenance personnel.
- If in doubt, shut down the motor immediately, taking into account the plant-specific safety regulations.

NOTICE**Motor damage in the event of uneven running or abnormal noises**

Improper handling during transportation, storage, or assembly can damage the motor. A damaged motor may run unevenly or make abnormal noises during operation. If you operate a damaged motor, this may result in damage to the winding or bearings, or even total destruction of the system.

- Switch the motor off in case of uneven running or abnormal noises.
- Identify the cause.

NOTICE**Motor damage when the maximum speed is exceeded**

The maximum speed $n_{\max}$ is the highest permissible motor operating speed. The maximum speed is specified on the rating plate (nameplate).

Impermissible speeds can cause damage to the motor.

- Enable speed setpoint monitoring in the control unit or drive so as not to exceed the maximum speed $n_{\max}$.



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.

NOTICE

Wear of the holding brake due to impermissible voltage supply

Operating the holding brake outside the permissible voltage range at the motor connection will damage the brake.

- Only operate the holding brake within its permissible voltage range.



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 Product damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESDs) are electronic devices, modules, or individual components with freely accessible contacts, e.g. products with signal and communication interfaces or modules without an enclosed housing, which can be damaged by electrostatic fields or electrostatic discharges.



NOTICE

Product damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can damage individual electronic components, integrated circuits, and modules. A pre-damaged or damaged product causes malfunctions, which in turn increase the probability of failure and a shortened service life.

- Only pack, store, transport, and ship individual electronic components, modules, or products in their original packaging or in other suitable materials, e.g. conductive ESD foam or aluminum foil.
- When you open the product, e.g. to replace a component or a module, or if you touch electrical contacts, then ground yourself using one of the following measures:
 - Wear an ESD armband
 - Wear ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic modules or individual components on a conductive surface, e.g. on an ESD surface, on ESD foam, on an ESD packaging bag, or an 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 customer-specific solutions, but merely serve to provide assistance with 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 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity 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 cybersecurity 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.

2.4 Cybersecurity information

For additional information on industrial cybersecurity measures that may be implemented, please visit
<https://www.siemens.com/cybersecurity-industry>.

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 Cybersecurity RSS Feed under
<https://www.siemens.com/cert>.

Further information is provided on the Internet:

Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>)



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 state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

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

2.5 Residual risks of power drive systems

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.

Description

3.1 System overview

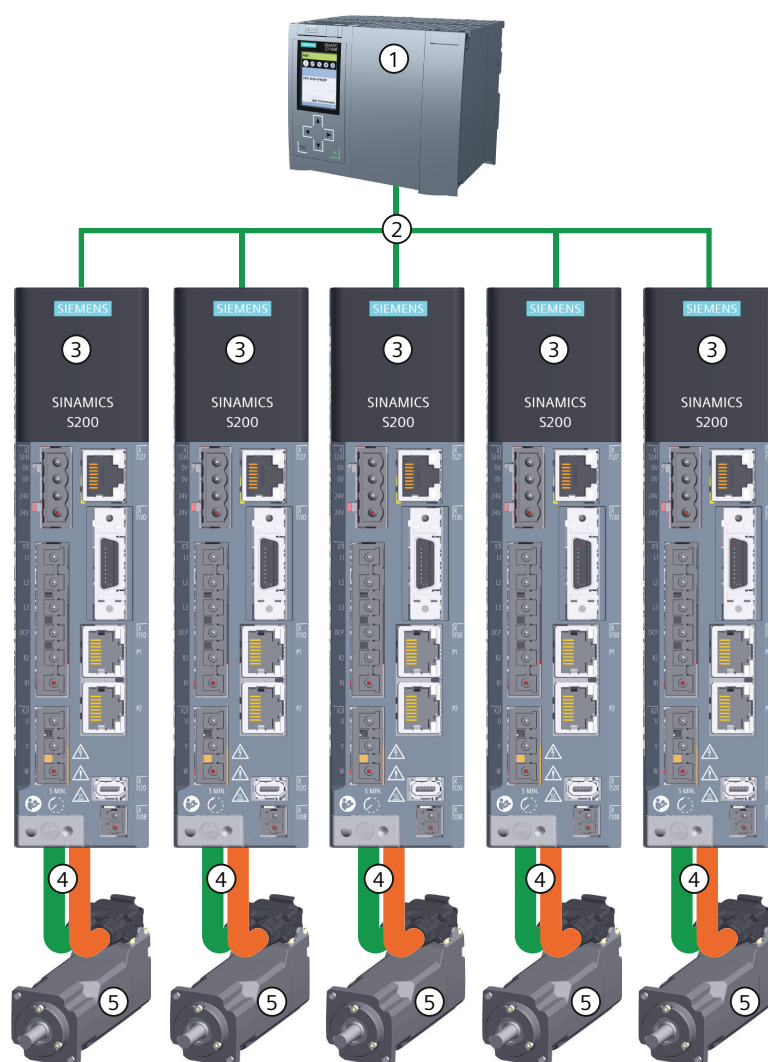
Description

The SINAMICS S200 servo drive system (PN version) is a single-axis servo drive system. It includes the following components tailored to one another:

- SINAMICS S200 converter product line (PN version), which is available in the following two variants:
 - SINAMICS S200 Basic PN converter (referred to as "S200 Basic PN")
 - SINAMICS S200 PN converter (referred to as "S200 PN")
- SIMOTICS S-1FL2 motor (referred to as "1FL2")
- MOTION-CONNECT 350 standard cable or MOTION-CONNECT 380 drag chain cable

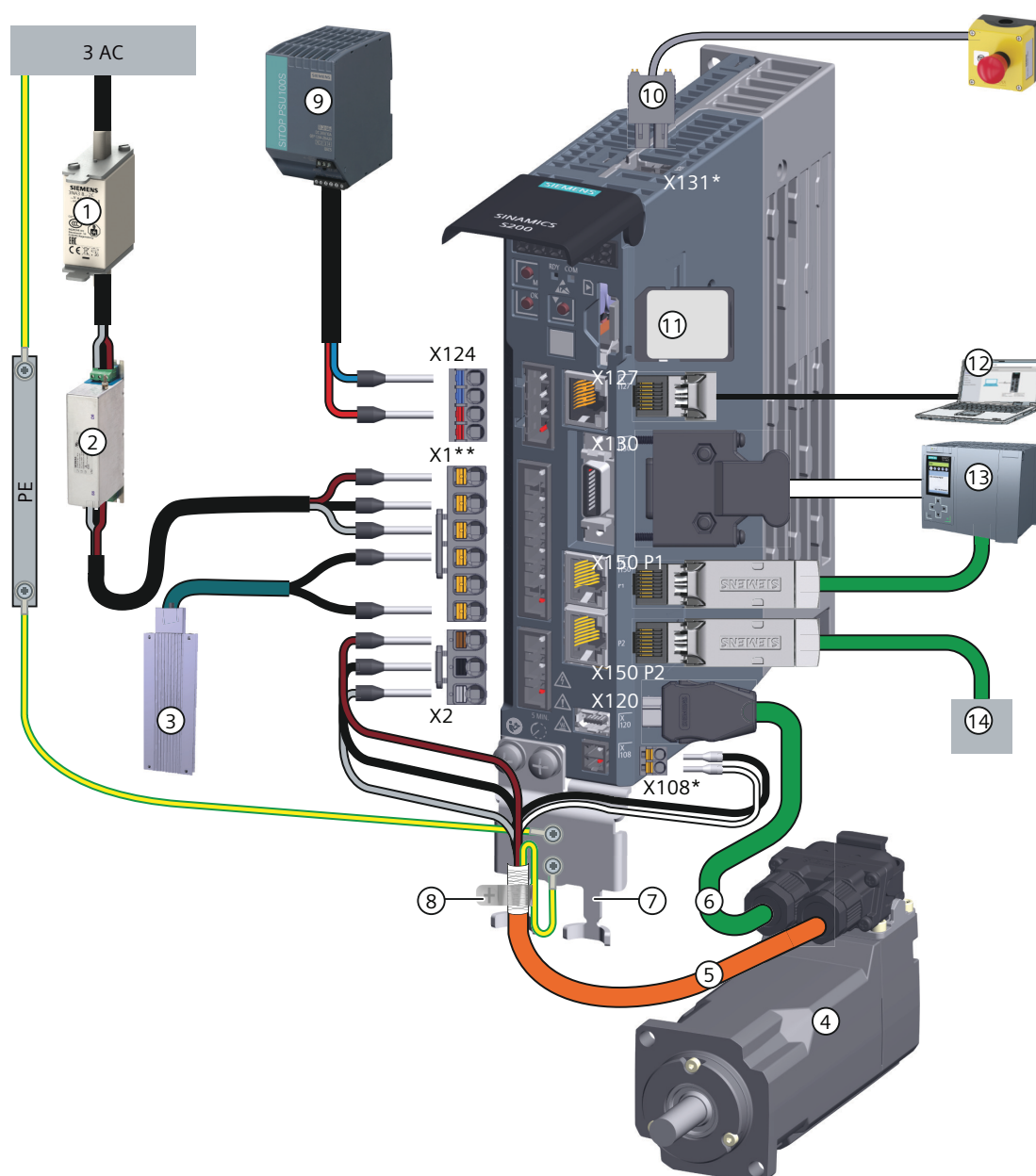
The converter and the motor are intended for use with a higher-level controller (PLC).

3.1 System overview



- ① Controller (for example, SIMATIC S7-1500 or S7-1200 G2)
- ② Communication between the converter and the controller via PROFINET
- ③ SINAMICS S200 converter product line
- ④ MOTION-CONNECT 350 or MOTION-CONNECT 380 cables for the motor power, the motor holding brake, and the encoder connections
- ⑤ SIMOTICS S-1FL2 motor

Figure 3-1 System overview



* The interfaces X131 and X108 are available on S200 PN only. For more information about the motor holding brake connection on S200 Basic PN, see Section "Connecting the motor holding brake (Page 145)".

** For the single-phase mains supply network, you can connect the mains supply to any two terminals out of L1, L2, and L3.

- | | |
|--|---|
| ① Fuse or motor starter protector | ⑧ Shield clamp |
| ② Line filter (optional) ¹⁾ | ⑨ 24 V DC power supply |
| ③ External braking resistor (optional) ¹⁾ | ⑩ STO plug |
| ④ SIMOTICS S-1FL2 motor | ⑪ Memory card (SD card, optional) |
| ⑤ Motor power cable (with brake conductors) | ⑫ Commissioning device |
| ⑥ Encoder cable | ⑬ Controller (for example, SIMATIC S7-1500) |
| ⑦ Shield plate | ⑭ PROFINET to the next participant |

¹⁾ When using the components, make sure that they are connected to the ground correctly.

Figure 3-2 System components and accessories for converters with 3 AC line connection

More information

For more information about the device combination, see Section "Device combinations (Page 55)".

For more information about the interface connection, see Section "Connecting (Page 135)".

3.1.1 Converter

Description

The S200 converter product line (PN version) includes two converter variants: S200 Basic PN (200 V only) and S200 PN (200 V and 400 V).

All the converter variants can be used on the 1 AC 200 V or 3 AC 200 V mains supply network to control the 1FL2 motor with low or medium moments of inertia.

S200 PN can additionally be used on the 3 AC 400 V mains supply network to control the 1FL2 motor with all the moments of inertia.

Table 3-1 Converter variants

Converter	Frame size	Rated power (kW)	Mains supply network
S200 Basic PN/S200 PN	FSA	0.1, 0.2	1 AC/3 AC 200 V ... 240 V
	FSB	0.4	
	FSC	0.75, 1.0	
S200 PN	FSA	0.2, 0.4	3 AC 380 V ... 480 V
	FSB	0.75, 1.0	
	FSC	1.75, 2.5	
	FSD	3.5, 5.0, 7.0	

3.1.2 Motor

Description

The 1FL2 motor is intended for use with the S200 converter product line. The motor is available in the 200 V variant (low or medium inertia) and the 400 V variant (low, medium, or high inertia), and with different shaft heights.

Table 3-2 Motor variants

Shaft height	Moments of inertia	Rated power (kW)	Mains supply network
SH20	Low inertia	0.05, 0.1	200 V/400 V
SH30	Low inertia, medium inertia	0.2, 0.4	
SH40		0.75, 1.0	
SH40 (New)		0.75, 1.0	
SH48	Medium inertia	0.94, 1.45	400 V
SH52	Low inertia	1.45, 2.1	
SH45	High inertia	0.4, 0.75	
SH65		0.75, 0.85, 1.0, 1.3, 1.5, 1.75, 2.0	
SH90		2.5, 2.9, 3.5, 5.0, 7.0	

3.1.3 MOTION-CONNECT 350 and 380 cables

Description

Prefabricated MOTION-CONNECT cables are used to connect the 1FL2 motor to the S200 converter product line. The cables are available in two variants:

- MOTION-CONNECT 350 standard cable, which provides a connection solution for fixed installation applications
- MOTION-CONNECT 380 drag chain cable, which provides a connection solution for drag chain installation applications that require a high number of bending cycles

3.2 Scope of delivery

3.2.1 Converter

Description

The converter delivery includes at least the following components:

- A ready-to-run converter with loaded firmware
- A connector kit:
 - X124 plug: connector for external 24 V DC power supply
 - X1 plug: connector for power supply (jumper for internal braking resistor and blanking plug for R1 terminal are included)
 - X2 plug: connector for motor power connection
 - X108 plug: connector for motor holding brake (only available in the delivery scope of S200 PN)
 - X131 (STO) plug: connector for connecting the external safety devices (only available in the delivery scope of S200 PN)
 - X131 (STO) disable plug: connector for disabling Safety Integrated Functions (only available in the delivery scope of S200 PN)
 - A shield plate and four fixing screws
- The converter contains open-source software (OSS). The OSS license terms are stored in the converter and can be displayed via webserver.

3.2.1.1 Rating plate

Description

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

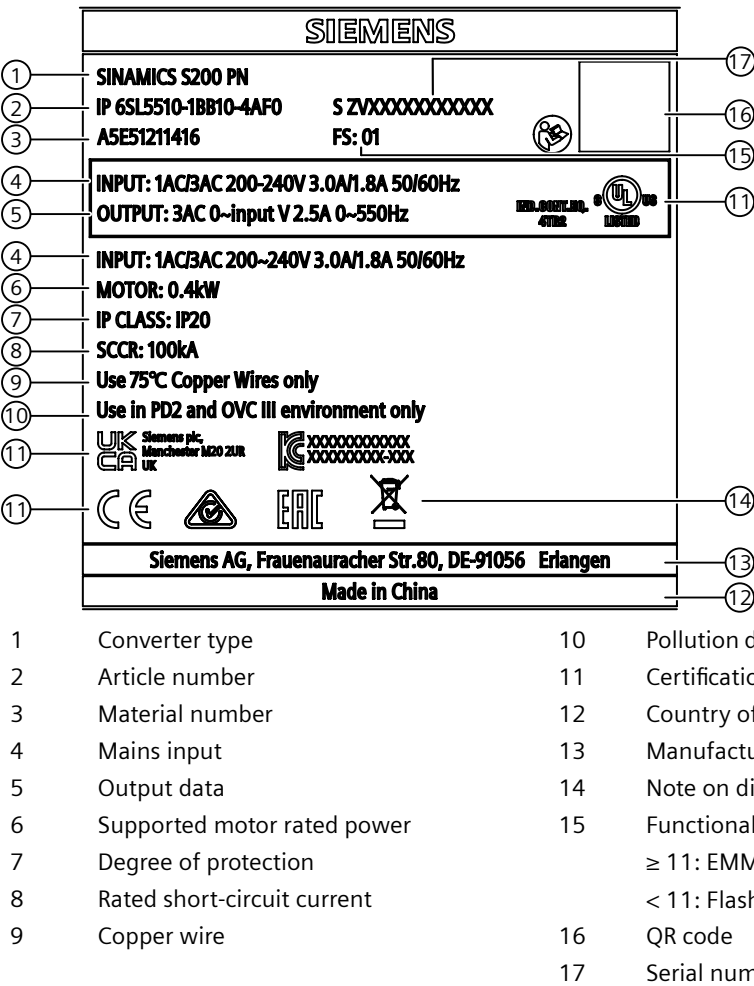


Figure 3-3 Rating plate example

3.2.1.2 Article number explanation

Description

The following figure shows an explanation of the article number for the converter.

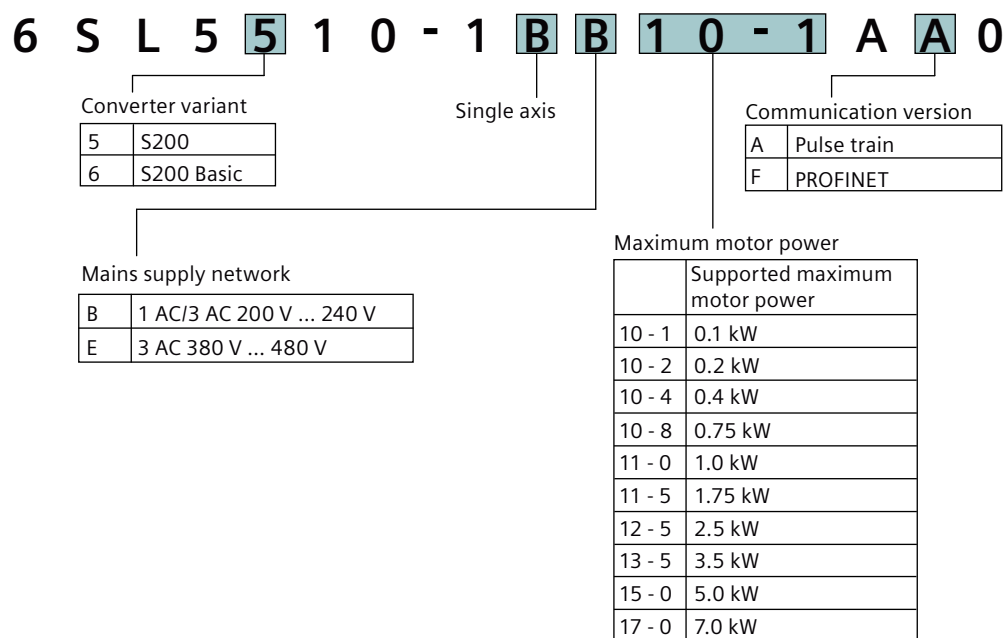
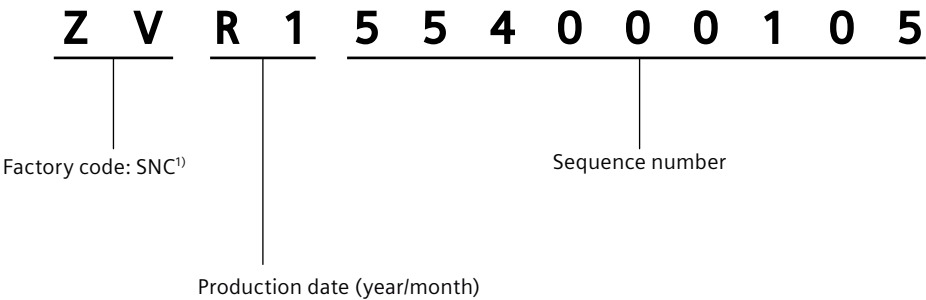


Figure 3-4 Article number for the S200 converter product line

3.2.1.3 Serial number explanation

Description



Code	Calendar year	Code	Month
A	2010, 2030	1	January
B	2011, 2031	2	February
C	2012, 2032	3	March
D	2013, 2033	4	April
E	2014, 2034	5	May
F	2015, 2035	6	June
H	2016, 2036	7	July
J	2017, 2037	8	August
K	2018, 2038	9	September
L	2019, 2039	0	October
M	2020, 2040	N	November
N	2021, 2041	D	December
P	2022, 2042		
R	2023, 2043		
S	2024, 2044		
T	2025, 2045		
U	2026, 2046		
V	2027, 2047		
W	2028, 2048		
X	2029, 2049		

¹¹ SNC = Siemens Numerical Control Ltd., Nanjing

Figure 3-5 Serial number for S200 converter product line

3.2.2 Motor

Description

The 1FL2 motor is a servo motor with an integrated encoder and a high degree of protection.

3.2 Scope of delivery

The motor delivery includes a ready-to-run motor.

3.2.2.1 Rating plate

Description

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

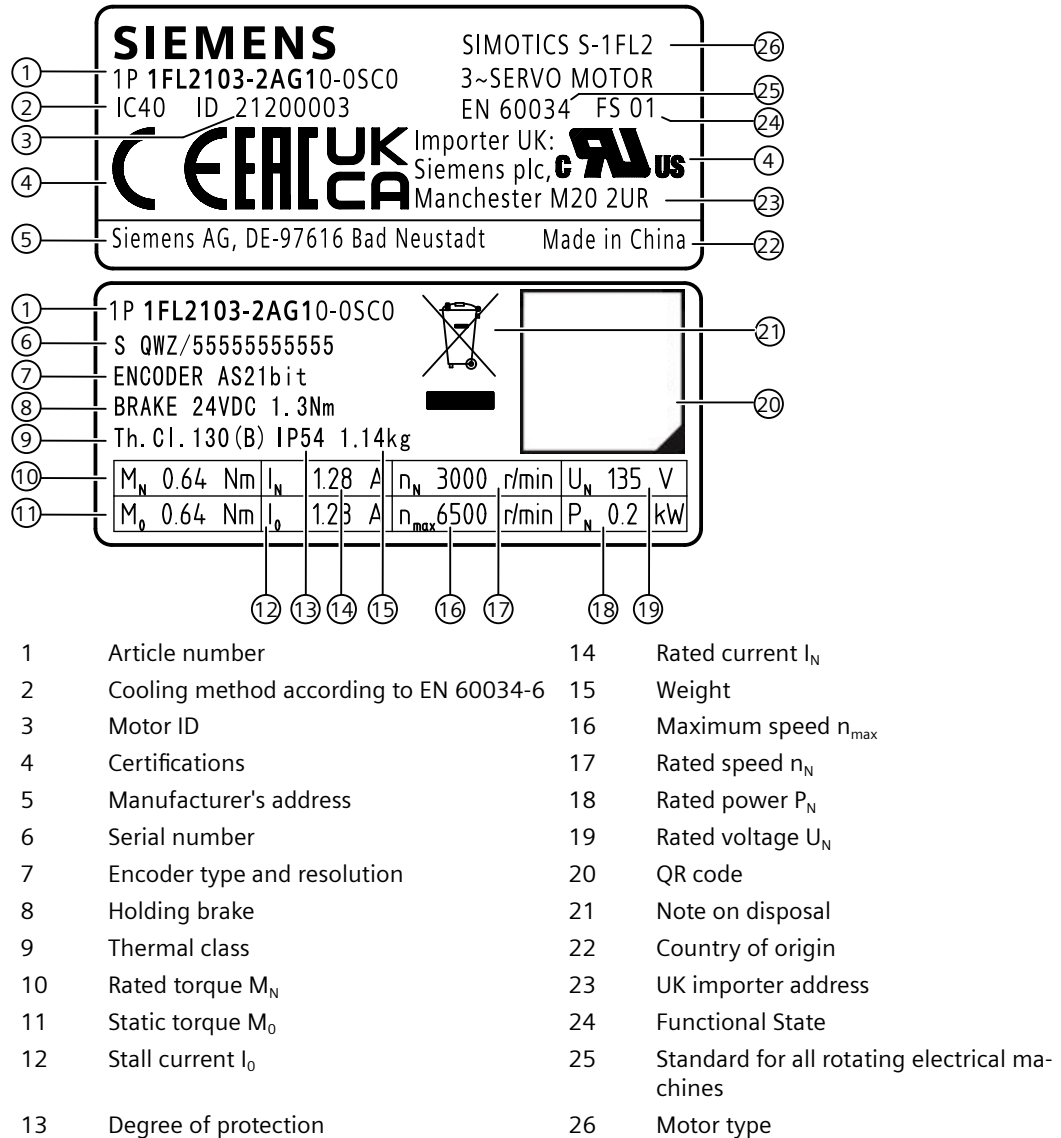


Figure 3-6 Rating plate example for 1FL2 SH20 and SH30

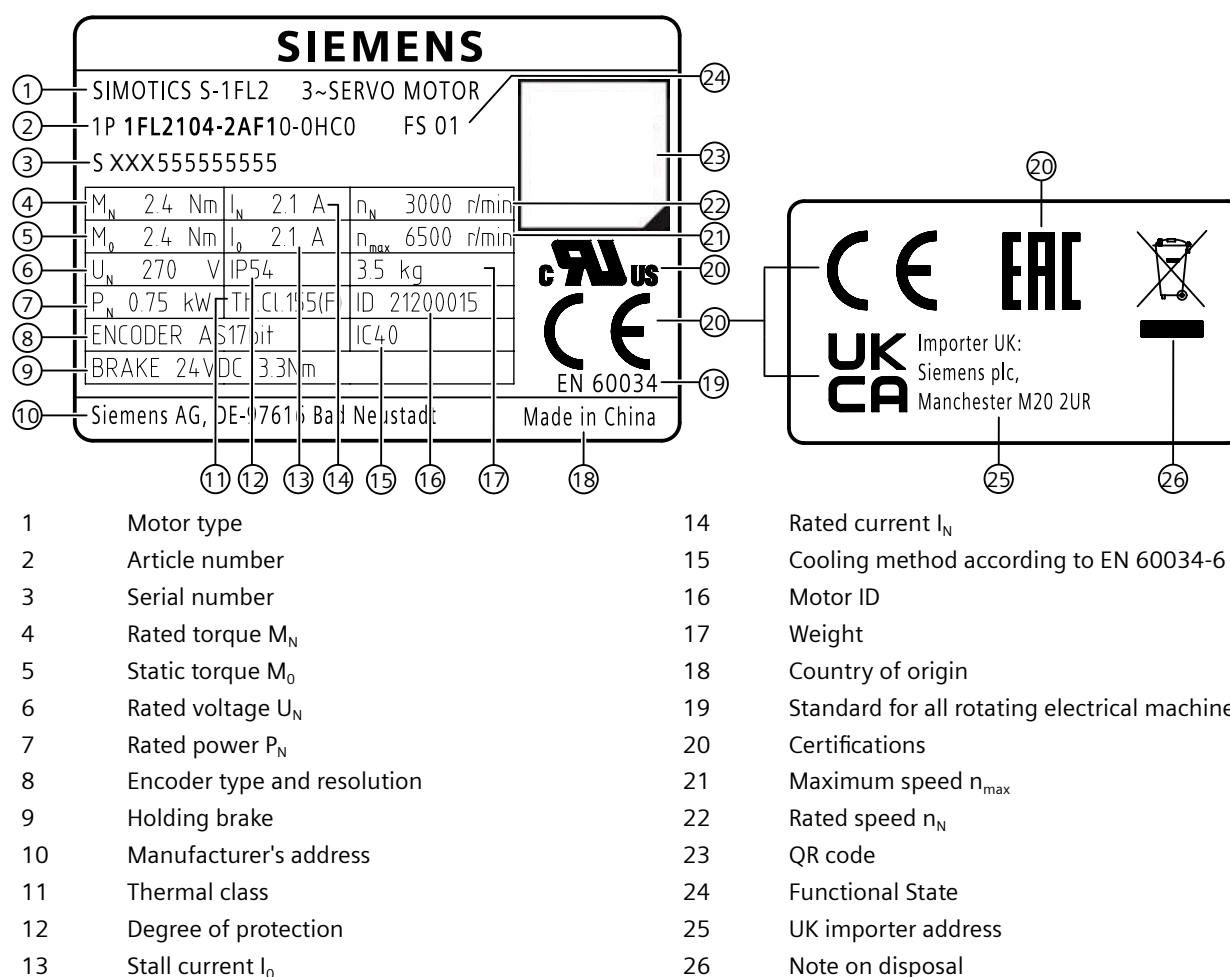


Figure 3-7 Rating plate example for 1FL2 SH40/SH40 (New) and above

3.2.2.2 Article number explanation

Description

The following figure shows an explanation of the article number for the motor.

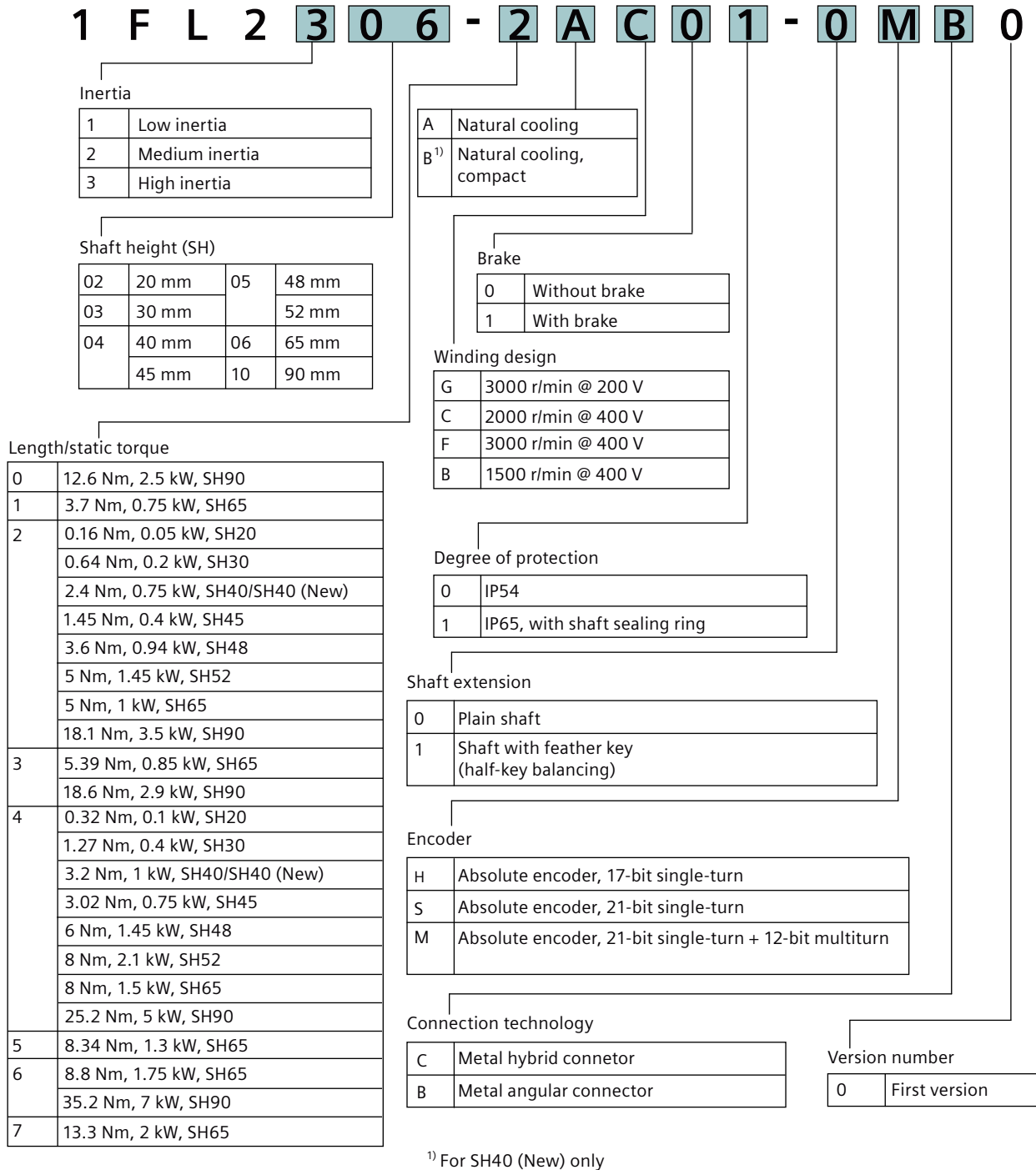
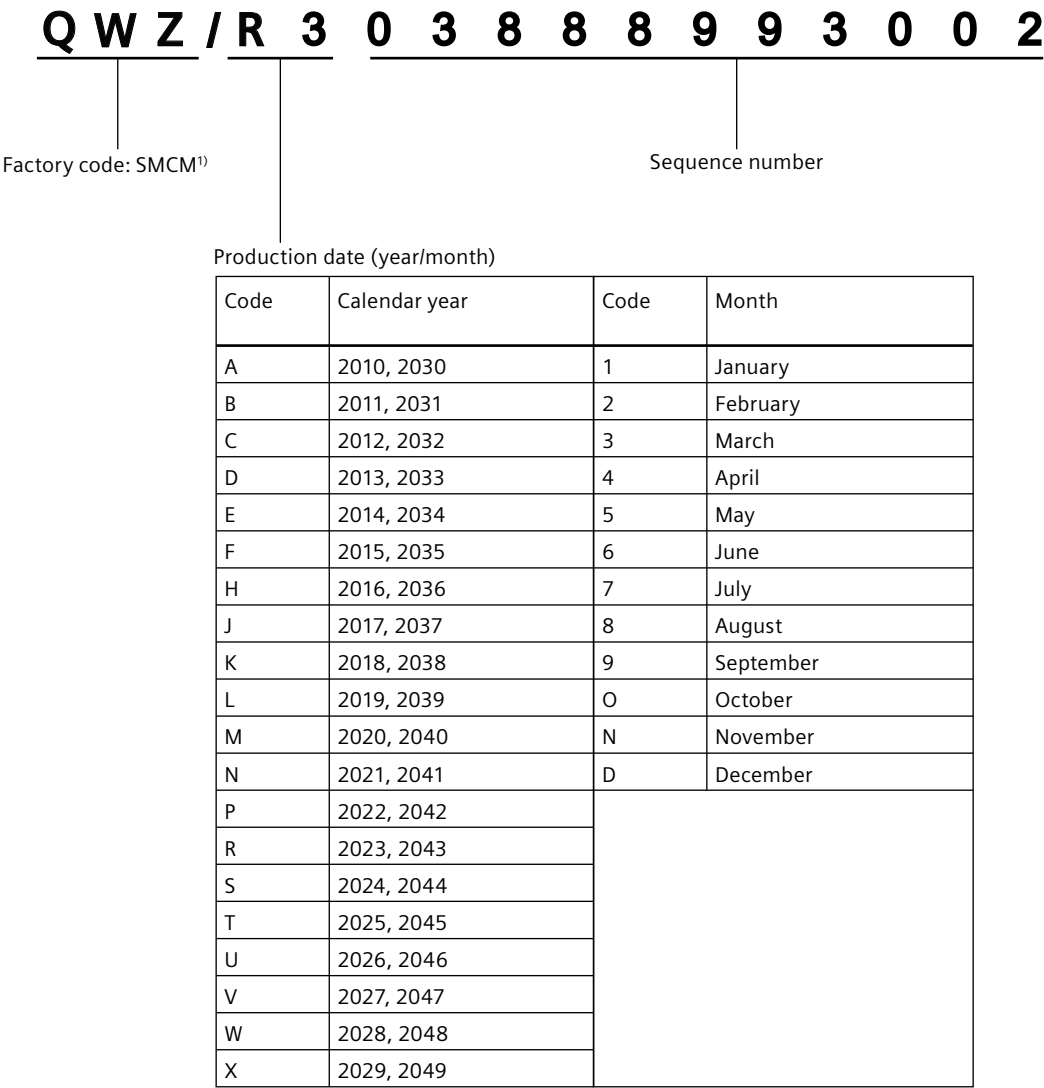


Figure 3-8 Article number for 1FL2 servo motors

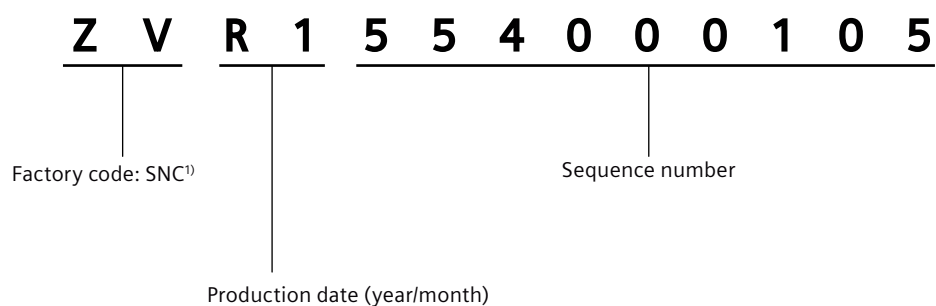
3.2.2.3 Serial number explanation

Description



¹⁾ SMCM = Siemens Motion Control Motors JiangSu Ltd.

Figure 3-9 Serial number for 1FL2 SH20, SH30, and SH40 (New)



Code	Calendar year	Code	Month
A	2010, 2030	1	January
B	2011, 2031	2	February
C	2012, 2032	3	March
D	2013, 2033	4	April
E	2014, 2034	5	May
F	2015, 2035	6	June
H	2016, 2036	7	July
J	2017, 2037	8	August
K	2018, 2038	9	September
L	2019, 2039	0	October
M	2020, 2040	N	November
N	2021, 2041	D	December
P	2022, 2042		
R	2023, 2043		
S	2024, 2044		
T	2025, 2045		
U	2026, 2046		
V	2027, 2047		
W	2028, 2048		
X	2029, 2049		

¹⁾ SNC = Siemens Numerical Control Ltd., Nanjing

Figure 3-10 Serial number for 1FL2 SH40 and above

3.2.3 MOTION-CONNECT 350 and 380 cables

3.2.3.1 Overview

Description

The MOTION-CONNECT 350/380 cable delivery includes the following components:

- The MOTION-CONNECT cable with assembled connectors for connecting the motor to the converter
- A shield clamp for connection of the power cable to the shield plate of the converter

3.2.3.2 Article number explanation

Description

Table 3-3 Article numbers for MOTION-CONNECT 350 and 380 cables

Description		Position of the article number																				
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16			
MOTION-CONNECT cables		6	F	X	3		0	2														
Cable variant	MOTION-CONNECT 350 standard cable					5																
	MOTION-CONNECT 380 drag chain cable					8																
Connector type	Hybrid connector									7												
	Power connector or brake connector									5												
	Encoder connector									2												
Cable type	Power cable with brake conductors										D											
	Power cable without brake conductors										C											
	Dual cable with hybrid connector, drive-end outlet																			D		
	Dual cable with hybrid connector, non-drive-end outlet																			N		
	Power cable with M17 circular connector																			K		
	Power cable with M23 circular connector									5	C									L		
	Brake cable									5	B									L		
	Encoder cable with M17 circular connector (6FX2003-0DB63)									2	X									B	1	1
	Encoder cable with M17 circular connector (6FX2003-0DB13)									2	X									B	1	2
Cable cross-section	Dual cable with hybrid connector (0.75 mm²/18 AWG)												0	1								
	Power cable with M23 circular connector (0.75 mm²/18 AWG)																					
	Power cable with M23 circular connector (1.5 mm²/16 AWG)												0	2								
	Power cable with M23 circular connector (2.5 mm²/14 AWG)												1	2								
	Power cable with M17 circular connector (0.75 mm²/18 AWG)												3	2								
	Brake cable (0.75 mm²/18 AWG)												0	3								
Cable length	3 m															1	A	D	0			
	5 m															1	A	F	0			
	7 m															1	A	H	0			
	10 m															1	B	A	0			
	15 m															1	B	F	0			
	20 m															1	C	A	0			
	30 m															1	D	A	0			

More information

For more information about the cable and connector combination, see Section "MOTION-CONNECT cables and connectors (Page 61)".

3.3 Device combinations

3.3.1 200 V servo drive system

Description

Table 3-4 200 V servo drive system

1FL2 servo motors						200 V converters (S200 PN/S200 Basic PN)		MOTION-CON- NECT prefabri- cated cables
Rated torque (Nm)	Rated power (kW)	Rated speed (r/min)	Shaft height (mm)	Inertia	Article number 1FL2	Article number 6SL5□10-1BB	Frame size	Article number 6FX3□02-7□ □01- ¹⁾
0.16	0.05	3000	20	Low	102-2AG□□-□□C0	10-1AF0	FSA	□□□□
0.32	0.1	3000			102-4AG□□-□□C0			
0.64	0.2	3000	30	Low	103-2AG□□-□□C0	10-2AF0	FSB	
				Medium	203-2AG□□-□□C0			
1.27	0.4	3000		Low	103-4AG□□-□□C0	10-4AF0		
				Medium	203-4AG□□-□□C0			
2.4	0.75	3000	40	Low	104-2AG□□-□□C0	10-8AF0	FSC	
				Medium	204-2AG□□-□□C0			
3.2	1.0	3000		Low	104-4AG□□-□□C0	11-0AF0		
				Medium	204-4AG□□-□□C0			
2.4	0.75	3000	40 (New)	Low	104-2BG□1-□□C0	10-8AF0		
				Medium	204-2BG□1-□□C0			
3.2	1.0	3000		Low	104-4BG□1-□□C0	11-0AF0		
				Medium	204-4BG□1-□□C0			
Cable length								
3 m								1AD0
5 m								1AF0
7 m								1AH0
10 m								1BA0
15 m								1BF0
20 m								1CA0
30 m								1DA0

¹⁾ The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code.

3.3.2 400 V servo drive system

Description

Table 3-5 400 V servo drive system, with the motor rated at 3000/2000 r/min

1FL2 servo motors						400 V converters (S200 PN only)		MOTION-CON- NECT prefabrica- ted cables	
Rated torque (Nm)	Rated power (kW)	Rated speed (r/min)	Shaft height (mm)	Inertia	Article number 1FL2	Article num- ber 6SL5510-1BE	Frame size	Article number 6FX3□02- ¹⁾	
0.16	0.05	3000	20	Low	102-2AF□□-□□C0	10-2AF0	FSA	Dual cable with hy- brid connector: 7□□01-□□□□ Dual cable variants: <ul style="list-style-type: none">Power cable (with brake con- ductors) + en- coder cablePower cable (without brake conductors) + encoder cable	
0.32	0.1	3000			102-4AF□□-□□C0				
0.64	0.2	3000	30	Low	103-2AF□□-□□C0				
				Medium	203-2AF□□-□□C0				
1.27	0.4	3000	30	Low	103-4AF□□-□□C0	10-4AF0			
				Medium	203-4AF□□-□□C0				
2.4	0.75	3000	40	Low	104-2AF□□-□□C0	10-8AF0	FSB		
				Medium	204-2AF□□-□□C0				
3.2	1.0	3000		Low	104-4AF□□-□□C0	11-0AF0			
				Medium	204-4AF□□-□□C0				
2.4	0.75	3000	40 (New)	Low	104-2BF□1-□□C0	10-8AF0			FSC
				Medium	204-2BF□1-□□C0				
3.2	1.0	3000		Low	104-4BF□1-□□C0	11-0AF0			
				Medium	204-4BF□1-□□C0				
3.0	0.94	3000	48	Medium	205-2AF□1-□□B0	11-5AF0	Power cable (with brake conductors): 5DK32-□□□□ Power cable (with- out brake conduc- tors): 5CK32-□□□□ Encoder cable: 2XB11-□□□□		
4.6	1.45	3000			205-4AF□1-□□B0				
4.6	1.45	3000	52	Low	105-2AF□1-□□B0	12-5AF0			
6.6	2.1	3000			105-4AF□1-□□B0				

1FL2 servo motors						400 V converters (S200 PN only)		MOTION-CON- NECT prefabrica- ted cables	
Rated torque (Nm)	Rated power (kW)	Rated speed (r/min)	Shaft height (mm)	Inertia	Article number 1FL2	Article num- ber 6SL5510-1BE	Frame size	Article number 6FX3□□02- ¹⁾	
1.27	0.4	3000	45	High	304-2AF□1-□□B0	10-4AF0	FSA	Power cable: 5CL□□-□□□□ Brake cable: 5BL03-□□□□ Encoder cable: 2XB12-□□□□	
2.39	0.75	3000			304-4AF□1-□□B0	10-8AF0	FSB		
3.58	0.75	2000	65		306-1AC□1-□□B0	11-0AF0	FSC		
4.78	1.0	2000			306-2AC□1-□□B0				
7.16	1.5	2000			306-4AC□1-□□B0	11-5AF0	FSD		
8.4	1.75	2000			306-6AC□1-□□B0	12-5AF0			
9.6	2.0	2000			306-7AC□1-□□B0				
11.9	2.5	2000	90		310-0AC□1-□□B0	13-5AF0	FSD		
16.7	3.5	2000			310-2AC□1-□□B0				
23.9	5.0	2000			310-4AC□1-□□B0				
33.4	7.0	2000			310-6AC□1-□□B0				
Cable length									
3 m								1AD0	
5 m								1AF0	
7 m								1AH0	
10 m								1BA0	
15 m								1BF0	
20 m								1CA0	
30 m								1DA0	

¹⁾ The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code.

3.4 Supported SINUMERIK CNCs

Table 3-6 400 V servo drive system, with the motor rated at 1500 r/min

1FL2 servo motors ²⁾						400 V converters (S200 PN only)		MOTION-CON- NECT prefabrica- ted cables
Rated torque (Nm)	Rated power (kW)	Rated speed (r/min)	Shaft height (mm)	Inertia	Article number 1FL2	Article num- ber 6SL5510-1BE	Frame size	Article number 6FX3□□02- ¹⁾
5.39	0.85	1500	65	High	306-3AB□1-□□B0	11-5AF0	FSC	Power cable (with brake conductors): 5DD01-□□□□ Power cable (with- out brake conduc- tors): 5CD01-□□□□ Encoder cable: 2XB12-□□□□
8.34	1.3	1500			306-5AB□1-□□B0			
18.6	2.9	1500	90		310-3AB□1-□□B0	13-5AF0	FSD	Power cable (with brake conductors): 5DD12-□□□□ Power cable (with- out brake conduc- tors): 5CD12-□□□□ Encoder cable: 2XB12-□□□□
Cable length								
3 m								1AD0
5 m								1AF0
7 m								1AH0
10 m								1BA0
15 m								1BF0
20 m								1CA0
30 m								1DA0

¹⁾ The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code.

²⁾ When the motor operates at a speed > 3000 r/min, an external braking resistor must be used to dissipate the regenerative energy. Otherwise, when the motor is rapidly braked, fault F30002 may occur.

3.4 Supported SINUMERIK CNCs

Description

The 400 V converters with the rated power from 0.4 kW to 7 kW are approved for operation with the following CNC system:

SINUMERIK 828D Smart with PPU versions

PPU version	Operator panel	Article number (without CNC software)	Supported CNC software version
260.5	Vertical	6FC5370-3AA50-0AA0	V5.25 SP3 or later
261.5	Horizontal	6FC5370-2AA50-0AA0	

You can order the converter with the following article number, including a Z option.

Rated power of converter (kW)	Article number	Z option
0.4	6SL5510-1BE10-4AF0	T80
0.75	6SL5510-1BE10-8AF0	
1	6SL5510-1BE11-0AF0	
1.75	6SL5510-1BE11-5AF0	
2.5	6SL5510-1BE12-5AF0	
3.5	6SL5510-1BE13-5AF0	
5	6SL5510-1BE15-0AF0	
7	6SL5510-1BE17-0AF0	

Example:

Article number of the 400 V converter with the rated power 0.4 kW used for SINUMERIK 828D Smart:

6SL5510-1BE10-4AF0-Z T80

More information

For the applicable motors and cables, you can find more information in Chapter "400 V servo drive system (Page 56)".

3.5 Accessories

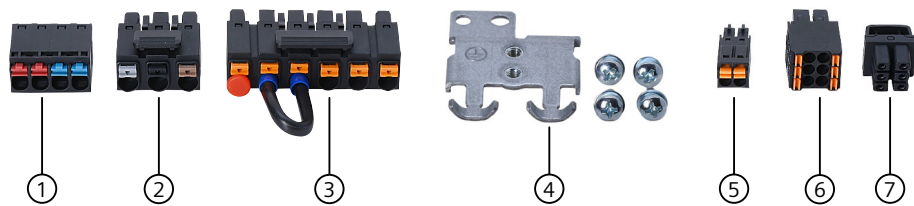
3.5.1 Connector kits

Description

If you need new connectors used on the converter front panel, you can order connector kits from Siemens using the following article numbers.

Description	Article number
Connector kit for S200 PN	6SL5568-0XX00-0AA0
Connector kit for S200 Basic PN	6SL5668-0XX00-0AA0

Scope of delivery



① X124 plug

② X2 plug

③ X1 plug

④ Shield plate, with 4 fixing screws

⑤ X108 plug¹⁾

⑥ X131 (STO) plug¹⁾

⑦ X131 (STO) disable plug¹⁾

¹⁾ Only available in the connector kit for S200 PN

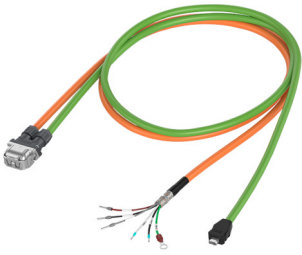
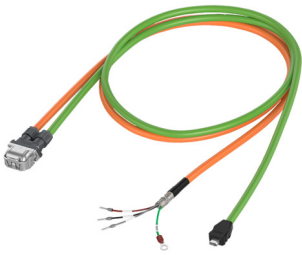
3.5.2 Cables and connectors

3.5.2.1 MOTION-CONNECT cables and connectors

Description

Siemens recommends that you use MOTION-CONNECT prefabricated cable assemblies and connectors for connecting the motor to the converter. All Siemens cable assemblies and connectors are tested and compliant with CE standards and EMC requirements.

Table 3-7 Overview of MOTION-CONNECT 350 and 380 cables for motors rated at 3000/2000 r/min

MOTION-CONNECT 350 and 380 cables				Connectors	
Type	Article number 6FX3□□02- ¹⁾	Applicable 1FL2 motor	Cross-section for conductors (mm ²)	Drive side 6FX2003- -	Motor side 6FX2003-
Dual cable with hybrid connector: Power cable (with brake conductors) ²⁾ + encoder cable 	7DD01- □□□□	SH20 SH30	<ul style="list-style-type: none"> Power cable (with brake conductors): <ul style="list-style-type: none"> 4 × 0.75 + 2 × 0.38 (4 × 18 AWG + 2 × 22 AWG) Encoder cable: <ul style="list-style-type: none"> Cable length ≤ 15 m: 3 × 2 × 0.25 (3 × 2 × 24 AWG) Cable length 20 m or 30 m: 2 × 2 × 0.25 + 2 × 0.38 (2 × 2 × 24 AWG + 2 × 22 A WG) 	0DE61	3HD00
	7DN01- □□□□	SH40 SH40 (New)			3HN00
Dual cable with hybrid connector: Power cable (without brake conductors) + encoder cable 	7CD01- □□□□		<ul style="list-style-type: none"> Power cable (without brake conductors): <ul style="list-style-type: none"> 4 × 0.75 (4 × 18 AWG) Encoder cable: <ul style="list-style-type: none"> Cable length ≤ 15 m: 3 × 2 × 0.25 (3 × 2 × 24 AWG) Cable length 20 m or 30 m: 2 × 2 × 0.25 + 2 × 0.38 (2 × 2 × 24 AWG + 2 × 22 A WG) 		3HD00
	7CN01- □□□□				3HN00

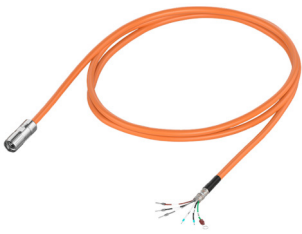
MOTION-CONNECT 350 and 380 cables				Connectors	
Type	Article number 6FX3□□02- ¹⁾	Applicable 1FL2 motor	Cross-section for conductors (mm ²)	Drive side 6FX2003 -	Motor side 6FX2003- -
Power cable (with brake conductors) 	5DK32- □□□□	SH48 SH52	4 × 0.75 + 2 × 0.38 (4 × 18 AWG + 2 × 22 AWG)	-	OLL63
Power cable (without brake conductors) 	5CK32- □□□□		4 × 0.75 (4 × 18 AWG)		
Power cable (without brake conductors) 	5CL01- □□□□	SH45 SH65	4 × 0.75 (4 × 18 AWG)	-	OLL13
	5CL02- □□□□	SH90	4 × 1.5 (4 × 16 AWG)		
	5CL12- □□□□		4 × 2.5 (4 × 14 AWG)		

MOTION-CONNECT 350 and 380 cables				Connectors	
Type	Article number 6FX3□□02- ¹⁾	Applicable 1FL2 motor	Cross-section for conductors (mm ²)	Drive side 6FX2003- -	Motor side 6FX2003- -
Encoder cable 	2XB11- □□□□	SH48 SH52	<ul style="list-style-type: none"> Cable length ≤ 15 m: 3 × 2 × 0.25 (3 × 2 × 24 AWG) Cable length 20 m or 30 m: 2 × 2 × 0.25 + 2 × 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG) 	0DE61	0DB63
	2XB12- □□□□	SH45 SH65 SH90			0DB13
Brake cable 	5BL03- □□□□		2 × 0.75 (2 × 18 AWG)	-	0LL53

¹⁾ The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code:
1AD0 = 3 m, 1AF0 = 5 m, 1AH0 = 7 m, 1BA0 = 10 m, 1BF0 = 15 m, 1CA0 = 20 m, 1DA0 = 30 m.

²⁾ The conductors for the motor holding brake are integrated in the MOTION-CONNECT power cable.

Table 3-8 Overview of MOTION-CONNECT 350 and 380 cables for motors rated at 1500 r/min

MOTION-CONNECT 350 and 380 cables				Connectors	
Type	Article number 6FX3□□02- ¹⁾	Applicable 1FL2 motor	Cross-section for conductors (mm ²)	Drive side 6FX2003 -	Motor side 6FX2003- OLL23
Power cable (with brake conductors) 	5DD01-□□□□	SH65	4 × 0.75 + 2 × 0.5 (4 × 18 AWG + 2 × 20 AWG)	-	OLL23
	5DD02-□□□□		4 × 1.5 + 2 × 0.5 (4 × 16 AWG + 2 × 20 AWG)		
	5DD12-□□□□	SH90	4 × 2.5 + 2 × 0.5 (4 × 14 AWG + 2 × 20 AWG)		
Power cable (without brake conductors) 	5CD01-□□□□	SH65	4 × 0.75 (4 × 18 AWG)		
	5CD02-□□□□		4 × 1.5 (4 × 16 AWG)		
	5CD12-□□□□	SH90	4 × 2.5 (4 × 14 AWG)		
Encoder cable 	2XB12-□□□□	SH65 SH90	<ul style="list-style-type: none"> Cable length ≤ 15 m: 3 × 2 × 0.25 (3 × 2 × 24 AWG) Cable length 20 m or 30 m: 2 × 2 × 0.25 + 2 × 0.38 (2 × 2 × 24 AWG + 2 × 22 AWG) 	ODE61	ODB13

¹⁾ The last four positions (□□□□) in the cable article number define the cable length corresponding to the length code:
 1AD0 = 3 m, 1AF0 = 5 m, 1AH0 = 7 m, 1BA0 = 10 m, 1BF0 = 15 m, 1CA0 = 20 m, 1DA0 = 30 m.

If you prefer to use non-Siemens cables, Siemens provides the following connectors for you to assemble your own cables.

Note that Siemens does not provide any guarantee or warranty regarding the functionality, reliability or quality of non-Siemens cables used with the S200 servo drive system, and is not

responsible for device (e.g. motor and converter) damages due to the use of non-Siemens cables.

Table 3-9 Overview of connectors and crimp contacts

Cable connectors					
	Article number 6FX2003-	Description	Connection type	Quantity per package	Illustration
Connector (connected to motor)	3HD00	Hybrid plug (drive end)	Crimping	5 pieces/pack	
	3HN00	Hybrid plug (non-drive end)	Crimping	5 pieces/pack	
	0LL63	M17 circular connector	Crimping	5 pieces/pack	
	0DB63	M17 circular connector	Crimping	5 pieces/pack	
	0LL13	M23 circular connector	Crimping	5 pieces/pack	
	0LL23	M23 circular connector	Crimping	5 pieces/pack	
	0DB13	M17 circular connector	Crimping	5 pieces/pack	
	0LL53	M17 circular connector	Crimping	5 pieces/pack	
Connector (connected to converter)	0DE61	IX-C connector	Crimping	5 pieces/pack	
Crimp contact	7HP00	Hybrid power contacts	Crimping	2000 pieces/reel	
	7HS00	Hybrid signal contacts	Crimping	2000 pieces/reel	

More information

For more information about the MOTION-CONNECT cable article number explanation, see Section "Article number explanation (Page 54)".

For more information about assembling cables, see Section "Assembling cables (Page 905)".

3.5.2.2 I/O cable and connector

Description

The cable is used to connect the converter to a controller for signal transmission on the interface X130.

Table 3-10 I/O cable and connector

Description	Article number
PROFINET I/O cable with a 20-pin MDR connector, length: 1 m	6SL5562-1XX00-0AC0
PROFINET I/O connector 20-pin MDR connector	6SL3260-2MA00-0VA0
PROFINET I/O adaptor¹⁾ 20-pin MDR connector and 12-pin terminal block	6SL5562-1XX00-0AD0

¹⁾ PTO function unsupported

More information

For more information about the I/O connection, see Section "Connecting the inputs and outputs (Page 160)".

For more information about how to assemble the I/O connector, see Section "Assembling the I/O connector (Page 911)".

3.5.2.3 PROFINET patch cables and RJ45 connectors

Description

Siemens recommends that you use the following patch cable to connect converters located adjacent to one another via PROFINET.

Table 3-11 PROFINET patch cables

Description	Article number
IE connecting cable RJ45 IE FC Trailing Cable GP, pre-assembled with 2 x IE FC RJ45 plug 180°	
Length: 1 m	6XV1871-5BH10
Length: 3 m	6XV1871-5BH30

Table 3-12 RJ45 connectors

Description	Article number
IE FC RJ45 Plug RJ45 plug-in connector (10/100 Mbit/s) with rugged metal enclosure and FC connection system, for IE FC TP cable 2 x 2	
180° cable outlet	6GK1901-1BB10-2AA0
145° cable outlet	6GK1901-1BB30-0AA0
90° cable outlet	6GK1901-1BB20-2AA0
IE RJ45 Plug PRO IP65 push-pull connector for on-site assembly with TP cables 2 x 2	
With FC connection system	6GK1901-1BB20-6AA0
Without FC connection system	6GK1901-1BB10-6AA0

More information

For more information about the connections, see Sections "Connecting the fieldbus (Page 169)" and "Connecting the service interface (Ethernet) (Page 171)".

3.5.3 Line filter

Description

Line filters limit the conducted interference emissions from the converters to the permissible limit values according to IEC 61800-3 Category C2.

Line filters are passive components used to expand the EMC properties of the servo drive system.

Siemens recommends that you use a line filter to protect the system from high frequency noise.

Note

For applications where EMC Category C2 or C3 is necessary, the use of the recommended line filters is mandatory to fulfill the local EMC directives.

3.5.3.1 Recommended line filters

Table 3-13 Recommended line filters

Converter frame size	Rated current (A)	Article number
1 AC 200 V ... 240 V		
FSA/FSB/FSC	18	6SL5550-0XB21-8CA0
3 AC 200 V ... 240 V		
FSA/FSB/FSC	5	6SL3203-0BE15-0VA0
3 AC 380 V ... 480 V		
FSA/FSB	5	6SL5550-0XE20-5CA0
FSC	12	6SL5550-0XE21-2CA0
FSD	20	6SL5550-0XE22-0CA0

3.5.3.2 Technical data

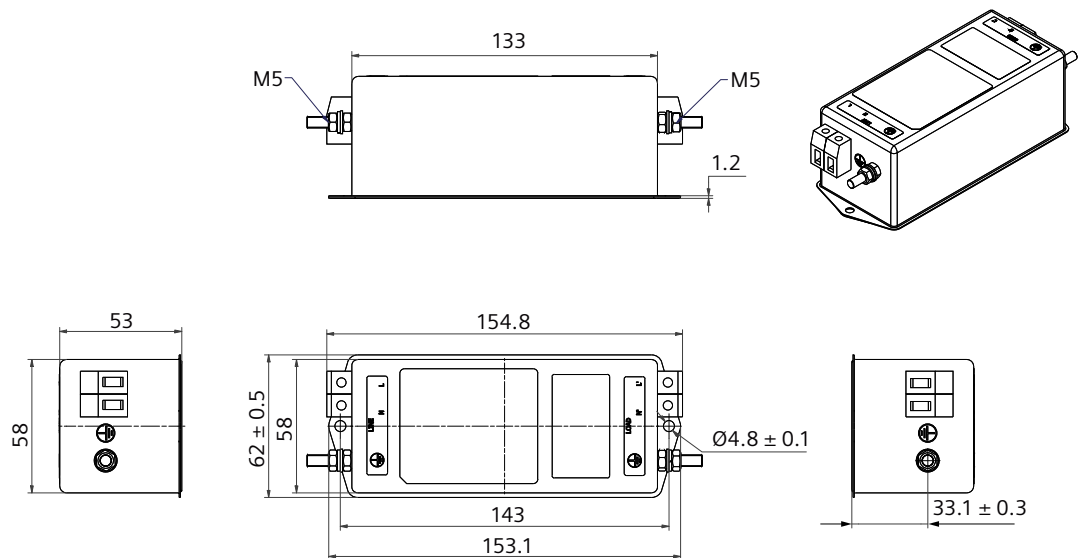
Table 3-14 Technical data of line filters

Article number	6SL5550-0XB21 -8CA0	6SL3203-0BE15 -0VA0	6SL5550-0XE20 -5CA0	6SL5550-0XE21 -2CA0	6SL5550-0XE22 -0CA0
Line voltage (V)	1 AC 200 ... 240	3 AC 275 ... 480	3 AC 275 ... 480	3 AC 275 ... 480	3 AC 275 ... 480
Rated current (A)	18	5	5	12	20
Power loss (W)	4.7	2	2.7	3.9	10.1
Type of connection	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
Conductor cross-section (mm ²)					
For single-conductor connection	0.75 ... 6 (AWG 18 ... 10)	0.75 ... 6 (AWG 18 ... 10)	0.75 ... 6 (AWG 18 ... 10)	0.75 ... 6 (AWG 18 ... 10)	0.75 ... 6 (AWG 18 ... 10)
For flexible cable connection	0.75 ... 4 (AWG 18 ... 10)	0.75 ... 4 (AWG 18 ... 10)	0.75 ... 4 (AWG 18 ... 10)	0.75 ... 4 (AWG 18 ... 10)	0.75 ... 4 (AWG 18 ... 10)
Insulation stripping length (mm)	8 ... 9	8 ... 9	8 ... 9	8 ... 9	8 ... 9
Protective conductor connection	M5	M6	M6	M6	M6
Degree of protection	IP20	IP20	IP20	IP20	IP20
Dimensions (W × H × D, mm)	58 × 155 × 53	55 × 170 × 130	55 × 170 × 130	75 × 195 × 140	60 × 250 × 130
Weight (kg)	0.75	0.67	0.72	1.34	1.5
Leakage current (mA)	11.84	4.31	4.37	7.05	8.88

3.5.3.3 Dimension drawing

6SL5550-0XB21-8CA0

All dimensions are specified in millimeters.



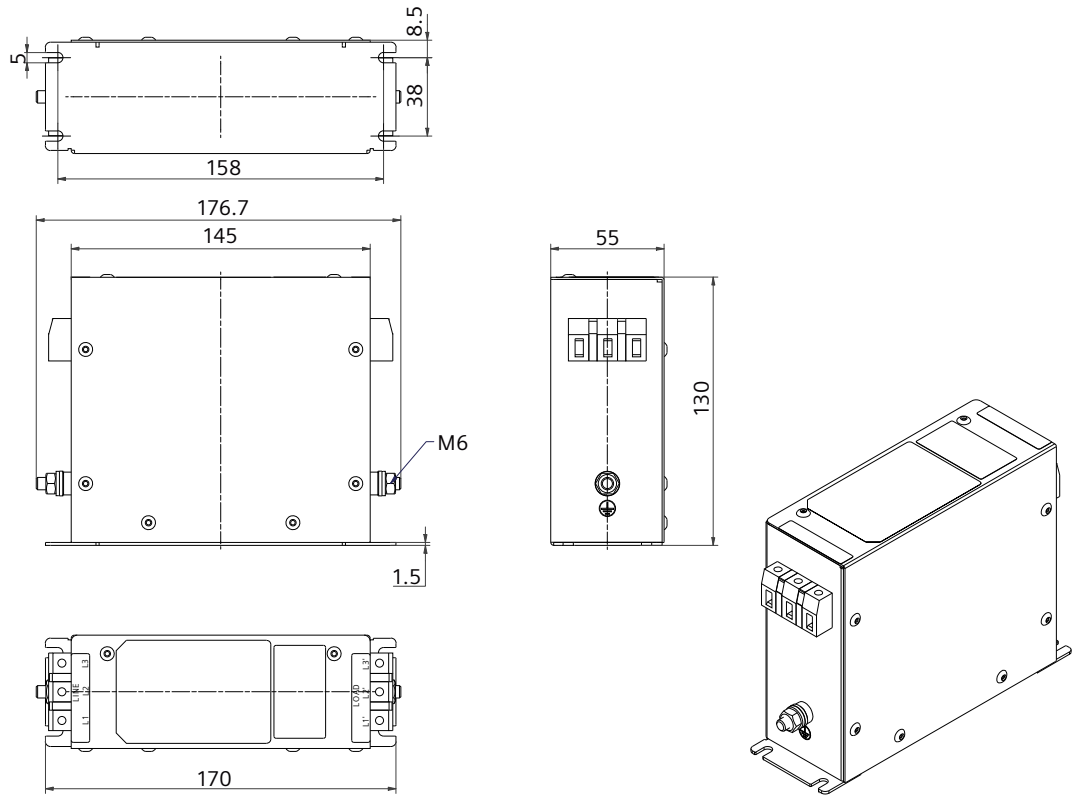
Tightening torque for the mounting screws: 2.5 Nm

Tightening torque for the protective conductor fastening bolt: 2.0 Nm ... 2.2 Nm

Tightening torque for the line-side and load-side screw connection: 0.7 Nm ... 0.8 Nm

6SL3203-0BE15-0VA0 and 6SL5550-0XE20-5CA0

All dimensions are specified in millimeters.



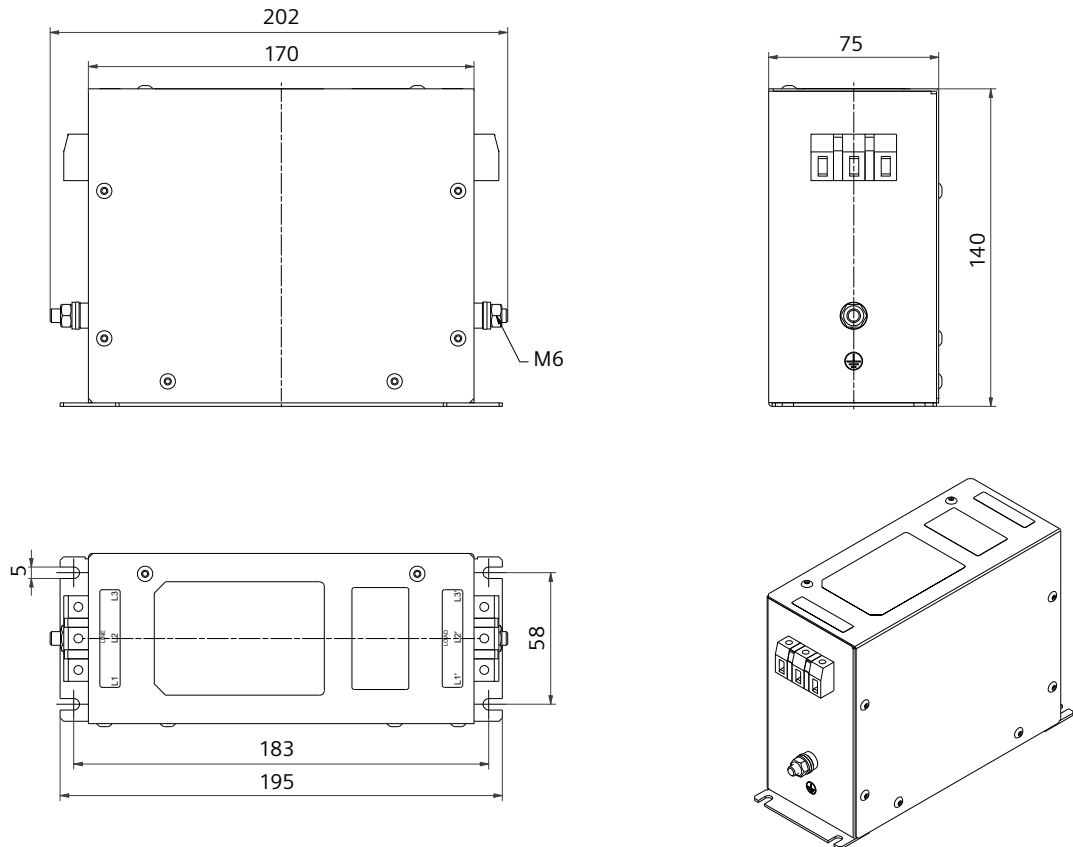
Tightening torque for the mounting screws: 2.5 Nm

Tightening torque for the protective conductor fastening bolt: 3.5 Nm ... 4.0 Nm

Tightening torque for the line-side and load-side screw connection: 0.7 Nm ... 0.8 Nm

6SL5550-0XE21-2CA0

All dimensions are specified in millimeters.



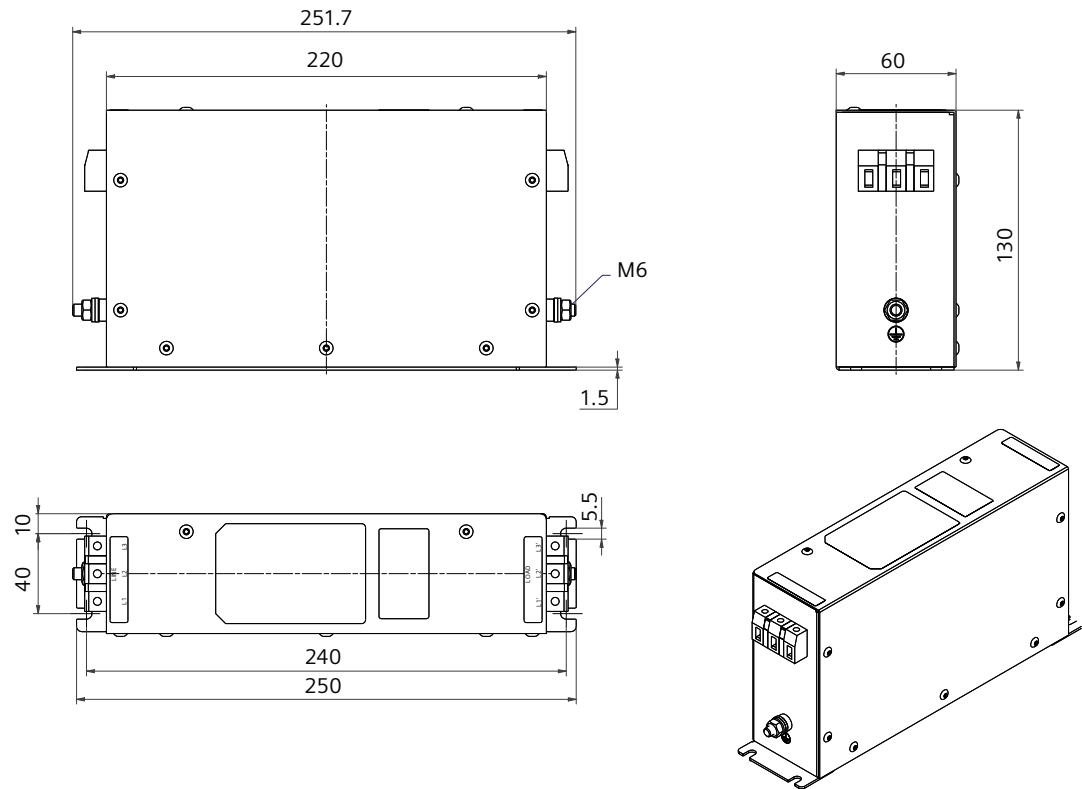
Tightening torque for the mounting screws: 2.5 Nm

Tightening torque for the protective conductor fastening bolt: 3.5 Nm ... 4.0 Nm

Tightening torque for the line-side and load-side screw connection: 0.7 Nm ... 0.8 Nm

6SL5550-0XE22-0CA0

All dimensions are specified in millimeters.



Tightening torque for the mounting screws: 2.5 Nm

Tightening torque for the protective conductor fastening bolt: 3.5 Nm ... 4.0 Nm

Tightening torque for the line-side and load-side screw connection: 0.7 Nm ... 0.8 Nm

3.5.3.4 Mounting instructions for the line filter

Description

- Observe the requirements for "EMC-compliant installation (Page 102)" when mounting the line filter.
- To achieve a low-impedance connection, mount the line filter on the same metallic mounting plate as the converter. Place the line filter close to the converter.

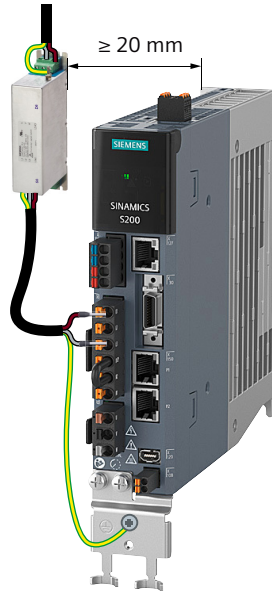


Figure 3-11 Connecting the line filter (example)

3.5.4 External 24 V DC power supply

Description

A 24 V DC power supply is needed to supply the converter. The following table provides the technical specifications of the required external 24 V DC power supply:

Table 3-15 Specifications of the required external 24 V DC power supply

Parameter	Description
Rated voltage (V)	24
Permissible voltage fluctuation (V)	When using a motor without brake: 20.4 ... 28.8 (-15% ... +20%) When using a motor with brake: 22.8 ... 28.8 (-5% ... +20%)
Maximum current (A)	<ul style="list-style-type: none"> For 200 V variants <ul style="list-style-type: none"> When using a motor without brake: 1.2 When using a motor with brake: 2.2 For 400 V variants <ul style="list-style-type: none"> When using a motor without brake: 1.2 When using a motor with brake: 3.2
Safety insulation class	SELV/PELV ¹⁾

¹⁾ For PELV systems, the ground connection must be carried out via the external 24 V DC power supply.

Note

Siemens recommends that you use different 24 V DC power supplies for the converter and for the inductive loads such as relays or solenoid valves.

If you use the 24 V DC power supply to supply both the inductive loads and the converter at the same time, make sure that you connect surge protection devices to the load side.

3.5.5 Replacement fans

Description

The 400 V converters FSC and FSD are integrated with a fan unit. The service life of the fan can reach 20000 hours at the rated operating temperature and the average 100% operating load.

Replace the defective fan in time to ensure the proper operation of the converter.

To replace the fan, you can order fan units from Siemens using the following article numbers.

Table 3-16 Replacement fans

SINAMICS S200 PN	Article number
3 AC, 380 V ... 480 V	
FSC	6SL5560-0CE00-0AA0
FSD	6SL5560-0DE00-0AA0

3.5.6 Shield plate kit

Description

The shield plate kit (article number: 6SL5566-0AB00-0AA0) includes 4 shield plates and 16 fixing screws (M4 × 12). The shield plate can establish ground connections to both shielded cables and protective conductors.

You can use the supplied two M4 screws to fix the shield plate to a tightening torque of 2.2 Nm.

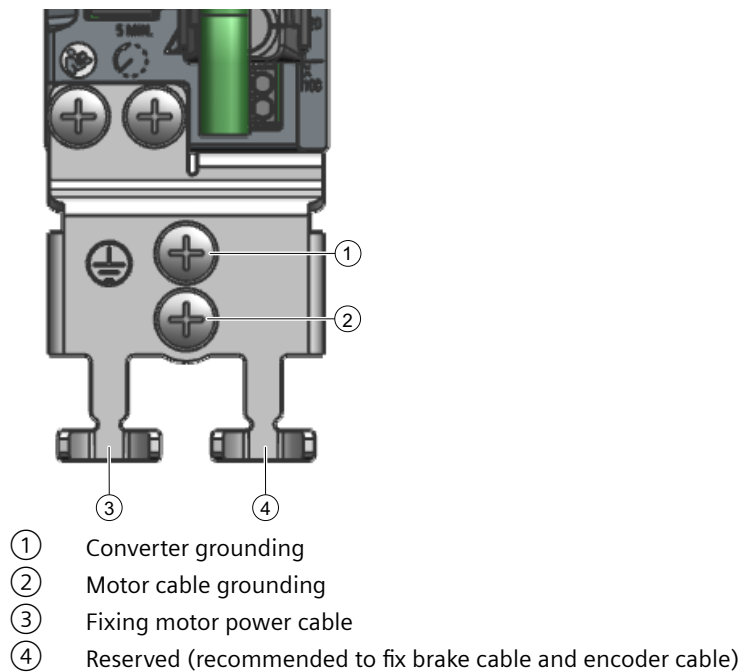


Figure 3-12 Shield plate

For the connection of ① or ②, you can connect the protective conductor with a cable lug and an M4 screw to the shield plate.

3.5.7 IP65 degree of protection kit for 1FL2 motors SH20 and SH30

Description

The IP65 degree of protection kit can be used as spare part or for upgrading the degree of protection from IP54 to IP65.

The main part of the IP65 degree of protection kit is a shaft sealing ring.

The motor satisfies IP65 degree of protection when the shaft sealing ring is installed.

Note

You can order a motor with IP65 degree of protection directly, in which the shaft sealing ring is already integrated.

More information about ordering IP65 degree of protection can be found in Section "1FL2 article number explanation (Page 50)".

Table 3-17 Ordering data for the IP65 degree of protection kit

Motor	Article number	Illustration
1FL2102	1FL2902-0GC00	
1FL2103	1FL2903-0GC00	
1FL2203		

More information

For more information about how to install or replace the shaft sealing ring, see Section "Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30 (Page 936)".

For more information about the degree of protection of 1FL2 motors, see Section "Degree of protection (Page 618)".

3.5.8 Memory card

Description

The converter can be operated with or without a memory card inserted.

The converter supports FAT32-format memory cards with a capacity of up to 32 GB.

A permanently inserted memory card from Siemens is required to use functions that require a license. The license key can only be assigned to the Siemens memory card.

A memory card from Siemens or a third-party manufacturer (for example, Kingston or SanDisk) is suitable for the following situations:

- Data backup and restore
- Transfer of the converter settings from one converter to another
- Firmware update

Table 3-18 Memory card ordering data

Siemens memory card (SD card)	Article number	Z option
Memory card without firmware	6SL5970-0AA00-0AA0	-
Memory card with firmware V6.4	6SL5570-0GE00-0AA0	-
Memory card with firmware V6.5	6SL5570-0GF00-0AA0	-
Memory card with firmware V6.7	6SL5570-0GH00-0AA0	-
"SINAMICS OPC UA Single Extended" license	-	H80

Example:

Article number of an empty memory card with license "SINAMICS OPC UA Single Extended":
6SL5970-0AA00-0AA0-Z H80

3.5.9 SINAMICS Smart Adapter

Description

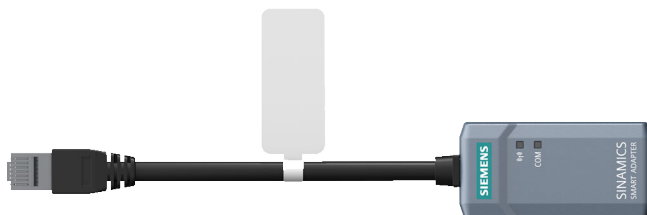


Figure 3-13 SINAMICS Smart Adapter

The SINAMICS Smart Adapter establishes a WLAN connection between the converter and an operating unit, for example a tablet, smartphone, panel or PC.

Once plugged into the converter's service interface X127, 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.

Table 3-19 SINAMICS Smart Adapter ordering data

Description	Article number
SINAMICS Smart Adapter	6SL4950-0AJ00-0AA0

More information

You can find more information on the Internet:

SINAMICS Smart Adapter Compact Operating Instructions (<https://support.industry.siemens.com/cs/us/en/view/109826894>)

3.5.10 SINAMICS SDI Pro 5.5"

Description

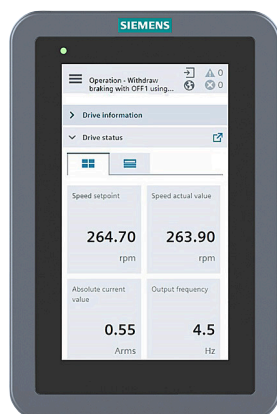


Figure 3-14 SINAMICS SDI Pro 5.5"

The SINAMICS SDI Pro 5.5" Operator Panel is a client device that allows you to access the web server integrated in the converter.

The SINAMICS SDI Pro 5.5" Operator Panel can be used to commission and diagnose the converter.

Table 3-20 SINAMICS SDI Pro 5.5" ordering data

Description	Article number
SINAMICS SDI Pro 5.5"	6SL4950-0AH35-2AA0

More information

You can find more information on the Internet:

SINAMICS Smart Drive Interface SDI Pro 5.5" Operating Instructions (<https://support.industry.siemens.com/cs/us/en/view/109963311>)

3.6 Directives and standards

Table 3-21 Certification overview

Certificate	S200 Basic PN converter	S200 PN converter	1FL2 motor	MOTION-CONNECT 350/380 cable
CE	✓	✓	✓	✓
UL	✓	✓	✓	✓
UKCA	✓	✓	✓	✓
EAC	✓	✓	✓	-

Certificate	S200 Basic PN converter	S200 PN converter	1FL2 motor	MOTION-CONNECT 350/380 cable
KC	✓	✓	-	-
RoHS	✓	✓	✓	✓
REACH	✓	✓	✓	✓
RCM/C-Tick	✓	✓	-	-
Functional Safety	-	✓	-	-
SEMI F47	✓	✓	-	-
China RoHS	✓	✓	✓	✓
ISO 9001 & ISO 14001	✓	✓	✓	✓
WEEE	✓	✓	✓	✓
China Energy Label	-	-	✓	-

3.6.1 Directives and standards for the converter

The following directives and standards are relevant for the converter:



European Low Voltage Directive

The converter fulfills the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if it is covered by the application area of this directive.

European Machinery Directive

The S200 PN converter fulfills the requirements stipulated in the Machinery Directive 2006/42/EC, if it is covered by the application area 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 RoHS Directive

The converter complies with Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

European EMC Directive

The compliance of the converter with the regulations of the Directive 2014/30/EU has been verified through full compliance with the IEC 61800-3.

Functional Safety

The S200 PN converter complies with the requirements relating to functional safety stipulated in IEC 61800-5-2, which depends on the correct functioning of the safety-related parts of the drive system and on external risk reduction measures.



Underwriters Laboratories (North American market)

The converters provided with the test symbol displayed fulfill the requirements stipulated for the North American market.

**UKCA certification**

The converter complies with the requirements for the market in Great Britain (England, Wales and Scotland).

**Australia and New Zealand (RCM formerly C-Tick)**

The converter with the symbol displayed on the rating plate fulfills the EMC requirements for Australia and New Zealand.

**Eurasian Conformity**

The converter complies with the requirements of the Russia/Belarus/Kazakhstan customs union (EAC).

**EMC requirements for South Korea**

The converter with the KC marking on the rating plate satisfies the EMC requirements for South Korea.

Registration, Evaluation and Authorization of Chemicals

The converter complies with the requirements of Registration, Evaluation and Authorization of Chemicals (REACH).

China RoHS

The converter complies with the requirements of China RoHS.

Immunity to voltage drop of semiconductor process equipment

The converter fulfills the requirements of the standard SEMI F47-0706.

Quality systems

Siemens employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Taking back and recycling waste electrical and electronic equipment (WEEE)

The converter complies with the requirements laid down in Directive 2012/19/EU with regard to returning and recycling scrap electrical and electronic equipment.

Certificates for download

You can find all relevant certificates via the ID link embedded in the QR code on the rating plate of the converter.

3.6.2 Directives and standards for the motor

The following directives and standards are relevant for the motors:



European Low Voltage Directive

The motors fulfill the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if they are covered by the application area of this directive.

European RoHS Directive

The motors comply with Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

European EMC Directive

The compliance of the motors with the regulations of the Directive 2014/30/EU has been verified through full compliance with the IEC 61800-3.



Underwriters Laboratories (North American market)

The motors provided with the test symbol displayed fulfill the requirements stipulated for the North American market.



UKCA certification

The motors comply with the requirements for the market in Great Britain (England, Wales and Scotland).



Eurasian Conformity

The motors comply with the requirements of the Russia/Belarus/Kazakhstan customs union (EAC), except for the motor type 1FL23□□-□AB.

Registration, Evaluation and Authorization of Chemicals

The motors comply with the requirements of Registration, Evaluation and Authorization of Chemicals (REACH).

China RoHS

The motors comply with the requirements of China RoHS.

Quality systems

Siemens employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Taking back and recycling waste electrical and electronic equipment (WEEE)

The motors comply with the requirements laid down in Directive 2012/19/EU with regard to returning and recycling scrap electrical and electronic equipment.

China Energy Label

The following table specifies the China Energy Label requirements that the SIMOTICS S-1FL2 motor must comply with.

Table 3-22 Motors requiring China Energy Label

Name of China National Standard	Minimum allowable values of energy efficiency and energy efficiency grades for permanent magnet synchronous motors (GB 30253-2024)
Date of entry into force	January 1, 2026
Affected motors	Permanent-magnet synchronous motors with a rated power of 0.55 kW to 1250 kW and a rated speed of 45 r/min to 6000 r/min, driven by variable-frequency equipment with a power supply of 1140 V or below
Motor requirements	As of the implementation date of the Standard, all motors involved must have the China Energy Label

Certificates for download

You can find all relevant certificates via the ID link embedded in the QR code on the rating plate of the motor.

3.6.3 Directives and standards for the MOTION-CONNECT cable

The following directives and standards are relevant for the MOTION-CONNECT cables:



European Low Voltage Directive

The MOTION-CONNECT cables fulfill the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if they are covered by the application area of this directive.

European RoHS Directive

The MOTION-CONNECT cables comply with Directive 2011/65/EU regarding limiting the use of certain hazardous substances.



Underwriters Laboratories (North American market)

The MOTION-CONNECT cables provided with the test symbol displayed fulfill the requirements stipulated for the North American market.



UKCA certification

The MOTION-CONNECT cables comply with the requirements for the market in Great Britain (England, Wales and Scotland).

Registration, Evaluation and Authorization of Chemicals

The MOTION-CONNECT cables comply with the requirements of Registration, Evaluation and Authorization of Chemicals (REACH).

China RoHS

The MOTION-CONNECT cables comply with the requirements of China RoHS.

Quality systems

Siemens employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Taking back and recycling waste electrical and electronic equipment (WEEE)

The MOTION-CONNECT cables comply with the requirements laid down in Directive 2012/19/EU with regard to returning and recycling scrap electrical and electronic equipment.

Certificates for download

You can find all relevant certificates via the ID link embedded in the QR code on the cable packaging.

3.7 Device disposal

Description



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.

Application planning

4.1 Protection against the spread of fire

Description

The converter with degree of protection IP20 may be operated only in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used. The installation of the converter in a metal control cabinet or the protection with another equivalent measure must prevent the spread of fire and emissions outside the control cabinet.

4.2 Fault protection for the motor circuit

Description

The converter provides short-circuit protection at the motor output terminals.

The manufacturer's declaration describes the conditions regarding protection against electric shock in the event of an insulation failure in the motor circuit.

More information

You can find more information on the Internet: Manufacturer's declaration (<https://support.industry.siemens.com/cs/ww/en/view/109476638>)

4.3 Permissible mains supply network configurations for motors

Description

In combination with the drive system, the motors are generally certified for operation on TN and TT line systems with grounded neutral point and on IT line systems.

Observe the following requirements:

- For operation on IT line systems, the occurrence of the first fault between an active part and ground must be signaled by a monitoring device. According to IEC 60364-4-41, Siemens recommends that you remove the first fault as quickly as practically possible. Motor operation in such a fault situation can reduce the service life due to damage to the insulation system as a result of partial discharge.
- For 3 AC 380 V ... 480 V mains supply networks with a grounded line conductor, an isolating transformer with grounded neutral point (secondary side) needs to be considered between the mains supply and the drive system to protect the motor insulation from excessive stress. For more information, see Section "Line connection conditions for the converter with the motor 1FL2 (Page 90)".

4.4 Line connection conditions for the converter with the motor 1FL2

Description

The drive system is designed for connection to grounded TN/TT and non-grounded IT mains supply networks.

Depending on the motor/converter combination and the planned installation altitude, the following constraints must be taken into account regarding the line connection.

Table 4-1 Line connection conditions for the converter with the motor 1FL2

Mo- tor	Converter in- put voltage	Permissible line system configura- tions for installation altitudes from 0 m to 2000 m	Permissible line system configura- tions for installation altitudes from 2000 m to 4000 m
200 V	1 AC 200 V ... 240 V (-15% ... +10%)	<ul style="list-style-type: none"> • TN and TT line systems with grounding at any potential • IT line systems^{*)} 	Install an isolating transformer and ground the secondary side at any potential.
200 V	3 AC 200 V ... 240 V (-15% ... +10%)	<ul style="list-style-type: none"> • TN and TT line systems with grounding at any potential • IT line systems^{*)} 	<ul style="list-style-type: none"> • TN and TT line systems with grounded neutral point • IT line systems with an isolating transformer with grounded neutral point (secondary side)
400 V	3 AC 380 V ... 480 V (-15% ... +10%)	<ul style="list-style-type: none"> • TN and TT line systems with grounded neutral point • IT line systems^{*)} 	For line systems without grounded neutral point and the input voltage > 465 V, install an isolating transformer and ground the secondary side at the neutral point.

4.5 Removing the screw for functional grounding when operated on IT line system

*) With the screw for functional grounding removed. For more information, see Section "Removing the screw for functional grounding when operated on IT line system (Page 91)".

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

In the event of a ground fault in the IT line system, the motor insulation can be damaged by the higher voltage to ground.

- Use a ground fault monitor.
- Eliminate the ground fault as quickly as possible.

4.5 Removing the screw for functional grounding when operated on IT line system

Overview

When connecting the converter to an IT line system, you must remove the screw for functional grounding.

Requirement

Switch off the converter power supply.

**CAUTION****Damage to the converter when connected to an IT line system**

The converter will be damaged if it is operated on an IT line system without removing the grounding screw.

- Remove the grounding screw from the converter when operating the converter on an IT line system.

**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 minutes until the capacitors in the converter have discharged so that the residual charge is at a non-hazardous level. Touching live components can result in death or severe injury.

- Check that there is absolutely no voltage between any of the power connections, or between them and the protective conductor connection.

Procedure



Figure 4-1 Removing the screw for functional grounding

Proceed as follows to remove the grounding screw from the converter:

1. Open the protective flap at the converter housing, e.g. using a slotted screwdriver.
2. Release the screw for functional grounding and remove it.

4.6 Minimum cross-section of the protective conductors

Overview

A high leakage current flows through the protective conductor in converter operation. For reliable touch protection during operation, the protective conductor of the converter must not be interrupted. This primarily results in requirements for the minimum conductor cross-section of the protective conductor.

No restriction applies to the length of the protective conductor for touch protection; however, short protective conductors are advantageous for EMC-compliant installation.

Description

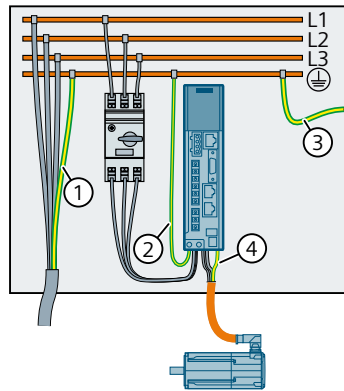


WARNING

Electric shock due to interrupted protective conductor

The drive components conduct a high leakage current via the protective conductor. Touching conductive parts when the protective conductor is interrupted can result in death or serious injury.

- Comply with the requirements for the protective conductor.



① Protective conductor for the mains supply cable

The protective conductor must be dimensioned in compliance with local installation rules for equipment with high leakage currents (for example, IEC 61800-5-1).

The minimum cross-section of the protective conductor depends on the cross-section of the line conductor of the mains supply cable:

Cross-section of line conductor of the mains supply cable S in mm ²	Minimum cross-section of the protective conductor ¹⁾
$S \leq 16 \text{ mm}^2$	S
$16 \text{ mm}^2 < S \leq 35 \text{ mm}^2$	16 mm^2
$S > 35 \text{ mm}^2$	$S/2$
¹⁾ The provided values are valid only if the protective conductor is made of the same material as the line conductor.	

Additionally, one or more of the following conditions must be satisfied:

- The protective conductor is routed so that along its complete length it is protected against mechanical damage.
Cables routed inside electrical cabinets or enclosed machine housings are considered to be adequately 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 second protective conductor with the same cross-section is provided.
- When establishing the connection using an industrial plug connector according to IEC 60309, the protective conductor of a multi-conductor cable must have a cross-section $\geq 2.5 \text{ mm}^2 \text{ Cu}$.
- The protective conductor of a multi-conductor cable has a cross-section $\geq 2.5 \text{ mm}^2 \text{ Cu}$.

② Protective conductor of the converter line supply cable

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 connection cable to the converter.

③ Protective conductor between PE and control cabinet

The cable cross-section must be dimensioned in compliance with local installation rules.

④ **Protective conductor of the motor power cable**

The protective conductor has the same cross-section as the line conductor of the motor power cable.

4.7 Configuring the braking resistor

4.7.1 Internal braking resistor

Description

An internal braking resistor is designed in the converter (excluding S200 Basic PN FSA and FSB and S200 PN FSA (0.1 kW)) to absorb regenerative energy from the motor. The table below shows the information of the internal braking resistor:

Table 4-2 Internal braking resistor of the SINAMICS S200 converter product line (PN version)

Frame size	Resistance (Ω)	Maximum continuous power ($P_{\text{cont_int}}$) (W)	Maximum peak power ($P_{\text{max_int}}$) (W)	Maximum braking energy ($E_{\text{max_int}}$) (J)
1 AC/3 AC, 200 V ... 240 V				
FSA (0.2 kW)	200	8	373	63
FSB (0.4 kW)	100	16	742	123
FSC (0.75 kW, 1 kW)	50	30	1884	292
3 AC, 380 V ... 480 V				
FSA (0.2 kW, 0.4 kW)	500	14	754	210
FSB (0.75 kW, 1.0 kW)	160	15	2312	637
FSC (1.75 kW, 2.5 kW)	70	30	5086	1137
FSD (3.5 kW, 5.0 kW, 7.0 kW)	27	65	9896	1948

More information

For more information about connecting the braking resistor, see Section "Connecting the braking resistor (Page 157)".

4.7.2 External braking resistor

4.7.2.1 Overview

Description

If the motor feeds back more energy than can be dissipated by the internal braking resistor, or when you use a converter without the internal braking resistor, you will require an external braking resistor. You can select a suitable external braking resistor according to your calculation result for the specific application.

When selecting a braking resistor, you must take into account the factors such as load inertia, deceleration time, speed variation, and braking period according to your specific application and technology.

Note

The resistance of the selected external braking resistor must not be lower than the resistance of the internal braking resistor for each frame size. For the minimum resistance applicable to 200 V converter FSA (0.1 kW), refer to the resistance of the internal braking resistor for FSA (0.2 kW).



WARNING

Risk of fire caused by continuous overload

An explosion or a fire could occur if the external braking resistor is continuously overloaded (for example as the result of a defective Braking Unit). This can result in severe injury or death and/or the enclosure could melt.

- Use only braking resistors that are intrinsically safe.

NOTICE

Damage to the converter due to its maximum load being exceeded

If the maximum permissible continuous power, peak power or braking energy is exceeded, the converter may be damaged.

- Only ever operate the converter within its maximum permissible working range.
- To monitor the external braking resistor, set p0215 to 3, and then configure parameters p0216, p0218, and p0219 correctly based on the selected braking resistor.

More information

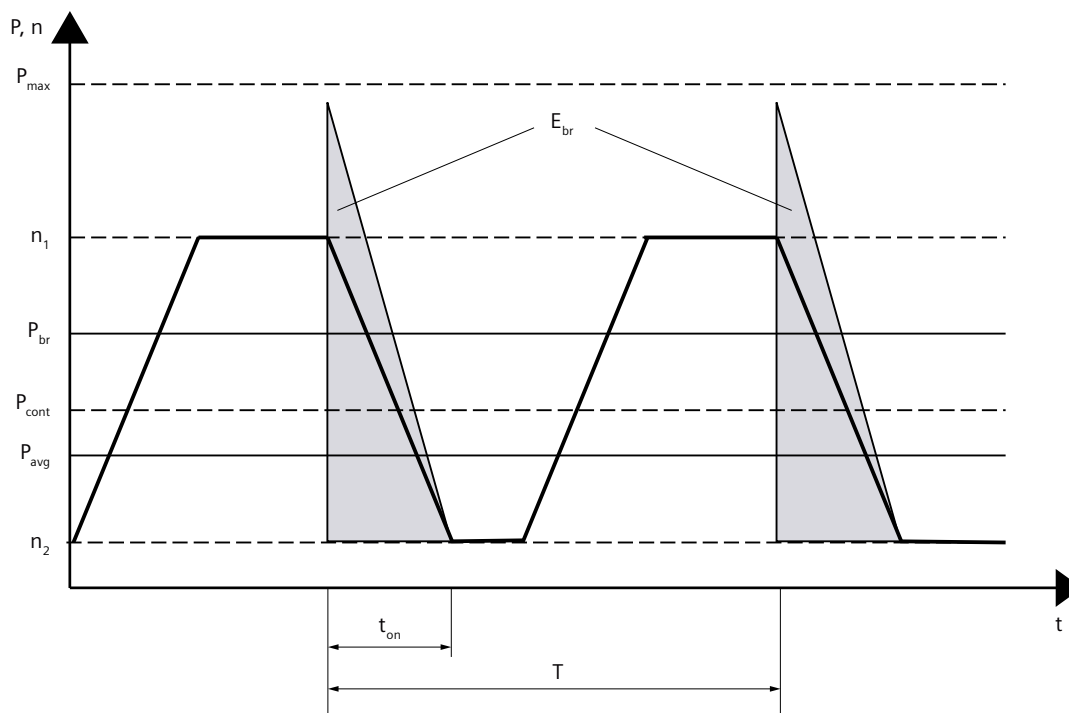
For more information about connecting the braking resistor, see Section "Connecting the braking resistor (Page 157)".

For the technical data and characteristics of the 1FL2 motors, see Section "Technical data and characteristics of the 1FL2 (Page 635)".

For more information about selecting a motor, see Section "Motor selection (Page 932)".

4.7.2.2 Selection and calculation

Load cycle for the braking resistor



$P_{\max}$ [W]: Maximum peak power

P_{cont} [W]: Maximum continuous power

P_{br} [W]: Application-specific braking power

P_{avg} [W]: Application-specific average braking power

$E_{\max}$ [J]: Maximum braking energy

E_{br} [J]: Application-specific braking energy

t_{on} [s]: Braking duration

T [s]: Cycle duration

n_1 [r/min]: Initial speed

n_2 [r/min]: Speed after braking

$P_{\text{max_int}}$ [W]: Maximum peak power of internal braking resistor

$P_{\text{max_ext}}$ [W]: Maximum peak power of external braking resistor

$P_{\text{cont_int}}$ [W]: Maximum continuous power of internal braking resistor

$P_{\text{cont_ext}}$ [W]: Maximum continuous power of external braking resistor

$E_{\text{max_int}}$ [J]: Maximum braking energy of internal braking resistor

$E_{\text{max_ext}}$ [J]: Maximum braking energy of external braking resistor

Figure 4-2 Peak power, continuous power and duty cycle of the braking resistor

Selection criteria

The following conditions must be met simultaneously when selecting the braking resistor:

- The calculated braking energy required in the application E_{br} must not exceed the maximum braking energy E_{max} . If $E_{br} < E_{max_intr}$, you don't require an external braking resistor. If $E_{br} > E_{max_intr}$, you must use the external braking resistor. Select the external braking resistor with $E_{max_ext} > E_{br}$.
- The braking power required in the application P_{br} must not exceed the maximum peak power P_{max} . When using the internal braking resistor, if $P_{br} > P_{max_intr}$, you can adjust the braking duration t_{on} . If the requirement ($P_{br} < P_{max_intr}$) of the specific application still can not be satisfied, you must use the external braking resistor. Select the external braking resistor with $P_{max_ext} > P_{br}$.
- The average braking power required in the application P_{avg} (arithmetic mean of the braking cycle) must not exceed the maximum continuous power P_{cont} . When using the internal braking resistor, if $P_{avg} > P_{cont_intr}$, you can adjust the braking cycle duration T . If the requirement ($P_{avg} < P_{cont_intr}$) of the specific application still can not be satisfied, you must use the external braking resistor. Select the external braking resistor with $P_{cont_ext} > P_{avg}$.

You can find the resistance data of the internal braking resistor for each frame size in Section "Internal braking resistor (Page 94)".

Calculating the braking energy, the braking power, and the average braking power

To find out whether you require an external braking resistor, proceed the following calculations:

- Calculate the braking energy according to the following formula:

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

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.

- Calculate the braking power according to the following formula:
 $P_{br} = E_{br} / t_{on}$
- Calculate the average braking power according to the following formula:
 $P_{avg} = E_{br} / T$

E_{br} / J	Application-specific braking energy
J_{mot} / kgm^2	Moment of inertia of the servo motor
J / 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
P_{br} / W	Application-specific braking power
P_{avg} / W	Application-specific average braking power

t_{on} / s	Braking duration
T / s	Cycle duration

Example for internal braking resistor application

A 1FL2104-4AG... servomotor with low moment of inertia (with integrated holding brake) with a mechanical system is fed from a SINAMICS S200 6SL5510-1BB11-0A□0. It is to be braked from 3000 r/min to 600 r/min with a braking duty cycle as $t_{\text{on}} = 0.05$ s, $T = 2$ s.

Moment of inertia of the servomotor 1FL2104-4AG... $J_{\text{mot}} = 0.71 \times 10^{-4} \text{ kgm}^2$

Moment of inertia of the driven mechanical system $J = 4 \times 10^{-4} \text{ kgm}^2$

$n_1 = 3000 \text{ r/min}$ $n_2 = 600 \text{ r/min}$

$\Rightarrow E_{\text{br}} = 22.31 \text{ J} < E_{\text{max_int}} = 292 \text{ J}$ (1 J = 1 Ws)

$\Rightarrow P_{\text{br}} = 446.26 \text{ W} < P_{\text{max_int}} = 1884 \text{ W}$

$\Rightarrow P_{\text{avg}} = 11.16 \text{ W} < P_{\text{cont_int}} = 30 \text{ W}$

In this case, therefore, no external braking resistor is required.

Example for external braking resistor application

A 1FL2104-4AG... servomotor with low moment of inertia (with integrated holding brake) with a mechanical system is fed from a SINAMICS S200 6SL5510-1BB11-0A□0. It is to be braked from 6000 r/min to 600 r/min with a braking duty cycle as $t_{\text{on}} = 0.05$ s, $T = 2$ s.

Moment of inertia of the servomotor 1FL2104-4AG... $J_{\text{mot}} = 0.71 \times 10^{-4} \text{ kgm}^2$

Moment of inertia of the driven mechanical system $J = 8 \times 10^{-4} \text{ kgm}^2$

$n_1 = 6000 \text{ r/min}$ $n_2 = 600 \text{ r/min}$

$\Rightarrow E_{\text{br}} = 170.21 \text{ J} < E_{\text{max_int}} = 292 \text{ J}$ (1 J = 1 Ws)

$\Rightarrow P_{\text{br}} = 3404.18 \text{ W} > P_{\text{max_int}} = 1884 \text{ W}$

$\Rightarrow P_{\text{avg}} = 85.10 \text{ W} > P_{\text{cont_int}} = 30 \text{ W}$

In this case, therefore, an external braking resistor is required. Select the external braking resistor according to the following table.

Frame size	Resistance (Ω)	Continuous power (W)	Peak power (W)	Braking energy (J)
FSC (1 kW)	≥ 50	> 85.10	> 3404.18	> 170.21

4.7.2.3 Recommended data of external braking resistors

Technical data

Note

The following data of external braking resistors is calculated theoretically based on the drive system's permissible overload capacity, the maximum motor speed, and the maximum load inertia specified in this document.

Siemens recommends that you calculate the actual resistor values using the formula provided in Section "Selection and calculation (Page 96)" according to your practical application.

Table 4-3 Recommended data of external braking resistors

Frame size	Minimum resistance (Ω)	Maximum continuous power ($P_{\text{cont_ext}}$) (W)	Maximum peak power ($P_{\text{max_ext}}$) (W)	Maximum braking energy ($E_{\text{max_ext}}$) (J)
1 AC/3 AC, 200 V ... 240 V				
FSA (0.2 kW)	200	60	1510	160
FSB (0.4 kW)	100	110	2730	280
FSC (0.75 kW, 1 kW)	50	260	6560	660
3 AC, 380 V ... 480 V				
FSA (0.2 kW, 0.4 kW)	500	120	2950	300
FSB (0.75 kW, 1.0 kW)	160	500	12750	1280
FSC (1.75 kW, 2.5 kW)	40	650	16800	1680
FSD (3.5 kW, 5.0 kW, 7.0 kW)	27	730	18900	1890

4.8 Electromagnetic compatibility (EMC)

4.8.1 Electromagnetic compatibility (EMC)

Description

Interference suppression measures increase the electromagnetic compatibility (EMC).

EMC interference suppression measures allow the product to function correctly. As a consequence, the product is neither a source of interference for other products nor an interference sink that can be disturbed by other products.

More information

Fundamental information for EMC-compliant planning and EMC-compliant installation is provided in the Internet:

EMC Design Guidelines Configuration Manual (<https://support.industry.siemens.com/cs/ww/en/view/60612658>)

4.8.2 EMC requirements for South Korea

Description

△ 경고
카테고리 C2
제2환경용 정격 전압 <1000 V 고정식 구동 시스템.
카테고리 C2 구동 시스템은 전문 인력에 의해 설치 및 커미셔닝이 수행되며 고조파 전류 한계가 준수되는 경우에만 제1 환경(주거 환경)에서 사용할 수 있습니다.
주거 환경에서 본 제품은 고조파 간섭을 유발할 수 있으며, 간섭 방지 조치가 필요합니다.
• 설치 및 커미셔닝 시 전문 인력이 적절한 간섭 방지 조치를 취하도록 하십시오.

△ Warning
Category C2
Stationary drive systems with a rated voltage < 1000 V for operation in the second environment.
Drive systems of Category C2 may only be used in the first environment (residential environment) if they are installed and commissioned by an expert and the limit values for harmonic currents are complied with.
In a residential environment, this product can cause radio-frequency interference, which may make interference suppression measures necessary.
• Have qualified personnel carry out the installation and commissioning with appropriate radio interference suppression measures.

△ 경고
카테고리 C3
제2환경에서만 사용하도록 설계된 정격 전압 <1000 V 구동 시스템.
주거 환경에서 본 제품은 고조파 간섭을 유발할 수 있습니다.
• 본 장치를 제1환경(주거 환경)에서는 사용하지 마십시오.

△ Warning
Category C3
Drive systems with a rated voltage < 1000 V that are solely intended for use in the second environment.
In a residential environment, this product may cause radio interference.
• Do not use this device in the first environment (residential environment).

4.8.3 Harmonic current emissions

Overview

IEC 61800-3 does not define any current harmonic limits when converters are operated on light industrial line supplies. A system evaluation according to IEC 61000-3-14 or IEC 61800-3 Annex B.4 is recommended.

Description

When operated with rated power, the converter generates the following typical current harmonics:

Table 4-4 Typical harmonic currents of the converter, 1 AC 200 V

200 V converter	Typical harmonic current (A) at U_k 4%								
	5th	7th	11th	13th	17th	19th	23rd	25th	THC
FSA	0.57	0.42	0.16	0.07	0.10	0.10	0.07	0.04	1.05
FSB	0.55	0.44	0.22	0.11	0.05	0.06	0.05	0.02	1.04
FSC	0.19	0.18	0.15	0.10	0.04	0.03	0.01	0.02	0.43

THC = Total Harmonic Current: sum of all harmonic currents

Table 4-5 Typical harmonic currents of the converter, 3 AC 200 V

200 V converter	Typical harmonic current (A) at U_k 4%								
	5th	7th	11th	13th	17th	19th	23rd	25th	THC
FSA	0.18	0.13	0.08	0.05	0.04	0.02	0.02	0.02	0.26
FSB	0.94	0.66	0.19	0.08	0.15	0.13	0.07	0.07	1.2
FSC	2.37	1.64	0.40	0.22	0.34	0.25	0.10	0.13	2.97

THC = Total Harmonic Current: sum of all harmonic currents

Table 4-6 Typical harmonic currents of the converter, 3 AC 400 V

400 V converter	Typical harmonic current (A) at U_k 4%								
	5th	7th	11th	13th	17th	19th	23rd	25th	THC
FSA	0.38	0.31	0.24	0.29	0.34	0.29	0.30	0.29	1.03
FSB	1.11	0.79	0.74	0.87	0.80	0.72	0.75	0.74	2.56
FSC	3.05	2.08	2.11	2.40	2.10	1.80	1.66	1.47	6.17
FSD	5.69	3.29	4.42	4.58	2.81	2.47	1.86	1.26	10.27

THC = Total Harmonic Current: sum of all harmonic currents

4.9 EMC-compliant installation

4.9.1 Shielded cables for the converter

Description

The following cables must be shielded to comply with EMC regulations:

- In the control cabinet:
 - Cable between the converter and an external line filter
 - Cable between the converter and the motor
 - Cable between the converter and an external braking resistor
 - Signal and data cables
 - Fieldbus cable
- Outside the control cabinet, all cables with the exception of the line supply cable

To achieve EMC-compliant installations of the converter, connect the shields of the power cable to the shield plate via the shield clamps. The shield plate is shipped with the converter.

For better EMC effects, Siemens recommends that you strip the brake cable and the encoder cable and connect the cable shields to earth. Make sure that the shield plate, the converter and the motor are properly grounded.

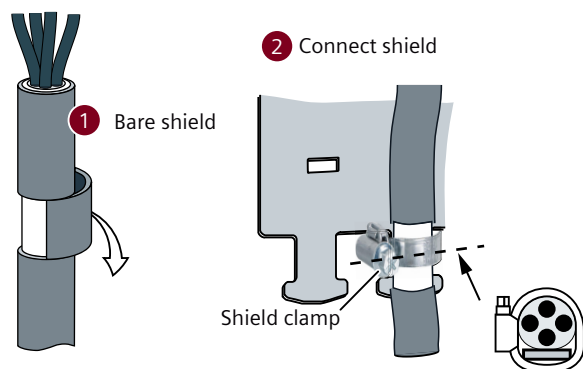


Figure 4-3 Correct EMC-compliant shield connection

4.9.2 Achievable EMC category

Overview

The servo drive system has been tested in accordance with the emission requirements of IEC 61800-3 Category C2.

- For a radiated emission test, an external line filter (between the mains supply network and the converter) is required to meet the EMC requirements. The converter needs to be installed inside a shielded metallic cabinet, while other parts of the motion control system (including the PLC, DC power supply, spindle drive, and motor) need to be put outside the shielded cabinet.
- For a conductive emission test, an external line filter (between the mains supply network and the converter) is required to meet the EMC requirements.
- For the radiated emission and conductive emission tests, the length of the line supply cable between the line filter and the converter must be shorter than 1 m.

Description

The achievable EMC category is dependent on the motor cable length and the line system configuration. The following conditions apply to the possible application environment.

Requirements		Achievable EMC Category	
		C2	C3
Converter		With line filters C2	With line filters C2 or C3
Maximum permissible cable length	Motor	30 m shielded	30 m shielded
	Line filter to the converter	1 m	1 m
Permissible application environment	Residential	No	No
	Light industrial	Yes	Yes
	Commercial	Yes	Yes
Permissible line system	Public	No	No
	Non-public	Yes	Yes
Line system configuration		TN or TT line system with a grounded neutral point	TN or TT line system with a grounded neutral point

Note

This device is not intended for use in residential environments and might not provide adequate protection to radio reception in such environments.

Note

Complying with Category C2 interference emission

When using a cable of more than 3 m to connect the converter to the PROFINET or Ethernet interface, electromagnetic interferences may occur. Use appropriate ferrite clamps, cabinet feedthrough, or fiber-optic transceivers to minimize the interference emission.

Note

The conducted and radiated emissions of the PROFINET ports are in compliance with the standards of IEC 61800-6-8, Class A (CISPR 32), and IEC 61800-3 Category C3.

Mounting

5.1 Converter

 WARNING
<p>Spread of fire</p> <p>In the event of a fault, a converter with an open design (built-in devices) can cause a fire or a pressure wave, which can result in severe personal injury and material damage. The higher the power rating of a converter, the more dangerous the effects of an arc or pressure wave.</p> <ul style="list-style-type: none"> • Install the converter in a robust metal control cabinet that is designed to prevent fire from escaping. • Only operate the converter with the control cabinet doors closed. • When control cabinet doors are open, only qualified electrical personnel are allowed to carry out service and maintenance work. • Comply with the minimum control cabinet volume.

Information on the minimum control cabinet volume is available on the Internet:

Protective devices for SINAMICS S200 product line (<https://support.industry.siemens.com/cs/us/en/view/109823555>)

5.1.1 Mounting instructions for the converter

Description

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.
- Ensure that all converters and cabinets are grounded according to Section "EMC-compliant installation (Page 102)".

- Use a conductive steel sheet with a thickness of not less than 2 mm as the mounting plate.
- The converter supports vertical mounting only. Mount the converter vertically with the integrated operator panel at the top.

Note

Keep the front flap of the integrated operator panel closed to protect the control buttons and the memory card.

Protection against condensation and conductive pollution

Protect the converter with degree of protection IP20 by installing it in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12 for example. Further measures may be necessary for particularly critical operating conditions.

If condensation or conductive pollution can be excluded at the installation site, a lower degree of control cabinet protection is permitted.

5.1.2 Mounting position

Description

NOTICE

Overheating due to impermissible mounting position

The converter can overheat and therefore be damaged if mounted in an impermissible position.

- Only mount the converter in a permissible position.

The converter supports vertical mounting only. Mount the converter vertically with the integrated operator panel at the top.

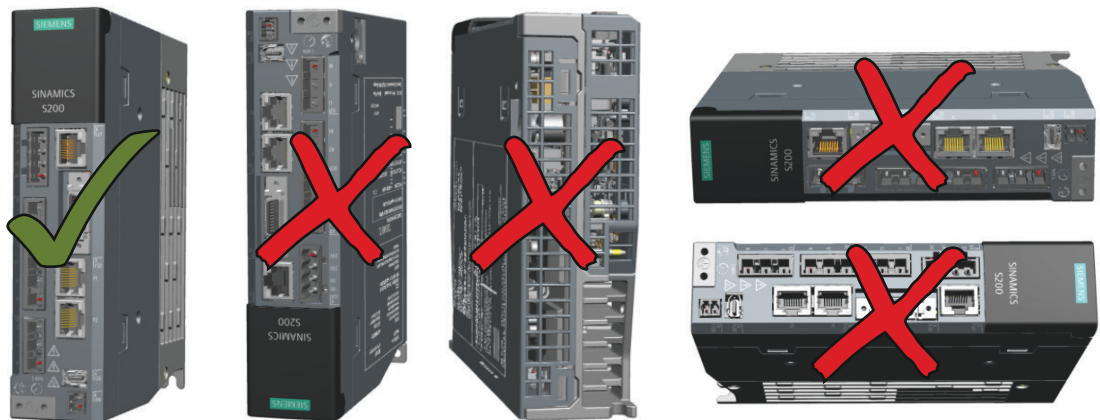


Figure 5-1 Converter mounting orientation

5.1.3 Dimension drawings and drilling dimensions

5.1.3.1 Dimension drawing and drilling dimensions for the 200 V converter

Dimension drawing

All dimensions are specified in millimeters.

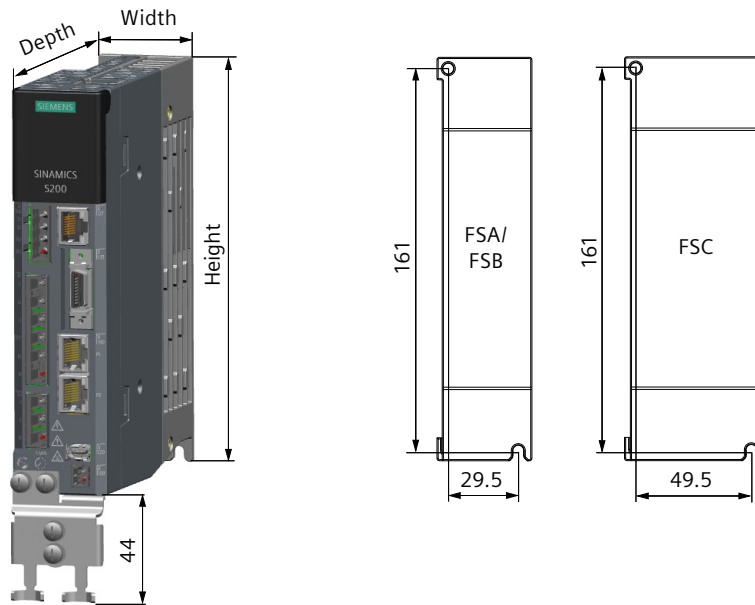


Table 5-1 Dimensions and mounting, 1 AC/3 AC 200 V, FSA ... FSC, IP20

Frame size	Width	Height	Depth	Fixing
FSA	40 mm	170 mm	135 mm	2 x M4 / 2.5 Nm
FSB	40 mm	170 mm	170 mm	
FSC	60 mm	170 mm	195 mm	

5.1.3.2 Dimension drawing and drilling dimensions for the 400 V converter

Dimension drawing

All dimensions are specified in millimeters.

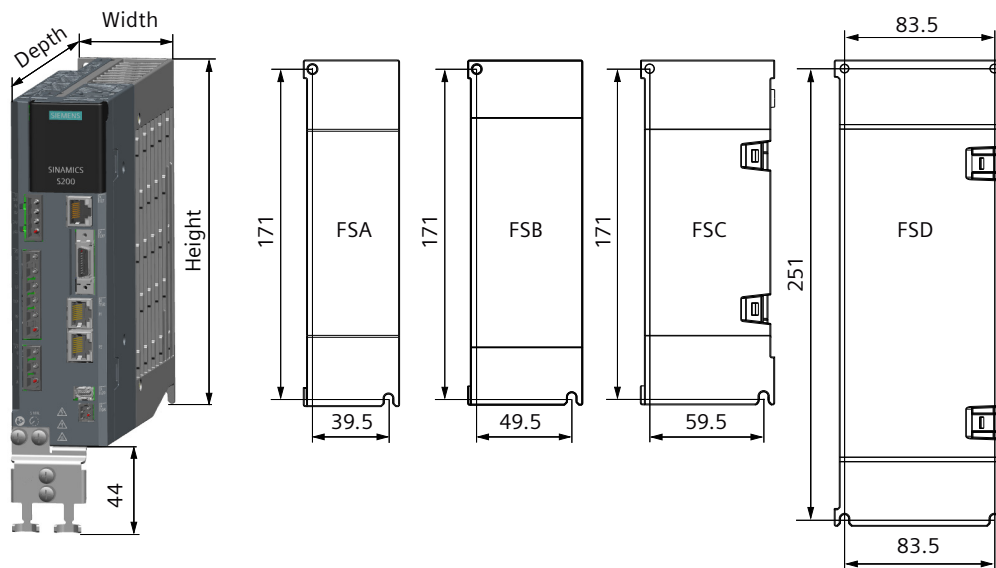


Table 5-2 Dimensions and mounting, 3 AC 400 V, FSA ... FSD, IP20

Frame size	Width	Height	Depth	Fixing
FSA	50 mm	180 mm	200 mm	2 x M4 / 2.5 Nm
FSB	60 mm	180 mm	200 mm	
FSC	70 mm	180 mm	200 mm	
FSD	95 mm	260 mm	230 mm	4 x M4 / 2.5 Nm

5.1.4 Minimum clearances

Description

Observe the following minimum mounting clearances. For converters without built-in fans, install cooling fans above the converters for sufficient heat dissipation.

Note

For converters without built-in fans, when the surrounding temperature in the cabinet is $\geq 45^\circ\text{C}$, the airflow velocity above the converters must be greater than 0.5 m/s.

All dimensions are specified in millimeters.

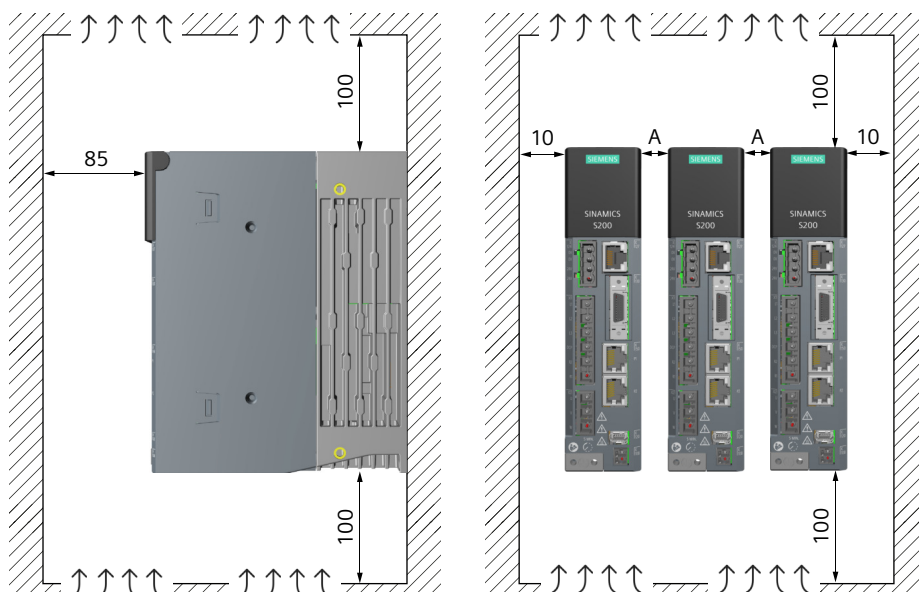


Table 5-3 Minimum clearances to other devices or components

	Single-converter installation	Side-by-side installation
Minimum clearance at top and bottom	100 mm	100 mm
Minimum clearance at front	85 mm	85 mm
Minimum lateral clearance (A) between multiple converters	-	200 V converter: 1 mm 400 V converter: 10 mm A mixture of 200 V and 400 V converters: 10 mm
Minimum lateral clearance to other devices	10 mm	10 mm

5.2 Motor

5.2.1 Transporting and lifting

Note

Comply with the local national regulations for the transportation of motors.

Requirement

- Use suitable load suspension devices when transporting and installing the motor.
- Do not lift the motor by the connector.
- Transport the motor carefully.

Procedure

Lifting and transporting the motor using slings

For the following motors weighing over 10 kg, you can lift and transport the motor using lifting slings:

- 1FL2306-2AC with brake
- 1FL2306-4AC with brake
- 1FL2306-6AC
- 1FL2306-7AC



WARNING

Incorrectly dimensioned or incorrectly used lifting slings

If lifting slings are incorrectly dimensioned or incorrectly used, the motor can fall and cause death, severe injury and/or damage to property.

- Only use lifting slings that are suitable for the weight of the motor.
- Attach the lifting slings as shown in the figure "Lifting and transporting with lifting slings".

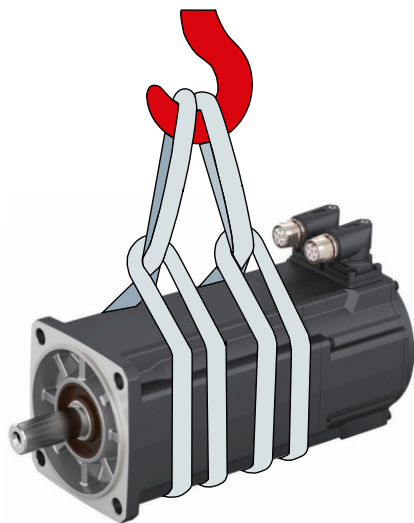


Figure 5-2 Lifting and transporting with lifting slings (example diagram)

Lifting and transporting the motor using eyebolts

The 1FL2310 motor (SH90) has two M8 threaded holes for screwing in two eyebolts. You can use eyebolts and a crossbar for lifting and transporting the motor.



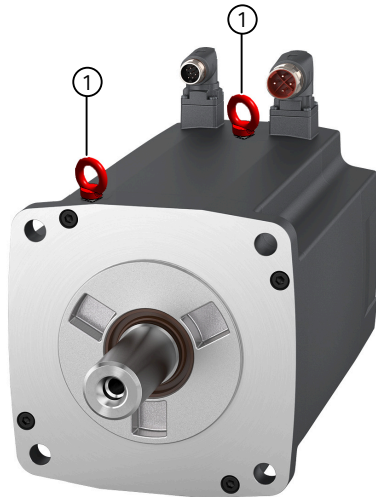
! WARNING

Incorrect or unused lifting points

Due to incorrect or unused lifting points, the motor can fall and cause death, severe injury and/or damage to property.

- Only lift and transport larger motors using the eyebolts.
- Completely screw in the eyebolts and tighten by hand (approx. 10 Nm, or according to your specific requirement).
- Do not use bent or damaged eyebolts.
- Only use eyebolts with laminated fiber washers.
- Loads applied transversely to the plane of the eyebolts are not permitted.

1. Screw in the eyebolts.



- ① Position of the eyebolts

2. Hook the crossbar into the eyebolts.

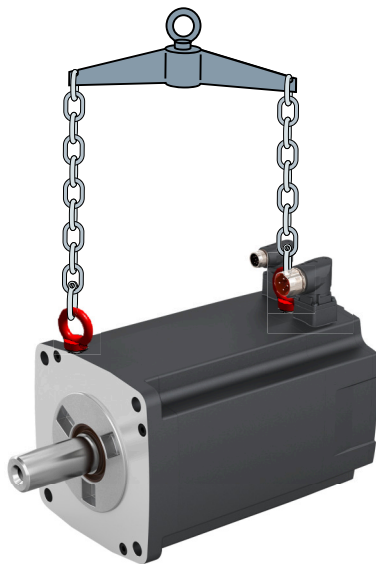


Figure 5-3 Lifting and transporting with a crossbar (example diagram)

3. Set the motor down on a hard, level surface.



⚠ WARNING

Danger of severe injury due to unintentional movements of the motor

If the motor is not secured after being set down, unintentional movements of the motor can cause serious injury.

- After the motor has been set down, secure it in position.
- Do not release the lifting devices until the motor has been secured in position.

4. Secure the motor against unintentional movements.

5.2.2 Checklist prior to mounting

Description

The checklist below is a minimum benchmark and must be performed in any case. Further checks before, during, and after the installation of the motor depend on the system-specific conditions and are the responsibility of the plant or system manufacturer.

Table 5-4 Checklist before installing

Check	OK
General checks	
Are the environmental conditions in the permissible range?	
Checks regarding the mechanical system	
Is the motor free of visible damage?	
Have the mounting surfaces such as the flange and shaft on the customer machine and on the motor been cleaned?	
Are the mounting surfaces free of corrosion?	
Do the mounting dimensions such as the shaft diameter, shaft length, and radial eccentricity on the customer machine meet the specifications?	

5.2.3 Safety labels on the motor

Description

NOTICE
Damage to the encoder due to shocks Shocks at the motor shaft extension can cause an encoder damage. <ul style="list-style-type: none">• Do not exert any shock at the shaft extension.

In the delivery state, the following two warning labels are attached to the motor.

	"Hot surface" warning label
	"No shocks at the shaft extension" warning label

5.2.4 Mounting instructions for the motor

Description

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.
<ul style="list-style-type: none">• 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.
<ul style="list-style-type: none">• Mount the motor in such a way that no radial eccentricity and axial forces at the shaft extension occur.

- Adhere to the specifications on the rating plate (Page 48).
- Observe the warning and information plates on the motor.
- Check the installation site and permissible environmental conditions such as temperature and installation altitude. See Section "Permissible environmental conditions for the motor (Page 611)".
- Thoroughly remove any anti-corrosion agents from the shaft extension with commercially available solvents.
- Ensure that power losses are adequately dissipated. See Section "Cooling (Page 615)".
- If the motor is installed vertically with the shaft extension facing up, ensure that no liquid can enter the upper bearing.
- 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.

- Avoid any uneven stressing when tightening the fastening screws.
- Observe the tightening torques for the fastening screws given in the following table. The general tolerance for the tightening torque is 10%. The tightening torque is based on a friction coefficient of $\mu = 0.14$.

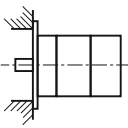
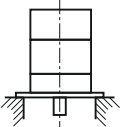
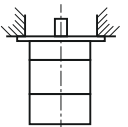
Motor	Screw DIN 7984	Washer ISO 7092 (mm)	Tightening torque for screws (not for electrical connections)
1FL2102	M4	4 ($d_{2\max} = 8$)	2.4 Nm
1FL2□03	M5	5 ($d_{2\max} = 9$)	4.7 Nm
1FL2104 1FL2204 1FL2205	M6	6 ($d_{2\max} = 11$)	8 Nm
1FL2105 1FL2304 1FL2306	M8	8 ($d_{2\max} = 15$)	20 Nm
1FL2310	M12	12 ($d_{2\max} = 20$)	85 Nm

5.2.5 Mounting position

Description

The 1FL2 motor supports flange mounting only. It can be installed in three orientations as shown in the following table.

Table 5-5 Type of construction according to IEC 60034-7

Designation	Representation	Description
IM B5		Standard
IM V1		The motor can be used in types of construction IM V1 and IM V3 without restriction.
IM V3		

Note

IM V3 type of construction

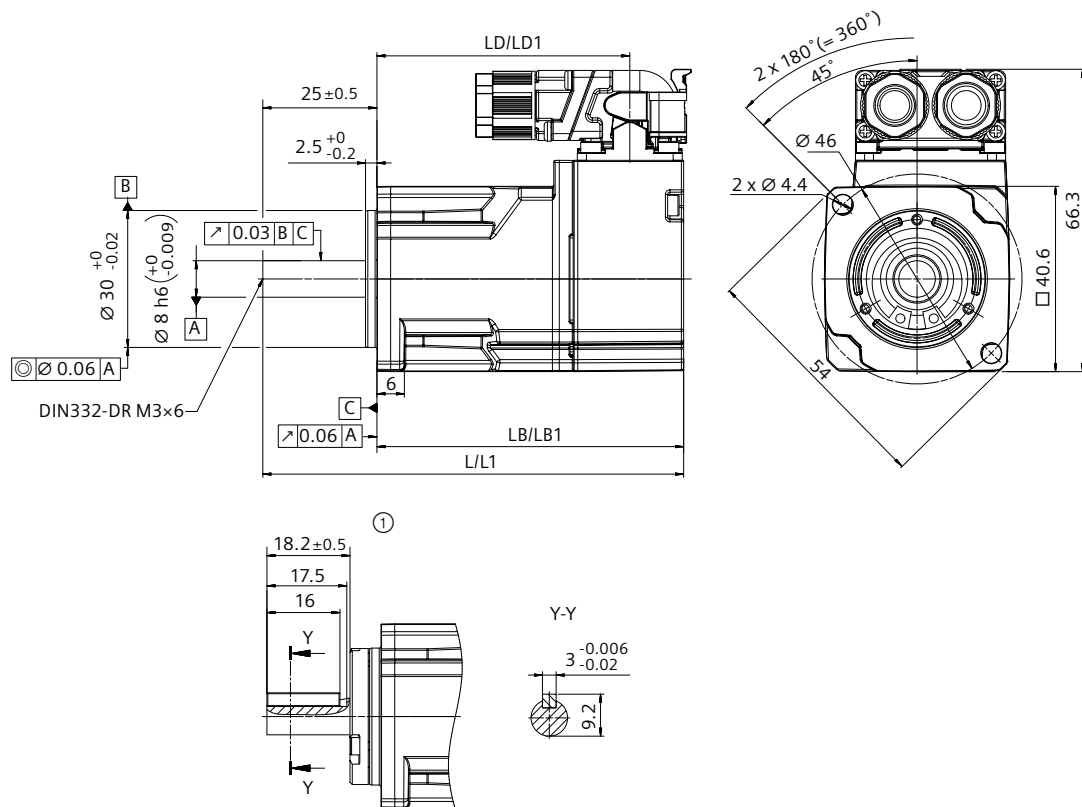
When configuring the IM V3 type of construction, pay attention to the permissible axial forces and especially to the necessary degree of protection.

5.2.6 Dimension drawings for motors

5.2.6.1 Dimension drawing for the 1FL2 motor, shaft height 20

Dimension drawing

All dimensions are specified in millimeters.



① With shaft sealing ring (IP65) and feather key

Table 5-6 Dimensions, 1FL2102

SIMOTICS S-1FL2 Shaft height 20	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2102-2	92.2	67.2	55.7	121.9	96.9	85.4
1FL2102-4	105.2	80.2	68.7	134.9	109.9	98.4

5.2.6.4 Dimension drawing for the 1FL2 motor, shaft height 40 (New)

Dimension drawing

All dimensions are specified in millimeters.

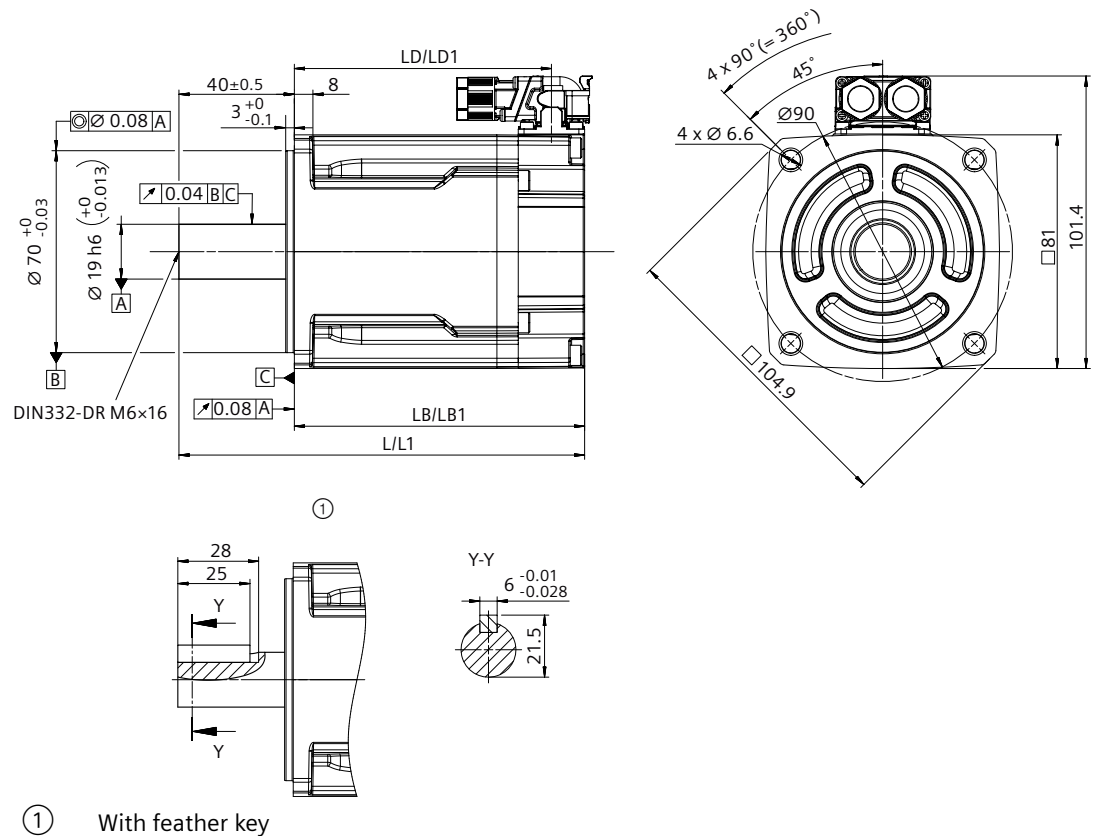


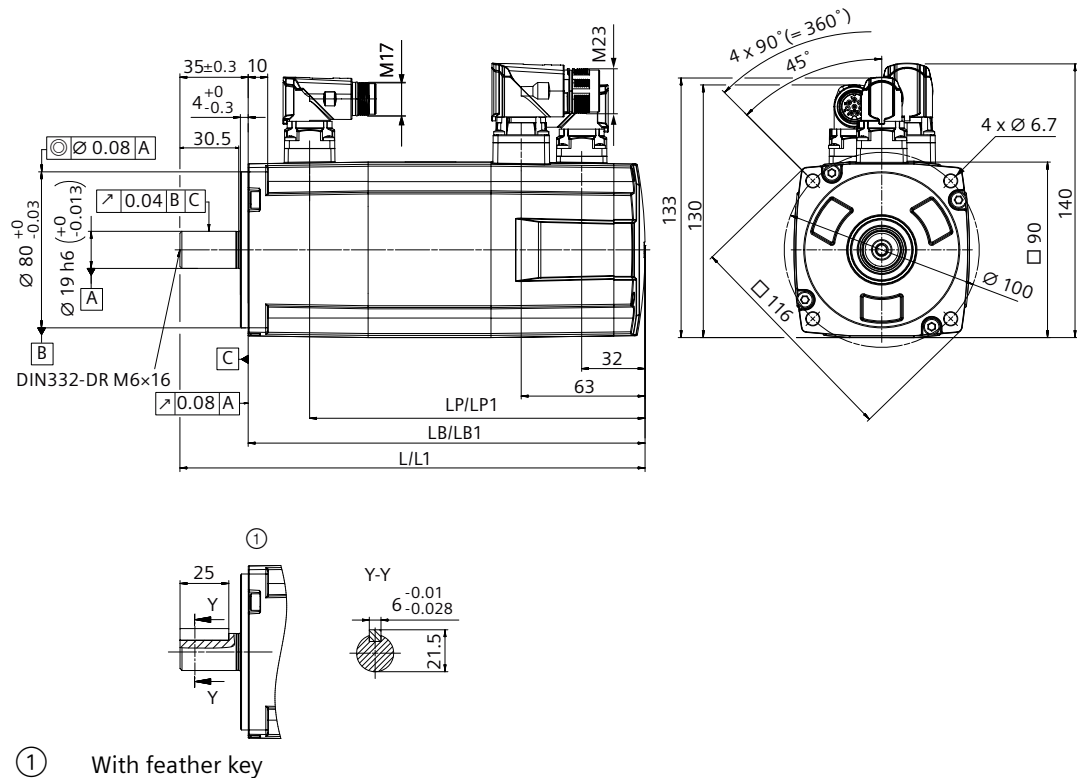
Table 5-9 Dimensions, 1FL2104-□B, 1FL2204-□B

SIMOTICS S-1FL2 Shaft height 40 (New)	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2104-2B	140.6	100.6	89.1	180.6	140.6	129.1
1FL2204-2B						
1FL2104-4B	152.6	112.6	101.1	192.6	152.6	141.1
1FL2204-4B						

5.2.6.5 Dimension drawing for the 1FL2 motor, shaft height 45

Dimension drawing

All dimensions are specified in millimeters.



① With feather key

Table 5-10 Dimensions, 1FL2304

SIMOTICS S-1FL2 Shaft height 45	Motor length					
	Without brake			With brake		
	L	LB	LP	L1	LB1	LP1
1FL2304-2	192	157	/	238.5	203.5	172
1FL2304-4	239	204	/	285.5	250.5	219

5.2.6.6 Dimension drawing for the 1FL2 motor, shaft height 48

Dimension drawing

All dimensions are specified in millimeters.

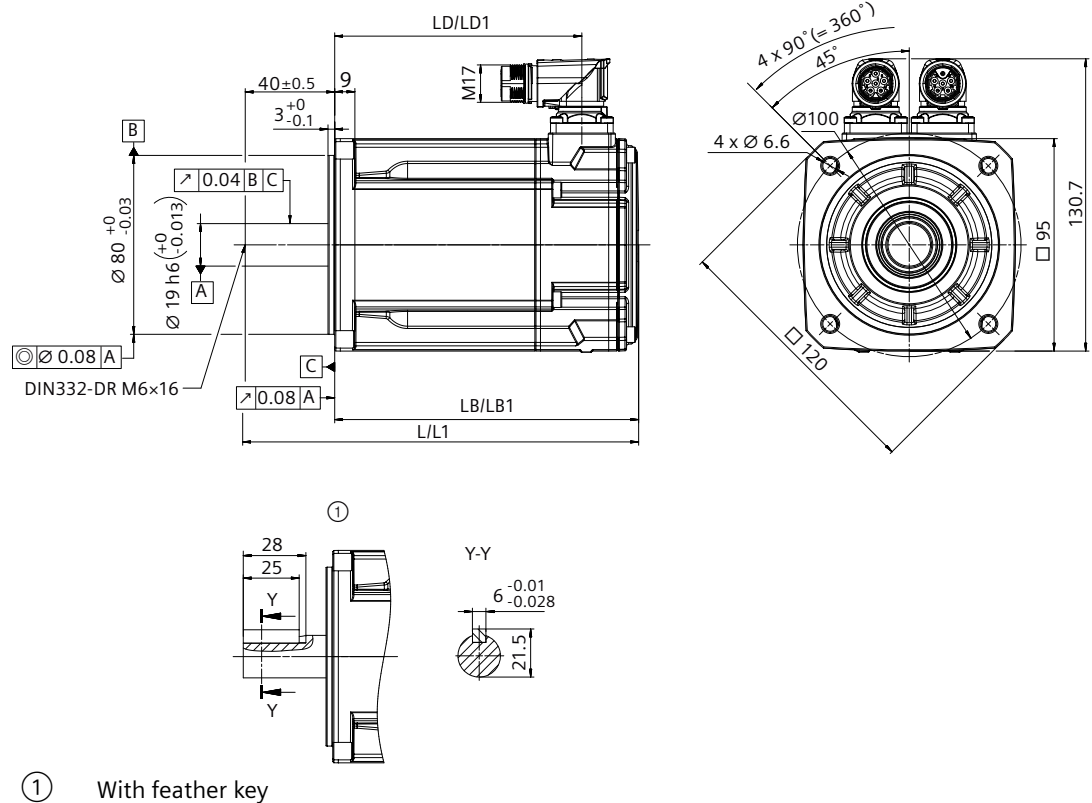


Table 5-11 Dimensions, 1FL2205

SIMOTICS S-1FL2 Shaft height 48	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2205-2	175.9	135.9	110.5	218.9	178.9	153.5
1FL2205-4	207.9	167.9	142.5	250.9	210.9	185.5

5.2.6.7 Dimension drawing for the 1FL2 motor, shaft height 52

Dimension drawing

All dimensions are specified in millimeters.

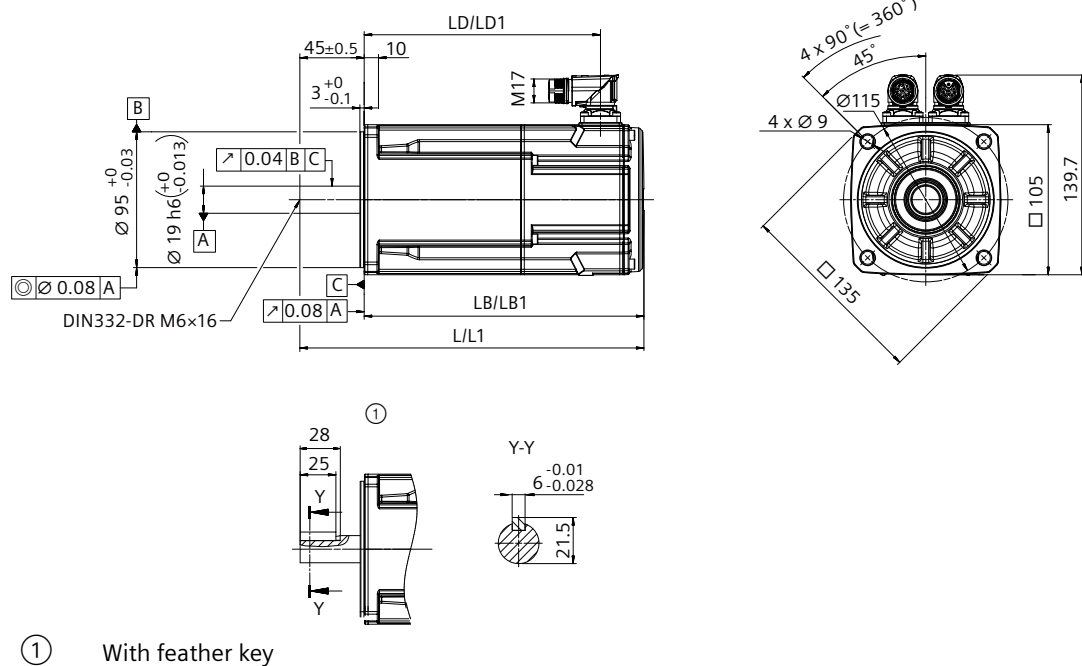


Table 5-12 Dimensions, 1FL2105

SIMOTICS S-1FL2 Shaft height 52	Motor length					
	Without brake			With brake		
	L	LB	LD	L1	LB1	LD1
1FL2105-2	213.9	168.9	138.5	240.7	195.7	165.3
1FL2105-4	255.9	210.9	180.5	282.7	237.7	207.3

5.2.6.8 Dimension drawing for the 1FL2 motor, shaft height 65, rated at 2000 r/min

Dimension drawing

All dimensions are specified in millimeters.

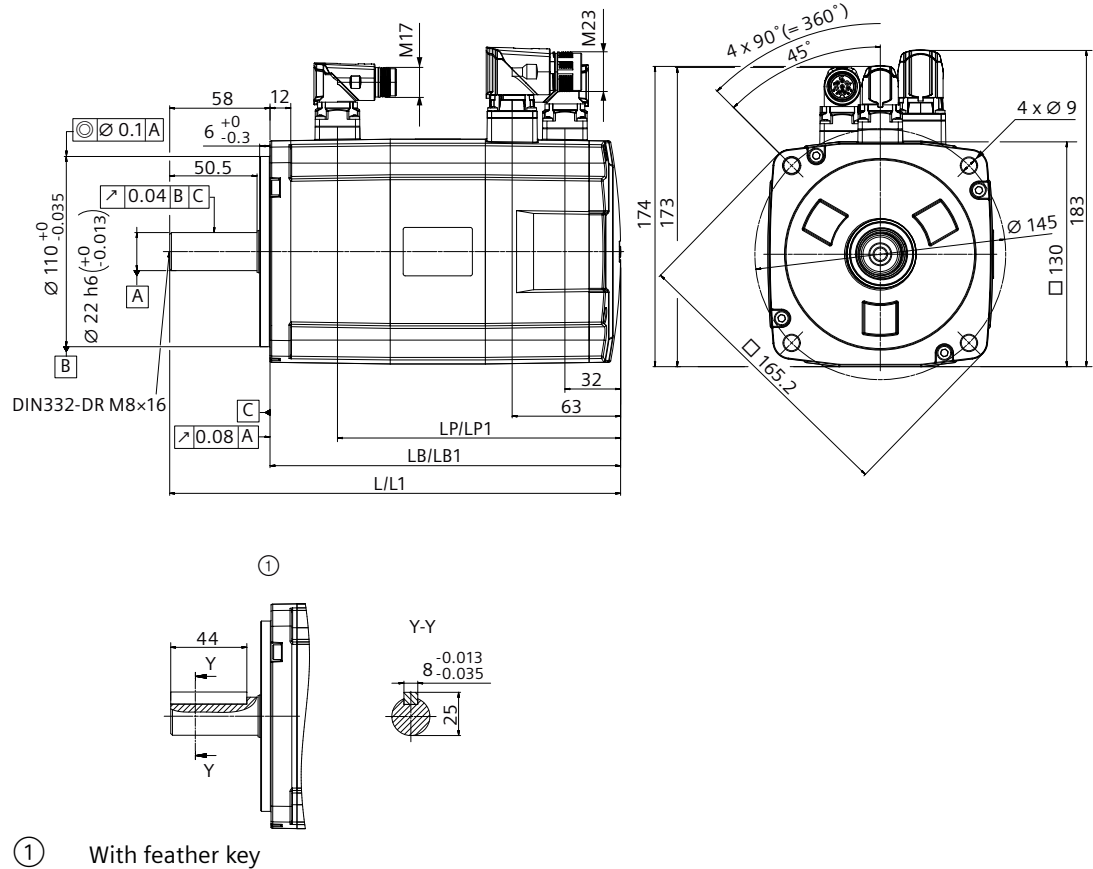


Table 5-13 Dimensions, 1FL2306-□AC

SIMOTICS S-1FL2 Shaft height 65	Motor length					
	Without brake			With brake		
	L	LB	LP	L1	LB1	LP1
1FL2306-1AC	206.2	148.2	/	260.7	202.7	163.7
1FL2306-2AC	222.7	164.7	/	277.2	219.2	180.2
1FL2306-4AC	239.2	181.2	/	293.7	235.7	196.7
1FL2306-6AC	272.2	214.2	/	326.7	268.7	229.7
1FL2306-7AC	305.2	247.2	/	359.7	301.7	262.7

5.2.6.9 Dimension drawing for the 1FL2 motor, shaft height 65, rated at 1500 r/min

Dimension drawing

All dimensions are specified in millimeters.

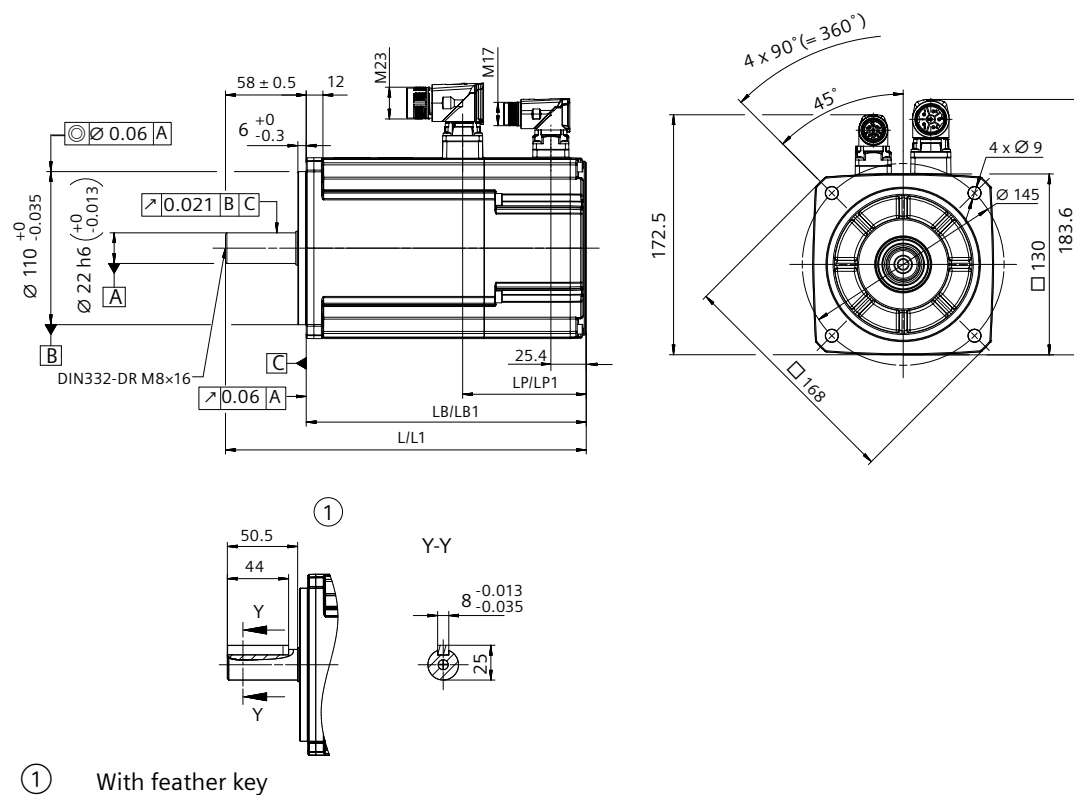


Table 5-14 Dimensions, 1FL2306-□AB

SIMOTICS S-1FL2 Shaft height 65	Motor length					
	Without brake			With brake		
	L	LB	LP	L1	LB1	LP1
1FL2306-3AB	198.2	140.2	54.8	232.2	174.2	88.8
1FL2306-5AB	212.2	154.2	54.8	246.2	188.2	88.8

5.2.6.10 Dimension drawing for the 1FL2 motor, shaft height 90, rated at 2000 r/min

All dimensions are specified in millimeters.

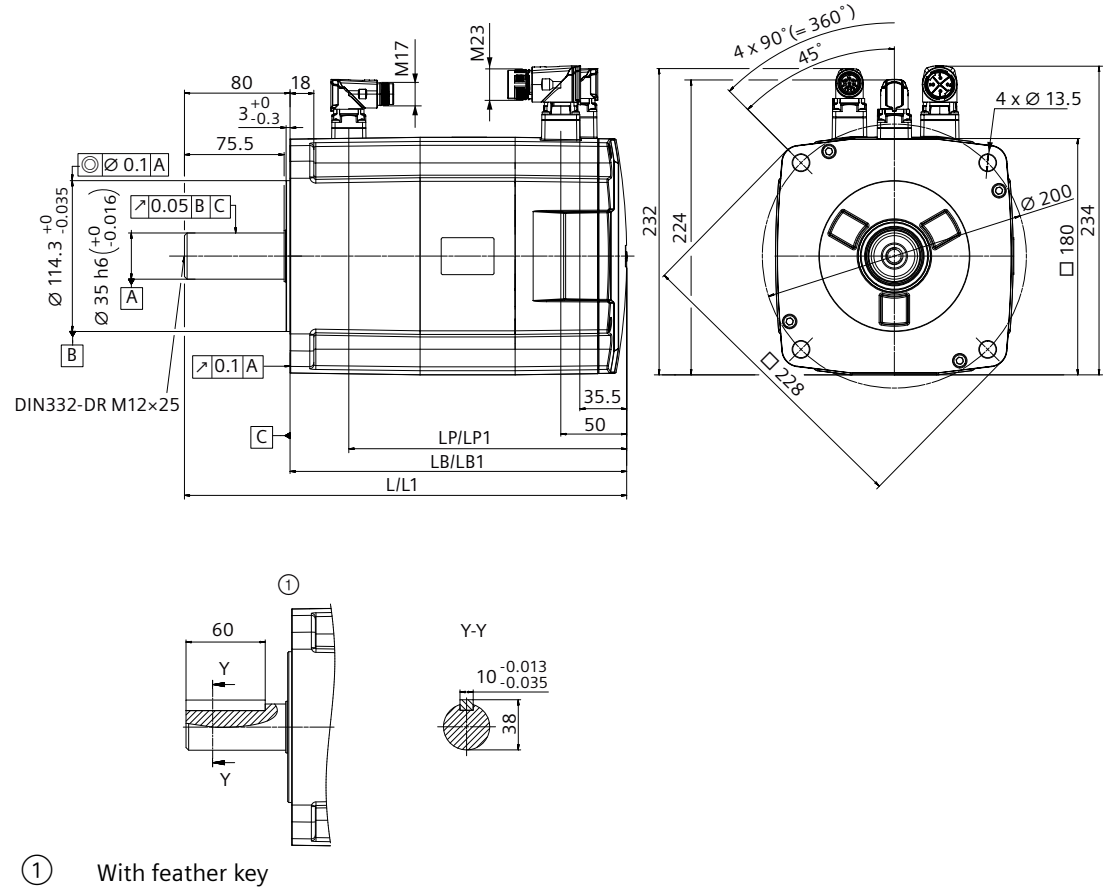


Table 5-15 Dimensions, 1FL2310-□AC

SIMOTICS S-1FL2 Shaft height 90	Motor length					
	Without brake			With brake		
	L	LB	LP	L1	LB1	LP1
1FL2310-0AC	269.5	189.5	/	335	255	210.5
1FL2310-2AC	295.5	215.5	/	361	281	236.5
1FL2310-4AC	321.5	241.5	/	387	307	262.5
1FL2310-6AC	373.5	293.5	/	439	359	314.5

All dimensions are specified in millimeters.

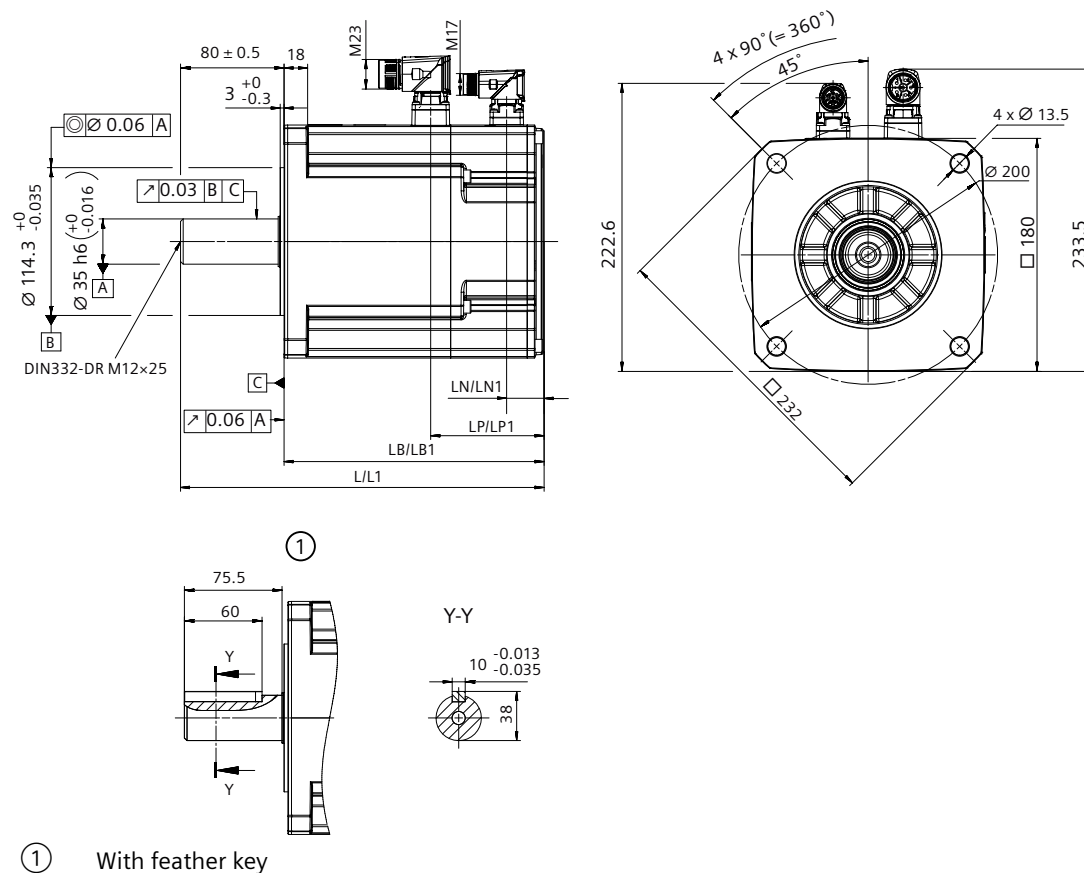


Table 5-16 Dimensions, 1FL2310-3AB

SIMOTICS S-1FL2 Shaft height 90	Motor length							
	Without brake				With brake			
	L	LB	LP	LN	L1	LB1	LP1	LN1
1FL2310-3AB	249.5	169.5	56.2	26.9	280.9	200.9	87.6	28.9

5.2.7 Mounting the feather key

Requirement



WARNING

Injuries due to feather key flung out

When a motor using a key is running, the feather key on the shaft can be thrown out by centrifugal force. This can result in personal injury or material damage.

- Before operating the motor, the feather key on the shaft must be firmly secured to prevent from being thrown out by the centrifugal force.

NOTICE

Damage to motor bearing due to improper operation

Never mount the feather key by hammering into the key slot; otherwise, there is a risk of bearing damage.

- Pay attention to the installation direction of the feather key.
- Mount the key without striking the key slot or the shaft extension.

Procedure

Proceed as follows to mount the feather key into the key slot:

1. Install the feather key ("①") to the key slot ("②") and make sure that the feather key and the key slot are fitted closely. Siemens recommends that you place the V-type block ("③") under the shaft extension for supporting.
2. Knock the feather key into the key slot by using a copper bar.

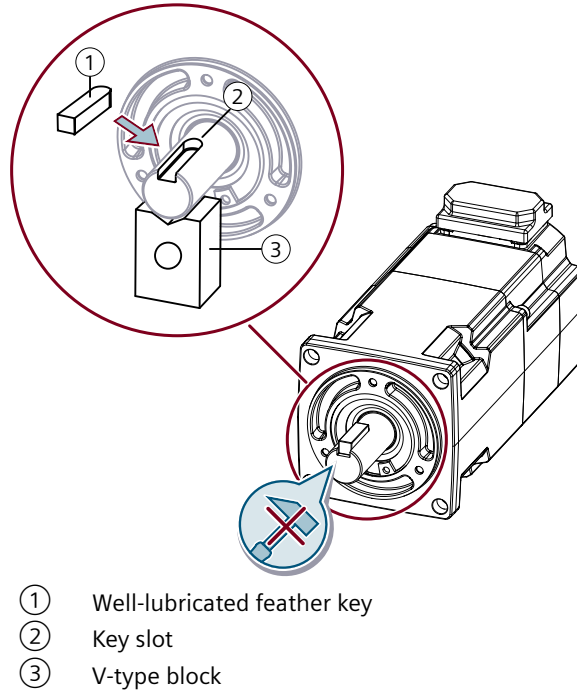


Figure 5-4 Mounting the feather key

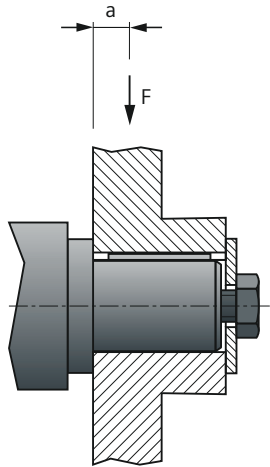
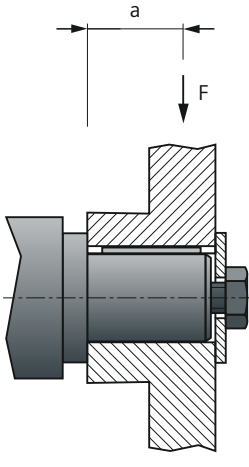
5.2.8 Attaching output elements

Overview

Appropriate arrangement of the output elements reduces the bending torque load applied to the shaft and the bearing.

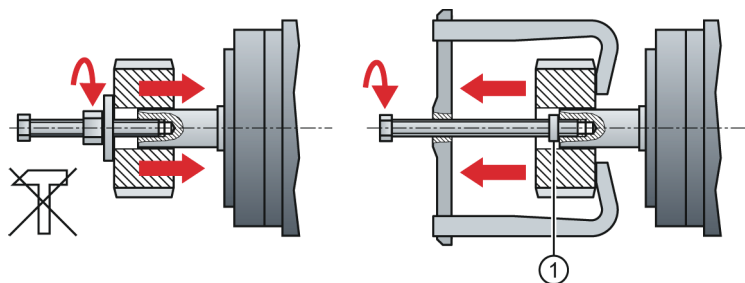
Requirement

Mount the output elements as close as possible to the motor bearing.

Optimum	Unfavorable
	
Low stress on shafts and bearings	High stress on shafts and bearings

Mount or remove the output elements (for example, couplings, gear wheels, and belt pulleys) by using suitable devices only.

- 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

Figure 5-5 Mounting and removing output elements

- If necessary, completely balance the motor together with the output elements according to ISO 1940.

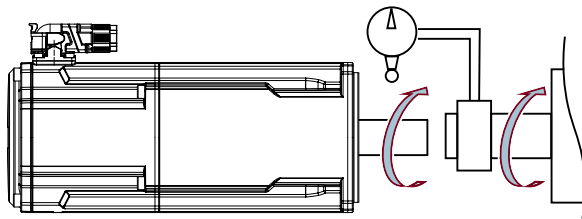
Note

Motors with feather key are half-key balanced. The motors have been balanced with half a feather key.

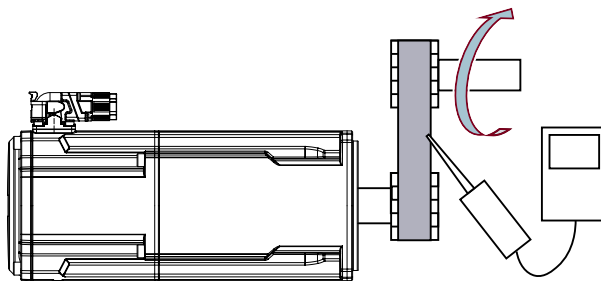
Procedure

Proceed as follows to attach an output element (for example, a coupling) to the motor:

1. Select a coupling.
Use a flexible coupling with high torsional rigidity specifically designed for servo motors, which can transfer the motor torque to the mechanics and compensate radial, axial, and angular misalignments.
2. Install the coupling.
Do not strike the shaft when installing a coupling. Ensure that the radial and axial forces are smaller than the allowable maximum values specified in Section "Axial and radial forces (Page 624)".
3. Align the coupling.
When a motor is used with a flange coupling, the radial deviation must be smaller than 0.03 mm; otherwise, the bearing will be damaged. The required alignment accuracy varies with the motor speed and the coupling type. Determine the accuracy according to actual applications.



- Rotate the motor shaft and the machine shaft to align the coupling.
 - An alignment accuracy test is preferred. If unachievable, judge the accuracy by observing whether the coupling can slide smoothly on both shafts.
4. Realign the coupling.
If the coupling gives out abnormal sounds, refer to Step 3 "Align a coupling" to realign the coupling until the sounds disappear.
 5. Measure tension.
The belt tension must be smaller than the allowable radial forces of the motor.



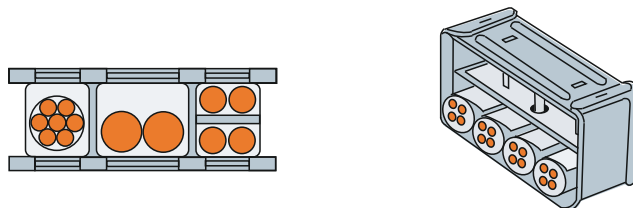
- Measure the belt tension at multiple points using a tension meter while turning the motor shaft by 45°.
- Reduce the axial misalignment of the belt-pulleys to keep the axial forces to the motor shaft to a minimum.

5.2.9 Laying cables in cable carriers (for MOTION-CONNECT 380 only)

Description

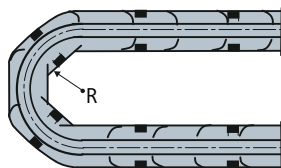
Laying cables

- Use spacers to separate cables with different outer diameters or cables made of different materials.
- Fill the spacers evenly to ensure that the position of cables does not change during operation.
- Distribute cables symmetrically according to their weights and dimensions.
- Keep cables untwisted in the 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.



Moving cables

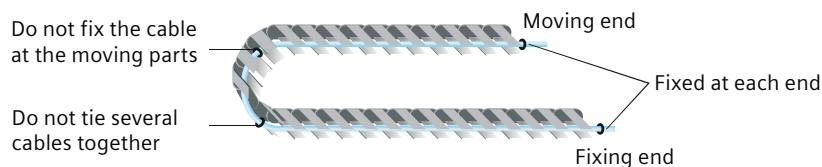
- Lay the cables loosely in the carrier, so that the cables are free to move in particular in the bending radii of the carrier.
- Observe the specified minimum bending radii.



R Bending radius on the cable carrier

Fixing cables

- Make sure that cables in the carrier are unattached and movable.
- Place cable fixings in a "dead" zone at each end, suitably far away from each end point of the moving parts.



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, Siemens recommends that the cable is additionally fixed for vibration load and with horizontal or vertical cable entries.

- Additionally fix the cable where the motor is fixed so that machine vibrations are not transferred to the connector.
-

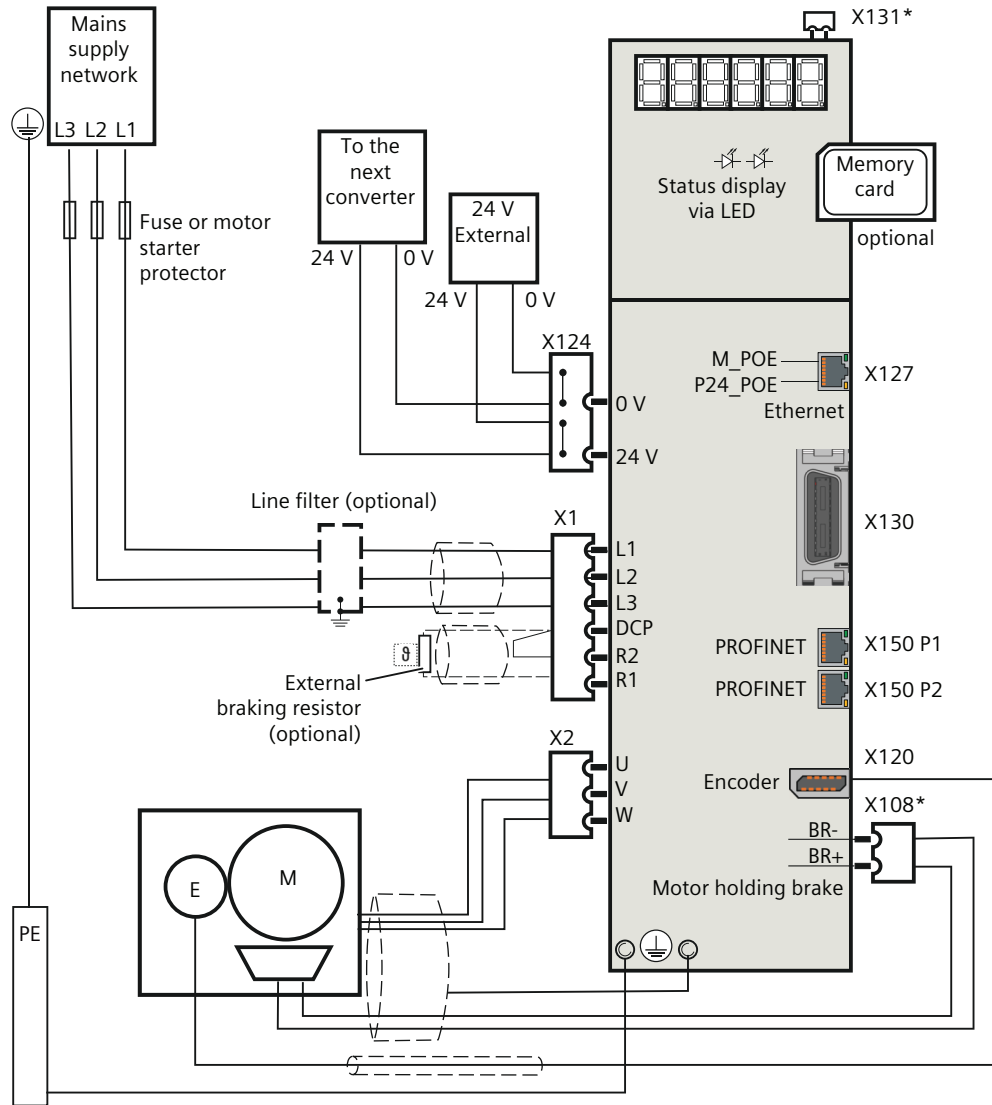
Connecting

Note

Fix all the connecting cables to the converter shield plate by using shield clamps or suitable cable ties.

6.1 System connection

Overview diagram

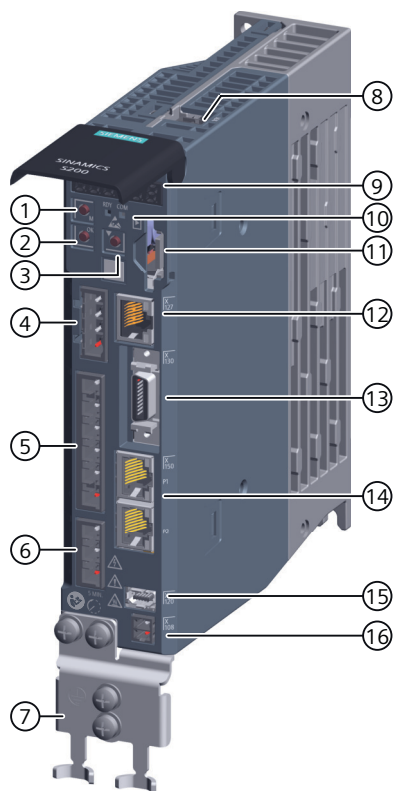


* The interfaces X131 and X108 are available on S200 PN only.

Figure 6-1 Connection example for converters with 3 AC line connection

6.2 Overview of the converter interfaces

Overview diagram



- | | |
|---|--|
| ① M button | ⑨ 6-digit display |
| ② OK button | ⑩ LED status indicators |
| ③ DOWN button | ⑪ Memory card slot |
| ④ 24 V DC power supply - X124 | ⑫ Service interface (Ethernet) - X127 |
| ⑤ Mains and braking resistor interface - X1 | ⑬ Control/status inputs and outputs - X130 |
| ⑥ Motor power interface - X2 | ⑭ PROFINET interface - X150 |
| ⑦ Shield plate | ⑮ Encoder interface - X120 |
| ⑧ STO interface - X131 ¹⁾ | ⑯ Motor holding brake interface - X108 ¹⁾ |

¹⁾ The interfaces X131 and X108 are available on S200 PN only.

Figure 6-2 Converter interfaces

6.3 Cables and connectors

6.3.1 Maximum permissible cable lengths

Technical data

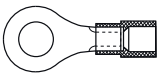
Table 6-1 Maximum permissible cable length

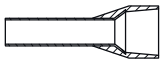
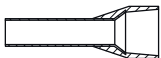
Connection type	Interface on the converter	Maximum permissible cable length (m)
Mains supply	X1 (L1, L2, and L3)	No restriction
External braking resistor	X1 (DCP and R1)	3
24 V DC power supply	X124	30
Motor power connection	X2	30
Encoder connection	X120	30
Motor holding brake	X108	30
Control/status inputs and outputs	X130	3
PROFINET connection	X150	100
Ethernet connection	X127	10
STO connection	X131	30

6.3.2 Conductor cross-sections and cable lugs

Description

Table 6-2 Conductor cross-sections and cable lugs

Connection type	Terminal type	Conductor cross-section	Stripping length	Cable lug
Mains supply (L1, L2, L3)	Spring-loaded	0.75 mm ² ... 2.5 mm ² (AWG: 14 ... 12)	9 mm ... 10 mm	Pin-type 
Mains supply (PE)	Screw-type	0.75 mm ² ... 2.5 mm ² (AWG: 14 ... 12)	10 mm	Ring type 
24 V DC power supply	Spring-loaded	0.5 mm ² ... 2.5 mm ² (AWG: 20 ... 12)	10 mm ... 11 mm ¹⁾	Pin-type 
External braking resistor	Spring-loaded	0.75 mm ² ... 2.5 mm ² (AWG: 18 ... 12)	9 mm ... 10 mm	Pin-type 

Connection type	Terminal type	Conductor cross-section	Stripping length	Cable lug
STO connection ²⁾	Spring-loaded	0.2 mm ² ... 1.5 mm ² (AWG: 24 ... 16)	10 mm	Pin-type 
Motor power connection	Spring-loaded	0.75 mm ² ... 2.5 mm ² (AWG: 18 ... 12)	9 mm ... 10 mm	Pin-type 
Motor holding brake ²⁾	Spring-loaded	0.38 mm ² ... 0.75 mm ² (AWG: 22 ... 18)	9 mm ... 10 mm	Pin-type 
Control/status inputs and outputs ³⁾	Spring-loaded	0.2 mm ² ... 0.5 mm ² (AWG: 24 ... 20) ⁴⁾	7 mm	Pin-type 

¹⁾ If you use cable lugs with insulated end sleeves, make sure that the length of the cable lugs is 12 mm.

²⁾ For S200 PN only

³⁾ For connection via the PROFINET IO Adaptor

⁴⁾ For uninsulated flexible cable conductors: 0.25 mm² ... 0.34 mm²; for insulated flexible cable conductors: 0.2 mm² ... 0.25 mm²

More information

For more information about assembling cable terminals, see Section "Assembling cables (Page 905)".

6.4 Connecting the mains supply

6.4.1 Interface description - X1

Overview

The converter connects to the mains supply via terminals L1, L2, and L3 on the interface X1.

Description

Table 6-3 Interface X1

X1	Terminal	Designation	Technical data
	L1	Line phase L1	Maximum current limit: 20 A
	L2	Line phase L2	
	L3	Line phase L3	
	DCP R2 R1		

Note

For applications on the single-phase mains supply network, you can connect the mains supply to any two terminals out of L1, L2, and L3.

6.4.2 Wiring

Requirement

You have assembled the converter line supply cable.

Procedure

1. Assemble the X1 plug to the converter.
2. Attach the cable terminals to the plug as shown below:

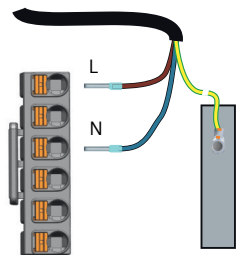


Figure 6-3 Connecting to the single-phase mains supply network

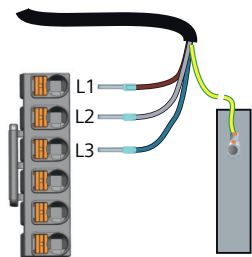


Figure 6-4 Connecting to the three-phase mains supply network

More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling the cable lugs (Page 906)".

6.4.3 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 makes recommendations for sizing 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.

6.5 Connecting the motor

6.5.1 Routing cables in damp environments

Description

To operate the motor in a damp environment, follow the installation instructions below:

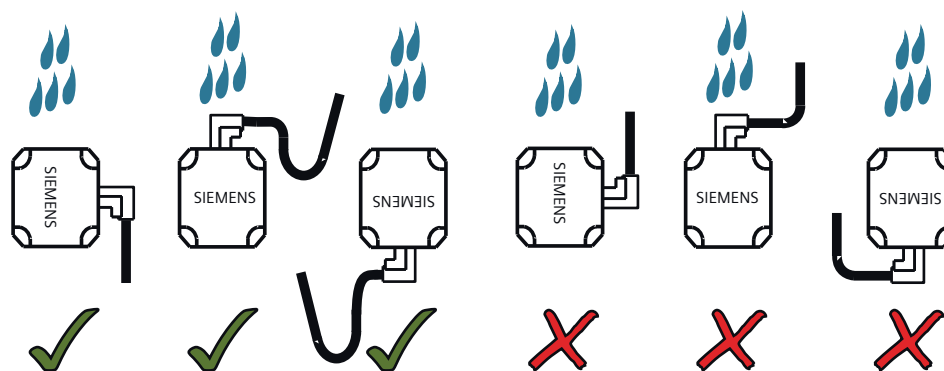


Figure 6-5 Routing cables in damp environments

6.5.2 Connecting the motor power

6.5.2.1 Interface description - X2 (converter side)

Overview

The converter connects to the motor on the interface X2.

Description

Table 6-4 Interface X2

X2	Terminal	Designation	Technical data
 U V W	U	Motor phase U	Maximum current limit: 20 A
	V	Motor phase V	
	W	Motor phase W	

6.5.2.2 Interface description - power connector (motor side)

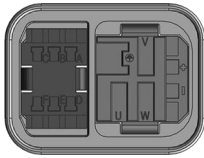
Overview

The 1FL2 motor power interface on the motor side has different variants:

- 1FL2 shaft heights 20, 30, and 40: hybrid connector that integrates power, encoder, and holding brake interfaces
- 1FL2 shaft heights 48 and 52: M17 angular connector that integrates power and holding brake interfaces
- 1FL2 shaft heights 65 (rated at 1500 r/min) and 90 (rated at 1500 r/min): M23 angular connector that integrates power and holding brake interfaces
- 1FL2 shaft heights 45, 65 (rated at 2000 r/min), and 90 (rated at 2000 r/min): M23 angular connector

Description

- 1FL2 shaft heights 20, 30, and 40

Motor power interface	Pin	Designation	Technical specifications
 Hybrid connector	U	Phase U	-
	V	Phase V	-
	W	Phase W	-
	PE	Protective grounding	-
	+	Holding brake, positive	-
	-	Holding brake, negative	-
	A	P_Supply	Encoder power supply, 5 V
	B	M	Encoder power supply, reference ground
	C	Clock_P	Absolute encoder clock signal, positive
	D	Clock_N	Absolute encoder clock signal, negative
	E	Data_P	Absolute encoder data signal, positive
	F	Data_N	Absolute encoder data signal, negative

- 1FL2 shaft heights 48 and 52

Motor power interface	Pin	Designation
 M17 angular connector	U	Phase U
	V	Phase V
	W	Phase W
	PE	Protective grounding
	A	Holding brake, positive
	B	Holding brake, negative
	Tightening torque: 1.0 Nm ... 1.5 Nm (8.9 lbf in ... 13.3 lbf in)	

6.5 Connecting the motor

- 1FL2 shaft heights 65 (rated at 1500 r/min) and 90 (rated at 1500 r/min)

Motor power interface	Pin	Designation
 M23 angular connector	1	Phase U
	2	Phase V
	PE	Protective grounding
	4	Holding brake, positive
	5	Holding brake, negative
	6	Phase W
	Tightening torque: 1.5 Nm ... 2.0 Nm (13.3 lbf in ... 17.7 lbf in)	

- 1FL2 shaft heights 45, 65 (rated at 2000 r/min), and 90 (rated at 2000 r/min)

Motor power interface	Pin	Designation
 M23 angular connector	1	Phase U
	2	Phase V
	3	Phase W
	PE	Protective grounding
	Tightening torque: 1.5 Nm ... 2.0 Nm (13.3 lbf in ... 17.7 lbf in)	

6.5.2.3 Wiring

Connection example

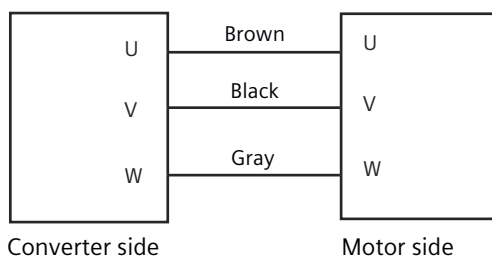
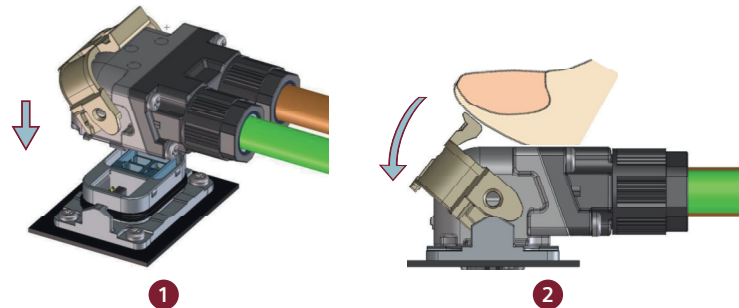


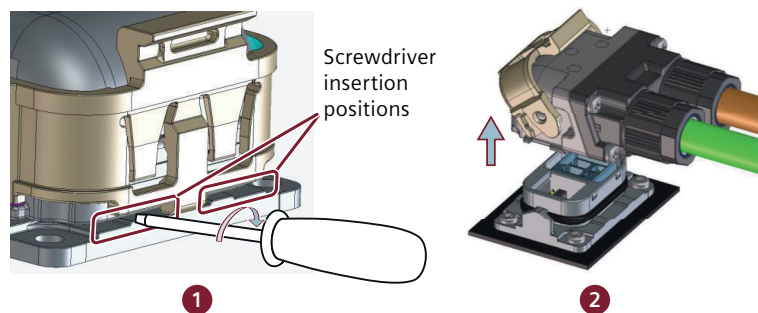
Figure 6-6 Motor power connection

Connection example of the hybrid connector

- Connecting the hybrid plug to the socket
Insert the hybrid plug into the socket and push down the lever to secure the connection.



- Disconnecting the hybrid plug from the socket
Insert a slotted screwdriver into the gap between the lever and the housing and slightly rotate the screwdriver to release the lever.



More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 905)".

6.5.3 Connecting the motor holding brake

6.5.3.1 Interface description (converter side)

Overview

The motor holding brake prevents the moving load from unexpected motions (for example, falling under the influence of gravity) when the servo drive system is deactivated.

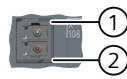
The holding brake is activated once the motor power is cut off. Use the holding brake only when the motor is at a standstill. Do not use the holding brake to stop the load in motion.

Description

S200 PN

SINAMICS S200 PN connects to the motor holding brake via the interface X108.

Table 6-5 Interface X108

X108	Terminal	Designation	Technical specifications
	1	BRN	Motor holding brake, negative
	2	BRP	Motor holding brake, positive

S200 Basic PN

SINAMICS S200 Basic PN does not have a designated interface for connecting to the holding brake. To use the holding brake, connect a third-party device via a digital output at the interface X130 and configure the holding brake function as follows:

- Set p1215 to 3.
- Interconnect the digital output signal to r0899.12.

6.5.3.2 Interface description (motor side)

Overview

The motor holding brake interface on the motor is used to connect the built-in holding brake to the converter.

Description

- 1FL2 shaft heights 20, 30, and 40
The holding brake interface is integrated into the hybrid connector. For more information, see Section "Interface description - power connector (motor side) (Page 143)".
- 1FL2 shaft heights 48 and 52
The holding brake interface is integrated into the M17 power connector. For more information, see Section "Interface description - power connector (motor side) (Page 143)".

- 1FL2 shaft heights 65 (rated at 1500 r/min) and 90 (rated at 1500 r/min)
The holding brake interface is integrated into the M23 power connector. For more information, see Section "Interface description - power connector (motor side) (Page 143)".
- 1FL2 shaft heights 45, 65 (rated at 2000 r/min), and 90 (rated at 2000 r/min)

Holding brake interface	Pin	Designation
 M17 angular connector	1	Holding brake, positive
	2	Holding brake, negative
	Tightening torque: 1.0 Nm ... 1.5 Nm (8.9 lbf in ... 13.3 lbf in)	

6.5.3.3 Wiring

Connection example

Connecting S200 PN to the motor holding brake

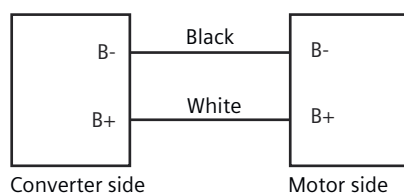


Figure 6-7 Motor holding brake connection via X108

Connecting S200 Basic PN to the motor holding brake

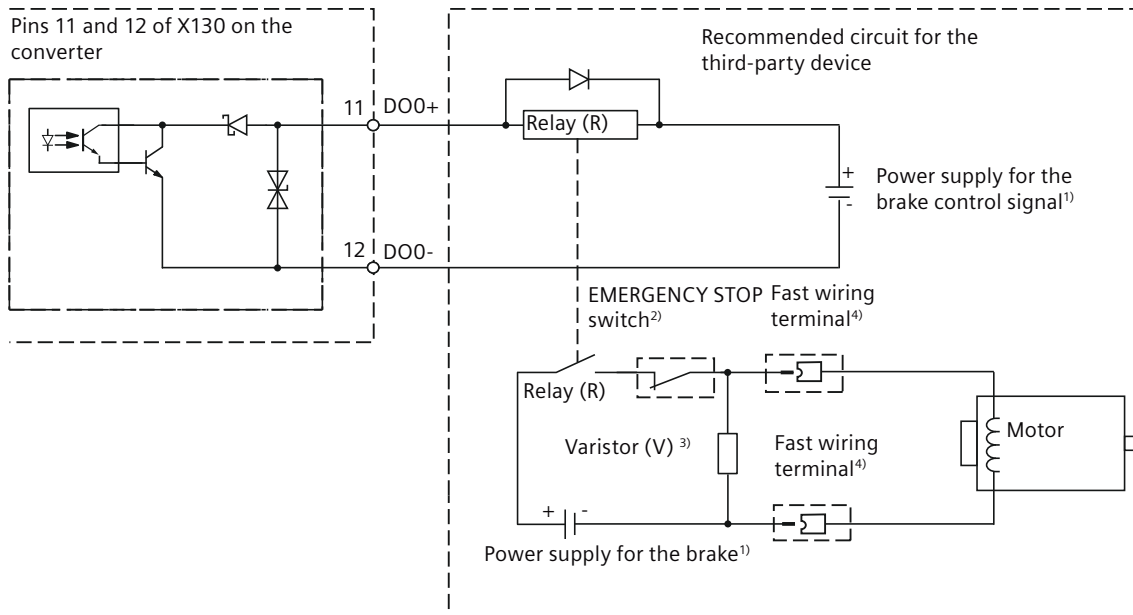


Figure 6-8 Motor holding brake connection via a digital output

Note

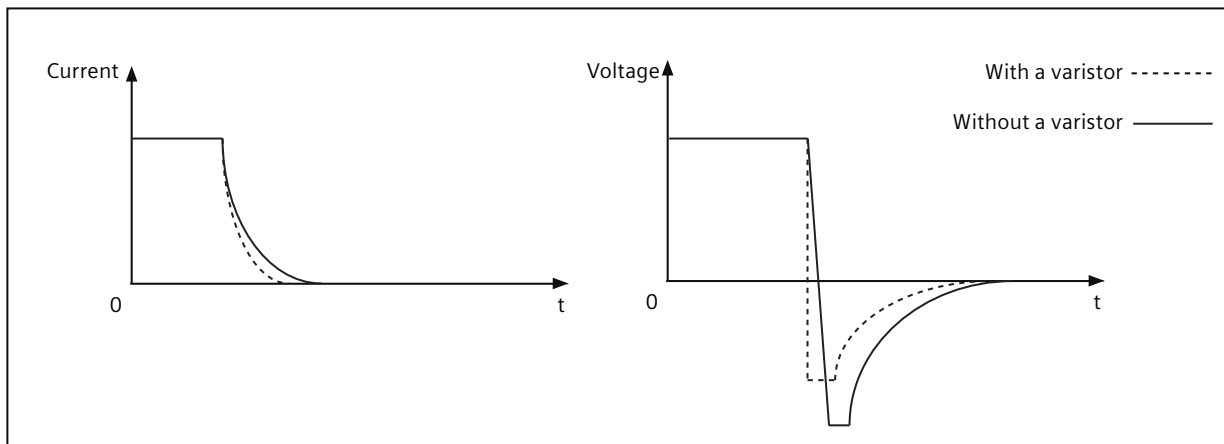
- ¹⁾ To avoid electro-magnetic interference to electronic components, make sure that you use different power supplies for the brake and the brake control signal.
- ²⁾ The motor holding brake can be controlled by the brake control signal from the digital output and an external EMERGENCY STOP device.
- ³⁾ Install a varistor to suppress the surge voltage or surge current generated by the relay (RY) during its ON/OFF operation
- ⁴⁾ To extend the connection of the holding brake to the relay, use appropriate fast wiring terminals.

Varistor (V) used for the power supply of the brake

Note

All the following data on a varistor is provided based on the low inertia motors with a rated power of 2 kW; however, the data is also applicable to the low inertia motors of other power ranges.

Consider the following current-time and voltage-time characteristics when using a varistor to suppress the surge voltage or surge current:



You may select an appropriate varistor with reference to the table below:

Power supply voltage of the brake		24 V DC
Order information	Manufacturer	EPCOS
	Model	S20K20
Specification requirements	Operating temperature	-20 °C to 60 °C
	Delay switching frequency	< 10 times/min
	Maximum operating DC voltage	26 V
	Average power dissipation	0.2 W
	Voltage at 1 mA	33 V ± 10%
	Clamping voltage at 20 A (8/20 µs)	65 V
	Energy absorption (2 ms) at a time	18 J

Relay (R) used for the power supply of the brake

Siemens recommends that you choose a Siemens relay (article number: 3RQ2000-1AW00 or 3RQ2000-2AW00).

You can also select other appropriate relays with reference to the table below:

Insulation voltage for overvoltage category III according to IEC 60664 for pollution degree 3	300 V
Max. permissible voltage for protective separation between control circuit and auxiliary circuit according to IEC 60947-1	300 V
Control supply voltage	24 ... 240 AC/DC; 50/60 Hz
Operating range factor of control supply voltage	0.7 ... 1.1
Current-carrying capacity of the output relay	2 A
<ul style="list-style-type: none"> At DC-13 at 24 V 	

Fast wiring terminals used for connecting the relay

You can extend the connection of the holding brake to the relay by using a two-pole fast wiring terminal or two one-pole fast wiring terminals.

You may select appropriate fast wiring terminals with reference to the table below:

Terminal type	Spring-loaded
Materials	Insulated, flame-retardant cover, with electrolytic copper contacts
Nominal voltage	450 V
Rated current	32 A
Rated power	7040 W
Supported conductor cross-sections	<ul style="list-style-type: none"> • Solid conductors: 0.2 mm² ... 4 mm² (AWG: 24 ... 12) • Stranded conductors: 0.2 mm² ... 2.5 mm² (AWG: 14 ... 12)
Stripping length	10 mm

More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 905)".

6.5.4 Connecting the encoder

6.5.4.1 Interface description - X120 (converter side)

Overview

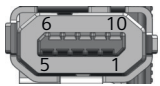
The servo drive system supports three types of encoders:

- Absolute encoder, 17-bit single-turn
- Absolute encoder, 21-bit single-turn
- Absolute encoder, 21-bit single-turn +12-bit multiturn

The converter connects to the encoder of the motor on the interface X120.

Description

Table 6-6 Interface X120

X120	Pin	Designation	Technical specifications
 IX-C socket	1	DP1	Absolute encoder data signal, positive
	2	DN1	Absolute encoder data signal, negative
	3	Reserved	Reserved
	4	CLKP1	Absolute encoder clock signal, positive
	5	CLKN1	Absolute encoder clock signal, negative
	6	M	Reserved for reference ground
	7	Power_ENC1	Encoder power supply, 5 V DC
	8	M_ENC1	Encoder power supply, reference ground
	9	Reserved	Reserved
	10	Reserved	Reserved

6.5.4.2 Interface description (motor side)

Overview

The encoder interface on the motor is used to transfer position data to the converter for real time control.

Description

- 1FL2 shaft heights 20, 30, and 40
The encoder interface is integrated into the hybrid connector. For more information, see Section "Interface description - power connector (motor side) (Page 143)".
- 1FL2 shaft heights 48 and 52

Encoder interface	Pin	Designation	Technical specifications
 M17 angular connector	1	P_Supply	Encoder power supply, 5 V
	2	M	Encoder power supply, reference ground
	3	Clock_P	Absolute encoder clock signal, positive
	4	Clock_N	Absolute encoder clock signal, negative
	5	Data_P	Absolute encoder data signal, positive
	6	Data_N	Absolute encoder data signal, negative
	Tightening torque: 1.0 Nm ... 1.5 Nm (8.9 lbf in ... 13.3 lbf in)		

- 1FL2 shaft heights 45, 65, and 90

Encoder interface	Pin	Designation	Technical specifications
 M17 angular connector	1	P_Supply	Encoder power supply, 5 V
	2	M	Encoder power supply, reference ground
	3	-	Reserved
	4	Clock_N	Absolute encoder clock signal, negative
	5	Data_P	Absolute encoder data signal, positive
	6	Clock_P	Absolute encoder clock signal, positive
	7	-	Reserved
	8	Data_N	Absolute encoder data signal, negative
Tightening torque: 1.0 Nm ... 1.5 Nm (8.9 lbf in ... 13.3 lbf in)			

6.5.4.3 Wiring

Connection example

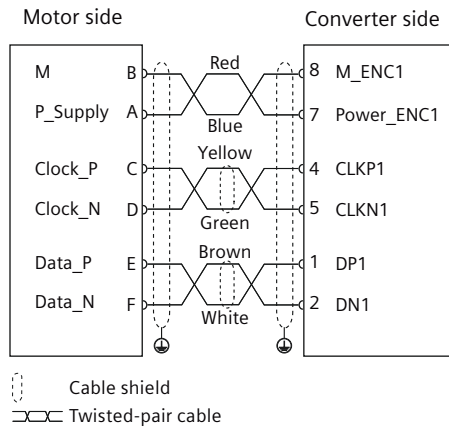


Figure 6-9 Encoder connection for 1FL2 shaft heights 20, 30, and 40

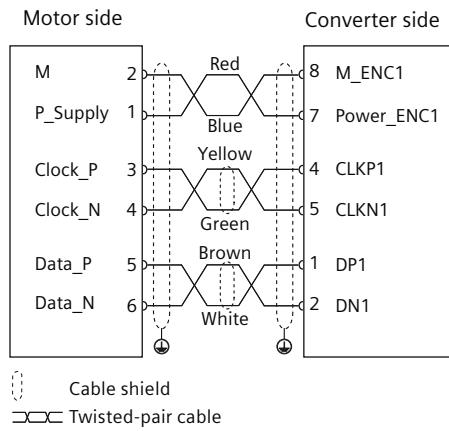


Figure 6-10 Wiring of encoder for 1FL2 shaft heights 48 and 52

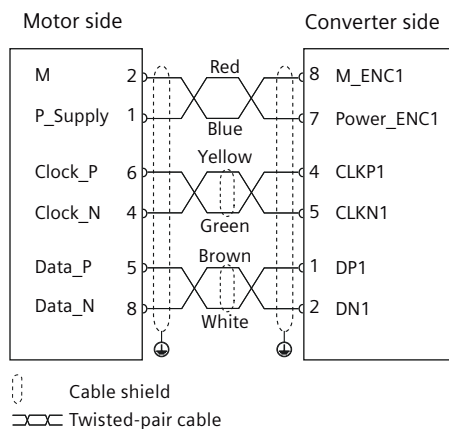


Figure 6-11 Wiring of encoder for 1FL2 shaft heights 45, 65, and 90

More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 905)".

6.5.5 Rotating the connectors at the motor

Overview

The connectors at the 1FL2 motor with shaft heights 45, 48, 52, 65, and 90 can be rotated to a different angle to a limited extent.

Use a suitable socket connector as a lever to rotate the connector.

Note

Rotating the connectors

- Do not exceed the permissible range of rotation.
- To ensure the degree of protection, do not rotate more than 10 times.



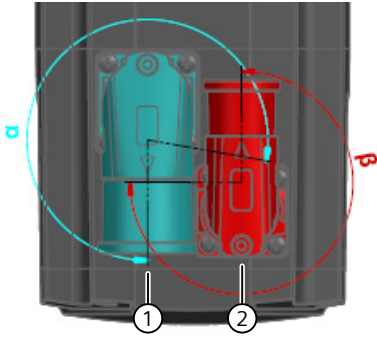
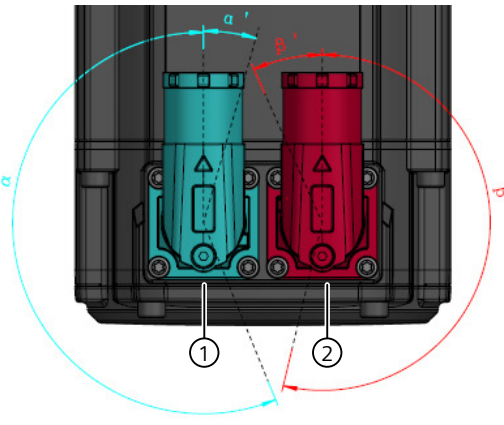
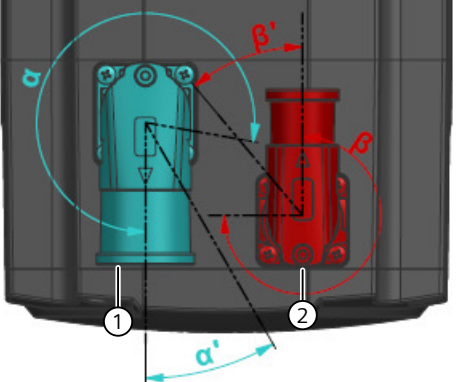
WARNING

Adjusting cable directions

Before adjusting the cables, switch off the power supply. Otherwise, the motor contains a hazardous voltage and a risk of electric shock.

Description

Table 6-7 Rotation range of the power connector ① and encoder connector ②

Motor	Power connector ①, size M17 and M23			Encoder connector ②, size M17		Drawing
	Size	Angle α	Angle α'	Angle β	Angle β'	
SH45	M23	280°	-	270°	-	
SH48 SH52	M17	225°	45°	225°	35°	
SH65 (rated at 2000 r/min)	M23	280°	30°	270°	40°	

6.5 Connecting the motor

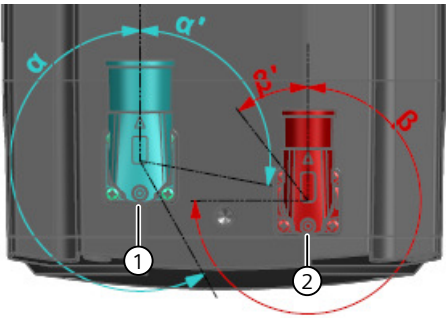
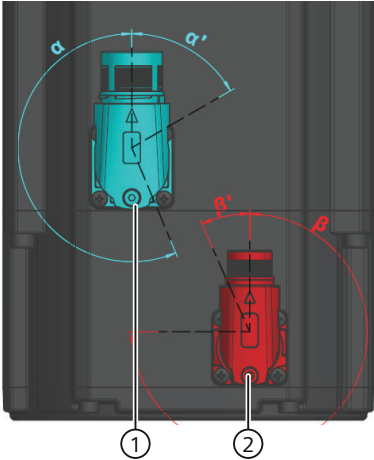
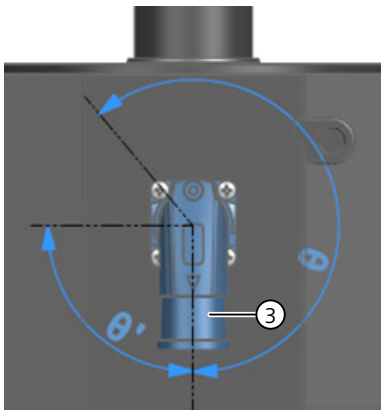
Motor	Power connector ①, size M23			Encoder connector ②, size M17		Drawing
	Size	Angle α	Angle α'	Angle β	Angle β'	
SH90 (rated at 2000 r/min)	M23	210°	100°	270°	40°	
SH65 SH90 (rated at 1500 r/min)	M23	210°	80°	270°	30°	

Table 6-8 Rotation range of the holding brake connector ③

Motor	Holding brake connector ③, size M17		Drawing
	Angle θ	Angle θ'	
SH45 SH65 (rated at 2000 r/min) SH90 (rated at 2000 r/min)	220°	90°	

6.6 Connecting the braking resistor

6.6.1 Interface description - X1

Overview

The converter connects to the braking resistor via terminals DCP, R1, and R2 on the interface X1.

Description

Table 6-9 Interface X1

X1	Terminal	Designation
	DCP	DC link positive (for connection to the braking resistor)
	R2	Connection to the internal braking resistor ¹⁾
	R1	Connection to the external braking resistor

¹⁾ S200 Basic PN (FSA and FSB) and S200 PN FSA (0.1 kW) do not have an internal braking resistor.

6.6.2 Wiring

Overview

S200 Basic PN FSC and S200 PN (excluding FSA 0.1 kW) converters have an integrated braking resistor for absorbing regenerative energy from the motor. To use the internal braking resistor, connect DCP and R2 with the jumper included in the scope of delivery.

To use an external braking resistor, connect the converter to an external braking resistor via terminals DCP and R1.

When the terminal R1 or R2 is not in use, cover it with the blanking plug provided in the connector kit (installed on R1 upon delivery).

Requirement

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 five minutes until the capacitors in the converter have discharged so that the residual charge is at a non-hazardous level. Touching the converter immediately after powering off can result in electric shock due to residual charge in the power components.

- Check the voltage at the converter connections before you connect the external braking resistor.

WARNING

Fire caused by an unsuitable or improperly installed braking resistor

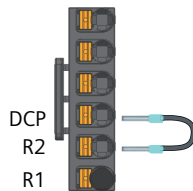
Using an unsuitable or improperly installed braking resistor can result in fire and formation of smoke. Fire and smoke can cause severe personal injury or property damage.

- Only use braking resistors that are approved for the converter.
- Install the braking resistor in accordance with regulations.

Procedure

Connecting the internal braking resistor

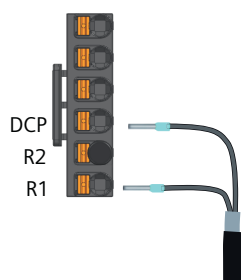
1. Switch off all power supplies to the converter, including the mains supply and the 24 V DC power supply.
2. Ensure that the terminal R1 is covered with the blanking plug.
3. Connect DCP and R2 with the jumper included in the scope of delivery as shown below:



Connecting an external braking resistor

1. Switch off all power supplies to the converter, including the mains supply and the 24 V DC power supply.
2. Wait for five minutes to allow the converter to discharge and check that no voltage is present at the converter connections.
3. Remove the jumper between DCP and R2, if present.

4. Remove the blanking plug from R1 and insert it into R2.
5. Connect the external braking resistor cable to terminals DCP and R1 as shown below:



More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 905)".

6.7 Connecting the 24 V DC power supply

6.7.1 Interface description - X124

Overview

The converter connects to an external 24 V power supply via interface X124. The interface supports daisy-chain connection of multiple converters. The maximum permissible number of daisy-chained converters depends on the maximum current limit of the X124 plug.

Description

Table 6-10 Interface X124

X124	Terminal	Designation	Technical data
	0 V	Power supply, 0 V	Maximum current limit: 10 A
	0 V	Power supply, 0 V	
	24 V	Power supply, 24 V DC	
	24 V	Power supply, 24 V DC	

6.7.2 Wiring

Requirement

WARNING

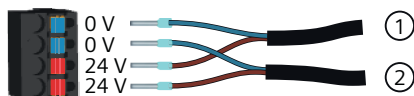
Electric shock due to unsuitable power supply

When the converter is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

- Only use 24 V power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages (maximum 60 V DC briefly).

Procedure

1. Assemble the X124 plug to the converter.
2. Attach the cable to the plug as shown below:



- ① Connecting to the 24 V DC power supply
- ② Connecting to the daisy-chained converter

More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling the cable lugs (Page 906)".

6.8 Connecting the inputs and outputs

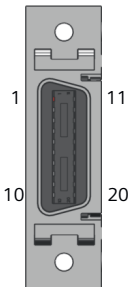
6.8.1 Interface description - X130

Overview

The converter connects to the controller for signal transmission on the interface X130.

Description

Table 6-11 Interface X130

X130	Pin	Designation		Technical specifications	Conductor color
		S200 PN	S200 Basic PN		
 20-pin MDR socket	1	DI0	DI0	Digital input 0 (high-speed digital input)	White-Gray
	2	DI1	DI1	Digital input 1 (high-speed digital input)	Gray-Brown
	3	DI2	DI2	Digital input 2	White-Pink
	4	DI3	DI3	Digital input 3	Pink-Brown
	5	M	M	Reference ground	White
	6	DI_COM	DI_COM	Common terminal for digital inputs	Brown
	7 ¹⁾	DI_COM	DI_COM	Common terminal for digital inputs	Green
	8	M	M	Reference ground	Yellow
	9 ¹⁾	-	-	-	-
	10	FE	FE	Functional grounding	Pink
	11	DO0+	DO0+	Digital output 0, positive	Blue
	12	DO0-	DO0-	Digital output 0, negative	Red
	13	DO1+	-	Digital output 1, positive	Black
	14	DO1-	-	Digital output 1, negative	Violet
	15 ¹⁾	PTOA+	-	Pulse train output A, positive	Gray-Pink
	16 ¹⁾	PTOA-	-	Pulse train output A, negative	Red-Blue
	17 ¹⁾	PTOB+	-	Pulse train output B, positive	White-Green
	18 ¹⁾	PTOB-	-	Pulse train output B, negative	Brown-Green
	19 ¹⁾	PTOZ+	-	Pulse train output Z, positive	White-Yellow
	20 ¹⁾	PTOZ-	-	Pulse train output Z, negative	Yellow-Brown

¹⁾ Not available on the PROFINET I/O adaptor.

6.8.2 Wiring

Overview

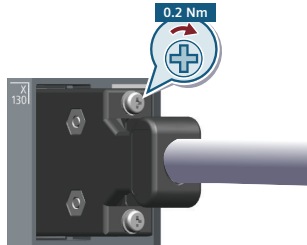
You have the following options to connect the control/status input and output signals:

- Using a prefabricated or self-assembled PROFINET I/O cable
- Using a 20-pin-to-12-pin PROFINET I/O adaptor and separate signal conductors

Procedure

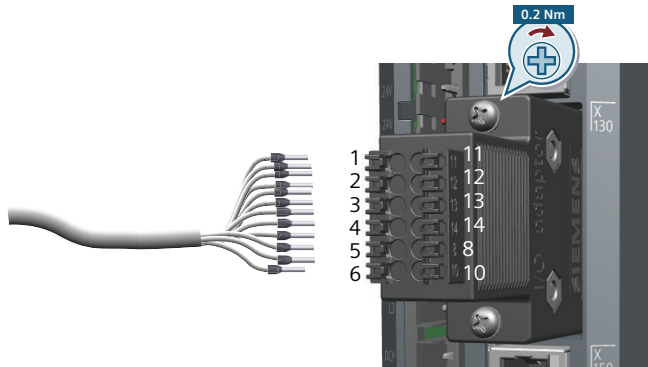
Connection via the PROFINET I/O cable

1. Insert the PROFINET I/O connector into the socket.
2. Tighten the screws to a tightening torque of 0.2 Nm.



Connection via the PROFINET I/O adaptor

1. Insert the PROFINET I/O adaptor into the socket.
2. Tighten the screws to a tightening torque of 0.2 Nm.
3. Secure the conductors into the corresponding terminal points on the adaptor.



More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling cables (Page 905)".

6.8.2.1 Wiring of digital inputs

Overview

The converter offers four digital inputs. DI0 and DI1 only support PNP wiring, and DI2 and DI3 support both NPN and PNP types of wiring.

Connection example

Connecting DI0 and DI1

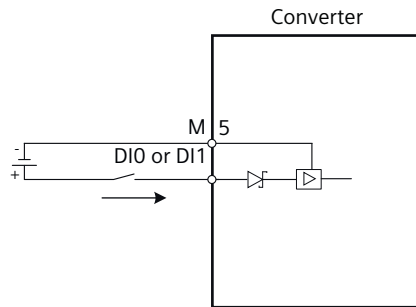
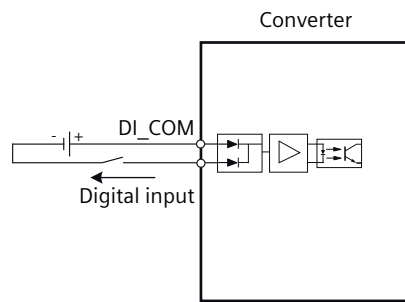
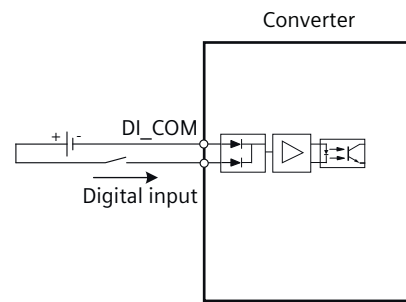


Figure 6-12 PNP wiring

Connecting DI2 and DI3



NPN wiring



PNP wiring

More information

For more information about the technical data of digital inputs, see Section "General technical data (Page 602)".

6.8.2.2 Wiring of digital outputs

Overview

S200 PN offers two digital outputs, DO0 and DO1, and S200 Basic PN offers only DO0. The digital outputs support both NPN and PNP types of wiring.

Requirement

⚠ CAUTION

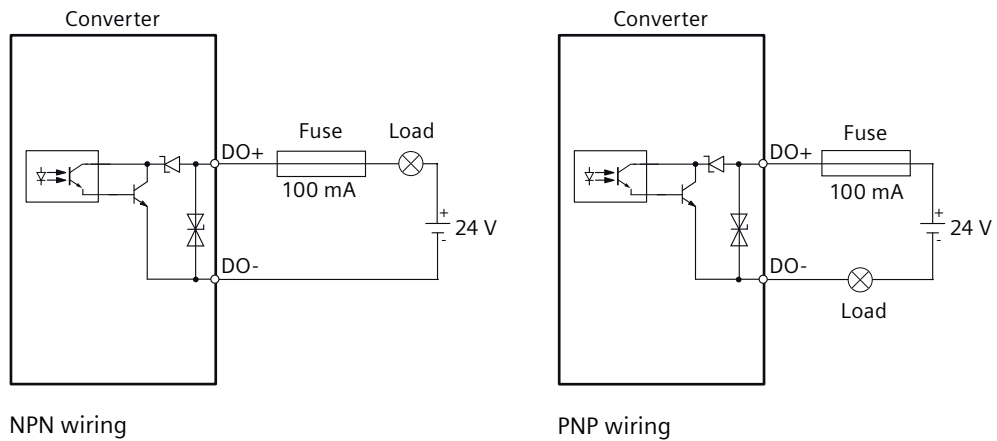
Damage to property due to overload of digital outputs

If digital outputs are overloaded, this can result in damage due to fire, device defects, or malfunctions.

- Ensure that the digital outputs are not loaded in excess of 100 mA.
- Install a 100 mA fuse for connection to the digital output.

Connection example

You can connect the digital outputs as shown below:



More information

For more information about the technical data of digital outputs, see Section "General technical data (Page 602)".

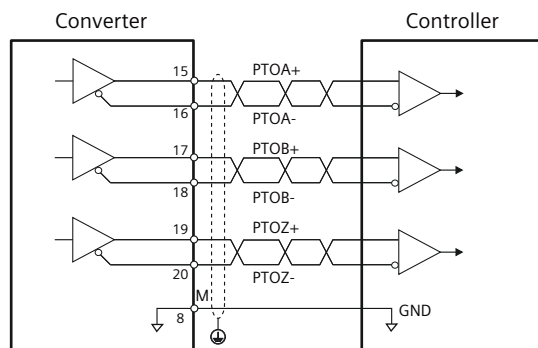
6.8.2.3 Wiring of pulse train outputs

Overview

S200 PN supports high-speed 5 V differential signals (A+/A-, B+/B-, Z+/Z-).

Connection example

You can connect the pulse train outputs as shown below:



Note

Use shielded twisted-pair cables for signal transmission. Make sure that Pin M is securely connected to the reference ground of the controller.

More information

For more information about the technical data of pulse train outputs, see Section "General technical data (Page 602)".

6.9 Connecting STO (for S200 PN only)

6.9.1 Interface description - X131

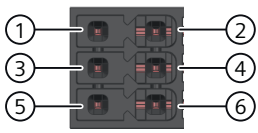
Overview

The S200 PN provides a fail-safe digital input (F-DI O) to support Safety Integrated Functions. The F-DI includes two STO channels and enables connection to the following devices via interface X131:

- Safety sensors, such as EMERGENCY STOP control devices and light curtains.
- Pre-processing devices, including fail-safe control systems and safety relays.

Description

Table 6-12 Interface X131

X131	Terminal	Designation	Technical specifications
	1	STO1+	STO channel 1, positive
	2	STO1-	STO channel 1, negative
	3	STO-VS	STO power supply
	4	STO-M	STO power supply, reference ground
	5	STO2+	STO channel 2, positive
	6	STO2-	STO channel 2, negative

6.9.2 Wiring

Overview

To connect to external safety devices, first assemble the X131 plug to the converter. You can use the internal or an external 24 V power supply for the connection.

To ensure EMC performance, Siemens recommends that you use twisted pair cables for STO connection.

Description

The F-DI 0 supports both NC/NC (Normally Closed/Normally Closed) and NC/NO (Normally Closed/Normally Open) contact configurations. The state of the safety function is determined by the contact configuration and the signals from the channels.

Table 6-13 NC/NC contact configuration

Signal		Status of safety function
Channel 1 (STO1)	Channel 2 (STO2)	
1	1	Deselected
0	0	Selected

Table 6-14 NC/NO contact configuration

Signal		Status of safety function
Channel 1 (STO1)	Channel 2 (STO2)	
1	0	Deselected
0	1	Selected

The contact configuration also affects the category that the drive system can achieve according to ISO 13849.

For the NC/NC configuration, the F-DI self-test mode determines the functional safety category.

Table 6-15 Category that can be achieved according to ISO 13849-1 when setting an F-DI as NC/NC contact

Category	Supply voltage	Application	Result
Cat 3	With or without using the internal supply voltage; however, without enabled self-test using specified dark pulses (p10018 = 0, p10041 = 0)	Local use, e.g. EMERGENCY STOP	The converter self-test detects errors in the circuits of the failsafe digital input.
Cat 4	Exclusive use of the internal supply voltage for PP circuit with enabled self-test using specified dark pulses at the internal supply voltage (p10041 = 1, p10018 > 0)	Protected cable routing, e.g. within a control cabinet	The converter self-test detects errors in the circuits of the failsafe digital input. The self-test of the connected cables with internally specified dark pulses detects the following errors: <ul style="list-style-type: none"> • Short-circuit to ground • Short-circuit to 24 V supply voltage
	Without using the internal supply voltage, but with test pulses of the connected external device (p10041 = 3)	Depending on the connected external device	

When setting the F-DI as an NC/NO contact (p10040 = 1), the application on the machine or system must switch the F-DI into a safe state (safety function is selected) at least once within a maximum time interval so that it can be fully tested by the converter and the desired PL and category according to ISO 13849-1 can be achieved. The following PL /categories can be achieved depending on the time interval:

- at least once per year: PL d / Category 3
- at least every three months: PL e / Category 3
- at least daily: PL e / Category 4

Note

In the NO contact path, in addition to switch failure, power supply failures and interrupted cabling with reference to functional safety must be taken into consideration.

Siemens recommends that you configure the F-DI as NC/NC contact (p10040 = 0).

Connection example

Interconnection for an EMERGENCY STOP button with 24 V DC internal

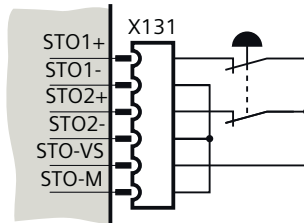


Figure 6-13 F-DI connection example with 24 V internal

Interconnection for an EMERGENCY STOP button with 24 V DC external

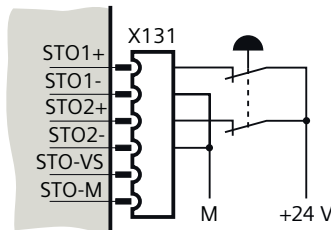


Figure 6-14 F-DI connection example with 24 V external

Interconnection of the fail-safe digital inputs with a fail-safe digital output

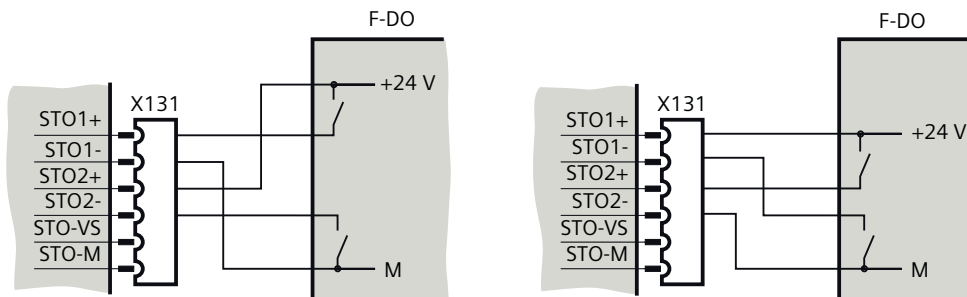


Figure 6-15 F-DI connection examples with a fail-safe digital output

More information

For more information about cable requirements, see Section "Cables and connectors (Page 138)".

For more information about assembling cable terminals, see Section "Assembling the cable lugs (Page 906)".

For more information about the STO function, see Section "Safety Integrated (for S200 PN only) (Page 358)".

6.10 Connecting the fieldbus

6.10.1 Interface description - X150

Overview

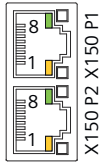
The converter connects to the PROFINET network via ports 1 and 2 of interface X150. The transmission rate on the interface is 10 Mbit/s or 100 Mbit/s.

Every PROFINET device on the network is uniquely identified by its PROFINET interface. For this purpose, a PROFINET interface has the following attributes:

- A MAC address (factory default)
- An IP address
- A device name (name of the station)

Description

Table 6-16 Interface X150

X150	Pin	Designation	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved	Reserved
	5	Reserved	Reserved
	6	RXN	Receive data -
	7	Reserved	Reserved
	8	Reserved	Reserved

LED states

For diagnostic purposes, the PROFINET interface X150 is equipped with a green LED and an orange LED.

Table 6-17 LED states of the service interface X150

LED	Color	Status	Description
Link port	-	Off	Missing or faulty link
	Green	Continuous light	10 or 100 Mbit link is available
Activity port	-	Off	Not connected
	Orange	Flashing light	Sending or receiving data

6.10.2 Wiring

Overview

The maximum length of cables between stations (L1 to Ln) is 100 m. Siemens recommends that you fix the cable on the cabinet to prevent connector damage caused by dragging. If a cable with a length of more than 3 m is connected to the PROFINET port, electromagnetic interference may occur. Minimization of the interference emission is possible by the use of ferrite cores, cabinet feedthrough or fiber-optic transceiver.

Note

When connecting the ports P1 and P2, make sure that the physical input and output connections are the same with the connections in the topology.

Connection example

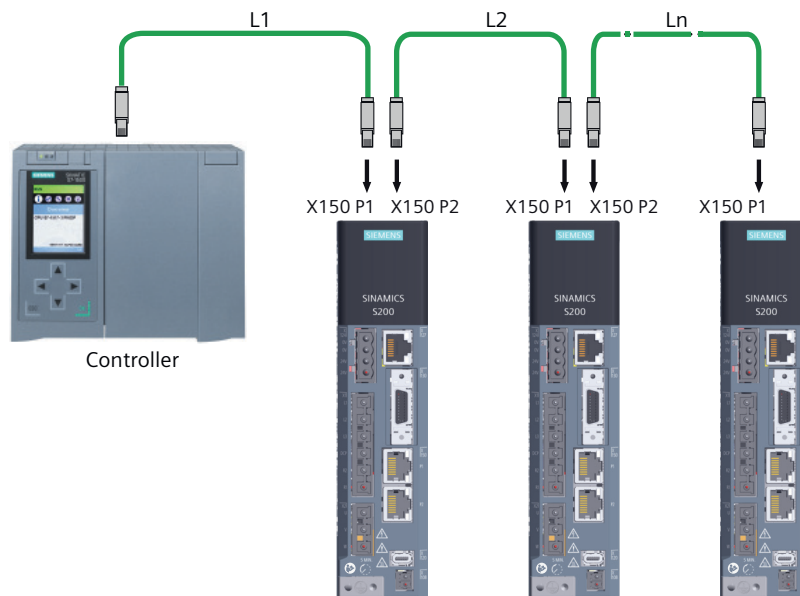


Figure 6-16 Connecting to the fieldbus

More information

For more information about cable requirements, see Section "PROFINET patch cables and RJ45 connectors (Page 66)" and Section "Cables and connectors (Page 138)".

6.11 Connecting the service interface (Ethernet)

Overview

The converter connects to a commissioning device via the Ethernet interface X127. The interface offers 24 V DC power supply to the connected device. The transmission rate on the interface is 10 Mbit/s or 100 Mbit/s.

Requirement

Note

The service interface X127 is used for commissioning and diagnostics. Do not use it for long-term monitoring.

Description

Table 6-18 Interface X127

X127	Pin	Designation	Technical specifications
 RJ45 socket	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	P24_POE	Power supply over Ethernet, 24 V DC
	5	P24_POE	Power supply over Ethernet, 24 V DC
	6	RXN	Receive data -
	7	M_POE	Power supply over Ethernet, reference ground
	8	M_POE	Power supply over Ethernet, reference ground

LED states

For diagnostic purposes, the service interface X127 is equipped with a green LED and an orange LED.

Table 6-19 LED states of the service interface X127

LED	Color	Status	Description
Link port	-	Off	Missing or faulty link
	Green	Continuous light	10 or 100 Mbit link is available
Activity port	-	Off	Not connected
	Orange	Flashing light	Sending or receiving data

More information

For more information about cable requirements, see Section "PROFINET patch cables and RJ45 connectors (Page 66)" and Section "Cables and connectors (Page 138)".

Commissioning (web server)

7.1 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
- Monitoring and operation
- Service and maintenance
- Support

After commissioning has been completed, the settings made are applied and transferred to the converter.

The web server has multi-level industrial cybersecurity functionality.

More information

For more information about security settings in the web server, see Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>).

7.2 Fundamentals

7.2.1 Requirements for commissioning

Description

- You have correctly installed the converter and the motor.
- You have mounted the motor including encoder onto the mechanical system.
- You have installed the safety equipment required (EMERGENCY OFF).
- You have connected the motor to the converter.
- You have connected the converter and the operating unit via the service interface X127, PROFINET interface X150, or WLAN.

- You have switched on the converter supply voltage.
- The converter has ramped up.

7.2.2 Supported operating units

Description

The following operating units are supported for the connection with the web server:

- Programming device, PC, notebook
- Smartphone, tablet PC
- SINAMICS SDI Pro 5.5"

The optional component Smart Adapter establishes a WLAN for the wireless connection between the converter and mobile devices.

As a result of the responsive design, content is adapted to the screen size of the operating unit.

More information

For more information about SINAMICS SDI Pro 5.5", see Section "SINAMICS SDI Pro 5.5" (Page 81)".

For more information about SINAMICS Smart Adapter, see Section "SINAMICS Smart Adapter (Page 80)".

7.2.3 Supported browsers

Description

The web server supports the following browsers:

- Apple Safari
- Google Chrome
- Microsoft Edge
- Mozilla Firefox

Siemens recommends that you use the latest stable versions of these browsers for optimal performance and security. You can find detailed information about the latest stable versions on the official web sites of the browsers.

7.2.4 Communications 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"> • IP address: 169.254.11.22 • Subnet mask: 255.255.0.0 • Data transfer via HTTPS is activated in the factory setting.
	Restrictions: <ul style="list-style-type: none"> • Only local access is allowed. • Only local networking in a closed and locked electrical cabinet is permissible. • For remote access to the electrical cabinet, you must apply additional Industrial Cybersecurity measures to prevent misuse through sabotage, data manipulation by unqualified persons and interception of confidential data.
PROFINET interface X150	<ul style="list-style-type: none"> • Converters are connected to several components, such as an operating unit or a higher-level control system, via PROFINET interface X150. • The network at PROFINET interface X150 must be located in a secure protection zone. Access to cables and open connections must be implemented in a protected fashion, such as in a control cabinet. • The IP addresses of the service interface X127 and the PROFINET interface X150 must not be in the same subnet.

7.3 Getting started

7.3.1 Calling the web server

Overview

The converter is commissioned via the user interface of the web server.

Requirement

- You have connected the converter to the operating unit via the service interface X127 or WLAN.
- If you have configured security settings for the web server, make sure that guest access to the web server is active.
If guest access is not permitted, you must log in with your user name and password when calling the web server.

Procedure

To access the web server, enter the IP address of the converter in the browser, e.g. `https://169.254.11.22`.

Result

- If you call the web server for the first time, you are prompted to define the basic settings.
- 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.

More information

Alternative access via the PROFINET interface X150

You can also access the web server via the PROFINET interface X150.

To access the integrated web server via the PROFINET interface, you must assign the interface a valid IP address using advanced setup or Startdrive. The IP addresses of the service interface X127 and the PROFINET interface X150 must not be in the same subnet.

7.3.2 Settings for brand-new converters

Overview

The basic settings are required before performing the first commissioning for a brand-new converter.

Requirement

- The operating unit is connected to the converter via the service interface X127, the PROFINET interface X150, or WLAN.
- The web server is accessed with the IP address:
 - For the service interface X127: 169.254.11.22 (default)
 - For the PROFINET interface X150: 0.0.0.0 (default)
Before you establish an online connection via PROFINET, you must configure a suitable IP address for the PROFINET interface in advanced setup or in Startdrive.

Description of function

If the web server is called, a forwarding function starts automatically to define the following settings:

- Basic settings (Page 177)
- Security settings (Page 179)

7.3.3 Basic settings

Overview

The function view provides the following options to configure the converter settings at the initial setup:

- Manually create a new set of converter settings
- Load the existing converter settings from a backup file

Requirement

- The web server is being called for the first time.
- To load the existing converter settings from a backup file, ensure that you have prepared a valid backup file on the operating unit.
 - For more information about backing up drive data, see Chapter "Backing up and restoring drive data (Page 580)".

Note

Restoring drive data from an encrypted backup file

To restore drive data from an encrypted backup file, the previously defined password for function "Drive data encryption" will be requested. For more details, see Chapter "Backup file with drive data encryption (Page 586)".

Procedure

Select a preferred language for the user interface and proceed according to you demand:

Option 1: Manually create a new set of converter settings

1. Select "Start a new configuration"
2. Configure the following basic settings:
 - Data saving preferences
 - Converter date and time
3. Click "Continue".

Option 2: Load the existing converter settings from a backup file

1. Select "Restore from backup".
2. Upload the backup file.
3. Click "Restore".
If the converter date and time were manually set in the restored settings, the current converter time is displayed for confirmation and can be reconfigured if needed.
4. Click "Finish".

Result

The initial setup is complete.

- For new configuration, the Security Wizard (Page 179) opens for security settings configuration.
- For restored configurations, the web server displays the appropriate page based on the User Management & Access Control (UMAC) settings saved in the restored settings:
 - If guest access is allowed, the home page is displayed.
 - If guest access is not allowed, the logon page is displayed.

7.3.4 Security settings

Overview

One of the following security options can be selected after the basic settings:

- "Configure security settings" in the Security Wizard
The Security Wizard offers the following settings for configuration:
 - User Management & Access Control (UMAC)
 - Access to the integrated web server via the fieldbus or service interface
 - Drive data encryption

Comprehensive protection against data manipulation requires that security settings are configured.

- "Continue with low security settings"
If you continue with low security settings, then UMAC is deactivated.

Siemens recommends that you configure the security settings before the converter goes into operation. You can also access the security settings via menu "Protection & Security (Page 228)".

Requirement

NOTICE

Data manipulation due to low protection

An inadequately protected converter makes it easier for potential attackers to access the drive data. Data manipulation can cause the drive to malfunction or damage it.

- Only use the low security settings in exceptional cases and only if an information security risk analysis finds that it is reasonable to do so.
- Configure the settings for full protection immediately after adding a drive or several drives to the project.

Procedure

If you select "Configure security settings", proceed as follows to finish the security settings in the Security Wizard:

1. Define the settings for UMAC on the following pages:
 - "Activate User Management & Access Control"
If UMAC is activated, it can only be deactivated by a full reset of the drive to factory settings.
For more information about the full reset to factory settings, see Section "Full reset of all device settings (Page 573)".
 - "Administrator setup"
Specify the user name and password of the drive administrator, who has all available rights of the drive.
Runtime role "Drive Administrator" is assigned to the administrator. You can change the assignment in "System > User management".
 - "Guest access configuration"
Choose whether users have read-only guest access to the drive without user name and password.
With guest access enabled, users can also acknowledge events without logging in.
2. Define the settings to access the web server:
 - "Web server activation"
The factory setting to access the web server is service interface X127 with HTTPS protocol. It is also possible to activate or deactivate PROFINET interface X150 with HTTPS protocol. If both interfaces are deactivated, it is not possible to access the web server.
3. Configure the optional drive data encryption:
 - "Drive data encryption"
The function encrypts UMAC user data and passwords in the backup file and on the memory card of the converter.
Assign an additional password for encryption of the drive data if you enable the function. To use the function independent of UMAC, deselect option "Activate UMAC for the drive" on page "Activate User Management & Access Control".
4. Check the configured settings:
 - "Summary"
The summary provides an overview of the configured settings.
5. Click on "Finish".

Result

The settings are applied.

You can continue with one of the following options:

- Continue with quick setup
- Continue with advanced setup
- Continue with the web server home page

More information

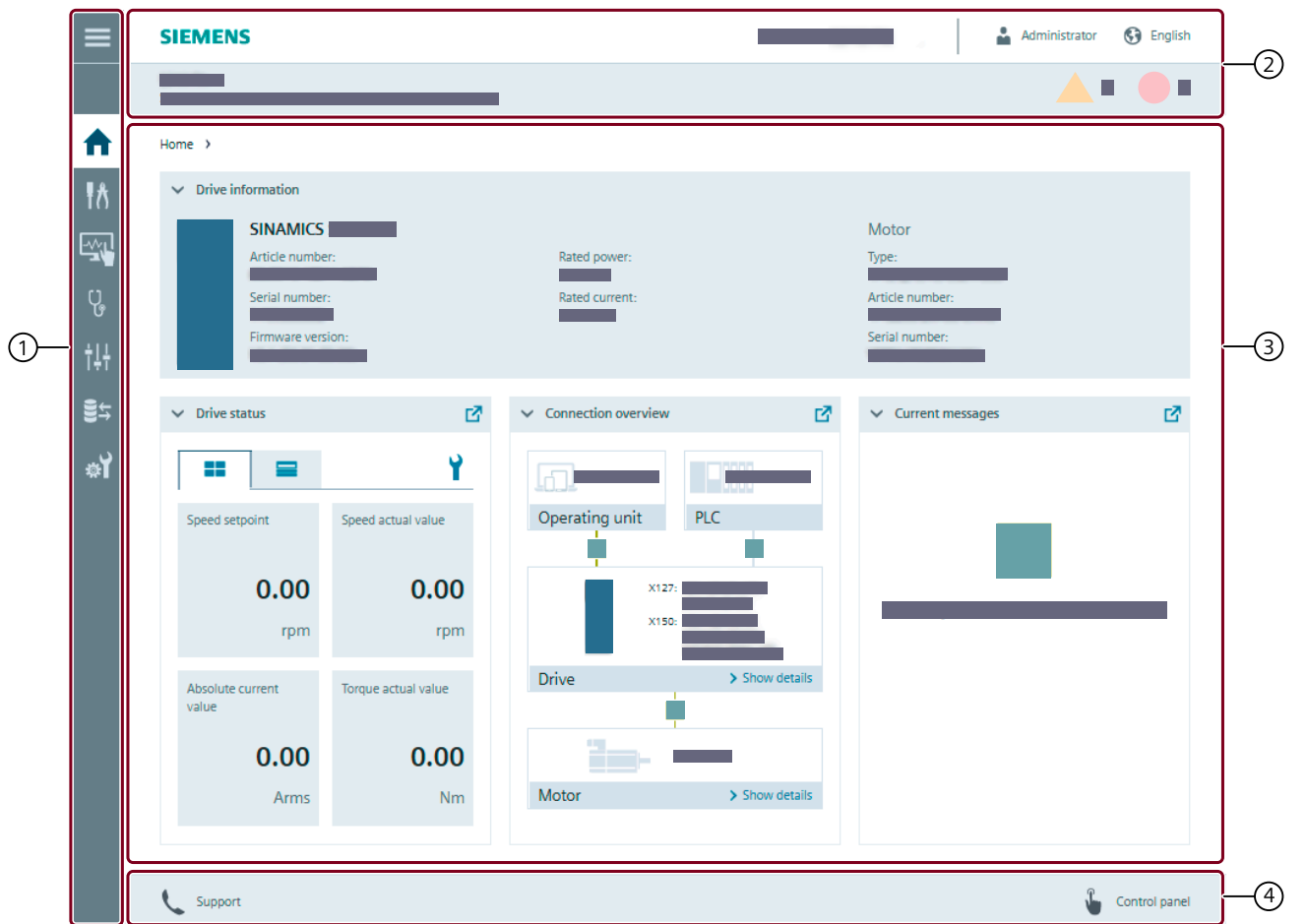
For more information about "Drive data encryption", see Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>)

7.3.5 Home page**Description**

The web server interface depends on the converter. The web server view of your converter may vary from that shown here depending on your product and firmware version.

The following figure shows the basic structure of the web server pages.

7.3 Getting started



- ① Navigation bar
The navigation bar provides access to converter functions and menus.
- ② Status bar
The status bar displays the converter product name and the converter status. Log in at the status bar and select the user interface language.
- ③ Main window
The main window provides information about converter functions and allows settings to be made.
- ④ Action bar
When manual saving is activated in menu "System" > "Settings", then symbol  is also shown in the action bar.

Figure 7-1 Structure of the web server (example)

7.3.6 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 directly access the product documentation. To do this, you must make the product documentation available on a prepared memory card.

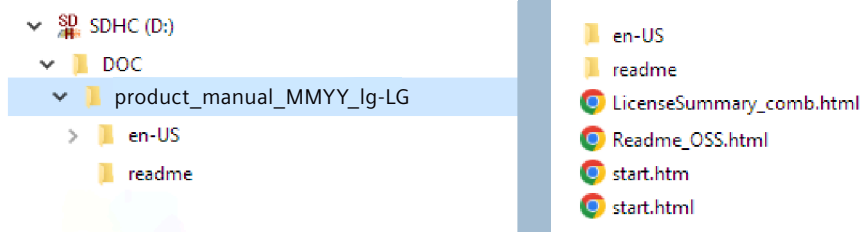
Requirement

- You have an empty memory card on which you can save the product documentation.
- You have connected a suitable memory card reader to your PC.

Procedure

To make the project documentation available for the web server information system, proceed as follows:

1. Download the product documentation to your PC
The project documentation for the web server information system can be found on the Internet:
Operating Instructions (<https://sieportal.siemens.com/su/bjPpg>)
ZIP archive "Multimedia document" is located under "Download".
The multimedia document contains file "product_manual_MMYL_Ig-LG.zip".
2. Unzip the file into a folder with the ZIP file name, e.g. "product_manual_MMYL_Ig-LG".
3. Insert a memory card into the memory card reader of your PC.
4. In the root directory of the memory card, create a folder called "DOC".
5. Copy the unzipped folder, e.g. "product_manual_MMYL_Ig-LG", into directory "DOC" on the memory card.



6. Eject the memory card from the PC.

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7. Remove the memory card from the reader.
8. Insert the memory card into the converter.

Result

You have made the product documentation in one language available for the web server information system.

For selected topics, you can access the content of the product documentation via the context-sensitive information system.

You can copy the product documentation in other languages to the memory card if there is sufficient space available on the memory card.

7.3.7 Using the web server information system

Overview

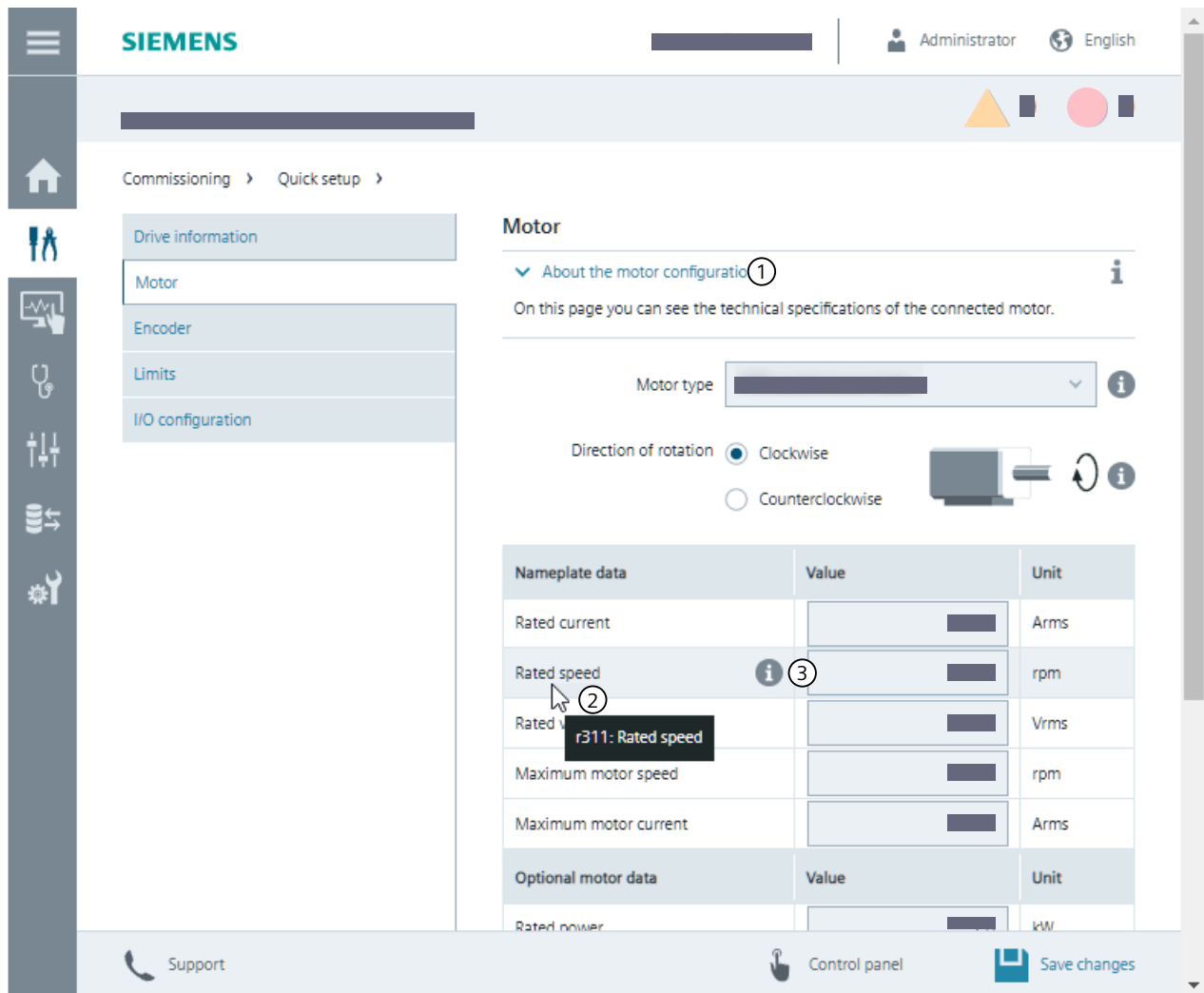
The web server supports you based on an integrated, multi-level information system.

Requirements

If you have provided the product documentation for the web server information system, then the web server also displays linked content of the manual.

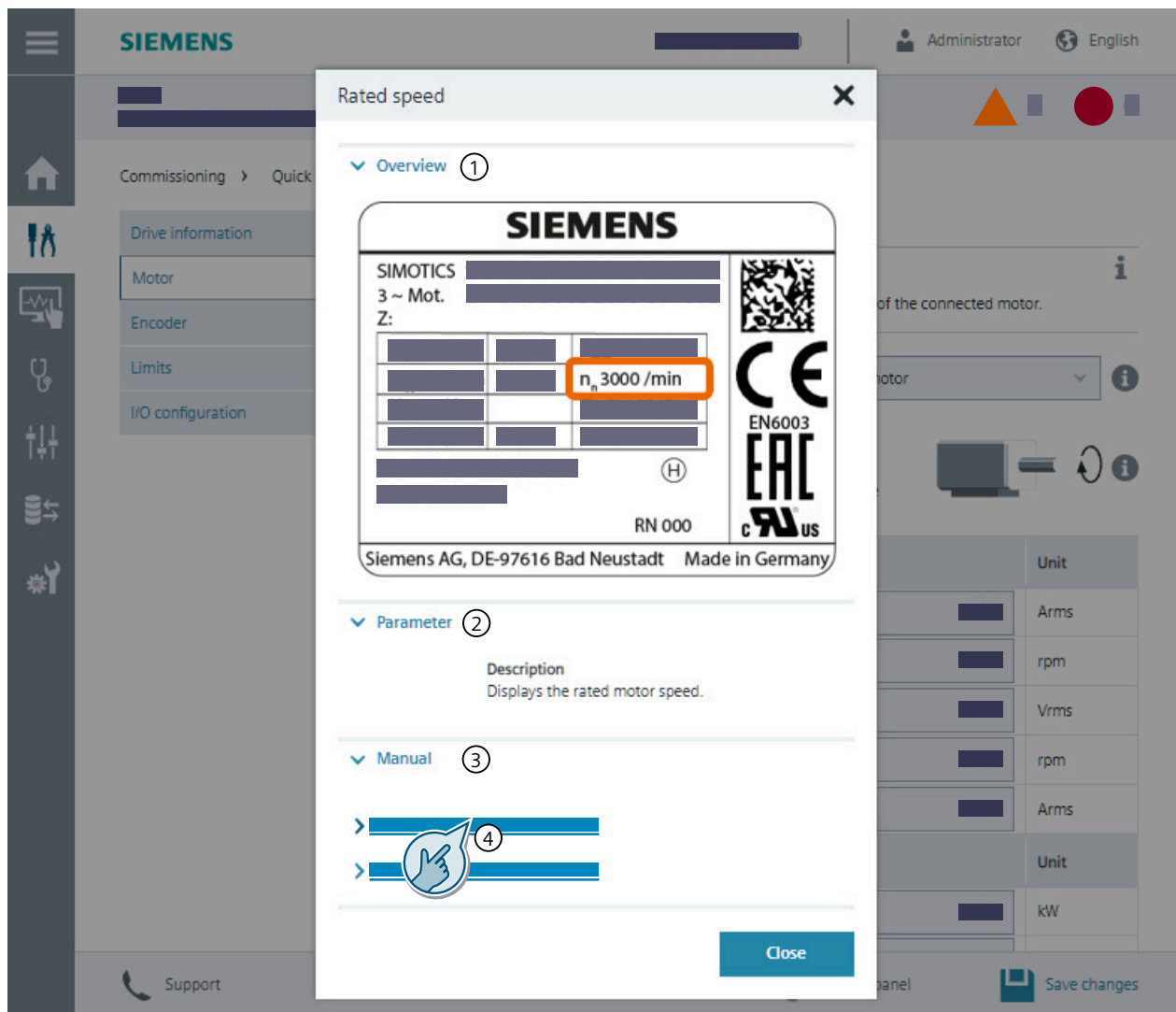
Description of function

Product-specific information and settings are covered over in the following diagrams.



- ① Clicking or tapping on the header or on the associated icon displays or hides general information about the function of the current view.
- ② 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 ("③") with the context-sensitive short information is displayed.
- 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 7-2 Information displayed in the current view



➤ ✓ Clicking or tapping on the header or the associated icon does the following:

- ① Displays and hides general information about the meaning or function of the setting.
- ② Displays and hides detailed information about the parameter.
- ③ Displays and hides links to the operating instructions.
- ④ A click or tap on a link displays the linked information of the operating instructions.

Figure 7-3 Product-dependent information in a context-sensitive help window

7.3.8 Reloading pages

Procedure

Reload the web server function views in the browser of your operating unit by pressing the <F5> key or by clicking the refresh button , in the following cases for example:

- The web server is not responding.
- The buttons of the function view are inactive or unlabeled.

7.4 Functions and menus

7.4.1 Commissioning

7.4.1.1 Complete commissioning workflow

Overview

The web server guides users step-by-step through the drive commissioning.

Description of function

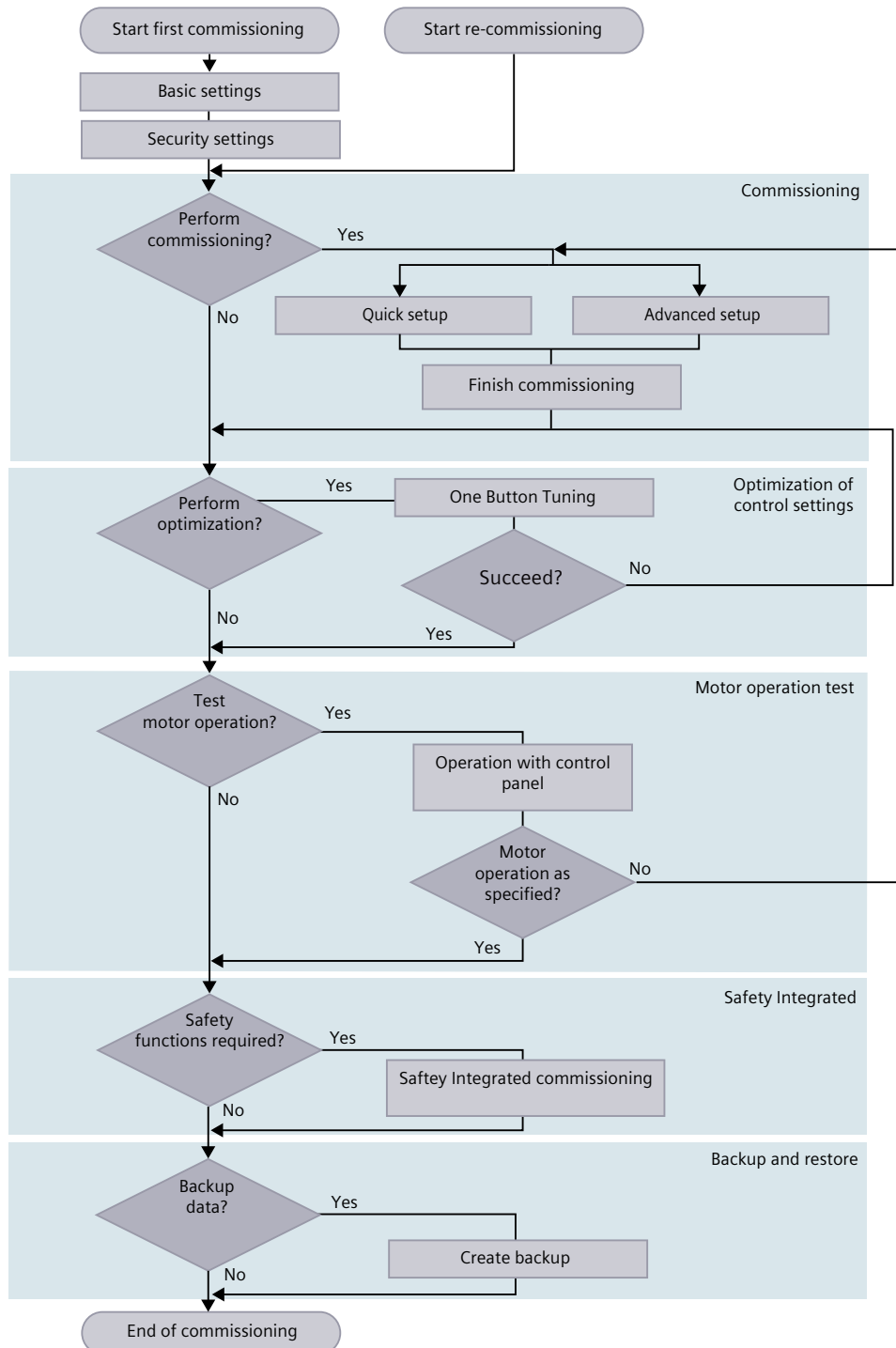


Figure 7-4 Commissioning sequence

Commissioning involves the following steps:

- Basic settings:
If the converter has already been commissioned, then the web server skips the basic settings.
The following settings are required for a brand-new converter:
 - Language, date, time
- Security settings:
The settings are configured with the help of the Security Wizard.
You can find more information in Section "Security settings (Page 179)".
- Commissioning
Menu "Commissioning"
The web server has 2 commissioning modes:
 - Quick setup
 - Advanced setup

In the read mode, the web server provides an overview of the commissioning. This allows you to become familiar with the commissioning steps, individual drive options, and functions or to check settings. Configuration is not possible in the read mode.
- Optimization:
Menu "Commissioning" > "Optimization"
The Optimization function measures the mechanical drive train using short test signals and adapts the controller parameters to the mechanics installed.
- Safety Integrated commissioning:
Menu "Commissioning" > "Safety Integrated"
Setting of the Safety Integrated Functions
- Motor operation test:
Action bar > "Control panel"
Test of motor operation using the control panel in jog mode or continuous operation
- Backup and restore:
Menu "Backup and restore"
Siemens recommends a backup of the drive settings after commissioning.

More information

For more information about user management and security settings, see Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>).

7.4.1.2 Commissioning

Overview

Important converter parameters are set during commissioning. After commissioning has been completed, the converter knows, for example, the data of the connected motor and has adapted its control interfaces to the specific requirements.

Requirement

- The drive system has been configured. The components are wired.
- Web server access is active.
- No other user controls the converter via the control panel.
- No other user has started commissioning.
- When UMAC is activated, then the required rights are assigned, for example, through the role "Drive Engineer and Service".

Product-specific information and settings are covered over in the diagram.

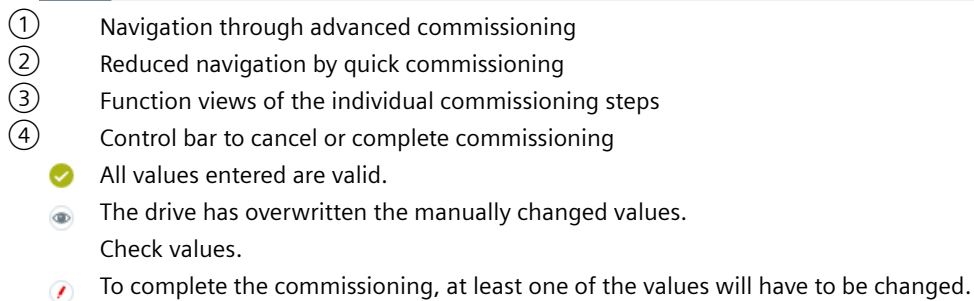


Figure 7-5 Advanced commissioning using the web server

The web server has 2 commissioning modes:

- **Quick setup**
Quick setup comprises the basic settings that are required to commission the converter. For example, this includes motor data, limit values and the configuration of inputs and outputs.
- **Advanced setup**
The advanced setup contains all settings of the quick commissioning, plus additional options and functions.
With advanced setup, drive options and functions that match the specific application can be configured.

The commissioning wizard runs through the commissioning menu.

The converter creates a restore point when commissioning is started. The converter saves the changes after every commissioning step. If you cancel commissioning before it has been completed, then the converter is reset to the restore point.

Table 7-1 Web server commissioning menu

Commissioning step	Description
Hardware data	
Drive information	The web server provides an overview of the drive system: <ul style="list-style-type: none"> • Converter • Motor • Encoder • Motor holding brake The drive name can be edited.
Motor	The data of the motor being used is displayed. The direction of rotation of the motor can be selected.
Encoder	The data of the encoder being used is displayed.
Drive options	If you use an external braking resistor with thermal model monitoring, manually enter the technical data of the braking resistor.
Application data	

Commissioning step	Description
Pulse Train Output (PTO)	<p>The following settings can be configured through "Output configuration" for PTO position control:</p> <ul style="list-style-type: none"> • PTO direction change Select the PTO direction for an application of fully closed-loop position control using PTI and PTO. The direction output defines the traversing direction. • PTO output frequency limit Set the maximum output frequency of the pulse train output. The output frequency represents the velocity and the number of output pulses for the section to be traversed. • PTO zero mark offset Set the zero mark offset to shift the zero mark within one mechanical revolution. <p>The following settings can be configured through "Electronic gear ratio" for PTO position control:</p> <ul style="list-style-type: none"> • Gear ratio configuration Set the number of PTO pulses per motor revolution to transfer the distance of mechanical movement to a controller.
Limits	Limit values can be set and adjusted in the table. Changes made are automatically reflected in the linked diagram.
I/O configuration	In the table, a function can be assigned to an input or output of the terminal. Specified functions can be selected. Do not assign a function to more than one input or output.
Fieldbus and telegrams	The PROFINET interface X150 can be configured and a PROFIdrive telegram can be selected.
Drive functions	<p>The "Setup-functions" list is created and managed under "Parameters" > "Parameter List". You can add parameters to the list. This allows uniform access to the parameters of a drive function.</p> <p>Further configuration options are displayed by clicking on the tool icon .</p>

The converter retentively saves the settings after commissioning has been successfully completed.

7.4.1.3 Basic positioner (EPOS) commissioning

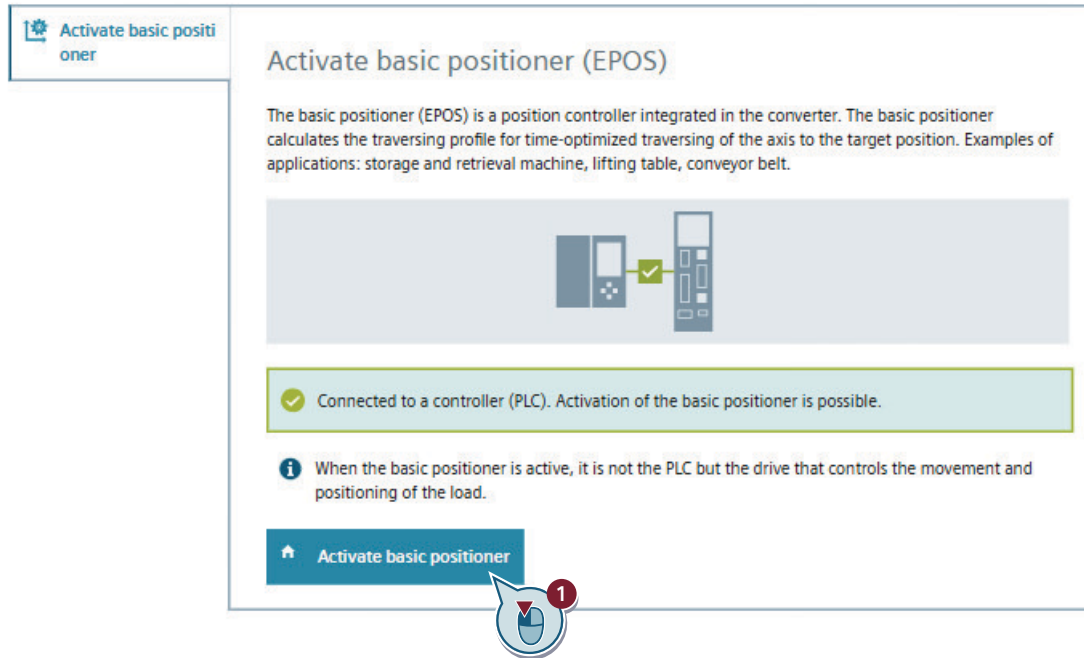
Requirement

- The drive system has been connected to the PLC.
- No other user has started commissioning.
- When UMAC is activated, ensure that the necessary rights for editing drive data have been assigned.
- (Recommended) You have completed quick setup or advanced setup.

Procedure

1. In the "Basic positioner (EPOS)" function view, click "Activate basic positioner" to activate the basic positioner (EPOS).

When EPOS is active, available EPOS function views appear on the area navigation. The function views are in read-only mode when the commissioning is not started.



2. Click "Start commissioning" to enter the commissioning mode.
The EPOS function views become editable. With the start of commissioning, the converter creates a recovery point. If you cancel commissioning, the converter is reset to the recovery point.

Activate basic positioner

Basic parameters / mechanics

Limits

Homing

Position monitoring functions

Direct setpoint specification (MDI)

Traversing blocks

Jog

Vibration suppression

Activate basic positioner (EPOS)

The basic positioner (EPOS) is a position controller integrated in the converter. The basic positioner calculates the traversing profile for time-optimized traversing of the axis to the target position. Examples of applications: storage and retrieval machine, lifting table, conveyor belt.



✓

The basic positioner is now active and can be configured after pressing the button "Start commissioning".

!

When the basic positioner is active, it is not the PLC but the drive that controls the movement and positioning of the load.

Assigned fieldbus telegram:

Drive control telegram	Standard telegram 7, PZD-2/2
------------------------	------------------------------

Deactivate basic positioner

Basic parameters / mechanics >

Start commissioning



Note

When a higher-level controller is connected, the telegram of the converter follows the controller.

- Configure the EPOS functions according to your application.
The converter saves the configuration in the RAM and applies changes in real time.
For details of each function view, see Chapter "Basic positioner (EPOS) (Page 320)".
- Click "Finish commissioning" to save all the configured settings in the ROM of your converter.

Activate basic positioner

Basic parameters / mechanics

Limits

Homing

Position monitoring functions

Direct setpoint specification (MDI)

Traversing blocks

Jog

Vibration suppression

Basic parameters / mechanics

Drive control telegram: Standard telegram 7, PZD-2/2

Selection of mechanical system and units

☐ Rotating movement ☒ Linear movement

Units	
Position unit	mm
Velocity input	mm/s

Changing the units will require the basic positioner to be recommissioned

- Encoder selection for the position control
- Modulo
- Backlash compensation
- Load gear position tracking
- Encoder evaluation

< Activate basic positioner Limits >

Cancel Finish commissioning

7.4.1.4 Optimization

Overview

After commissioning, you can use the function One Button Tuning (OBT) to optimize the converter settings.

With One Button Tuning, 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, the torque limit can be reduced before OBT. After OBT has been completed, the previous value can be set again.

NOTICE
Material damage caused by an impermissible direction of motion of the motor One Button Tuning runs the motor in both directions. Impermissible directions of motion can damage the machine or installation. <ul style="list-style-type: none">• If a particular direction of motion of the motor is impermissible, do not carry out One Button Tuning.

Description of function

The screenshot displays the Siemens S200 One Button Tuning web interface. The top status bar shows 'S200' and 'Switching on inhibited - Set "Operating condition/OFF3" = "1"'. The navigation menu on the left includes icons for home, tools, and various drive functions. The main content area is titled 'One Button Tuning' and includes a link to 'About One Button Tuning'. The 'Dynamic settings' section has three radio buttons: 'Conservative', 'Standard' (selected), and 'Dynamic'. The 'Machine property' section has a checkbox for 'Activate additional increase of dynamics'. Below these are three buttons: 'Take over control', 'Start optimization', and 'Return control'. A table at the bottom lists parameters with their current and previous values.

Parameter name	Current value	Previous value
P gain	0.0006 Nms/rad	-
Integral time	10.00 ms	-
Load moment of inertia	0.000000 kgm ²	-
Kv factor estimated	0.00 1000 rpm	-
Precontrol symmetrizing time estimated	0.00 ms	-

Figure 7-6 One Button Tuning

The controller settings are optimized using the following settings:

- "Dynamic settings"
 - Conservative
60% dynamic response; speed precontrol without torque precontrol
 - Standard
80% dynamic response; speed precontrol with torque precontrol
 - Dynamic
100% dynamic response; speed precontrol with torque precontrol

Note

By default, the torque precontrol is implemented in the speed controller. You can also implement torque precontrol in the position controller. For more information, see "One Button Tuning (Page 390)".

- "Machine property"

The "Activate additional increase of dynamics" 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.
- "Take over control" and "Return control"

Take over master control before starting to optimize the controller.

Return master control back to the converter once the controller has been optimized.
- "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, then optimization must be repeated with other settings.

7.4.1.5 Testing the converter configuration

Overview

After commissioning, the web server allows you to test the converter configuration in jog mode or continuous motion via the control panel.

Description of function

To test the configuration, the control panel must be open and the speed setpoint entered.

There are two ways of opening the control panel:

- Button "Finish commissioning" > Dialog query with selection option "Open control panel"
- Action bar > "Control panel"

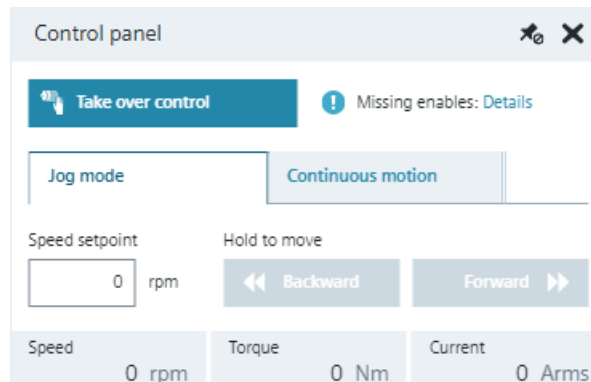


Figure 7-7 Testing the converter configuration via the control panel

More information

For more information, see Section "Control panel (Page 235)"

7.4.1.6 Safety Integrated commissioning (for S200 PN only)

Overview

The "Safety Integrated" function view provides a commissioning wizard to guide you through the commissioning of the Safety Integrated Functions of the converter; in addition, it offers a read-only mode for quick navigation through the Safety Integrated commissioning settings.

When the Safety Integrated commissioning process starts, the converter automatically enters a safe state and activates the Safe Torque Off (STO) function.

Changes to Safety Integrated settings are only possible in "Safety Integrated commissioning" mode.

Requirement

- The drive system has been configured. The components are wired.
- If UMAC is activated, you must have the "Edit Safety Integrated application" function right to modify the Safety Integrated settings.

Description of function

The commissioning process for Safety Integrated Functions must be completed in full. No settings are applied if the process is interrupted.

When starting Safety Integrated commissioning, the converter automatically activates "Safety Integrated commissioning" mode and creates a restore point. The converter saves your

settings automatically after each step. If you cancel the commissioning process before completion, the converter restores all settings from the restore point.

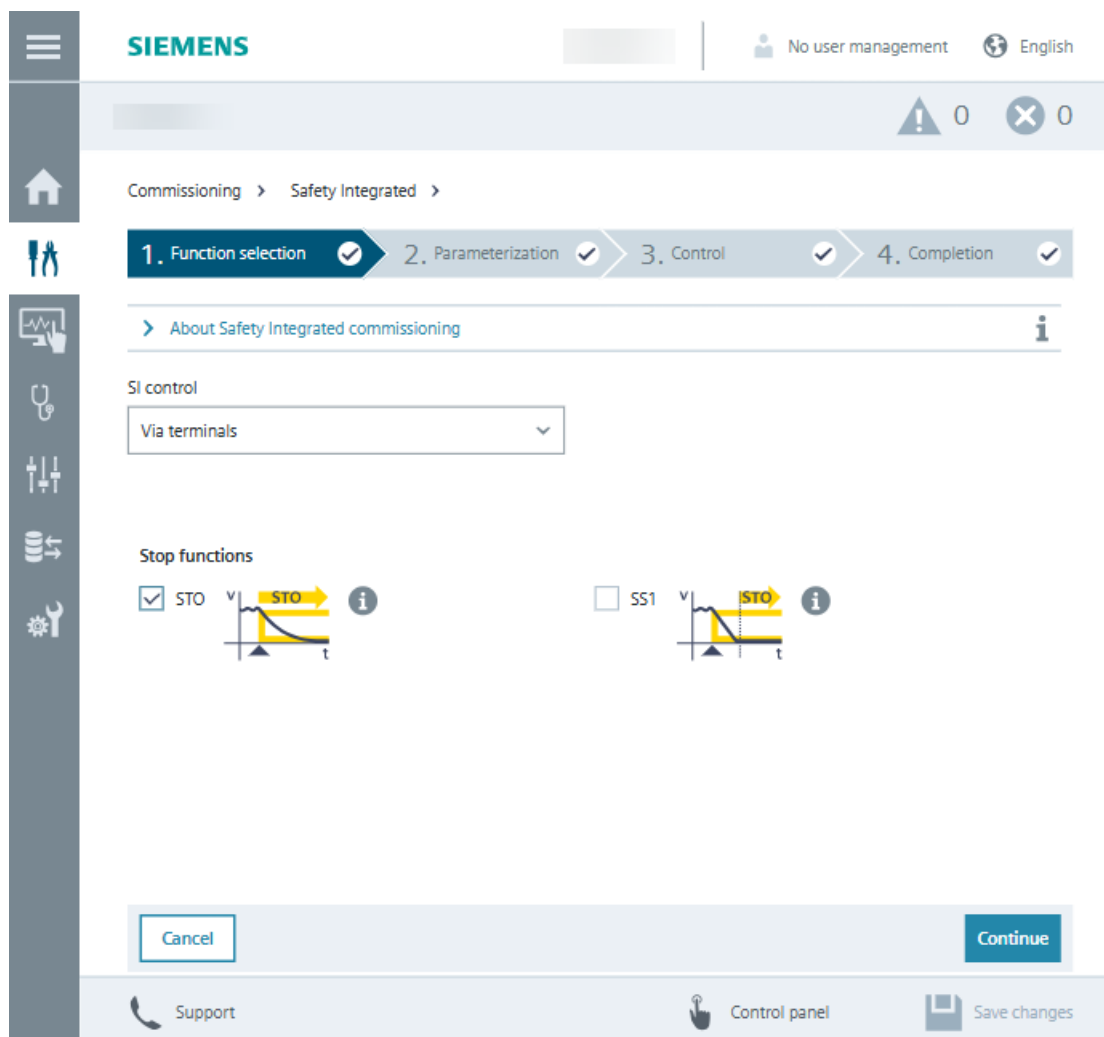


Figure 7-8 Safety Integrated commissioning

Safety Integrated commissioning involves the following steps:

1. Function selection
 - Select the Safety Integrated control type.
 - Select the available Safety Integrated Functions depending on the control type.
2. Parameter assignment

Configure the activated Safety Integrated Functions.

The web server displays function-dependent views with graphical representations. You can modify the parameter values according to your application requirements.

7.4 Functions and menus

3. Control
Configure the selected Safety Integrated control type.
4. Completion
Click "Finish" to complete and apply the configurations.
 - The converter applies the parameter assignments.
 - The converter calculates checksums.

More information

For more information about Safety Integrated Functions, see Chapter "Safety Integrated (for S200 PN only) (Page 358)".

7.4.2 Monitoring and operation

7.4.2.1 Drive status

Overview

Function view "Drive status" shows the current status of the converter.

Description of function

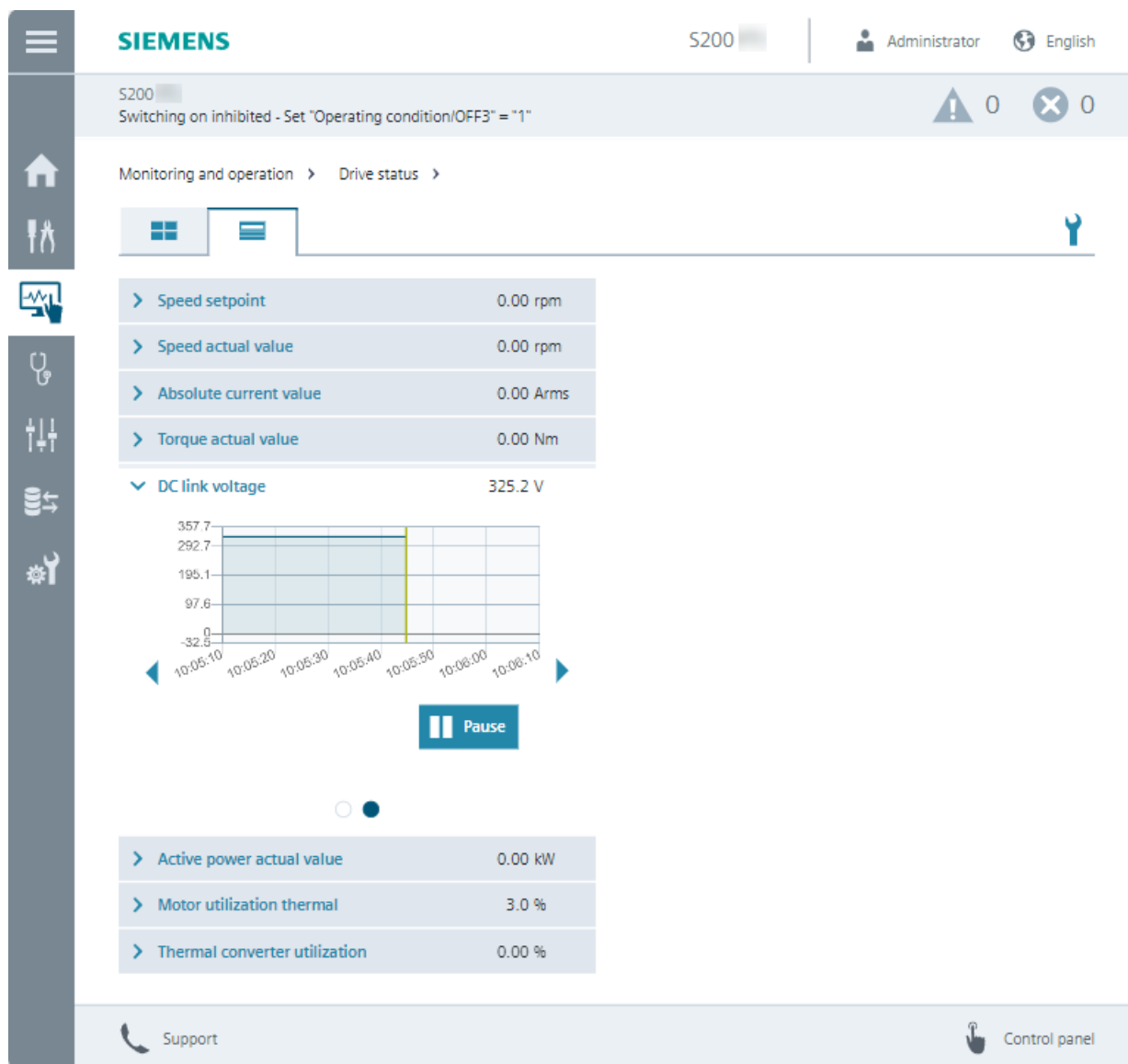


Figure 7-9 Drive status

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

7.4.2.2 Inputs/outputs

Overview

The function view "Inputs/outputs" shows the status of all inputs and outputs.

Description of function

The screenshot shows the Siemens S200 PN web interface. The top header displays the Siemens logo, the system name 'S200 PN', the user 'Administrator', and the language 'English'. Below the header, a status bar indicates 'S200 PN: Switching on inhibited - Set "Operating condition/OFF2" = "1"' with warning and error icons showing 0 counts. The main content area is titled 'Monitoring and operation > Inputs/outputs >'. It contains two tables: 'Digital inputs' and 'Digital outputs'. The 'Digital inputs' table lists DI 0 (X130.1) Measuring input 1, DI 1 (X130.2) Measuring input 2, DI 2 (X130.3) -, and DI 3 (X130.4) -, all with a 'Low' value. The 'Digital outputs' table lists DO 0 (DO+: X130.11 / DO-: X130.12) Operation enabled and DO 1 (DO+: X130.13 / DO-: X130.14) Fault present, both with a 'Low' value. The bottom of the interface has a 'Support' link and a 'Control panel' button.

Digital inputs	Value
DI 0 (X130.1) Measuring input 1	Low
DI 1 (X130.2) Measuring input 2	Low
DI 2 (X130.3) -	Low
DI 3 (X130.4) -	Low

Digital outputs	Value
DO 0 (DO+: X130.11 / DO-: X130.12) Operation enabled	Low
DO 1 (DO+: X130.13 / DO-: X130.14) Fault present	Low

Figure 7-10 Inputs/outputs

The function view "Inputs/outputs" shows the following information:

- Name and terminal marking of the input and output
- Function of the input and output
- Actual value, e.g. "high" or "low" for a digital input

7.4.2.3 Manual operation

Overview

The function view "Manual operation" enables you to perform the following operations:

- View the active operation mode of the converter
- Toggle between the manual and automatic modes for the converter
- Monitor the real-time drive status

Requirement

- If user management is active, the function right "Control drive in manual mode" is required to access the function view.
- To switch the operation mode using the function view, ensure that the following requirements are met:
 - You have completed quick setup or advanced setup.
 - The master control is not taken by other sources including the control panel on the action bar, another web server client, and the operator panel of the converter.

Description of function

Product-specific information and settings are covered over in the diagram.

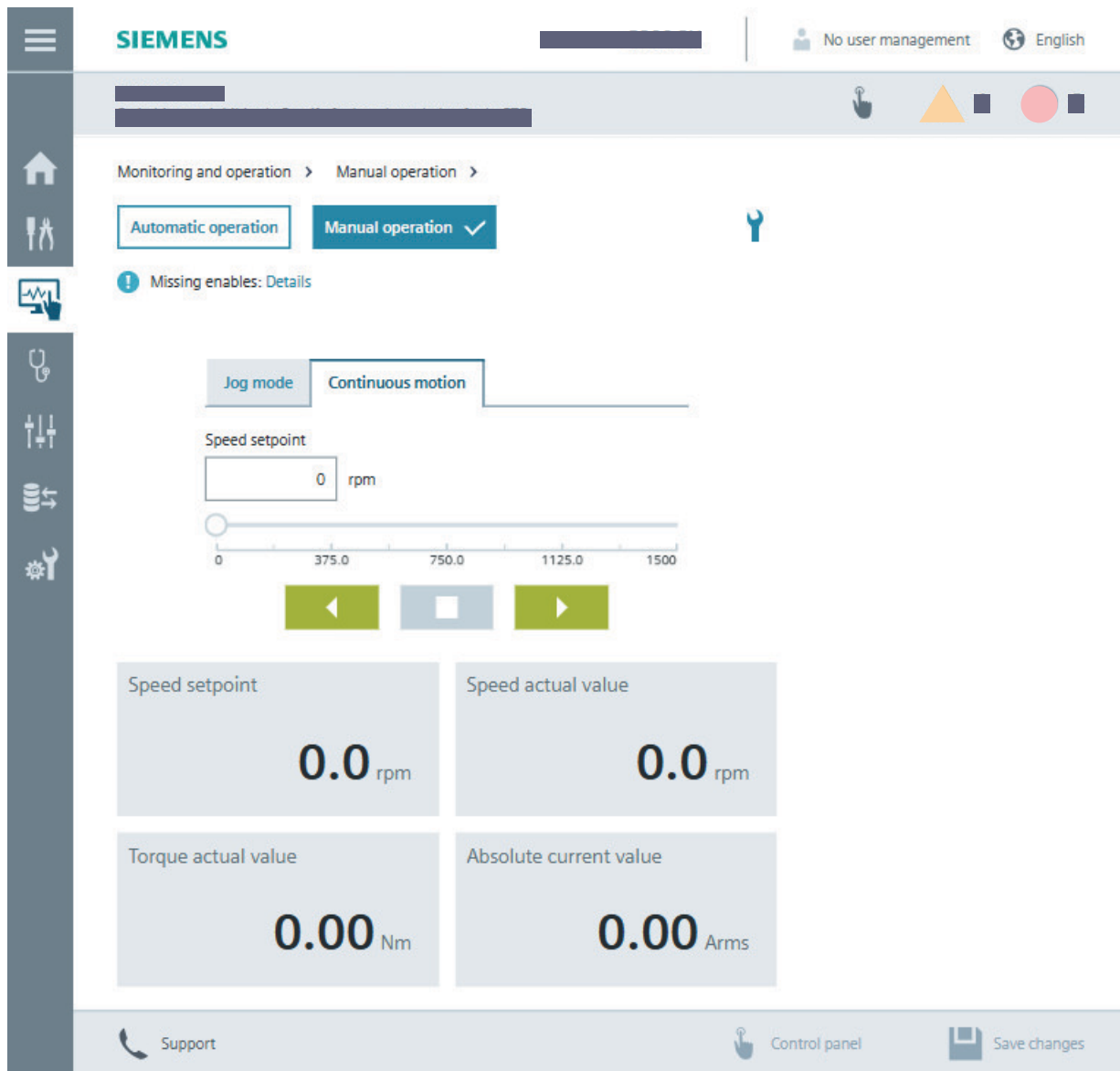


Figure 7-11 Manual mode

When mode switchover is possible on the function view, clicking on a button directly activates the corresponding operation mode:

- **Manual operation**
The operating unit takes over the master control. The control panel on the action bar is deactivated to prevent control conflicts. You can move the motor through the control area.
- **Automatic operation**
A higher-level controller takes over the master control.

The four parameters shown on the drive status display are preset at the factory. If user management is inactive, you can change the displayed parameters using the icon ; otherwise, the function right "Edit web server configuration" is additionally required.

7.4.3 Diagnostics

7.4.3.1 Messages

Overview

The function view "Messages" shows active and historical messages.

Description of function

The screenshot shows the Siemens S200 web interface. At the top, there is a header with the Siemens logo, the text 'S200', and user management options. Below the header, a status bar indicates 'Switching on inhibited - Carry out first commissioning' with 2 warning icons and 0 error icons. The main content area is titled 'Diagnostics > Messages >'. It features a 'Search and filters' section with a search box, a date filter, and a message type dropdown. Below this, a table lists messages with columns for Type, Incoming, Class, Message, and Outgoing. Two messages are shown: an alarm about safety configuration and a fault about DC link voltage. A sidebar on the left contains navigation icons for home, tools, and settings. At the bottom, there are links for 'Support' and 'Control panel'.

SIEMENS S200 No user management English

S200 Switching on inhibited - Carry out first commissioning 2 0

Diagnostics > Messages >

Search and filters

Search Message text Filter by date YYYY-MM-DD to YYYY-MM-DD Message types All

Show message history

Current drive time: 2020-01-02 07:46:08 Acknowledge faults

Type	Incoming	Class	Message	Outgoing
Alarm	2020-01-02 07:43:53	18	1637: SI: Safety configuration not protected	-
Alarm	2020-01-02 07:43:59	2	30016: Power unit: Load supply switched off (2)	-

Support Control panel

Figure 7-12 Messages

With search and filter options, the alarms and faults can be narrowed down.

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: |
- All
 - Fault
 - Alarm

Displaying messages

Type	Displaying the message type: <ul style="list-style-type: none"> • Alarm • Fault
Incoming	Time when the message was received
Class	Assigning the message to a message class according to PROFIdrive <ul style="list-style-type: none"> • The message number is output on all operating units, e.g. PC.
Message	Specification of the message number with message text
Outgoing	Time when the message went <ul style="list-style-type: none"> • Faults are given the status "Outgoing" if the following are true: <ul style="list-style-type: none"> – The causes have been eliminated. – The message has been acknowledged.
	Selection for more information: <ul style="list-style-type: none"> • Description of the message with cause and remedy

7.4.3.2 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

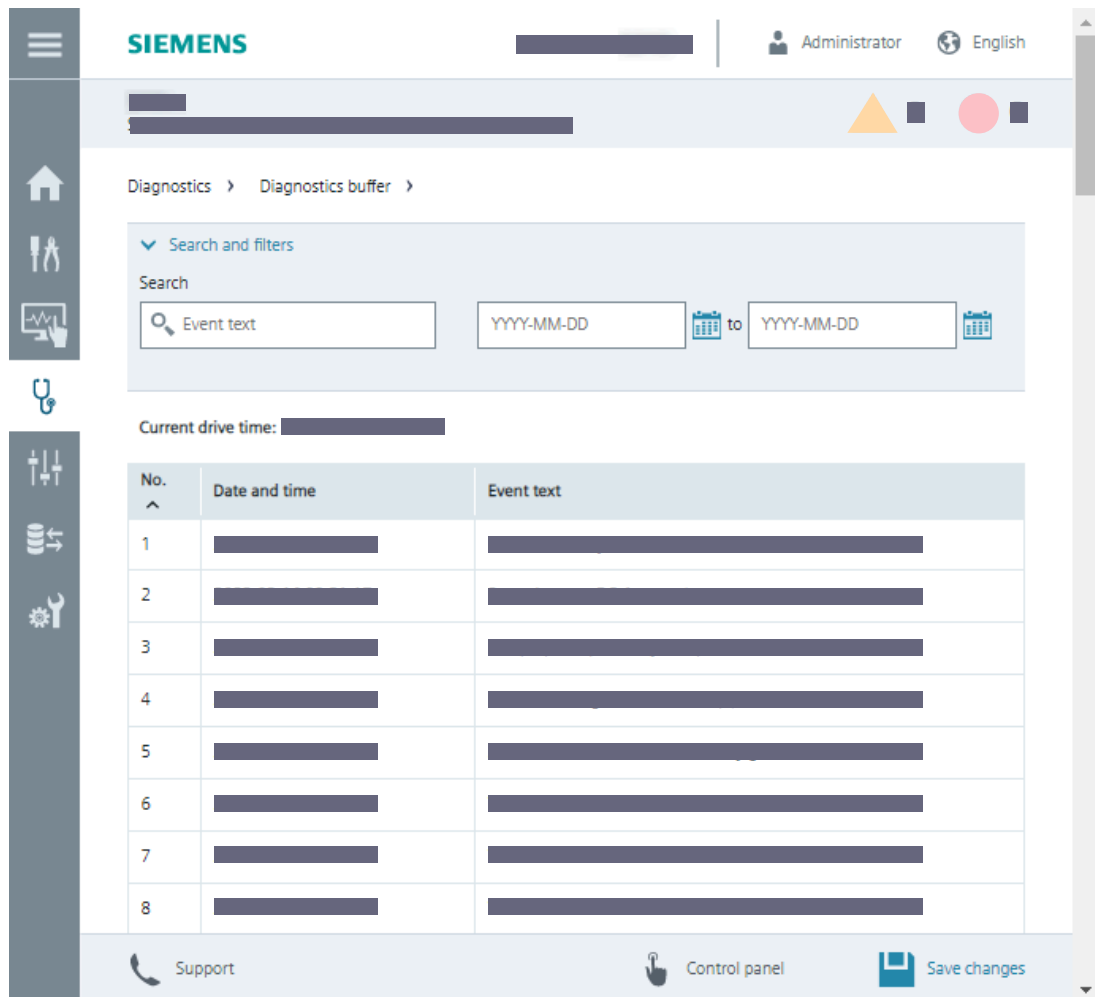


Figure 7-13 Diagnostics buffer

Reading out the diagnostics 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 diagnostics buffer can only be cleared by performing a manual reset to factory settings with a memory card. For more details, see Section "Full reset of all device settings (Page 573)".

The diagnostics buffer is kept when restoring factory settings via menu "Backup and restore".

7.4.3.3 Safety Integrated (for S200 PN only)

Overview

Function view "Safety Integrated" provides information about the Safety Integrated Functions that have been enabled.

Description of function

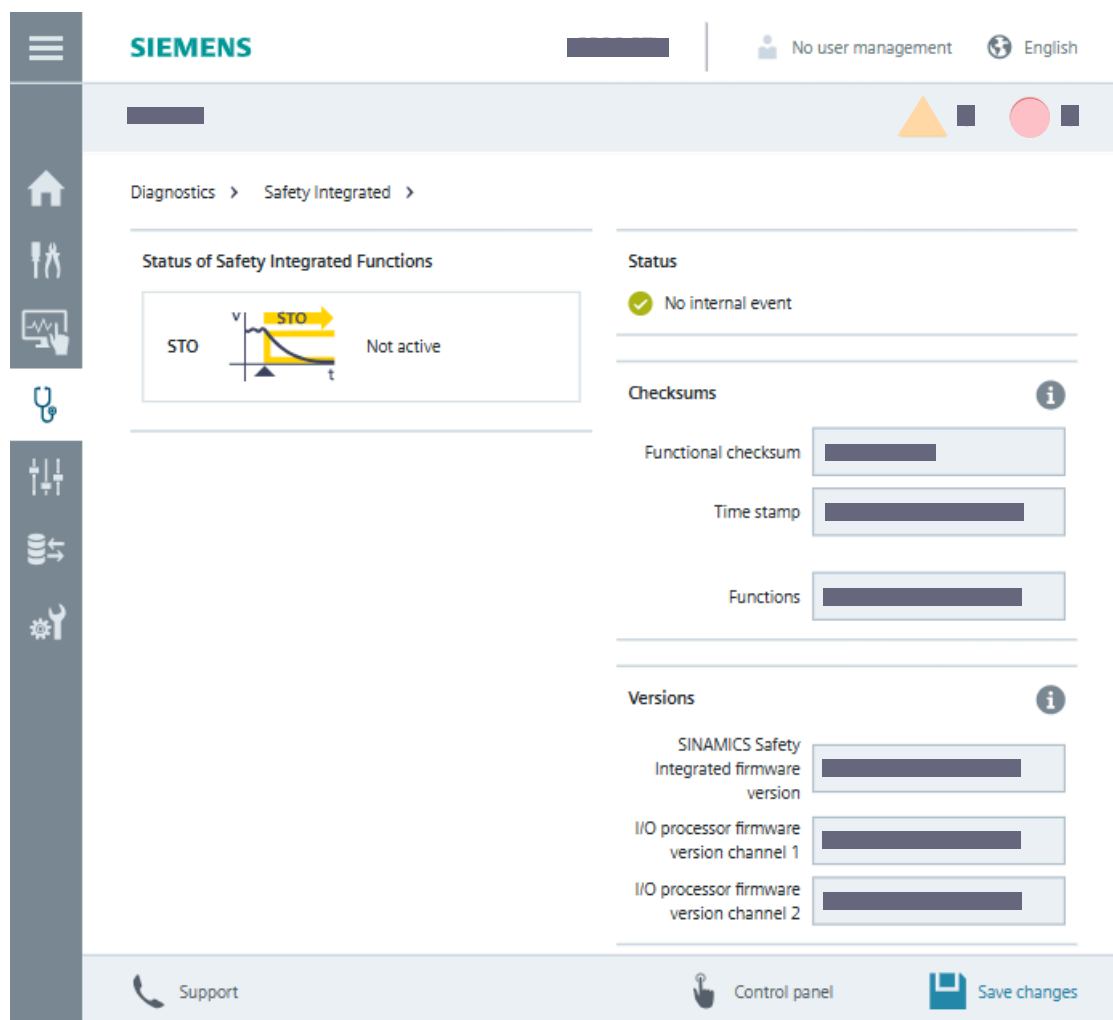


Figure 7-14 Monitoring Safety Integrated Functions

The following content is displayed:

- "Status of Safety Integrated Functions"
Displays the status of the enabled Safety Integrated Functions
- "Status"
Displays the internal events (e.g. system errors)
- "Checksums"
 - "Functional 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
 - "Time stamp"
The time stamp indicates when the update was made.
- "Versions"
Displays the safety-relevant software versions of the corresponding components

7.4.3.4 Connection overview

Overview

Function view "Connection overview" provides information about the connections in the drive system.

Description of function

The individual components with IP address and additional details are graphically displayed in the connection overview.

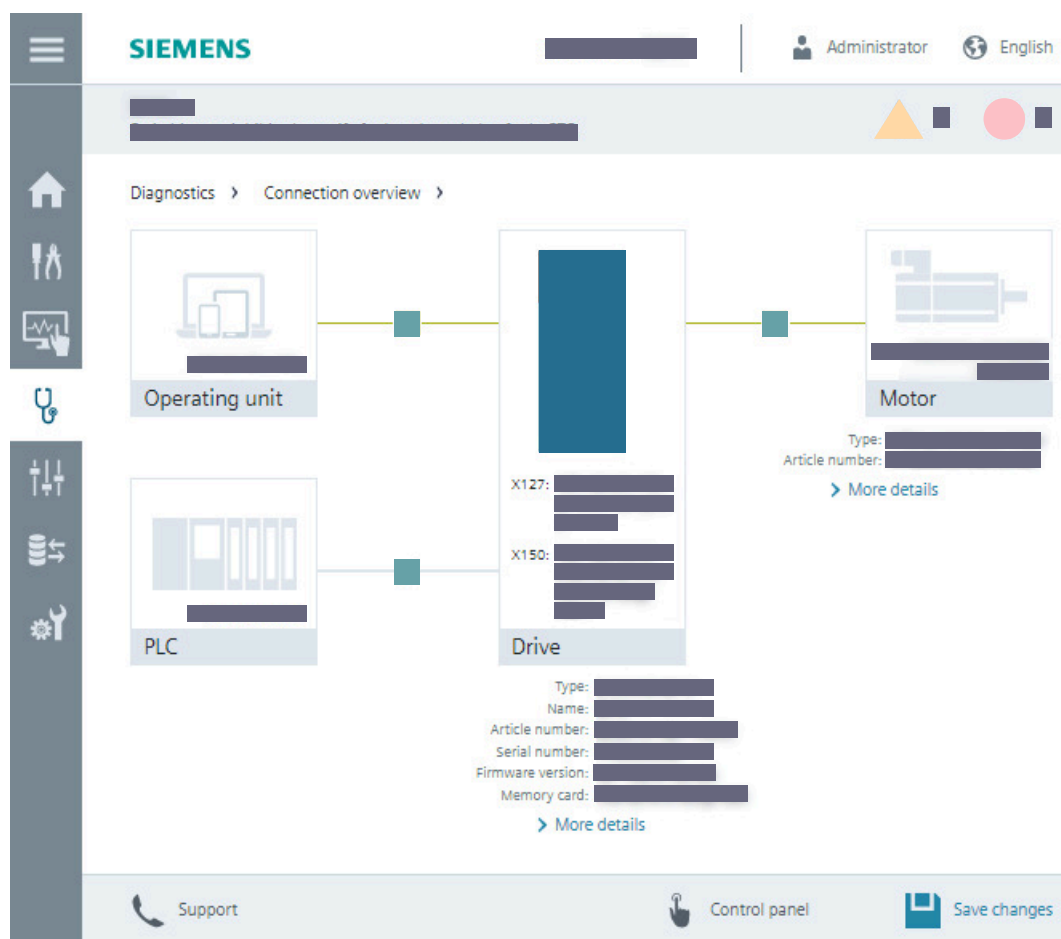


Figure 7-15 Connection overview

7.4.3.5 Communication

Overview

Function view "Communication" provides information about the activated fieldbus protocol.

Description of function

SIEMENS S200 PN Administrator English

S200 PN: Switching on inhibited - Carry out first commissioning

Diagnostics > Communication >

Fieldbus standard: PROFINET Name of station: -
 IP address: 0.0.0.0 Cyclic connection diagnostics: Not connected

PROFIdrive PZD telegram selection: SIEMENS telegram 105, PZD-10/10

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

Support Control panel Save changes

Figure 7-16 Communication

The following content is displayed:

- Connection status
- Process data of the set telegram in the send and receive directions.
Telegrams are selected by users with corresponding function rights during converter commissioning as part of advanced setup.

The values are shown in the hexadecimal format. The display of individual values is switched between the binary, decimal, and hex format by clicking on the button to the right of the value.

7.4.3.6 Status word and control word

Overview

Function view "Control/status word" provides information about the current status of the sequence control system.

Description of function

SIEMENS S200 Administrator English

S200 Switching on inhibited - Set "Operating condition/OFF3" = "1"

Diagnostics > Control/ status word >

Parameter	Value
Control word sequence control	143A H
00: ON/OFF1	No
01: Operating condition / OFF2	Yes
02: Operating condition / OFF3	No
03: Enable operation	Yes
04: Enable ramp-function generator	Yes
05: Continue ramp-function generator	Yes
06: Enable speed setpoint	No
07: Command open brake	No
10: Master control by PLC	Yes
12: Enable speed controller	Yes
14: Command close brake	No

Parameter	Value
Status word sequence control	2250 H
00: Ready for switching on	No
01: Ready	No
02: Operation enabled	No
03: Jog active	No
04: No coasting active	OFF2 inactive
05: No Quick Stop active	OFF3 active
06: Switching on inhibited active	Yes
07: Drive ready	No
08: Controller enable	No
09: Control requested	Yes
11: Pulses enabled	No
12: Motor holding brake control	No
13: Motor holding brake status	Yes

Support Control panel

Figure 7-17 Control and status word

Control and state word show all signals of the sequence control.

7.4.3.7 Trace

Overview

The function view "Trace" allows for the recording of signal characteristics in the converter.

Requirement

- If user management is active, the function right "Perform drive diagnostics" is required to access the function view.

Description of function

Product-specific information and settings are covered over in the diagrams.

The screenshot displays the Siemens web interface for trace configuration. The top navigation bar includes the Siemens logo, a user profile icon, and settings for 'No user management' and 'English'. The main content area is divided into two tabs: 'Configuration' (selected) and 'Time diagram'. Under the 'Configuration' tab, there is a section for 'Trace configuration templates' which includes a table of templates and an 'Apply' button. To the right, the 'Signals' section contains a warning message and a table for adding parameters. At the bottom, there are sections for 'Recording' and 'Trigger' settings, and an 'Activate recording' button.

Configuration template	Created by
Analyze speed controller behaviour	Siemens
Check drive status	Siemens
Check speed history	Siemens
Check speed ramp-up	Siemens
Diagnose speed controller errors	Siemens
Diagnose sporadic errors	Siemens

No.	Parameter number and name
1	Add parameter or choose from list
2	Add parameter or choose from list
3	Add parameter or choose from list
4	Add parameter or choose from list
5	Add parameter or choose from list
6	Add parameter or choose from list
7	Add parameter or choose from list
8	Add parameter or choose from list

Figure 7-18 Trace configuration

Configuration

You define the following conditions in the tab "Configuration" before activating the recording:

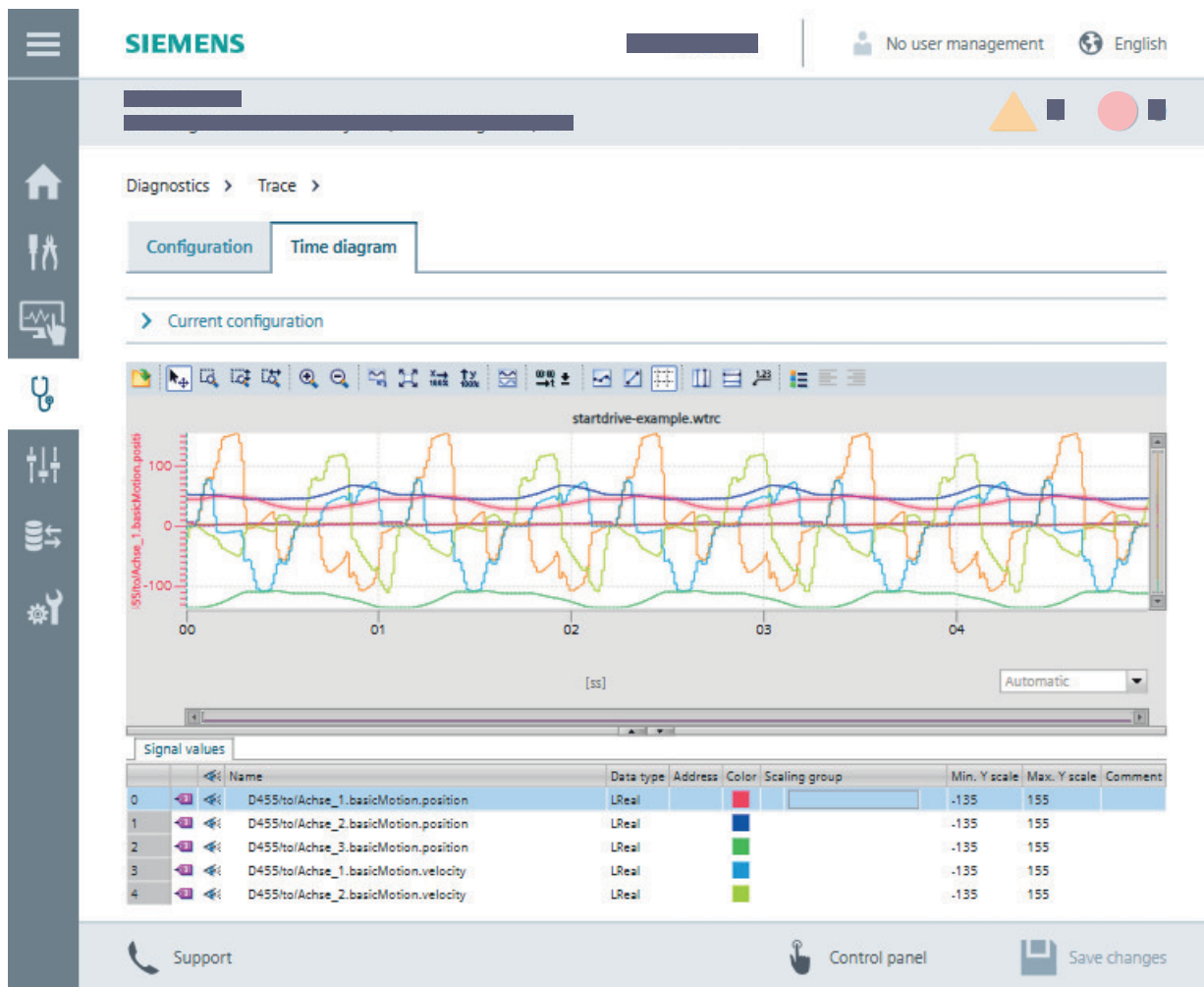
- Signals to be traced
- Recording duration
- Trigger condition

To simplify the configuration process, the tab also provides a list of trace configuration templates preset for various diagnostic purposes. When you select a trace template and click the "Apply" button, the signal selection and recording conditions of your trace configuration are automatically updated. You can directly use the configuration or make additional adjustments before activating the recording.

You can view the results in the tab "Time diagram". You can also export them in either web server format (.WTRC file) or Startdrive format (.ACX file).

Time diagram

The "Time Diagram" tab allows you to view trace results directly after the recording or from a loaded .WTRC file.



- ① Current configuration Shows the trace configuration and time stamp of the recording.
- ② Toolbar Provides options that adapts the display of the time diagram.
- ③ Time diagram Displays the recorded signal measurements over time.
- ④ Signal table Lists the signals shown in the diagram and provides setting options.

Figure 7-19 Time diagram

The following table shows the functions of the icons for adapting the display of the time diagram:

Table 7-2 Toolbar of the time diagram

Icon	Function	Description
	Open measurement	Loads an existing trace recording.
	Move	Moves the display with the mouse button pressed.
	Zoom selection	Selects an arbitrary range with the mouse button pressed. The display is scaled to the range selection.
	Zoom vertical/horizontal	Selects a vertical/horizontal range with the mouse button pressed. The display is scaled to the range selection.

Icon	Function	Description
	Zoom in/out	Enlarges/reduces the display.
		
	Standard view	Restores the display to the initial view.
	Display all	Scales the display of the available data so that the entire time range and all values are displayed.
	Display 100% in Y-axis	Scales the display so that all values are visible for the currently displayed time range.
	Display 100% in X-axis	Scales the display so that all values within the currently displayed value range are visible for the entire time range.
	Arrange in tracks	Activates the track arrangement. The signals are arranged among themselves with the relevant value axes. Scaling groups are displayed in the same trace. This setting does not affect the display for the bit tracks.
	Change X-axis unit	Changes the unit of the time axis. The following options are possible: <ul style="list-style-type: none"> • Samples • Relative time • Absolute time When the X-axis is displayed based on relative time, a drop-down list for selecting the unit is available below the curve for the time axis. The "Automatic" setting automatically adjusts the unit based on the displayed time range.
	Measuring points	Displays the measuring points as small circles on the curves.
	Interpolated view	Displays the linear interpolation between two consecutive measuring points for floating point numbers. If linear interpolation is not enabled (default), the connection between the measuring points is drawn in steps.
	Raster	Shows/hides the grid display.
	Show vertical cursor	Shows the vertical measurement cursor. The vertical position of the two measurement cursors can be moved using the mouse. The associated measured values and the difference of the measurement cursors corresponding to the position are shown in the signal table. You can also use the "Vertical cursor" pane to view the values and reposition the measurement cursor through entering the value.
	Show horizontal cursor	Shows the horizontal measurement cursor. The horizontal position of the two measurement cursors can be moved using the mouse. You can also use the "Vertical cursor" pane to view the values and reposition the measurement cursor through entering the value.
	Show value cursors	Shows/hides the value of the measurement cursors.
	Display chart legend	Shows/hides the legend in the curve diagram and the bit track labels.
	Align the chart legend to the left	Shows the legend and the bit track labels on the left side of the curve diagram.
	Align the chart legend to the right	Shows the legend and the bit track labels on the right side of the curve diagram.

The following table shows the settings and displays of the signal table:

Table 7-3 Setting options and displays in the signal table

Column	Description
	Enables the selection of up to 16 signals for the display in the curve diagram. The dot in the icon indicates that, for the signal in the bit selection, at least one bit has been selected for display as a bit track.
Name	Displays the signal name. A click on the name of a displayed signal updates the scale in the curve diagram.
	Opens the bit selection. Individual bits can be selected for display as a bit track in the lower curve diagram. Select or deselect the relevant bit for display by clicking the  icon.
Data type	Shows the data type of the signal.
Address	Displays the address of the signal. The field remains empty with optimized / type correct tags.
Color	Shows the set color of the signal. This color can be changed.
Scaling group	Shows the name of a scaling group. This name can be changed. The Y-scales are scaled identically for all signals of one scaling group. <ul style="list-style-type: none"> Enter an identical signal group name for those signals that are to be scaled identically. Remove signals from the signal group by deleting the signal group name.
Gray field for chain icon	Move the cursor over the gray field or the chain icon ( or ) to add the signal to a scaling group or delete the signal from the scaling group. <ul style="list-style-type: none">  : Adds the signal to a scaling group or creates a new scaling group.  : Removes the signal from the scaling group. For a selected signal with scaling group, the  chain icon displays all signals of the same scaling group.
Input field	Displays the scaling group name. As an alternative to the chain icon, you can assign or delete a group name via text input in this field.
Min. Y-scale	Displays the minimum value for scaling the signal. This value can be changed.
Max. Y-scale	Displays the maximum value for scaling the signal. This value can be changed.
Y(t1)	Displays the value at the position of the first measurement cursor.
Y(t2)	Displays the value at the position of the second measurement cursor.
ΔY	Displays the value difference between the first and the second measurement cursor.
Comment	Shows a comment for the respective signal. The comment can be changed.

7.4.4 Parameters

7.4.4.1 Parameter lists

Overview

Function view "Parameter list" shows all the parameters of the converter. The parameter list allows specific parameters to be changed.

Description of function

The screenshot displays the Siemens Parameter list web interface. The top header includes the Siemens logo, a user status indicator showing 'No user management', and a language selector set to 'English'. The main content area features a breadcrumb trail 'Parameter > Parameter list' and tabs for 'All parameters', 'Setup_functions', and '+ Create list'. Below the tabs is a search and filter section with a search bar, a 'Displayed parameters' dropdown, and filters for 'Parameter group' and 'Parameter types'. An 'Advanced view' button is located to the right of the filter section. The main table lists parameters with columns for 'Parameter', 'Value', and 'Unit'. The table contains several rows of parameters, some of which are redacted with black bars. The bottom of the interface includes a 'Support' link and a 'Control panel' button.

Parameter	Value	Unit
[Redacted]	[Redacted]	
[Redacted]	[Redacted]	rpm
[Redacted]	[Redacted]	rpm
[Redacted]	[Redacted]	Hz
[Redacted]	[Redacted]	Vrms
[Redacted]	[Redacted]	V
[Redacted]	[Redacted]	Arms

Figure 7-20 Parameter list

The function view shows the following tabs:

- Parameter list
Depending on the setting in the "System" menu > Settings, the parameter list shows either all parameters or just the standard parameters.
- User-defined parameter list (optional)
 - The user-defined parameter list contains selected parameters and is created using the  **Create list** tab.
 - "Setup_functions" parameter list
The "Setup_functions" parameter list is intended for parameters that are configurable only in the commissioning mode but not accessible via dialogs of the advanced setup menu. Suggestions are included in the factory setting.
Starting the advanced setup automatically activates the commissioning mode. To enable users to configure these parameters during advanced setup, the parameter list is created and managed with the name "Setup_functions".
Additional parameters can be added to the parameter list. This allows uniform access to the parameters of a drive function, for example.

For more details, see Chapter "User-defined parameter list (Page 223)".

The parameter list offers the following options:

- Toggling between two list views
 - Show as "Simple view" and "Advanced view" with parameter numbers
- Managing user-defined parameter lists
 - Create a user-defined parameter lists
 - Copy the selected parameters to a designated user-defined parameter list
 - Import and export user-defined parameter lists
- 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	Can be read and edited.
		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.

7.4.4.2 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.

7.4.5 Backup and restore

Overview

In the "Backup and restore" function view, you can back up parameters and other settings and restore the settings if necessary.

Description of function

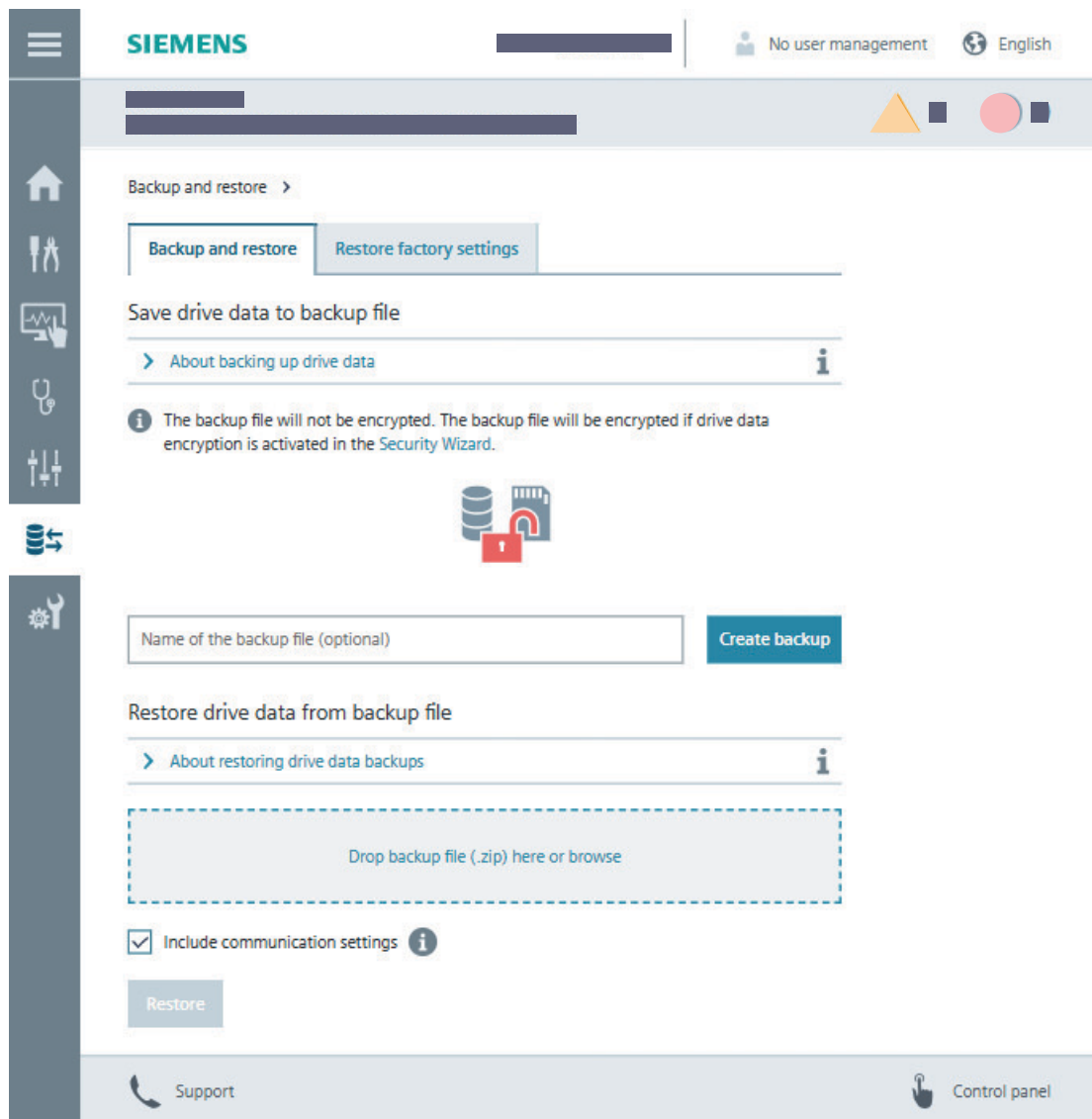


Figure 7-21 Backup and restore

Backup and restore

The following functions are available to back up data and settings:

- **Save drive data to backup file**
Back up the settings to a file after commissioning.
The drive data are encrypted in the backup file if function "Drive data encryption" is activated in the Security Wizard.
- **Restore drive data from backup file**
When replacing a converter or performing series commissioning, you can load the backed-up parameter settings to the converter.
You can select whether to restore the communications interface settings. If you do not want to restore them, the converter retains its current communications interface settings.

Restore factory settings

- Restore factory settings
The user-specific parameterization of the converter is deleted.
- Restore Safety Integrated to factory settings
You only restore the settings of the Safety Integrated Functions to factory settings. All other settings remain unchanged.

Note

When configuring the restore settings, you can select whether to automatically save changes from RAM to ROM after a restore. If you enable this option, the converter automatically saves the changes after the restore.

More information

If you want to restore the converter to factory settings with the memory card, see the information in Chapter "Full reset of all device settings (Page 573)".

7.4.6 System**7.4.6.1 Settings****Overview**

The function view "Settings" offers basic settings for the web server and the converter.

Requirement

- To edit the web server settings, you need the "Edit web server configuration" right.
- To edit the drive settings, you need the "Edit device configuration or drive applications" right.

Description of function**Web server**

The web server offers options for saving changes and displaying parameters.

Interfaces

The web server provides information about the status and the settings of the interfaces of the converter:

- The settings of service interface X127 are configurable.
- The interface settings for the X150 fieldbus interface are displayed.

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.

Maintenance

The web server displays the wear of the converter fan. For converters that do not have a fan, a message is displayed specifying that no fan maintenance is required.

Support settings

The web server provides the option to store additional support and hotline data. The web server displays the data in the function view "Support".

Custom pages

Custom pages extend the web server functionality by enabling the configuration and commissioning of additional converter functions. The custom pages tab becomes visible after you upload the custom page files from your operating unit to the converter.

7.4.6.2 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 Security Wizard at the step "Configure security settings (Page 179)" during first commissioning.
- You are logged into the web server and have the necessary rights to manage users.

Description of function

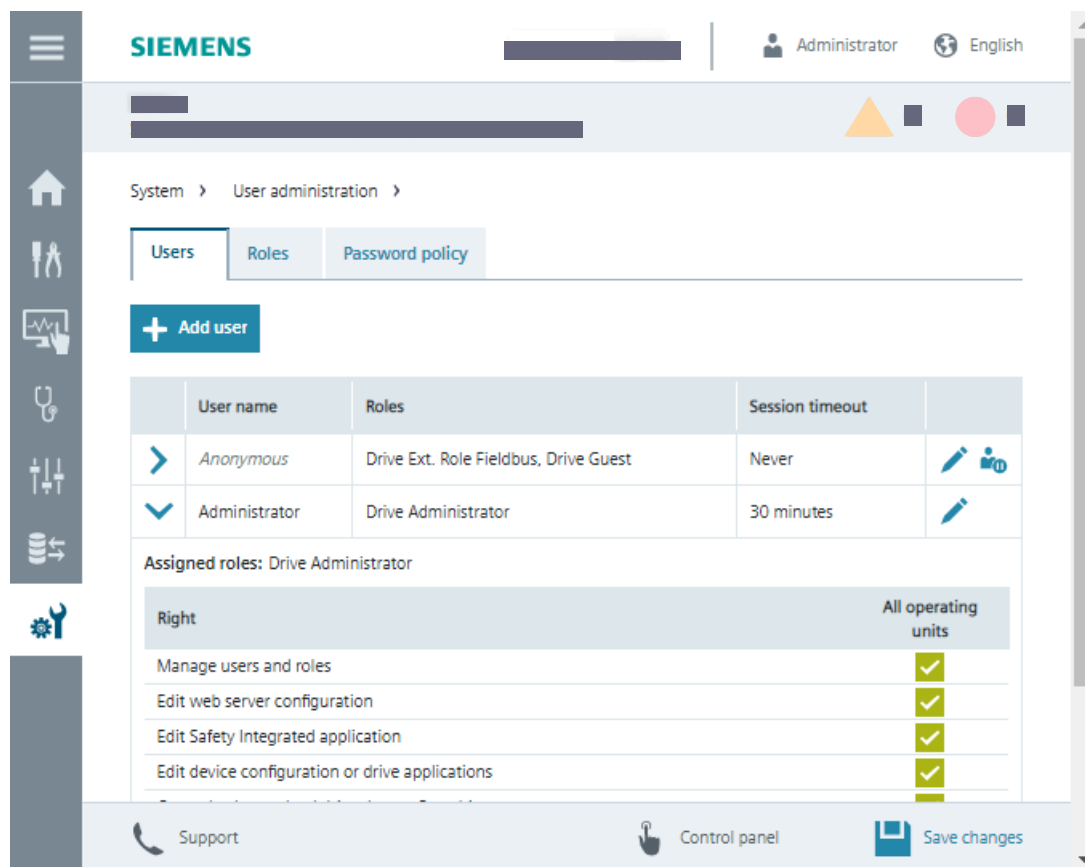


Figure 7-22 User management

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.

Note

Extended role for access via fieldbus protocols

The "Drive Ext. Role Fieldbus" extended role is available for access via fieldbus protocols. If read and write access is required for fieldbus communication (cyclic communication excepted), the "Anonymous" user must be assigned the "Drive Ext. Role Fieldbus" role.

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 Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>).

7.4.6.3 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

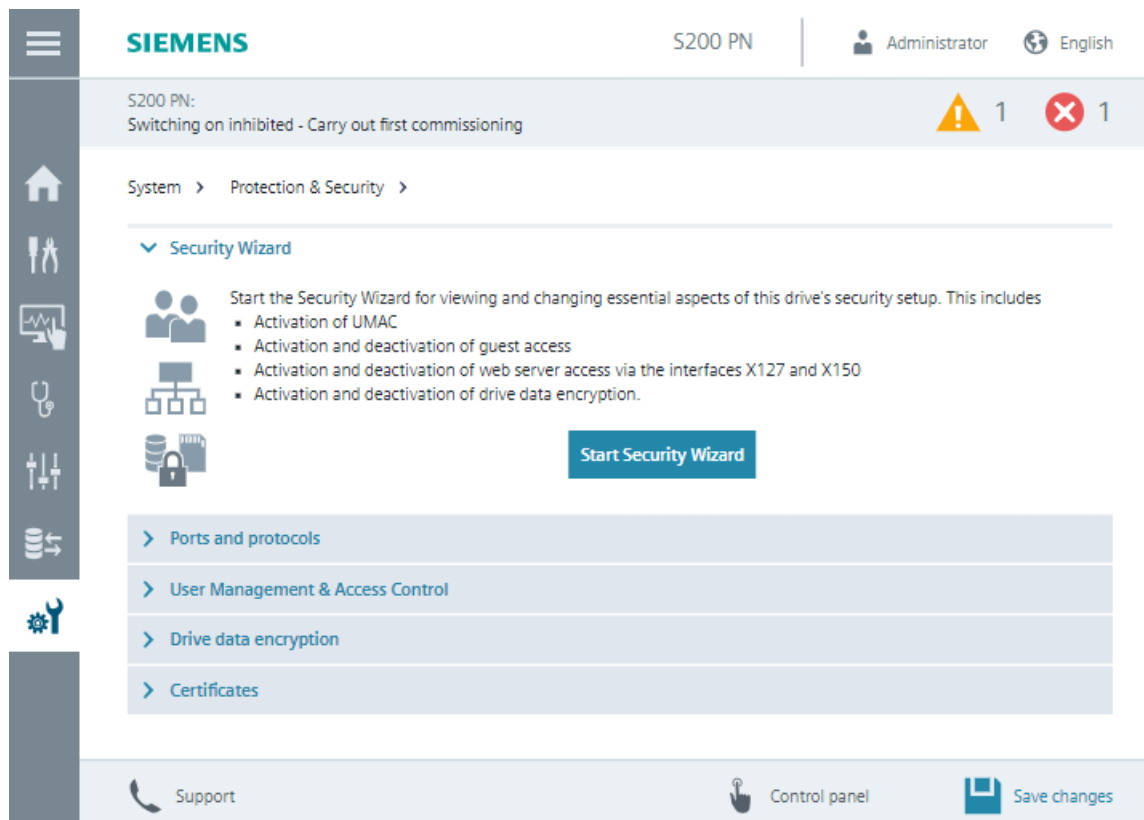


Figure 7-23 Protection & Security

Start Security Wizard

The Security Wizard guides you through the converter security settings, including User Management & Access Control, web server activation, and drive data encryption.

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.

Drive data encryption

The web server shows whether the converter encrypts sensitive drive data.

Certificates

The necessary certificate files are included in the firmware files of the converter. The web server provides an overview of the following certificates used:

- **HTTPS certificate:**
Generated automatically when the web server is called for the first time.
The HTTPS certificate is classified as not trusted when the web server is called for the first time. The browser establishes a non-secure HTTPS connection to the web server. The browser flags the non-secure connection with a security warning. The next time the web server is called, the HTTPS is classified as trusted if it is signed by the root certificate.
- **Root certificate:**
Needed in order for the HTTPS certificate to be signed by a trusted root certification authority. If the root certificate has been imported into the certificate store of the operating unit, the HTTPS certificate will be signed when the web server is called. The browser then classifies the signed HTTPS certificate as valid and establishes a secure HTTPS connection to the web server.

Use "Download certificate to operating panel" to download a certificate to the operating unit. Please keep and install the downloaded certificates in the operating unit.

More information

More detailed information on configuring secure communication is provided in Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>).

7.4.6.4 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 unit is connected online with the drive.

Description of function

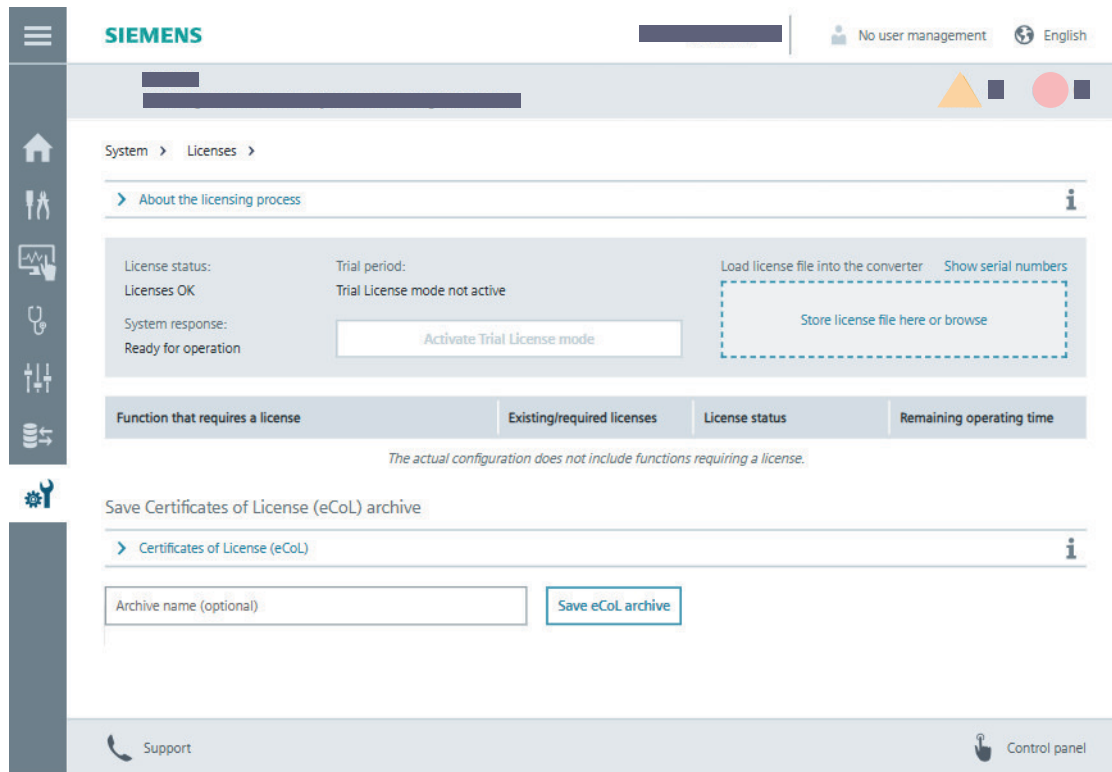


Figure 7-24 Licenses

The function view "Licenses" offers the following functions:

- Display the installed functions requiring licenses
- Read and copy the serial numbers of the following products:
 - The converter
 - The Siemens memory 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.

Save Certificates of License (eCoL) archive

Under "Save Certificates of License (eCoL) archive", you transfer the eCoL to the file system of the operating unit or a memory card.

7.4.6.5 Firmware update

Overview

You can perform a firmware update in the web server:

- For an upgrade, the converter and web server settings are retained.
- For a downgrade, the converter and web server are reset to factory settings. All user-defined settings are reset to the factory settings, including:
 - Parameterization of the converter
 - Activation and settings of User Management & Access Control
 - "IP configuration" and "Device name" of the communication interface
 - Self-generated certificates
 - User-defined parameter lists in the web server

Requirement

You have saved the ZIP file with the firmware to a drive, which you can access using the operating unit.

Description of function

This function view "Firmware update" displays the current version of the firmware and of the web server.

To copy a different firmware version to the converter, load the ZIP file containing the firmware from the file system of the operating unit.

7.4.6.6 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 unit 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 Cybersecurity
- Privacy policy

7.4.7 Support

Overview

The action bar of the web server contains a support dialog.

Description of function

The figure displays two views of the 'Support' dialog box. The left view shows the 'Support' tab with three sections: 'Example' (1) containing contact information, 'Links to the Siemens Industry Online Support' (2) with general and product-specific links, and 'Link to product information' (3) showing a QR code for a specific component. The right view shows the 'Diagnostics report' tab with options to generate and send reports, select report language, content, and transfer method, and a 'Generate diagnostics report' button.

① Additional support and hotline data configured in "Settings"

② Links to product support websites

③ QR codes of online support pages for individual components

Figure 7-25 Support information

Support

Under "Support", you can access links to additional information for the converter.

Diagnostics report

By default, the storage location is the download folder of your operating unit.

The diagnostics report helps technical support by providing basic information on the current state of the converter, for example, in the event of a fault.

The diagnostics report always contains the drive, motor, and encoder data and optionally an overview with errors and messages that have occurred. The time stamps at the top of the report correspond to the local time at the operating unit with technical support and the local time at the converter.

The diagnostics report is provided for downloading and sending as a ZIP file in the Downloads folder of the operating unit used.

If you select the "Write email to" check box, an email with standard text is additionally generated. The email must be updated with the relevant letter text and the diagnostics report as an attachment and sent to the recipient. This function is only available on operating units that support an email application. An Internet connection is required to send emails.

The following figure shows a printout of a diagnostics report:

Diagnostics report

SIEMENS

Created: [REDACTED]

Drive time on creation: [REDACTED]

Component	Type:	Name	Article number Serial number	Firmware version
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]	
[REDACTED]	[REDACTED]		[REDACTED]	
[REDACTED]				
[REDACTED]	[REDACTED]		[REDACTED]	

Current messages:

Type	Incoming	Class	Message	Outgoing
[REDACTED]				

Message history:

Type	Incoming	Class	Message	Outgoing
[REDACTED]				

Diagnostics buffer:

No.	Date and time	Event text
1	[REDACTED]	[REDACTED]
2	[REDACTED]	[REDACTED]
3	[REDACTED]	[REDACTED]

Figure 7-26 Diagnostics report printout

7.4.8 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

<p>⚠ WARNING</p> <p>Unexpected motor movement through incorrect operation</p> <p>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.</p> <ul style="list-style-type: none"> • 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

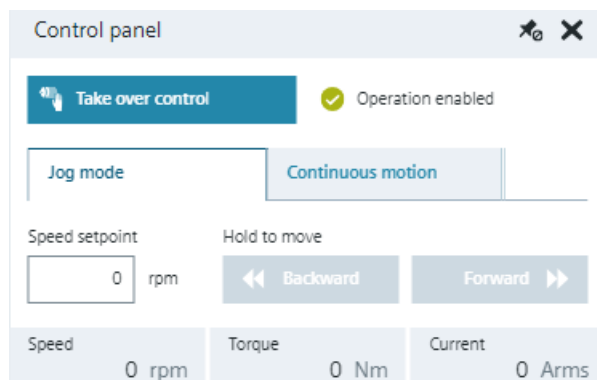


Figure 7-27 Control panel

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)

8.1 Functions of the Startdrive commissioning tool

Overview

SINAMICS Startdrive is software tool for integrating SINAMICS drives into an automation environment. It is a component of the Totally Integrated Automation Portal (TIA Portal).

Requirement

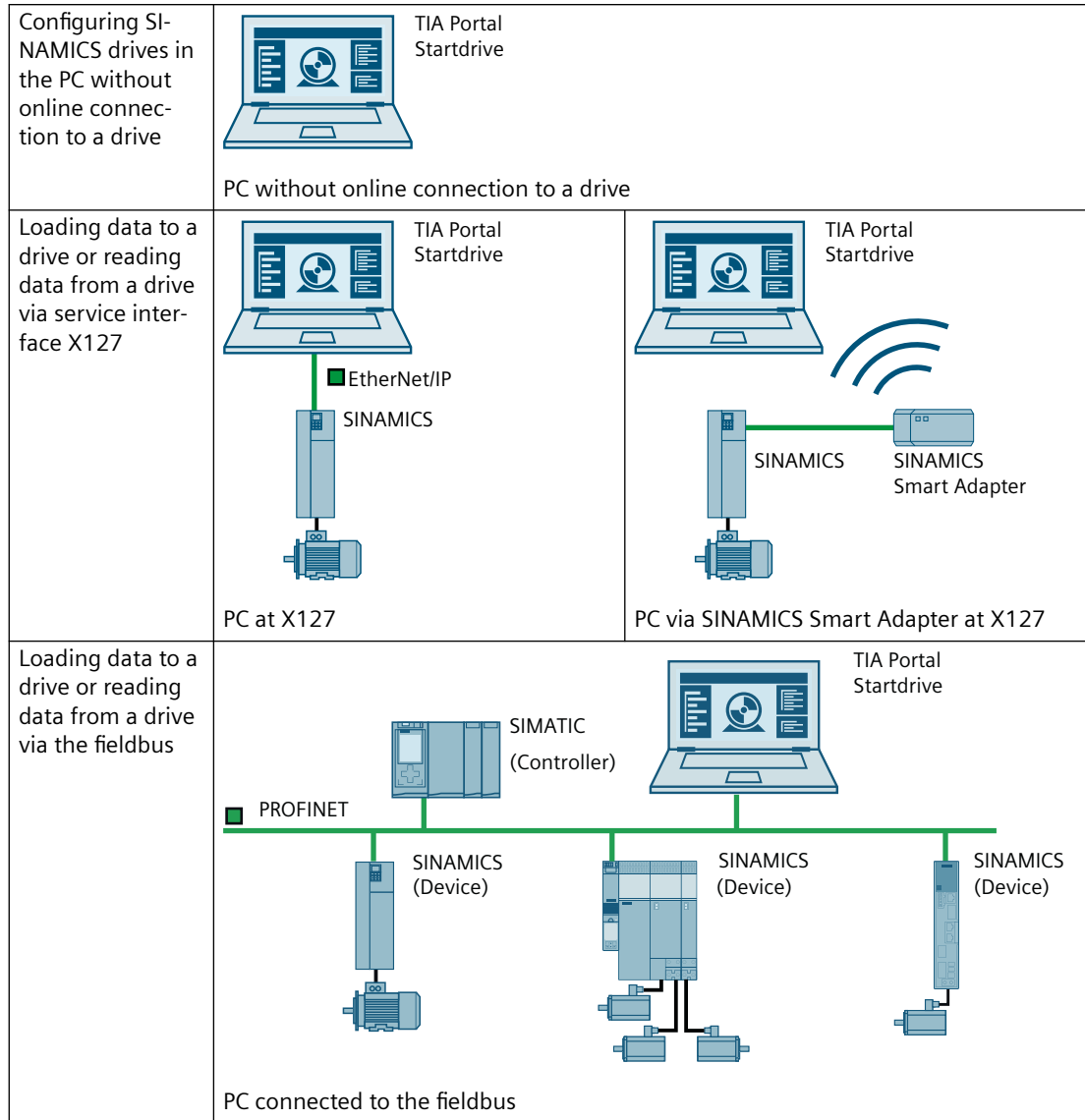
A license is required to use Startdrive Advanced functions.

Description

SINAMICS Startdrive is used to configure and troubleshoot SINAMICS drives.

8.1 Functions of the Startdrive commissioning tool

Startdrive can be used as follows:



SINAMICS Startdrive is available in the Basic and Advanced variants. Startdrive Basic includes all of the essential functions for commissioning and troubleshooting drives. Startdrive Advanced contains additional functions, e.g. the Safety Integrated acceptance test.

SINAMICS Startdrive Basic has the following functions:

- Industrial cybersecurity
 - User and rights management (UMAC)
 - Access protection of the project offline data
 - Access protection of data in the drive
- Commissioning
 - Configuring hardware components of the converter
 - Configuring fieldbus communications with the higher-level control
 - Displaying and setting converter settings:
 - Function view as graphic display
 - Parameter view in list form
 - Automatic controller optimization
- Diagnostics
 - Displaying faults and alarms
 - Acknowledging faults
 - Recording traces of converter signals
 - Displaying firmware versions
 - Comparing the settings of various drives with one another
 - Exporting the user-defined parameter list for the web server
- Support
 - Software wizard to support making industrial cybersecurity settings
 - Software wizard to provide commissioning support
 - Online help
- Maintenance
 - Backing up drive data to the backup file
 - Restoring drive data from a backup file
 - Firmware update

Startdrive supports TIA Portal Openness. TIA Portal Openness is a programming interface (API) to automate workflows in the TIA Portal.

TIA Portal Openness has the following functions:

- Reading and setting converter parameters
- Configuring drives and drive components
- Creating a telegram configuration
- Loading configured drive data into a converter

More information

More information on TIA Portal Openness can be found on the Internet:

- API to automate engineering workflows (<https://support.industry.siemens.com/cs/us/en/view/109826886>)
- Openness for SINAMICS Startdrive and DCC (<https://support.industry.siemens.com/cs/ww/en/view/109763491>)

More information on industrial cybersecurity can be found on the Internet:

Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>)

8.2 Install Startdrive commissioning tool

Overview

The installation package includes both the Basic variant as well as the Advanced variant of Startdrive.

Requirement

The latest STEP 7 version is installed on the PC.

Procedure

Installing Startdrive:

1. Download the current Startdrive version into a target directory of the PC.
The target directory name must not contain any blanks.
2. Open the installation directory by double-clicking on file "STARTDRIVE_BASIC_ADVANCED_Vxx.iso".
Vxx designates the Startdrive version.
3. Install Startdrive by double-clicking on file "Start.exe".

More information

Download STEP 7 and Startdrive: SINAMICS Startdrive (www.siemens.com/startdrive)

8.3 Configuring a drive

Requirement

You have created a new project in Startdrive or have opened an existing project.
In the project, you have added a "new device".

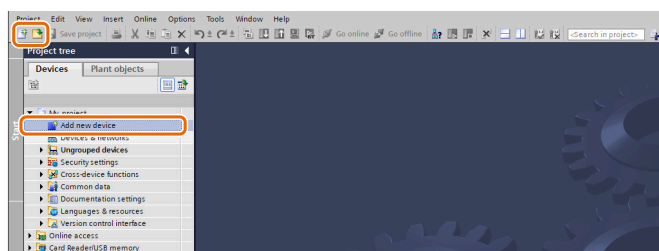


Figure 8-1 Adding a new device to a project

Description

Startdrive displays an incomplete drive configuration as follows:

- A white object in the configuration representation
- Icon  in the inspector window when selecting the corresponding object in the configuration display

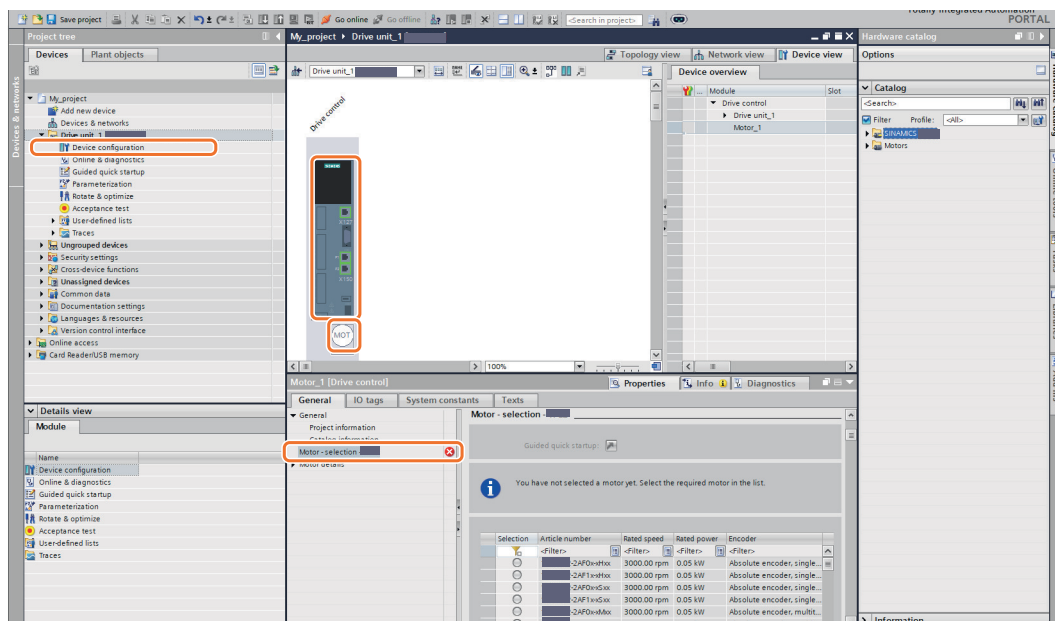


Figure 8-2 Displaying the incomplete configuration of a drive

After the drive has been completely configured, all objects in the configuration representation are colored:

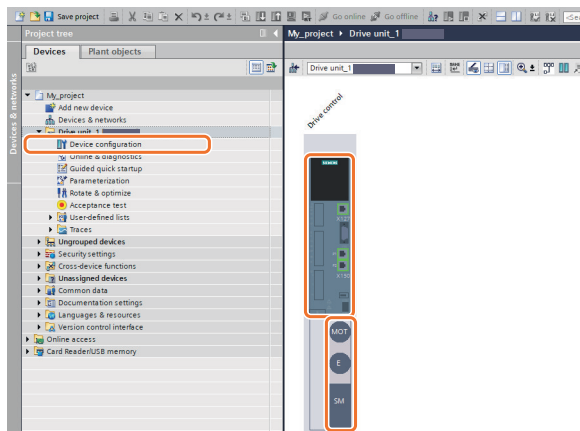


Figure 8-3 Displaying the complete configuration of a drive

8.4 Data management in the drive and on the PC

Description

A Startdrive project on the PC contains the digital image of the real SINAMICS drives.

The following options are available to create the digital image:

- You configure the drives without online connection.
- Via an online connection, Startdrive searches for accessible drives and loads the drive data into the project as digital image.

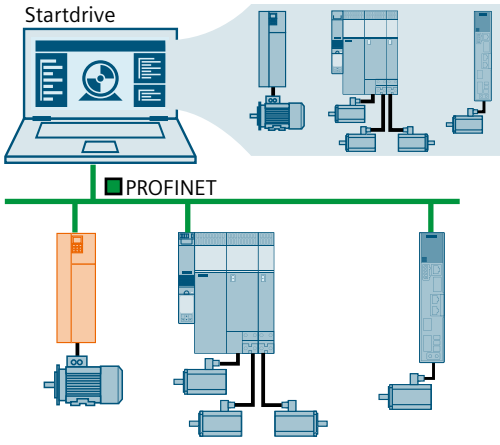
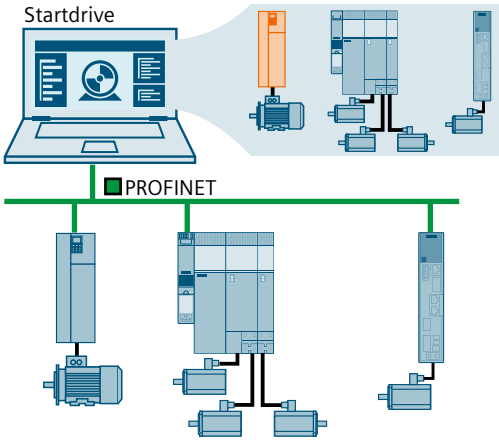
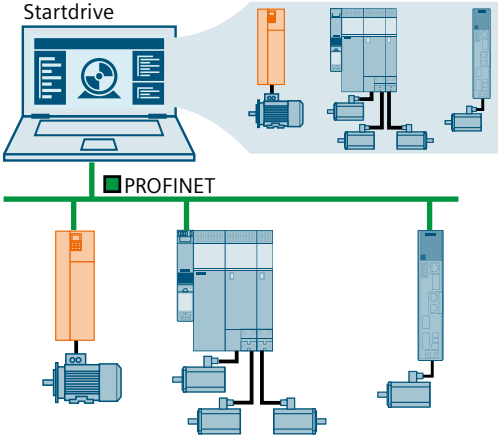
The data of the real drive and the data of the Startdrive project are not always consistent. Inconsistent data has various causes:

- An operator changed the adjustable parameters of a drive at a local operator panel.
- A higher-level control changed the data of a real drive via the fieldbus.
- A service person replaced a drive.
- A configuring engineer changed the drive data in the Startdrive project.

There are 2 options to align the drive data:

- Loading data of the real drive into the Startdrive project
- Loading Startdrive project data into the real drive

Table 8-1 Aligning the drive data

	Loading data of the real drive into the Startdrive project	Loading Startdrive project data into the real drive
Situation	 <p>Changed drive data of real drives</p>	 <p>Changed drive data in the project</p>
Action	Loading from the device 	 Loading into the device
Result	 <p>The data of the project and the real drives are identical.</p>	

8.5 Online connection to the drive

Description

The following interfaces are available for establishing an online connection to the converter:

Interface	Description of the restrictions
Service interface X127	Default settings: <ul style="list-style-type: none"> • IP address: 169.254.11.22 • Subnet mask: 255.255.0.0 • Data transfer via HTTPS is activated in the factory setting.
	Constraints: <ul style="list-style-type: none"> • Without applying additional measures, an online connection is only permissible in the control cabinet. • Additional measures are required to remotely access the drive, which prevent the following: <ul style="list-style-type: none"> – Misuse through sabotage – Unqualified data manipulation – Interception of confidential data
PROFINET interface X150	Installing the network in a secure protection area must prevent access to cables and open connections.

The IP addresses of the service interface X127 and the PROFINET interface X150 must not be in the same subnet.

More information

More information about the supported protocols is available on the Internet:

Configuration Manual Industrial Cybersecurity (<https://support.industry.siemens.com/cs/ww/en/view/109975311>)

8.6 Guided quick startup

Description

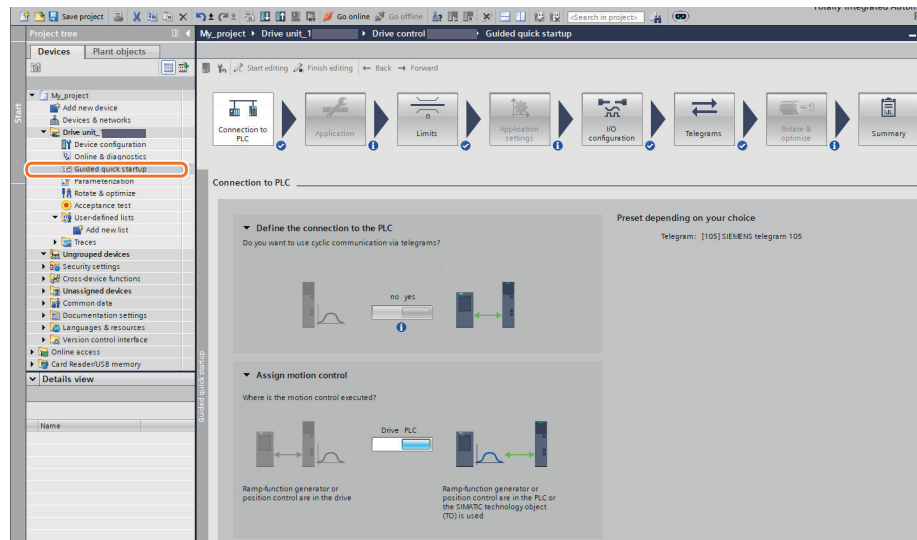


Figure 8-4 Guided quick startup

The guided quick startup supports the following drive settings:

- Communications with the higher-level control
- Activating the basic positioner
- Selecting the speed control
- Automatic optimization of the speed and position controllers
- Speed limits
- Configuring the inputs and outputs

8.7 Simplified or extended view of the functions

Description

Startdrive offers 2 different views of the drive data setting options.

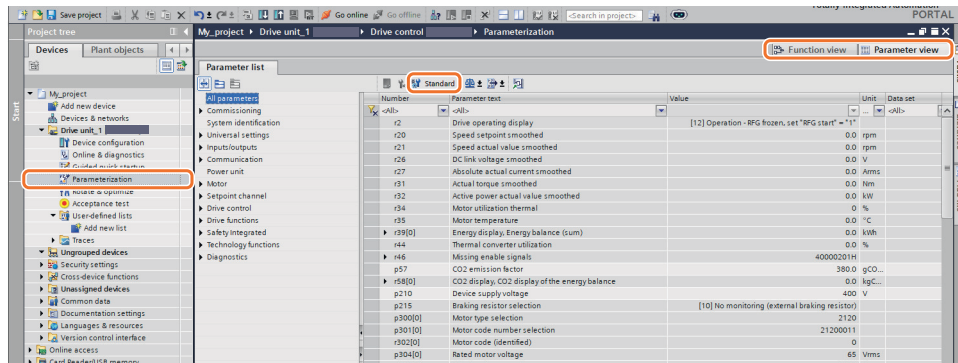


Figure 8-5 Extended view of functions and parameters

If you select "Parameterization" in the project tree, the scope of the displayed functions and parameters and the setting options can be toggled between:

- Standard** Reduces the scope of functions and adjustable parameters in the function view and in the parameter view.
Those drives parameters sufficient for standard applications are visible and adjustable.
- Extended** Displays the extended functions and adjustable parameters.
All drive parameters are visible and can be set.

8.8 Save the changed settings in the drive so they are not lost if the power fails

Overview

Startdrive saves changes to the drive data in a volatile drive memory. After transferring the changes to the drive retentive memory, drive data is also kept even when the power fails.

Requirement

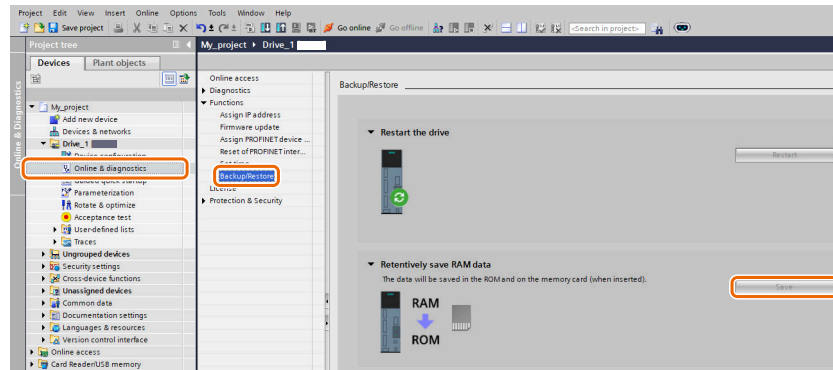
A drive is created in the Startdrive project and you have established an online connection to the drive.

8.8 Save the changed settings in the drive so they are not lost if the power fails

Procedure

The following options are available to save changed drive data settings so that they are protected against power failure.

- Press button .
- Select "Online & diagnostics" > "Functions" > "Backup and restore" > "Save".



If a memory card is inserted, the drive also saves the changes on the memory card.

8.8 Save the changed settings in the drive so they are not lost if the power fails

Series commissioning

9.1 Series commissioning

Overview

For series commissioning, transfer the data and settings of converter 1 to converter 2 or other converters.

Requirement

Converter 2 must comply with the following requirements:

- The rated power of converter 2 corresponds to the rated power of converter 1.
- The firmware version of converter 2 is higher than or equal to the firmware version of converter 1.
- The machines that are commissioned via series commissioning are identical in terms of the application, converter and motor.
- Converter 2 has the factory setting.

Description of function

There are two options when carrying out series commissioning of the converter:

- Series commissioning with memory card
- Series commissioning using commissioning tools

9.2 Series commissioning with memory card

Overview

"Series commissioning using a memory card" transfers the settings of converter 1 using a memory card to converter 2 or to additional converters.

Procedure

Proceed as follows to perform series commissioning using a memory card:

1. Switch off all power supplies to converter 1.
2. Insert an empty memory card with a maximum capacity of 32 GB into the card slot of converter 1.
3. Switch on all power supplies to converter 1.

4. Commission the converter.
 5. Save the settings retentively at the end of commissioning.
This means that you save the settings retentively not only in converter 1 but also to the memory card.
 6. Switch off all power supplies to converter 1.
 7. Remove the memory card from converter 1.
 8. Switch off all power supplies to converter 2.
 9. Insert the memory card into converter 2.
 10. Switch on all power supplies to converter 2 and wait until the RDY LED lights green.
Converter 2 takes the settings of converter 1 from the memory card, including the following settings:
 - User management
 - Access control
 - IP configuration
 - Device name
 11. Switch off all power supplies to converter 2.
 12. Remove the memory card from converter 2.
- Repeat steps 8 to 12 for all additional converters to which you wish to transfer these settings.

9.3 Series commissioning using a commissioning tool

Overview

For the series commissioning using a commissioning tool, transfer the settings of converter 1 using the commissioning tool to converter 2 or to additional converters.

Procedure

Proceed as follows to perform series commissioning using a commissioning tool:

1. Switch on the supply voltage of converter 1.
2. Commission the converter using your operating unit, e.g. a PC.
3. Save the settings retentively at the end of commissioning.
4. Save the drive data to a backup file.
5. Switch on the supply voltage of converter 2.
6. Restore the drive data from the backup file.
Converter 2 takes the settings from the backup file.
After a restart, the security settings configured in converter 1, e.g. drive password, UMAC data, become active in converter 2.

Repeat steps 5 and 6 for all additional converters to which you wish to transfer the settings of converter 1.

Functions

10.1 Overview of the functions

Description

The converter firmware functions adapt motor operation to the requirements of the specific application.

Table 10-1 Converter firmware functions

Firmware function	Description
Fieldbus communications	Communications with higher-level controller
Inputs/outputs	Interconnection of converter signals with drive functions
Drive functions	Basic functions for motor operation
Drive control	Speed control (S) Basic positioner (EPOS)
Safety Intergrated (for S200 PN only)	Stop functions for applications with high reliability demands

10.2 Inputs/outputs

10.2.1 Digital inputs

Overview

A digital input detects a signal coming from outside. The function of a digital input is adjustable.

Description of function

S200 PN and S200 Basic PN have four digital inputs, DI0 ... DI3. A parameter r0722.x is assigned to each digital input. You can adjust the function of digital inputs by interconnecting the signals to r0722.x in commissioning tools.

The following signals are assignable to the digital inputs.

Table 10-2 Assignable signals

Parameter	Signal	Type	Description	Available control mode	
				EPOS	S
c2104	Acknowledge all faults (RESET)	Edge 0→1	0→1: reset alarms	✓	✓
c2569	EPOS negative hardware limit switch	Edge 1→0	<ul style="list-style-type: none"> 1: condition for operation 1→0: quick stop (OFF3) 	✓	-
c2570	EPOS positive hardware limit switch	Edge 1→0	<ul style="list-style-type: none"> 1: condition for operation 1→0: quick stop (OFF3) 	✓	-
c0849	No quick stop OFF3 (EMGS)	Level	<ul style="list-style-type: none"> 0: OFF3 1: no OFF3 	✓	✓
c29048	Torque limit selection bit 0 (TLIM0)	Level	TLIM1 : TLIM0 <ul style="list-style-type: none"> 0 : 0: internal torque limit 0 0 : 1: internal torque limit 1 1 : 0: internal torque limit 2 1 : 1: internal torque limit 3 	✓	✓
c29049	Torque limit selection bit 1 (TLIM1)	Level			
c29063	Speed limit selection bit 0 (SLIM0)	Level	SLIM1 : SLIM0 <ul style="list-style-type: none"> 0 : 0: internal speed limit 0 0 : 1: internal speed limit 1 1 : 0: internal speed limit 2 1 : 1: internal speed limit 3 	✓	✓
c29064	Speed limit selection bit 1 (SLIM1)	Level			
c2596	EPOS set home position (SREF)	Level	<ul style="list-style-type: none"> 0: do not set home position 1: set home position 	✓	-
c2612	EPOS active homing reference cam selection	Level	1: reference cam active	✓	-
c2613	EPOS active homing negative reversing cam	Level	<ul style="list-style-type: none"> 1: reversing cam not reached 0: reversing cam reached 	✓	-
c2614	EPOS active homing positive reversing cam	Level	<ul style="list-style-type: none"> 1: reversing cam not reached 0: reversing cam reached 	✓	-

The following signals are assigned to the digital inputs by default.

Table 10-3 Default configuration of digital inputs

Digital input	Parameter	Default signal	
		S200 PN	S200 Basic PN
DI0	r0722.0	Measuring probe 1	Measuring probe 1
DI1	r0722.1	Measuring probe 2	Measuring probe 2
DI2	r0722.2	EPOS negative hardware limit switch	-
DI3	r0722.3	EPOS positive hardware limit switch	-

More information

For more information about wiring digital inputs, see Section "Wiring of digital inputs (Page 162)".

Parameters

The following list includes the parameters of the "Digital inputs" function.

Number	Name	Unit
r0722.0...3	Digital inputs status	-
c0849[0]	No Quick Stop / Quick Stop (OFF3)	-
c2104[0]	2nd acknowledge faults	-
c2569	EPOS negative hardware limit switch	-
c2570	EPOS positive hardware limit switch	-
c2596	EPOS set home position	-
c2612[0...1]	EPOS active homing reference cam	-
c2613	EPOS active homing negative reversing cam	-
c2614	EPOS active homing positive reversing cam	-
c29048	Torque limit selection bit 0	-
c29049	Torque limit selection bit 1	-
c29063	Speed limit selection bit 0	-
c29064	Speed limit selection bit 1	-

10.2.2 Digital outputs

Overview

A digital output reports signal states of the converter to the outside. The function of a digital output is adjustable.

Description of function

S200 PN has two digital outputs, DO0 and DO1. S200 Basic PN offers DO0 only.

You can adjust the function of digital outputs by interconnecting the signal parameters to c730 and c731 in commissioning tools.

The following signals are assignable to the digital outputs.

Table 10-4 Assignable signals

Parameter	Signal	Available control mode	
		EPOS	S
r899.2	Operation enabled (RDY) <ul style="list-style-type: none"> 1: the converter is ready. 0: the converter is not ready (a fault occurs or the enable signal is missing). 	✓	✓
r29404.0	Ready for servo-on (RDY_ON) <ul style="list-style-type: none"> 1: the converter is ready for servo-on. 0: the converter is not ready for servo-on. 	✓	✓
r2139.3	Fault present (FAULT) <ul style="list-style-type: none"> 1: in the fault state. 0: no fault. 	✓	✓
r2684.10	Target position reached <ul style="list-style-type: none"> 1: the converter has reached target position. 0: the converter has not reached target position. 	✓	-
r2199.0	n_act < p2161: zero speed detection (ZSP) <ul style="list-style-type: none"> 1: motor speed ≤ zero speed (can be set with p2161). 0: motor speed > zero speed + hysteresis (10 r/min). 	✓	✓
r1407.7	Torque limit reached (TLR) <ul style="list-style-type: none"> 1: the generated torque has nearly (internal hysteresis) reached the value of the positive torque limit or negative torque limit. 0: the generated torque has not reached any torque limit. 	✓	✓
r899.12	Motor holding brake control <ul style="list-style-type: none"> 1: release the motor holding brake. The motor can rotate. 0: engage the motor holding brake. The motor cannot rotate. 	✓	✓
r899.13	Motor holding brake status <ul style="list-style-type: none"> 1: the motor holding brake is active. The motor cannot rotate. 0: the motor holding brake is released. The motor can rotate. 	✓	✓
r29404.2	Overload level reached (OLL) <ul style="list-style-type: none"> 1: the motor has reached the parameterizable output overload level (p29080 in % of the rated torque). 0: the motor has not reached the overload level. 	✓	✓
r2684.11	Home position set (REFOK) <ul style="list-style-type: none"> 1: homing is completed. 0: homing is not completed. 	✓	-
r46.8	STO status (STO_EP) <ul style="list-style-type: none"> 1: the enable signal is missing, indicating that STO is active. 0: the enable signal is available, indicating that STO is inactive. <p>Note: STO_EP is only a status signal for STO input terminals but not a safe DO for the Safety Integrated function.</p>	✓	✓

Parameter	Signal	Available control mode	
		EPOS	S
r2683.10	Direct output 1 via traversing block	✓	-
r2683.11	Direct output 2 via traversing block	✓	-

The following signals are assigned to the digital outputs by default.

Table 10-5 Default configuration of digital outputs

Digital output	Parameter	Default signal	
		S200 PN	S200 Basic PN
DO0	c0730	RDY	RDY
DO1	c0731	FAULT	-

More information

For more information about wiring digital outputs, see Section "Wiring of digital outputs (Page 163)".

Parameters

The following list includes the parameters of the "Digital outputs" function.

Number	Name	Unit
r0046.0...30	Missing enable signals	-
c0730	Signal for terminal DO 0	-
c0731	Signal for terminal DO 1	-
r0899.0...13	Status word sequence control	-
r1407.0...28	Status word speed controller	-
r2139.0...15	Status word faults/alarms 1	-
r2199.0...11	Status word monitoring 3	-
r2683.0...14	EPOS status word 1	-
r2684.0...15	EPOS status word 2	-
r29404.0...5	DO status word	-

10.3 PROFINET communication

10.3.1 PROFINET IO fieldbus

Overview

You can integrate the converter into a PROFINET network.

Requirement

- A converter with the PROFINET interface X150
- Installed TIA Portal with the current Startdrive version or for third-party control systems, the GSDML file of the converter.
- The PN topology is configured in the controller to replace the device without removable data storage medium.

Description of function

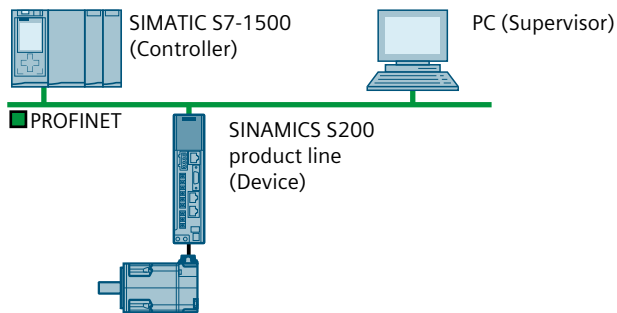


Figure 10-1 The converter in PROFINET IO operation (examples)

The converter supports the following functions:

- RT (Real-Time)
- IRT (Isochronous Real-Time)
- MRP (Media Redundancy Protocol): Media redundancy, with transition bump.
- MRPD (Media Redundancy for Planned Duplication): Media redundancy, bumpless.
- DFP (Dynamic Frame Packing)
- Diagnostic alarms in accordance with the error classes specified in the PROFIdrive profile.
- Device replacement without removable data storage medium: The replacement converter is assigned the device name from the IO controller, not from its memory card or from the programming device.

The converter automatically accepts a standard telegram or a manufacturer-specific telegram configured in the controller. A freely configured telegram is not automatically accepted.

More information

The GSDML file of the converter is available on the Internet:

GSDML SINAMICS S200 (<https://support.industry.siemens.com/cs/us/en/view/109812644>)

10.3.2 PROFINET protocols

Overview

The converter supports the PROFINET protocols listed in the table.

The information contained is required to set Industrial Cybersecurity measures such as the firewall to protect the system.

Description of function

The address parameters, the relevant communication layer, and the communication role and communication direction are specified for each protocol.

Table 10-6 PROFINET protocols

Protocol	Port number	Layer (2) Link layer (4) Transport layer	Description
DCP: Discovery and Configuration Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 8892 hex (PROFINET)	<p>Accessible participants, discovery and configuration for PROFINET port X150 and service interface X127</p> <p>DCP detects and changes the IP-suite settings (IP address, subnet, gateway and NameOfStation) of Ethernet-based interfaces.</p> <p>Available modes:</p> <ul style="list-style-type: none"> • DCP access disabled Device is not visible and communications via the DCP protocol is blocked. • DCP read/write The identification of the device is enabled and the IP-suite settings can be changed. IP address, subnet and gateway can be changed for X127 without limitation and for X150 if no cyclic communication with a PLC is established. • DCP read only The identification of the device is enabled; however, changing the IP-suite settings is blocked. • DCP read only after establishment of application relation (only possible for PROFINET port X150) The identification of the device is enabled. Write access to the IP-suite settings is only possible during commissioning. After cyclic communication is established, the device behaves like in the mode "DCP read only".
LLDP: Link Layer Discovery Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 88CC hex (PROFINET)	<p>PROFINET Link Layer Discovery Protocol</p> <p>LLDP determines and manages neighbor relationships between PROFINET products.</p> <p>LLDP uses the special multicast MAC address: 01-80-C2-00-00-0E</p>

10.3 PROFINET communication

Protocol	Port number	Layer (2) Link layer (4) Transport layer	Description
MRP: Media Redundancy Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 88E3 hex (PROFINET)	PROFINET Medium Redundancy MRP enables the control of redundant routes through a ring topology. MRP uses the special multicast MAC address: xx-xx-xx-01-15-4E, xx-xx-xx = Organizationally Unique Identifier
PTCP: Precision Transparent Clock Protocol	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 8892 hex (PROFINET)	PROFINET send clock and time synchronization, based on IEEE 1588 PTCP enables the send clock synchronization and time synchronization between RJ45 ports required for IRT operation. PTCP uses the special multicast MAC address: xx-xx-xx-01-0E-CF, xx-xx-xx = Organizationally Unique Identifier
PROFINET IO data	not relevant	(2) Ethernet II and IEEE 802.1Q and Ethertype 8892 hex (PROFINET)	PROFINET cyclic IO data transfer The PROFINET IO telegrams transfer process data cyclically between the PROFINET IO controller and IO devices via Ethernet.
PROFINET Context Manager	34964	(4) UDP	PROFINET connectionless RPC The PROFINET Context Manager provides an endpoint mapper in order to establish an application relationship (PROFINET AR).

10.3.3 Media redundancy

Overview

The converter supports media redundancy based on MRP (Media Redundancy Protocol). Media redundancy is a function to increase system availability through redundant communication paths.

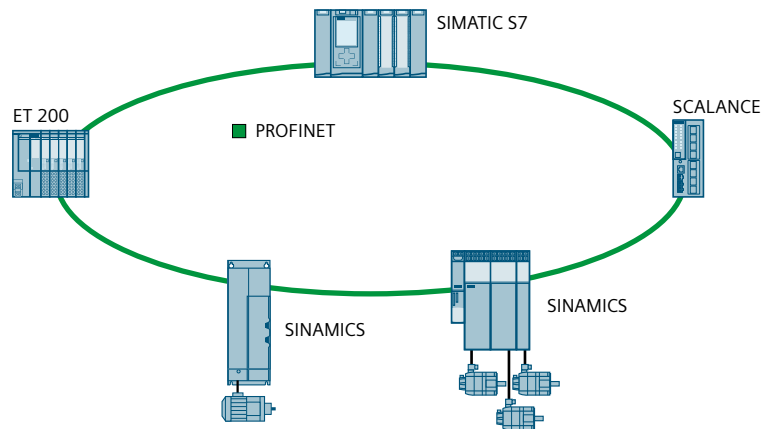
MRP can be expanded to MRPD (Media Redundancy for Planned Duplication).

Requirement

The following preconditions apply regarding media redundancy:

- PROFINET as ring topology with redundancy manager
- Each device in the ring topology supports MRP or MRPD
- Maximum of 50 devices for each ring topology
- MRPD requires a suitable controller. In addition, a topology must be configured.

Description of function



SIMATIC S7	PROFINET controller
ET 200	Distributed I/O
SINAMICS	Converter
SCALANCE	Redundancy manager

Figure 10-2 Example of a ring topology

Ethernet as basis for PROFINET only permits a single, unique data path from the controller to a device via a line-type topology or a star-type topology. MRP allows a line-type topology to be closed using a redundancy manager to create a ring-type topology. This means that every device can be accessed via 2 data paths.

When a device fails or if a cable is interrupted, the redundancy manager informs the device that the ring-type topology has now been switched over to a linear-type topology. The devices can be accessed again once a switchover has been made to a linear-type topology.

When the cable is interrupted, a short-time interruption (0 ... 200 ms) of the data transfer may occur until the redundant data path is switched.

If a short-time interruption is not allowed, there are two alternative ways:

- Set the watchdog time in the hardware configuration above 200 ms.
- Set the data transfer to IRT High Performance.

10.3.4 Connection-oriented communication protocols

Overview

The converter supports connection-oriented communication protocols.

Connection-oriented communication ensures that data arrives in the correct order.

Description of function

Table 10-7 Connection-oriented communication protocols

Protocol	Port number	Layer (2) Link layer (4) Transport layer	Description
DHCP Dynamic Host Configuration Protocol	68	(4) UDP	Is used to query an IP address. Is closed when delivered, and is opened when selecting the DHCP mode.
ISO on TCP (according to RFC 1006)	102	(4) TCP	ISO on TCP (according to RFC 1006) is used for the message-oriented data exchange to a remote CPU, WinAC or devices of other suppliers. Communication with engineering system, human machine interface, etc. Is activated in the factory setting.
SNMP Simple network management protocol	161	(4) UDP	SNMP enables network management data to be read out and set (SNMP managed objects) by the SNMP manager. SNMP is deactivated in the factory setting and can be activated by the user.
https Secure Hypertext Transfer Protocol	443	(4) TCP	https is used for communication with the CU-internal web server via Transport Layer Security (TLS). Is open in the as-supplied state and can be deactivated.
Reserved	49152 ... 65535	(4) TCP (4) UDP	Dynamic port area that is used for the active connection endpoint if the application does not specify the local port number.

10.3.5 Field Device Integration

Overview

The converter supports the standardized "Field Device Integration (FDI)" via PROFINET.

Requirement

The data set protocol of fieldbus interface X150 is configured using a commissioning tool, for example, in the web server via "System" → "Protection and security".

Description of function

Using data sets DS102 and DS103, the converter exchanges commands and configuration data with the higher-level control.

10.3.6 Diagnostics with PROFINET

Overview

The converter provides diagnostic data according to the PROFINET standard. SINAMICS faults and alarms are mapped onto PROFIdrive fault classes, enabling them to be directly displayed on an HMI through the PROFINET controller.

Description of function

The fault and alarm messages are saved in the parameters of the converter.

The converter transfers messages in the sequence in which they occur. The converter records the time when a message occurs, and the controller generates a time stamp when it receives the message.

The faults and alarms are mapped onto PROFIdrive failure classes and sent via PROFINET channel diagnosis to the PROFINET controller.

10.3 PROFINET communication

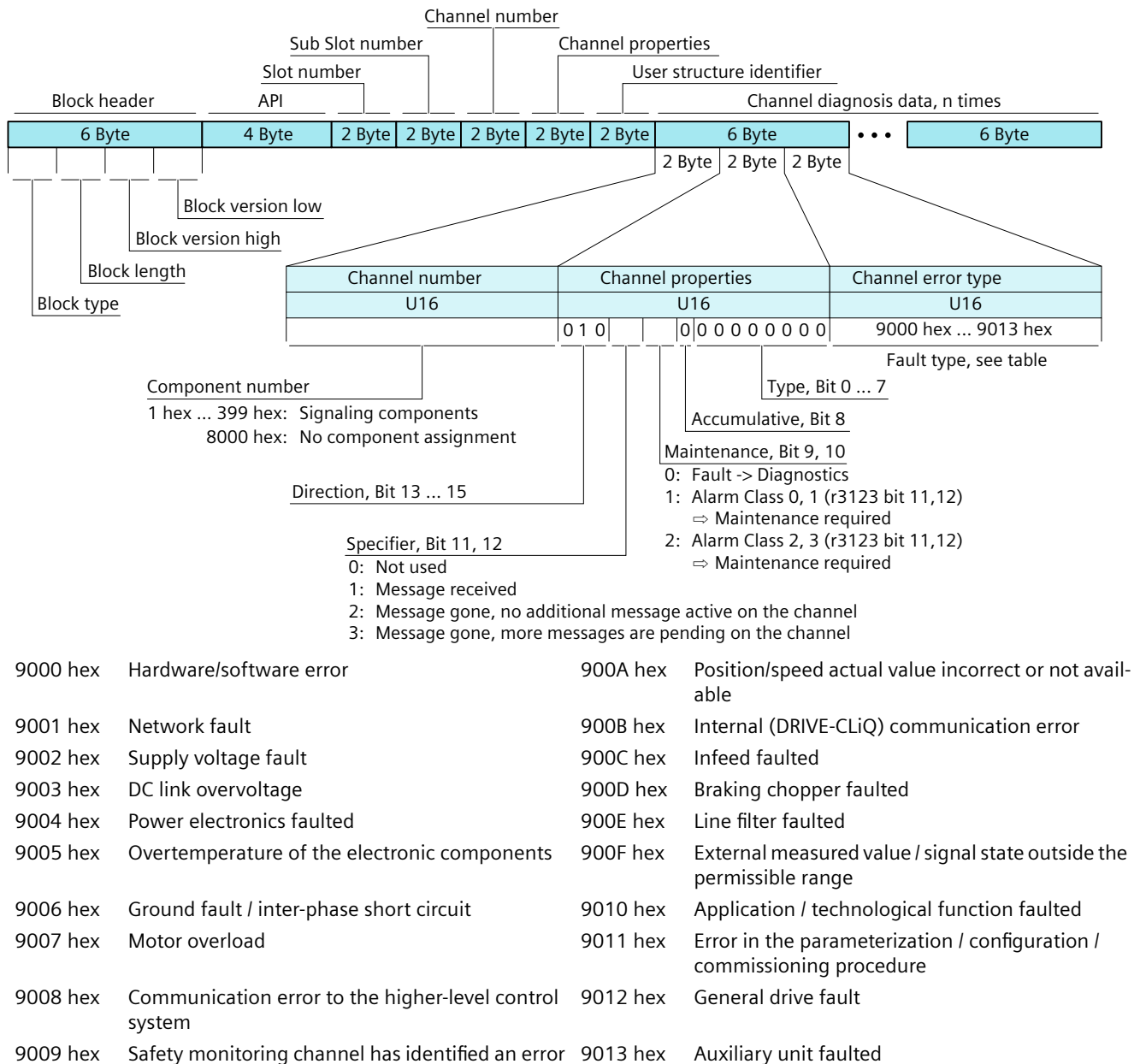


Figure 10-3 Structure of the channel diagnostics

The diagnostic data can be accessed via the PROFINET controller by reading the record with index 0x800C on the module access of the converter.

The following rules apply:

- 1 message block (=ChannelDiagnosisData)
if (one or several) faults of the same message class are detected at the converter
- n message blocks
if at the converter, n faults of different message classes are detected

10.3.7 PROFIdrive telegrams

10.3.7.1 Telegram structure

Overview

Converter and higher-level control system exchange data via a fieldbus using telegrams.

Description of function

The converter receives data from the higher-level control cyclically and returns data to the control cyclically.

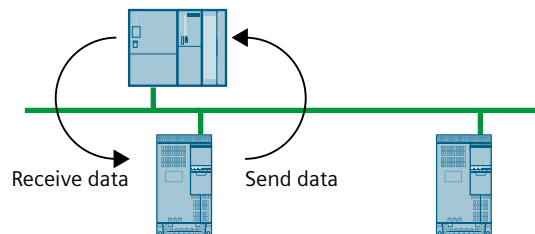


Figure 10-4 Cyclic data exchange

Converter and higher-level control system package their data in telegrams.

Specific telegrams are defined for typical applications in the PROFIdrive profile and are provided with a fixed PROFIdrive telegram number. Behind every PROFIdrive telegram number is thus a fixed composition of signals. This means that a telegram number provides an unambiguous description of the cyclic data exchange.

10.3.7.2 Receive data

Overview

The converter writes the receive data of the set telegram to signal sources designated for that purpose.

Requirement

You have activated communication via fieldbus and set a telegram.

Description of function

Receive data are available in the following formats:

- "Word" in r2050
- "Double word" in r2060
- "Floating point" with 32 bit resolution in r8600

The converter interconnects the receive data with the signal sinks that match the selected telegram.

Parameters

The following list includes the parameters of the "Receive data" function.

Number	Name	Unit
r0922	IF1 PROFIdrive PZD telegram	-
r0922	IF1 PROFIdrive PZD telegram	-
r2050[0...31].0...15	PROFIdrive PZD receive word	-
r2060[0...30]	PROFIdrive PZD receive double word	-
r8600[0...30]	PROFIdrive PZD receive Float32	-
r8602[0...28]	PROFIdrive PZD receive Float64	-

10.3.7.3 Send data

Overview

The converter receives the send data of the set telegram from signal sinks designated for that purpose.

Requirement

You have activated communication via fieldbus and set a telegram.

Description of function

Send data are available in the following formats:

- "Word" in c2053
- "Double word" in c2063
- "Floating point" with 32 bit resolution in r8601

The converter interconnects the send data with the signal sources that match the selected telegram.

Parameters

The following list includes the parameters of the "Send data" function.

Number	Name	Unit
r0922	IF1 PROFIdrive PZD telegram	-
r0922	IF1 PROFIdrive PZD telegram	-
c2053[0...31]	PROFIdrive PZD send word	-
c2063[0...30]	PROFIdrive PZD send double word	-
c8601[0...30]	PROFIdrive PZD send Float32	-

c8603[0...28]

PROFIdrive PZD send Float64

-

10.3.7.4 Telegram 1

Overview

The telegram is suitable for closed-loop speed control of a drive.

Description of function

Process data	Telegram 1			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_A	16-bit speed setpoint	NIST_A	Speed actual value 16-bit

10.3.7.5 Telegram 2

Overview

The telegram is suitable for closed-loop speed control of a drive.

Description of function

Process data	Telegram 2			
	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

10.3.7.6 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	---		G1_XIST2	Position actual value 2 from encoder 1
PZD08	---			
PZD09	---			

10.3.7.7 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				

10.3.7.8 Telegram 7

Overview

The telegram is suitable for the basic positioner with selection of the traversing block.

Description of function

Process data	Telegram 7			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	SATZANW	Selects the traversing block	AKTSATZ	Currently selected traversing block

10.3.7.9 Telegram 9

Overview

The telegram is suitable for the basic positioner with direct setpoint input (MDI).

Description of function

Process data	Telegram 9			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	SATZANW	Selects the traversing block	AKTSATZ	Currently selected traversing block
PZD03	STW2	Control word 2	ZSW2	Status word 2
PZD04	MDI_TARPOS	Position setpoint for direct setpoint input (MDI)	XIST_A	Actual position value (32 bits)
PZD05				
PZD06	MDI_VELOCITY	MDI velocity	---	Not assigned
PZD07			---	
PZD08	MDI_ACC	MDI accelerating torque	---	
PZD09	MDI_DEC	MDI braking torque	---	
PZD10	MDI_MOD	Selects the positioning mode in the case of direct setpoint input (MDI)	---	

10.3.7.10 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	---		G1_XIST2	Position actual value 2 from encoder 1
PZD09	---			
PZD10	---			

10.3.7.11 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				

10.3.7.12 Telegram 111

Overview

The telegram is suitable for the basic positioner with direct setpoint input (MDI).

Description of function

Process data	Telegram 111			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex $\triangleq$ 100%)	MELDW	Status word for messages
PZD06	MDI_TAR- POS	MDI target position in INT32	XIST_A	Position actual value in INT32
PZD07				
PZD08	MDI_VE- LOCITY	MDI velocity in INT32	NIST_B	Actual speed value in INT32
PZD09				
PZD10	MDI_ACC	MDI acceleration in INT16 (4000 hex $\triangleq$ 100%)	FAULT_CODE	Number of the actual fault
PZD11	MDI_DEC	MDI deceleration in INT16 (4000 hex $\triangleq$ 100%)	WARN_CODE	Number of the actual alarm
PZD12	Not assigned	---	Not assigned	---

10.3.7.13 Telegram 112

Overview

The telegram is suitable for basic positioners with direct setpoint input (MDI) with physical and LU units, override, position actual value and velocity actual value.

Description of function

Process data	Telegram 112			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex $\triangleq$ 100%)	Reserved	---
PZD06	MDI_TAR- POS_F	MDI target position in Float32	XIST_F	Position actual value in Float32
PZD07				
PZD08	MDI_VELOCI- TY_F	MDI velocity in Float32	VIST_F	Velocity actual value in Float32
PZD09				
PZD10	MDI_ACC_F	MDI acceleration in Float32	MELDW	Message word
PZD11			FAULT_CODE	Fault code
PZD12	MDI_DEC_F	MDI deceleration in Float32	WARN_CODE	Alarm code
PZD13			---	---
PZD14	Reserved	---	---	---
PZD15		---	---	---
PZD16	REF_COORDI- NATE_F	Homing position in Float32	---	---
PZD17			---	---

10.3.7.14 Telegram 113

Overview

The telegram is suitable for basic positioners with direct setpoint input (MDI) with physical and LU units, override, position actual value and velocity actual value.

Description of function

Process data	Telegram 113			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex $\hat{=}$ 100%)	Reserved	---
PZD06	MDI_TAR- POS_D	MDI target position in Float64	XIST_D	Position actual value in Float64
PZD07				
PZD08				
PZD09				
PZD10	MDI_VELOC- TY_F	MDI velocity in Float32	VIST_F	Velocity actual value in Float32
PZD11				
PZD12	MDI_ACC_F	MDI acceleration in Float32	MELDW	Message word
PZD13			FAULT_CODE	Fault code
PZD14	MDI_DEC_F	MDI deceleration in Float32	WARN_CODE	Alarm code
PZD15			---	---
PZD16	Reserved	---	---	---
PZD17		---	---	---
PZD18	REF_COORDI- NATE_D	Homing position in Float64	---	---
PZD19			---	---
PZD20			---	---
PZD21			---	---

10.3.7.15 Supplementary telegram overview

Description

The supplementary telegram can only be used with a main telegram (a standard telegram or a nonsupplementary Siemens telegram). It cannot be used separately.

Note

Before setting the supplementary telegram, you must select a main telegram firstly. If you change the main telegram, the supplementary telegram will be disabled automatically. So after changing the main telegram, you must set the supplementary telegram again.

However, if you change the control mode of the converter, the supplementary telegram keeps the same state as that in the former control mode. The available supplementary telegram will not be disabled automatically. For example, if you enabled the supplementary telegram 750 before you change the control mode, the supplementary telegram 750 keeps enabled after the control mode change.

Note

After you enabled the supplementary telegram, the PZDs of the supplementary telegram follow after the PZDs of the main telegram.

10.3.7.16 Supplementary telegram 700 (for S200 PN only)

Overview

Supplementary telegram 700 transfers the status of Safety Integrated Functions to the higher-level control, independently of PROFIsafe.

Description of function

Process data	Telegram 700			
	Control → Converter		Converter → Control "Safety Info Channel"	
	Signal	Explanation	Signal	Explanation
PZDn+1	---	Not assigned	S_ZSW1B	Status word 1B Status of the Safety Integrated Functions
PZDn+2	---		S_V_LIMIT_B	Reserved
PZDn+3	---			

The Safety Info Channel enables the higher-level control to react promptly to the selection of a Safety Integrated Function.

Transfer of telegram 700 is not failsafe. A PROFIsafe telegram is required for failsafe transfer.

10.3.7.17 Supplementary 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	Additional torque	M_ACT	Actual torque
PZDn+2	M_LIMIT_POS	Upper torque limit	---	Not assigned
PZDn+3	M_LIMIT_NEG	Lower torque limit	---	

Note

When you use the telegram 750 in application of rewinding and unwinding, the built-in braking resistor of the converter is not sufficient to absorb the excess regenerative energy.

Note

When you use the telegram 750, if either of the following settings is done, the motor will accelerate in an uncontrollable manner:

- Setting a negative value of the upper torque limit via the PZD M_LIMIT_POS
- Setting a positive value of the lower torque limit via the PZD M_LIMIT_NEG

10.3.7.18 Telegram extension

Overview

The telegram extension can be added to a main telegram via Startdrive. The length (≤ 6 words) and the signal assignment of the telegram extension can be configured freely.

Description of function

Table 10-8 Telegram extension

Process data	Telegram extension			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	---	---	Digital inputs status	
.	---	---	Freely assignable	Freely assignable
PZD06	---	---		

The first PZD of the telegram extension must be configured as "Digital inputs status" and the other PZDs are configured as "Fixed value (0) selected" as default. You can configure the other PZDs freely from the provided drop-down list.

Table 10-9 Overview of the drop-down list

Parameter	Description	Unit
r0026	DC link voltage smoothed	V
r0027	Absolute actual current smoothed	A
r0032	Active power actual value smoothed	W
r0034	Motor utilization thermal	%
r0044	Thermal converter utilization	%
r0081	Torque utilization	%
r0722	Digital inputs status	-
r0747	Digital outputs status	-
r2131	Actual fault code	-
r2132	Actual alarm code	-

Example

Adding the telegram extension to a main telegram

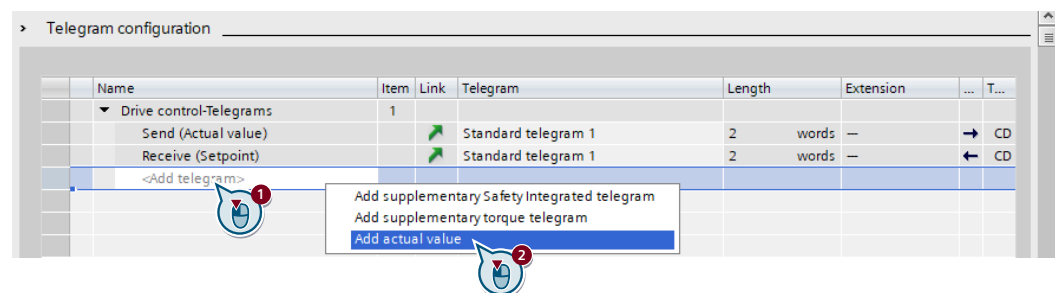


Figure 10-5 Adding the telegram extension

Configuring the PZD of the telegram extension

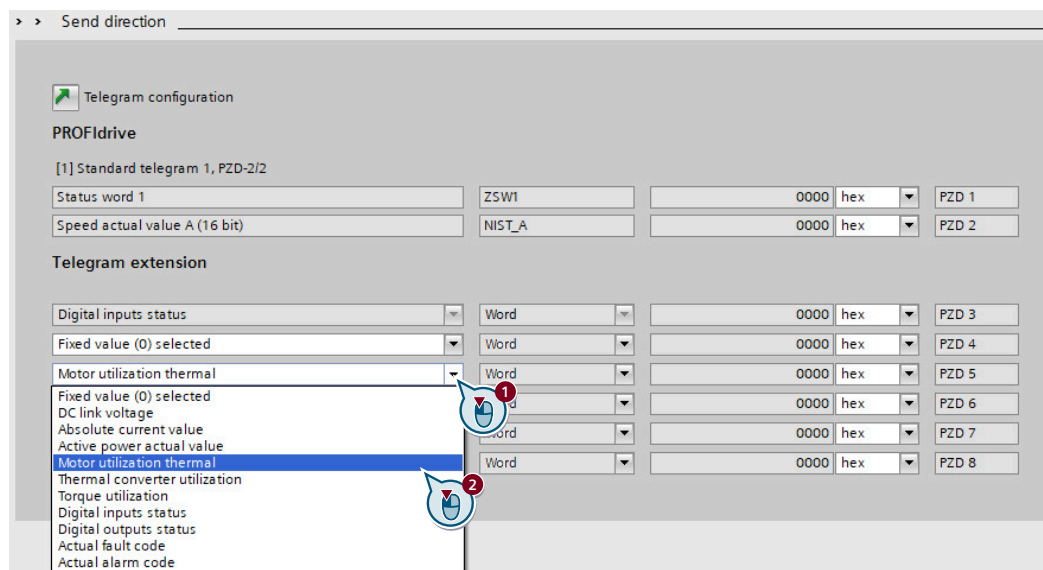


Figure 10-6 Configuring the PZD

10.3.8 Control words, status words and message word

10.3.8.1 Control 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

For speed control (telegrams 1, 2, 3, 5, 102, 105)

Note

When telegram 5 and telegram 105 are used, STW1.4 and STW1.6 must be set to 0.

Note

STW1.10 must be set to 1 to allow the PLC to control the converter.

Control word 1 (STW1)				
Control → Converter				
Bit	Drive function		Explanation	
	Telegrams 102, 105	Telegrams 1, 2, 3, 5	Telegrams 102, 105	Telegrams 1, 2, 3, 5
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			
12	1 = Open holding brake	Reserved	Unconditionally open motor holding brake	--
13	Reserved			

Control word 1 (STW1)				
Control → Converter				
Bit	Drive function		Explanation	
	Telegrams 102, 105	Telegrams 1, 2, 3, 5	Telegrams 102, 105	Telegrams 1, 2, 3, 5
14	1 = Torque control active 0 = Closed-loop speed control active	Reserved	Switch-over from speed to torque control	--
15	Reserved			

Status word 1 (ZSW1)				
Converter → Control				
Bit	Status		Explanation	
	Telegrams 102, 105	Telegrams 1, 2, 3, 5	Telegrams 102, 105	Telegrams 1, 2, 3, 5
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 acknowledgment 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	1 = Alarm class bit 0	1 = Torque limit reached	Internal diagnostics for automation systems with integrated SINAMICS functionality	Comparison value for current or torque has been reached or exceeded.
12	1 = Alarm class bit 1	1 = Holding brake open		Signal to open and close a motor holding brake.
13	Reserved	0 = Alarm, motor over-temperature	--	Motor temperature alarm threshold reached

Status word 1 (ZSW1)				
Converter → Control				
Bit	Status		Explanation	
	Telegrams 102, 105	Telegrams 1, 2, 3, 5	Telegrams 102, 105	Telegrams 1, 2, 3, 5
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

For position control (telegrams 7, 9, 111, 112, 113)

Note

STW1.10 must be set to 1 to allow the PLC to control the converter.

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 = Reject a traversing task	The converter rejects a traversing task. The motor brakes with the maximum deceleration rate.
	1 = Do not reject a traversing task	The converter accepts a traversing task.
05	0 = Intermediate stop	The converter stops performing the traversing task.
	1 = No intermediate stop	The converter continues to perform the traversing task.
06	0 → 1 = Activate traversing task	The traversing task is activated.
07	0 → 1 = Acknowledge faults	Acknowledge fault. If the ON command is still active, the converter switches to the "switching on inhibited" state.
08	1 = Jog 1 signal source	Jog 1 is activated.
09	1 = Jog 2 signal source	Jog 2 is activated.

Control word 1 (STW1)		
Control → Converter		
Bit	Drive function	Explanation
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	1 = Start homing	The converter starts homing.
	0 = Stop homing	The converter stops homing.
12	Reserved	
13	0 → 1 = External block change	The external block is changed.
14	Reserved	
15	Reserved	

Status word 1 (ZSW1)			
Converter → Control			
Bit	Status		Explanation
	Telegrams 7, 9	Telegrams 111, 112, 113	
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 present		Motor remains switched on; no acknowledgement is necessary.
08	1 = Following error in tolerance		The actual difference between the actual position and the position setpoint is within the permissible tolerance p2546.
09	1 = Control requested		The automation system has been requested to take over control of the converter.
10	1 = Target position reached		The axis has reached the target position.
11	1 = Home position set		---
12	0 → 1 = Acknowledgement, traversing block active		---
13	1 = Setpoint fixed		---
14	Reserved	1 = Axis accelerated	---
15	Reserved	1 = Axis decelerated	---

10.3.8.2 Control 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	
	Telegrams 102, 105	Telegrams 2, 3, 5, 9, 111, 112, 113
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	Reserved	
06	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	
	Telegrams 102, 105	Telegrams 2, 3, 5, 9, 111, 112, 113
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	1 = Open holding brake	1 = Alarm class bit 0
06	1 = Speed controller integrator disable	1 = Alarm class bit 1
07	Reserved	
08	1 = Travel to fixed stop active	

Status word 2 (ZSW2)		
Converter → Control		
Bit	Status	
	Telegrams 102, 105	Telegrams 2, 3, 5, 9, 111, 112, 113
09	Reserved	
10	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	

10.3.8.3 Control and status word for encoder 1

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

10.3.8.4 Control word for block selection

Overview

The block selection control word (SATZANW) activates the traversing block selection functions.

Description of function

Bit	Function
0	1 = Traversing block selection, bit 0
1	1 = Traversing block selection, bit 1
2	1 = Traversing block selection, bit 2
3	1 = Traversing block selection, bit 3
4	1 = Traversing block selection, bit 4
5	1 = Traversing block selection, bit 5
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	1 = Activate MDI 0 = Deactivate MDI

10.3.8.5 Control word for MDI mode

Overview

The MDI mode control word (MDI_MOD) activates the positioning type selection.

Description of function

Bit	Function
0	1 = Absolute positioning is selected 0 = Relative positioning is selected
1	00, 11 = Absolute positioning for a rotary axis through the shortest distance
2	01 = Absolute positioning for rotary axes in the positive direction 10 = Absolute positioning for rotary axes in the negative direction
3	Reserved
4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

10.3.8.6 Control and status word 1 for the positioner

Overview

Positioning control word 1 (POS_STW1) activates the converter drive functions.

Positioning status word 1 (POS_ZSW1) signals the status of the converter to the higher-level control.

Description of function

Positioning control word 1 (POS_STW1)	
Control → Converter	
Bit	Function
0	1 = Traversing block selection, bit 0
1	1 = Traversing block selection, bit 1
2	1 = Traversing block selection, bit 2
3	1 = Traversing block selection, bit 3
4	1 = Traversing block selection, bit 4
5	1 = Traversing block selection, bit 5
6	Reserved
7	1 = Unconditionally open the holding brake
8	1 = Absolute positioning is selected 0 = Relative positioning is selected
9	00, 11 = Absolute positioning for a rotary axis through the shortest distance
10	01 = Absolute positioning for rotary axes in the positive direction 10 = Absolute positioning for rotary axes in the negative direction
11	Reserved
12	1 = Continuous transfer 0 = Activate MDI block change with of a traversing task (STW1.6)
13	Reserved
14	1 = Signal setting-up selected 0 = Signal positioning selected
15	1 = MDI selection

Positioning status word 1 (POS_ZSW1)	
Converter → Control	
Bit	Status
0	Active traversing block bit 0
1	Active traversing block bit 1
2	Active traversing block bit 2
3	Active traversing block bit 3
4	Active traversing block bit 4
5	Active traversing block bit 5

Positioning status word 1 (POS_ZSW1)	
Converter → Control	
Bit	Status
6	Reserved
7	1 = Open the holding brake
8	1 = Negative hardware limit switch active
9	1 = Positive hardware limit switch active
10	1 = Jogging active
11	1 = Home position approach active
12	1 = Passive homing active
13	1 = Traversing block active
14	1 = Set-up active
15	1 = MDI active 0 = MDI inactive

10.3.8.7 Control and status word 2 for the positioner

Overview

Positioning control word 2 (POS_STW2) activates the converter drive functions.

Positioning status word 2 (POS_ZSW2) signals the status of the converter to the higher-level control.

Description of function

Positioning control word 2 (POS_STW2)		
Control → Converter		
Bit	Function	
	Telegram 112, 113	Telegram 111
0	1 = Tracking mode active	
1	1 = Set home position	
2	1 = Reference cam active	
3	1 = Initiate absolute encoder adjustment	Reserved
4	Reserved	
5	1 = Jogging, incremental active 0 = Jogging, velocity active	
6	Reserved	
7	Reserved	
8	1 = Select homing using passive homing 0 = Select homing via the home position approach	
9	1 = Start the search for homing in the negative direction 0 = Start the search for homing in the positive direction	
10	1 = Select measuring probe 2 0 = Select measuring probe 1	
11	1 = Falling edge of the measuring probe 0 = Rising edge of the measuring probe	
12	Reserved	
13	Reserved	
14	1 = Software limit switch active	
15	1 = Hardware limit switch active	

Positioning status word 2 (POS_ZSW2)		
Converter → Control		
Bit	Status	
	Telegram 112, 113	Telegram 111
0	1 = Tracking mode active	
1	1 = Velocity limiting active	
2	1 = Set position reached	1 = Setpoint fixed

Positioning status word 2 (POS_ZSW2)		
Converter → Control		
Bit	Status	
	Telegram 112, 113	Telegram 111
3	1 = Printing mark outside outer window	
4	1 = Axis moves forward	
5	1 = Axis moves backwards	
6	1 = Negative software limit switch reached	
7	1 = Positive software limit switch reached	
8	1 = Position actual value $\leq$ cam switching position 1	
9	1 = Position actual value $\leq$ cam switching position 2	
10	1 = Direct output 1 via traversing block	
11	1 = Direct output 2 via traversing block	
12	1 = Fixed stop reached	
13	1 = Fixed stop clamping torque reached	
14	1 = Travel to fixed stop active	
15	1 = Traversing command active	

10.3.8.8 Safety Info Channel status word 1B

Overview

The converter signals the status of the Safety Integrated Functions to the higher-level control using Safety Info Channel status word 1B (S_ZSW1B).

Description of function

Safety Info Channel status word 1B (S_ZSW1B)	
Converter → Control	
Bit	Safety status
00	STO active
01	SS1 active
02	Reserved
03	Reserved
04	Reserved
05	Reserved
06	Reserved
07	Internal event
08	Reserved
09	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Safety message active

10.3.8.9 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
03	n_actual < 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

10.3.9 Acyclic PROFIdrive communication

10.3.9.1 Acyclic communication via PROFINET

Description of function

The converter supports acyclic communication via B02E hex and B02F hex for PROFINET. The maximum data length per job is 240 bytes.

10.3.9.2 Reading parameter values

Overview

To read a parameter value, the higher-level control sends a read job to the converter. After receiving the read job, the converter sends its response to the higher-level control.

Description of function

Values in *italics* in the following tables mean that these values must be adapted to the specific request.

Table 10-10 Request to read parameters

Data block	Byte n	Bytes n + 1	n
Header	Reference <i>01 hex ... FF hex</i>	01 hex: Read job	0
	01 hex (drive object)	Number of parameters (m)	2
Address, parameter 1	Attribute <i>10 hex:</i> Parameter value <i>20 hex:</i> Parameter description	Number of the indices <i>00 hex ... EA hex</i> (For parameters without index: 00 hex)	4
	Parameter number <i>0001 hex ... FFFE hex</i>		6
	Number of the 1st index <i>0000 hex ... FFFE hex</i> (for parameters without index: 0000 hex)		8
	...		...
Address, parameter 2	...		...
...	...		...
Address, parameter m	...		...

Table 10-11 Converter response to a read job

Data block	Byte n	Bytes n + 1	n
Header	Reference (identical to a read job)	01 hex: Converter has executed the read job. 81 hex: Converter was not able to completely execute the read job.	0
	01 hex (ID of drive objects)	=Number of parameters (m) (identical to the read job)	2

Data block	Byte n	Bytes n + 1	n
Values, parameter 1	Format <i>02 hex</i> : Integer8 <i>03 hex</i> : Integer16 <i>04 hex</i> : Integer32 <i>05 hex</i> : Unsigned8 <i>06 hex</i> : Unsigned16 <i>07 hex</i> : Unsigned32 <i>08 hex</i> : FloatingPoint <i>0A hex</i> : OctetString <i>0D hex</i> : TimeDifference <i>34 hex</i> : TimeOfDay without date indication <i>35 hex</i> : TimeDifference with date indication <i>36 hex</i> : TimeDifference without date indication <i>41 hex</i> : Byte <i>42 hex</i> : Word <i>43 hex</i> : Double word <i>44 hex</i> : Error	Number of index values or - for a negative response - number of error values	4
	Value of the 1st index or - in case of negative response - error value 1		6
	...		...
Values, parameter 2	...		
...	...		
Values, parameter m	...		

10.3.9.3 Changing parameter values

Overview

To change a parameter value, the higher-level control sends a change request to the converter. After receiving the change request, the converter changes the parameter value and sends its response to the higher-level control.

Description of function

Values in italics in the following tables mean that these values must be adapted to the specific request.

Table 10-12 Request to change parameters

Data block	Byte n	Bytes n + 1	n
Header	Reference <i>01 hex ... FF hex</i>	02 hex : Change request	0
	01 hex (drive object)	Number of parameters (m) <i>01 hex ... 27 hex</i>	2
Address, parameter 1	10 hex : Value of the parameter	Number of indices <i>00 hex ... EA hex</i> (00 hex and 01 hex are equivalents)	4
	Parameter number <i>0001 hex ... FFFF hex</i>		6
	Number of the 1st index <i>0000 hex ... FFFE hex</i>		8
	...		...
Address, parameter 2	...		

Data block	Byte n	Bytes n + 1	n
...	...		...
Address, parameter m	...		
Values, parameter 1	Format 02 hex: Integer 8 03 hex: Integer 16 04 hex: Integer 32 05 hex: Unsigned 8 06 hex: Unsigned 16 07 hex: Unsigned 32 08 hex: Floating Point 0A hex: Octet String 0D hex: Time Difference 34 hex: TimeOfDay without date indication 35 hex: TimeDifference with date indication 36 hex: TimeDifference without date indication 41 hex: Byte 42 hex: Word 43 hex: Double word	Number of index values 00 hex ... EA hex	
	Value of the 1st index		
	...		
Values, parameter 2	...		
...	...		
Values, parameter m	...		

Table 10-13 Response, if the converter has executed the change request

Data block	Byte n	Bytes n + 1	n
Header	Reference (identical to a change request)	02 hex (change request successful)	0
	01 hex (ID of drive objects)	Number of parameters (identical to a change request)	2

Table 10-14 Response if the converter was not able to completely execute the change request

Data block	Byte n	Bytes n + 1	n
Header	Reference (identical to a change request)	82 hex: (Converter was not able to completely execute the write request)	0
	01 hex (ID of drive objects, for G120 always = 01 hex)	Number of parameters (identical to a change request)	2
Values, parameter 1	Format 40 hex: Zero (change request for this data block executed) 44 hex: Error (change request for this data block not executed)	Number of error values 00 hex 01 hex or 02 hex	4
	Only for "Error" - error value 1		6
	Only for "Error" - error value 2		8
	Error value 2 is either zero, or it contains the number of the first index where the error occurred.		
Values, parameter 2	...		

Data block	Byte n	Bytes n + 1	n
...	...	...	...
Values, parameter m	...		

10.3.9.4 Error value 1 for read and change requests

Overview

If the converter receives an erroneous request to read or change parameter values, then the response from the converter will contain one or two error values. Error value 1 provides information about the type of faulty request.

Description of function

Table 10-15 Error value 1

Error value 1	Meaning
00 hex	Illegal parameter number (access to a parameter that does not exist)
01 hex	Parameter value cannot be changed (change request for a parameter value that cannot be changed)
02 hex	Lower or upper value limit exceeded (change request with a value outside the value limits)
03 hex	Incorrect subindex (access to a parameter index that does not exist)
04 hex	No array (access with a subindex to non-indexed parameters)
05 hex	Incorrect data type (change request with a value that does not match the data type of the parameter)
06 hex	Setting not permitted, only resetting (change request with a value not equal to 0 without permission)
07 hex	Descriptive element cannot be changed (change request to a descriptive element that cannot be changed)
09 hex	Description data not available (access to a description that does not exist, parameter value is available)
0B hex	No master control (change request but with no master control)
0F hex	Text array does not exist (although the parameter value is available, the request is made to a text array that does not exist)
11 hex	Request cannot be executed due to the operating state (access is not possible for temporary reasons that are not specified)
14 hex	Inadmissible value (change request with a value that is within the limits but which is illegal for other permanent reasons, i.e. a parameter with defined individual values)
15 hex	Response too long (the length of the actual response exceeds the maximum transfer length)
16 hex	Illegal parameter address (illegal or unsupported value for attribute, number of elements, parameter number, subindex or a combination of these)
17 hex	Illegal format (change request for an illegal or unsupported format)
18 hex	Number of values not consistent (number of values of the parameter data to not match the number of elements in the parameter address)
19 hex	Drive object does not exist (access to a drive object that does not exist)
20 hex	Parameter text cannot be changed
21 hex	Service is not supported (illegal or not support request ID).
6B hex	A change request for a controller that has been enabled is not possible. (The converter rejects the change request because the motor is switched on. Observe the "Can be changed" parameter attribute in the parameter list.)

Error value 1	Meaning
6C hex	Unknown unit.
6E hex	Change request is only possible in the "Motor commissioning" state.
6F hex	Change request is only possible in the "Power unit commissioning" state.
70 hex	Change request is only possible in the "Quick commissioning" ("Basic commissioning") state.
71 hex	Change request is only possible if the converter is in the "ready" state.
72 hex	Change request is only possible for a parameter reset (restore factory settings).
73 hex	Change request is only possible in the "Safety Integrated commissioning" state.
74 hex	Change request is only possible in the "Commissioning the technological application/units" state
75 hex	Change request is only possible in a commissioning state.
76 hex	Change request is not possible for internal reasons.
77 hex	Change request is not possible during download.
81 hex	Change request is not possible during download.
82 hex	Accepting the master control is inhibited.
83 hex	Desired interconnection is not possible (signal source does not supply float value, but the signal sink requires float)
84 hex	Converter does not accept a change request (the converter is busy with internal calculations)
85 hex	No access methods defined.
86 hex	Write access only during commissioning of the data records (the operating status of the converter prevents a parameter change)
87 hex	Know-how protection active: access inhibited
88 hex	Write access only in the commissioning state Safety Integrated device
89 hex	Access blocked due to missing UMAC function right
C8 hex	Change request below the currently valid limit (change request for a value that lies within the "absolute" limits, but is below the currently valid lower limit)
C9 hex	Change request above the currently valid limit (example: a parameter value is too large for the converter power)
CC hex	Change request not permitted (change is not permitted as the access code is not available)
CD hex	Converter temporarily does not accept a change request (example: the converter is currently storing drive data in its internal memory)

10.3.10 Identification & Maintenance (I&M) data

Overview

I&M data is identification and maintenance data that is stored in a device. The higher-level controller has access to the I&M data of all devices on the fieldbus.

Using the I&M data, the plant operator can identify and label products and specify maintenance measures.

The converter supports the identification and maintenance (I&M) data listed in the table.

Description of function

Table 10-16 I&M data

I&M data	Format	Explanation	Example for the content
I&M0	u8[54] PROFINET	Converter-specific data, read only	See below
I&M1	Visible String [32]	Plant/system identifier	"ak12-ne.bo2=fu1"
	Visible String [22]	Location code	"sc2+or45"
I&M2	Visible String [16]	Date	"2013-01-21 16:15"
I&M3	Visible String [54]	Any comment or remark	-
I&M4	Octet String[54]	Check signature to track changes for Safety Integrated.	Values of r9781[0] and r9782[0]

When requested, the converter transfers its I&M data to a higher-level control or to a PC/PG with installed TIA Portal.

Table 10-17 I&M0

Designation	Format	Example for the content
MANUFACTURER_ID	u16	42d hex (=Siemens)
ORDER_ID	Visible String [20]	"6SL3246-0BA22-1FA0"
SERIAL_NUMBER	Visible String [16]	"T-R32015957"
HARDWARE_REVISION	u16	0001 hex
SOFTWARE_REVISION	char, u8[3]	"V" 04.70.19
REVISION_COUNTER	u16	0000 hex
PROFILE_ID	u16	3A00 hex
PROFILE_SPECIFIC_TYPE	u16	0000 hex
IM_VERSION	u8[2]	01.02
IM_SUPPORTED	bit[16]	001E hex

10.4 OPC UA communication

10.4.1 License for OPC UA

Description

Function "OPC UA" requires license "H80 - SINAMICS OPC UA Single Extended".

You activate the license "H80 - SINAMICS OPC UA Single Extended" with one of the following options:

- Memory card with license as Z option
The memory card can be ordered with preinstalled license.
- Allocate the license to an existing Siemens memory card
Use the "Web License Manager" to assign a purchased license to a particular memory card and create a new license file for the memory card.

More information

For more information about ordering a memory card, see section "Memory card (Page 79)".

For more information about assigning the license to a memory card, see Section "Creating the license file using the Web License Manager and downloading (Page 381)".

For more information about functions that require licensing, see Section "Functions that require licensing (Page 380)".

10.4.2 Properties of OPC UA

Overview

The converter supports the OPC Unified Architecture (OPC UA) protocol as server.

Requirement

The OPC UA server in the converter is configured using the Startdrive commissioning tool.

The following user-defined data are filled in Startdrive:

- OPC UA application URI (Uniform Resource Identifier)
- OPC UA application name

Description of function

OPC UA is based on open technologies and standards. This is the reason that the OPC UA server in the converter permits interoperable data exchange between devices from the same manufacturer as well as across various manufacturers.

The OPC UA server in the converter is accessible via `opc.tcp://<IP address of X150>:<port>`, e.g. `opc.tcp://192.168.0.31:4840`.

A client connects with the OPC UA server of the converter either as a participant of a PROFINET network or via a point-to-point connection.

OPC UA permits data exchange via TCP/IP in parallel to real-time communications.

The converter supports the following OPC UA specifications:

- OPC 10000-100, Device Model
- OPC UA Powertrain Information Model 40400-1 for Asset Management corresponding to the conformance unit "Powertrain Asset Identification"
- OPC UA SINAMICS Functional Model for Process Data

The converter exchanges data with all OPC UA clients via OPC UA. Examples of OPC UA clients:

- Control systems
- HMI
- Digitalization applications
- PC-based OPC UA clients

The converter provides the following data:

- Hardware version
- Firmware version
- Measured values for process data acquisition, e.g. for quality or energy management or condition monitoring
- Converter topology

An OPC UA client reads the converter data. To guarantee secure data transfer, OPC UA provides the following read access mechanisms to:

- Secure the integrity and confidentiality protection of the transferred data
- Connect to the user and access management of the converter (UMAC)

The OPC UA server supports encrypted communication with security guidelines that can be set. When activating security guidelines or when changing the application URI (Uniform Resource Identifier), after the supply voltage has been switched on, the OPC UA server generates a new certificate. Generating the certificate can delay the OPC UA server start by approximately 3 to 4 minutes.

More information

More information on the OPC UA server of the converter can be found on the Internet:

SINAMICS OPC UA server (<https://support.industry.siemens.com/cs/ww/en/view/109990876>)

An overview of the articles and links on the topic of OPC UA is available on the Internet:

OPC UA topic page (<https://support.industry.siemens.com/cs/ww/en/view/109770435>)

10.5 General functions

10.5.1 Stopping method at servo-off

Overview

You can select a stopping method when the converter is in "servo-off" state. The following stopping methods are available:

- Ramp-down (OFF1)
- Coast-down (OFF2)
- Quick stop (OFF3)

Description of function

Ramp-down (OFF1) and coast-down (OFF2)

The ramp-down and coast-down can be configured with the PROFINET control words STW1.0 and STW1.1:

- **Ramp-down (OFF1)**

Control word	Setting	Description
STW1.0	Rising edge (0 → 1)	Power circuit is powered on and the servo motor is ready to run.
	0	Motor ramps down.

Note

The control word STW1.0 can be used to control the start and stop of the motor.

- **Coast-down (OFF2)**

Control word	Setting	Description
STW1.1	1	The servo motor is ready to run.
	0	Motor coasts down.

Quick stop (OFF3)

The quick stop can be configured with the PROFINET control word STW1.2 or the digital input signal EMGS:

- **Configuring with STW1.2**

Control word	Setting	Description
STW1.2	1	The servo motor is ready to run.
	0	Quick stop.

- **Configuring with EMGS**

DI signal	Setting	Description
EMGS	1	The servo motor is ready to run.
	0	Quick stop.

More information

For more information about the PROFINET control word and the digital input signal EMGS, see Sections "Control words, status words and message word (Page 280)" and "Inputs/outputs (Page 253)".

10.5.2 Power failure detection (for S200 PN only)**Overview**

The converter provides the power failure detection function to avoid machine damage in case of the power failure.

Requirement

This function is only available for the converters with FS code ≥ 11 .

Description of function

The converter is designed with the power failure detection function, and the function is activated by default. This function can be deactivated using parameter p2149.16.

When a power failure occurs, the converter detects the power failure within the delay time specified in p3234 and triggers the fault F30265, and then forces the motor to a quick stop (OFF3).

10.5.3 Speed limit

Overview

The following four sources are available for the speed limit selection. You can select one of them via a combination of digital input signals SLIM0 and SLIM1 and switch among them when the converter is running.

Table 10-18 Combinations of SLIM0 and SLIM1 signals

Digital input		Speed limit
SLIM1	SLIM0	
0	0	Internal speed limit 0
0	1	Internal speed limit 1
1	0	Internal speed limit 2
1	1	Internal speed limit 3

In addition to the above four sources, the overall speed limit is also valid.

Note

Fault F07901 occurs when the actual speed exceeds the positive speed limit + hysteresis speed (p2162) or the negative speed limit - hysteresis speed (p2162).

Description of function

Internal speed limit

Select an internal speed limit by setting the following parameters. The default parameter value depends on the maximum motor speed.

Table 10-19 Parameter - internal speed limit

Parameter	Value range	Default	Unit	Description	Digital input	
					SLIM1	SLIM0
p29070[0]	0 ... 210000	210000	r/min	Internal speed limit 0 (positive)	0	0
p29070[1]	0 ... 210000	210000	r/min	Internal speed limit 1 (positive)	0	1
p29070[2]	0 ... 210000	210000	r/min	Internal speed limit 2 (positive)	1	0
p29070[3]	0 ... 210000	210000	r/min	Internal speed limit 3 (positive)	1	1
p29071[0]	-210000 ... 0	-210000	r/min	Internal speed limit 0 (negative)	0	0
p29071[1]	-210000 ... 0	-210000	r/min	Internal speed limit 1 (negative)	0	1
p29071[2]	-210000 ... 0	-210000	r/min	Internal speed limit 2 (negative)	1	0
p29071[3]	-210000 ... 0	-210000	r/min	Internal speed limit 3 (negative)	1	1

Overall speed limit

The overall speed limit can be configured by setting the following parameters.

Table 10-20 Parameter - overall speed limit

Parameter	Value range	Default	Unit	Description
p1083	0 ... 210000	210000	r/min	Overall speed limit for positive direction
p1086	-210000 ... 0	-210000	r/min	Overall speed limit for negative direction

Note

After the motor is commissioned, the internal speed limit is set to the default value and the overall speed limit is set to the maximum speed of the motor automatically.

Parameters

The following list includes the parameters of the "Speed limit" function.

Number	Name	Unit
p1083[0]	Speed limit in positive direction of rotation	rpm
p1086[0]	Speed limit in negative direction of rotation	rpm
p2162[0]	Hysteresis speed $n_{act} > n_{max}$	rpm
p29070[0...3]	Speed limit in positive direction of rotation	rpm
p29071[0...3]	Speed limit in negative direction of rotation	rpm

10.5.4 Torque limit

Overview

The following four sources are available for the torque limit in all control modes. You can select one of them via a combination of digital input signals TLIM0 and TLIM1 and switch among them when the converter is running.

Table 10-21 Combinations of TLIM0 and TLIM1 signals

Digital input		Torque limit
TLIM1	TLIM0	
0	0	Internal torque limit 0
0	1	Internal torque limit 1
1	0	Internal torque limit 2
1	1	Internal torque limit 3

In addition to the above four sources, the overall torque limit is also valid.

Note

When the motor torque exceeds the torque limit of the selected group determined by TLM0 and TLM1, fault F07900 occurs.

Description of function

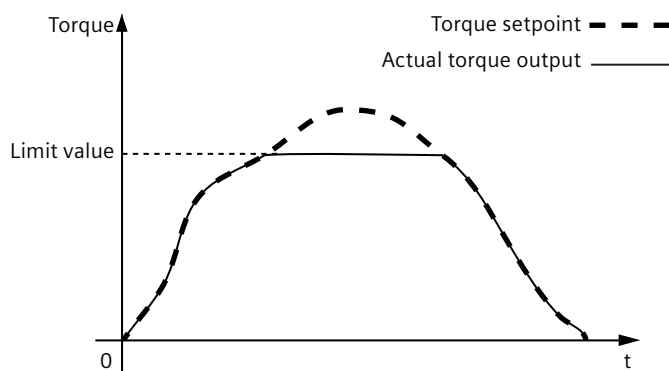
Internal torque limit

Select an internal torque limit by setting the following parameters.

Table 10-22 Parameter - internal torque limit

Parameter	Value range	Default	Unit	Description	Digital input	
					TLIM1	TLIM0
p29050[0]	-150 ... 350	350	%	Internal torque limit 0 (upper)	0	0
p29050[1]	-150 ... 350	350	%	Internal torque limit 1 (upper)	0	1
p29050[2]	-150 ... 350	350	%	Internal torque limit 2 (upper)	1	0
p29050[3]	-150 ... 350	350	%	Internal torque limit 3 (upper)	1	1
p29051[0]	-350 ... 150	-350	%	Internal torque limit 0 (lower)	0	0
p29051[1]	-350 ... 150	-350	%	Internal torque limit 1 (lower)	0	1
p29051[2]	-350 ... 150	-350	%	Internal torque limit 2 (lower)	1	0
p29051[3]	-350 ... 150	-350	%	Internal torque limit 3 (lower)	1	1

The following diagram shows how the internal torque limit functions. When the torque setpoint reaches the torque limit, the actual torque output is limited to the value selected by TLIM0/TLIM1.



Overall torque limit

The overall torque limit takes effect when a quick stop (OFF3) happens. In this case, the servo drive brakes with a maximum torque.

Table 10-23 Parameter - overall torque limit

Parameter	Value range	Default	Unit	Description
p1520	-1000000.00 ... 20000000.00	0	Nm	Overall torque limit (upper)
p1521	-20000000.00 ... 1000000.00	0	Nm	Overall torque limit (lower)

Torque limit reached (TLR)

When the generated torque has nearly (internal hysteresis) reached the value of the upper torque limit, lower torque limit or analog torque limit, the signal TLR is output.

Parameters

The following list includes the parameters of the "Torque limit" function.

Number	Name	Unit
p1520[0]	Torque limit upper	Nm
p1521[0]	Torque limit lower	Nm
p29050[0...3]	Upper torque limit	%
p29051[0...3]	Lower torque limit	%

10.5.5 Vertical axis

10.5.5.1 Vertical axis

Requirement

The vertical axis function cannot be used in torque control mode.

Description of function

With a vertical axis without mechanical weight compensation, electronic weight compensation can be set by offsetting the torque limits (p1532). The torque limits specified in p1520 and p1521 are shifted by this offset value. The offset value can be read in r0031 and transferred in p1532.

To reduce compensation after a brake has been released, the torque offset can be interconnected as a supplementary torque setpoint. As a result, the holding torque is immediately specified after the brake is released.

Automatically configuring weight compensation

Siemens recommends that this function is used for vertical axes with an almost constant force due to weight. Start the automatic determination of the force due to weight using

p1558 = 1. As soon as the technique has been started, the torque, which is required to hold the axis, is measured and entered into p1532. Further, interconnection between supplementary torque setpoint and p1532 is established for the precontrol, and the scaling of the precontrol channel is set to 100%.

The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If the measurement was started with the pulses inhibited, it is only executed after the pulses have been enabled. In both cases, after starting, alarm A07991 (Drive: motor data identification activated) is output. The alarm is automatically withdrawn after the motor data identification routine has been successfully completed.

If the force due to weight is not constant: 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.

Parameters

The following list includes the parameters of the "Vertical axis" function.

Number	Name	Unit
r0031	Actual torque smoothed	Nm
p1520[0]	Torque limit upper	Nm
p1521[0]	Torque limit lower	Nm
p1532[0]	Torque limit offset	Nm
p1558	Measure/precontrol hanging/suspended axis force due to weight	-

10.5.5.2 Setting SS1 in conjunction with vertical axes

Requirement

The Safety Integrated Function "Safe Stop 1 with time control" (SS1-t) is enabled.

Description of function

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

Table 10-24 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 behaves as follows:

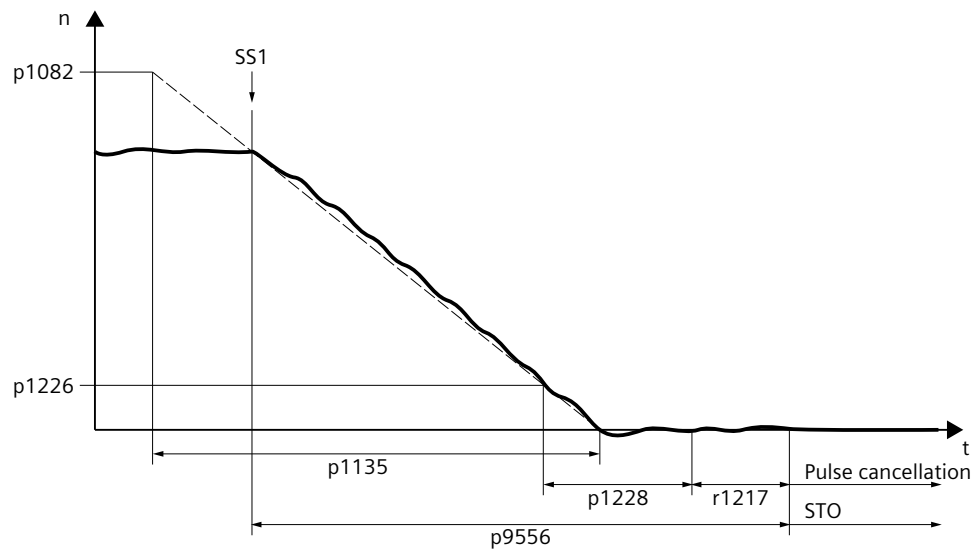


Figure 10-7 Correct setting of p9556 for SS1-t

- 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 includes the parameters to set SS1-t in conjunction with a vertical axis.

Number	Name	Unit
p1135[0]	OFF3 ramp-down time	s
p1217[0]	Motor holding brake closing time	ms
p1226[0]	Threshold for standstill detection	rpm
p1227[0]	Standstill detection monitoring time	s
p1228[0]	Pulse cancellation delay time	s
p9556	SI transition time SS1 to STO	ms

10.5.6 PTO function (for S200 PN only)

Overview

Pulse Train Output is a simple and universal interface between a SIMATIC control and a SINAMICS drive. PTO is supported worldwide by many stepper drives and servo drives and is used in many positioning applications, for example, for adjusting or feed axes.

A pulse train encoder output which provides pulse signals can transmit the signals to the controller to realize a closed-loop control system inside the controller, or transmit them to another drive as pulse train setpoint for a synchronous axis or as control interface of another device (for example, a line scan camera).

Description of function

Output configuration

PTO is referred to as AB track pulse.

- **PTO direction output**

You can define whether the PTO position actual value should be inverted via p4422:

- Positive logic (= not inverted, default setting)
- Negative logic (= inverted)

- **Maximum output frequency**

The maximum output frequency represents the maximum output frequency supported by the converter. You can set the maximum output frequency of the pulse train output via p4405.

Pulse Train Output (PTO)

> About Pulse Train Output (PTO) position control



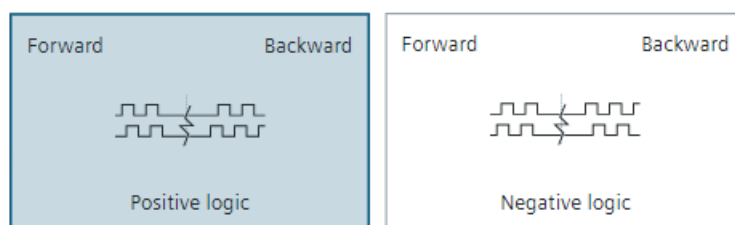
Output configuration

Electronic gear ratio

PTO direction change

For an application of fully closed-loop position control using PTI and PTO, you can set the PTO direction with the following setting.

AB track pulse



PTO output frequency limit

Sets the maximal output frequency of the pulse train output.

Maximum output frequency kHz

PTO zero mark offset

Set the zero mark offset.

PTO zero mark offset

< Application data

Electronic gear ratio >

Figure 10-8 PTO output configuration

Electronic gear ratio

The electronic gear ratio is a multiplier factor to the pulse train output to a controller.

You can select one of the following two values to define the electronic gear ratio:

- Number of PTO pulses per motor revolution (p4408).

Pulse Train Output (PTO)

> About Pulse Train Output (PTO) position control



Output configuration

Electronic gear ratio

Encoder information

Encoder: Digital encoder interface AM21, multiturn 4096

Encoder pulses: 1024

Gear ratio configuration

The electronic gear ratio is a multiplier factor for the pulse train output to a controller. It is implemented with a numerator and a denominator.

☒ Number of setpoint pulses per motor revolution

Pulses per revolution

1024

☐ Enter the electronic gear ratio manually

Electronic gear ratio =

1

1

Calculated PTO pulses per motor revolution: 1024

< Output configuration

Limits >

- Gear ratio by using a numerator (p4410) and a denominator (p4409).

Pulse Train Output (PTO)

> About Pulse Train Output (PTO) position control



Output configuration

Electronic gear ratio

Encoder information

Encoder: Digital encoder interface AM21, multturn 4096

Encoder pulses: 1024

Gear ratio configuration

The electronic gear ratio is a multiplier factor for the pulse train output to a controller. It is implemented with a numerator and a denominator.

☐ Number of setpoint pulses per motor revolution

Pulses per revolution

0

☒ Enter the electronic gear ratio manually

2

Electronic gear ratio =

1

Calculated PTO pulses per motor revolution: 2048

< Output configuration

Limits >

Note

When you use the numerator and the denominator to define the electronic gear ratio, the number of PTO pulses per motor revolution (p4408) must be set to 0. Otherwise, no electronic gear ratio is active.

Note

When you use the PTO electronic gear function, the electronic gear is based on the encoder resolution. The encoder resolution can be read from parameter p0408[0] and the default value is 1024 ppr.

The range of electronic gear ratio is from 0.02 to 8000.

The electronic gear ratio can be set at servo-off state only.

Note

When you use the PTO electronic gear function, if the product of the PTO setpoint pulses per motor revolution multiplied by the electronic gear ratio is not an integer, there is no zero mark generated.

Example

Calculating the PTO output frequency by using different electronic gear ratio configuration when the motor speed is 600 r/min:

- p4408 ≠ 0: by using number of PTO pulses per motor revolution
Set p4408 = 4096, then PTO output frequency = $(600/60) \times 4096$.
- p4408 = 0: by using a numerator (p4410) and a denominator (p4409)
Set p4410 = 2, p4409 = 1 and read the encoder pulse 1024 from p0408[0], then PTO output frequency = $(600/60) \times 1024 \times (2/1)$.

Parameters

The following list includes the parameters of the "PTO" function.

Number	Name	Unit
p0408[0]	Rotary encoder pulse number	-
p4405	PTO maximum output frequency	kHz
p4408	PTO pulse number	-
p4409	Gearbox encoder (motor)/PTO denominator (Control Unit)	-
p4410	Gearbox encoder (motor)/PTO numerator (Control Unit)	-
r4419	PTO diagnostics position setpoint	-
c4420	PTO position setpoint	-
p4422.0	PTO configuration	-
p4426	PTO zero mark offset	-

10.5.7 Ramp-function generator

Overview

The "ramp-function generator" function is used to limit acceleration in the event of abrupt setpoint changes and thus helps prevent load surges during drive operation.

Description of function

The ramp-up time p1120 and ramp-down time p1121 can be used to set mutually independent acceleration and deceleration ramps. This allows a controlled transition to be made in the event of setpoint changes.

The maximum speed p1082 is used as a reference value for calculating the ramps from the ramp-up and ramp-down time. For a quick stop (OFF3), a special adjustable ramp is available via the ramp-down time p1135 (for example, for quick, controlled stopping after an EMERGENCY OFF button has been pressed).

The following versions are available:

- Basic ramp-function generator (p1115 = 0)
- Extended ramp-function generator (p1115 = 1)

Basic ramp-function generator

The basic ramp-function generator is characterized by the following features:

- Ramp-up time T_{up} (p1120)
- Ramp-down time T_{dn} (p1121)

You can see the properties of the ramp-function generator from the diagram below:

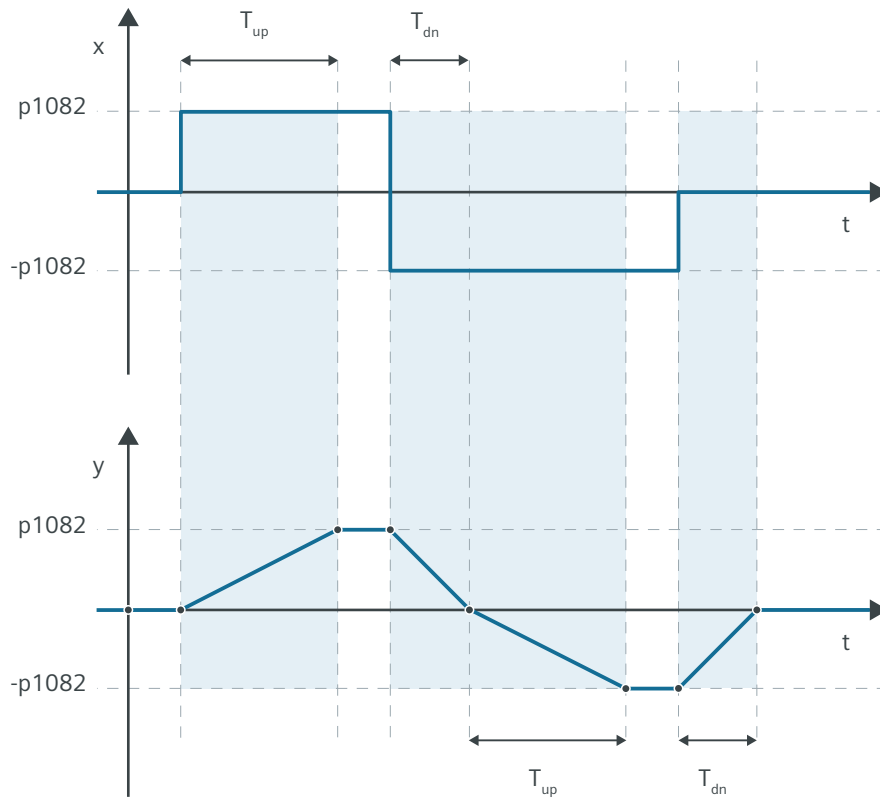


Figure 10-9 Basic ramp-function generator

Extended ramp-function generator

The extended ramp-function generator is characterized by the following features:

- Ramp-up time T_{up} (p1120)
- Ramp-down time T_{dn} (p1121)
- Initial rounding IR (p1130)
- Final rounding FR (p1131)
- Effective ramp-up time

$$T_{up_eff} = T_{up} + (IR/2 + FR/2)$$
- Effective ramp-down time

$$T_{dn_eff} = T_{dn} + (IR/2 + FR/2)$$

You can see the properties of the extended ramp-function generator from the diagram below:

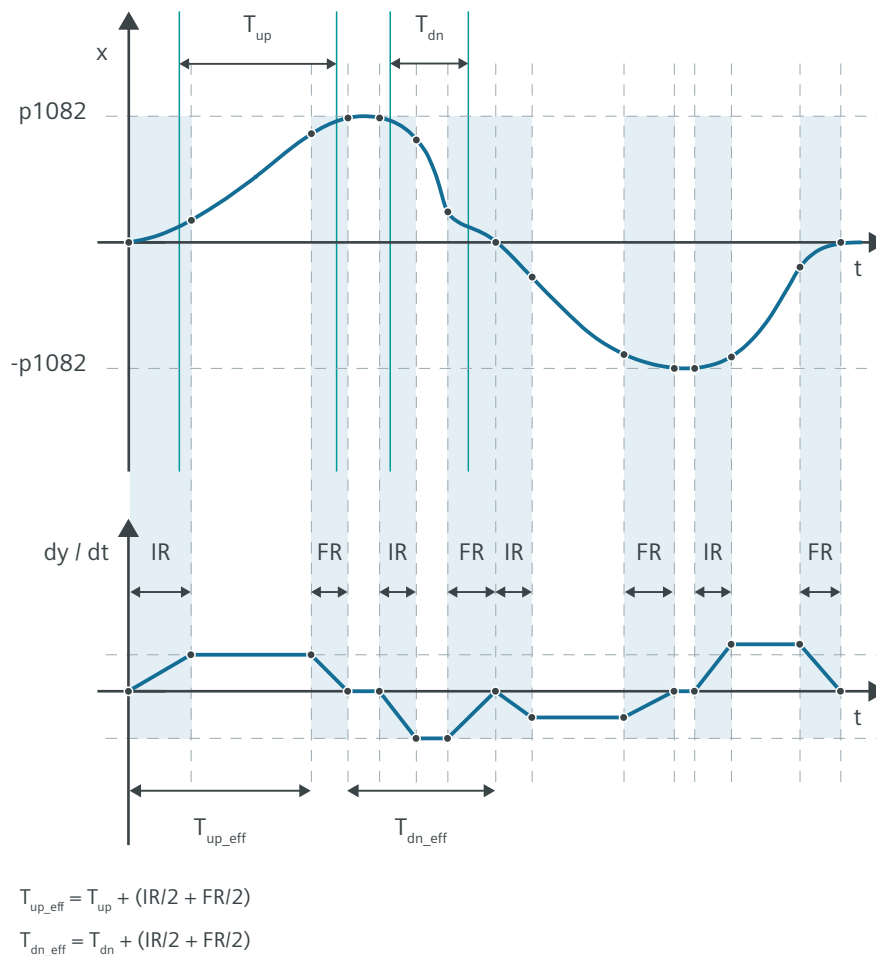


Figure 10-10 Extended ramp-function generator

Parameters

The following list includes the parameters of the "Ramp-function generator" function.

Number	Name	Unit
p1082[0]	Maximum speed	rpm
p1115	Ramp-function generator selection	-
p1120[0]	Ramp-function generator ramp-up time	s
p1121[0]	OFF1 ramp-down time	s
p1130[0]	Ramp-function generator initial rounding-off time	s
p1131[0]	Ramp-function generator final rounding-off time	s
p1135[0]	OFF3 ramp-down time	s

10.5.8 Setting motor overload protection in accordance with UL 61800-5-1 Ed.2

Overview

The motor overload protection function works without temperature sensors in the 1FL2 motors. To comply with UL 61800-5-1 Ed.2, you must make some additional settings when operating the converter with a 1FL2 motor.

Requirement

- You have completed quick commissioning with the correct motor data.

Procedure

Proceed as follows to activate the motor overload protection according to UL 61800-5-1 Ed.2:

1. Set p5375.0 = 1
2. Set p5375.1 = 1

10.6 Basic positioner (EPOS)

Overview

Position control means controlling the position of an axis. An "axis" is a machine or system component that comprises the converter with active position control and the driven mechanical system.

The basic positioner (EPOS) is a positioner integrated in the converter and calculates the traversing profile for the time-optimized traversing of the axis to the target position for the position controller. With the basic positioner (EPOS), the positioning tasks can be transferred to the converter and thus relieve the higher-level control system.

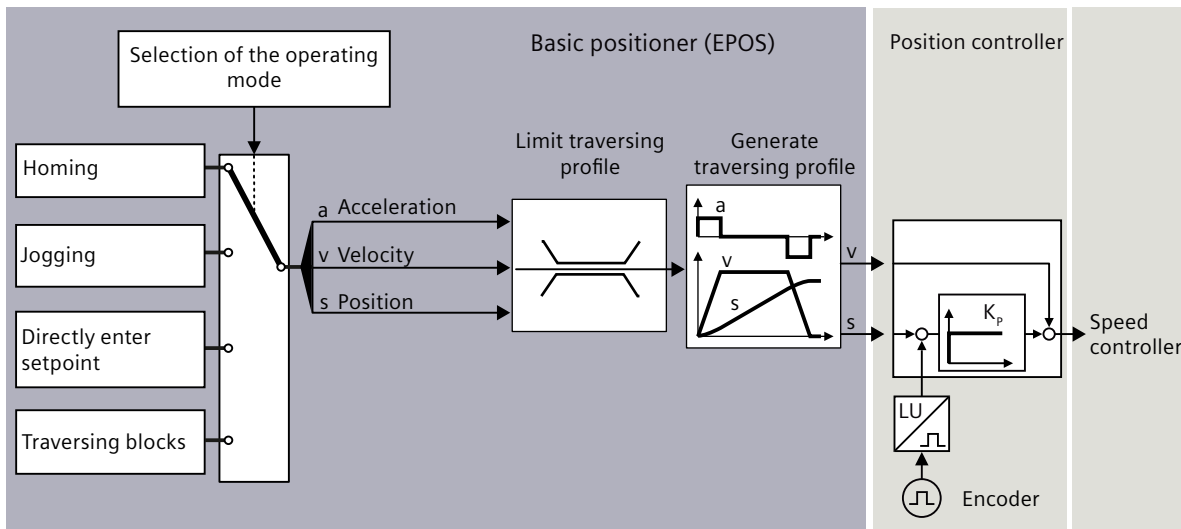


Figure 10-11 Basic positioner and position control

Description of function

The following functions can be carried out by using the basic positioner:

- **Limits**

- Limiting the traversing range: specification of the possible traversing range through the configuration of positive and negative software limit switches, and positive and negative hardware limit switches
- Limiting the traversing profiles: restriction of the dynamic travel response through limitation of the maximum velocity, acceleration, deceleration, and jerk

- **Monitoring**

- Position/standstill monitoring: monitoring of the axis positioning motion and monitoring of the axis position after a traversing motion
- Following error monitoring: monitoring of the maximum deviation between the actual value and the setpoint

- **Homing**

Homing establishes the reference between the coordinate origin of the drive axis and the machine zero point. When homing, the absolute position of the measuring system used for EPOS is determined. Possible homing types are:

- Active homing
- Passive homing
- Absolute encoder adjustment

- **Traversing blocks**

Position, velocity, and acceleration are saved in different traversing blocks in the converter. The external control selects a traversing block.

10.6 Basic positioner (EPOS)

- **Direct setpoint input (MDI)**
The external control specifies the setpoints (position, velocity, and acceleration) for the axis.
- **Jogging**
This function is used to traverse the axis in jog mode.

More information

For more information about configuring the basic positioner (EPOS) in Startdrive, see the information system of the TIA Portal.

10.6.1 Mechanical system

10.6.1.1 Axis type

Overview

Axes in your actual application can be configured with different motion control applications:

- For speed control applications: flexible control of the speed and direction of rotation of rotary axes
- For positioning control applications: relative/absolute positioning of rotary or linear axes (depending on mechanics)

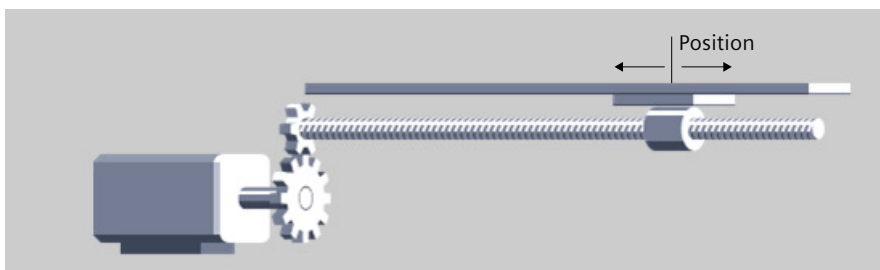
Description of function

Linear axis

A linear axis is an axis whose traversing range is limited in both motor directions of rotation by the mechanical system of the machine, for example:

- Stacker crane
- Elevating platform
- Tilting station
- Gate/door drive
- Conveyor belt
- Roller conveyor

For linear axes, the position of the axis is specified as a linear measure, for example, millimeters (mm).

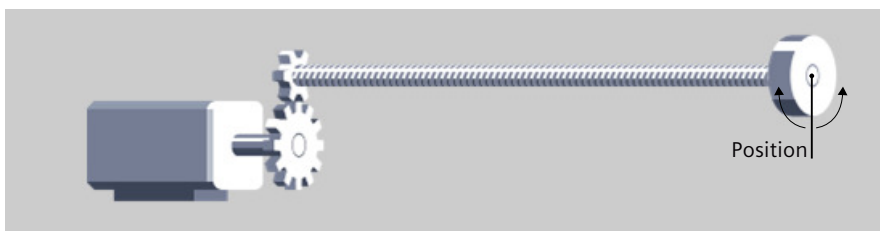


Rotary axis

A rotary axis is an axis with an infinite traversing range, for example:

- Rotary table

For rotary axes, the position of the axis is specified as an angular measure, for example, degrees ($^{\circ}$).



10.6.1.2 Units of measurement

Overview

In addition to physical units, the converter also supports the length unit (LU) for positioning operation.

Description of function

- **Physical units (default setting)**

The converter provides the physical units for position, speed, acceleration/deceleration, and jerk. You can select the desired physical units according to the actual axis type via relevant parameters during commissioning.

Axis type	Available physical units	
	Position	Velocity
Linear axis	km, m, mm , μm , nm, in, ft, mi	km/h, km/min, m/h, m/min, m/s, mm/h, mm/min, mm/s , in/min, in/s, ft/min, ft/s, mi/h
Rotary axis	degree (°)	degree (°)/s

Note:

Units in bold are the default units.

The acceleration is set accordingly as the position/s² measurement unit.

The jerk is set accordingly as the position/s³ measurement unit.

- **Length Unit**

The converter calculates the position actual value of the axis using the neutral position unit LU (Length Unit). The length unit LU is independent of whether the converter controls the position of an elevating platform or the angle of rotary table.

Note

If you change the axis type from linear axis to rotary axis or vice versa, the units will be set to default units automatically.

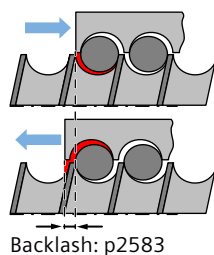
The settings you made will not be converted when changing the units.

Note

If you have moved the motor axis after servo-off, make sure that you set POS_STW2.0 to 1 before you enable servo-on; otherwise, the motor may overspeed and the fault F07452 occurs.

10.6.1.3 Setting the backlash

Overview



Backlash (also called play, dead travel on reversing) is the distance or the angle that a motor must travel through when the direction of rotation reverses until the axis actually moves in the other direction.

Description of function

Backlash measurement

Proceed as follows to measure the backlash:

1. Move the axis to position A in the machine. Mark this position in the machine and note down the actual position value in the converter.
2. Move the axis a little bit more in the same direction.
3. Move the axis in the opposite direction until the actual position value in the converter shows the same value as at position A. Due to the backlash when reversing, the axis is now at position B.
4. Measure the position difference $\Delta = A - B$ in the machine.

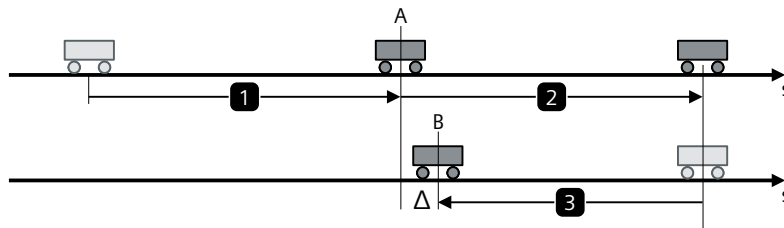


Figure 10-12 Measuring backlash

Backlash compensation

When mechanical force is transferred between a machine part and its drive, generally backlash occurs. If the mechanical system was to be adjusted/designed so that there was absolutely no backlash, this would result in high wear. Thus, backlash can occur between the machine component and the encoder.

When the axis with the motor encoder is operated in a process that the traversing direction is reversed, the mechanical backlash can increase or decrease the traversing distance and thus result in an error of the traversing distance.

Note

Precondition for backlash compensation

The backlash compensation is active with the precondition that the axis has been homed.

In order to compensate the backlash, the determined backlash must be specified in p2583 with the correct polarity. At each direction of rotation reversal, the actual axis value is corrected dependent on the actual traversing direction and displayed in r2667. This value is taken into account in the actual position value using p2516 (position offset).

If a stationary axis is homed by setting the home position or an adjusted axis is powered-up with an absolute encoder, then the parameter c2604 (home position approach, starting direction) is relevant for switching-in the compensation value.

Parameters

The following list includes the parameters of the "Setting the backlash" function.

Number	Name	Unit
p2583	EPOS backlash compensation	mm
p2583	EPOS backlash compensation	°
r2685	EPOS corrective value	mm
r2685	EPOS corrective value	°

10.6.1.4 Load gear position tracking**Overview**

Position tracking enables the load position to be reproduced when using gearboxes. It can also be used to extend the position range.

Requirement

- Using an absolute encoder

Description of function

Position tracking of the load gear is activated via parameter p2720.0 = 1 and is only relevant for a motor encoder. The load gear ratio is entered via parameters p2504 and p2505. Position tracking can be activated with rotary axes (modulo) and linear axes.

Position tracking for the load gear can only be activated once for each motor data set MDS.

The load actual position value in r2723 (must be requested via G1_STW.13) comprises the following information:

- Encoder pulses per revolution (p0408)
- Fine resolution per revolution (p0419)
- Virtual number of stored revolutions of a rotary absolute encoder (p2721)
- Load gear ratio (p2504/p2505)

Note

The sum of p0408, p0419 and p2721 is limited to 32 bits.

Features

- Configuration of p2720
- Virtual multiturn via p2721
- Tolerance window for monitoring the position at switching on p2722

- Input of the load gear via p2504 and p2505
- Display via r2723

Commissioning the function

You can commission the load gearbox via parameter p2720 as follows:

- p2720.0: Activation of position tracking
- p2720.2: Reset position
The position values stored in a non-volatile fashion are reset for the following events:
 - When encoder replacement is detected.
 - When the configuration of the encoder data set (EDS) is modified.
 - When the absolute encoder is adjusted again.

Note

If position tracking of the load gear is activated with parameter p2720[0] = 1 (position gear load tracking) after the encoder is adjusted (p2507 = 3), the adjustment will be reset.

If the encoder is adjusted again when load position tracking is active, the load gear position will be reset (overflows).

The permissible position tracking range is mapped on the reproducible encoder range of EPOS. It is possible to activate position tracking for several DDS.

Virtual multiturn (p2721)

The virtual multiturn resolution is used to set the number of resolvable load rotations for an absolute encoder with activated position tracking.

Note

The repeatability after power-off/power-on is specified by p0419. If you reduce the value of p0419 too much for a higher virtual multiturn resolution, the lower accuracy you get.

With activated position tracking (p2720.0 = 1), parameter p2721 is preset with p0421 and can be changed.

Note

If the gear ratio is not equal to 1, then p2721 always refers to the load side. The virtual resolution, which is required for the load, is then set here.

Example: Single-turn encoder

The value for p2721 is preset to 1. However, parameter p2721 can be altered subsequently, e.g. the user can program p2721 = 5. As a result, the encoder evaluation initiates five load rotations before the same absolute value is achieved again.

Example: Multiturn encoder

The value for p2721 is set to 4096 for an encoder with p0421 = 4096. If, as a result of extension of the multiturn information, the displayable area of r2723 (32 bits) is exceeded, the fine resolution (p0419) must be reduced accordingly.

Tolerance window (p2722)

After switching on, the difference between the stored position and the current position is determined and initiated depending on the following:

Difference within the tolerance window -> the position is reproduced based on the current actual encoder value.

Difference outside the tolerance window -> an appropriate fault (F07449) is output.

Note

When the fault F07449 occurs, click the reset button in Startdrive to reset the position tracking first and then acknowledge the fault.

If the telegrams 112 and 113 are used, you can also acknowledge the fault F07449 by setting POS_STW2.3 to 1 and 0 twice. After the acknowledgement, the position is set to the values of REF_COORDINATE_D and the absolute encoder is adjusted (p2507 = 3).

The tolerance window is preset to quarter of the encoder range and can be changed.

Note

The position can only be reproduced if, in the powered-down state, the encoder was moved through less than half of the range that it can represent. For the standard encoder, this is 2048 revolutions or half a revolution for single-turn encoders.

Note

The ratio stamped on the gear rating plate is often just a rounded-off value (e.g. 1:7.34). If, for a rotary axis, it is not permissible to have any long-term drift, then the actual ratio of the gearbox teeth must be requested from the gearbox manufacturer.

Example**Position range extension**

With absolute encoders without position tracking, it must be ensured that the traversing range around 0 is less than half the encoder range, because beyond this range, no unique reference remains after switching on and off (see description on parameter p2507). This traversing range can be extended using the virtual multiturn (p2721).

The following diagram illustrates an absolute encoder that can represent eight encoder revolutions (p0421 = 8).

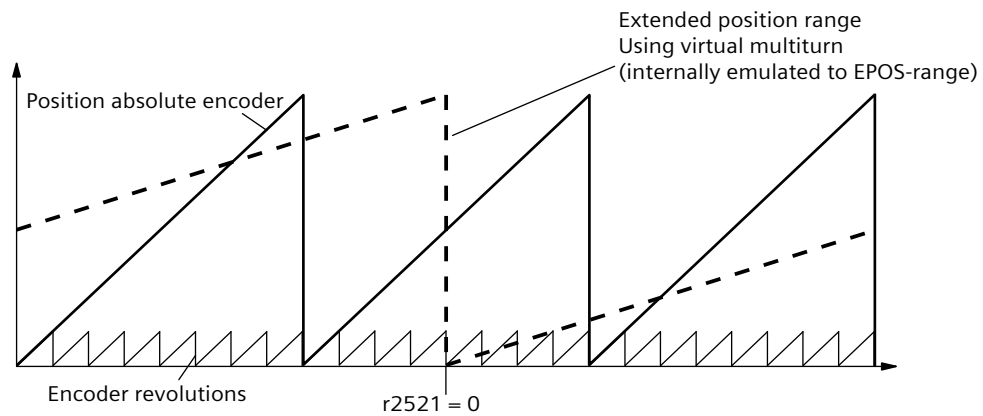


Figure 10-13 Position tracking (p2721 = 24), setting p2504 = p2505 = 1 (gear ratio = 1)

In this example, this means:

- Without position tracking, the position for +/- 4 encoder revolutions around r2521 = 0 LU can be reproduced.
- With position tracking, the position for +/- 12 encoder revolutions (+/- 12 load revolutions with load gear) can be reproduced (p2721 = 24).

Parameters

The following list includes the parameters of the "Load gear position tracking" function.

Number	Name	Unit
p0404[0...n].1...20	Encoder configuration effective	-
p0408[0...n]	Rotary encoder pulse number	-
p0421[0...n]	Absolute encoder rotary multitrurn resolution	-
p2504[0]	LR motor/load motor revolutions	-
p2505[0]	LR motor/load load revolutions	-
p2507[0...n]	LR absolute encoder adjustment status	-
p2720[0].0...2	Load gear configuration	-
p2721[0]	Load gear rotary absolute encoder revolutions virtual	-
p2722[0]	Load gear position tracking tolerance window	-
r2723[0]	Load gear absolute value	-

10.6.2 Limits

10.6.2.1 Limiting the traversing range

Overview

The traversing range of a linear axis can be limited using either the software limit switch or the hardware limit switch.

Requirement

NOTICE

Damage to the machine when passing a hardware limit switch

The machine can be damaged when a hardware limit switch is passed.

- Monitor axis motion, and manually stop the axis in time, e.g. by issuing an EMERGENCY STOP.

The traversing range limiting by using hardware limit switch is only active when the hardware limit switches are activated ($c2568 = 1$).

The traversing range limiting by using software limit switch is only active when the following preconditions are met:

- The software limit switches are activated ($c2582 = 1$).
- The home position is set ($r2684.11 = 1$).
- The modulo correction is not active ($c2577 = 0$).

Description of function

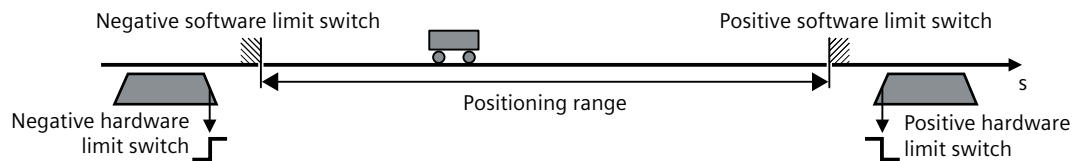


Figure 10-14 Software and hardware limit switches

If the position setpoint is beyond a software limit switch, the motor stops according to the travel profile before the software limit switch. During the braking process, the converter signals the warning A07479 or A07480.

Activated hardware limit switches are evaluated on the converter using $c2569$ (negative hardware limit switch) and $c2570$ (positive hardware limit switch) and they are low active. When triggering the hardware limit switch, the converter brakes the axis with the OFF3 ramp-down time, switches the motor off and outputs fault F07491 or F07492. After the fault is acknowledged, the motor is switched on again. In order to bring the axis back into the valid traversing range, you must move the axis away from the hardware limit switch, for example, by using the jogging function.

Parameters

The following list includes the parameters of the "Traversing range" function.

Number	Name	Unit
c2568	EPOS hardware limit switch activation	-
c2569	EPOS negative hardware limit switch	-
c2570	EPOS positive hardware limit switch	-
c2578	EPOS negative software limit switch	mm

c2578	EPOS negative software limit switch	°
c2579	EPOS positive software limit switch	mm
c2579	EPOS positive software limit switch	°
p2580	EPOS negative software limit switch	mm
p2580	EPOS negative software limit switch	°
p2581	EPOS positive software limit switch	mm
p2581	EPOS positive software limit switch	°
c2582	EPOS software limit switch activation	-

10.6.2.2 Limiting the traversing profiles

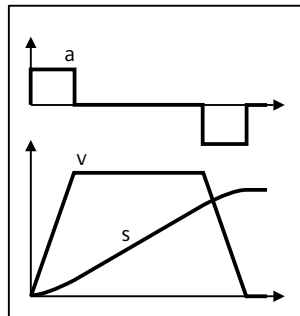
Overview

The traversing profile is the acceleration, velocity and position characteristics of an axis when being positioned. You can influence the traversing profile by limiting the velocity, the acceleration, or the jerk (= change of the acceleration over time).

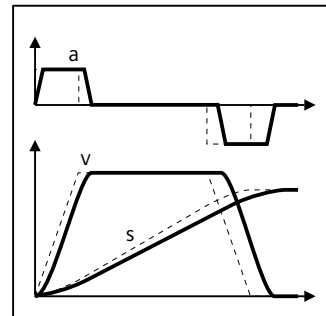
Description of function

If the axis must traverse more slowly or must accelerate at a lower rate or "softly", then you must set the relevant limits to lower values. The lower that one of the limits is, the longer the converter needs to position the axis.

- Without jerk limitation



- With jerk limitation



Jerk limitation is not active when messages are generated with stop responses OFF1/OFF2/OFF3.

In the event of a fault with stop response OFF1, the motor brakes with the OFF1 ramp-down time p1121. The acceleration in the event of a fault can therefore be greater than the acceleration in positioning. In order to comply with the mechanical boundary conditions even in the event of a fault, we recommend to set the OFF1 ramp-down time p1121 to match the acceleration time.

Parameters

The following list includes the parameters of the "Traversing profile" function.

Number	Name	Unit
--------	------	------

10.6 Basic positioner (EPOS)

p2571	EPOS maximum velocity	mm/s
p2571	EPOS maximum velocity	°/s
p2572	EPOS maximum acceleration	mm/s ²
p2572	EPOS maximum acceleration	°/s ²
p2573	EPOS maximum deceleration	mm/s ²
p2573	EPOS maximum deceleration	°/s ²
p2574	EPOS jerk limiting	mm/s ³
p2574	EPOS jerk limiting	°/s ³
c2575	EPOS jerk limiting activation	-

10.6.3 Position monitoring

The converter supports the following position monitoring functions:

- Standstill and positioning monitoring
- Following error monitoring

10.6.3.1 Positioning and standstill monitoring

Overview

Positioning and standstill monitoring is used to monitor the axis positioning motion and the axis position after a traversing motion.

Description of function

As soon as the setpoint for the position within a positioning operation no longer changes, then the converter sets the "Setpoint stationary" signal to 1. With this signal, the converter starts to monitor the position actual value:

- As soon as the axis has reached the positioning window, the converter signals that the target has been reached, and maintains the axis in closed-loop control.
- If the axis does not come to a standstill within the standstill monitoring time, the converter reports fault F07450.
- If the axis does not enter the positioning window within the positioning monitoring time, the converter reports fault F07451.

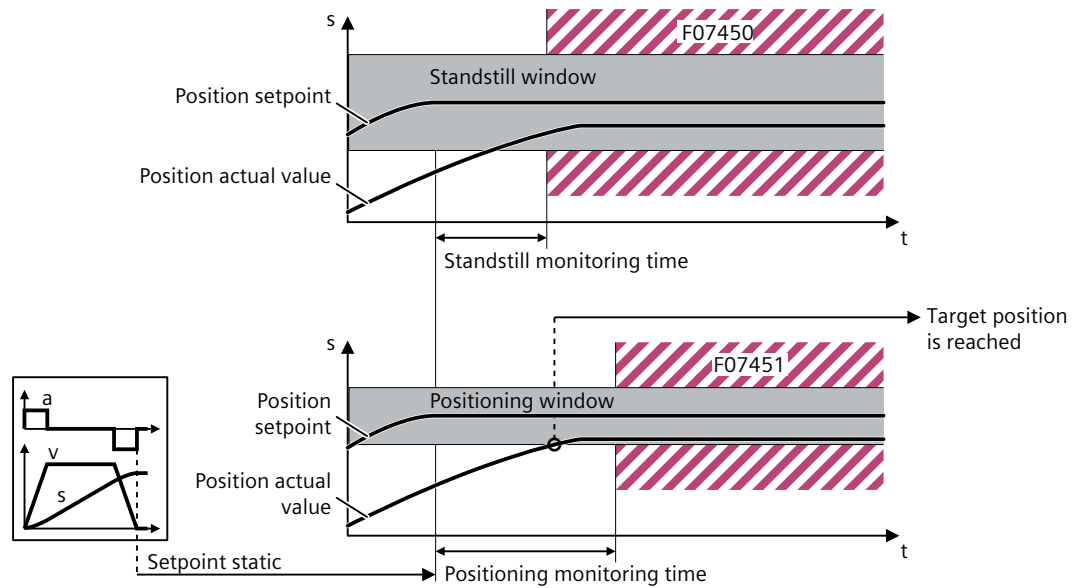


Figure 10-15 Standstill monitoring and positioning monitoring

Parameters

The following list includes the parameters of the "Positioning and standstill monitoring" function.

Number	Name	Unit
p2542	LR standstill window	mm
p2542	LR standstill window	°
p2543	LR standstill monitoring time	ms
p2544	LR positioning window	mm
p2544	LR positioning window	°
p2545	LR positioning monitoring time	ms

10.6.3.2 Following error monitoring

Overview

Following error monitoring is used to monitor the maximum deviation between the actual value and the position setpoint.

Description of function

The following error is the deviation between the position setpoint and the position actual value while the converter is positioning the axis. The converter reports fault F07452 if the following error is too high. If you set the tolerance to 0, monitoring is deactivated.

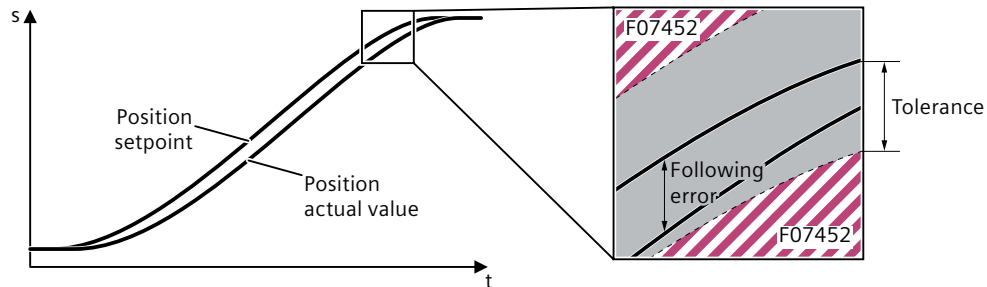


Figure 10-16 Following error monitoring

Parameters

The following list includes the parameters of the "Following error monitoring" function.

Number	Name	Unit
p2546[0]	LR dynamic following error monitoring tolerance	mm
p2546[0]	LR dynamic following error monitoring tolerance	°
r2563	LR following error dynamic model	mm
r2563	LR following error dynamic model	°

10.6.4 Homing

Overview

Homing establishes the reference between the coordinate origin of the drive axis and the machine zero point. When homing, the absolute position of the measuring system used for EPOS is determined.

Homing is a requirement for display of the correct position for the technology object and for absolute positioning.

Absolute encoders retain their position information, even after the supply has been switched off.

The converter offers various ways of homing the axis:

- Active homing - with all encoder types
- Passive homing - with all encoder types
- Absolute encoder adjustment - with absolute encoders

Description of function

Homing can occur by means of an independent homing motion (active homing), the detection of a homing mark during a motion initiated (passive homing) or a direct position assignment.

- **Active homing**
The converter automatically traverses the axis to a defined home position.
- **Passive homing**
The converter corrects its position actual value while traversing (homing during traversing).
- **Absolute encoder adjustment**
The converter takes the reference point coordinate as the new axis position.

10.6.4.1 Terms for homing

Overview

After switching on the machine, the reference between the coordinate origin of the drive axis and the machine zero point must be established for positioning. This progress is called homing. The following terms are relevant to the homing.

Description

Homing mark

A homing mark is an input signal, on whose occurrence a known mechanical position can be assigned to the actual values.

A homing mark can be the zero mark of an encoder or an external zero mark via digital input.

Reference cam

If there are several zero marks in the traversing range, the reference cam is used to select a specific zero mark before or after the reference cam.

The reference cam is evaluated with the settings of the telegrams 111, 112 and 113 via the higher-level control system. Alternatively, there is also the possibility to evaluate the reference cam via a digital input of the converter. For this purpose, a digital input must be parameterized as the reference cam selection 2 (p11550 = 1).

Homing mark position

This is the position assigned to the homing mark.

With active homing, the homing mark position corresponds to the home position minus home position offset.

With passive homing, the homing mark position corresponds to the home position.

Reversing cam

A reversing cam causes the converter to change the search direction when referencing. After reaching a reversing cam, the converter continues to search for the reference cam in the opposite direction.

Home position

At the end of the active homing motion, the axis arrives at the home position.

Home position offset

The difference between the home position and the homing mark position is the home position offset.

Approach velocity

Up to three parameterizable approach velocities are available:

- to the reference cam
- to the zero mark
- to the home position

10.6.4.2 Active homing

Overview

Three homing modes are available for active homing:

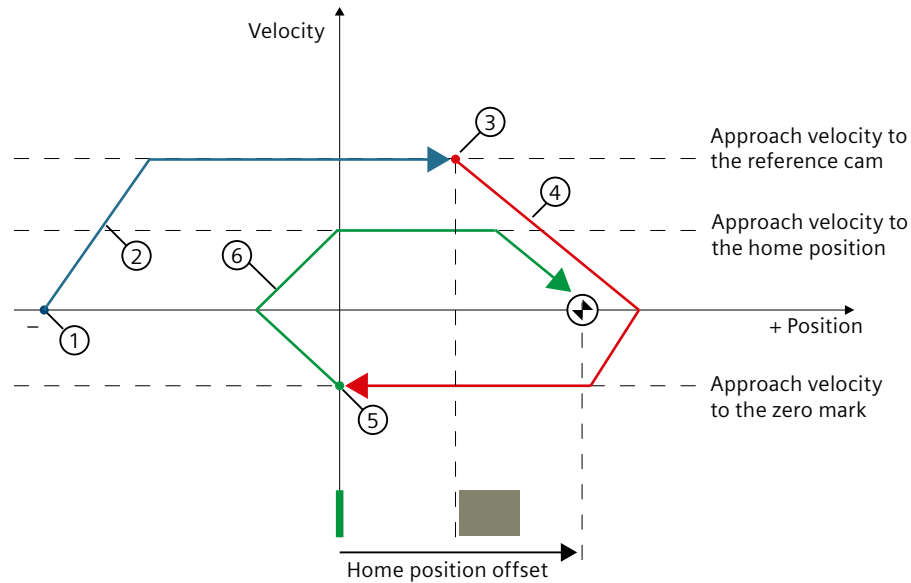
- Use encoder zero mark and reference cam
- Use encoder zero mark
- Use external zero mark via digital input

Description of function

Active homing by using encoder zero mark and reference cam

The following figure shows an example of the homing motion with the following settings:

- Active homing with reference cam and encoder zero mark
- Homing in the positive direction
- Positive home position offset



⊗ Home position

█ Encoder zero mark (Homing mark)

█ Reference cam

Motion sequence

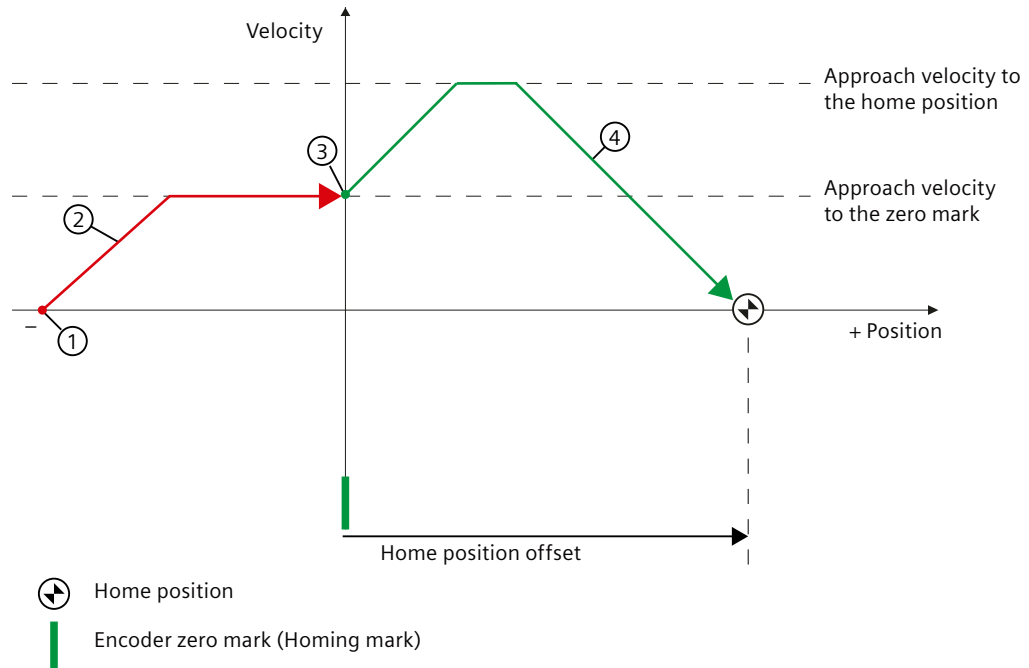
- ① Start of active homing
- ② Approach to the reference cam in approach direction with the corresponding approach velocity
- ③ Enable detection of the reference cam and homing mark detection
- ④ Approach to the homing mark with the corresponding approach velocity
- ⑤ Detection of the homing mark
- ⑥ Approach to the home position with the corresponding approach velocity

Figure 10-17 Example: active homing in positive direction by using encoder zero mark and reference cam

Active homing by using encoder zero mark

The following figure shows an example of the homing motion with the following settings:

- Active homing with encoder zero mark
- Homing in the positive direction
- Positive home position offset

**Motion sequence**

- ① Start of active homing
- ② Approach to the homing mark in the homing direction with the corresponding approach velocity to the zero mark
- ③ Detection of the homing mark
- ④ Approach to the home position with the corresponding approach velocity to the home position

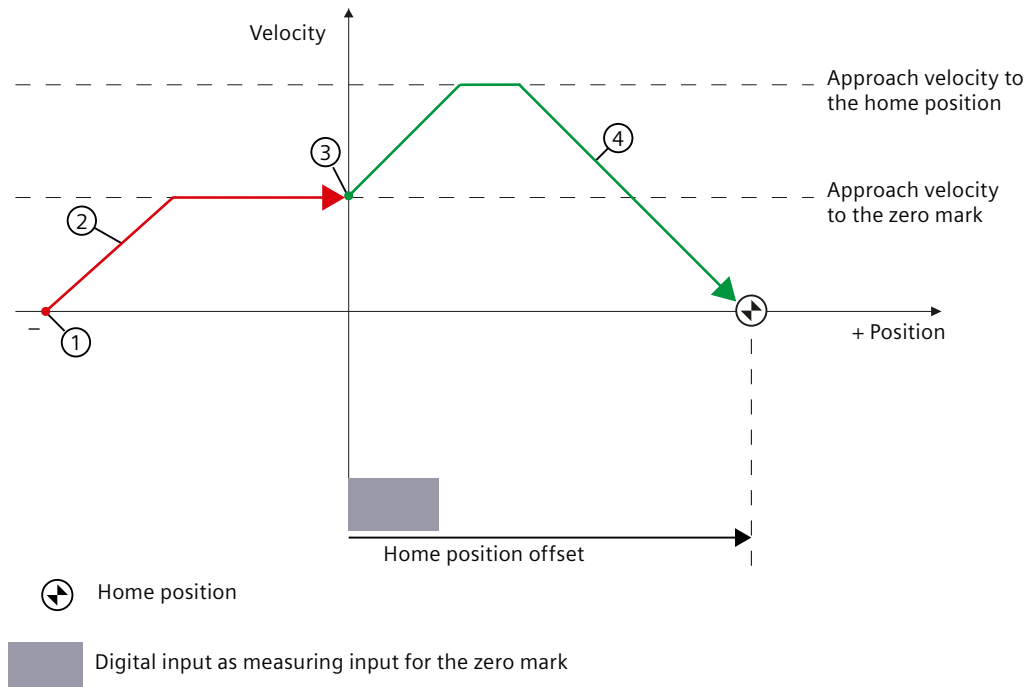
Figure 10-18 Example: active homing in positive direction by using encoder zero mark

Active homing by using external zero mark via digital input

The following figure shows an example of the homing motion with the following settings:

- Active homing with digital input
- Approach in the positive direction

- Homing mark on the negative side of the digital input
- Positive home position offset



Motion sequence

- ① Start of active homing
- ② Approach to the homing mark in the homing direction with the corresponding approach velocity to the zero mark
- ③ Detection of the homing mark via digital input
- ④ Approach to the home position with the corresponding approach velocity to the home position

Figure 10-19 Example: active homing in positive direction by using external zero mark via digital input

Reversing cam

If a signal of c2613 (EPOS active homing negative reversing cam) or c2614 (EPOS active homing positive reversing cam) is detected during active homing, the search direction is reversed.

If the negative reversing cam is approached in the positive traversing direction, or the positive reversing cam is approached in the negative traversing direction, fault F07499 (EPOS: Reversing cam approached with the incorrect traversing direction) is output. In this case, the wiring of the reversing cam (c2613, c2614) or the traversing direction to approach the reversing cam must be checked.

The reversing cams are low active. If both reversing cams are active (c2613 = 0 and c2614 = 0), the axis remains at a standstill. As soon as the reference cam is found, synchronization to the zero mark is immediately started.

Parameters

The following list includes the parameters of the "Active homing" function.

10.6 Basic positioner (EPOS)

Number	Name	Unit
c2595	EPOS homing start	-
c2596	EPOS set home position	-
c2597	EPOS homing type selection	-
c2598[0...3]	EPOS home position signal	mm
c2598[0...3]	EPOS home position signal	°
p2599	EPOS home position value	mm
p2599	EPOS home position value	°
p2600	EPOS active homing home position offset	mm
p2600	EPOS active homing home position offset	°
c2604	EPOS active homing start direction	-
p2605	EPOS active homing approach velocity reference cam	mm/s
p2605	EPOS active homing approach velocity reference cam	°/s
p2606	EPOS active homing reference cam maximum distance	mm
p2606	EPOS active homing reference cam maximum distance	°
p2607	EPOS active homing reference cam available	-
p2608	EPOS active homing approach velocity zero mark	mm/s
p2608	EPOS active homing approach velocity zero mark	°/s
p2609	EPOS active homing max distance reference cam and zero mark	mm
p2609	EPOS active homing max distance reference cam and zero mark	°
p2610	EPOS active homing tolerance band for distance to zero mark	mm
p2610	EPOS active homing tolerance band for distance to zero mark	°
p2611	EPOS active homing approach velocity home position	mm/s
p2611	EPOS active homing approach velocity home position	°/s
c2612[0...1]	EPOS active homing reference cam	-
c2613	EPOS active homing negative reversing cam	-
c2614	EPOS active homing positive reversing cam	-

10.6.4.3 Passive homing

Overview

Passive homing is used to dynamically modify the current position value to zero when the axis is working in any positioning state. The function can be used in every mode (jog, traversing block, direct setpoint specification for positioning / setup) and is superimposed over the active operating mode.

Description of function

The "Passive homing" function is superimposed on an active operating mode, it is therefore not an active mode. In contrast to the home position approach, the function can be carried out superimposed by the machine process.

As standard, for passive homing, measuring probe evaluation is used; when enabled, the measuring probe is selected and the measuring probe edge evaluation is active. (In the default settings, measuring probe 1 is always the measuring probe and the measuring probe evaluation is always the 0/1 edge.)

If the axis has reached the home position, the actual position value and position setpoint are set to the values specified via c2598 which is interconnected to p2599 as default. The axis is then homed and the status r2684.11 (Home position set) is set.

Parameters

The following list includes the parameters of the "Passive homing" function.

Number	Name	Unit
p2601	EPOS passive homing inner window	mm
p2601	EPOS passive homing inner window	°
p2602	EPOS passive homing outer window	mm
p2602	EPOS passive homing outer window	°

10.6.4.4 Absolute encoder adjustment

Overview

The function is only available when using a motor with the absolute encoder. When commissioning the absolute encoder for the first time, a mechanical axis position is aligned with the encoder absolute position and then the system is synchronized.

After the drive has been switched off, the encoder position information is retained. This means that the axis does not have to be readjusted when the drive powers up.

Description of function

Absolute encoder adjustment (via telegram 112 or 113)

Requirement

The absolute encoders must be adjusted the first time that they are commissioned.

For the absolute encoder adjustment, the machine axis must be moved to the desired position first. This can be done as follows:

- In jog mode or manually.
A position marking, a fixed stop, or the measuring distance between the axis and the fixed home position can be used as a reference. Once the desired position of the axis is reached, the absolute encoder adjustment can be performed. You must save the settings in the device permanently.
- With the active homing.
You must select the option during configuration of the active homing.

When using the telegram 112 or 113, the absolute encoder adjustment can be initiated via the position control word 2, bit 3 (POS_STW2.3).

Note

After being commissioned for the first time, carefully ensure that the drive train and its configuration cannot be mechanically changed or modified. When mechanical changes are made, the synchronization between the encoder actual value and the machine zero is lost. In this particular case, it is crucial that the axis is readjusted.

Absolute encoder adjustment (via Startdrive)
Requirement

The function is only available when the converter is online in Startdrive.

- Setting the absolute encoder adjustment status
You can perform the absolute encoder adjustment (p2507 = 2) and the status "Home position set" (r2684.11) is updated. When the adjustment is correct, "Absolute encoder adjusted" is displayed.
- Resetting the absolute encoder adjustment status
You can also reset the status "Absolute encoder adjusted" and the status display for the absolute encoder adjustment is then updated. The adjustment is deactivated. After the reset, "Absolute encoder not adjusted" is displayed.

10.6.5 Traversing blocks

10.6.5.1 Traversing block tasks

Overview

A traversing block describes a positioning instruction for the drive. Up to 32 different traversing blocks can be saved in the converter. All parameters which describe a traversing task are effective during a block change.

Description of function
Activating the traversing block function

When telegrams 111, 112, and 113 are used, the traversing block function can be configured with the PROFINET control word POS_STW1.15:

Control word	Signal	Description
POS_STW1.15	1	MDI selection.
	0	Traversing block selection.

When telegrams 7 and 9 are used, the traversing block function can be configured with the PROFINET control word SATZANW.15:

Control word	Signal	Description
SATZANW.15	1	MDI selection.
	0	Traversing block selection.

Traversing blocks are parameterized using parameter sets that have a fixed structure:

- **Traversing block number (p2616[0...31])**
Each traversing block must have a traversing block number assigned to it. The traversing blocks are executed in the sequence of the traversing block numbers. Numbers containing the value "-1" are ignored so that the space can be reserved for subsequent traversing blocks, for example.
- **Task (p2621[0...31])**
 - 1: POSITIONING
 - 2: FIXED ENDSTOP
 - 3: ENDLESS_POS
 - 4: ENDLESS_NEG
 - 5: WAIT
 - 6: GOTO
 - 7: SET_O
 - 8: RESET_O
 - 9: JERK
- **Motion parameters**
 - Target position or traversing distance (p2617[0...31])
 - Velocity (p2618[0...31])
 - Acceleration override (p2619[0...31])
 - Deceleration override (p2620[0...31])

- **Task mode (p2623[0...31])**

Processing a traversing task can be affected by the parameter p2623 (task mode).

Value = 0000 cccc bbbb aaaa

- aaaa: Identifiers
000x → hide/show block (x = 0: show, x = 1: hide)
- bbbb: Continuation condition
0000, END: 0/1 edge at STW1.6
0001, CONTINUE_WITH_STOP:
The exact position parameterized in the block is approached (brake to standstill and positioning window monitoring) before block processing can continue.
0010, CONTINUE_ON-THE-FLY:
The system switches to the next traversing block "on the fly" when the braking point for the current block is reached (if the direction needs to be changed, this does not occur until the drive stops within the positioning window).
0011, CONTINUE_EXTERNAL:
Same as "CONTINUE_ON-THE-FLY", except that an instant block change can be triggered up to the braking point by a 0/1 edge. If an external block change is not triggered, a block change is triggered at the braking point.
0100, CONTINUE_EXTERNAL_WAIT:
Control signal "External block change" can be used to trigger a flying changeover to the next task at any time during the traveling phase. If "External block change" is not triggered, the axis remains in the parameterized target position until the signal is issued. The difference here is that with CONTINUE_EXTERNAL, a flying changeover is carried out at the braking point if "External block change" has not been triggered, while here the drive waits for the signal in the target position.
0101, CONTINUE_EXTERNAL_ALARM:
This is the same as CONTINUE_EXTERNAL_WAIT, except that alarm A07463 "External traversing block change in traversing block x not requested" is output when "External block change" is not triggered by the time the drive comes to a standstill. The alarm can be converted to a fault with a stop response so that block processing can be canceled if the control signal is not issued.
- cccc: positioning mode
The POSITIONING task (p2621 = 1) defines how the position specified in the traversing task is to be approached.
0000, ABSOLUTE:
The position specified in p2617 is approached.
0001, RELATIVE:
The axis is traveled along the value specified in p2617
0010, ABS_POS:
For rotary axes with modulo offset only. The position specified in p2617 is approached in a positive direction.
0011, ABS_NEG:
For rotary axes with modulo offset only. The position specified in p2617 is approached in a negative direction.

- **Task parameter (command-dependent significance) (p2622[0...31])**

Traversing block tasks

- **POSITIONING**

The POSITIONING task initiates motion. The following parameters are evaluated:

- p2616[x] Block number
- p2617[x] Position
- p2618[x] Velocity
- p2619[x] Acceleration override
- p2620[x] Deceleration override
- p2623[x] Task mode

The task is executed until the target position is reached. When the task is activated, the converter is already located at the target position, then for the block change enable (CONTINUE_ON-THE-FLY or CONTINUE_EXTERNAL), the next task is selected in the same interpolation cycle. For CONTINUE_WITH_STOP, the next block is activated in the next interpolation cycle. CONTINUE_EXTERNAL_ALARM causes a message to be output immediately.

- **FIXED STOP**

The FIXED STOP task triggers a traversing movement with reduced torque to fixed stop. The following parameters are relevant:

- p2616[x] Block number
- p2617[x] Position
- p2618[x] Velocity
- p2619[x] Acceleration override
- p2620[x] Deceleration override
- p2623[x] Task mode
- p2622[x] Task parameter clamping torque [0.01 Nm] with rotary motors.

Possible continuation conditions include END, CONTINUE_WITH_STOP, CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT.

- **ENDLESS POS, ENDLESS NEG**

Using these tasks, the axis is accelerated to the specified velocity and is moved until:

- A software limit switch is reached.
- A hardware limit switch signal has been issued.
- The traversing range limit is reached.
- Motion is interrupted by the control signal "no intermediate stop / intermediate stop" (STW1.5).
- Motion is interrupted by the control signal "do not reject traversing task / reject traversing task" (STW1.4).
- An external block change is triggered (with the appropriate continuation condition).

The following parameters are relevant:

- p2618[x] Velocity
- p2619[x] Acceleration override
- p2623[x] Task mode

All continuation conditions are possible.

- **JERK**

Jerk limitation can be activated (command parameter = 1) or deactivated (task parameter = 0) by means of the JERK task. p2575 "Active jerk limitation" must be set to zero. The value parameterized in "jerk limit" p2574 is the jerk limit.

A precise stop is always carried out here regardless of the parameterized continuation condition of the task preceding the JERK task.

The following parameters are relevant:

- p2622[x] Task parameter = 0 or 1

All continuation conditions are possible.

- **WAIT**

The WAIT task can be used to set a waiting period which should expire before the following task is processed.

The following parameters are relevant:

- p2622[x] Task parameter = delay time in milliseconds ≥ 0 ms, but is rounded-off to a multiple of numeral 8
- p2623[x] Task mode

Regardless of the parameterized continuation condition which is parameterized for the task that precedes the WAIT task, a precise stop is always executed before the waiting time expires. The WAIT task can be executed by an external block change.

Possible continuation conditions include END, CONTINUE_WITH_STOP, CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT, and CONTINUE_EXTERNAL_ALARM.

The fault message is triggered when "External block change" has still not been issued after the waiting time has elapsed.

- **GOTO**

Using the GOTO task, jumps can be executed within a sequence of traversing tasks. The block number which is to be jumped to must be specified as task parameter. A continuation condition is not permissible. If there is no block with this number, then alarm A07468 (jump destination does not exist in traversing block x) is output and the block is designated as being inconsistent.

The following parameters are relevant:

- p2622[x] Task parameter = Next traversing block number

Any two of the SET_O, RESET_O and GOTO tasks can be processed in an interpolation cycle and a subsequent POSITION and WAIT task can be started.

- **SET_O, RESET_O**

The tasks SET_O and RESET_O allow up to two binary signals (output 1 or 2) to be simultaneously set or reset. The number of the output (1 or 2) is specified bit-coded in the task parameter.

The following parameters are relevant:

- p2616[x] Block number
- p2622[x] Task parameter = bit-coded output:
 - 0x1: Output 1
 - 0x2: Output 2
 - 0x3: Output 1 and output 2

Possible continuation conditions are END, CONTINUE_ON-THE-FLY and CONTINUE_WITH_STOP, and CONTINUE_EXTERNAL_WAIT.

Any two of the SET_O, RESET_O and GOTO tasks can be processed in an interpolation cycle and a subsequent POSITIONING and WAIT task can be started.

Intermediate stop and reject a traversing task

When telegrams 7, 9, 111, 112, and 113 are used, perform an intermediate stop with the PROFINET control word STW1.5:

Control word	Signal	Description
STW1.5	1	No intermediate stop.
	0	Intermediate stop.

When telegrams 7, 9, 111, 112, and 113 are used, reject a traversing task with the PROFINET control word STW1.4:

Control word	Signal	Description
STW1.4	1	Do not reject a traversing task.
	0	Reject a traversing task (ramp-down with the maximum deceleration).

Parameters

The following list includes the parameters of the "Traversing block" function. The parameters displayed twice indicate that they may have different properties and descriptions depending on the selected axis type. For more information, see Section "Parameter list (Page 698)".

Number	Name	Unit
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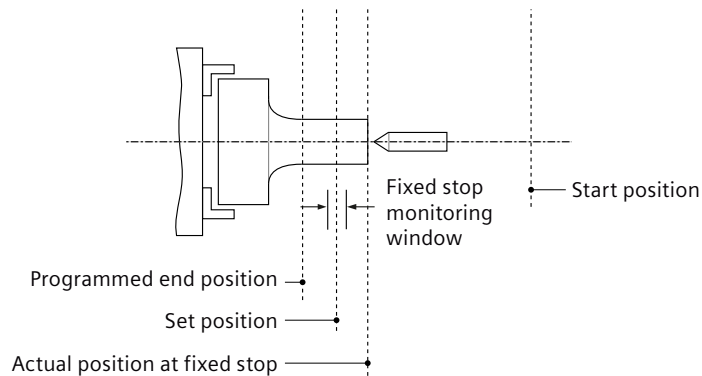
10.6 Basic positioner (EPOS)

p2615	EPOS maximum number of traversing blocks	-
p2616[0...n]	EPOS traversing block block number	-
p2617[0...n]	EPOS traversing block position	mm
p2617[0...n]	EPOS traversing block position	°
p2618[0...n]	EPOS traversing block velocity	mm/s
p2618[0...n]	EPOS traversing block velocity	°/s
p2619[0...n]	EPOS traversing block acceleration override	%
p2620[0...n]	EPOS traversing deceleration override	%
p2621[0...n]	EPOS traversing block task	-
p2622[0...n]	EPOS traversing block task parameter	-
p2623[0...n]	EPOS traversing block task mode	-

10.6.5.2 Travel to fixed stop

Overview

The function can be used to move the motor to a fixed stop at a specified torque without a fault being signaled. The specified torque is built up and remains applied after the motor reaches the fixed stop.



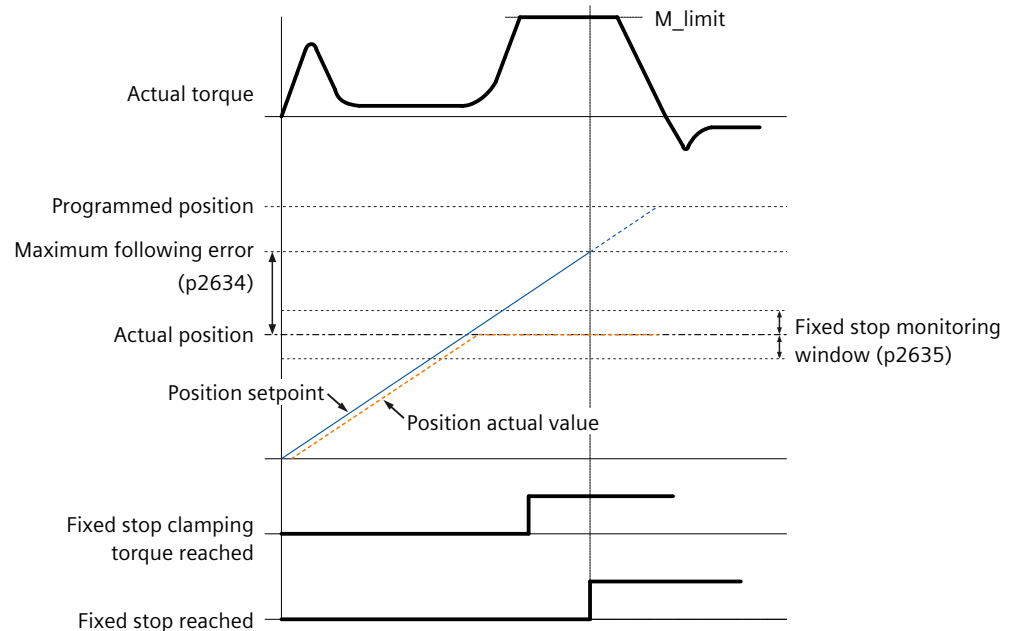
Description of function

In positioning mode, travel to fixed stop is started when a traversing block is processed with the FIXED STOP task. You can set the required clamping torque of the FIXED STOP function by the task parameter p2622.

An adjustable monitoring window for travel to fixed stop prevents the drive from traveling beyond the window if the fixed stop should break away.

From the start position onwards, the target position is approached with the parameterized speed. The fixed stop (the workpiece) must be between the start position and the braking point of the axis; that is, the target position is placed inside the workpiece. The preset torque limit is effective from the start, i.e. travel to fixed stop also occurs with a reduced torque. The preset acceleration and delay overrides and the current speed override are also effective.

Dynamic following error monitoring (p2546) in the position controller is not effective when traveling to the fixed stop. As long as the drive travels to the fixed stop or is in fixed stop, the "Travel to fixed stop active" status bit r2683.14 is set.



Fixed stop is reached

As soon as the axis comes into contact with the mechanical fixed stop, the closed-loop control in the drive raises the torque so that the axis can move on. The torque increases up to the value specified in the task and then remains constant. If the actual position following error exceeds the value set in parameter p2634 (Fixed stop: maximum following error), fixed stop is reached.

Once the "Fixed stop reached" status has been detected, the traversing task "Travel to fixed stop" is ended. The program advances to the next block depending on the task parameterization.

If the axis leaves the position that has been detected as the fixed stop by more than the selected monitoring window for the fixed stop (p2635), the speed setpoint is set to 0, and fault F07484 "Fixed stop outside of the monitoring window" is triggered with the reaction OFF3 (quick stop). The monitoring window can be set using the parameter p2635 ("Fixed stop monitoring window"). It applies to both positive and negative traversing directions and must be selected such that it will only be triggered if the axis breaks away from the fixed stop.

Fixed stop is not reached

If the brake application point is reached without the "Fixed stop reached" status being detected, then the fault F07485 "Fixed stop is not reached" is output with fault reaction OFF1, the torque limit is canceled and the drive cancels the traversing block.

Parameters

The following list includes the parameters of the "Travel to fixed stop" function.

Number	Name	Unit
p2634[0]	EPOS fixed stop maximum following error	mm
p2634[0]	EPOS fixed stop maximum following error	°
p2635	EPOS fixed stop monitoring window	mm
p2635	EPOS fixed stop monitoring window	°

10.6.6 Direct setpoint input (MDI)

Overview

The "direct setpoint input (MDI, Manual Data Input)" function allows for positioning (absolute, relative) and setting-up (endless position-controlled) by means of direct setpoint inputs (e.g. via the PLC using process data). A higher-level control provides the converter with the position setpoint and traversing profile.

Description of function

During traversing, the motion parameters can also be influenced (on-the-fly setpoint acceptance) and an on-the-fly change can be undertaken between the "setting-up" and "positioning" modes. The "direct setpoint specification" mode (MDI) can also be used if the axis is not homed in the "setting-up" or "relative positioning" modes.

"Setting-up" mode

The higher-level control selects the mode "Set-up":

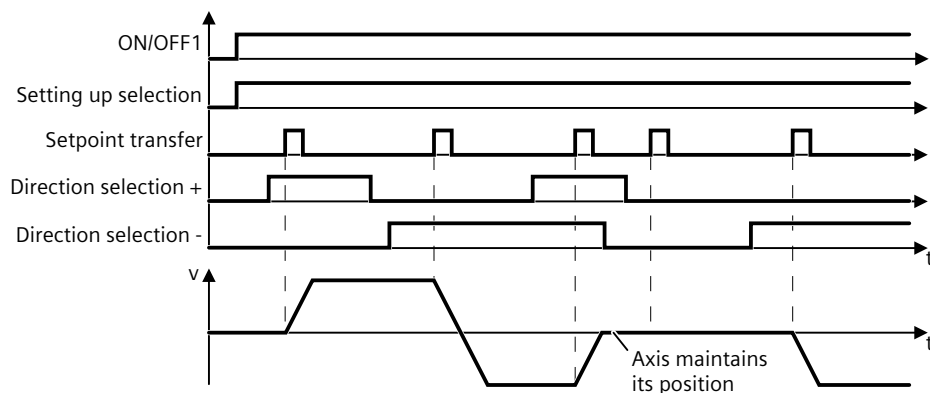


Figure 10-20 Set up axis with direct setpoint input (MDI)

"Positioning" mode

The higher-level control specifies the value of the setpoint either as a relative or an absolute position setpoint:

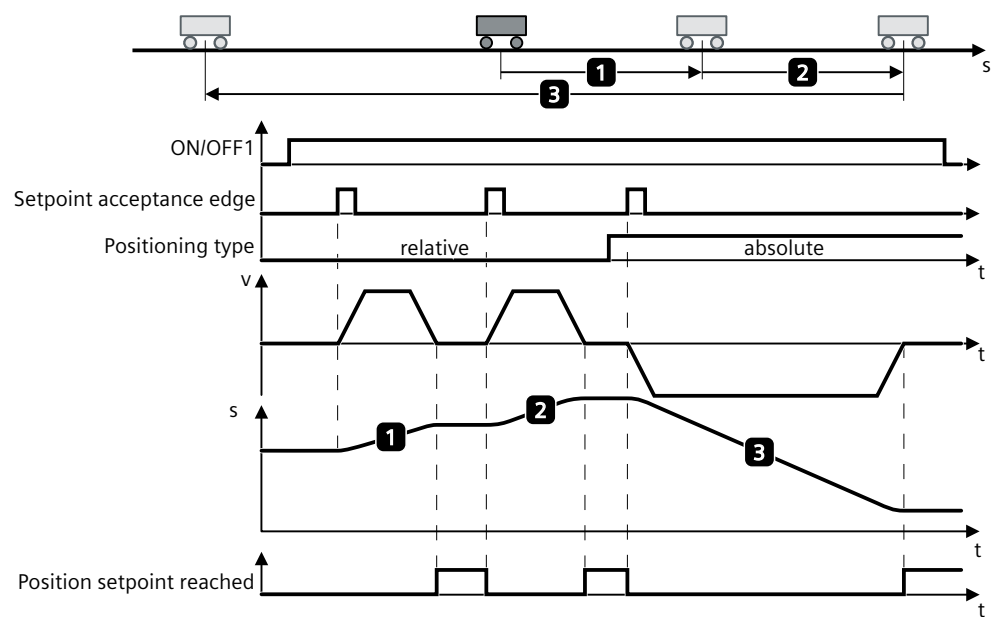


Figure 10-21 Position axis with direct setpoint input (MDI)

Activating the direct setpoint input function

When telegrams 111, 112, and 113 are used, the direct setpoint input function can be configured with the PROFINET control word POS_STW1.15:

Control word	Signal	Description
POS_STW1.15	1	MDI selection.
	0	Traversing block selection.

When telegrams 7 and 9 are used, the direct setpoint input function can be configured with the PROFINET control word SATZANW.15:

Control word	Signal	Description
SATZANW.15	1	MDI selection.
	0	Traversing block selection.

Selecting a working mode

In "Positioning" mode, the parameters (position, velocity, acceleration and deceleration) can be used to carry out absolute or relative positioning.

In "Setting-up" mode, using parameters (velocity, acceleration and deceleration) endless closed-loop position control behavior can be carried out.

When telegrams 111, 112, and 113 are used, select a working mode with the PROFINET control word POS_STW1.14:

Control word	Signal	Description
POS_STW1.14	1	Select "setting-up" mode.
	0	Select "positioning" mode. ¹⁾

¹⁾ Telegrams 7 and 9 can only work in "positioning" mode.

Selecting a positioning type in "positioning" mode

When telegrams 111, 112, and 113 are used, select a positioning type with the PROFINET control word POS_STW1.8:

Control word	Signal	Description
POS_STW1.8	1	Select absolute positioning.
	0	Select relative positioning.

When telegram 9 is used, select a positioning type with the PROFINET control word MDI_MOD.0:

Control word	Signal	Description
MDI_MOD.0	1	Select absolute positioning.
	0	Select relative positioning.

Selecting an absolute positioning direction in "positioning" mode

When telegrams 111, 112, and 113 are used, select an absolute positioning direction with the PROFINET control words POS_STW1.9 and POS_STW1.10:

Control word		Description
POS_STW1.9	POS_STW1.10	
0	0	Absolute positioning through the shortest distance.
0	1	Absolute positioning/MDI direction selection, positive.
1	0	Absolute positioning/MDI direction selection, negative.
1	1	Absolute positioning through the shortest distance.

When telegram 9 is used, select an absolute positioning direction with the PROFINET control words MDI_MOD.1 and MDI_MOD.2:

Control word		Description
MDI_MOD.1	MDI_MOD.2	
0	0	Absolute positioning through the shortest distance.
0	1	Absolute positioning/MDI direction selection, positive.
1	0	Absolute positioning/MDI direction selection, negative.
1	1	Absolute positioning through the shortest distance.

Selecting a direction in "setting-up" mode

When telegrams 111, 112, and 113 are used, select a direction with the PROFINET control words POS_STW1.9 and POS_STW1.10

Control word		Description
POS_STW1.9	POS_STW1.10	
0	1	MDI direction selection, positive.
1	0	MDI direction selection, negative.

Selecting an MDI transfer type

When telegrams 111, 112, and 113 are used, select an MDI transfer type with the PROFINET control word POS_STW1.12:

Control word	Signal	Description
POS_STW1.12	1	Continuous transfer.
	0	Activate MDI block change with of a traversing task (STW1.6).

Setting MDI setpoints

When telegrams 9, 111, 112, and 113 are used, set MDI setpoints with the following PROFINET control words:

- Position setpoint
 - MDI_TARPOS in telegrams 9, 111: 1 hex = 1 LU
 - MDI_TARPOS_F in telegram 112: LU or MU as floating-point number
 - MDI_TARPOS_D in telegram 113: LU or MU as 64-bit floating-point number
- Velocity setpoint
 - MDI_VELOCITY in telegrams 9, 111: 1 hex = 1000 LU/min
 - MDI_VELOCITY_F in telegrams 112, 113: floating-point number
- Acceleration override
 - MDI_ACC in telegrams 9, 111: 4000 hex = 100%
 - MDI_ACC_F in telegrams 112, 113: floating-point number
- Deceleration override
 - MDI_DEC in telegrams 9, 111: 4000 hex = 100%
 - MDI_DEC_F in telegrams 112, 113: floating-point number

Intermediate stop and reject an MDI task

When telegrams 7, 9, 111, 112, and 113 are used, perform an intermediate stop with the PROFINET control word STW1.5:

Control word	Signal	Description
STW1.5	1	No intermediate stop.
	0	Intermediate stop with parameterized deceleration MDI_DEC (telegrams 9, 111, 112, and 113).

When telegrams 7, 9, 111, 112, and 113 are used, reject an MDI task with the PROFINET control word STW1.4:

Control word	Signal	Description
STW1.4	1	Do not reject a traversing task.
	0	Reject a traversing task (ramp-down with the maximum deceleration).

Parameters

The following list includes the parameters of the "Direct setpoint input (MDI)" function.

Number	Name	Unit
c2642	EPOS direct setpoint input/MDI position setpoint	mm
c2642	EPOS direct setpoint input/MDI position setpoint	°
c2643	EPOS direct setpoint input/MDI velocity setpoint	mm/s
c2643	EPOS direct setpoint input/MDI velocity setpoint	°/s
c2644	EPOS direct setpoint input/MDI acceleration override	%
c2645	EPOS direct setpoint input/MDI deceleration override	%
c2646	EPOS velocity override	%
c2647	EPOS direct setpoint input/MDI selection	-
c2648	EPOS direct setpoint input/MDI positioning type	-
c2649	EPOS direct setpoint input/MDI transfer type selection	-
c2650	EPOS direct setpoint input/MDI setpoint acceptance edge	-
c2651	EPOS direct setpoint input/MDI direction selection, positive	-
c2652	EPOS direct setpoint input/MDI direction selection negative	-
c2653	EPOS direct setpoint input/MDI setting-up selection	-
c2654	EPOS direct setpoint input/MDI mode adaptation	-

10.6.7 Jog

Overview

It is possible to change over between jog incremental and jog velocity. The traversing distances p2587 and p2588 and velocities p2585 and p2586 are entered according to the jog signals c2589 and c2590. The traversing distances are only effective for a "1" signal at p2591 (jog incremental). For p2591 = "0", the axis moves with the specified velocity.

Description of function

Jog incremental

In the case of incremental jogging, input a relative traversing distance and a velocity setpoint into the converter. With the signals "Jogging 1" or "Jogging 2" the converter positions the axis by the respective travel path.

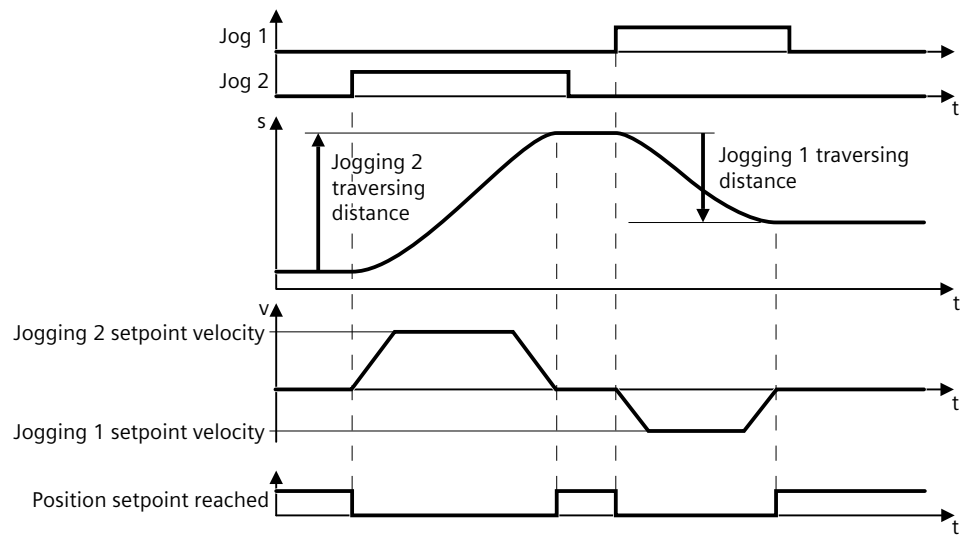


Figure 10-22 Jog incremental

Jog velocity

Only input a setpoint velocity for the converter for velocity jog. With the signal "Jogging 1" or "Jogging 2", the converter accelerates the axis to the relevant setpoint velocity. The converter stops the axis when the respective "Jog" signal returns to zero.

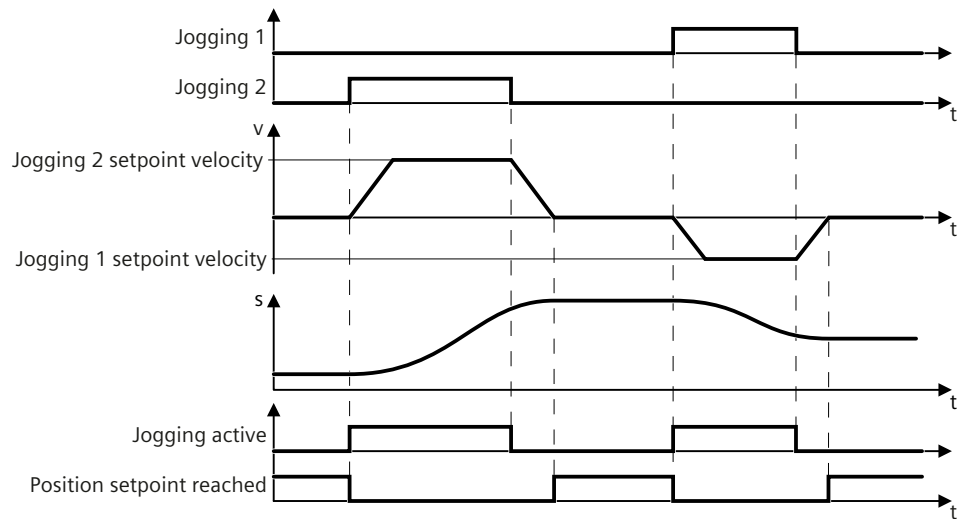


Figure 10-23 Jog velocity

Selecting a jogging channel

When telegrams 7, 9, 111, 112 and 113 are used, select a jogging channel with the control words STW1.8 and STW1.9:

Control word		Description
STW1.8	STW1.9	
0	0	No jogging channel activated
1	0	Activate Jog 1 signal source rising edge

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Control word		Description
STW1.8	STW1.9	
0	1	Activate Jog 2 signal source rising edge
1	1	Keep old setpoint

Selecting a jogging mode**Note**

When telegrams 7 and 9 are used, "Jog velocity" is activated.

When telegrams 111, 112 and 113 are used, select a jogging mode with the control word POS_STW2.5:

Control word	Signal	Description
POS_STW2.5	1	Activate "Jog incremental"
	0	Activate "Jog velocity"

Setting jogging setpoints

When telegrams 7 and 9 are used, set the following jogging setpoint with the appropriate parameters:

- Velocity (p2585, p2586)

When telegrams 111, 112 and 113 are used, set the following jogging setpoints with the appropriate parameters:

- Velocity (p2585, p2586)
- Traversing distance (p2587, p2588)

Parameters

The following list includes the parameters of the "Jog" function. The parameters displayed twice indicate that they may have different properties and descriptions depending on the selected axis type. For more information, see Section "Parameter list (Page 698)".

Number	Name	Unit
p2585	EPOS jog 1 setpoint velocity	mm/s
p2585	EPOS jog 1 setpoint velocity	°/s
p2586	EPOS jog 2 setpoint velocity	mm/s
p2586	EPOS jog 2 setpoint velocity	°/s
p2587	EPOS jog 1 traversing distance	mm
p2587	EPOS jog 1 traversing distance	°
p2588	EPOS jog 2 traversing distance	mm
p2588	EPOS jog 2 traversing distance	°
c2589	EPOS jog 1	-
c2590	EPOS jog 2	-
c2591	EPOS jogging incremental	-

10.6.8 Measuring probe evaluation and homing mark search

Overview

The converter supports the "homing mark search" and the "measuring probe evaluation" in position control.

Description of function

The "homing mark search" and the "measuring probe evaluation" functions mode can be defined via c2510 (measuring probe evaluation selection) and c2511 (measuring probe evaluation edge). In the default settings, measuring probe 1 is always the measuring probe and the measuring probe evaluation is always the 0/1 edge.

The probe signals are recorded via the encoder status and control word. To speed up signal processing, direct measuring probe evaluation can be activated by selecting the input terminals for probes 1 or 2.

The system outputs a message if the same probe input is already being used (see also p0488, p0489).

The appropriate function is started using a 0/1 edge via the encoder control word. Status bit r2526.1 (homing active) signals that the function is active (feedback from the encoder status word). Status bit r2526.2 (measured value valid) shows the presence of the required measurement r2523.

Once the function is completed (position determined for homing mark or measuring probe), r2526.1 (homing active) and r2526.2 (measured value valid) remain active and the measurement is provided by r2523 until the corresponding encoder control word is reset (0 signal).

If the function (homing mark search or measuring probe evaluation) has not been completed yet, while the encoder control word is reset, then the function is interrupted and the status bit r2526.1 (homing active) is reset via the encoder status word.

If the homing mark search and the measuring probe evaluation functions are simultaneously set, this causes the active function to be interrupted or no function is enabled. Alarm A07495 "homing function interrupted" occurs and remains until the signals at the inputs are reset. The alarm is also generated if a fault is signaled using the encoder status word during an activated function (homing mark search or measuring probe evaluation).

If the "position control" function is activated, these parameters (c2510 to c2511) are preassigned with "0". If the "basic positioner" function is activated, the "homing mark search" (for the homing position searching) and "measuring probe evaluation" (for the passive homing function) functions are initiated by the "basic positioner" function and feedback (r2526, r2523) returned to this.

Parameters

The following list includes the parameters of the "Homing mark search" and "Measuring probe evaluation" functions.

Number	Name	Unit
p0488[0...2]	Measuring probe 1 input terminal	-

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p0489[0...2]	Measuring probe 2 input terminal	-
c2510[0...3]	LR selecting measuring probe evaluation	-
c2511[0...3]	LR measuring probe evaluation edge	-
r2523[0...3]	LR measured value	mm
r2523[0...3]	LR measured value	°
r2526.0...12	LR status word	-

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10.7.1 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 of function

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.

In the machinery directive, a drive system is designated as power drive system (PDS).

10.7.2 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 of function

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 various safety types (e.g. by specifying the cause of potential 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).

10.7.3 Safety Integrated Functions

Overview

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

Requirement

 WARNING**Unsafe operation as a result of inadequate measures applied to minimize risk**

Safety Integrated can reduce the level of risk associated with systems and machines. Machines or plants, however, can only be operated safely in conjunction with Safety Integrated if the machine OEM carefully complies with the following:

- The machine OEM precisely knows the safety instructions and residual risks specified in the technical user documentation and complies with the documented constraints for Safety Integrated.
- Carefully constructs and configures the system or machine. A careful and thorough acceptance test must then be performed by qualified personnel and the results documented.
- Implements and validates all the measures required in accordance with the system or machine risk analysis using programmed and configured Safety Integrated Functions or by other means.
- The use of Safety Integrated does not replace the risk assessment of the system or machine by the machine manufacturer as specified by the EU Machinery Directive.
In addition to using Safety Integrated Functions, additional risk reduction measures must be implemented.

 WARNING**Unexpected automatic start of the motor**

An EMERGENCY STOP must stop the motor involved according to stop category 0 or 1 according to IEC 60204-1 using Safety Integrated Function STO or SS1.

Dangerous operating states can occur if the motor automatically starts when the EMERGENCY STOP is reset.

- After stopping according to stop Category 0 or 1, avoid that the motor automatically starts again.
- If the risk analysis permits it, the motor may automatically start after deselecting a Safety Integrated Function for motion monitoring. An automatic start is possible when a protective door is closed, for example.

 WARNING**Undesirable motor motion after changing the hardware or software**

Unsafe operating states can occur after changing or replacing hardware or software components.

- Close all protective devices after changing or replacing.
Persons must not be present in the danger zone.
- Depending on whether a change or replacement was carried out, perform either a reduced or a complete acceptance test.
- Before you enter the hazardous area, test all drives by briefly moving them in both directions of motion to ensure that the closed-loop response is stable.

 WARNING

Unexpected machine motion immediately after switching on the supply voltage

The Safety Integrated Functions cannot be selected immediately after switching on the supply voltage. The Safety Integrated Functions can only be selected after the system has completely run-up. As a consequence, there is an increased risk of an accident while the system runs-up. Accidents can result in death or severe injuries.

- Close all protective devices before the system runs up.
Persons must not be present in the danger zone.

 WARNING

Unexpected motor movements due to manipulated connecting cables

The manipulation of the connecting cables can cause unexpected motor movements in a machine or plant. Particularly in machines or plants in which Safety Integrated Functions are used to minimize risks, manipulation can result in serious personal injury or death.

- Prevent unauthorized access to the converter, for example by using a lockable control cabinet.
- Protect the cables inside and outside the control cabinet against manipulation by taking one of the following measures:
 - Sheathe the cables to the motors, encoders and sensors.
 - Route the cables in empty conduits.

 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.

- Prevent unauthorized persons accessing the drive.
- Protect configurations with active Safety Integrated Functions against changes by assigning roles using user management (UMAC).

NOTICE

Material damage due to overshooting the speed or position that briefly violates the upper limit value

Violation of limits may briefly lead to a speed higher than the speed setpoint, or the axis may pass the defined position to a certain extent, depending on the dynamic response of the drive and on parameter settings.

- Design your machine appropriately.

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.

Note

Protection against manipulation by unauthorized third parties

Safety Integrated Functions protect against hardware and software faults, 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
-

Note

Safety Integrated Functions should be protected with UMAC (User Management and Access Control).

The "Drive Safety Engineer" role must be assigned to a named user and must not be assigned to Anonymous.

If the role is not assigned, alarm A01637 is displayed.

Note

Resetting safety messages

Withdrawing and inserting components in operation can result in a reset of safety messages.

Description of function

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

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.

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

The converter performs a cyclic data comparison of the monitoring channels and identifies limit value violations of Safety Integrated Functions. Faults that are detected result in a safety message with a subsequent stop response.

The Safety Integrated Functions are in conformance with the following standards:

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

10.7.4 Certification

Description

The Safety Integrated Functions comply with:

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

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

The individual Safety Integrated components have the following certifications:

Table 10-25 Certifications for the converter Safety Integrated component

Converter	SIL	PL	Category
Control via F-DI	SIL 3	PL e	Category 3 or 4 ¹⁾
Stop functions STO, SS1	SIL 3	PL e	Category 4

¹⁾ Depending on the parameterized self-test of the Fail-safe Digital Inputs

10.7.5 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 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>)

10.7.6 Usage time when using Safety Integrated Functions

Requirement

WARNING

Unexpected motor response when the service life is exceeded

If the service life is exceeded, the probability of failure of the Safety Integrated Functions increases. This can result in unexpected motor movement and as a consequence can cause accidents involving death or severe injury.

- Take the converter out of service once the service life has been exceeded.

Description

The safety parameters of Safety Integrated Functions are applicable for a usage time of 20 years.

10.7.7 Stop functions

10.7.7.1 Safe Torque Off (STO)

Overview

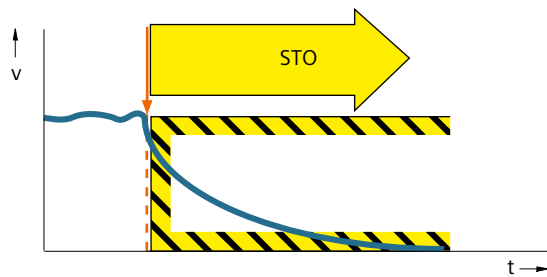


Figure 10-24 Overview STO

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

Requirement

STO function is enabled in the function selection.

WARNING

Unexpected motor movement through active Safe Torque Off

When the Safe Torque Off (STO) function is active, then the motor can move unexpectedly, e.g. a suspended load can accelerate the motor. Unexpected movements can lead to damage to property, risk to persons, severe injury and death.

- Take account of the way the Safe Torque Off (STO) function works when you perform risk assessments of the machine or system.
- Prevent movements of the motor, for example by using a holding brake.

WARNING

Danger due to short, limited motion

If two power transistors simultaneously fail in the power unit (one in the upper and one in the lower inverter bridge), then this can cause brief, limited movement.

The maximum movement can be:

- Synchronous rotary motors: Max. movement = $180^\circ / \text{no. of pole pairs}$
- Synchronous linear motors: Max. movement = pole width

Description of function

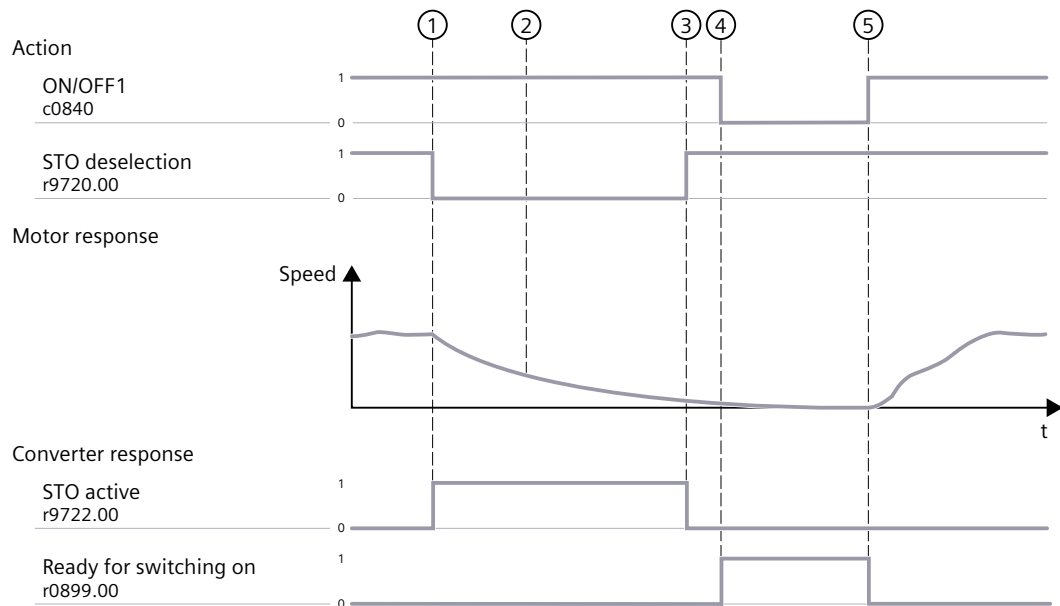


Figure 10-25 Flow diagram STO

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Action		Motor / converter response
①	Selection of STO	<ul style="list-style-type: none"> The converter detects selection of STO and signals the status "STO active" (r9722.00). The converter interrupts the torque-generating energy supply to the motor. The "switching on inhibited" status prevents the motor from restarting automatically.
②	Coast down	<ul style="list-style-type: none"> The motor coasts down to a standstill.
③	Deselection of STO	<ul style="list-style-type: none"> The converter detects deselection of STO.
④	Signal change at ON/OFF1 from 1 to 0	<ul style="list-style-type: none"> The converter is ready to start again.
⑤	Signal change at ON/OFF1 from 0 to 1	<ul style="list-style-type: none"> The motor starts again.

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.

Parameters

The following list includes the parameters of the "Safe Torque Off (STO)" function.

Number	Name	Unit
p9603.0	SI control	-
p9604.0...2	SI enable	-
r9720.0...7	SI control word	-
r9722.0...7	SI status signals	-
r10352.0...15	SI STO select cause	-

10.7.7.2 Safe Stop 1 (SS1)

Overview

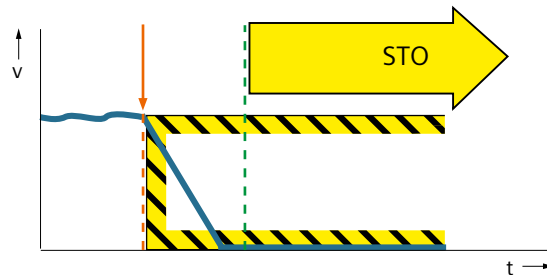


Figure 10-26 Overview SS1

Safe Stop 1 (SS1) stops a dangerous movement of a machine component.

Note

SS1 cannot be interrupted

- If SS1 is deselected again during this time, the STO function is selected and deselected again by the drive immediately after the delay time has elapsed. 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 IEC 60204-1 relating to an EMERGENCY STOP function in stop Category 1.

Requirement

SS1 is enabled in the function selection.



WARNING

Unexpected motor movement through active Safe Torque Off

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.

- Consider the functionality of the SS1 function in the risk assessment of the machine or plant.
- Prevent movements of the motor, for example, by using a holding brake.

Description of function

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

The supported safe stop version of the converter is Safe Stop 1 with time control (SS1-t).

Example

Table 10-26 SS1 application example

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

10.7.7.3 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.

Description of function

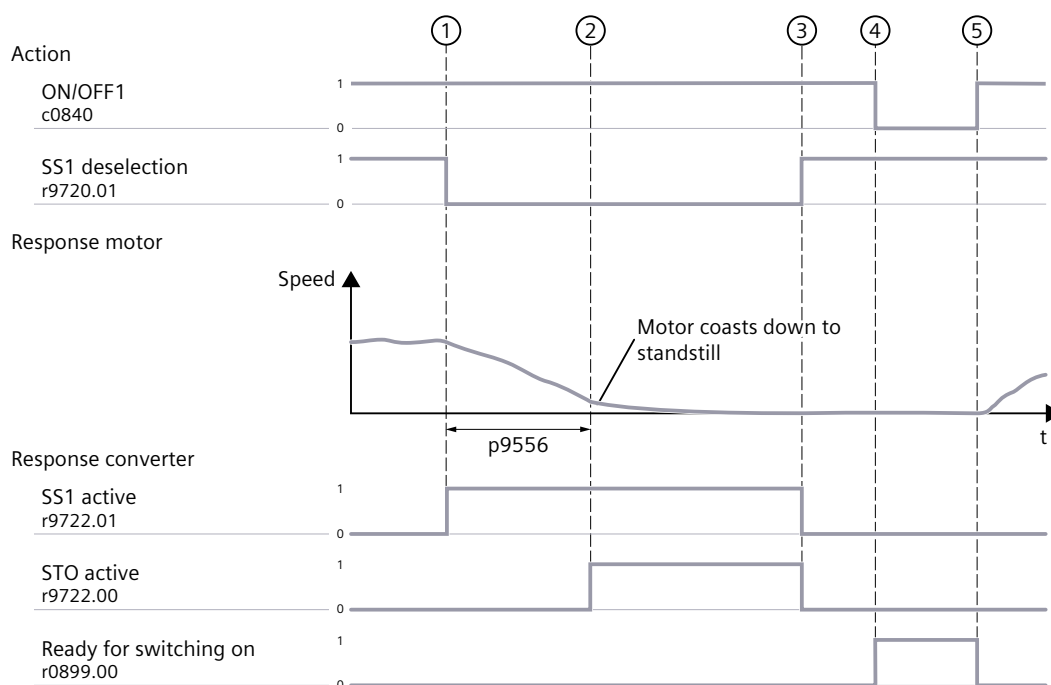


Figure 10-27 Flow diagram Safe Stop 1 with time control (SS1-t)

Action		Motor / converter response
①	Selection of SS1	<ul style="list-style-type: none"> The converter detects selection of SS1 and signals the status "SS1 active" (r9722.01). The converter starts the transition time SS1 to STO (p9556). The converter stops the motor along the OFF3 ramp. Stopping along the OFF3 ramp is not monitored. Deselecting SS1 after the time ① does not interrupt the stopping of the motor.
②	Transition to STO	<ul style="list-style-type: none"> The transition time from SS1 to STO (p9556) has elapsed. The converter activates STO and signals status "STO active" (r9722.00) and status "SS1 active". The converter activates STO even if SS1 is deselected in the mean-time. STO interrupts the torque-generating supply of energy to the motor and prevents the motor from restarting. The motor coasts down to a standstill.
③	Deselection of SS1	<ul style="list-style-type: none"> The converter detects when SS1 is deselected. The converter deactivates STO.
④	Signal change at ON/OFF1 from 1 to 0	<ul style="list-style-type: none"> The converter is ready to start again.
⑤	Signal change at ON/OFF1 from 0 to 1	<ul style="list-style-type: none"> The motor starts again.

Parameters

The following list includes the parameters of the "Safe Stop 1 with time control (SS1-t)" function.

Number	Name	Unit
p9556	SI transition time SS1 to STO	ms
p9603.0	SI control	-
p9604.0...2	SI enable	-
r9720.0...7	SI control word	-
r9722.0...7	SI status signals	-
r10353.0...13	SI SS1 select cause	-

10.7.7.4 Functional features of Safety Integrated Functions

Overview

The STO function is enabled by default and it is active with specified default settings.

Description of function

A stop function (STO or SS1) for EMERGENCY STOP via X131 terminal is defined and is permanently assigned.

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You can use the provided STO plug to connect the external safety device, for example, an EMERGENCY STOP button.

If you do not want to use the safety function, you can either insert the provided STO disable plug into the X131 socket or select "No Safety Integrated Functions" in the commissioning tool during commissioning.

More information

For more information about the terminal description and terminal wiring, see Section "Connecting STO (for S200 PN only) (Page 165)".

10.7.7.5 Selection of the Safety Integrated Functions

Overview

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

The function selection offers the following setting option:

- Selection of each individual function

Description of function

Safety Integrated Functions are enabled with default settings. The default settings can be parameterized. Each Safety Integrated Function can be separately enabled or inhibited. When supplied, the Safety Integrated Function STO is already enabled.

If the STO and SS1 functions should be controlled via F-DI, the SI control type "Via terminals" must be selected in the function selection. Even if the functions STO and SS1 are not enabled in the function selection, the STO and SS1 functions are used as stop responses in case of a safety fault. Therefore, the STO and SS1 functions must always be parameterized, otherwise, the default settings of the functions are used for the stop responses.

The safety monitoring cycle is 4 ms by default. This cycle time cannot be changed.

10.7.7.6 Control via terminals

Overview

The F-DI configuration includes the following steps:

- Assigning Safety Integrated Functions to a fail-safe digital input (F-DI)
- Defining the input modes of the 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 define 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.

10.7.7.7 Checksums of Safety Integrated Functions

Overview

The checksums correspond to a fingerprint for the parameterized Safety Integrated functionality of the converter.

Description of function

Once commissioning has been completed, the converter calculates the checksums.

Functional checksum (r9780) and time stamp (r9781 and r9782) are used to track changes (safety logbook). The checksum is updated after completing the Safety Integrated commissioning.

Based on the checksum of functions (r9798), it can be identified whether the parameterization of the Safety Integrated Functions 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.

10.7.7.8 Discrepancy time

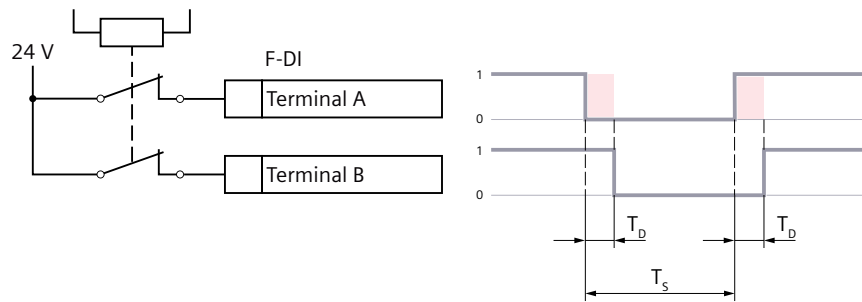
Overview

The converter tolerates brief, different logical signal states at a fail-safe digital input.

Description of function

With electromechanical sensors, e.g. EMERGENCY STOP pushbutton or position switch, the two sensor contacts do not switch at exactly the same time.

During time T_D , the input signals of the F-DI have a different logical signal state.



T_D Temporary discrepancy

T_S Shortest switching interval to be expected

Figure 10-28 Signal states at the F-DI when switching a relay

There is an adjustable maximum discrepancy time p10002 so that the converter does not respond to a brief discrepancy with a safety message.

As a consequence, the converter tolerates a brief discrepancy. A permanent discrepancy signifies an error in the F-DI interconnection. In this case, after the discrepancy time has elapsed, the converter responds with a safety message.

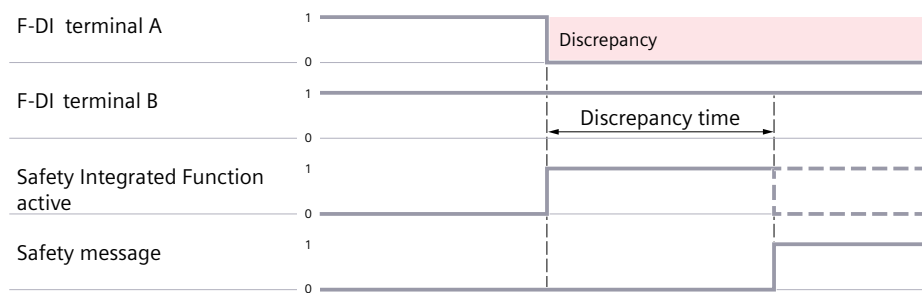


Figure 10-29 Safety message for continuous discrepancy at F-DI terminals

A signal change at the F-DI terminal activates the Safety Integrated Function, which is assigned to the F-DI.

The safety message deactivates the Safety Integrated Function and the converter is stopped. The Safety Integrated Function remains active if the previously active Safety Integrated Function and the stop function are identical.

For p10002 the following applies:

- $p10002 > T_D$, to tolerate a brief discrepancy.
- $p10002 < T_S$, to be able to acquire even short signal changes at the F-DI.

The maximum discrepancy time p10002 does not extend the converter response time when a signal at the F-DI changes.

10.7.7.9 Input filter

Overview

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

Requirement



WARNING

Unexpected movements due to long connecting cables

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.

- Only connect cables with a length of ≤ 30 m to a fail-safe digital input.

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 set input filter impacts the response time of the safety function connected to the F-DI.

10.7.7.10 Self-test of the fail-safe 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 fail-safe digital input (F-DI):

- Self-test with internal test signals
- Self-test using specified dark pulses
- Self-test using externally specified 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 fail-safe state (to "low"). If the converter does not detect a feedback signal, then it triggers a fault response.

The input filter time (p10017) prevents a converter response to the dark pulse. If the input filter 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 with internal test signals complies with:

- Safety Integrity Level (SIL) 3 according to IEC 61800-5-2
- Performance Level (PL) e according to ISO 13849-1
- Category 3 according to ISO 138491

Self-test using specified dark pulses

The converter provides the switchable voltage source VS+ at terminal block X131. 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.

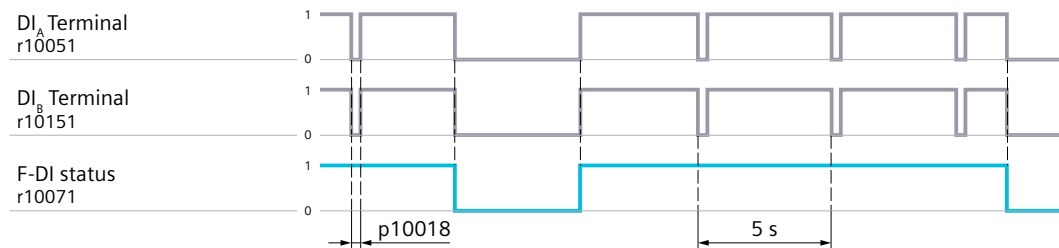


Figure 10-30 Dark pulses through switchable power supply

For the input filter:

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

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

- Safety Integrity Level (SIL) 3 according to IEC 61800-5-2
- Performance Level (PL) e according to ISO 13849-1
- Category 4 according to ISO 138491

Self-test using externally specified 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.

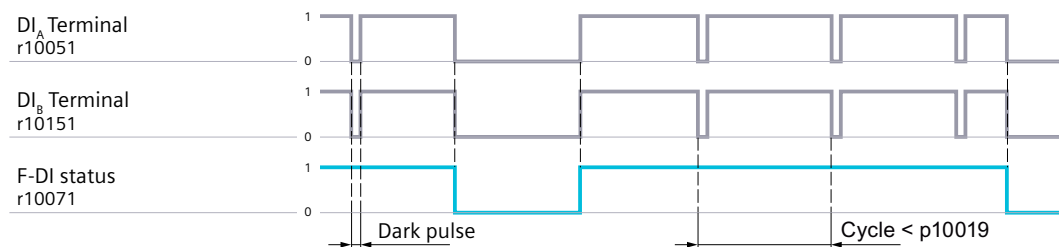


Figure 10-31 Dark pulses through control

For the input filter:

- $p10017 > \text{dark pulse length} + 2 \text{ ms}$
The test pulse length of the external control must be checked and the input filter must be adapted.

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

- Safety Integrity Level (SIL) 3 according to IEC 61800-5-2
- Performance Level (PL) e according to ISO 13849-1
- Category 4 according to ISO 138491

10.7.8 Acceptance - completion of commissioning

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 verifies 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

The documentation must be signed.

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.

10.7.9 Acceptance after series commissioning

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)
- Countersigned acceptance report with the following content:
 - New converter data (HW/SW version)
 - Changed checksum
 - Time stamp

10.7.10 Acceptance after a component has been replaced

Overview

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

Requirement

 WARNING
Unexpected movement due to incorrect component replacement 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"> • After component replacement, run a simplified function test.

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 10-27 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) ¹⁾	
Converter	All	A01641.0 = 1	Yes	r9776.2 = 1

¹⁾ 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.

Converter replacement

Replacement of a converter is indicated after running up as the checksums change and alarm A01641 is output. No additional stop response is initiated, and operation of the drive is not restricted as a result. 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:

- Test of the EMERGENCY STOP function (STO or SS1)
- Countersigned acceptance report with the following content:
 - New converter data (HW/FW version)
 - Changed checksum
 - Time stamp

10.7.11 Responses to safety messages

10.7.11.1 Stop responses

Requirement

Safety Integrated Functions STO and SS1 are set so that they fit the specific application.

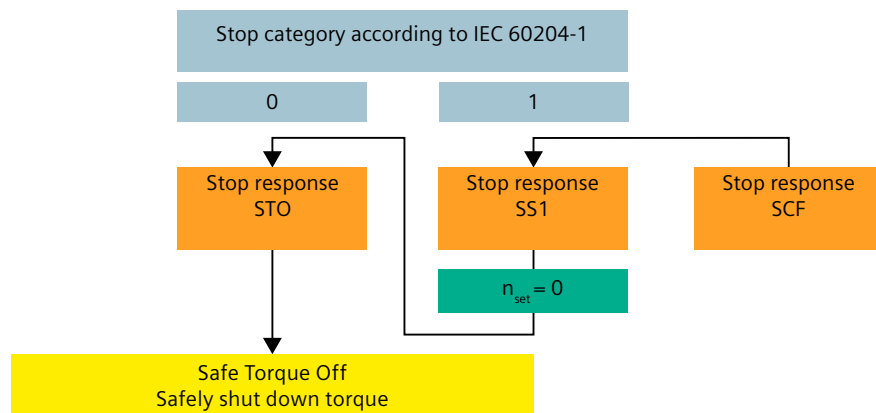
Description of function

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

- Stop response Safe Channel Failure (SCF)
In the Safety Integrated monitoring channels, the converter detects an error in the result and data comparison.
The converter initiates an SS1 after stop response Safe Channel Failure (SCF).
If at least one safety function is selected, then the stop response SS1 is initiated immediately.

It is not possible to select a stop response externally.

All stop responses bring the motor to a standstill.



STO Safe Torque Off

SCF Safety Channel Failure

Figure 10-32 Stop responses

10.7.11.2 Fail-safe acknowledgement of safety messages

Overview

In the event of safety messages, the converter detects an internal event.

A safety message requires a fail-safe acknowledgement.

Requirement

You have checked and eliminated the cause of the internal event.

Procedure

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

Via selection and deselection of STO/SS1

By selecting and then deselecting STO/SS1, the safety messages are automatically withdrawn.

By switching the supply voltage off and on

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.

10.7.12 Response time

Technical data

The following response times are applicable for stop functions for control via terminals of the fail-safe 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 monitoring cycle is 4 ms by default.

Table 10-28 Technical data - Response times

Function	Unit	One Fault Delay Time	Worst Case Delay Time	Final state
STO	ms	p10017 + 3 · 4 ms + 3.5 ms	p10017 + 2 · 4 ms + 3.5 ms	STO active
SS1	ms	p10017 + 3 · 4 ms + 5.5 ms	p10017 + 2 · 4 ms + 5.5 ms	Brake ramp started

Input filter of F-DI: p10017 (factory setting: 4 ms)

Monitoring cycle: 4 ms

Note

Closing delay of the holding brake

The closing signal (low level) of the holding brake is output 20 ms after the STO is triggered.

10.8 Functions that require licensing

10.8.1 Using functions that require a license

Overview

The firmware functions of the converter can be expanded using functions that require a license.

Description of function

To use a function that requires licensing, the appropriate license must be assigned to the converter.

The following ways are available for assigning the license to the converter:

- **License on a SINAMICS memory card**
The license is assigned to the serial number of the memory card.
The memory card contains the license file and is inserted into the converter for as long as the license-required functions are being used.
The memory card can be ordered as Z-option with pre-installed licenses.
- **License in the converter**
The license is assigned to the serial number of the converter.
You can create a license file with the "Web License Manager" and then save it to the converter with a commissioning tool.

Each purchased license has a license certificate (eCoL).

The license certificate (eCoL) contains licensing information. Siemens recommends that you archive the license certificate (eCoL) according to the license-assigning method.

- **The license is assigned to a SINAMICS memory card.**
 - If the SINAMICS memory card is ordered with the license together, the license certificate (eCoL) is saved on the SINAMICS memory card from the factory. Transfer the license certificate (eCoL) from the memory card to your operating unit or to another storage medium for archiving.
 - If a license has been purchased subsequently and the license certificate (eCoL) has already been saved on the SINAMICS memory card, transfer the license certificate (eCoL) from the memory card to your operating unit or to another storage medium.
- **The license is assigned to the converter.**
 - It's not possible to save the license certificate (eCoL) in the converter.
 - Archive the license certificate (eCoL) on your operating unit, on the converter memory card, or on another storage medium.

License certificate (eCoL) and license differ as follows:

Type	Description
License certificate (eCoL)	<ul style="list-style-type: none"> • PDF file for each purchased license • Contains the delivery note number and license number • Is required to create the license file in the Web License Manager • Not contained in the license file • Saved on any external storage medium, on an operating unit of the converter, or on the converter memory card
License	<ul style="list-style-type: none"> • ZIP file • Contains serial number of the memory card or serial number of the converter in the file name • Cannot be transferred to another memory card or another converter • Is required to use the license-required functions in the converter • Contains a signature file <p>The converter uses the signature file to verify the authenticity of the licenses.</p>

More information

More information about Web License Manager can be found on the Internet:

Web License Manager (<http://www.siemens.com/automation/license>)

More information about licensing can be found on the Internet:

Siemens Support (<https://support.industry.siemens.com/cs/ww/en/view/110002326>)

10.8.2 Creating the license file using the Web License Manager and downloading

Overview

After you have purchased a license, you can create a license file with the license certificate (eCoL) in the "Web License Manager".

Requirement

Note

The following requirements are not necessary if you have the SINAMICS memory card with pre-installed license.

Authentication with a Siemens ID is required to access the "Web License Manager".

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

- License certificate (eCoL)
- Product designation
- Serial number of the SINAMICS memory card or serial number of the converter
The serial numbers are available on the memory card, on the converter rating plate, or in the license overview in the commissioning tool you are using.

Procedure

Proceed as follows to create a license file:

1. Click "Direct access" in "Web License Manager".
2. Enter the license number and delivery note number of your license certificate (eCoL).
3. Enter the serial number of the memory card or the serial number of the converter.
4. Select the product you are using.
In the "Already assigned licenses" column, you can see which licenses have already been assigned to the memory card or to the converter.
In the "Additional licenses to be assigned" column, you can activate the licenses you want and specify how many additional licenses you require.
5. Activate the required licenses.
6. Click "Assign".
The "Web License Manager" assigns the license to the specified memory card or the converter. Then, the license file is available for downloading.
7. Download the license file "LK_HW_aabb.zip" to the file system of your operating unit.
aabb = serial number of the SINAMICS memory card or the converter

Result

The license file has been created with the "Web License Manager" and downloaded to the operating unit.

More information

Web License Manager can be found on the Internet:

Web License Manager (<http://www.siemens.com/automation/license>)

10.8.3 Downloading the license file at a later time

Requirement

Note

The following requirements are not necessary if you have the SINAMICS memory card with pre-installed license.

Authentication with a Siemens ID is required to access the Web License Manager.

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

Procedure

Proceed as follows to display the license file that you can download:

1. In "Web License Manager", click the "Display license key" option in the "User menu".
2. Enter the serial number of the memory card or the serial number of the converter you are using in the "Hardware serial number" field. Additionally, fill in another field. The recommended field to use is the "License number" field, in which you enter the corresponding license number from the license certificate (eCoL).
3. Click the "Display license key" button.
The "Web License Manager" displays the license file available for download.
4. Download the license file "LK_HW_aabb.zip" to the file system of your operating unit.
aabb = serial number of the SINAMICS memory card or the converter

Result

The license file "LK_HW_aabb.zip" is saved to the file system of your operating unit.

More information

Web License Manager can be found on the Internet:

Web License Manager (<http://www.siemens.com/automation/license>)

10.8.4 Transferring the license file to the converter and activating it

Overview

After you have created a license file with the "Web License Manager" and downloaded it to your operating unit, you can assign the license file to the converter and activate it.

The procedure described below is using Startdrive as an example.

Requirement

Note

The following requirements are not necessary if you have the SINAMICS memory card with pre-installed license.

You have created the license file "LK_HW_aabb.zip" with the "Web License Manager" and saved it to the file system of your operating unit.

aabb = serial number of the SINAMICS memory card or the converter

A commissioning tool is required to assign the license created in the "Web License Manager" to the converter.

If you use the commissioning tool Startdrive, the data in the converter and in the Startdrive project must be consistent.

If you assign the license to a SINAMICS memory card, the memory card must be inserted into the converter.

Procedure

Proceed as follows to assign the license to the converter and activate it:

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

Result

The license in the converter is activated.

You can also copy the following data to the SINAMICS memory card to activate the license without a commissioning tool:

- Copy the license file "LK_HW_aabb.zip" for the SINAMICS memory card to the directory "KEYS/SINAMICS".
- Copy the license certificate (eCoL) to the directory "KEYS/SINAMICS/eCoL".

10.8.5 Restoring licensing after the memory card is removed

Overview

If you remove the memory card with the license from the converter, the operation of the converter will be blocked after restarting of the converter.

Requirement

The license file is saved on a SINAMICS memory card.

Procedure

Proceed as follows to restore the license of the converter:

1. Insert the memory card into the converter.
2. Switch off the converter power supply.
3. Wait until all the LEDs on the converter are dark.
4. Switch on the converter power supply.
5. Check whether the license is activated in the license overview page in the commissioning tool.

10.8.6 Backing up license certificate (eCoL) to the operating unit

Overview

You can back up the license certificate (eCoL) which is stored on the memory card to your operating unit.

Requirement

A license certificate (eCoL) is stored in the directory "KEYS/SINAMICS/eCoL" of the memory card.

Procedure

Proceed as follows to back up the license certificate (eCoL):

1. Click "Save eCOL archive" button.
2. Select the directory in your operating unit in which you want to back up the license certificate (eCoL).
3. Confirm the selection.

10.8.7 Trail License mode

Overview

With a "Trial License", functions requiring a license can be activated for a limited time without a valid license key.

Requirement

The Trial License is activated with a commissioning tool.

The Trial License is only permissible while commissioning and in the case of service.

Procedure

With a Trial License, functions requiring a license can be activated without a valid license.

The Trial License requires neither a memory card with a license file nor a license file stored in the converter.

The Trial License is valid for 3 Trial License periods, each for a maximum of 300 operating hours.

The operating hours for a Trial License period start when the converter supply voltage is switched on and firmware functions requiring a license have been activated without a valid license key.

The operating hours of a Trial License period stop when one of the following conditions is satisfied:

- All firmware functions requiring a license that do not have a valid license key are deactivated.
- A valid license key for using the functions requiring a license is activated.
- The converter power supply has been switched off.

No additional Trial License can be activated once the last Trial License period has elapsed.

The converter can only continue to operate if all firmware functions requiring a license without having a valid license key are either deactivated or licensed.

Example

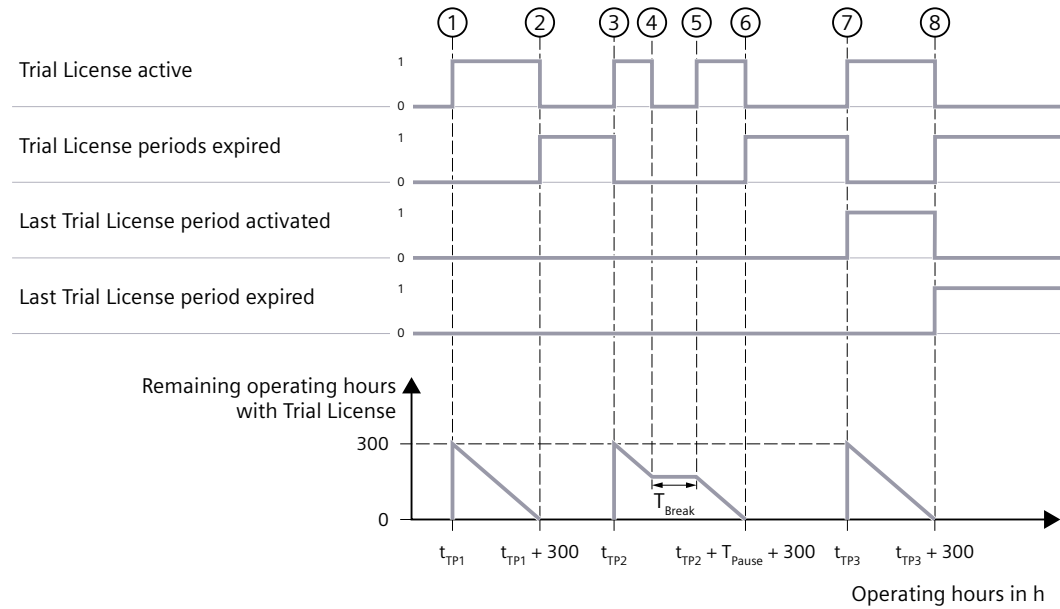


Figure 10-33 Trial License periods

Table 10-29 Explanation of the example

①	The 1st Trial License period is activated
②	The 1st Trial License period has expired
③	The 2nd Trial License period is activated
④	The operating hours counter stops, for example as all firmware functions requiring a license have been temporarily deactivated
⑤	The operating hours counter restarts, e.g. as a firmware function requiring a license has been reactivated.
⑥	The 2nd Trial License period has expired
⑦	The last Trial License period is activated
⑧	The last Trial License period has expired

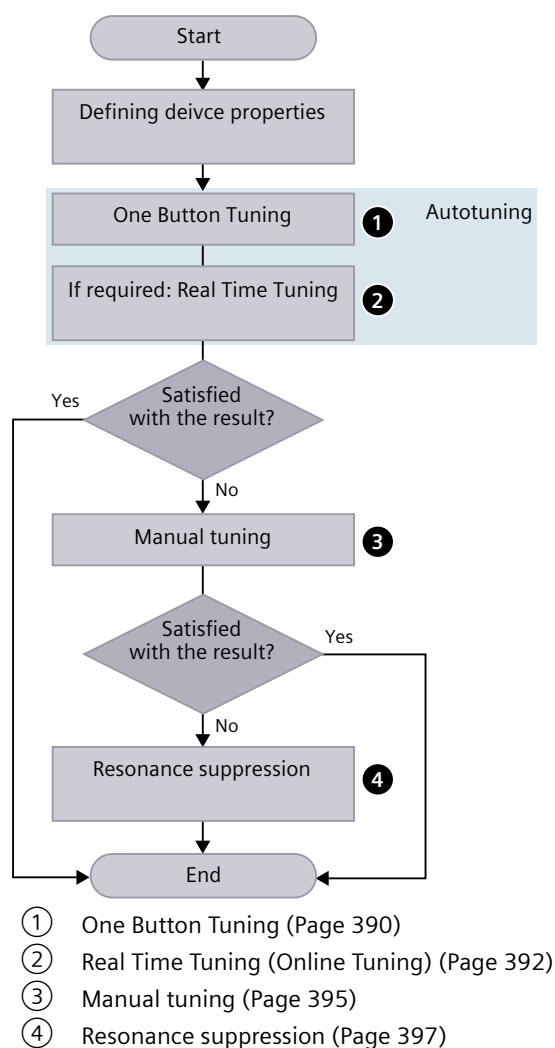
Tuning

11.1 Tuning workflow

Overview

Tuning is a process of adjusting servo gains in the control loops of the converter to achieve desired performance.

Description of function



11.2 Autotuning

Overview

The term "Autotuning" comprises all converter-internal functions that adapt controller parameters during operation based on internal measured variables. The settings are written to the parameters, but are not saved permanently.

Description of function

Applications

The autotuning function is applicable to the following scenarios:

- Support of the commissioning
- Adaptation of the controller to major changes in the mechanical system

Available modes

The autotuning function is activated/deactivated with parameter p5300. The following autotuning modes are available for the converter:

- **One Button Tuning**
With this procedure, the speed controller and position controller can be automatically tuned (optimized). In this regard, the servo drive system is measured once and the controller is then set.
- **Real Time Tuning**
With this procedure, controller parameters are determined from the constantly estimated or parameterized moments of inertia.
Deactivate Real Time Tuning as soon as the controller data has been calculated and the established values for controller optimization, as well as the filter settings have been saved in a non-volatile memory.

11.2.1 One Button Tuning

Requirement

NOTICE
Changing the controller parameters manually
Manually changing controller parameters that were set automatically by One Button Tuning can result in an unstable controller and therefore material damage.
<ul style="list-style-type: none">• Do not change the following parameters during One Button Tuning: p0430, p1160, p1400, p1413 to p1426, p1428, p1429, p1433 to p1435, p1441, p1460 to p1465, p1498, p1513, p1656 to p1676, p2533 to p2539, p2567, p2572, p2573, p5280

Note

If EPOS is required, perform One Button Tuning after EPOS is activated; otherwise, the tuning results of EPOS relevant parameters will be incomplete.

If EPOS is no longer required, perform One Button Tuning after EPOS is deactivated; otherwise, the tuning results of previously optimized parameters will be incorrect.

Procedure

Proceed as follows to perform One Button Tuning with your operating unit:

1. Configure the dynamic response setting (p5292).
The higher the dynamic factor, the faster and more unstable the control. You should find a desired dynamic factor within a resonance-free range.
2. Set the traversing distance for the test signal (p5308).
Generally, longer traversing distances result in better tuning results.
The traversing distance of the motor equals to the distance of the test signal (p5308) plus the distance generated from the configured setpoint. For example, if you have configured a valid speed setpoint (other than 0 rpm) via the control panel, the actual traversing distance of the motor equals to the distance of the test signal (p5308) plus the distance traversed by the motor at the set velocity.
3. Configure the One Button Tuning function (p5301).
The following settings are possible:

Bit	Explanation
00	Determining the speed controller gain: <ul style="list-style-type: none"> The speed controller gain is determined and set with the aid of a noise signal.
01	Determining the current setpoint filter: <ul style="list-style-type: none"> Any required current setpoint filters are determined and set with the aid of a noise signal. In this way, a higher dynamic response can be achieved in the speed control loop.
02	Determining the moment of inertia: <ul style="list-style-type: none"> The moment of inertia is determined and set with the aid of a test signal. Requirements: <ul style="list-style-type: none"> Distance limiting has been set in p5308. The duration of the test signal has been set in p5309. If this bit is not set, the moment of inertia must be set manually in p1498.
07	Activating synchronized axes: <ul style="list-style-type: none"> Activation of this function is required for interpolating axes. With this function, the axes are adapted to the dynamic response set in p5275. The time in p5275 should be set with the lowest dynamic response in accordance with the axis.
08	Determining the moment of inertia from the frequency response: <ul style="list-style-type: none"> With this function, the moment of inertia is determined from the frequency response using a test signal. When bit 02 is inactive, the moment of inertia is transferred to p1498. To determine the moment of inertia with greater accuracy, we recommend setting the traversing distance via p5308 before the measurement.

4. Set the controllers via p5271.

The following table shows only the commonly used bits:

Bit	Explanation
03	Activates speed precontrol <ul style="list-style-type: none"> Only relevant for EPOS.
04	Activates torque precontrol <ul style="list-style-type: none"> If EPOS is active, then the torque precontrol from EPOS is used (p2567). If EPOS is not active, <ul style="list-style-type: none"> when the supplementary telegram 750 is not selected, the torque precontrol of the speed controller is used (r0341, p1498). The automatic calculation of the torque precontrol depends primarily on the settings of p1498. when the supplementary telegram 750 is selected, the torque precontrol should be from the high-level controller via PZD: M_ADD1.

For more information about p5271, see Section "Parameter list (Page 698)".

5. Activate the One Button Tuning function (p5300 = 1).

Parameters

The following list includes the parameters of the "One Button Tuning" function.

Number	Name	Unit
p5271[0].0...7	Real Time / One Button Tuning configuration	-
p5292	FFT tuning dynamic factor	%
p5300[0]	Autotuning selection	-
p5301[0].0...8	One Button Tuning configuration 2	-
p5308[0]	One Button Tuning distance limiting	°

11.2.2 Real Time Tuning (Online Tuning)

Requirement

NOTICE

Changing the controller parameters manually

Manually changing controller parameters that were set automatically by Real Time Tuning can result in an unstable controller and therefore material damage.

- Do not change the following parameters during Real Time Tuning:
p0430, p1160, p1400, p1413 to p1426, p1428, p1429, p1433 to p1435, p1441, p1460 to p1465, p1498, p1513, p1656 to p1676, p2533 to p2539, p2567, p2572, p2573, p5280

Procedure

Proceed as follows to perform Real Time Tuning with your operating unit:

1. Configure the Real Time Tuning function (p5302).

The following settings are possible:

Bit	Explanation
02	The moment of inertia is determined using the inertia estimator. If this bit is not set, the load moment of inertia must be parameterized manually in p1498. The test signal must have been previously set in p5308 and p5309.
03	If "Once" is set, the inertia estimator is deactivated after successful determination of the moment of inertia by p1498. The parameters must then be saved in non-volatile memory (p0977 = 1). If "Cyclically" is parameterized, the moment of inertia is determined continuously and the controller parameters are adapted. As soon as the moment of inertia has been successfully established ($r1407.26 = 1$), we recommend saving the parameters. The necessity for resettling of the controllers following a POWER ON will thus be avoided.
06	The function current setpoint filter adaptation is enabled. This function can be useful for damping a variable resonance in the mechanical system.
07	The axes are adapted to the dynamic response set in p5275. This setting is required for interpolating axes. Recommendation: Set the time in p5275 according to the axis with the lowest dynamic response.

2. Set the controllers via p5271.

The following table shows only the commonly used bits:

Bit	Explanation
03	Activates speed precontrol <ul style="list-style-type: none"> • Only relevant for EPOS.
04	Activates torque precontrol <ul style="list-style-type: none"> • If EPOS is active, then the torque precontrol from EPOS is used (p2567). • If EPOS is not active, <ul style="list-style-type: none"> – when the supplementary telegram 750 is not selected, the torque precontrol of the speed controller is used ($r0341$, p1498). The automatic calculation of the torque precontrol depends primarily on the settings of p1498. – when the supplementary telegram 750 is selected, the torque precontrol should be from the high-level controller via PZD: M_ADD1.

For more information about p5271, see Chapter "Parameter list (Page 698)".

3. Activate Real Time Tuning (p5300 = 2). Run the drive system to start tuning.

4. If Real Time Tuning cannot achieve desired tuning results, adjust the Real Time Tuning dynamic factor (p5272); otherwise, skip this step.
The speed controller gain K_p is proportional to both the moment of inertia and the dynamic factor p5272. Higher dynamic factor makes the speed control more sensitive to vibrations but less stable. Set a desired dynamic factor within a resonance-free range.
5. To save the determined values for speed and position controllers, save the parameters in a non-volatile memory (RAM to ROM or p0977 = 1).
In this way, the start values for Real Time Tuning are retained, for example, after POWER ON. Through deactivation and reactivation of Real Time Tuning, the estimated load moment of inertia and the load torques are reset.

Note

When the EPOS function is active, operating the motor during Real Time Tuning may trigger faults F07450, F07451, F07452 due to inappropriate initial closed-loop control gains. To avoid the occurrence of these faults, temporarily set p2542, p2544, and p2546 each to 0 or set them all to a value greater than the current value. Before saving the Real Time Tuning relevant parameters, change the aforesaid three parameters back to the values suitable for your particular application.

Note

If you want to minimize the vibrations of the mechanical system while keeping a high dynamic factor, perform One Button Tuning or manually configure current setpoint filters before Real Time Tuning; otherwise, proceed and activate current setpoint filter adaptation (p5302.6) during Real Time Tuning configuration. For more information about resonance suppression methods, see Chapter "Resonance suppression (Page 397)".

Parameters

The following list includes the parameters of the "Real Time Tuning" function.

Number	Name	Unit
p2542	LR standstill window	mm
p2542	LR standstill window	°
p2544	LR positioning window	mm
p2544	LR positioning window	°
p2546[0]	LR dynamic following error monitoring tolerance	mm
p2546[0]	LR dynamic following error monitoring tolerance	°
p5271[0].0...7	Real Time / One Button Tuning configuration	-
p5272[0]	Real Time Tuning dynamic factor	%
p5300[0]	Autotuning selection	-
p5302[0].2...8	Real Time Tuning configuration	-

11.3 Manual tuning

Overview

When the autotuning function cannot achieve your expected tuning results, you can manually perform tuning.

Description of function

To perform tuning manually, you can disable the autotuning function by setting the parameter p5300:

- p5300 = -1: The autotuning function is disabled and the default values for the speed and position controller are restored.
- p5300 = 0: The autotuning function is disabled and the existing controller parameters are not changed.

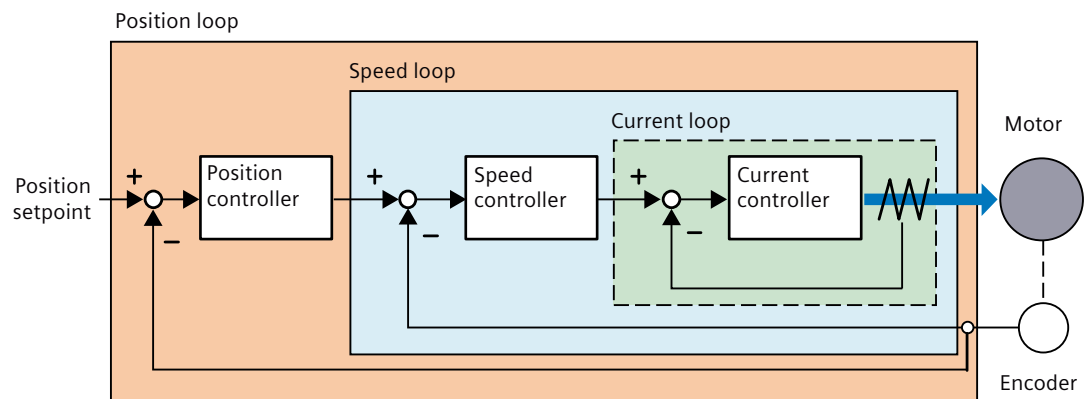
To store the determined values for the speed and position controller retentively, set p0977 = 1 or execute the "Copy RAM to ROM" command.

11.3.1 Control loops

Description

The converter consists of three control loops:

- Current control loop
- Speed control loop
- Position control loop



The control loops monitor the feedback of the controlled machines and correct the commands given to the converter.

In theory, frequency width of the inside control loop must be wider than that of the outer control loop; otherwise, the whole control system might vibrate or show low responsiveness. The relationship between the frequency widths of these three control loops is as follows:

Current loop > speed loop > position loop

11.3.2 Servo gain adjustment

Overview

You can set the loop servo gains in the control loops to optimize the responsiveness of a machine.

The servo gains are set through a combination of parameters. These parameters influence each other so you must consider the balance between the set values when tuning.

Description of function

Generally, the responsiveness of a machine with high rigidity can be improved by increasing the servo gains; however, if the servo gains of a machine with low rigidity are increased, the machine may vibrate and the responsiveness cannot be improved.

Since the current loop gain is automatically set by the system according to the detected motor data, you can adjust the following control parameters for servo gain adjustment:

- **Position loop gain**
The position loop gain directly influences the responsiveness of the position loop. If the mechanical system does not vibrate or produce noises, you can increase the position loop gain to increase the responsiveness of the position loop and shorten the positioning time.
- **Position loop feed forward gain**
You can slowly increase the position loop feed forward gain to increase the responsiveness and reduce the position deviation.
An inappropriately high position loop feed forward gain may lead to overshoots in the motor speed and a repeated ON/OFF switch of the digital output signal INP.
- **Speed loop gain**
The speed loop gain directly influences the responsiveness of the speed loop. If the mechanical system does not vibrate or produce noises, you can increase the speed loop gain to increase the responsiveness of the speed loop.
- **Speed loop integral time**
With the integral component added to the speed loop, the converter can eliminate the steady-state error of speed and respond to small speed changes.
If the mechanical system does not vibrate or produce noises, you can decrease speed loop integral time to increase the system rigidity.
For mechanical systems with a resonance factor or a high load inertia ratio, you can increase the speed loop integral time to suppress resonance.

Parameters

The following list includes the parameters of the "Servo gain adjustment" function.

Number	Name	Unit
p1460[0]	Speed controller P gain	Nms/rad
p1462[0]	Speed controller integral time	ms
p2534[0]	LR speed precontrol factor	%
p2538[0]	LR proportional gain	1000 rpm

11.4 Resonance suppression

Overview

The resonance suppression functions suppresses mechanical resonance at a frequency higher than 100 Hz.

The function is achieved by setting the current setpoint filters as bandstop filters. Four current setpoint filters are available for the converter.

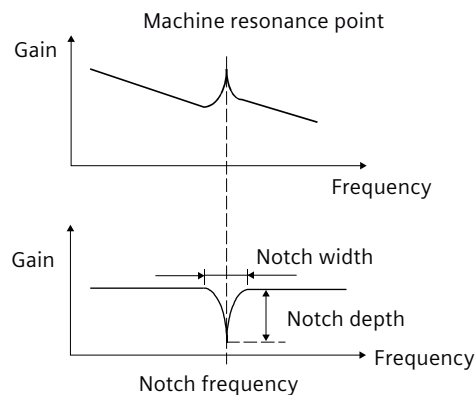


Figure 11-1 Working principle of a bandstop filter

Description of function

Resonance suppression with autotuning

During the autotuning process, resonance suppression is activated by default.

- Resonance suppression with One Button Tuning (p5300 = 1, p5291.1 = 1)
The current setpoint filters are automatically determined and set once with the aid of a noise signal. Four current setpoint filters can be activated at most after One Button Tuning is completed.
- Resonance suppression with Real Time Tuning (p5300 = 2, p5302.6 = 1)
Filter 4 is automatically parameterized as a bandstop filter and activated as an adaptive resonance filter. To use the other three current setpoint filters in this case, you must manually configure their settings.
When there is no resonance in the machine, Siemens recommends that the resonance suppression function is deactivated (p5302.6 = 0) in Real Time Tuning to get a high dynamic performance.

Resonance suppression with manual tuning

When resonance suppression with autotuning cannot reach the suppression effect, you can proceed as follows to suppress the resonance manually:

1. Activate the current setpoint filters that you want to use (p1656[0].0...3).
2. For the activated current setpoint filters, parameterize the following values:
 - Type: general 2nd order filter
 - Denominator natural frequency
 - Denominator damping
 - Numerator natural frequency
 - Numerator damping

Note

Assume the notch frequency is f_{sp} , notch width is f_{BB} , and notch depth is K , then the filter parameters can be calculated as follows:

- Denominator natural frequency = Numerator natural frequency = f_{sp}
 - Denominator damping = $f_{BB}/(2 \times f_{sp})$
 - Numerator damping = $(f_{BB} \times 10^{(K/20)})/(2 \times f_{sp})$
-

Parameters

The following list includes the parameters of the "Resonance suppression" function.

Number	Name	Unit
p1656[0].0...3	Activates current setpoint filter	-
p1657[0]	Current setpoint filter 1 type	-
p1658[0]	Current setpoint filter 1 denominator natural frequency	Hz
p1659[0]	Current setpoint filter 1 denominator damping	-
p1660[0]	Current setpoint filter 1 numerator natural frequency	Hz
p1661[0]	Current setpoint filter 1 numerator damping	-
p1662[0]	Current setpoint filter 2 type	-
p1663[0]	Current setpoint filter 2 denominator natural frequency	Hz
p1664[0]	Current setpoint filter 2 denominator damping	-
p1665[0]	Current setpoint filter 2 numerator natural frequency	Hz
p1666[0]	Current setpoint filter 2 numerator damping	-
p1667[0]	Current setpoint filter 3 type	-
p1668[0]	Current setpoint filter 3 denominator natural frequency	Hz
p1669[0]	Current setpoint filter 3 denominator damping	-
p1670[0]	Current setpoint filter 3 numerator natural frequency	Hz
p1671[0]	Current setpoint filter 3 numerator damping	-
p1672[0]	Current setpoint filter 4 type	-
p1673[0]	Current setpoint filter 4 denominator natural frequency	Hz
p1674[0]	Current setpoint filter 4 denominator damping	-
p1675[0]	Current setpoint filter 4 numerator natural frequency	Hz
p1676[0]	Current setpoint filter 4 numerator damping	-

p5291.0...16	FFT tuning configuration	-
p5302[0].2...8	Real Time Tuning configuration	-

11.5 Low-frequency vibration suppression

11.5.1 Operating principle

Overview

The low-frequency vibration suppression function uses a configurable setpoint filter to minimize vibrations in the natural frequency range of the moving mechanism.

Requirement

- The basic positioner (EPOS) function is enabled.
- The Basic Vibration Suppression function is activated.

Description of function

To absorb oscillations, the configurable setpoint filter changes the command variable of an axis so that there is as little oscillation as possible excited in the damped natural frequency range of the moving mechanical system. While this does slightly delay the motion sequence, with correct parameterization, the additional travel time is significantly less than the wait time for the oscillation levels in the mechanical system to be within the tolerance range.

Low-frequency natural frequency oscillations above 10 Hz can be eliminated.

11.5.2 Methods to determine the frequency

Overview

The natural frequency is set in p31585. This value cannot be changed during motion. Frequency f_d must be determined by making the appropriate measurements.

Requirement

License is required if you want to determine the frequency using the measuring function via Startdrive.

Procedure

You can use the following three methods to determine the natural frequency of the mechanical system via Startdrive.

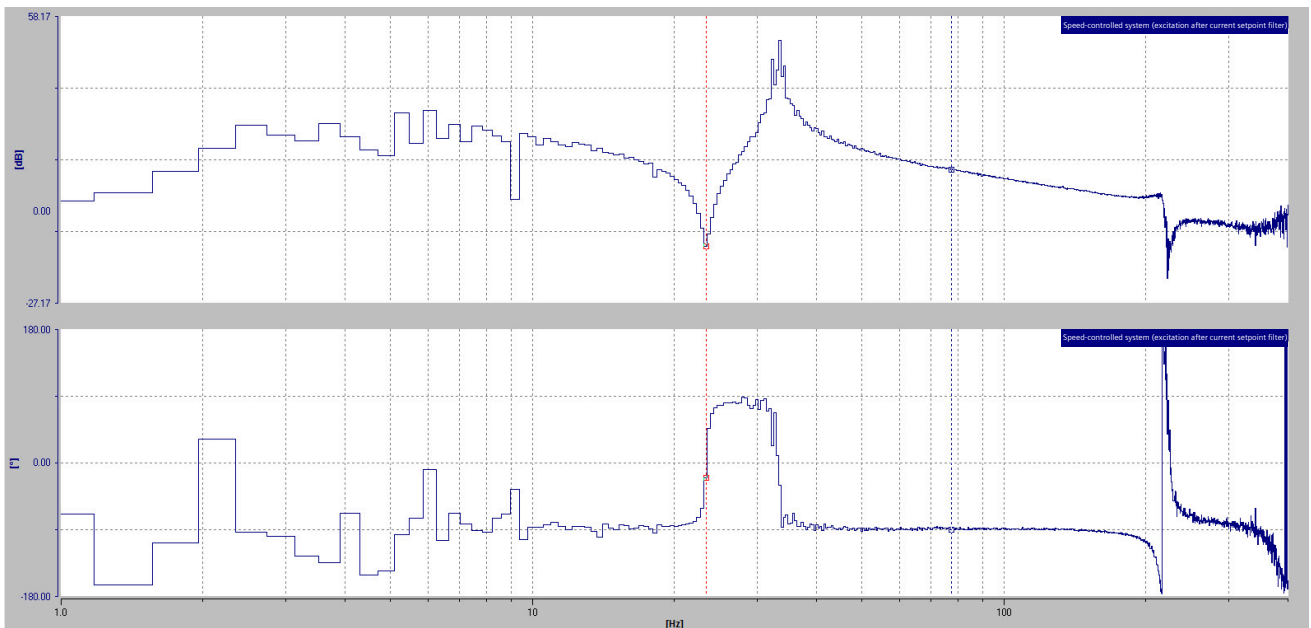
Empirically determining the frequency if the natural frequency to be absorbed is approximately known

1. Set the estimated frequency (p31585).
2. Check the effect of the filter while traveling with different load levels.
3. Repeat step 1 and step 2 with a different frequency until the frequency with the optimum filter effect has been found.

Use the lowest value if you determine several values for the frequency.

Determining the frequency using the measuring function in the frequency domain

1. Double-click "Add new measuring function".
2. Select "Speed-controlled system (excitation after current setpoint filter)" in the drop-down list.
3. Parameterize the measuring function:
 - Amplitude
From experience, practical values lie in the range 1% ... 5%. The value is scaled to p2003.
 - Offset
From experience, values in the range 0.5% ... 1% of the maximum axis velocity are sufficient.
 - Ramp-up time
This value should be generously dimensioned corresponding to the offset that has been set (e.g. 200 ms ... 500 ms).
 - Measuring period
Set the highest possible number of measuring periods (e.g. number = 4). Ensure that the available travel distance of the axis is sufficient for the offset velocity that has been set. Observe displayed measuring time.
 - Bandwidth
Select this value so that the expected natural frequency can be displayed with a good resolution (e.g. bandwidth < 400 Hz).
4. Perform the measuring function.
 - Assuming control priority
 - Switch on the drive
 - Start the measuring function
5. Evaluate the result.
After the measuring function has been completed, the result is automatically displayed in the Bode diagram.



The Bode diagram shows the absolute value (top) and the phase (bottom) of the complex transfer function in a logarithmic scale.

The natural frequency f_d to be damped can be identified by the notch in the absolute value diagram (zero position). A positive phase rotation also occurs at this position. You can shift to the notch with a colored measuring cursor, which displays the natural frequency to be damped.

Determining the frequency in the time domain using traversing motion

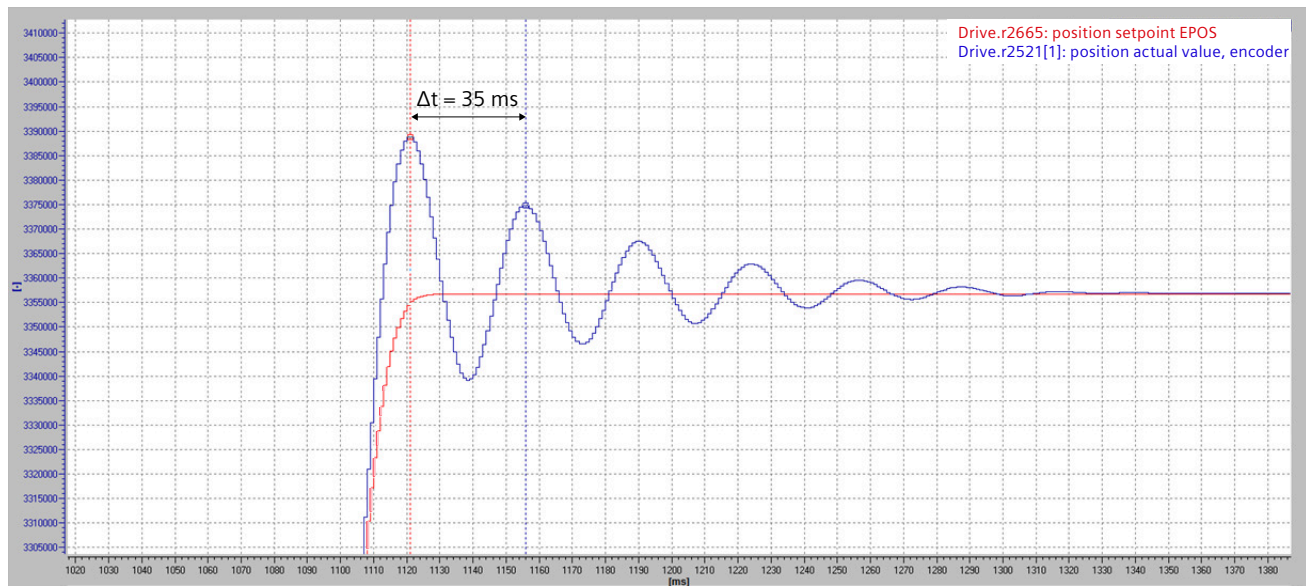
Use the dynamic positioning method to determine the natural frequency to be absorbed. The actual values with respect to time are recorded in a trace.

Then, calculate the low-frequency natural frequency, which is determined from the inverse of the time period of the oscillation at the motor, namely $f_d = 1 / \text{time period}$.

The following parameters are recommended as measuring variables:

- r2665: EPOS position setpoint
- r2521[1]: LR position actual value, encoder

The following diagram shows a positioning operation to determine the frequency.



In the diagram above, the time period is marked using a colored measuring cursor, which shows $dT = 34.966 \text{ ms} (\approx 35.0 \text{ ms})$.

The frequency of the natural oscillation to be damped is calculated as follows:

$$f_d = 1 / \text{time period} = 1 / 0.0350 \text{ s} = 28.6 \text{ Hz}$$

Alternatively, you can use the velocity or the torque as measurement variables.

- Recommended parameter for velocity:
 - r2666: EPOS velocity setpoint
 - r0061[0]: Unsmoothed speed actual value, encoder
- Recommended parameter for current:
 - r0080: Actual torque value

Parameters

The following list includes the parameters of the "Low-frequency vibration suppression" function.

Number	Name	Unit
r0061[0...1]	Actual speed unsmoothed	rpm
r0080	Torque actual value	Nm
p2003	Reference torque	Nm
r2521[0...3]	LR position actual value	mm
r2521[0...3]	LR position actual value	°
r2665	EPOS position setpoint	mm
r2665	EPOS position setpoint	°
r2666	EPOS velocity setpoint	mm/s
r2666	EPOS velocity setpoint	%s
p31585	VIBSUP natural frequency	Hz

System messages

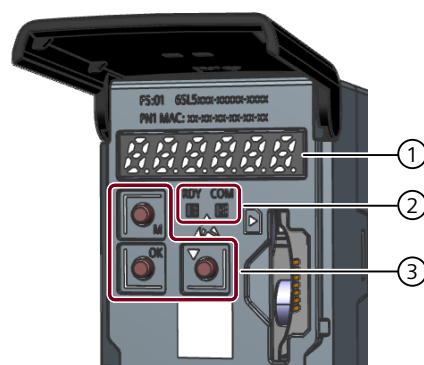
12.1 SDI Status

12.1.1 SDI Status overview

Description

The converter is designed with a SINAMICS SDI (Smart Drive Interface) Status panel behind the front flap of the converter.

To access the panel, gently lift the front flap from the lower right corner.



- ① 6-digit 7-segment display
- ② LED display
- ③ Function buttons

Figure 12-1 SDI Status layout

You can use the SDI Status panel for the following operations:

- **Monitoring**
The SINAMICS SDI Status enters the monitoring mode when the servo state changes from OFF to ON. In this mode, it displays the actual speed, actual torque, actual position, actual DC link voltage, and position following error. You can press the DOWN button to navigate to the next item.
- **Diagnostics**
The SINAMICS SDI Status enters the diagnostics mode when a new fault, alarm, or safety message appears. You can press the OK button to acknowledge the faults after eliminating the causes.
You can press the M button to switch between the monitoring mode and the diagnostics mode.

Note

If you failed to configure UMAC as required, A01637 will be triggered. In this case, the monitoring mode does not switch to the diagnostics mode automatically unless you press the M button. To exit the diagnostics mode, press the M button again.

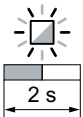
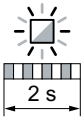
- **Converter restart**
You can press the key combination of the M button and the OK button for four seconds to restart the converter.

12.1.2 Status display via LEDs

Description

The following tables explain the LED icons and states:

Table 12-1 Explanation of LED icons

LED	Explanation
	LED is ON.
	LED is OFF.
	LED flashes slowly.
	LED flashes quickly.
	LED flashes with variable frequency.

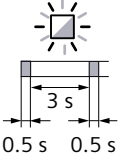
LED	Explanation
	LED flashes in alternating order 3 times quickly - 2 s pause - ...
	LED flashes briefly every 3 s

Table 12-2 Signal states of RDY and COM LEDs during converter ramp-up and operation

RDY	COM	Description	Remedy
 Orange	 Orange	Possible causes: <ul style="list-style-type: none"> Temporary state after the supply voltage is switched on Restart 	-
 Green	 Green	Temporary state after the supply voltage is switched on: firmware being loaded and initialized.	-
Not relevant	 Green	Cyclic communication in progress	-
 Red	 Red	No fieldbus connection: <ul style="list-style-type: none"> No data exchange or configuration error Data exchange lost Data exchange in progress, but there are no setpoints (controller in stop state) 	Possible remedies: <ul style="list-style-type: none"> Check message display and rectify cause of fault. Check operating mode of controller (PLC).
 Red	 Not relevant	Possible causes: <ul style="list-style-type: none"> Converter signals a fault. Firmware error 	Possible remedy: Check message display, rectify cause of fault.
 Green	Not relevant	Converter is ready for operation and error-free.	-

RDY	COM	Description	Remedy
	 Red	Possible causes: <ul style="list-style-type: none"> • BIOS error: <ul style="list-style-type: none"> – General error – Loading error • File error: <ul style="list-style-type: none"> – Memory card is not available or is faulty. – File corrupt • CRC error 	Possible remedies: <ul style="list-style-type: none"> • Switch the converter supply voltage off and on. • Check memory card if available. • Reload firmware. • Contact Hotline/Support.
 Orange	Not relevant	Converter detection via DCP flashing	-
 Orange		Commissioning or restore factory settings via commissioning tool	-

Table 12-3 Signal states of RDY and COM LEDs during firmware update

RDY	COM	Description	Remedy
 Green	 Green	Firmware update in progress	-
	 Red	Firmware update signals an error.	Possible remedies: <ul style="list-style-type: none"> • Switch the converter supply voltage off and on, and repeat the firmware update. • Firmware update via memory card: Replace memory card and repeat firmware update. • Contact Support/Hotline.
 Green		Firmware update is completed. The converter is waiting.	Switch the converter supply voltage off and on.

Table 12-4 Signal states of RDY and COM LEDs during full reset to factory settings

RDY	COM	Description	Remedy
 Green	 Green	All user-defined settings are being reset to factory settings.	-
 Green	 	All user-defined settings have been reset to factory settings.	Switch the converter supply voltage off and on.
 	 Red	Reset of all user-defined settings to factory settings is unsuccessful.	Possible remedies: <ul style="list-style-type: none"> • Check the memory card with the empty file called RESET.TXT • Switch off and switch on the converter supply voltage and reset all user-defined settings to the factory setting. • Contact Support/Hotline.

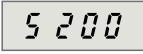
Please contact Technical Support for LED states that are not described above.

12.1.3 SDI Status display

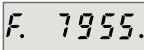
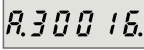
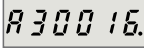
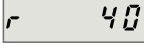
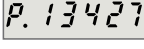
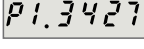
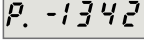
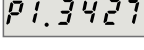
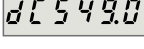
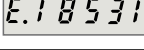
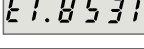
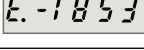
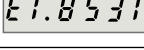
Description

Note

The SDI Status displays the values in a 32-bit floating-point format, with a maximum of seven effective digits.

Display	Example	Description	Remarks
S 200		Converter is in initialization state	-
-xxxxx		Converter is in startup state	The illuminated "-" symbols indicate the startup progress. Once all the "-" symbols are lit, the startup process is complete.
L24		24 V DC supply voltage is too low.	"L24" appears when the voltage (including transient voltage) of the external 24 V DC power supply drops below required voltage under normal converter operation. Remedy: Check the external 24 V DC power supply and restart the converter.
Fxxxxx		Fault code	In the case of a single fault

12.1 SDI Status

Display	Example	Description	Remarks
F.xxxxx.		Fault code of the first fault	In the case of multiple faults
Fxxxxx.		Fault code	In the case of multiple faults
Axxxxx		Alarm code	In the case of a single alarm
A.xxxxx.		Alarm code of the first alarm	In the case of multiple alarms
Axxxxx.		Alarm code	In the case of multiple alarms
Cxxxxx		Safety message code	In the case of a single safety message
C.xxxxx.		Safety message code of the first safety message	In the case of multiple safety messages
Cxxxxx.		Safety message code	In the case of multiple safety messages
S Off		Operating display: servo-off	-
r xxx		Actual speed (positive direction)	-
r -xxx		Actual speed (negative direction)	-
T x.x		Actual torque (positive direction)	-
T -x.x		Actual torque (negative direction)	-
P.xxxxx		Actual position (positive direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Px.xxxx		Actual position (positive direction)	The remaining digits have been fully displayed.
P.-xxxx		Actual position (negative direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Px.xxxx		Actual position (negative direction)	The remaining digits have been fully displayed.
DCxxx.x		Actual DC link voltage	-
E.xxxxx		Position following error (positive direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Ex.xxxx		Position following error (positive direction)	The remaining digits have been fully displayed.
E.-xxxx		Position following error (negative direction)	The digits are not fully displayed. Press the DOWN button to scroll to the next page.
Ex.xxxx		Position following error (negative direction)	The remaining digits have been fully displayed.

Display	Example	Description	Remarks
Restart		Restart the converter	-
P-----		The parameter does not exist.	The symbol "P" could be other parameter symbols, like "T", "E", etc.

12.1.4 Function buttons

Description

Button	Description	Functions
	M button	Switch between the diagnostics mode and the monitoring mode
	OK button	Acknowledge faults in the diagnostics mode
	DOWN button	Navigate to the next item
	Press the key combination for four seconds to restart the converter ¹⁾	

¹⁾ The converter cannot be restarted with this key combination when it is in the "servo-on" state.

12.2 System runtime

Overview

By evaluating the system runtime of the converter, you can decide when you should replace components (such as fans and motors) subject to wear in time before they fail.

Description of function

The system runtime starts once the power supply of the converter is switched on. The system runtime stops when the power supply is switched off.

The system runtime includes r2114[0] (milliseconds) and r2114[1] (days). It is calculated as follows:

$$\text{System runtime} = r2114[1] \times \text{days} + r2114[0] \times \text{milliseconds}$$

If r2114[0] has reached a value of 86400000 ms (24 hours), r2114[0] is set to the value 0 and the value of r2114[1] is increased by 1.

You cannot reset the system runtime.

Parameters

The following list includes the parameters of the "System runtime" function.

Number	Name	Unit
r2114[0...1]	System runtime total	-

12.3 Faults and alarms

12.3.1 Overview of faults and alarms

Description

Definitions

A message includes a letter and a relevant number.

The letters have the following meaning:

- A means "Alarm"
- F means "Fault"
- N means "No message" or "Internal message"
- C means "Safety message"

In the delivery state ($p3117 = 0$), safety messages correspond to message type "C" and the safety message buffer is active. With $p3117 = 1$, safety messages correspond to the message types "A" or "F" and are stored in the fault buffer or the alarm buffer.

Differences between faults and alarms

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.

Table 12-5 Differences between faults and alarms

Type	Description
Faults	<p>How does a converter respond when a fault occurs?</p> <ul style="list-style-type: none"> • Initiate the appropriate fault reaction. • Set the status signal ZSW1.3. • Enter the fault into the fault buffer. <p>How are faults eliminated?</p> <ul style="list-style-type: none"> • Remove the cause of the fault. • Acknowledge the fault. <p>What happens when the converter is switched off and switched on?</p> <ul style="list-style-type: none"> • Faults are saved retentively.
Alarms	<p>How does a converter respond when an alarm occurs?</p> <ul style="list-style-type: none"> • Set the status signal ZSW1.7. • Enter the alarm into the alarm buffer. <p>How are alarms eliminated?</p> <ul style="list-style-type: none"> • Alarms are self-acknowledging. <p>If the cause of the alarm is no longer present, the converter resets the alarm.</p> <p>What happens when the converter is switched off and switched on?</p> <ul style="list-style-type: none"> • The alarm buffer is lost when the supply voltage is switched off.

Note:

Messages from encoders whose signal is not used for control purposes are output by the converter as a warning.

12.3.2 Faults

Overview

A fault indicates that the reliable operation of the motor by the converter is at risk.

Description of function

Properties of faults

Faults have the following properties:

- Faults may cause the motor to be switched off.
- Faults must be acknowledged.
- Faults are displayed as follows:
 - On the converter via the LEDs
 - On the SINAMICS SDI Status panel via the 6-digit 7-segment display
 - In the web server
You can find more information on the display of faults in Section "Messages (Page 207)"
 - In Startdrive

Acknowledge faults

You need to resolve the cause of the fault before you can acknowledge a fault.

To acknowledge a fault, you have the following options:

- Acknowledging via the OK button on the SINAMICS SDI Status panel
- Switching off the converter power supply and switch on again
- Acknowledging via the web server or Startdrive
- The Safety Integrated fault is acknowledged by selecting and then deselecting the STO or SS1 function.

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 Section "Overview of faults and alarms (Page 410)".

12.3.3 Alarms

Overview

An alarm indicates that the reliable operation of the motor by the converter is at risk.

Description of function

Properties of alarms

Alarms have the following properties:

- Incoming alarms have no direct influence on the drive system.
- When the cause is eliminated, the alarm is no longer displayed.
- Alarms do not have to be acknowledged.
- Alarms are displayed as follows:
 - On the converter via the LEDs
 - On the SINAMICS SDI Status panel via the 6-digit 7-segment display
 - In the web server
You can find more information on the display of alarms in Section "Messages (Page 207)".
 - In Startdrive

Alarm code or alarm value describe the cause of the alarm.

More information

You can find more information on alarms in Section "Overview of faults and alarms (Page 410)".

12.3.4 Explanation of the list of faults and alarms

Overview

The representation of a message includes as a maximum the information listed below. Depending on the message, some information can be omitted.

The messages are displayed according to the following pattern:

Fxxxxx (A, N)		Fault location (optional): Name								
Message class:	Text of the message class (number according to PROFIdrive)									
Message value:	Component number: %1, fault cause: %2									
Variant:	Product variant									
Component:	Hardware component									
Response:	NONE									
Acknowledgment:	POWER ON									
Explanation of the message value:	For %2									
	<table><tr><th>Value</th><th>Cause</th><th>Remedy</th></tr><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></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								
Cause:	Description of possible causes. Fault value (r0949, interpret <format>): or alarm value (r2124, interpret <format>): (optional) Information about fault and alarm values (optional).									
Remedy:	Description of possible remedies									
Response upon A:	NONE									
Acknowl. upon A:	IMMEDIATELY									
Response upon N:	NONE									
Acknowl. upon N:	NONE									

Description of function

Fxxxxx (A, N)

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" or "Internal message"
- C means "Safety message" (dedicated message buffer)

The optional brackets indicate whether the type specified for this message can be changed and which message types can be adjusted via parameters (p2118, p2119).

For a message with a message type that can be changed, information about response and acknowledgment is specified independently (e.g. response upon F, acknowledgment upon F).

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).

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 higher-level control systems 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.

Table 12-6 Message classes and coding of various diagnostic interfaces

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
		PN (hex)	DS1 (dec)
Hardware/software fault A hardware or software malfunction was detected. <ul style="list-style-type: none"> • Carry out a POWER ON for the relevant component. • If it occurs again, contact the hotline. • Replace device. 	(1)	9000	0
Line fault A line supply fault has occurred (phase failure, voltage level...). <ul style="list-style-type: none"> • Check the line supply/fuses. • Check the supply voltage. • Check the wiring. 	(2)	9001	1
Supply voltage fault An electronics supply voltage fault (48 V, 24 V, 5 V...) was detected. <ul style="list-style-type: none"> • Check the wiring. • Check the voltage level. 	(3)	9002	2
DC link overvoltage The DC link voltage has assumed an inadmissibly high value. <ul style="list-style-type: none"> • Check the dimensioning of the system (line supply, reactor, voltages). • Check the infeed settings. 	(4)	9003	3
Power electronics fault An inadmissible operating state of the power electronics has been identified (overcurrent, overtemperature, IGBT failure...). <ul style="list-style-type: none"> • Check that the permissible duty cycles are complied with. • Check the ambient temperatures (fan). 	(5)	9004	4

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		PN (hex)	DS1 (dec)
Electronic component overload The temperature in the component has exceeded the highest permissible limit. <ul style="list-style-type: none"> • Check the ambient temperature /control cabinet cooling. 	(6)	9005	5
Ground fault/inter-phase short-circuit detected A ground fault/interphase short-circuit was detected in the power cables or in the motor windings. <ul style="list-style-type: none"> • Check the power cables (connection). • Check the motor. 	(7)	9006	6
Motor overload The motor was operated outside the permissible limits (temperature, current, torque...). <ul style="list-style-type: none"> • Check the duty cycles and set limits. • Check the ambient temperature/motor cooling. 	(8)	9007	7
Communication error to the higher-level controller The communication to the higher-level controller (internal coupling, PROFIBUS, PROFINET...) is faulted or interrupted. <ul style="list-style-type: none"> • Check the state of the higher-level control system. • Check the communication connection/wiring. • Check the bus configuration/clock cycles. 	(9)	9008	8
Safety monitoring channel has identified an error A safe operation monitoring function (Safety) has detected an error.	(10)	9009	9
Actual position value/actual speed value incorrect or not available An illegal signal state was detected while evaluating the encoder signals (track signals, zero marks, absolute values...). <ul style="list-style-type: none"> • Check the encoder/status of the encoder signals. • Observe the maximum permissible frequencies. 	(11)	900A	10
Internal (DRIVE-CLiQ) communication error The internal communication between the SINAMICS components is faulted or interrupted. <ul style="list-style-type: none"> • Check the DRIVE-CLiQ wiring. • Ensure an EMC-compliant design. • Observe the maximum quantity structure/cycles. 	(12)	900B	11
Infeed fault The infeed is faulted or has failed. <ul style="list-style-type: none"> • Check the infeed and its environment (line supply, filters, reactors, fuses...). • Check the infeed control. 	(13)	900C	12

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		PN (hex)	DS1 (dec)
Braking controller/Braking Module faulted The internal or external Braking Module is faulted or overloaded (temperature). <ul style="list-style-type: none"> • Check the connection/state of the Braking Module. • Comply with the permissible number of braking operations and their duration. 	(14)	900D	13
Line filter faulted The line filter monitoring has identified an excessively high temperature or other inadmissible state. <ul style="list-style-type: none"> • Check the temperature/temperature monitoring. • Check the configuration to ensure that it is permissible (filter type, infeed, thresholds). 	(15)	900E	14
External measured value/signal state outside of the permissible range A measured value/signal state read in via the input area (digital/analog/temperature) has assumed an inadmissible value/state. <ul style="list-style-type: none"> • Determine and check the relevant signal. • Check the set thresholds. 	(16)	900F	15
Application/technology function faulted The application/technological function has exceeded a (set) limit (position, speed, torque...). <ul style="list-style-type: none"> • Determine and check the relevant limit. • Check the setpoint specified by the higher-level controller. 	(17)	9010	16
Error in the parameterization/configuration/commissioning sequence An error has been identified in the parameterization or in a commissioning procedure, or the parameterization does not match the actual device configuration. <ul style="list-style-type: none"> • Determine the precise cause of the fault using the commissioning tool. • Adapt the parameterization or device configuration. 	(18)	9011	17
General drive fault Group fault. <ul style="list-style-type: none"> • Determine the precise cause of the fault using the commissioning tool. 	(19)	9012	18
Auxiliary unit faulted The monitoring of an auxiliary unit (incoming transformer, cooling unit...) has identified an inadmissible state. <ul style="list-style-type: none"> • Determine the exact cause of the fault and check the device involved. 	(20)	9013	19

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 placeholders (%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.

Table 12-7 Fault responses

List	PROFIdrive	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	Closed-loop speed control <ul style="list-style-type: none"> The motor is braked by immediately specifying $n_{set} = 0$ at the ramp-function generator deceleration ramp (p1121). The pulses are suppressed when standstill has been identified. "Switching on inhibited" is activated. Torque control <ul style="list-style-type: none"> The following applies for torque control: Response as for OFF2. When switching into torque control, the following applies: There is no dedicated braking response. The pulses are suppressed when standstill has been identified. "Switching on inhibited" is activated.
OFF2	COASTSTOP	Internal/external pulse inhibit	Closed-loop speed and torque control <ul style="list-style-type: none"> Immediate pulse cancellation, the motor "coasts down" to a standstill. "Switching on inhibited" is activated.

List	PROFIdrive	Response	Description
OFF3	QUICKSTOP	Braking along the OFF3 deceleration ramp followed by pulse inhibit	Closed-loop speed control <ul style="list-style-type: none"> The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering $n_set = 0$. The pulses are suppressed when standstill has been identified. "Switching on inhibited" is activated. Torque control <ul style="list-style-type: none"> Switchover to closed-loop speed control and other responses as described for closed-loop speed control.
STOP2	–	STOP2	<ul style="list-style-type: none"> The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering $n_set = 0$. The drive remains in closed-loop speed control.
ENCODER	–	Internal/external pulse inhibit	The ENCODER fault response occurs because of a sensor error and results in OFF2.

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.

Table 12-8 Acknowledging faults

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.

12.3.5 List of fault codes and alarm codes

Note**Inapplicable descriptions for the S200 servo drive system**

The list of faults and alarms contains some generic descriptions for SINAMICS products that are not applicable to the S200 servo drive system. These inapplicable descriptions include but may not limit to the following:

- DRIVE-CLiQ
 - Motor Module
 - Line Module
 - Hydraulic Module
 - Hydraulic cylinder
 - Hydraulic valve
 - Controller Extension
 - CX32 module
 - Sensor Module
 - Voltage Sensing Module
-

Product: SINAMICS S200, Version: 607012000, Language: eng
Objects: S200 Basic PN, S200 PN

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 relevant for internal fault diagnostics.

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 converter.

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 relevant for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Check configuration and signals of the blocks in FBLOCKS. - Check configuration and signals of DCC charts. - Check configuration and signals of TEC charts. - 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 relevant for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - 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 relevant for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Contact Technical Support.

N01004 (F, A) 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 relevant for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - Contact Technical Support.
Response upon: F:	OFF2
Acknowl. upon F:	POWER ON
Response upon: A:	NONE
Acknowl. upon A:	NONE

A01009 (N)	Control Unit overtemperature
Message class:	Overtemperature of the electronic components (6)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	The temperature of the converter has exceeded the specified limit value. Alarm value (r2124, interpret decimal): 0: Internal auxiliary fan is not inserted or is not rotating 1: Internal auxiliary fan rotating
Remedy:	- Check the ambient temperature at the converter installation location - Check the converter air intake. - Check the converter fan. Note: The alarm is automatically withdrawn once the limit value has been fallen below.
Response upon N:	NONE
Acknowl. upon N:	NONE
F01011 (N)	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.
Response upon N:	NONE
Acknowl. upon N:	NONE
F01014	Topology: Component property changed
Message class:	Hardware/software error (1)
Message value:	Component number: %1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The properties of the component have fundamentally changed. Fault value (r0949, interpret hexadecimal): Component number.
Remedy:	- Carry out a restart, reload parameters.

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 relevant for internal fault diagnostics.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.
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:	Write access to the internal RAM disk was unsuccessful.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Contact Technical Support.
F01022	BIOS update required
Message class:	Hardware/software error (1)
Message value:	-
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	The current firmware is not compatible with the installed BIOS. A BIOS update is required to use the device with this firmware.
Remedy:	- Updating the BIOS to the current version - Alternatively, downgrade to the previous firmware
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 relevant for internal fault diagnostics.
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!

A01032 (F)	All parameters must be saved
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	Data backup is incomplete The partially saved parameters are not loaded the next time the system runs up. For the system to successfully power up, all of the parameters must have been completely backed up. Alarm value (r2124, interpret decimal): Only relevant for internal fault diagnostics.
Remedy:	Save all parameters. See also: p0977 (Save all parameters)
Response upon: F:	NONE
Acknowled. upon F:	IMMEDIATELY

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: p0304, p0305, p2000, p2001, p2002, p2003, p2004

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 set 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: p0304, p0305, p2000, p2001, p2002, p2003, p2004
Remedy:	- Select the value of the reference parameter such that the parameter involved can be calculated in the per unit representation.

A01035 (F)	Parameter backup files corrupted
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	When the converter runs up, 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: Run-up was realized without data backup. The drive is in the factory setting. aa = 02 hex: The last available backed up data set has been loaded. The parameterization must be checked. It is recommended that the parameterization is downloaded again. aa = 03 hex: An external card with valid parameter backup was found and copied to the converter. Run-up is realized from this project. aa = 04 hex: An external card with incomplete or defective parameter backup was found. Run-up was realized without data backup. The drive is in the factory setting. dd, cc, bb: Only relevant for internal fault diagnostics. See also: p0977 (Save all parameters)
Remedy:	- Download the project again using the commissioning tool. - Retentively save parameters (save all parameters p0977 = 1) See also: p0977 (Save all parameters)
Response upon F:	NONE
Acknowl. upon F:	IMMEDIATELY

F01036 (A)	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 the project data are backed up using the commissioning tool, then the project must be downloaded again. Retentively save parameters (save all parameters, p0977 = 1), as a consequence, parameter files are completely written back to the non-volatile memory. Note: If the project data have not been backed up, then a new first commissioning is required.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F01038 (A) Loading the parameter backup file unsuccessful

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	An error has occurred when loading parameter backup files from the non-volatile memory.
Remedy:	- If you have saved the project data using the commissioning tool, then download the project again. Retentively save the data or set p0977 = 1. This means that the parameter files are again completely written to the non-volatile memory. - Replace the memory card or the converter.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F01039 (A) Writing to the parameter back-up file 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 in the non-volatile memory was unsuccessful. - A parameter backup file 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.
Remedy:	- Check the free memory space in the non-volatile memory. - Replace the memory card or the converter.
Response upon: A:	NONE
Acknowl. upon A:	NONE

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:	1. Retentively save changes in the drive. 2. Carry out a POWER ON (switch-off/switch-on) for all components. 3. Load changes from the drive into the 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
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 relevant for internal fault diagnostics.
Remedy:	- Save the parameters. - Reload the project into the converter. - Update the firmware - If required, replace the converter 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

Cause:

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.

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): 14: Drive status cannot be changed to "ready for operation" (r0947 and r0949). Additional values: Only relevant for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - 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, motors, encoders, power units 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	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 the converter.

F01045	Configuring data invalid
Message class:	Hardware/software error (1)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY

12.3 Faults and alarms

Cause:	<p>The run-up from the loaded project was unsuccessful.</p> <p>Possible projects:</p> <ul style="list-style-type: none"> - Download with commissioning tool - Run-up from data backup after retentively saving - Run-up from data backup after cloning created from external card - Restart <p>Fault value (r0949, interpret hexadecimal):</p> <p>Only relevant for internal fault diagnostics.</p>
Remedy:	<ul style="list-style-type: none"> - Restore the factory setting (p0976 = 1) and reload the project into the converter. <p>Then retentively save the parameterization or set p0977 = 1. This overwrites the incorrect parameter files in the non-volatile memory – and this alarm is withdrawn.</p>

F01046	Parameter value from the project not accepted
Message class:	Hardware/software error (1)
Message value:	Parameter: %1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	<p>When running up from the loaded project, a parameter value was not accepted.</p> <p>Possible projects:</p> <ul style="list-style-type: none"> - Download with commissioning tool - Run-up from data backup after retentively saving - Run-up from data backup after cloning created from external card - Run-up from an old project or upgrade the firmware - Restart <p>Fault value (r0949, interpret decimal):</p> <p>Parameter number whose value was not accepted.</p>
Remedy:	Check the parameter value of the parameter that was not accepted and, if required, correct.

F01047	Unable to restore drive data from the backup file
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	<p>An error occurred when restoring the drive data from the backup file.</p> <p>An unsuitable or incorrect backup file was detected under path BACKUPFILE_NEXT_START on the memory card.</p> <p>Fault value (r0949, interpret decimal):</p> <ul style="list-style-type: none"> 1: The backup file has the wrong format. Only files are supported with extension .zip or .ZIP. 2: Several files were found in path BACKUPFILE_NEXT_START. It cannot be determined from which backup file the drive data should be restored. 3: The backup file name is too long. 4: Unzipping the backup file failed. 5, 6, 7, 8 or 9: The content of the backup file is invalid or the backup file was generated with encryption. 10: The backup file was generated with an incompatible (older) firmware version. Restoring the drive data is not supported. 11: The backup file version is newer than the converter firmware version being used. 12: The backup file was generated for a different converter family. <p>Additional values: Only relevant for internal fault diagnostics.</p>

Remedy:

For fault value = 1: Use a file with .zip or .ZIP extension.

For fault value = 2: Only save the required backup file under BACKUPFILE_NEXT_START, remove other files.

For fault value = 3: Rename the backup file. Notice: Special characters can be longer than a visible character.

For fault value = 4, 5, 6, 7, 8 or 9: Use the backup file which was created using a Siemens commissioning tool (Startdrive, web server).

Before a backup file is created, encryption of the drive data must be deactivated.

For fault value = 10: Only converter backup files with firmware versions greater than or equal to V6.1 are supported. Use a suitable backup file.

For fault value = 11: Use the converter backup file that was created with a lower firmware version or the same firmware version.

For fault value = 12: Use the backup file for the matching converter family.

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):

Number drive object

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 converter or power unit.

A01051 (F) **Project is loaded from the memory card at the next power on**

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: A memory card with a user data backup that is different from the actual converter parameterization was detected.

This user data backup (if compatible) will be copied to the converter during the next power on run-up.

This overrides the actual converter parameterization and can extend the ramp-up.

Remedy: 1. The memory card and the converter parameterization should remain unchanged > withdraw card.

 2. The memory card should be overwritten with the actual converter parameterization - > to do this, execute "Save all parameters".

 See also: p0977 (Save all parameters)

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

F01054	CU: System limit exceeded
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	At least one system overload has been identified. Fault value (r0949, interpret decimal): 1: Computing time load too high. 5: Peak load too high. Note: As long as this fault is present, it is not possible to save the parameters (p0977). See also: r9994 (Calculated system utilization)
Remedy:	- Reduce the computing time load of the converter to less than 100 %. - Deactivate functions.
F01068	CU: Data memory memory overflow
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The utilization for a data memory area is too large. Fault value (r0949, interpret binary): Bit 0 = 1: High-speed data memory 1 overloaded Bit 1 = 1: High-speed data memory 2 overloaded Bit 2 = 1: High-speed data memory 3 overloaded Bit 3 = 1: High-speed data memory 4 overloaded
Remedy:	- Deactivate function. - Deactivate drive object. - Remove drive object from the target topology.
A01069	Parameter backup on memory card incompatible
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	The parameter backup on the memory card and in the converter do not match. If available, when it is switched on, the drive loads the internal valid data backup. Example: Parameter backup to memory card is newer than the firmware in the device. Parameter backup to memory card contains a different product type.
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). Note: This overwrites the memory card.
A01073 (N)	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:	<p>The parameter assignment on the visible partition of the memory card has changed.</p> <p>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.</p> <p>Note:</p> <p>A new POWER ON can be requested via this alarm (e.g. after retentively saving).</p>
Remedy:	<ul style="list-style-type: none">- Carry out a POWER ON (switch-off/switch-on).- Carry out a hardware reset (RESET button, p0972).
Response upon: N:	NONE
Acknowl. upon N:	NONE

F01082	Parameter error when running up from data backup
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

Cause:	<p>Parameterizing errors have been detected (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters.</p> <p>The detailed cause of the fault can be determined using the fault value.</p> <p>Fault value (r0949, interpret hexadecimal):</p> <p>ccbbaaaa hex</p> <p>aaaa = Parameter</p> <p>bb = Index</p> <p>cc = fault cause</p> <p>0: Parameter number illegal.</p> <p>1: Parameter value cannot be changed.</p> <p>2: Lower or upper value limit exceeded.</p> <p>3: Sub-index incorrect.</p> <p>4: No array, no sub-index.</p> <p>5: Data type incorrect.</p> <p>6: Setting not permitted (only resetting).</p> <p>7: Descriptive element cannot be changed.</p> <p>9: Descriptive data not available.</p> <p>11: No master control.</p> <p>15: No text array available.</p> <p>17: Task cannot be executed due to operating state.</p> <p>20: Illegal value.</p> <p>21: Response too long.</p> <p>22: Parameter address illegal.</p> <p>23: Format illegal.</p> <p>24: Number of values not consistent.</p> <p>25: Drive object does not exist.</p> <p>101: Presently deactivated.</p> <p>104: Illegal value.</p> <p>107: Write access not permitted when controller enabled.</p> <p>108: Unit unknown.</p> <p>109: Write access only in the commissioning status, encoder.</p> <p>110: Write access only in the commissioning status, motor.</p> <p>111: Write access only in the commissioning status, power unit.</p> <p>112: Write access only in the quick commissioning mode.</p> <p>113: Write access only in the ready mode.</p> <p>114: Write access only in the commissioning status, parameter reset.</p> <p>115: Write access only in the Safety Integrated commissioning status.</p> <p>116: Write access only in the commissioning status, technological application/units.</p> <p>117: Write access only in the commissioning status.</p> <p>118: Write access only in the commissioning status, download.</p> <p>119: Parameter may not be written in download.</p> <p>120: Write access only in the commissioning status, drive basis configuration.</p> <p>121: Write access only in the commissioning status, define drive type.</p> <p>122: Write access only in the commissioning status, data set basis configuration.</p> <p>123: Write access only in the commissioning status, device configuration.</p> <p>124: Write access only in the commissioning status, device download.</p> <p>125: Write access only in the commissioning status, device parameter reset.</p> <p>126: Write access only in the commissioning status, device ready.</p> <p>127: Write access only in the commissioning status, device.</p> <p>129: Parameter may not be written in download.</p> <p>131: Requested signal interconnection not possible as the signal source supplies non-float value.</p> <p>132: Free signal interconnection via PROFIdrive telegram setting inhibited.</p>
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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:

- Based on the fault value, identify the parameter that caused the fault.
- Correct the value in the specified parameter.
- Download the project again using the commissioning tool and retentively save parameters. Or retentively save parameters and carry out a POWER ON (switch-off/switch-on).

See also: p2118, p2119

A01100 CU: Memory card withdrawn

Message class: General drive fault (19)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The memory card (non-volatile memory) was withdrawn during operation.
Notice:

It is not permissible for the memory card to be withdrawn or inserted under voltage.

Remedy:

- Switch off the drive system.
- Re-insert the memory card that was withdrawn - This card must match the drive system.
- Switch on the drive system again.

F01107 CU: Save to memory card unsuccessful

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: A data save in the non-volatile memory was not able to be successfully carried out.
- Non-volatile memory is defective.
- Insufficient space in the non-volatile memory.
Fault value (r0949, interpret decimal):
Only relevant for internal fault diagnostics.

Remedy:

- Try to save again.
- Replace the memory card or Control Unit.

F01122 (A) 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.
Response upon A:	NONE
Acknowledgment upon A:	NONE

F01200	CU: Time slice management internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A time slice management error has occurred. It is possible that the sampling times have been inadmissibly set. Fault value (r0949): 105: Invalid input of cycle time or smallest common multiple of sampling times too high 998: Too many time slices occupied by technology functions (e.g. DCC). 999: Too many time slices occupied by the basic system. Too many different sampling times may have been set. Additional values: Only relevant for internal fault diagnostics.
Remedy:	- Contact Technical Support.

F01205	CU: Time slice overflow
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	Insufficient processing time is available for the existing topology. Fault value (r0949, interpret hexadecimal): Only relevant for internal fault diagnostics.
Remedy:	- Reduce the number of drives.

F01250	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 converter. Fault value (r0949, interpret decimal): Only relevant for internal fault diagnostics.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Replace the converter.

A01251	CU: CU-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 relevant for internal fault diagnostics.
Remedy:	For alarm value r2124 < 256, the following applies: - Carry out a POWER ON (switch-off/switch-on). - Replace the converter. For alarm value r2124 ≥ 256, the following applies: - For the converter with this alarm, clear the fault memory (p0952 = 0). - Replace the converter.

F01255	CU: Option Board EEPROM read-only data error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	POWER ON
Cause:	Error when reading the read-only data of the EEPROM in the Option Board. Fault value (r0949, interpret decimal): Only relevant for internal fault diagnostics.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Replace the Control Unit.

A01256	CU: Option Board EEPROM read-write data error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	Error when reading the read-write data of the EEPROM in the Option Board. Alarm value (r2124, interpret decimal): Only relevant for internal fault diagnostics.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Replace the Control Unit.

A01314	Topology: Component must not be present
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1, to %2, %3, connection: %4

12.3 Faults and alarms

Component: None
Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1, %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	

For %3

Component in target topology

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	

12.3 Faults and alarms

41 X401
 42 X402
 50 X500
 51 X501
 52 X502
 53 X503
 54 X504
 55 X505
 56 X506
 57 X507

Cause: For a component, "deactivate and not present" is set but this component is still in the topology.
 Alarm value (r2124, interpret hexadecimal):
 ddccbbaa hex:
 aa = component number
 bb = component class of the component
 cc = connection number
 Note:
 Component class and connection number are described in F01375.

Remedy: - Remove the corresponding component.
 - Change the setting "deactivate and not present".
 Note:
 Under "Topology --> Topology view", the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01319 **Inserted component not initialized**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: Initialization is required for at least one inserted component.
 This is only possible if the pulse inhibit is active on all drive objects.
Remedy: Activate pulse inhibit for all drive objects.

F01325 **Topology: Component number not included in target topology**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component number: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The component referenced in a data set is not contained in the target topology.
 Fault value (r0949, interpret decimal)
Remedy: Establish consistency between the topology and data set configuration.

A01330 **Topology: Quick commissioning not possible**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Fault cause: %1, supplementary information: %2, preliminary component number: %3
Component: None
Response: NONE

Acknowledgment: NONE
Cause: Unable to carry out a quick commissioning. The existing actual topology does not fulfill the requirements.

Alarm value (r2124, interpret hexadecimal):
ccccbbaa hex: cccc = preliminary component number, bb = supplementary information, aa = fault cause
aa = 08 hex = 8 dec:
The motor is not completely connected.

Remedy: 1) Connect the motor encoder connector
2) Carry out a POWER ON (switch-off/switch-on).

For alarm value aa = 8:
3) Restore the factory setting.
4) Retentively save the project.

F01356 **Topology: There is a defective component**
Message class: Hardware/software error (1)
Message value: Fault cause: %1, component number: %2, connection number: %3
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The actual topology indicates at least one defective component.
Note:
Pulse enable is withdrawn and prevented.
Remedy: Replace the defective component and restart the system.

F01380 **Topology: Actual topology EEPROM defective**
Message class: Hardware/software error (1)
Message value: Preliminary component number: %1
Component: None
Response: NONE
Acknowledgment: POWER ON
Cause: When detecting the actual topology, a component with a defective EEPROM was detected.
Fault value (r0949, interpret hexadecimal):
bbbbaaaa hex:
bbbb = reserved
aaaa = preliminary component number of the defective components
Remedy: Output the fault value and remove the defected component.

A01382 **Topology: Sensor Module incorrectly inserted**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component: %1, to %2, %3, connection: %4
Component: None
Response: NONE

12.3 Faults and alarms

Acknowledgment: NONE

Explanation of the message For %1

value: Component in target topology

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	

For %3

Component in actual topology

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 Sensor Module in the actual topology that has been incorrectly inserted with respect to the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa hex:
dd = connection number (%4)
cc = component number (%3)
bb = component class (%2)
aa = component number of the incorrectly inserted component (%1)
Note:
The component is described in dd, cc and bb, where the component involved is incorrectly inserted.
Component class and connection number are described in F01375.
The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

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).
- Automatically resolve the topology error.
Note:
Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01388

Topology: Encoder incorrectly inserted

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component: %1, to %2, %3, connection: %4
Component: None
Response: NONE

Acknowledgment: NONE

Explanation of the message For %1

value: Component in target topology

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	

For %3

Component in actual topology

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 an EnDat encoder in the actual topology that has been incorrectly inserted with respect to the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa hex:
dd = connection number (%4)
cc = component number (%3)
bb = component class (%2)
aa = component number of the incorrectly inserted component (%1)
Note:
The component is described in dd, cc and bb, where the component involved is incorrectly inserted.
Component class and connection number are described in F01375.
The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

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).
- Automatically resolve the topology error.
Note:
Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01420

Topology: Component different

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component: %1, target: %2, actual: %3, difference: %4
Component: None
Response: NONE

Acknowledgment: NONE

Explanation of the message value:

For %1

Component in target topology

For %2, %3

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	

For %4

Value	Cause	Remedy
1	Different component type	
2	Different article number	
3	Different manufacturer	
4	Incorrect subcomponent connected	
5	NX10 or NX15 used instead of CX32.	
6	CX32 used instead of NX10 or NX15.	
7	Different number of connections	

Cause: The topology comparison has detected differences in the actual and target topologies in the electronic nameplate component.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

aa = component number (%1),

bb = component class of the target topology (%2),

cc = component class of the actual topology (%3),

dd = difference (%4)

Note:

The component class is described in F01375.

The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

Remedy:

Adapting topologies:

- Connect the expected component (correct the actual topology).

- Adapt the project/parameterizing in the commissioning tool (correct the target topology).

Note:

Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01422	Topology: Required data rate cannot be set		
Message class:	Error in the parameterization / configuration / commissioning procedure (18)		
Message value:	Component: %1, connection: %2, difference: %3		
Component:	None		
Response:	NONE		
Acknowledgment:	NONE		
Explanation of the message value:	For %1 Component in target topology For %2		
	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	
	For %3		
	Value	Cause	Remedy
	1	Incorrect cable	Correct cable
	2	Incorrect interface	Correct interface

Cause:	The topology comparison identified differences in the data rate for the connection between two components. Note: The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.
Remedy:	Load a project that matches the hardware.

A01425**Topology: Serial number different**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, %2, differences: %3

Component: None

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1
Component in target topology

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	

Cause: The topology comparison has detected differences in the actual and target topologies in relation to one component. The serial number is different.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

dd = reserved

cc = number of differences (%3)

bb = component class (%2)

aa = component number (%1)

Note:

The component class is described in F01375.

The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

Remedy: Adapting topologies:

- Change over the actual topology to match the target topology.

- Load the target topology that matches the actual topology (commissioning tool).

Note:

Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

F01451	Topology: Target topology is invalid
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	An error was detected in the target topology. The target topology is invalid. Fault value (r0949, interpret hexadecimal): ccccbbaa hex: cccc = index error, bb = component number, aa = fault cause aa = 1B hex = 27 dec: Error not specified. aa = 1C hex = 28 dec: Value illegal. aa = 1D hex = 29 dec: Incorrect ID. aa = 1E hex = 30 dec: Incorrect ID length. aa = 1F hex = 31 dec: Too few indices left. aa = 20 hex = 32 dec: component is not connected to the converter.
Remedy:	Download the target topology again using the commissioning tool.

A01481 (N)	Topology: Internal communications faulted
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Component: %1, to %2, %3, connection: %4
Component:	None
Response:	NONE

Acknowledgment: NONE

Explanation of the message value: For %1, %3
Component in target topology
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	

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: Internal communications faulted.
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Replace the device.
Response upon N: NONE
Acknowl. upon N: NONE

A01486 **Topology: Component 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

Acknowledgment: NONE

Explanation of the message value: For %1, %3
Component in target topology
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	

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 component that is missing in the actual topology with respect to the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa 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 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).

A01488

Topology: Encoder 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

Acknowledgment: NONE

Explanation of the message value: For %1, %3
Component in target topology
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	

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 an encoder that is missing in the actual topology with respect to the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa 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 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).

A01489

Topology: Motor 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

Acknowledgment: NONE

Explanation of the message value: For %1, %3
Component in target topology
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	

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 that is missing in the actual topology with respect to the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa 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 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).

F01512 **No scaling available**

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: OFF2
Acknowledgment: POWER ON
Cause: An attempt was made to determine a conversion factor for a scaling that does not exist.
Fault value (r0949, interpret decimal):
Unit (e.g. corresponding to SPEED) for which an attempt was made to determine a factor.
Remedy: Apply scaling or check the transfer value.

A01514 (F) **Error when writing during a reconnect**

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: NONE

Cause: During a reconnect operation (e.g. while booting or downloading - but can also occur in normal operation) a parameter was not able to be written to.
The parameter is then reset to the factory setting.

Alarm value (r2124, interpret decimal):
Parameter number

Remedy: Not necessary.

Response upon: F: NONE

Acknowl. upon F: IMMEDIATELY

F01550 Security: Drive data encryption invalid

Message class: Hardware/software error (1)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: POWER ON

Cause: The password for drive data encryption (DDE) does not match the password configured in the converter or no password was configured.
The DDE password protects sensitive data on the SD card.
It is not possible to transfer the data backup from the SD card.

Remedy: To be able to restore the data backup on the SD card, the DDE password must correspond to the password that was originally configured for the data backup in the original converter:
- With the SD card inserted, enter the correct DDE password in the Security Wizard of the web server and restart the converter.
- In Startdrive, with the SD card inserted, under Online & Diagnostics, enter the correct DDE password in screen form "Specify password for encryption of the drive data" and restart the converter.

If the data backup on the SD card is not be used:
- Remove the SD card from the converter and restart the converter.

Notice: Not observing this and continuing to work at the converter can lead to the data backup on the SD card being lost.

F01551 Security: Integrity protection check unsuccessful

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The integrity protection check failed (for example, after data manipulation).

Fault value (r0949, interpret decimal):
1, 2: Integrity protection violation in the internal memory
3: Integrity protection violation on the memory card or in backup file

Remedy:

For fault value 1:

- Transfer reloaded components again.
- Then load the drive configuration onto the converter again.
- If the error persists, reset the device to its original state.

For fault value 2:

- Insert the memory card with the required firmware level and restart the drive.
- Then load the drive configuration onto the converter again.
- If the error persists, reset the device to its original state.

For fault value 3:

- Use a different backup file if the error occurred while restoring the drive configuration.
- Back up project data from the memory card to a PC and then delete it on the memory card.

A01552 Security: Syslog server not accessible

Message class: Hardware/software error (1)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The syslog server cannot be accessed.

- IP address is incorrect
- Incorrect port address
- Protocol selection is incorrect
- Cable break
- Server service inactive

Remedy:

- Check the IP address, port address, protocol selection in the Startdrive and adapt if necessary.
- Check cables for cable breaks and replace them if necessary.
- Check server service for availability and/or contact administrator.

A01553 Security: Syslog send buffer temporarily overflowed

Message class: Hardware/software error (1)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The syslog send buffer has temporarily overflowed.
Too many events have occurred in a short period of time.
It is possible that not all messages could be sent.

Remedy: Find and eliminate the cause of the frequent occurrence of the events.

A01554 Security: Syslog server connection interrupted

Message class: Hardware/software error (1)

Message value: -

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The connection to the syslog server has been interrupted.

Remedy:

- Check cables for cable breaks and replace them if necessary.
- Check server service for availability and/or contact administrator.

A01555 Security: Syslog server certificate validation failed

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: Syslog server certificate validation error
Remedy: Invalid server certificate

A01556 Security: Local log memory will soon be in the ring mode

Message class: Hardware/software error (1)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The memory capacity of locally stored security events will soon be exceeded and will then operate in the ring mode.
Remedy:

A01557 Security: Local log memory is in the ring mode

Message class: Hardware/software error (1)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The memory capacity for the locally stored security events has been exceeded and is now operating in the ring mode.
Remedy:

F01560 Security: Authenticity check failed

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The authenticity check failed (e.g. after data manipulation).
Changes were not accepted.
Remedy:

- Check the configuration and validity of the certificates configured in the drive.
- Check that the certificate is correct, which is used, for example, when downloading the project.

Correct the certificate configuration in the engineering system and transfer it again to the drive.

A01561 Security: Alarm, authenticity check failed

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Response: NONE
Acknowledgment: NONE
Cause: The authenticity check failed (e.g. after data manipulation).

Remedy:

- Check the configuration and validity of the certificates configured in the drive.
- Check that the certificate is correct, which is used, for example, when downloading the project.

Correct the certificate configuration in the engineering system and transfer it again to the drive.

A01570 **Security: Certificate invalid**

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause: The certificate on the Control Unit is invalid.
Alarm value (r2124, interpret hexadecimal):
AABB hex: AA = certificate type, BB = fault cause
AA:
11: Embedded Issuing CA
12: https
13: OPC-UA
BB:
01: Certificate expired
02: Certificate not yet valid
03: Certificate chain (trust chain) invalid
04: Certificate not found
05: Signature validation not successful

Remedy:

- Create/sign Embedded Issuing CA certificate again and check the time setting on the module
- Contact Technical Support

A01571 **Security: Certificate management event**

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Response: NONE

Acknowledgment: NONE

Cause:	<p>A certificate management event may require intervention.</p> <p>Alarm value (r2124, interpret hexadecimal):</p> <p>Alarm value: 0xAABB</p> <p>AA: Certificate type</p> <p>11: Embedded Issuing CA</p> <p>12: https</p> <p>13: OPC-UA</p> <p>BB: Fault cause</p> <ul style="list-style-type: none"> - 11: The certificate was not able to be created. - 12: The CSR for the certificate was not able to be created on the device - 13: The certificate was not able to be installed on the device. - 14: Incompatible configuration for the certificate. - 20: The certificate still has sufficient validity. - 21: The certificate expires in less than 1 day. - 22: The certificate expires in less than 3 days. - 23: The certificate expires in less than 7 days. - 24: The certificate expires in less than 14 days. - 25: The certificate expires in less than 21 days. - 26: The certificate expires in less than 28 days.
Remedy:	<p>For fault cause = 11-14:</p> <p>Contact Technical Support</p> <p>For fault cause = 21-26:</p> <p>Manually renew Embedded Issuing CA certificate via Startdrive</p>

A01572	Security: Technology Extension certificate invalid
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>No valid certificates were found for the Technology Extensions used.</p> <p>Alarm value (r2124, interpret hexadecimal):</p> <ul style="list-style-type: none"> - 0x5001: One or more certificates of Technology Extensions (TEC) have expired. - 0x5002: One or more certificates of the Technology Extensions (TEC) are not yet valid. - 0x5003: The certificate chain is not valid for one or more certificates of the Technology Extensions. - 0x5004: No certificate was found for one or more Technology Extensions - 0x5005: For one or more Technology Extension the signature was not able to be verified.
Remedy:	Load valid certificates for the Technology Extensions used onto the drive.

F01580	Security: Hardware fault
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	<p>The drive has detected a fault in the security module.</p> <p>Fault value (r0949, interpret hexadecimal):</p> <p>0xF001: Hardware fault,</p>
Remedy:	- Contact Technical Support.

C01600	SI: STO (Safe Torque Off) initiated
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Variant:	S200 PN
Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>"Safety Integrated Functions" identified a fault in the self test of the switch-off signal path, and initiated an STO (Safe Torque Off).</p> <p>Message value (r60049, interpret decimal):</p> <p>0: Subsequent response to another fault.</p> <p>1005: STO active, although STO not selected and there is no internal STO active.</p> <p>1010: STO inactive, although STO is selected or an internal STO is active.</p> <p>1015: The self test in operation was unsuccessful.</p> <p>1016: Error in the communications path for F-DI/STO.</p> <p>1017: Error in the communications path for the control.</p>
Remedy:	<ul style="list-style-type: none"> - Select STO and then de-select again. - Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade software to a later version. - Contact Technical Support.
C01603	SI: Module temperature - limit value exceeded
Message class:	Safety monitoring channel has identified an error (10)
Message value:	-
Variant:	S200 PN
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:	<ul style="list-style-type: none"> - Check the ambient air 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
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	<p>Safety relevant EEPROM data are not correct.</p> <p>This fault results in an STO (Safe Torque Off).</p> <p>Fault value (r0949, interpret decimal): Only relevant for internal fault diagnostics.</p>
Remedy:	Replace the module.
A01605	SI: Checksum error has occurred
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1

12.3 Faults and alarms

Variant:	S200 PN
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 relevant for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on). - Upgrade firmware to later version. - Contact Technical Support.

F01606	SI: Safety HW version incorrect
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	The actual software for Safety Integrated is not compatible with the existing hardware. This fault results in an STO (Safe Torque Off). Fault value (r0949, interpret decimal): Only for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - Update the software. - Replace the module.

C01630	SI: Brake control error
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Variant:	S200 PN
Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The SBC (Safe Brake Control) function integrated in the drive has identified a brake control fault and has initiated an STO (Safe Torque Off). Message value (r60049, interpret decimal): 3: Hardware is defective or does not support the brake control. <ul style="list-style-type: none"> - Communications with the brake control has failed. - SBC is enabled on a module that does not support brake control.
Remedy:	<ul style="list-style-type: none"> - Check whether the brake control is supported. - Replace the hardware.

A01637 (F)	SI: Safety configuration not protected
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Variant:	S200 PN
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	Safety configuration is not protected using UMAC (User Management and Access Control).

Remedy:	Activate UMAC and assign the rights for changing the "Edit Safety Integrated application" safety configuration to a specific user that is saved with user name and password.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY

A01641 (F, N) **SI: Component exchange identified and save necessary**

Message class:	General drive fault (19)
Message value:	Fault cause: %1
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Explanation of the message value:	For %1

	Bit	Cause	Remedy
	0	It was identified that the drive was replaced	
Cause:	<p>"Safety Integrated" identified that a component has been replaced.</p> <p>No additional stop response is initiated, and therefore the operation of the specific drive is not restricted.</p> <p>When "Safety Integrated Functions" are active, after a component has been replaced a partial acceptance test must be performed.</p> <p>Alarm value (r2124, interpret binary).</p>		
Remedy:	<p>- Retentively save all parameters (p0977 = 1).</p> <p>- Acknowledge fault.</p> <p>See also: r9776 (SI diagnostics)</p>		
Response upon: F:	NONE		
Acknowl. upon F:	IMMEDIATELY		
Response upon: N:	NONE		
Acknowl. upon N:	NONE		

C01642 **SI: Time slice monitoring error identified**

Message class:	Hardware/software error (1)
Message value:	%1
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A time slice monitoring error has occurred.

	Note:
	This message results in an STO (Safe Torque Off) that cannot be acknowledged. Message value (r60049, interpret hexadecimal): For internal fault diagnostics only.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Repeat commissioning of "Safety Integrated" and carry out a POWER ON. - Upgrade firmware to later version. - Contact Technical Support. - Replace hardware component.

C01643 **SI: General run-up fault**

Message class:	Hardware/software error (1)
Message value:	Module: %1, line: %2
Variant:	S200 PN

Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A fault occurred when running up. One possible cause is withdrawing or inserting the DRIVE-CLiQ cable when running up. Note: This message results in an STO (Safe Torque Off) that cannot be acknowledged. Message value (r60049, interpret hexadecimal): Only for internal fault diagnostics.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Repeat commissioning of "Safety Integrated" and carry out a POWER ON. - Upgrade firmware to later version. - Contact Technical Support. - Replace hardware component.

F01646	SI: Change logbook
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>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):</p> <p>1: The safety logbook has identified that a functional safety checksum has changed. An acceptance test is required.</p> <p>2: The safety logbook has identified that a hardware-related safety checksum has changed. An acceptance test is required.</p>
Remedy:	<p>For fault value = 1:</p> <ul style="list-style-type: none"> - Carry out an acceptance test and generate an acceptance report. <p>For fault value = 2:</p> <ul style="list-style-type: none"> - Carry out the function checks for the modified hardware and generate an acceptance report. <p>Note:</p> <p>The procedure when carrying out an acceptance test as well as an example of the acceptance report are provided in the Safety Integrated product documentation.</p>

C01649	SI: Internal software error
Message class:	Hardware/software error (1)
Message value:	Module: %1, line: %2
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>An internal error has occurred in the Safety Integrated software.</p> <p>Note:</p> <p>This message results in an STO (Safe Torque Off) that cannot be acknowledged. Message value (r60049, interpret hexadecimal): Only for internal fault diagnostics.</p>

- Remedy:**
- Carry out a POWER ON (switch-off/switch-on) for all components.
 - Repeat commissioning of "Safety Integrated" and carry out a POWER ON.
 - Upgrade firmware to later version.
 - Contact Technical Support.
 - Replace hardware component.

F01650	SI: Acceptance test required
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	"Safety Integrated Functions" 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.

F01661	SI: Simulation of the safety inputs active
Message class:	General drive fault (19)
Message value:	Fault cause: %1 bin
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The simulation of the digital inputs is active (p0795). It is not permissible that safety inputs are simulated. Message value (r0949, interpret binary): The displayed bits indicate which digital inputs must not be simulated.
Remedy:	- Deactivate the simulation of the digital inputs for the safety inputs (p0795). - Acknowledge message.

C01668	SI: Checksum error safety monitoring functions
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	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 diagnostics)
Remedy:	- Carry out safety commissioning. - Carry out an acceptance test.

C01676 SI: Parameterization of the failsafe inputs not permissible**Message class:** Error in the parameterization / configuration / commissioning procedure (18)**Message value:** %1**Variant:** S200 PN**Component:** Control Unit (CU)**Response:** OFF2**Acknowledgment:** IMMEDIATELY

Cause: When controlled via terminal (p9603.0 = 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 of the incorrect signal interconnection

Remedy: Correct parameters:

- Interconnect with a valid signal source.
- Inhibit control via terminal (p9603.0 = 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**Variant:** S200 PN**Component:** None**Response:** NONE**Acknowledgment:** IMMEDIATELY

Cause:	<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): yyyyxxxx dec: yyyy = supplementary information xxxx = parameter</p> <p>yyyy = 0: No additional information available.</p> <p>xxxx = 10000 and yyyy = F-DI number: A non-existent F-DI was enabled.</p> <p>xxxx = 10002: The F-DI discrepancy time (p10002) is less than or equal to the SI monitoring clock cycle.</p> <p>xxxx = 10017 and yyyy = F-DI number: 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: Setting "F-DI self test length 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: An invalid value was set in "F-DI self test mode selection" (p10041[y]).</p> <p>xxxx = 10071 and yyyy = F-DI number: An F-DI status r10071[y], which was not enabled in p10000, was set.</p>
Remedy:	<p>Correct the parameter value.</p> <p>For xxxx = 10000 and yyyy = F-DI number: - Correct "SI F-DI enable" (p10000).</p> <p>For xxxx = 10002: - Set "SI F-DI switchover discrepancy time" (p10002) greater than the "SI monitoring clock cycle".</p> <p>For xxxx = 10017 and yyyy = F-DI number: - Set "SI digital inputs input filter" (p10017) greater than (p10018 + 2 ms) - Change "SI F-DI self test mode selection" (p10041[y])</p> <p>For xxxx = 10018 and yyyy = F-DI number: - Set "SI F-DI self test length dark pulses" (p10018) greater than zero. - Change p10041[y] "SI F-DI self test mode selection".</p> <p>For xxxx = 10041 and yyyy = F-DI number: - Change "SI F-DI self test mode selection" (p10041[y])</p> <p>For xxxx = 10071 and yyyy = F-DI number: - Correct "SI F-DI enable" (p10000).</p>

C01680

SI: Checksum error safety monitoring functions

Message class:

Safety monitoring channel has identified an error (10)

Message value:	%1
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	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. 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 diagnostics)
Remedy:	<ul style="list-style-type: none"> - Check the safety-relevant parameters and if required, correct. - Retentively save parameters. - Carry out a POWER ON (switch-off/switch-on) if safety parameters requiring a POWER ON were 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
Variant:	S200 PN
Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The parameter cannot be parameterized with this value. Note: This message results in an STO. Message value (r60049, interpret decimal): yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter yyyy = 0: No additional information available. xxxx = 9603: The type of control displayed under additional information is not permissible for p9603 on this device. xxxx = 10022 or 10023: An inadmissible signal source for the control via F-DI was set.
Remedy:	Carry out a POWER ON (switch-off/switch-on) for all components.

C01682	SI: Monitoring function not supported
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Variant:	S200 PN
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. If all bits are set in the fault value, Safety is generally not supported on this component. Safety must be locked. 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. If all bits are set in the fault value, Safety must be locked using parameter p9603. See also: p9604 (SI enable)

C01690	SI: Data backup problem for the NVRAM
Message class:	Hardware/software error (1)
Message value:	%1
Variant:	S200 PN
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 message does not result in a safety stop response. Message 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 message value = 1: - Replace the hardware. For message 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 (F)	SI: Commissioning mode active
Message class:	General drive fault (19)
Message value:	-
Variant:	S200 PN
Component:	Control Unit (CU)
Response:	NONE
Acknowledgment:	NONE
Cause:	"Safety Integrated" commissioning 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.
Response upon F:	NONE
Acknowl. upon F:	IMMEDIATELY

C01700	SI: STO (Safe Torque Off) initiated
Message class:	Safety monitoring channel has identified an error (10)
Message value:	-
Variant:	S200 PN
Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The drive is stopped using STO (Safe Torque Off). Possible causes: Subsequent response, following messages: C01701, C01711.
Remedy:	Carry out diagnostics for the active messages (C01701, C01711).
C01701	SI: SS1 (Safe Stop 1) initiated
Message class:	Safety monitoring channel has identified an error (10)
Message value:	-
Variant:	S200 PN
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 message, after the time parameterized in p9556 has expired, STO (Safe Torque Off) is initiated. Possible causes: Subsequent response to message C01711.
Remedy:	Carry out diagnostics for the active messages (C01711).
C01711	SI: SCF (Safety Channel Failure) initiated
Message class:	Safety monitoring channel has identified an error (10)
Message value:	-
Variant:	S200 PN
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 to message C01769. Note: This message results in an SS1 (Safe Stop 1), and as a consequence STO (Safe Torque Off) is initiated.
Remedy:	Carry out diagnostics for the active messages (C01769).
C01769	SI: Error for data cross-check
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Variant:	S200 PN
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.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Recommission "Safety Integrated" 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
Variant:	S200 PN
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:	<p>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</p> <p>Note: If several faults occur consecutively, then this message is only signaled for the first fault that occurs.</p>
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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 (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 (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 greater or equal to the SI monitoring clock cycle (it must always be rounded up or down to be an integer multiple of the SI monitoring clock cycle).

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 greater or equal to the SI monitoring clock cycle. 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

Variant: S200 PN

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

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

C01799**SI: Acceptance test mode active**

Message class: Safety monitoring channel has identified an error (10)

Message value: -

Variant: S200 PN

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 (A) Internal communications faulted

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause:
Remedy: Replace the component involved.
Response upon: A: NONE
Acknowl. upon A: NONE

A01900 (F) PN: Configuration telegram error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
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 is specified by the number of indices in r2050/c2053.
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.
Additional values:
Only relevant for internal fault diagnostics.
Remedy: Check the bus configuration on the controller and device sides.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY

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:	<p>Parameterization for isochronous operation is not permissible.</p> <p>Alarm value (r2124, interpret decimal):</p> <p>0: Bus cycle time Tdp < 0.5 ms.</p> <p>1: Bus cycle time Tdp > 32 ms.</p> <p>2: Bus cycle time Tdp is not an integer multiple of the current controller sampling time.</p> <p>3: Instant of the actual value sensing Ti > Bus cycle time Tdp or Ti = 0.</p> <p>4: Instant of the actual value sensing Ti is not an integer multiple of the current controller sampling time.</p> <p>5: Instant of the setpoint acceptance To >= Bus cycle time Tdp or To = 0.</p> <p>6: Instant of the setpoint acceptance To is not an integer multiple of the current controller sampling time.</p> <p>7: Controller application cycle time Tmapc is not an integer multiple of the speed controller sampling time.</p> <p>8: Bus reserve bus cycle time Tdp - Data exchange time Tdx less than two current controller sampling times.</p> <p>10: Instant of the setpoint acceptance To <= data exchange time Tdx + current controller sampling time</p> <p>11: Controller application cycle time Tmapc > 14 x Tdp or Tmapc = 0.</p> <p>12: PLL tolerance window Tpll_w > Tpll_w_max.</p> <p>13: Bus cycle time Tdp is not a multiple of the speed controller clock cycle.</p>
Remedy:	<p>- Adapt the bus parameterization Tdp, Ti, To.</p> <p>- Adapt the sampling time for the current controller or speed controller.</p> <p>For alarm value = 10:</p> <p>- Reduce Tdx by using fewer bus participants or shorter telegrams.</p> <p>Note:</p> <p>PN: PROFINET</p>

A01904 (F, N)	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:	<p>A controller attempts to set a PZD telegram. The setting is not applied.</p> <p>Alarm value (r2124, interpret decimal):</p> <p>1: Project contains free telegram interconnections.</p> <p>2: Controller specifies a combination of fixed and free telegrams.</p> <p>3: Controllers have no function rights for making changes.</p> <p>4: Telegram cannot be set as a result of the drive configuration.</p> <p>5: Setting temporarily inhibited (data is retentively saved).</p> <p>6: Supplementary telegram cannot be set .</p> <p>See also: r0922</p>
Remedy:	<p>Check and align the telegram settings in the drive project and in the controller.</p> <p>For alarm value = 4:</p> <p>- Align telegram and control mode (closed-loop speed control/basic positioner).</p> <p>For alarm value = 5:</p> <p>- Restart PLC or drive.</p>
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

A01905 (N)	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.
Response upon: N:	NONE
Acknowl. upon N:	NONE

F01910 (N, A)	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.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F01911 (N, A)	PN: Isochronous operation, clock cycle failure
Message class:	Communication error to the higher-level control system (9)
Message value:	-
Component:	None
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
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F01912 (N, A)	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:	<ul style="list-style-type: none"> - 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
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F01916	Internal communications error
Message class:	Communication error to the higher-level control system (9)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	An internal Ethernet communications error has occurred.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.

F01917	Internal communications error
Message class:	Communication error to the higher-level control system (9)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	An internal PROFINET communications error has occurred.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.

A01932	PN: Isochronous mode 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 isochronous mode or isochronous sign of life and DSC is selected.
	Note:
	DSC: Dynamic Servo Control
	See also: r0922
Remedy:	Set isochronous mode across the bus configuration and transfer isochronous sign-of-life.

A01940	PN: Isochronous mode not reached
Message class:	Communication error to the higher-level control system (9)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>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.</p> <ul style="list-style-type: none"> - The controller does not send an isochronous telegram, although isochronous operation was selected when configuring the bus. - The controller uses another isochronous bus clock cycle than was transferred to the device in the parameterizing telegram.
Remedy:	<ul style="list-style-type: none"> - 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. <p>Note: PN: PROFINET</p>
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:	<p>Check the controller application and bus configuration.</p> <p>Note: PN: PROFINET</p>
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:	<p>The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.</p> <p>The synchronization telegram is irregularly received.</p> <ul style="list-style-type: none"> - 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:	<ul style="list-style-type: none"> - 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. <p>Note: PN: PROFINET</p>
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 (N, A)	PN: Isochronous operation, synchronization unsuccessful
Message class:	Communication error to the higher-level control system (9)
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 relevant for internal fault diagnostics. Note: PN: PROFINET
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

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. Check parameters "Name of Station" and "IP of Station".

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:	<p>A controller attempts to establish a connection to the drive, and as a consequence exceeds the permitted number of PROFINET connections.</p> <p>The alarm is automatically withdrawn after approx. 30 seconds.</p> <p>Alarm value (r2124, interpret hexadecimal):</p> <p>yyyyxxx hex: yyyy = info. 1, xxxx = info. 2</p> <p>Info 1 = 0: Number of RT connections exceeded</p> <p>Info 1 > 0: Number of IRT connections exceeded</p> <p>Info 2: permitted number of connections</p>
Remedy:	Check the PROFINET controller configuration.

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:	<p>The cyclic actual values and/or setpoints were not transferred within the specified times.</p> <p>Alarm value (r2124, interpret hexadecimal):</p> <p>Only relevant for internal fault diagnostics.</p>
Remedy:	Correctly set T_io_input or T_io_output.

A02000	Function generator: Start not possible
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The function generator has already been started.
Remedy:	<p>Stop the function generator and restart again if necessary.</p> <p>Note:</p> <p>The alarm is reset as follows:</p> <ul style="list-style-type: none"> - Remove the cause of this alarm. - Restart the function generator.

A02006	Function generator: No drive specified for connection
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	No drive specified for connection was specified.
Remedy:	<p>At least one drive to be connected must be specified.</p> <p>Note:</p> <p>The alarm is reset as follows:</p> <ul style="list-style-type: none"> - Remove the cause of this alarm. - Restart the function generator.

A02010	Function generator: Speed setpoint from the drive is not zero
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-

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Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The speed setpoint of a drive selected for connection is greater than the value for the standstill detection set using p1226.
Remedy:	For all of the drives specified for connection, set the speed setpoints to zero. Note: The alarm is reset as follows: - Remove the cause of this alarm. - Restart the function generator.

A02020	Function generator: Parameter cannot be changed
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	This parameter setting cannot be changed when the function generator is active.
Remedy:	- Stop the function generator before parameterizing. - Possibly start the function generator. Note: The alarm is reset as follows: - Remove the cause of this alarm. - Restart the function generator.

A02026	Function generator: Pulse width too high
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The selected pulse width is too high. The pulse width must be less than the period duration.
Remedy:	Reduce pulse width. Note: The alarm is reset as follows: - Remove the cause of this alarm. - Restart the function generator.

A02030	Function generator: Physical address equals zero
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The specified physical address is zero.

Remedy: Set a physical address with a value other than zero.

Note:

The alarm is reset as follows:

- Remove the cause of this alarm.
- Restart the function generator.

A02040 Function generator: Illegal value for offset

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The value for the offset is higher than the value for the upper limit or lower than the value for the lower limit.

Remedy: Adjust the offset value accordingly.

Note:

The alarm is reset as follows:

- Remove the cause of this alarm.
- Restart the function generator.

A02041 Function generator: Illegal value for bandwidth

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The bandwidth referred to the time slice clock cycle of the function generator has either been set too low or too high.

Depending on the time slice clock cycle, the bandwidth is defined as follows:

$\text{Bandwidth_max} = 1 / (2 \times \text{time slice clock cycle})$

$\text{Bandwidth_min} = \text{Bandwidth_max} / 100000$

Example:

Assumption: Time slice clock cycle = 125 μs

--> $\text{Bandwidth_max} = 1 / (2 \times 125 \mu\text{s}) = 4000 \text{ Hz}$

--> $\text{Bandwidth_min} = 4000 \text{ Hz} / 100000 = 0.04 \text{ Hz}$

Remedy: Check the value for the bandwidth and adapt accordingly.

Note:

The alarm is reset as follows:

- Remove the cause of this alarm.
- Restart the function generator.

A02047 Function generator: Time slice clock cycle invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The time slice clock cycle selected does not match any of the existing time slices.

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Remedy: Enter an existing time slice clock cycle. The fastest cycle time can be read out using the commissioning tool.

Note:
The alarm is reset as follows:

- Remove the cause of this alarm.
- Restart the function generator.

A02050 **Trace: Start not possible**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The trace has already been started.

Remedy: Stop the trace and, if necessary, start again.

A02055 **Trace: Recording time too short**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The trace duration is too short.
The minimum is twice the value of the trace clock cycle.

Remedy: Check the selected recording time and, if necessary, adjust.

A02056 **Trace: Recording cycle too short**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The selected recording clock cycle is shorter than the selected basic clock cycle 0.

Remedy: Increase the value for the trace cycle. The fastest cycle time can be read out using the commissioning tool.

A02057 **Trace: Time slice clock cycle invalid**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The time slice clock cycle selected does not match any of the existing time slices.

Remedy: Enter an existing time slice clock cycle. The fastest cycle time can be read out using the commissioning tool.

A02059 **Trace: Time slice clock cycle for 2 x 8 recording channels not valid**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment:	NONE
Cause:	The selected time slice clock cycle cannot be used for more than 4 recording channels.
Remedy:	Enter the clock cycle of an existing time slice with a cycle time ≥ 4 ms or reduce the number of recording channels to 4 per trace. The fastest cycle time can be read out using the commissioning tool.
<hr/>	
A02060	Trace: Signal to be traced missing
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	- A signal to be traced was not specified. - The specified signals are not valid.
Remedy:	- Specify the signal to be traced. - Check whether the relevant signal can be traced.
<hr/>	
A02062	Trace: Invalid trigger signal
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	- A trigger signal was not specified. - The specified signal does not exist. - The specified signal is not a fixed-point signal. - The specified signal cannot be used as a trigger signal for the trace.
Remedy:	Specify a valid trigger signal.
<hr/>	
A02063	Trace: Invalid data type
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The specified data type to select a signal using a physical address is invalid.
Remedy:	Use a valid data type.
<hr/>	
A02070	Trace: Parameter cannot be changed
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The trace parameter settings cannot be changed when the trace is active.
Remedy:	- Stop the trace before parameterization. - If required, start the trace.

A02075	Trace: Pretrigger time too long
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The selected pretrigger time must be shorter than the trace time.
Remedy:	Check the pretrigger time setting and change if necessary.
F02080	Trace: Parameterization deleted due to unit changeover
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The trace parameterization in the converter was deleted due to a unit changeover or a change in the reference parameters.
Remedy:	Restart trace.
A02085	Message function: Parameterization error
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1, index:%2
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	A parameterization error was identified when starting the variable message function. Alarm value (r2124, interpret decimal): yyxxxx dec: yy = index, xxxx = parameter
Remedy:	Correct the parameter and restart. Note: The alarm is automatically withdrawn when stopping, or when successfully starting the variable message function.
A02096	MTrace 0: Cannot be saved
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	It is not possible to save the measurement results of a multiple trace on the memory card (trace recorder 0). A multiple trace is not started or is canceled. Alarm value (r2124, interpret decimal): 1: Memory card cannot be accessed. - Card is not inserted or is blocked by a mounted USB drive. 3: Data save operation too slow. - A second trace has been completed before the measurement results of the first trace were able to be saved. - Writing the measurement result files to the card is blocked by the parameter save. 4: Data save operation canceled. - For instance, the file required for the data save operation was not able to be found.

- Remedy:**
- Insert or remove the memory card.
 - Use a larger memory card.
 - Configure a longer trace time or use an endless trace.
 - Avoid saving parameters while a multiple trace is running.
 - Check whether other functions are presently accessing measurement result files.

A02098	MTrace 1: Cannot be saved
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	It is not possible to save the measurement results of a multiple trace on the memory card (trace recorder 1). A multiple trace is not started or is canceled. Alarm value (r2124, interpret decimal): 1: Memory card cannot be accessed. - Card is not inserted or is blocked by a mounted USB drive. 3: Data save operation to slow. - A second trace has been completed before the measurement results of the first trace were able to be saved. - Writing the measurement result files to the card is blocked by the parameter save. 4: Data save operation canceled. - For instance, the file required for the data save operation was not able to be found.
Remedy:	<ul style="list-style-type: none"> - Insert or remove the memory card. - Use a larger memory card. - Configure a longer trace time or use an endless trace. - Avoid saving parameters while a multiple trace is running. - Check whether other functions are presently accessing measurement result files.

A02099	Trace: Insufficient Control Unit memory
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The memory space still available on the Control Unit is no longer sufficient for the trace function.
Remedy:	Reduce the memory required, e.g. as follows: <ul style="list-style-type: none"> - Reduce the trace time. - Increase the trace clock cycle. - Reduce the number of signals to be traced.

F02151 (A)	TEC: Internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	An internal software error has occurred within a Technology Extension. Fault value (r0949, interpret hexadecimal): Only relevant for internal fault diagnostics.

Remedy:

- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the Control Unit.

Note:

TEC: Technology Extension

Response upon: A: NONE

Acknowl. upon A: NONE

F02152 (A) TEC: Insufficient memory

Message class: Hardware/software error (1)

Message value: %1

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The functionality on the converter is too extensive (e.g. functions, data sets, Technology Extensions, blocks, etc.).

Fault value (r0949, interpret decimal):

Only relevant for internal fault diagnostics.

Remedy: Contact Technical Support.

Response upon: A: NONE

Acknowl. upon A: NONE

F02153 TEC: Technology function does not exist

Message class: Hardware/software error (1)

Message value: -

Component: None

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: A technology function does not exist on the converter or the particular version is too old.

When configuring, a technology function is activated, which either does not exist on the converter or is only available in an outdated version. This can occur when downloading a project or when powering up.

Remedy:

- Load the required technology function or version to the converter.
- If required, deactivate the technology function not required in the configuration.

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 converter.
The NVRAM data affected was deleted.

Remedy: Carry out a POWER ON (switch-off/switch-on) for all components.

F06310 (A) Supply voltage (p0210) incorrectly parameterized

Message class: Line supply fault (2)

Message value: -

Component: None

Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	For AC/AC drive units, the measured DC link 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 voltage. See also: p0210 (Device supply voltage)
Response upon: A:	NONE
Acknowled. upon A:	NONE

F07011	Drive: Motor overtemperature
Message class:	Motor overload (8)
Message value:	%1
Component:	Motor
Response:	OFF2
Acknowledgment:	IMMEDIATELY
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 (N)	Drive: Motor temperature model overtemperature
Message class:	Motor overload (8)
Message value:	%1
Component:	Motor
Response:	NONE
Acknowledgment:	NONE

12.3 Faults and alarms

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 (l2t): 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. 500: Motor temperature model 3 gearbox: Gearbox temperature too high See also: r0034, p0613
Remedy:	- Check the motor load and if required, reduce. - Check the motor ambient temperature. - Check activation of the additional motor overload protection (p5375). See also: r0034 (Motor utilization thermal)
Response upon N:	NONE
Acknowl. upon N:	NONE

F07082**Macro: Execution not possible**

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Fault cause: %1, supplementary information: %2, preliminary parameter number: %3
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY

Cause:	<p>The macro cannot be executed.</p> <p>Fault value (r0949, interpret hexadecimal): ccccbbaa hex: cccc = preliminary parameter number, bb = supplementary information, aa = fault cause</p> <p>Fault causes for the trigger parameter itself:</p> <p>19: Called file is not valid for the trigger parameter. 20: Called file is not valid for parameter 15. 21: Called file is not valid for parameter 700. 22: Called file is not valid for parameter 1000. 23: Called file is not valid for parameter 1500. 24: Data type of a TAG is incorrect (e.g. Index, number or bit is not U16).</p> <p>Fault causes for the parameters to be set:</p> <p>25: Error level has an undefined value. 26: Mode has an undefined value. 27: A value was entered as string in the tag value that is not "DEFAULT". 31: Entered drive object type unknown. 32: A device was not able to be found for the determined drive object number. 34: A trigger parameter was recursively called. 35: It is not permissible to write to the parameter via macro. 36: Check, writing to a parameter unsuccessful, parameter can only be read, not available, incorrect data type, value range or assignment incorrect. 37: Source parameter for a signal interconnection was not able to be determined. 38: An index was set for a non-indexed (or CDS-dependent) parameter. 39: No index was set for an indexed parameter. 41: A bit operation is only permissible for parameters with the parameter format DISPLAY_BIN. 42: A value not equal to 0 or 1 was set for a bit operation. 43: Reading the parameter to be changed by the bit operation was unsuccessful. 51: Factory setting for DEVICE may only be executed on the DEVICE. 61: The setting of a value was unsuccessful.</p>
Remedy:	<p>- Check the parameter involved. - Check the macro file and signal interconnection.</p>

F07084	Macro: Condition for WaitUntil not fulfilled
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	Only for internal fault diagnostics.
Remedy:	Not necessary.

F07085 (N)	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.
Response upon: N:	NONE
Acknowled. upon N:	NONE

F07086	Units changeover: Parameter limit violation due to reference value change
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	A reference parameter was changed in the system. This resulted in the fact that for the parameters involved, the set value was not able to be written in the per unit notation. The values of the parameters were set to the corresponding violated minimum limit/maximum limit or to the factory setting. Possible causes: - The steady-state minimum limit/maximum limit or that defined in the application was violated. Fault value (r0949, parameter): Diagnostics parameter to display the parameters that were not able to be re-calculated. See also: p0304, p0305, p2000, p2001, p2002, p2003, p2004
Remedy:	Check the adapted parameter value and if required correct.

F07088	Units changeover: Parameter limit violation due to units changeover
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	A changeover of units was initiated. This resulted in a violation of a parameter limit Possible causes for the violation of a parameter limit: - When rounding off a parameter corresponding to its decimal places, the steady-state minimum limit or maximum limit was violated. - Inaccuracies for the data type "FloatingPoint". In these cases, when the minimum limit is violated then the parameter value is rounded up and when the maximum limited is violated the parameter value is rounded down. Fault value (r0949, interpret decimal).
Remedy:	Check the adapted parameter values and if required correct.

A07089	Unit switchover: Function activation is blocked because the units have been switched over
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE

Acknowledgment:	NONE
Cause:	An attempt was made to activate a function. This is not permissible if the units have already been changed over.
Remedy:	Restore units that have been changed over to the factory setting.

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).

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 (A)	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:	<p>An error was identified when executing the "Test signal" function.</p> <p>The function was not executed or was canceled.</p> <p>Fault value (r0949, interpret decimal):</p> <p>1: No distance limit has been defined (p5308 = 0).</p> <p>2: The moment of inertia estimator has not stabilized in the parameterized time (p5309).</p> <p>3: The parameterized distance (p5308) was exceeded.</p> <p>4: No motor encoder parameterized (closed-loop speed control without encoder).</p> <p>6: Pulse enable was withdrawn while traversing.</p> <p>7: Speed setpoint not equal to zero.</p> <p>See also: p5308, p5309</p>
Remedy:	<p>For fault value = 1:</p> <ul style="list-style-type: none"> - Define distance limiting (p5308). <p>For fault value = 2:</p> <ul style="list-style-type: none"> - Increase the duration, distance limit or speed limit (p5309, p5308, p1082, p1083, p1086). <p>For fault value = 3:</p> <ul style="list-style-type: none"> - Check distance limiting (p5308). <p>For fault value = 4:</p> <ul style="list-style-type: none"> - Configure speed control with encoder. <p>For fault value = 6:</p> <ul style="list-style-type: none"> - Keep the drive switched on until the "Test signal" function has been completely exited. <p>For fault value = 7:</p> <ul style="list-style-type: none"> - Set the speed setpoint to zero. It is possible that the setpoint was specified from the control panel.
Response upon: A:	NONE
Acknowledgment upon A:	NONE

F07094	General parameter limit violation
Message class:	Hardware/software error (1)
Message value:	Parameter: %1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	<p>As a result of the violation of a parameter limit, the parameter value was automatically corrected.</p> <p>Minimum limit violated --> parameter is set to the minimum value.</p> <p>Maximum limit violated --> parameter is set to the maximum value.</p> <p>Invalid Enum value --> parameter is set to the default value.</p> <p>Fault value (r0949, interpret decimal):</p> <p>Parameter number, whose value had to be adapted.</p>
Remedy:	Check the adapted parameter values and if required correct.

A07095 (N)	Drive: One Button Tuning activated
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>The One Button Tuning function is active.</p> <p>One Button Tuning is performed at the next switch-on command.</p> <p>See also: p5300 (Autotuning selection)</p>

Remedy:	Not necessary. The alarm is automatically withdrawn after One Button Tuning has been exited (p5300 = 0).
Response upon: N:	NONE
Acknowl. upon N:	NONE

F07097 (A)	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 = fault cause, xxxx = traversing distance. See also: p5308, p5309
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.
Response upon: A:	NONE
Acknowl. upon A:	NONE

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 influenced via control word bit 0 via the master control.
Remedy:	Switch the signal via control word bit 0 via the master control to 0.

F07220 (N, A)	Drive: Control by PLC missing
Message class:	Communication error to the higher-level control system (9)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The "Control by PLC" signal was missing in operation. - The higher-level control has withdrawn the "Control by PLC" signal. - Data transfer via the fieldbus (controller/drive) was interrupted.

Remedy:	<ul style="list-style-type: none"> - Check the "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 "Control by PLC", then the fault response must be parameterized to NONE or the message type should be parameterized as alarm.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

A07350 (F)	Drive: Measuring probe parameterized to a digital output
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The measuring probe is connected to a parameterizable digital input/output and the terminal is set as output. Alarm value (r2124, interpret decimal): 8: DI/DO 8 (X122.9) 9: DI/DO 9 (X122.10) 10: DI/DO 10 (X122.12) 11: DI/DO 11 (X122.13) 12: DI/DO 12 (X132.9) 13: DI/DO 13 (X132.10) 14: DI/DO 14 (X132.12) 15: DI/DO 15 (X132.13)
Remedy:	- Deselect measuring probe (p0488, p0489).
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY

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: <ul style="list-style-type: none"> - Motor not connected or motor contactor open. - Phase failure in the motor feeder cable. - No DC link voltage present. - Power unit defective.
Remedy:	<ul style="list-style-type: none"> - Connect the motor, check the motor feeder cable 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: <ul style="list-style-type: none"> - 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. - Phase failure in the motor feeder cable.
Remedy:	<ul style="list-style-type: none"> - Check the phase sequence for the motor, and if required, correct. - Check the motor feeder cable. - If the encoder mounting was changed, re-adjust the encoder. - Replace the defective motor and/or motor encoder.

F07419	Drive: Current setpoint filter adaptation error
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	An error has occurred when configuring or when using the "Current setpoint filter adaptation" function. Fault value (r0949, interpret binary): Bit 2: the assigned filter is a type or has a characteristic, which is unsuitable for adaptation. Bit 3: the assigned filter has not been activated (p1656). Bits 0, 1, 4 ... 31: internal fault occurred.
Remedy:	The remedy should be applied depending on the fault value. For bit 2: Set the filter type "General filter 2nd order" and set the characteristic of a bandstop filter. For bit 3: Activate filter (p1656). For bits 0, 1, 4 ... 15: <ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version.

F07420	Drive: Current setpoint filter natural frequency > Shannon frequency
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	One of the filter natural frequencies is greater than the Shannon frequency. The Shannon frequency is calculated according to the following formula: $0.5 / \text{current controller sampling time}$ Fault value (r0949, interpret binary): Bit 0: Filter 1 (p1658, p1660) Bit 1: Filter 2 (p1663, p1665) Bit 2: Filter 3 (p1668, p1670) Bit 3: Filter 4 (p1673, p1675)
Remedy:	<ul style="list-style-type: none"> - Reduce the numerator or denominator natural frequency of the current setpoint filter involved. - Deactivate the filter involved (p1656).

F07421	Drive: Speed filter natural frequency > Shannon frequency
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	One of the filter natural frequencies is greater than the Shannon frequency. The Shannon frequency is calculated according to the following formula: $0.5 / \text{speed controller sampling time}$. Fault value (r0949, interpret binary): Bit 0: Filter 1 (p1417, p1419) Bit 1: Filter 2 (p1423, p1425)
Remedy:	- Reduce the numerator or denominator natural frequency of the speed setpoint filter involved. - Deactivate the filter involved (p1414).
F07422	Drive: Reference model natural frequency > Shannon frequency
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The natural filter frequency of the PT2 element for the reference model (p1433) is greater than the Shannon frequency. The Shannon frequency is calculated according to the following formula: $0.5 / \text{speed controller sampling time}$.
Remedy:	- Reduce the natural frequency of PT2 element for reference model (p1433).
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: $p1082 \leq 11.695 * \text{DC link voltage overvoltage threshold} / r0316$ DC link voltage overvoltage threshold: - Line connection 1 AC: 410 V - Line connection 3 AC: 820 V See also: r0316, p1082
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.

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).

See also: p2572, p2573, p2574

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.
To permanently accept the determined position offset, it must be retentively saved (p0977).
Possible causes:

- Motor or encoder were replaced (applies to EQN and DQI).
- Position-relevant parameters were changed.
- A non-adjusted encoder was adjusted (retentively save the project).

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.
See also: p2507 (LR absolute encoder adjustment status)

F07442 (A) LR: Multiturn does not match the modulo range

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The ratio between the multiturn resolution and the modulo range (p2576) is not an integer number.
This results in the adjustment being set back, as the position actual value cannot be reproduced after switch-off/switch-on.

Remedy: Make the ratio between the multiturn resolution and the modulo range an integer number.
The ratio v is calculated as follows:

- Without position tracking for the load gearbox

$$v = (p0421 * p2506 * p2505) / (p2504 * p2576)$$

- With position tracking for the load gearbox

$$v = (p2721 * p2506) / p2576$$

 See also: p0421, p2504, p2505, p2506, p2576, p2721

Response upon: A: NONE

Acknowl. upon A: NONE

F07443 (A) 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 (p2599) 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 was specified in the fault value.

See also: c2598 (EPOS home position signal), p2599 (EPOS home position value)

Response upon: A: NONE

Acknowl. upon A: NONE

F07446 (A) Load gearbox: Position tracking cannot be reset

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The position tracking cannot be reset.

Remedy: Reset the position tracking as follows:

- Select encoder commissioning.

- Reset position tracking, position ($p2720.2 = 1$).

- Deselect encoder commissioning.

Then acknowledge the fault and, if necessary, re-adjust the absolute encoder (p2507).

Response upon: A: NONE

Acknowl. upon A: NONE

F07447 Load gearbox: Position tracking, maximum actual value exceeded

Message class: Application/technological function faulted (17)

Message value: Component number: %1, encoder data set: %2, drive data set: %3

Component: None

Response: NONE

Acknowledgment: IMMEDIATELY

Cause:	<p>When the position tracking of the load gearbox is configured, the drive/encoder (motor encoder) identifies a maximum possible absolute position actual value (r2723) that can no longer be represented within 32 bits.</p> <p>Maximum value: $p0408 * p2721 * 2^{p0419}$</p> <p>Fault value (r0949, interpret hexadecimal):</p> <p>cbbbaa hex</p> <p>aa = encoder data set</p> <p>bb = component number</p> <p>cc = drive data set</p> <p>See also: p0408, p0419, p2721</p>
Remedy:	<p>- Reduce the fine resolution (p0419).</p> <p>- Reduce the multiturn resolution (p2721).</p> <p>See also: p0419, p2721</p>

F07448 (A)	Load gearbox: Position tracking, linear axis has exceeded the maximum range
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	<p>For a configured linear axis/no modulo axis, the currently active motor encoder has exceeded the maximum possible traversing range.</p> <p>For the configured linear axis, the maximum traversing range is defined to be 64x (+/- 32x) of p0421. It should be read in p2721 and interpreted as the number of load revolutions.</p>
Remedy:	<p>The fault should be resolved as follows:</p> <ul style="list-style-type: none"> - Select commissioning. - Reset position tracking, position (p2720.2 = 1). - Deselect commissioning. <p>The fault should then be acknowledged and the absolute encoder adjusted.</p>
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07449 (A)	Load gearbox: Position tracking actual position outside tolerance window
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	<p>When switched off, the currently effective motor encoder was moved through a distance greater than was parameterized in the tolerance window. It is possible that there is no longer any reference between the mechanical system and encoder.</p> <p>Fault value (r0949, interpret decimal):</p> <p>Deviation (difference) to the last encoder position in increments of the absolute value after the measuring gearbox - If one is being used. The sign designates the traversing direction.</p> <p>Note:</p> <p>The deviation (difference) found is also displayed in r2724.</p> <p>See also: p2722 (Load gear position tracking tolerance window), r2724 (Load gear position difference)</p>

Remedy:	Reset the position tracking as follows: - Select commissioning. - Reset position tracking, position (p2720.2 = 1). - Deselect commissioning. The fault should then be acknowledged and, if necessary, the absolute encoder adjusted (p2507). See also: p2507 (LR absolute encoder adjustment status)
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07450 (A)	LR: Standstill monitoring has responded
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	After the standstill monitoring time (p2543) expired, the drive left the standstill window (p2542). - Standstill window set too small (p2542). - Standstill monitoring time set too low (p2543). - Position loop gain too low (p2538). - Position loop gain too high (instability/oscillation, p2538). - Mechanical overload. - Connecting cable, motor/drive converter incorrect (phase missing, interchanged).
Remedy:	Check the causes and resolve.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07451 (A)	LR: Position monitoring has responded
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	When the position monitoring time (p2545) expired, the drive had still not reached the positioning window (p2544). - Positioning window parameterized too small (p2544). - Position monitoring time parameterized too short (p2545). - Position loop gain too low (p2538). - Position loop gain too high (instability/oscillation, p2538). - Drive mechanically locked.
Remedy:	Check the causes and resolve.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07452 (A)	LR: Following error too high
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY

Cause:	<p>The difference between the position setpoint position actual value (following error dynamic model, r2563) is higher than the tolerance (p2546).</p> <ul style="list-style-type: none"> - The drive torque or accelerating capacity exceeded. - Position measuring system fault. - Encoder cable interrupted. - Position control sense incorrect. - Mechanical system locked. - Excessively high traversing velocity or excessively high position reference value (setpoint) differences.
Remedy:	Check the causes and resolve.
Response upon A:	NONE
Acknowl. upon A:	NONE

F07453	LR: Position actual value preprocessing error
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	<p>- A fault of the position measuring system selected in p2502 (e.g.: F3x110, F3x111) has occurred or this encoder has been parked (G1_ZSW.14).</p>
Remedy:	<p>- Remove the causes of the faults of the position measuring system selected in p2502 and acknowledge.</p> <p>- Unpark the encoder.</p> <p>See also: p2502 (LR encoder assignment)</p>

A07454	LR: Position actual value preprocessing does not have a valid encoder
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>One of the following problems has occurred with the position actual value preprocessing:</p> <ul style="list-style-type: none"> - An encoder is not assigned for the position actual value preprocessing (p2502 = 0). - An encoder and an encoder data set have been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).
Remedy:	<p>Check the drive data sets, encoder data sets and encoder assignment.</p> <p>See also: p0400, p2502</p>

A07455	EPOS: Maximum velocity limited
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>The maximum velocity (p2571) is too high to correctly calculate the modulo correction.</p> <p>Within the sampling time for positioning, at the maximum velocity, a maximum of the half modulo length must be moved through. p2571 was limited to this value.</p>
Remedy:	- Reduce the maximum velocity (p2571).

A07456	EPOS: Setpoint velocity limited
Message class:	Application/technological function faulted (17)

12.3 Faults and alarms

Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The actual setpoint velocity is greater than the parameterized maximum velocity (p2571) and is therefore limited.
Remedy:	<ul style="list-style-type: none"> - Check the specified setpoint velocity. - Reduce the velocity override (c2646). - Increase the maximum velocity (p2571).

A07457	EPOS: Combination of input signals illegal
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>An illegal combination of input signals that are simultaneously set was identified.</p> <p>Alarm value (r2124, interpret decimal):</p> <p>0: Jog 1 and jog 2 (c2589, c2590).</p> <p>1: Jog 1 or jog 2 and direct setpoint input/MDI (c2589, c2590, c2647).</p> <p>2: Jog 1 or jog 2 and start homing (c2589, c2590, c2595).</p> <p>3: Jog 1 or jog 2 and activate traversing task (c2589, c2590, c2631).</p> <p>4: Direct setpoint input/MDI and starting homing (c2647, c2595).</p> <p>5: Direct setpoint input/MDI and activate traversing task (c2647, c2631).</p> <p>6: Start homing and activate traversing task (c2595, c2631).</p>
Remedy:	Check the appropriate input signals and correct.

F07458	EPOS: Reference cam not found
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	After the active homing starts, the axis moved through the maximum permissible distance to search for the reference cam without actually finding the reference cam.
Remedy:	<ul style="list-style-type: none"> - Check signal "Reference cam" (c2612). - Check the maximum permissible distance to the reference cam (p2606). - If axis does not have any reference cam, then set p2607 to 0. <p>See also: p2606 (EPOS active homing reference cam maximum distance), p2607 (EPOS active homing reference cam available), c2612 (EPOS active homing reference cam)</p>

F07459	EPOS: No zero mark
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	After leaving the reference cam, the axis has traversed the maximum permissible distance between the reference cam and zero mark without finding the zero mark.

Remedy:

- Check the encoder regarding the zero mark.
- Check the maximum permissible distance between the reference cam and zero mark (p2609).
- Use an external encoder zero mark (equivalent zero mark) (p0494).

See also: p2609 (EPOS active homing max distance reference cam and zero mark)

F07460 **EPOS: End of reference cam not found**

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: In the "active homing" mode, when approaching the zero mark, the axis reached the end of the traversing range without detecting an edge at binary signal "Reference cam" (c2612).
Maximum traversing range: -2147483648 [LU] ... -2147483647 [LU]

Remedy:

- Check signal "reference cam" (c2612).
- Repeat active homing.

See also: c2612 (EPOS active homing reference cam)

A07461 **EPOS: Home position not set**

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: When starting a traversing block/direct setpoint input, a home position is not set (r2684.11 = 0).

Remedy: Carry out homing (active homing, passive homing, set home position).

A07462 **EPOS: Selected traversing block number does not exist**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A traversing block selected via binector input c2625 ... c2629 was started via binary signal c2631 = 0/1 edge "Activate traversing task".

- The number of the started traversing block is not contained in p2616[0...n].
- The started traversing block is suppressed.

Alarm value (r2124, interpret decimal):
Number of the selected traversing block that is also not available.

Remedy:

- Correct the traversing program.
- Select an available traversing block number.

A07463 (F) **EPOS: External block change not requested in the traversing block**

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Response: NONE

Acknowledgment: NONE

Cause:	For a traversing block with the block change enable CONTINUE_EXTERNAL_ALARM, the external block change was not requested. Alarm value (r2124, interpret decimal): Number of the traversing block.
Remedy:	Resolve the reason why the signal edge at the measuring probe is missing.
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY

F07464	EPOS: Traversing block is inconsistent
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The traversing block does not contain valid information. Fault value (r0949, interpret decimal): Number of the traversing block with invalid information.
Remedy:	Check the traversing block and where relevant, take into consideration alarms that are present.

A07465	EPOS: Traversing block does not have a subsequent block
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	There is no subsequent block in the traversing block. Alarm value (r2124, interpret decimal): Number of the traversing block with the missing subsequent block.
Remedy:	- Parameterize this traversing block with the block change enable END. - Parameterize additional traversing blocks with a higher block number and for the last block, using the block change enable END.

A07466	EPOS: Traversing block number assigned a multiple number of times
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The same traversing block number was assigned a multiple number of times. Alarm value (r2124, interpret decimal): Number of the traversing block that was assigned a multiple number of times.
Remedy:	Correct the traversing blocks.

A07467	EPOS: Traversing block has illegal task parameters
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE

Cause: The task parameter in the traversing block contains an illegal value.
Alarm value (r2124, interpret decimal):
Number of the traversing block with an illegal task parameter.

Remedy: Correct the task parameter in the traversing block.

A07468 EPOS: Traversing block jump destination does not exist
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In a traversing block, a jump was programmed to a non-existent block.
Alarm value (r2124, interpret decimal):
Number of the traversing block with a jump destination that does not exist.

Remedy: - Correct the traversing block.
- Add the missing traversing block.

A07469 EPOS: Traversing block target position < negative software limit switch
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the traversing block the specified absolute target position lies outside the range limited by the negative software limit switch.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.

Remedy: - Correct the traversing block.
- Change the negative software limit switch (c2578, p2580).

A07470 EPOS: Traversing block target position > positive software limit switch
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the traversing block the specified absolute target position lies outside the range limited by the positive software limit switch.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.

Remedy: - Correct the traversing block.
- Change the positive software limit switch (c2579, p2581).

A07471 EPOS: Traversing block target position outside the modulo range
Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE

Cause:	In the traversing block the target position lies outside the modulo range. Alarm value (r2124, interpret decimal): Number of the traversing block with illegal target position.
Remedy:	- In the traversing block, correct the target position. - Change the modulo range (p2576).

A07472	EPOS: Traversing block ABS_POS/ABS_NEG not possible
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	In the traversing block the positioning mode ABS_POS or ABS_NEG were parameterized with the modulo correction not activated. Alarm value (r2124, interpret decimal): Number of the traversing block with the illegal positioning mode.
Remedy:	Correct the traversing block.

A07473 (F)	EPOS: Beginning of traversing range reached
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	When traversing, the axis has moved to the traversing range limit.
Remedy:	Move away in the positive direction.
Response upon F:	OFF1
Acknowl. upon F:	IMMEDIATELY

A07474 (F)	EPOS: End of traversing range reached
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	When traversing, the axis has moved to the traversing range limit.
Remedy:	Move away in the negative direction.
Response upon F:	OFF1
Acknowl. upon F:	IMMEDIATELY

F07475 (A)	EPOS: Target position < start of traversing range
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The target position for relative traversing lies outside the traversing range.
Remedy:	Correct the target position.
Response upon A:	NONE

Acknowl. upon A: NONE

F07476 (A) **EPOS: Target position > end of the traversing range**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The target position for relative traversing lies outside the traversing range.
Remedy: Correct the target position.
Response upon: A: NONE
Acknowl. upon A: NONE

A07477 (F) **EPOS: Target position < negative software limit switch**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the actual traversing operation, the target position is less than the negative software limit switch.
Remedy: - Correct the target position.
 - Change the negative software limit switch (c2578, p2580).
 See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07478 (F) **EPOS: Target position > positive software limit switch**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: In the actual traversing operation, the target position is greater than the positive software limit switch.
Remedy: - Correct the target position.
 - Change the positive software limit switch (c2579, p2581).
 See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)
Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY

A07479 **EPOS: Negative software limit switch reached**
Message class: Application/technological function faulted (17)
Message value: -
Component: None
Response: NONE
Acknowledgment: NONE
Cause: The axis is at the position of the negative software limit switch. An active traversing block was interrupted.

Remedy:

- Correct the target position.
- Change the negative software limit switch (c2578, p2580).

See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)

A07480 **EPOS: Positive software limit switch reached**

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: The axis is at the position of the positive software limit switch. An active traversing block was interrupted.

Remedy:

- Correct the target position.
- Change the positive software limit switch (c2579, p2581).

See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)

F07481 (A) **EPOS: Axis position < negative software limit switch**

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The actual position of the axis is less than the position of the negative software limit switch.

Remedy:

- Correct the target position.
- Change the negative software limit switch (c2578, p2580).

See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)

Response upon: A: NONE

Acknowl. upon A: NONE

F07482 (A) **EPOS: Axis position > positive software limit switch**

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The actual position of the axis is greater than the position of the positive software limit switch.

Remedy:

- Correct the target position.
- Change the positive software limit switch (c2579, p2581).

See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)

Response upon: A: NONE

Acknowl. upon A: NONE

A07483 **EPOS: Travel to fixed stop clamping torque not reached**

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Response: NONE

Acknowledgment:	NONE
Cause:	The fixed stop in the traversing block was reached without the clamping torque/clamping force having been achieved.
Remedy:	- Check the torque limits (p1520, p1521).

F07484	EPOS: Fixed stop outside the monitoring window
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	In the "fixed stop reached" state, the axis has moved outside the defined monitoring window (p2635).
Remedy:	- Check the monitoring window (p2635). - Check the mechanical system.

F07485 (A)	EPOS: Fixed stop not reached
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	In a traversing block with the task FIXED STOP, the end position was reached without detecting a fixed stop.
Remedy:	- Check the traversing block and locate the target position further into the workpiece. - If required, reduce the maximum following error window to detect the fixed stop (p2634).
Response upon: A:	NONE
Acknowl. upon A:	NONE

A07486	EPOS: Intermediate stop missing
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	In operating mode "traversing blocks" or "direct setpoint input/MDI", at the start of motion, c2640 is set to an intermediate stop, i.e. to a 0 signal.
Remedy:	Set c2640 to "No intermediate stop" (1 signal) and restart motion. See also: c2640 (EPOS intermediate stop (0 signal))

A07487	EPOS: Reject traversing task missing
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	In the modes "Traversing blocks" or "Direct setpoint input/MDI" at the start of motion, the binary signal sink "Do not reject traversing task/reject traversing task" (c2641) does not have a 1 signal.
Remedy:	Connect a 1 signal to the binary signal sink "Do not reject traversing task/reject traversing task" (c2641) and restart motion. See also: c2641 (EPOS reject traversing task (0 signal))

F07488	EPOS: Relative positioning not possible
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	In the mode "direct setpoint input/MDI", for continuous transfer (c2649 = 1) relative positioning was selected (c2648 = 0 signal).
Remedy:	Check the control.
A07489	EPOS: Home position correction outside the window
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	For the function "passive homing" the difference between the measured position at the measuring probe and the home position lies outside the parameterized window.
Remedy:	- Check the mechanical system.
F07490 (N)	EPOS: Enable signal withdrawn while traversing
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	- For a standard assignment, another fault may have occurred as a result of withdrawing the enable signals. - The drive is in the "switching on inhibited" state (for a standard assignment).
Remedy:	- Set the enable signals or check the cause of the fault that first occurred and then result (for a standard assignment). - Check the assignment to enable the basic positioning function.
Response upon N:	NONE
Acknowled. upon N:	NONE
F07491 (A)	EPOS: Negative hardware limit switch reached
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	A 0 signal was detected at c2569, i.e. the negative hardware limit switch was reached. For a positive traversing direction, the negative hardware limit switch was reached - i.e. the hardware limit switch wiring is incorrect. See also: c2569 (EPOS negative hardware limit switch)
Remedy:	- Leave the negative hardware limit switch in the positive traversing direction and return the axis to the valid traversing range. - Check the wiring of the hardware limit switch.
Response upon A:	NONE
Acknowled. upon A:	NONE

F07492 (A)	EPOS: Positive hardware limit switch reached
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	<p>A 0 signal was detected at c2570, i.e. the positive hardware limit switch was reached.</p> <p>For a negative traversing direction, the positive hardware limit switch was reached - i.e. the hardware limit switch wiring is incorrect.</p> <p>See also: c2570 (EPOS positive hardware limit switch)</p>
Remedy:	<p>- Leave the positive hardware limit switch in the negative traversing direction and return the axis to the valid traversing range.</p> <p>- Check the wiring of the hardware limit switch.</p>
Response upon: A:	NONE
Acknowl. upon A:	NONE
F07493	LR: Overflow of the value range for position actual value
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	<p>The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded.</p> <p>When the overflow occurs, the "homed" or "adjustment absolute measuring system" status is reset.</p> <p>Fault value (r0949, interpret decimal):</p> <ol style="list-style-type: none"> 1: The position actual value (r2521) has exceeded the value range. 2: The encoder position actual value Gn_XIST2 has exceeded the value range. 3: The maximum encoder value times the factor to convert the absolute position Gn_XIST2 from increments to length units (LU) has exceeded the value range for displaying the position actual value.
Remedy:	<p>If required, reduce the traversing range or position resolution (p2506).</p> <p>Note for fault value = 3:</p> <p>If the value for the maximum possible absolute position (LU) is greater than 4294967296, then it is not possible to make an adjustment due to an overflow.</p> <p>For rotary encoders, the maximum possible absolute position (LU) is calculated as follows:</p> $p2506 * p2505 / p2504$ $p2506 * p2505 * p0421 / p2504 \text{ for multiturn encoders}$
A07495 (F, N)	LR: Homing function interrupted
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>An activated homing function (homing mark search or measuring probe evaluation) was canceled.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> - An encoder fault has occurred (Gn_ZSW.15 = 1). - Position actual value was set during an activated homing function. - Homing mark search and measuring probe evaluation simultaneously activated. - Activated homing function (homing mark search or measuring probe evaluation) was deactivated.

Remedy:

- Check the causes and resolve.
- Reset the control and activate the required function.
- Set the input terminal for the measuring probe.

Response upon: F: OFF1
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A07496 EPOS: Enable not possible

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Response: NONE
Acknowledgment: NONE
Cause: It is not possible to enable the basic positioner because at least one condition is missing.
 Alarm value (r2124, interpret decimal):
 1: EPOS enable missing.
 2: Position actual value, valid feedback signal missing.
Remedy: Check the corresponding missing condition.

A07498 (F) LR: 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 measuring probe.
 4100:
 The measuring pulse frequency is too high.
 > 50000:
 The measuring clock cycle is not a multiple integer of the position controller clock cycle.
Remedy: Deactivate measuring probe evaluation.
 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 > 50000:
 Set the clock cycle ratio of the measuring clock cycle to the position controller clock cycle to an integer multiple.
 To do this, the currently effective measuring clock cycle can be determined from the alarm value as follows:
 $T_{\text{meas}} [125 \mu\text{s}] = \text{alarm value} - 50000$
 With PROFIdrive, the measuring clock cycle corresponds to the bus clock cycle.
 Without PROFIdrive, the measuring clock cycle is an internal cycle time that cannot be influenced.
Response upon: F: OFF1

Acknowl. upon F: IMMEDIATELY

F07499 (A)	EPOS: Reversing cam approached with the incorrect traversing direction
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	The negative reversing cam was approached in the positive traversing direction, or the positive reversing cam was approached in the negative traversing direction. See also: c2613 (EPOS active homing negative reversing cam), c2614 (EPOS active homing positive reversing cam)
Remedy:	- Check the wiring of the reversing cam (c2613, c2614). - Check the traversing direction to approach the reversing cam.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07503	EPOS: Hardware limit switch approached with the incorrect traversing direction
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The negative hardware limit switch was approached in the positive traversing direction, or the positive hardware limit switch was approached in the negative traversing direction.
Remedy:	- Check the wiring of the hardware limit switch (c2569, c2570). - Check the traversing direction when approaching the hardware limit switch.

A07507	EPOS: Home position cannot be set
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	Motor
Response:	NONE
Acknowledgment:	NONE
Cause:	After the home position correction, the position setpoint lies outside the traversing range limits.
Remedy:	- Optimize the position controller. - Due to a possible position controller deviation, home position p2599 should not be directly placed at the traversing range limits.

A07550 (F, N)	Drive: Not possible to reset encoder parameters
Message class:	Hardware/software error (1)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	When restoring a factory setting, it was not possible to reset the encoder parameters. The encoder parameters are directly read out of the encoder. Alarm value (r2124, interpret decimal): Component number of the encoder involved.

Remedy:	- Repeat the operation. - Check the encoder connection.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

F07555 (A)**Drive encoder: Configuration position tracking**

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Component number: %1, encoder data set: %2, drive data set: %3, fault cause: %4
Component:	Encoder 1
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	For position tracking, the configuration is not supported. Position tracking can only be activated for absolute encoders. For linear axes, it is not possible to simultaneously activate the position tracking for load and measuring gears. Fault value (r0949, interpret hexadecimal): ddccbbaa hex aa = encoder data set bb = component number cc = drive data set dd = fault cause dd = 00 hex = 0 dec An absolute encoder is not being used. dd = 01 hex = 1 dec Position tracking cannot be activated because the memory of the internal NVRAM is not sufficient or a Control Unit does not have an NVRAM. dd = 02 hex = 2 dec For a linear axis, the position tracking was activated for the load and measuring gearbox. dd = 03 hex = 3 dec Position tracking cannot be activated because position tracking with another gear ratio, axis type or tolerance window has already been detected for this encoder data set. dd = 04 hex = 4 dec A linear encoder is being used. See also: p0404 (Encoder configuration effective)
Remedy:	For fault value 0: - Use an absolute encoder. For fault value 1: - Use a Control Unit with sufficient NVRAM. For fault value = 2, 4: - If necessary, deselect the position tracking (p2720 for the load gearbox). For fault value 3: - Only activate position tracking of the load gearbox in the same encoder data set if the gear ratio (p2504, p2505), axis type (p2720.1) and tolerance window (p2722) are also the same. These parameters must be the same in all drive data sets, which use the same motor encoder.
Response upon: A:	NONE
Acknowl. upon A:	NONE

A07557 (F)**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 via p2599 when adjusting the encoder lies outside 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. See also: c2598 (EPOS home position signal)
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY

A07565 (F, N)	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).
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

A07569 (F)	Enc identification active
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	During encoder identification (waiting) with p0400 = 10100, the encoder could still not be identified. There is possibly an incorrect encoder or no encoder available, an incorrect encoder cable inserted or no encoder cable inserted.
Remedy:	- Check the encoder cable and if necessary connect it. - Enter the corresponding encoder type in p0400.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY

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

12.3 Faults and alarms

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 (F)	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 bus cycle time is not a multiple integer of the position controller clock cycle.
Remedy:	Deactivate measuring probe evaluation. 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 bus cycle time and the position controller clock cycle to an integer multiple.
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY

A07580 (F, N)	Drive: No Sensor Module with matching component number
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Encoder data set: %1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	A Sensor Module with the specified component number was not found. Alarm value (r2124, interpret decimal): Encoder data set involved.
Remedy:	Correct the component number of the Sensor Module.
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

A07581 (F)	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. See also: p2502 (LR encoder assignment)
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY

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, p2502

A07593 (F, N)	Motor encoder: Value range for position actual value exceeded
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded. When the overflow occurs, the "homed" or "absolute encoder adjusted" status is reset. Alarm value (r2124, interpret decimal): 1: The position actual value (r2521) has exceeded the value range. 2: The encoder position actual value Gn_XIST2 has exceeded the value range. 3: The maximum encoder value multiplied by the factor to convert the absolute position Gn_XIST2 from increments to length units (LU) has exceeded the value range for displaying the position actual value.
Remedy:	If required, reduce the traversing range or position resolution. For alarm value = 3: Reducing the position resolution and conversion factor: - Reduce the length unit (LU) per load revolution for rotary encoders (p2506).
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

A07596 (F, N)	Motor encoder: Homing function interrupted
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	NONE

12.3 Faults and alarms

Cause:	An activated homing function (homing mark search or measuring probe evaluation) was canceled. - An encoder fault has occurred (Gn_ZSW.15 = 1). - Position actual value was set during an activated homing function. - Homing mark search and measuring probe evaluation simultaneously activated. - Activated homing function (homing mark search or measuring probe evaluation) was deactivated.
Remedy:	- Check the causes and resolve. - Reset the control and activate the required function.
Response upon: F:	OFF1
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

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 not available or jumper not inserted at X1/X4. - Supply voltage incorrectly set. - Defective drive.
Remedy:	- Switch on the load supply. - Check the line connection and supply voltage (p0210). - Insert the jumper for the internal braking resistor. - Connect an external braking resistor (X1/X4) - Replace the drive.

F07810	Drive: Power unit EEPROM without rated data
Message class:	Hardware/software error (1)
Message value:	-
Component:	Power Unit
Response:	NONE
Acknowledgment:	IMMEDIATELY

Cause: No rated data are stored in the power unit EEPROM.
Remedy: - Replace the power unit.
 - Contact Technical Support.

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 diagnostics.
 See also: p0201 (Power unit code number)
Remedy: - 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 series commissioning, only use the same converter types (order number, power class).

F07860 (A) External fault 1
Message class: External measured value / signal state outside the permissible range (16)
Message value: -
Component: None
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The condition for "External fault 1" is active.
 Note:
 "External fault 1" is initiated by a 1/0 edge via c2106.
 See also: c2106 (External fault 1)
Remedy: - Eliminate the causes of this fault.
 - Acknowledge fault.
Response upon: A: NONE
Acknowl. upon A: NONE

F07900 (N, A) Drive: Motor blocked/speed controller at its limit
Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
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 oscillates and the speed controller output repeatedly and briefly goes to its limit.
 This message can also be output for a phase failure in the motor feeder cable.
 See also: p2175, p2177
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).
 - Check the motor feeder cable.

Response upon: N: NONE
 Acknowl. upon N: NONE
 Response upon: A: NONE
 Acknowl. upon A: NONE

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.

The maximum permissible positive speed is formed as follows: Minimum (p1082, p1083, p29072) + p2162.
 The maximum permissible negative speed is formed as follows: Maximum (-p1082, p1086, p29073) - p2162

Remedy:
 - Check the speed controller (p1460, p1462).
 - Check the moment of inertia (p1498).
 The following applies for a positive direction of rotation:
 - Appropriately set p1082, p1083 and p2162.
 The following applies for a negative direction of rotation:
 - Appropriately set p1082, p1086 and p2162.

A07920 Drive: Torque/speed too low
 Message class: Application/technological function faulted (17)
 Message value: -
 Component: Motor
 Response: NONE
 Acknowledgment: NONE
 Cause: The torque deviates from the torque/speed envelope characteristic (too low).
 Remedy:
 - Check the connection between the motor and load.
 - Adapt the parameterization corresponding to the load.

A07921 Drive: Torque/speed too high
 Message class: Application/technological function faulted (17)
 Message value: -
 Component: Motor
 Response: NONE
 Acknowledgment: NONE
 Cause: The torque deviates from the torque/speed envelope characteristic (too high).
 Remedy:
 - Check the connection between the motor and load.
 - Adapt the parameterization corresponding to the load.

A07922 Drive: Torque/speed out of tolerance
 Message class: Application/technological function faulted (17)
 Message value: -
 Component: Motor
 Response: NONE
 Acknowledgment: NONE
 Cause: The torque deviates from the torque/speed envelope characteristic.

Remedy:

- Check the connection between the motor and load.
- Adapt the parameterization corresponding to the load.

F07923 **Drive: Torque/speed too low**
Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The torque deviates from the torque/speed envelope characteristic (too low).
Remedy: - Check the connection between the motor and load.
 - Adapt the parameterization corresponding to the load.

F07924 **Drive: Torque/speed too high**
Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The torque deviates from the torque/speed envelope characteristic (too high).
Remedy: - Check the connection between the motor and load.
 - Adapt the parameterization corresponding to the load.

F07925 **Drive: Torque/speed out of tolerance**
Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The torque deviates from the torque/speed envelope characteristic.
Remedy: - Check the connection between the motor and load.
 - Adapt the parameterization corresponding to the load.

F07950 (A) **Drive: Incorrect motor parameter**
Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: - The motor parameters were incorrectly entered while commissioning (e.g. p0300 = 0, no motor).
 - The braking resistor has still not been parameterized - Commissioning cannot be completed.
 Fault value (r0949, interpret decimal):
 Parameter number involved.
 300:
 For this control mode, the motor type is not supported.
 307:
 The following motor parameters could be incorrect:
 p0304, p0305, p0307
 See also: p0300, p0301, p0304, p0305, p0307, p0311, r0316, p0322, p0323

12.3 Faults and alarms

Remedy:	Compare the motor data with the rating plate data and if required, correct. For fault value = 300: Operate a motor type supported by the selected control mode.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07955	Drive: Motor has been changed
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1
Component:	Motor
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The code numbers of the bearings, gearbox or brake do not match the saved numbers. Fault value (r0949, interpret decimal): Number of the incorrect parameter See also: p0301, r0302
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.

F07956 (A)	Drive: Motor code does not match the list (catalog) motor
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Motor
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The motor code of the connected motor does not match the possible list motor types (see selection in p0300). It is possible that this firmware version does not support the connected motor. Fault value (r0949, interpret decimal): Motor code of the connected motor. Note: The first three digits of the motor code generally correspond to the list motor type.
Remedy:	Use a motor with matching motor code.
Response upon: A:	NONE
Acknowl. upon A:	NONE

F07990	Drive: Incorrect motor data identification
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Motor
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A fault has occurred during the identification routine. Fault value (r0949, interpret decimal): 151: The determined force due to weight is higher than the rated motor torque. 152: The torque precontrol channel is already interconnected (e.g. via telegram 750). 190: Speed setpoint not equal to zero.

Remedy:

For fault value = 151:

- The motor cannot continuously hold the force due to weight. Either reduce the force due to weight or use a motor with a higher rated torque.

For fault value = 152:

- Add the measured force due to weight (p1532) to the signal source of c1511.
- If required, remove the interconnection and repeat the measurement.

For fault value = 190:

- Set speed setpoint to zero.

A08560 **IE: Syntax error in configuration file**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A syntax error has been detected in the configuration file for the Industrial Ethernet interface (X127). The saved configuration file has not been loaded.

Note:

IE: Industrial Ethernet

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

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

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).

A08562 **PROFINET: Syntax error in configuration file**

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Response: NONE

Acknowledgment: NONE

Cause: A syntax error has been detected in the configuration file for the PROFINET interface (X150). The saved configuration file has not been loaded.

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:	<p>A consistency error was detected when activating the configuration for the PROFINET interface (X150). Alarm value (r2124, interpret decimal):</p> <p>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. 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).</p> <p>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</p>
Remedy:	Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).
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:	<p>- The converter uses options that require a license and the licenses are not sufficient. - An error has occurred when checking the licensing.</p> <p>Fault value (r0949, interpret decimal):</p> <p>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.</p>

Remedy:	<p>For fault value = 0: Transfer a license file with the required licenses to the converter.</p> <p>For fault value = 1: Reinsert the memory card into the converter. If you have to replace a defective memory card, contact Technical Support.</p> <p>For fault value = 2: Transfer a license file with the required licenses to the converter.</p> <p>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.</p> <p>For fault value = 4, 5, 6, 7, 8, 9: - Carry out a POWER ON. - Upgrade firmware to later version. - Contact Technical Support.</p> <p>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).</p>
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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
Cause:	<p>- For the converter, the options that require a license are being used but the licenses are not sufficient.</p> <p>- An error occurred when checking the existing licenses.</p> <p>Alarm value (r2124, interpret decimal):</p> <p>0: The existing license is not sufficient.</p> <p>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.</p> <p>2: An adequate license was not able to be determined as there is no licensing data available on the memory card.</p> <p>3: An adequate license was not able to be determined as there is no licensing data available on the memory card.</p> <p>4, 5, 6, 7: An adequate license was not able to be determined as the licensing data were manipulated and are therefore invalid.</p> <p>8,9: An internal error occurred when checking the license.</p>
Remedy:	<p>For alarm value = 0: Additional licenses are required and must be activated.</p> <p>For alarm value = 1: Reinsert or replace the memory card that matches the system.</p> <p>For alarm value = 2: Transfer the license file to the converter.</p> <p>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.</p> <p>For alarm value = 4, 5, 6, 7, 8, 9: - Carry out a POWER ON. - Upgrade firmware to later version. - Contact Technical Support.</p> <p>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).</p>

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 converter.
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 converter.
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:	<p>The drive has detected an overcurrent condition.</p> <ul style="list-style-type: none"> - 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 reactor. - Power cables are not correctly connected. - The power cables exceed the maximum permissible length. - Defective drive. - Line phase interrupted. <p>Fault value (r0949, interpret bit by bit):</p> <p>Bit 0: Phase U.</p> <p>Bit 1: Phase V.</p> <p>Bit 2: Phase W.</p>
Remedy:	<ul style="list-style-type: none"> - Check the motor data, carry out commissioning if required. - Check the assignment of the rated currents of the motor and converter. - Infeed: Check the line quality. - Infeed: Reduce the motor load. - Infeed: Check that the line filter and line reactor are correctly connected. - Check the power cable connections. - Check the power cables for short-circuit or ground fault. - Check the length of the power cables. - Check the line phases. - Replace the drive.

F30002	Drive: DC link overvoltage
Message class:	DC link overvoltage (4)
Message value:	%1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>The drive has detected an overvoltage condition in the DC link.</p> <ul style="list-style-type: none"> - Motor regenerates too much energy. - Device supply voltage too high. - Line phase interrupted. - Ground fault - Short-circuit <p>Fault value only for internal diagnostics.</p>
Remedy:	<ul style="list-style-type: none"> - 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 phases. - Check for a ground fault and short-circuit. <p>See also: p0210 (Device supply voltage)</p>

F30003	Power unit: DC link voltage undervoltage
Message class:	Infeed faulted (13)

12.3 Faults and alarms

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 voltage below the permissible value. - Line infeed failed or interrupted. - Line phase interrupted. Note: The monitoring threshold for undervoltage in the DC link is indicated in r0296.
Remedy:	- Check the line voltage. - Check the line infeed and observe the fault messages relating to it (if there are any). - Check the line phases. - Check the 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 (AC)
Message class:	Power electronics faulted (5)
Message value:	%1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The fault threshold for the I2t overload on the AC side of the power unit has been exceeded. The permissible duty cycle or the continuous load was not maintained. Fault value (r0949, interpret decimal): I2t (AC) [100 % = 16384] See also: r0036 (Power unit overload)

Remedy:

- Reduce the continuous load.
- Adapt the duty cycle.
- Check the rated currents of the motor and power unit.

See also: p0307 (Rated motor power)

F30011 **Power unit: Line asymmetry**

Message class: Line supply fault (2)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: On the power section, the DC link voltage ripple has exceeded the corresponding limit value for an impermissibly long time. Frequencies have been detected that would suggest line asymmetry or failure of a line phase. It is also possible that a motor phase has failed.

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 only for internal fault diagnostics.

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 (N, A) **Power unit: 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.

Note:

Chassis power units do not feature phase failure monitoring.

Remedy:

- Check the motor feeder cables.
- Check the speed controller settings.

Response upon: N: NONE

Acknowl. upon N: NONE

Response upon: A: NONE

Acknowl. upon A: NONE

A30016 (N) Power unit: Load supply switched off

Message class: Infeed faulted (13)
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 the load supply.
- Check the line supply if necessary.
Response upon: N: NONE
Acknowledgment upon N: NONE

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 0: Phase U
Bit 1: Phase V
Bit 2: Phase W
Additional bits:
Only relevant for internal fault diagnostics.
Note:
Fault value = 0 means that the phase with current limiting is not known.
Remedy: - 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.

F30021 Drive: Ground fault

Message class: Ground fault / inter-phase short-circuit detected (7)
Message value: %1
Component: Power Unit
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause:	<p>The drive has detected a ground fault.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> - 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. <p>Fault value (r0949, interpret decimal):</p> <p>0:</p> <ul style="list-style-type: none"> - The hardware DC current monitoring has responded. - Short-circuit at the braking resistor. <p>> 0:</p> <p>Absolute value summation current amplitude.</p>
Remedy:	<ul style="list-style-type: none"> - 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.

F30022	Power unit: Monitoring U_{ce}
Message class:	Ground fault / inter-phase short-circuit detected (7)
Message value:	Fault cause: %1 bin
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>In the power unit, the monitoring of the collector-emitter voltage (U_{ce}) of the semiconductor has responded.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> - The power supply for power semiconductor gating missing. - Short-circuit at the power unit output. - Defective semiconductor in the power unit. <p>Fault value (r0949, interpret binary):</p> <p>Bit 0: Short-circuit in phase U</p> <p>Bit 1: Short-circuit in phase V</p> <p>Bit 2: Short-circuit in phase W</p> <p>Bit 3: Short-circuit in phase N</p> <p>See also: r0949 (Fault value)</p>
Remedy:	<ul style="list-style-type: none"> - Check the power cable connections. - Select the defective semiconductor and replace. - When alarm 30269 simultaneously occurs, then the power supply for the power semiconductor gating is overloaded. A hardware defect must be assumed. Contact Technical Support.

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:	<p>The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible fault threshold.</p> <ul style="list-style-type: none"> - The permissible duty cycle was not maintained. - Insufficient cooling, fan failure. - Overload. - Ambient temperature too high. - Pulse frequency too high. - Motor phase is missing. <p>Fault value (r0949, interpret hexadecimal): yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C See also: r0037 (Power unit temperatures)</p>
Remedy:	<ul style="list-style-type: none"> - Adapt the 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. - Check the motor phases.

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:	<p>The chip temperature of the power semiconductor involved has exceeded the permissible fault threshold.</p> <ul style="list-style-type: none"> - The permissible duty cycle was not maintained. - Insufficient cooling, fan failure. - Overload. - Ambient temperature too high. - Pulse frequency too high. <p>Fault value (r0949, interpret hexadecimal): yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C</p>
Remedy:	<ul style="list-style-type: none"> - Adapt the 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. <p>Note: This fault can only be acknowledged after the alarm threshold for alarm A030252 has been fallen below. See also: r0037 (Power unit temperatures)</p>

F30026 (A)	Power unit: DC link precharging asymmetry
Message class:	Power electronics faulted (5)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	IMMEDIATELY

Cause:	Asymmetry has occurred during DC link precharging. This message can occur in the following cases: - Asymmetrical line voltage dips, interruptions (possibly even very briefly for just a few milliseconds) - One or several line phases failed / not connected - Device damage Fault value only for internal diagnostics.
Remedy:	Caution: Continuous operation with F30026 is not permissible, and can damage the converter. - Check the line supply and connection
Response upon: A:	NONE
Acknowled. upon A:	NONE

A30030	Power unit: Internal overtemperature alarm
Message class:	Power electronics faulted (5)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	The temperature inside the drive converter has exceeded the permissible temperature limit. - Insufficient cooling, fan failure. - Overload. - Ambient temperature too high. Alarm value (r2124, interpret decimal): Only relevant for internal fault diagnostics.
Remedy:	- Possibly use an additional fan. - Check whether the ambient temperature is in the permissible range. Notice: This alarm is automatically withdrawn once the permissible temperature limit value has been fallen below minus 5 K.

A30031	Power unit: Hardware current limiting in phase U
Message class:	Power electronics faulted (5)
Message value:	-
Variant:	S200 PN
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 and if required, recalculate the control parameters. As an alternative, run a motor data identification (p1910 = 1, p1960 = 1). - 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.

A30031	Power unit: Hardware current limiting in phase U
Message class:	Power electronics faulted (5)
Message value:	-
Variant:	S200 Basic PN
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>Hardware current limit for phase U responded. The pulsing in this phase is inhibited for one pulse period.</p> <ul style="list-style-type: none"> - 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.
Remedy:	<ul style="list-style-type: none"> - Check the power cable connections. - Check power cables or motor for short-circuits or ground faults. - Check the length of the power cables. - Replace power unit. - Replace the motor if the motor has a short-circuit.
A30032	Power unit: Hardware current limiting in phase V
Message class:	Power electronics faulted (5)
Message value:	-
Variant:	S200 PN
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>Hardware current limit for phase V responded. The pulsing in this phase is inhibited for one pulse period.</p> <ul style="list-style-type: none"> - 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. <p>Note:</p> <p>Alarm A30031 is always output if, for a Power Module, the hardware current limiting of phase U, V or W responds.</p>
Remedy:	<p>Check the motor data and if required, recalculate the control parameters. As an alternative, run a motor data identification (p1910 = 1, p1960 = 1).</p> <ul style="list-style-type: none"> - 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.
A30032	Power unit: Hardware current limiting in phase V
Message class:	Power electronics faulted (5)
Message value:	-
Variant:	S200 Basic PN
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE

Cause:

- Hardware current limit for phase V 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.

Remedy:

- Check the power cable connections.
- Check power cables or motor for short-circuits or ground faults.
- Check the length of the power cables.
- Replace power unit.
- Replace the motor if the motor has a short-circuit.

A30033 Power unit: Hardware current limiting in phase W

Message class: Power electronics faulted (5)

Message value: -

Variant: S200 PN

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause:

- Hardware current limit for phase W 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, for a Power Module, the hardware current limiting of phase U, V or W responds.

Remedy:

- Check the motor data and if required, recalculate the control parameters. As an alternative, run a motor data identification (p1910 = 1, p1960 = 1).
- 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.

A30033 Power unit: Hardware current limiting in phase W

Message class: Power electronics faulted (5)

Message value: -

Variant: S200 Basic PN

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause:

- Hardware current limit for phase W 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.

- Remedy:**
- Check the power cable connections.
 - Check power cables or motor for short-circuits or ground faults.
 - Check the length of the power cables.
 - Replace power unit.
 - Replace the motor if the motor has a short-circuit.

A30034 Power unit: Internal overtemperature**Message class:** Power electronics faulted (5)**Message value:** %1**Component:** Power Unit**Response:** NONE**Acknowledgment:** NONE

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.

- Remedy:**
- Check the ambient air 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.

- 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.

F30037 Power unit: Rectifier overtemperature**Message class:** Power electronics faulted (5)**Message value:** %1**Component:** Power Unit**Response:** OFF2**Acknowledgment:** IMMEDIATELY

Cause: The temperature in the rectifier of the power unit has exceeded the permissible temperature limit.

- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Line phase failure.

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.
- Check the line phases.

Notice:
This fault can only be acknowledged after the alarm threshold for alarm A05004 has been undershot.

A30042 (N)	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:	<p>The maximum operating time of at least one fan will soon be reached, or has already been exceeded.</p> <p>Alarm value (r2124, interpret binary):</p> <p>Bit 0 = 1: The service indicator of the main 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.</p> <p>Bit 2 = 1: The service indicator of the main fan has exceeded 100 %.</p> <p>Bit 8 = 1: The service indicator of auxiliary fan 1 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.</p> <p>Bit 10 = 1: The service indicator of auxiliary fan 1 has exceeded 100 %.</p> <p>Bit 16 = 1: The service indicator of auxiliary fan 2 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.</p> <p>Bit 18 = 1: The service indicator of auxiliary fan 2 has exceeded 100 %.</p>
Remedy:	<p>For the fan involved, carry out the following:</p> <ol style="list-style-type: none"> 1. Replace the fan. 2. Reset the service indicator using the corresponding button in the commissioning tool. <p>See also: r0277 (Power unit fan service indicator)</p>
Response upon: N:	NONE
Acknowl. upon N:	NONE

A30046 (F)	Power unit: Undervoltage alarm
Message class:	Power electronics faulted (5)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>Before the last restart, a problem occurred at the power unit power supply.</p> <p>The voltage monitor in the internal FPGA of the PSA signals an undervoltage fault on the module.</p> <p>Alarm value (r2124, interpret decimal): Register value of the voltage fault register.</p>
Remedy:	<ul style="list-style-type: none"> - Check the 24 V DC voltage supply to power unit. - Carry out a POWER ON (switch-off/switch-on) for the component. - Replace the module if necessary.

Response upon: F: NONE
 Acknowl. upon F: IMMEDIATELY

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 relevant for internal fault diagnostics.
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 relevant for internal fault diagnostics.
Remedy: Replace the power unit module or update the EEPROM data.

F30053 FPGA data faulty

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Response: NONE
Acknowledgment: POWER ON
Cause: The FPGA data of the power unit are faulty. This can be caused, for example, if a firmware update is interrupted.
Remedy: Replace the power unit or update of the FPGA data by updating the firmware.
 Note:
 If this fault occurs after a firmware update, then update the firmware again.

F30055 Power unit: Braking Module overcurrent

Message class: Braking Module faulted (14)

Message value:	-
Component:	None
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	An overcurrent condition has occurred in the Braking Module.
Remedy:	<ul style="list-style-type: none"> - 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 Module is only enabled again when the pulses are enabled after the fault has been acknowledged.

A30057	Power unit: Line asymmetry
Message class:	Line supply fault (2)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>Frequencies have been detected on the DC link voltage that would suggest line asymmetry or failure of a line phase.</p> <p>It is also possible that a motor phase has failed.</p> <p>If these frequencies occur with the same or even higher amplitudes, then after a device-specific time elapses, fault F30011 is output</p> <p>Alarm value only for internal diagnostics.</p>
Remedy:	<ul style="list-style-type: none"> - Check the line phase connection. - Check the motor feeder cable connections. <p>If there is no phase failure of the line or motor, then line asymmetry is involved.</p> <ul style="list-style-type: none"> - Reduce the power in order to avoid fault F30011.

F30058 (N, A)	Power unit: Main fan defective
Message class:	External measured value / signal state outside the permissible range (16)
Message value:	Fault cause: %1 bin
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>The feedback signal of the main fan signals a fault, or there is a communications error with the fan.</p> <ul style="list-style-type: none"> - Fan defective. - Fan blocked. - Feedback signal error. <p>Fault value (r0949, interpret binary):</p> <p>Value in bits 0 to 15:</p> <p>0: Feedback signal of the fan signals a fault</p> <p>1: Internal communication error to the fan</p> <p>Bits 16 to 31 are only for internal diagnostics.</p>
Remedy:	<ul style="list-style-type: none"> - Check the main fan and replace if necessary. - For communication errors, update the software or replace the power unit. <p>Note:</p> <ul style="list-style-type: none"> - If the fault can be acknowledged, this does not necessarily mean that the cause of the fault has been resolved. It is also possible that the software switched off the fan, and therefore can no longer evaluate the feedback signal.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE

Acknowledgment upon A: NONE

F30059 Power unit: Auxiliary fan 1 defective

Message class: Auxiliary unit faulted (20)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The feedback signal of auxiliary fan 1 signals a fault, or there is a communications error with the fan.

Fault value (r0949, interpret decimal):

0: Feedback signal of the fan signals a fault

1: Internal communication error to the fan

Remedy: - Check auxiliary fan 1 and replace if necessary.

- For communication errors, update the software or replace the power unit.

Note:

If the fault can be acknowledged, this does not necessarily mean that the cause of the fault has been resolved. It is also possible that the software switched off the fan, and therefore can no longer evaluate the feedback signal.

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 (N) Power unit: Thermal overload braking resistor alarm

Message class: Braking Module faulted (14)

Message value: %1

Component: Power Unit

Response:	NONE
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.
Response upon: N:	NONE
Acknowl. upon N:	NONE

A30077 (N)	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.
Response upon: N:	NONE
Acknowl. upon N:	NONE

A30079 (N)	Power unit: Referred to the supply voltage, the DC link voltage is too high
Message class:	Infeed faulted (13)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	The alarm is output if the following conditions are simultaneously satisfied: 1. The device supply voltage (p0210) was reduced. 2. A DC link voltage is present, which is too high when referred to the new supply voltage. DC link precharging cannot be completed as this could place some converter components at risk. Alarm value (r2124, interpret decimal): Voltage value to which the DC link voltage must, in the meantime, be reduced in order to complete precharging [V]. See also: p0210 (Device supply voltage)
Remedy:	As a minimum, reduce the DC link voltage to the voltage specified in the alarm value. Note: The alarm is automatically withdrawn if the DC link voltage drops below the voltage specified in the alarm value. Fault F07802 is output if an attempt is made to enable the pulses even though an alarm is active.
Response upon: N:	NONE
Acknowl. upon N:	NONE

F30081**Power unit: Switching operations too frequent****Message class:** Power electronics faulted (5)**Message value:** Fault cause: %1 bin**Component:** Power Unit**Response:** OFF2**Acknowledgment:** IMMEDIATELY

Cause: The power unit has executed too many switching operations for current limitation.

- Closed-loop control is incorrectly parameterized.
- Motor has a short-circuit or fault to ground (frame).
- 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 reactor.
- Power cables are not correctly connected.
- Power cables exceed the maximum permissible length.
- Power unit defective.

Fault value (r0949, interpret bit by bit):

Bit 0: Phase U.

Bit 1: Phase V.

Bit 2: Phase W.

Remedy:

- Infeed: Check the line quality.
- Infeed: Reduce the motor load.
- Infeed: Correct connection of the line reactor.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace the power unit.

F30105**PU: Actual value sensing fault****Message class:** Power electronics faulted (5)**Message value:** -**Component:** Power Unit**Response:** OFF2**Acknowledgment:** IMMEDIATELY

Cause: At least one incorrect actual value channel was detected on the Power Stack Adapter (PSA).
The incorrect actual value channels are displayed in the following diagnostic parameters.

Remedy: Evaluate the diagnostic parameters.
If the actual value channel is incorrect, check the components and if required, replace.

A30250 (N)**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 duty cycle been appropriately dimensioned?
- Has the cooling failed?

Response upon: N: NONE
Acknowl. upon N: NONE

A30251 (N) Power unit: Rectifier overtemperature
Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for the overtemperature of the rectifier has been reached. The response is set using p0290. If the temperature of the rectifier increases by an additional 5 K, then fault F30037 is triggered.
Remedy: Check the following:
 - Is the ambient temperature within the defined limit values?
 - Have the load conditions and the duty cycle been appropriately dimensioned?
 - Has the fan failed? Check the direction of rotation.
 - Has a phase of the line supply failed?
 - Is an arm of the supply (incoming) rectifier defective?
Response upon: N: NONE
Acknowl. upon N: NONE

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):
 yyyyxxxx 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 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):
 yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

12.3 Faults and alarms

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 (AC)**Message class:** Power electronics faulted (5)**Message value:** -**Component:** Power Unit**Response:** NONE**Acknowledgment:** NONE

Cause: The alarm threshold for the I2t overload on the AC side of the power unit has been exceeded. Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30005.

See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
- Check the rated currents of the motor and power unit.
See also: p0290 (Power unit overload response)

A30257 Power unit: Overload I2t (DC)**Message class:** Power electronics faulted (5)**Message value:** -**Component:** Power Unit**Response:** NONE**Acknowledgment:** NONE

Cause: The alarm threshold for the I2t overload on the DC side of the power unit has been exceeded. Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30258.

See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0290 (Power unit overload response)

F30258 Power unit: Overload I2t (DC)**Message class:** Power electronics faulted (5)**Message value:** %1**Component:** Power Unit**Response:** OFF2**Acknowledgment:** IMMEDIATELY

Cause: The fault threshold for the I2t overload on the DC side of the power unit has been exceeded. The permissible duty cycle or the continuous load was not maintained.

Fault value (r0949, interpret decimal):

I2t (DC) [100 % = 16384]

See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0307 (Rated motor power)

A30259	Braking resistor value too low
Message class:	Braking Module faulted (14)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	The braking resistor value used in p0216 is too low. This can result in an excessively high braking current. Alarm value (r2124, interpret decimal): Minimum limit value of the braking resistor [0.1 Ohm] See also: p0216 (Braking resistance value)
Remedy:	- Use a braking resistor with the appropriate resistance value - Observe the product documentation
F30260	Power unit: Fault in the driver supply for the power semiconductor
Message class:	Power electronics faulted (5)
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 Module defective
Message class:	Power electronics faulted (5)
Message value:	-
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The Braking Module is defective.
Remedy:	Replace the converter.
F30263	Power unit: Upper Braking Module defective
Message class:	Power electronics faulted (5)
Message value:	-
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The upper Braking Module is defective.
Remedy:	Replace the converter.
F30264	Power unit: Braking Module locked due to implausible DC link voltage
Message class:	Braking Module faulted (14)
Message value:	%1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause: The Braking Module was inhibited because the unloaded DC link voltage continuously reaches or exceeds the activation threshold. This prevents the Braking Module from being permanently active and possibly damaged.

Possible causes:

The value of parameter p0210 does not match the line voltage.

Fault value (r0949, interpret decimal): DC link voltage [V]

Remedy: Replace the converter.

A30267 Power unit: Active power overload

Message class: Power electronics faulted (5)

Message value: -

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: The alarm threshold for the active power overload of the power unit has been exceeded. Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30268.

See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0290 (Power unit overload response)

F30268 Power unit: Active power overload

Message class: Power electronics faulted (5)

Message value: %1

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The fault threshold for the active power overload of the power unit has been exceeded.

The permissible duty cycle or the continuous load was not maintained.

Fault value (r0949, interpret decimal):

Active power [100 % = 16384]

See also: r0036 (Power unit overload)

Remedy: - Reduce the continuous load.
- Adapt the duty cycle.
See also: p0307 (Rated motor power)

A30269 Power unit: Internal hardware fault

Message class: Power electronics faulted (5)

Message value: Fault cause: %1 bin

Component: Power Unit

Response: NONE

Acknowledgment: NONE

Cause: Frequent occurrence can mean that there is a hardware defect.
The component involved is specified in the alarm value.

Alarm value (r2124, interpret binary):

Bit 0 = 1: Power supply board

Bit 1 = 1: IGBT gate drive

Bit 2 - bit 31: Reserved

Remedy: - Contact Technical Support.

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: -

Variant: S200 PN

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 air 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

Variant: S200 PN

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 (r60049, interpret decimal): Only relevant for internal 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
Variant:	S200 PN
Component:	None
Response:	NONE
Acknowledgment:	NONE
Cause:	A checksum error (CRC error) has occurred in the converter program memory.
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on). - Upgrade firmware to later version. - Contact Technical Support.

F30606 SI: Safety HW version of the Motor Module incorrect

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Variant:	S200 PN
Component:	Power Unit
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	<p>The actual software for Safety Integrated is not compatible with the existing hardware.</p> <p>This fault results in an STO (Safe Torque Off).</p> <p>Fault value (r0949, interpret decimal):</p> <p>Only for internal fault diagnostics.</p>
Remedy:	<ul style="list-style-type: none"> - Update the software. - Replace the module.

C30642 SI: Time slice monitoring error identified

Message class:	Hardware/software error (1)
Message value:	%1
Variant:	S200 PN
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>A time slice monitoring error has occurred.</p> <p>Note:</p> <p>This message results in an STO (Safe Torque Off) that cannot be acknowledged. Message value (r60049, interpret hexadecimal): For internal fault diagnostics only.</p> <p>Fault 30810 is always signaled.</p>
Remedy:	<ul style="list-style-type: none"> - Carry out a POWER ON (switch-off/switch-on) for all components. - Repeat commissioning of "Safety Integrated" and carry out a POWER ON. - Upgrade firmware to later version. - Contact Technical Support. - Replace hardware component.

C30649 SI: Internal software error

Message class:	Hardware/software error (1)
Message value:	Module: %1, line: %2
Variant:	S200 PN

Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	An internal error has occurred in the Safety Integrated software or the terminals of the motor holding brake are incorrectly connected. Note: This message results in an STO (Safe Torque Off) that cannot be acknowledged. Message value (r60049, interpret hexadecimal): Only for internal fault diagnostics.
Remedy:	- Check the motor holding brake connection. The holding brake must be connected via outputs BR+ and BR- of connector X1 or X2. It is not permissible that conductor BR- is directly connected to the electronics ground M. - Carry out a POWER ON (switch-off/switch-on) for all components. - Repeat commissioning of "Safety Integrated" and carry out a POWER ON. - Upgrade firmware to later version. - Contact Technical Support. - Replace hardware component.

N30800 (F)	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.
Response upon F:	OFF2
Acknowl. upon F:	IMMEDIATELY

F30801	Power unit: 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:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	Internal communications error. The computing time load might be too high. Message value (r0949/r2124): 0000yyxx hex: yy = component number, xx = error cause xx = 0A hex (10 dec): The sign-of-life bit in the received telegram is not set.
Remedy:	Contact Technical Support.

F30802	Power unit: Time slice overflow
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY

12.3 Faults and alarms

Cause:	A time slice overflow has occurred. Fault value (r0949, interpret decimal): xx: Time slice number
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.

F30804 (N, A)	Power unit: Checksum error occurred
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A checksum error (CRC error) has occurred for the power unit.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

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.

F30809	Power unit: Switching information not valid
Message class:	Hardware/software error (1)
Message value:	-
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	For 3P gating unit, the following applies: The last switching status word in the setpoint telegram is identified by the end ID. Such an end ID was not found.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.

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:	<ul style="list-style-type: none"> - 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:	<ul style="list-style-type: none"> - Replace the hardware. - Contact Technical Support.

F30820	Power unit: 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
Cause:	<p>Internal communications error.</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 received telegram does not match the receive list.</p> <p>5 (= 05 hex): The type of the received telegram does not match the receive list.</p> <p>6 (= 06 hex): The address of the component in the telegram and in the receive list do not match.</p> <p>7 (= 07 hex): A SYNC telegram is expected - but the received telegram is not a SYNC telegram.</p> <p>8 (= 08 hex): No SYNC telegram is expected - but the received telegram is one.</p> <p>9 (= 09 hex): The error bit in the received telegram is set.</p> <p>16 (= 10 hex): The received 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>

Remedy:

- Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.

F30835 **Power unit: Cyclic data transfer error**

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: Internal communications error. 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.

F30836 **Power unit: Send error**

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: Internal communications error. 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.

F30845 **Power unit: Cyclic data transfer error**

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause:	Internal communications error. 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).

F30850	Power unit: Internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Response:	OFF1
Acknowledgment:	POWER ON
Cause:	An internal software error has occurred in the power unit. Fault value (r0949, interpret decimal): Only relevant for internal fault diagnostics.
Remedy:	- If required, upgrade the firmware in the power unit. - Replace the power unit. - Contact Technical Support.

F30851	Power unit (CU): Sign-of-life missing
Message class:	Internal (DRIVE-CLiQ) communication error (12)
Message value:	Component number: %1, fault cause: %2
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	Internal communications error. The component did not set the sign-of-life. Message value (r0949/r2124): 0000yyxx hex: yy = component number, xx = error cause xx = 0A hex (10 dec): The sign-of-life bit in the received telegram is not set.
Remedy:	- Deselect functions that are not required. - Replace the component involved.

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 (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
Cause:	<p>Internal communications error.</p> <p>Error cause:</p> <p>1 (= 01 hex):</p> <p>Checksum error (CRC error).</p> <p>2 (= 02 hex):</p> <p>Telegram is shorter than specified in the length byte or in the receive list.</p> <p>3 (= 03 hex):</p> <p>Telegram is longer than specified in the length byte or in the receive list.</p> <p>4 (= 04 hex):</p> <p>The length of the received telegram does not match the receive list.</p> <p>5 (= 05 hex):</p> <p>The type of the received telegram does not match the receive list.</p> <p>6 (= 06 hex):</p> <p>The address of the power unit in the telegram and in the receive list do not match.</p> <p>9 (= 09 hex):</p> <p>The internal communications from the component involved signals a failure of the supply voltage.</p> <p>16 (= 10 hex):</p> <p>The received telegram is too early.</p> <p>17 (= 11 hex):</p> <p>CRC error and the received telegram is too early.</p> <p>18 (= 12 hex):</p> <p>The telegram is shorter than that specified in the length byte or in the receive list and the received telegram is too early.</p> <p>19 (= 13 hex):</p> <p>The telegram is longer than that specified in the length byte or in the receive list and the received telegram is too early.</p> <p>20 (= 14 hex):</p> <p>The length of the received telegram does not match the receive list and the received telegram is too early.</p> <p>21 (= 15 hex):</p> <p>The type of the received telegram does not match the receive list and the received telegram is too early.</p> <p>22 (= 16 hex):</p> <p>The address of the power unit in the telegram and in the receive list does not match and the received telegram is too early.</p> <p>25 (= 19 hex):</p> <p>The error bit in the received telegram is set and the received telegram is too early.</p> <p>Note regarding the message value:</p> <p>The individual information is coded as follows in the message value (r0949/r2124):</p> <p>0000yyxx hex: yy = component number, xx = error cause</p>
Remedy:	<p>- Carry out a POWER ON (switch-off/switch-on).</p> <p>- Check the electrical cabinet design and cable routing for EMC compliance.</p>

F30875	Power unit: Supply voltage failed
Message class:	Supply voltage fault (undervoltage) (3)
Message value:	Component number: %1, fault cause: %2
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause:	<p>The component involved has signaled that the 24 V supply has failed.</p> <p>Error cause:</p> <p>9 (= 09 hex):</p> <p>The supply voltage for the component has failed.</p> <p>Note regarding the message value:</p> <p>The individual information is coded as follows in the message value (r0949/r2124):</p> <p>0000yyxx hex: yy = component number, xx = error cause</p>
Remedy:	<p>- Check the supply voltage wiring (interrupted cable, contacts, ...).</p> <p>- Check the dimensioning of the 24 V supply, check cable lengths.</p>

F30885	Power unit CU (CU): Cyclic data transfer error
Message class:	Internal (DRIVE-CLiQ) communication error (12)
Message value:	Component number: %1, fault cause: %2
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>Internal communications error.</p> <p>The nodes do not send and receive in synchronism.</p> <p>Error cause:</p> <p>26 (= 1A hex):</p> <p>Sign-of-life bit in the received telegram not set and the received telegram is too early.</p> <p>33 (= 21 hex):</p> <p>The cyclic telegram has not been received.</p> <p>34 (= 22 hex):</p> <p>Timeout in the telegram receive list.</p> <p>64 (= 40 hex):</p> <p>Timeout in the telegram send list.</p> <p>98 (= 62 hex):</p> <p>Error at the transition to cyclic operation.</p> <p>Note regarding the message value:</p> <p>The individual information is coded as follows in the message value (r0949/r2124):</p> <p>0000yyxx hex: yy = component number, xx = error cause</p>
Remedy:	<p>- Check the supply voltage of the component involved.</p> <p>- Carry out a POWER ON.</p> <p>- Replace the component involved.</p>

F30886	Power unit (CU): Error when sending
Message class:	Internal (DRIVE-CLiQ) communication error (12)
Message value:	Component number: %1, fault cause: %2
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	<p>Internal communications error.</p> <p>Data were not able to be sent.</p> <p>Error cause:</p> <p>65 (= 41 hex):</p> <p>Telegram type does not match send list.</p> <p>Note regarding the message value:</p> <p>The individual information is coded as follows in the message value (r0949/r2124):</p> <p>0000yyxx hex: yy = component number, xx = error cause</p>
Remedy:	<p>Carry out a POWER ON.</p>

F30895	Power unit (CU): Alternating cyclic data transfer error
Message class:	Internal (DRIVE-CLiQ) communication error (12)
Message value:	Component number: %1, fault cause: %2
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	Communications error. 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).
F30896	Power unit (CU): Inconsistent component properties
Message class:	Internal (DRIVE-CLiQ) communication error (12)
Message value:	Component number: %1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Explanation of the message value:	For %1 Component in target topology
Cause:	The properties of the component (power unit), specified by the fault value, have changed in an incompatible fashion with respect to the properties when running up. Fault value (r0949, interpret decimal): Component number.
Remedy:	- Carry out a POWER ON.
F30899 (N, A)	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, which cannot be interpreted by the converter firmware. This can occur if the firmware on this component is more recent than the converter firmware. 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 converter.
Remedy:	- Replace the firmware on the power unit by an older firmware version. - Upgrade the converter firmware.
Response upon N:	NONE
Acknowl. upon N:	NONE
Response upon A:	NONE
Acknowl. upon A:	NONE

F30903	Power unit: I2C bus error occurred
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	Communications error with an EEPROM or an analog/digital converter. Fault value (r0949, interpret hexadecimal): 80000000 hex: - Internal software error. 00000001 hex ... 0000FFFF hex: - Module fault.
Remedy:	For fault value = 80000000 hex: - Upgrade firmware to later version. For fault value = 00000001 hex ... 0000FFFF hex: - Replace the module.
F30907	Power unit: FPGA configuration unsuccessful
Message class:	Hardware/software error (1)
Message value:	-
Component:	Power Unit
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	During initialization within the power unit, an internal software error has occurred.
Remedy:	- If required, upgrade the firmware in the power unit. - Replace the power unit. - Contact Technical Support.
A30919	Power unit: Temperature monitoring failed
Message class:	Overtemperature of the electronic components (6)
Message value:	%1
Component:	Power Unit
Response:	NONE
Acknowledgment:	NONE
Cause:	The temperature monitoring in the power unit has failed. Fault-free operation of the drive system is no longer guaranteed. Alarm value (r2124, interpret binary): Bit 0: Sensor 1 for the internal temperature can no longer be evaluated. Bit 1: Sensor 2 for the internal temperature can no longer be evaluated.
Remedy:	Replace the power unit immediately.
F30950	Power unit: Internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Response:	OFF2
Acknowledgment:	POWER ON

12.3 Faults and alarms

Cause:	An internal software error has occurred. Fault value (r0949, interpret decimal): Information about the fault source. Only relevant for internal fault diagnostics.
Remedy:	- If necessary, upgrade the firmware in the power unit to a later version. - Contact Technical Support.

A30999 (F, N)	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 has occurred on the power unit, 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 power unit by an older firmware version. - Upgrade the converter firmware.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

F31110 (N, A)	Motor encoder: Serial communication faulted
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:	There is an error in the transfer of the serial communication protocol between the encoder and internal or external evaluation module. Fault value (r0949, interpret binary): Bit 0: Alarm bit in the position protocol. Bit 2: Encoder does not respond (does not supply a start bit within 50 ms). Bit 3: CRC error: The checksum in the protocol from the encoder does not match the data. Bit 6: Timeout when cyclically reading. Bit 7: Timeout for the register communication. Bit 14: Register communication error.

Remedy:	<p>For fault value, bit 0 = 1:</p> <ul style="list-style-type: none"> - Encoder defect. F31111 may provide further details. <p>For fault value, bit 2 = 1:</p> <ul style="list-style-type: none"> - Incorrect encoder type / replace the encoder or encoder cable. <p>For fault value, bit 3 = 1:</p> <ul style="list-style-type: none"> - EMC / connect the cable shield, replace the encoder or encoder cable. <p>For fault value, bit 6 = 1:</p> <ul style="list-style-type: none"> - Update the firmware <p>For fault value, bit 7 = 1:</p> <ul style="list-style-type: none"> - Incorrect encoder type / replace the encoder or encoder cable. <p>For fault value, bit 14 = 1:</p> <ul style="list-style-type: none"> - Incorrect encoder type / replace the encoder or encoder cable.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F31111 (N, A)	Motor encoder: Encoder signals an internal error (detailed information)
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Message class:	Position/speed actual value incorrect or not available (11)
Message value:	Fault cause: %1 bin, additional information: %2
Component:	Encoder 1
Response:	ENCODER
Acknowledgment:	PULSE INHIBIT
Cause:	<p>The encoder error word provides detailed information (error bit).</p> <p>Fault value (r0949, interpret binary):</p> <p>yyyyxxxx hex: yyyy = supplementary information, xxxx = fault cause</p> <p>Bit 0: Error in the multiturn block.</p> <p>Bit 1: EEPROM error.</p> <p>Bit 2: Singleturn position incorrect.</p> <p>Bit 3: Multiturn position incorrect.</p> <p>Bit 4: MLS generation error.</p> <p>Bit 5: The battery must be changed.</p> <p>Bit 6: Overtemperature.</p> <p>Bit 7: Internal fault.</p>
Remedy:	<p>Encoder is defective. Replace the encoder or motor.</p> <p>For fault value, bit 5 = 1:</p> <p>The battery must be changed (only for encoders with battery backup).</p>
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F31112 (N, A)	Motor encoder: Encoder signals an internal error
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Message class:	Position/speed actual value incorrect or not available (11)
Message value:	%1
Component:	Encoder 1
Response:	ENCODER
Acknowledgment:	PULSE INHIBIT

Cause:	The encoder signals an internal error via serial protocol. Fault value (r0949, interpret binary): Bit 0: Fault bit in the position protocol.
Remedy:	For fault value, bit 0 = 1: In the case of an EnDat encoder, F31111 may provide further details.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F31142 (N, A)	Motor encoder: Battery voltage error
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	Encoder 1
Response:	ENCODER
Acknowledgment:	IMMEDIATELY
Cause:	When switched-off, the encoder uses a battery to back up the multiturn information. The battery voltage is no longer sufficient to check the multiturn information.
Remedy:	- Check the encoder cable connection or replace the battery. - Acknowledge errors via OA. - Avoid unwanted motor movement. After the error has been acknowledged, adjust the absolute encoder as the encoder position has been reset.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F31150 (N, A)	Motor encoder: Initialization error
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Sensor Module Encoder 1
Response:	ENCODER
Acknowledgment:	PULSE INHIBIT
Cause:	Encoder functionality selected in p0404 cannot be executed. Fault value (r0949, interpret hexadecimal): Encoder malfunction. The bit assignment corresponds to that of p0404 (e.g. bit 5 set: Error track C/D). See also: p0404 (Encoder configuration effective)
Remedy:	- Check that p0404 is correctly set. - Check the encoder type used (incremental/absolute) and for SMCxx, the encoder cable. - If relevant, note additional fault messages that describe the fault in detail.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

A31407 (F, N)	Motor encoder: Function reserve low
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	%1
Component:	Encoder 1

Response: NONE
Acknowledgment: NONE
Cause: The encoder function reserve is too low.
 Alarm value (r2124, interpret decimal):
 1: Incremental signals
 3: Absolute track
 4: Code connection
Remedy: - For open measuring systems, clean the encoder.
 - If required, replace the encoder.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A31410 (F, N) Motor encoder: Communication error (encoder and Sensor Module)

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin
Component: Encoder 1
Response: NONE
Acknowledgment: NONE
Cause: There is an error in the transfer of the serial communication protocol between the encoder and internal or external evaluation module.
 Fault value (r0949, interpret binary):
 Bit 0: Alarm bit in the position protocol.
 Bit 2: Encoder does not respond (does not supply a start bit within 50 ms).
 Bit 3: CRC error: The checksum in the protocol from the encoder does not match the data.
 Bit 6: Timeout when cyclically reading.
 Bit 7: Timeout for the register communication.
 Bit 14: Register communication error.
Remedy: - Check that the encoder cables are routed in compliance with EMC.
 - Check the plug connections.
 - Replace encoder.
Response upon: F: NONE
Acknowl. upon F: IMMEDIATELY
Response upon: N: NONE
Acknowl. upon N: NONE

A31411 (F, N) Motor encoder: Encoder signals an internal alarm (detailed information)

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin, additional information: %2
Component: Encoder 1
Response: NONE
Acknowledgment: NONE

Cause:	The encoder error word provides detailed information (alarm bit). Alarm value (r2124, interpret binary): yyyyxxxx hex: yyyy = supplementary information, xxxx = fault cause Bit 0: LED current incorrect. Bit 1: Signal amplitude outside the control range. Bit 2: Overtemperature. Bit 3: Overspeed. Bit 4: Battery discharged.
Remedy:	Replace encoder.
	For fault value bit 4 = 1: Battery must be replaced (only for encoders with battery backup).
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

A31412 (F, N) Motor encoder: Encoder signals an internal alarm

Message class:	Position/speed actual value incorrect or not available (11)
Message value:	%1
Component:	Encoder 1
Response:	NONE
Acknowledgment:	NONE
Cause:	The encoder signals an internal alarm via serial protocol. Alarm value (r2124, interpret binary): Bit 0: Fault bit in the position protocol. Bit 1: Alarm bit in the position protocol.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Check that the encoder cables are routed in compliance with EMC. - Check the plug connections. - Replace encoder.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

A31442 (F, N) Motor encoder: Battery voltage alarm threshold reached

Message class:	Position/speed actual value incorrect or not available (11)
Message value:	-
Component:	Encoder 1
Response:	NONE
Acknowledgment:	NONE
Cause:	When switched-off, the encoder uses a battery to back up the multiturn information. The multiturn information can no longer be buffered if the battery voltage drops even further.
Remedy:	Avoid the risk of losing the multiturn position, ensure that the S200 is always switched on with 24 V and disconnect the main power supply for at least 10 minutes. Then replace the battery, following the instructions in the manual.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

F31502 (N, A)	Motor encoder: Encoder with measuring gearbox without valid signals
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	-
Component:	Sensor Module Encoder 1
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The encoder with measuring gearbox no longer provides any valid signals.
Remedy:	It must be ensured that all of the encoders, with mounted measuring gearbox, provide valid actual values in operation.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE
F31503 (N, A)	Motor encoder: Position tracking cannot be reset
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	-
Component:	None
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The position tracking for the measuring gearbox cannot be reset.
Remedy:	The fault should be resolved as follows: - Select commissioning. - Deselect commissioning. The fault should then be acknowledged and the absolute encoder adjusted.
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE
F31802 (N, A)	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 (only relevant for 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.
Response upon N:	NONE
Acknowl. upon N:	NONE
Response upon A:	NONE
Acknowl. upon A:	NONE

F31804 (N, A)	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 being maintained.
Response upon N:	NONE
Acknowl. upon N:	NONE
Response upon A:	NONE
Acknowl. upon A:	NONE

F31805 (N, A)	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.
Response upon N:	NONE
Acknowl. upon N:	NONE
Response upon A:	NONE
Acknowl. upon A:	NONE

A31811 (F, N)	Motor encoder: Encoder serial number changed
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	Encoder 1
Response:	NONE
Acknowledgment:	NONE

Cause:	<p>The serial number of the motor encoder of a synchronous motor has changed. The motor with integrated and adjusted encoder was replaced.</p> <p>Note:</p> <p>With closed-loop position control, the serial number is accepted when starting the adjustment (p2507 = 2). When the encoder is adjusted (p2507 = 3), the serial number is checked for changes and if required, the adjustment is reset (p2507 = 1).</p>
Remedy:	Adjust absolute encoder again using p2507 = 2.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE

F31850 (N, A)	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
Cause:	<p>An internal software error has occurred in the Sensor Module of the motor encoder.</p> <p>Fault value (r0949, interpret decimal):</p> <p>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: Description data from EEPROM incorrect. 11500 ... 11899: Calibration data from EEPROM incorrect. 11900 ... 11999: Configuration data from EEPROM incorrect. 12000 ... 12008: Communications error with analog/digital converter.</p>
Remedy:	<p>- If required, upgrade the firmware. - Contact Technical Support.</p>
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F31899 (N, A)	Motor encoder: Unknown fault
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	New message: %1
Component:	Sensor Module Encoder 1
Response:	ENCODER
Acknowledgment:	IMMEDIATELY
Cause:	<p>A fault has occurred on the Sensor Module for the motor encoder, which cannot be interpreted by the converter firmware.</p> <p>This can occur if the firmware on this component is more recent than the converter firmware.</p> <p>Fault value (r0949, interpret decimal):</p> <p>Fault number.</p> <p>Note:</p> <p>If required, the significance of this new fault can be read about in a more recent description.</p>
Remedy:	<p>- Replace the firmware on the Sensor Module by an older firmware version. - Upgrade the converter firmware</p>
Response upon: N:	NONE

Acknowl. upon N: NONE
 Response upon: A: NONE
 Acknowl. upon A: NONE

A31902 (F, N) Motor encoder: SPI-BUS error occurred

Message class: Hardware/software error (1)
 Message value: %1
 Component: Sensor Module Encoder 1
 Response: NONE
 Acknowledgment: NONE
 Cause: Error when operating the internal SPI bus.
 Alarm value (r2124, interpret hexadecimal):
 Only relevant for internal fault diagnostics.
 Remedy:
 - Replace motor.
 - Contact Technical Support.
 Response upon: F: NONE
 Acknowl. upon F: IMMEDIATELY
 Response upon: N: NONE
 Acknowl. upon N: NONE

A31903 (F, N) Motor encoder: I2C-BUS error occurred

Message class: Hardware/software error (1)
 Message value: %1
 Component: Sensor Module Encoder 1
 Response: NONE
 Acknowledgment: NONE
 Cause: Error when operating the internal I2C bus.
 Alarm value (r2124, interpret hexadecimal):
 Only relevant for internal fault diagnostics.
 Remedy:
 - Replace motor.
 - Contact Technical Support.
 Response upon: F: NONE
 Acknowl. upon F: IMMEDIATELY
 Response upon: N: NONE
 Acknowl. upon N: NONE

F31905 (N, A) Motor encoder: Encoder parameterization error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
 Message value: Parameter: %1, supplementary information: %2
 Component: Sensor Module Encoder 1
 Response: ENCODER
 Acknowledgment: IMMEDIATELY

Cause:	<p>An error was identified in the encoder parameterization.</p> <p>It is possible that the parameterized encoder type does not match the connected encoder.</p> <p>Determine the parameter number using the fault value (r0949).</p> <p>Fault value (r0949, interpret decimal):</p> <p>yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter</p> <p>yyyy = 0:</p> <p>No additional information available.</p> <p>yyyy = 10:</p> <p>The connected encoder is not supported.</p>
Remedy:	<p>- Check whether the connected encoder type matches the encoder that has been parameterized.</p> <p>- Correct the parameter specified by the fault value (r0949).</p>
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F31916 (N, A)	Motor encoder: Encoder parameterization error
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1, supplementary information: %2
Component:	Sensor Module Encoder 1
Response:	ENCODER
Acknowledgment:	IMMEDIATELY
Cause:	<p>An encoder parameter was detected as being incorrect.</p> <p>It is possible that the parameterized encoder type does not match the connected encoder.</p> <p>The parameter involved can be determined as follows:</p> <p>- Determine the parameter number using the fault value (r0949).</p> <p>Fault value (r0949, interpret decimal):</p> <p>Parameter number.</p>
Remedy:	<p>- Check whether the connected encoder type matches the encoder that has been parameterized.</p> <p>- Correct the parameter specified by the fault value (r0949).</p>
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

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:	<p>An internal software error has occurred.</p> <p>Fault value (r0949, interpret decimal):</p> <p>The fault value contains information regarding the fault source.</p> <p>Only relevant for internal fault diagnostics.</p>
Remedy:	<p>- If necessary, upgrade the firmware in the Sensor Module to a later version.</p> <p>- Contact Technical Support.</p>

A31999 (F, N)	Motor encoder: Unknown alarm
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	New message: %1
Component:	Sensor Module Encoder 1
Response:	NONE
Acknowledgment:	NONE
Cause:	<p>An alarm has occurred on the Sensor Module for encoder 1, which cannot be interpreted by the converter firmware.</p> <p>This can occur if the firmware on this component is more recent than the converter firmware.</p> <p>Alarm value (r2124, interpret decimal):</p> <p>Alarm number.</p> <p>Note:</p> <p>If required, the significance of this new alarm can be read about in a more recent description of the converter.</p>
Remedy:	<ul style="list-style-type: none"> - Replace the firmware on the Sensor Module by an older firmware version. - Upgrade the converter firmware.
Response upon: F:	NONE
Acknowl. upon F:	IMMEDIATELY
Response upon: N:	NONE
Acknowl. upon N:	NONE
F34950	VSM: Internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Voltage Sensing Module (VSM)
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	<p>An internal software error in the Voltage Sensing Module (VSM) has occurred.</p> <p>Fault value (r0949, interpret decimal):</p> <p>Information about the fault source.</p> <p>Only relevant for internal fault diagnostics.</p>
Remedy:	<ul style="list-style-type: none"> - If necessary, upgrade the firmware in the Voltage Sensing Module to a later version. - Contact Technical Support.
F35220 (N, A)	PTO: Frequency limit reached for signal output
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	Terminal Module (TM)
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	<p>The signals output from the PTO for tracks A/B have reached the limit frequency. The output signals are no longer in synchronism with the specified setpoint.</p> <p>The signal at c4420 has an excessively high actual speed.</p>
Remedy:	<ul style="list-style-type: none"> - Enter a lower speed setpoint (c4420). - Reduce the pulse number (p4408).
Response upon: N:	NONE
Acknowl. upon N:	NONE
Response upon: A:	NONE
Acknowl. upon A:	NONE

F35950	TM: Internal software error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Terminal Module (TM)
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	An internal software error has occurred. Fault value (r0949, interpret decimal): Information about the fault source. Only relevant for internal fault diagnostics.
Remedy:	- If necessary, upgrade the firmware in the Terminal Module to a later version. - Contact Technical Support.

F53430	VIBSUP EPOS not activated
Message class:	General drive fault (19)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	It was identified that the "Basic positioner, EPOS" is not activated.
Remedy:	Activate function "Basic positioner, EPOS". Note: VIBSUP: VIBration SUPpression

F53432	VIBSUP frequency fd > Shannon frequency
Message class:	General drive fault (19)
Message value:	-
Component:	None
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The VIBSUP filter frequency is higher than the Shannon frequency.
Remedy:	Reduce the VIBSUP filter frequency (p31585). Note: VIBSUP: VIBration SUPpression

Corrective maintenance

13.1 Service and maintenance for the converter

13.1.1 Restoring the converter to factory settings

13.1.1.1 Restoring factory settings via a commissioning tool

Requirement

When User Management & Access Control (UMAC) is active, you have the right that allows you to edit device configuration or drive application.

Description

The restoring 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 restoring:

- 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 restoring to factory settings with the commissioning tool is described in the following sections:

- Web server: Backup and restore (Page 223)
- Startdrive: in the information system of the TIA Portal

13.1.1.2 Full reset of all device settings

Overview

The following user-defined settings are stored in 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

13.1 Service and maintenance for the converter

- User-defined parameter lists in the web server
- License file transferred to the converter

In the following cases it may be necessary to reset all user-defined converter settings to the factory setting:

- 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.

Requirement

The following preconditions apply when completely resetting all device settings:

- You can access the converter manually.
- All electrical connections from the converter to the motor are disconnected.
- The PROFINET connection to the control system and other devices is disconnected.
- You have an empty writable memory card with a maximum of 32 GB; e.g. 6SL5970-0AA00-0AA0.

Procedure

Proceed as follows to perform a full reset of all device settings of the converter:

1. Create an empty file called RESET.TXT in the root directory of the memory card.
When you write text KEEP_COMM to file RESET.TXT, then the settings for the communications interfaces are kept after the reset.
2. Switch off all power supplies to the converter.
3. Wait until all the LEDs on the converter are dark.
4. Insert the memory card into the converter.
5. Switch on all power supplies to the converter.
6. The converter deletes the user-defined settings.
7. The user-defined settings are deleted.

RDY	COM	Description
		Factory settings are being restored.
		Factory settings have been restored.
		Restoring factory settings is unsuccessful.

8. Switch off all power supplies to the converter.
9. Remove the memory card.
10. Switch on all power supplies to the converter for approximately one minute.
11. Switch off all power supplies to the converter.

Result

The result depends on the content of file RESET.TXT:

File RESET.TXT is empty	File RESET.TXT contains text KEEP_COMM
<p>All user-defined converter settings are deleted. The converter firmware is unchanged.</p> <p>After the manual reset to the factory setting, access to the web server is possible via the service interface (X127) or via the PROFINET interface (X150). For access via the service interface (X127), use the secure transmission protocol HTTPS.</p> <p>If license files that have been transferred to the converter are included, these license files must be reassigned and activated for the converter again.</p>	<p>The converter firmware is unchanged.</p> <p>The setting of the communication interfaces, e.g. the setting of service interface (X127), is unchanged.</p> <p>All other user-defined converter settings are deleted.</p> <p>If license files that have been transferred to the converter are included, these license files must be reassigned and activated for the converter again.</p>

13.1.1.3 Restore Safety Integrated to factory settings

Overview

A separate function exists for Safety Integrated settings, which exclusively restores Safety Integrated settings to factory settings.

Requirement

You have the rights required for active user management (UMAC):

- Edit device configuration or drive applications
- Edit Safety Integrated application

Procedure

Proceed as follows to reset the converter Safety Integrated settings to the factory settings:

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 in the "Ready" state and the "RDY" and "COM" LEDs are green.

Result

The Safety Integrated settings for the converter have been reset.

13.1.2 Converter firmware update

13.1.2.1 Overview of firmware update

Requirement

NOTICE
Damage to equipment during firmware update due to voltage supply interruption
When 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">• Do not switch off the converter's supply voltage during firmware update.

Description of function

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 all user-defined settings to factory settings, including:
 - 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 following options are available for a firmware update:

- Firmware update via a memory card (Page 577)
- Firmware update via web server (Page 232)
- Firmware update via Startdrive

13.1.2.2 Firmware update via a memory card

Overview

The converter firmware can also be updated using a memory card.

Requirement

You have performed a BIOS update if a BIOS update is required for the firmware update.

We recommend that you use an empty Siemens memory card for the firmware update.

NOTICE

Damage to equipment during firmware update due to voltage failure

A voltage failure during a firmware update can lead to defects or malfunctions of the converter.

- Do not switch off the converter power supply during a firmware update.
- If the power supply was interrupted during a firmware update, restart the firmware update.

Procedure

Proceed as follows to update the firmware using a memory card:

1. Download the required firmware to your PC from the Internet.
Alternatively, the firmware can be ordered on a memory card.
2. Extract the files to a directory of your choice on your PC.
3. Copy the unzipped files to the root nodes of an empty memory card.

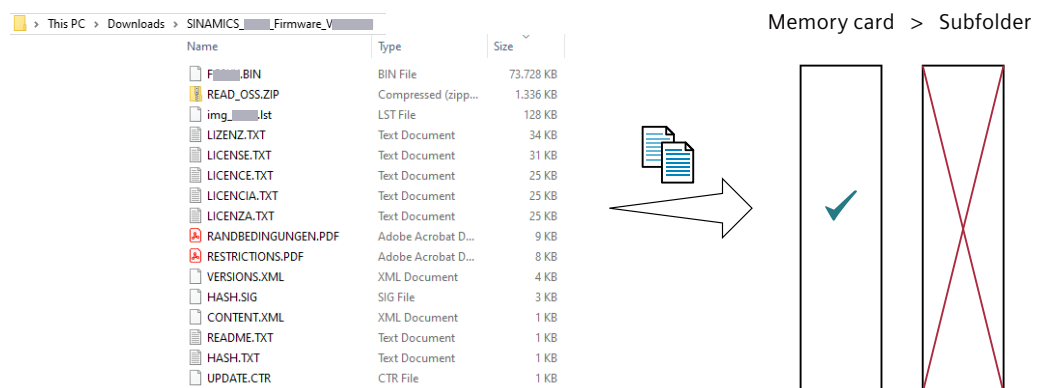


Figure 13-1 Copy the files for the firmware update to the root nodes of the memory card

4. Switch off the converter supply voltage.
5. Insert the memory card with the downloaded firmware into the converter.
6. Switch on the converter supply voltage.

13.1 Service and maintenance for the converter

7. The new firmware is installed. The procedure takes a few minutes.

RDY	COM	Explanation of LED displays
		The firmware is being updated. Do not switch off the converter supply voltage.
	-	Firmware update completed

8. Switch off the converter supply voltage.
9. Remove the memory card.
10. Switch on the converter supply voltage.

Result

The converter firmware has been updated.

The commissioning tool displays the firmware version of the converter.

More information

A BIOS update may be required for a firmware update. If a BIOS update is also required for a firmware update, you will find the BIOS update next to the firmware update on the same website.

For more information about the firmware versions, see Section "Firmware updates and constraints (Page 22)".

13.1.2.3 BIOS update via a memory card

Overview

A BIOS update of the converter is only possible with a memory card.

Requirement

Before updating the firmware, you created a backup using the commissioning tool if you have already carried out configurations at the converter.

We recommend that you use an empty Siemens memory card for the BIOS update.

NOTICE

Damage to equipment during BIOS update due to voltage failure

A voltage failure during a BIOS update can lead to defects or malfunctions of the converter.

- Do not switch off the converter power supply during a BIOS update.
- If the power supply was interrupted during a BIOS update, restart the BIOS update.

Procedure

Proceed as follows to update the BIOS using a memory card:

1. Download the required BIOS to your PC from the Internet.
2. Extract the files to a directory of your choice on your PC.
3. Copy the unzipped files to the root nodes of an empty memory card.

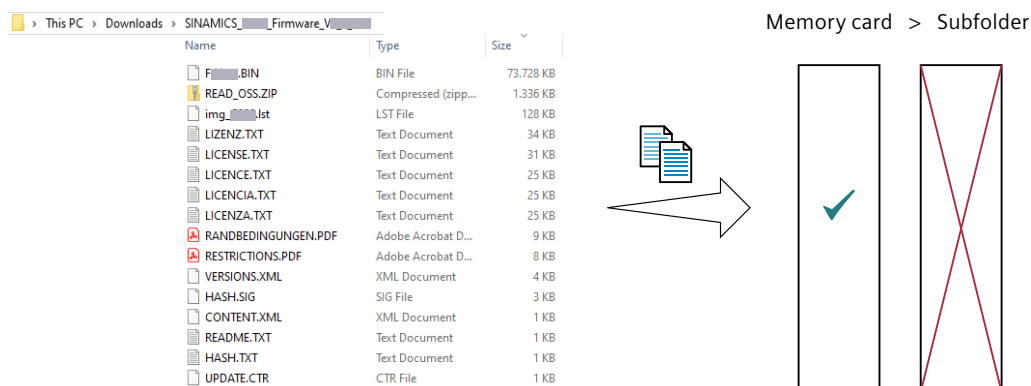


Figure 13-2 Copy the files for the BIOS update to the root nodes of the memory card

4. Switch off the converter supply voltage.
5. Insert the memory card into the converter.
6. Switch on the converter supply voltage.
7. The new BIOS is installed. The procedure takes several seconds.

RDY	COM	Explanation of LED displays
		BIOS is being updated. Do not switch off the converter supply voltage.
	-	BIOS update completed

8. Switch off the converter supply voltage.
9. Remove the memory card.
10. Switch on the converter supply voltage.

Result

The converter BIOS has been updated.

More information

The BIOS of the converter is backwards compatible with the firmware. Therefore, no BIOS update is required after a firmware update from a newer to an older firmware version.

For more information about BIOS update, see Section "Firmware updates and constraints (Page 22)".

13.1.3 Backing up and restoring drive data

13.1.3.1 Automatically backing up drive data using a memory card and restoring this data

Overview

An inserted memory card backs up all drive data and in the case of service, after a converter has been replaced, guarantees that the system or machine is immediately ready for operation again.

Description of function

The drive backs up changed drive data both in its internal memory as well as on the inserted memory card.

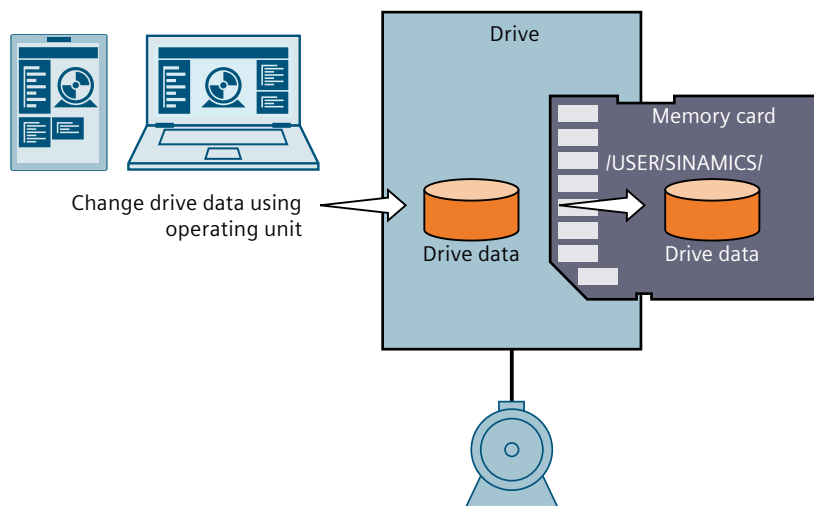


Figure 13-3 Drive data backed up on the memory card

The drive data comprises the following components:

- Changed parameters
- UMAC settings

The drive data is on the memory card in directory `/USER/SINAMICS/`.

After inserting an empty memory card for the first time, the drive creates directory `/USER/SINAMICS/`.

After the supply voltage has been switched on, the drive loads the drive data from the memory card into its internal memory.

Automatically loading the drive data from the memory card allows a converter to be replaced without using an operating unit.

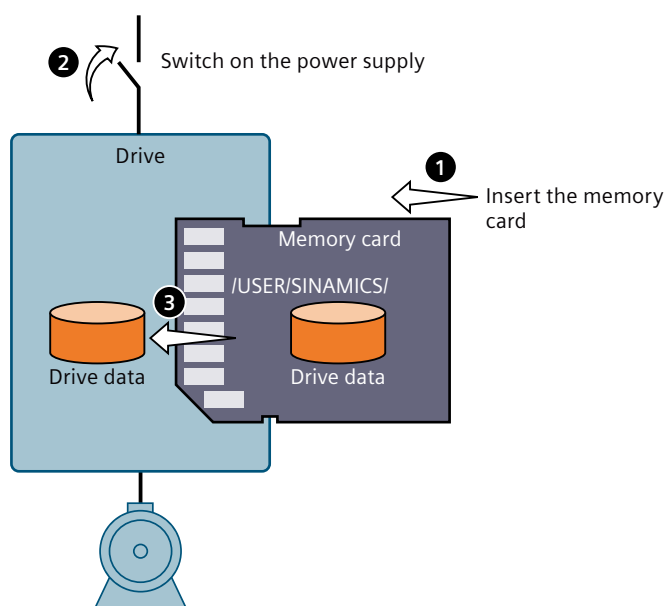


Figure 13-4 Automatically loading drive data from a memory card after a converter has been replaced

13.1.3.2 Backing up drive data to the backup file

Overview

A backup file backs up the drive data and allows the drive data to be restored if service is required or for series commissioning. A backup file can be created in various ways.

Requirement

One of the following preconditions applies depending on the backup option:

- If you back up the backup file on the operating unit via a commissioning tool:
You are connected online with the drive with a commissioning tool.
- If you create the backup file in the TIA portal and back it up on the operating unit:
You have configured the drive in the TIA Portal.

Procedure

The following options are available to save the drive data to a backup file:

- Back up the backup file on the operating unit via web server or Startdrive:
Using the "Backup/restore" → "Save drive data to backup file" function to back up the drive data in a backup file on the operating unit, e.g. on a PC.

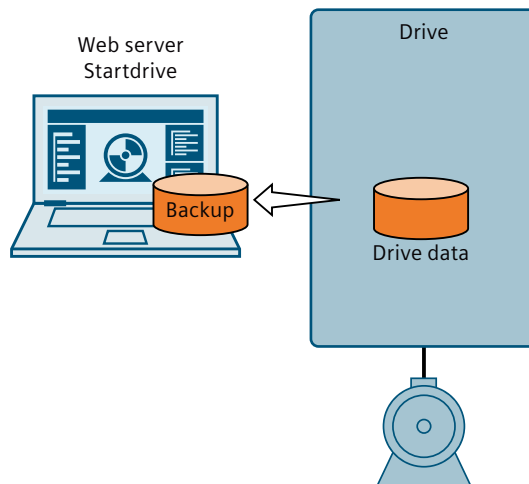


Figure 13-5 Back up the backup file on the operating unit

- Create a backup file from the TIA Portal and back it up on an operating unit:
In the TIA project, drag and drop the configured drive to "Card Reader/USB Memory" in the project tree. There, drag and drop the drive to a subdirectory in the "Removable Data Media" folder or a subdirectory in the "Reader_x".

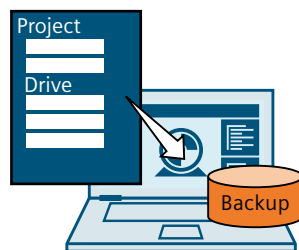


Figure 13-6 Back up the backup file in the TIA Portal on the operating unit

Result

The backup file contains the following drive data:

- Changed parameters
- UMAC settings

13.1.3.3 Creating a memory card with backup file to automatically restore the drive data

Overview

A memory card with backup file allows drive data to be automatically restored after the card is inserted into the drive. The memory card can be created with and without Startdrive.

Requirement

One of the following preconditions applies depending on the procedure:

- Create a memory card with backup file offline using Startdrive:
A memory card is inserted in the card reader of your PC.
- Create a memory card with backup file without Startdrive:
You have either configured the drive using Startdrive or you already have the backup file of your drive.

Procedure

The following options are available to create a memory card with a backup file:

- Create a memory card with backup file offline using Startdrive:
In the TIA project, drag and drop the configured drive to "Card Reader/USB Memory" in the project tree. There, drag and drop the drive to a subdirectory in the "Reader_x" folder and follow the instructions.
Startdrive creates directory /BACKUPFILE_NEXT_START/ and saves the backup file there.

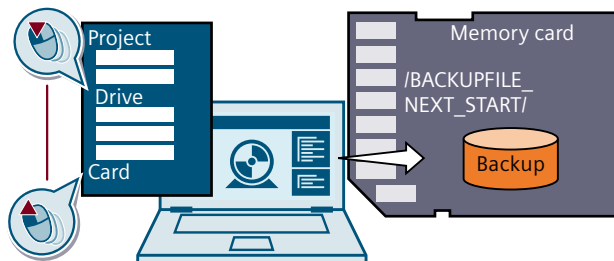


Figure 13-7 Create a memory card with backup file using Startdrive

- Create a memory card with backup file without Startdrive:
The backup file can be received by email, stored in a cloud or locally.
Create directory /BACKUPFILE_NEXT_START/ on the memory card and copy the backup file to this directory.

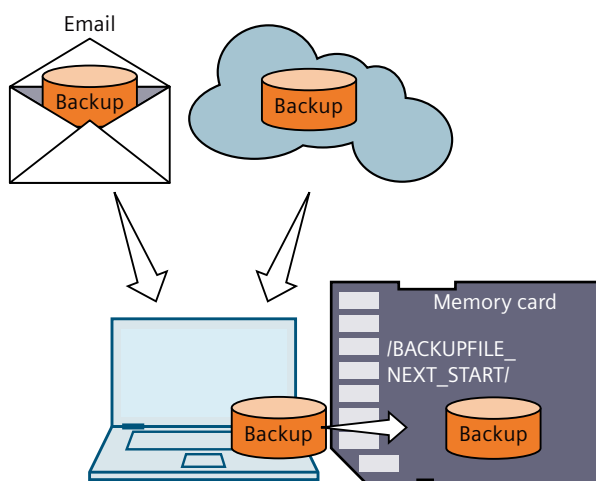


Figure 13-8 Saving the backup file to the memory card without using Startdrive

Result

The memory cards contains the backup file with the following drive data:

- Changed parameters
- UMAC settings

13.1.3.4 Restoring drive data from a backup file

Overview

A backup file backs up the drive data and allows the drive data to be restored if service is required. The drive data can be restored online using a commissioning tool or via a memory card.

Requirement

One of the following preconditions applies, depending on the restore option:

- Drive data restoration using a commissioning tool:
You have stored the backup file on the operating unit.
- Automatic restoration of the drive data with a backup file on a memory card:
You have a memory card with the backup file in the /BACKUPFILE_NEXT_START/ directory.

Procedure

Note

If you want to restore the drive data from a backup file of an old converter with FW V6.3 to a new converter with FW $\geq$ V6.4, you must first full reset the settings of the new converter with an empty memory card, and then restore the drive data according to the procedures below.

The following options are available to restore the drive data from a backup file:

- Restore drive data using a web server or Startdrive:
Using the "Backup/restore" → "Restore drive data from backup file" function to transfer the backup file from an operating unit to the drive. The drive accepts the content of the backup file into the drive data on its internal memory.

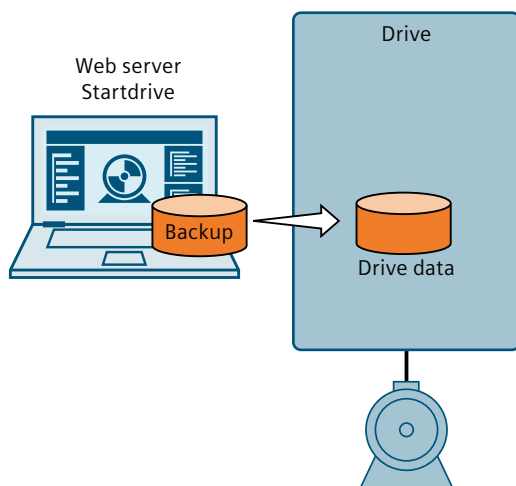


Figure 13-9 Restoring drive data from a backup file

- Automatically restore drive data with a backup file on a memory card:
After the supply voltage has been switched on, the drive receives the drive data from the backup file in the /BACKUPFILE_NEXT_START/ directory and transfer it to its internal memory.

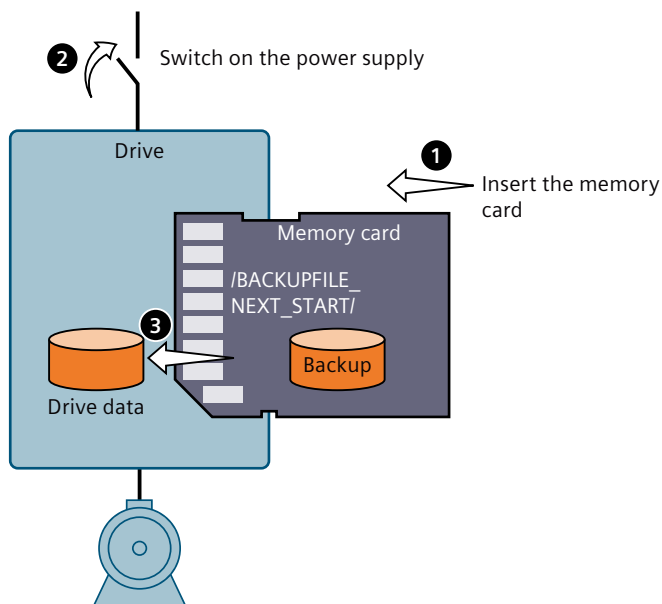


Figure 13-10 Automatically restoring drive data using a backup file on a memory card

After accepting the drive data:

- The drive deletes the backup file and directory /BACKUPFILE_NEXT_START/
- The drive backs up the drive data from the memory card in directory /USER/SINAMICS/

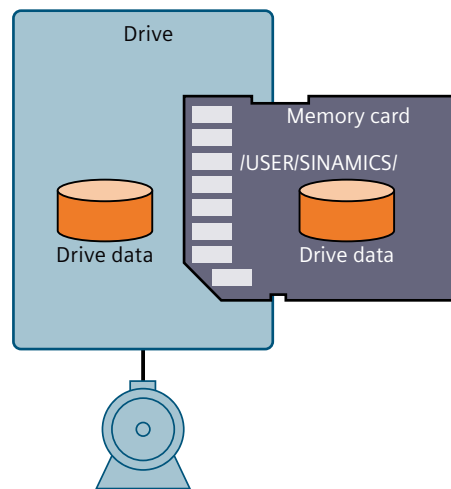


Figure 13-11 Memory card after restoring the drive data

Result

The LEDs signal the drive status:

RDY	COM	Explanation
	not relevant	The drive has accepted the following drive data from the backup file into its internal memory: <ul style="list-style-type: none"> • Changed parameters • UMAC settings
	☐	The drive signals a fault. Check the cause of the fault.

13.1.3.5 Backup file with drive data encryption

Overview

Restoring drive data from a backup file with encrypted data is only possible if you know the backup password.

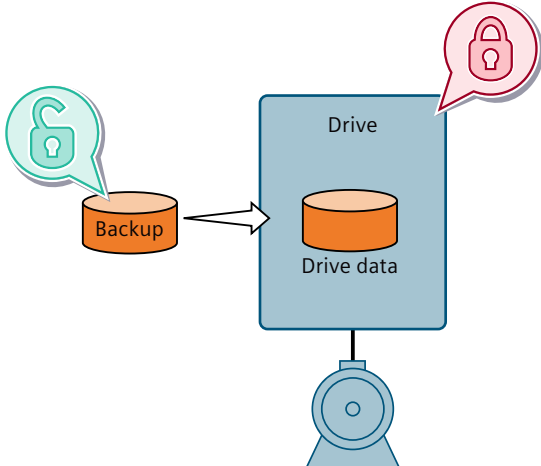
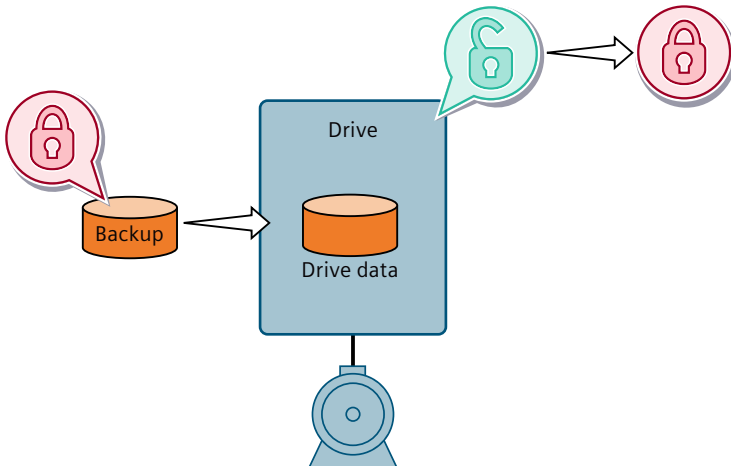
Requirement

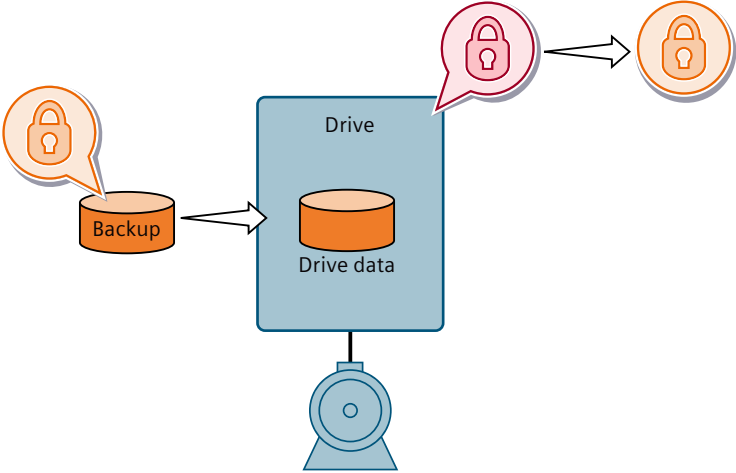
Required runtime authorizations with active user management (UMAC):

- "Create backup or load drive data to Startdrive"
- If the backup file contains Safety Integrated Functions settings:
"Edit Safety Integrated application"

Description of function

Procedures vary depending on which of the following drive data encryption scenarios applies:

Encryption	Password to be entered to restore the drive data	Result
<p>The backup file is unencrypted. The drive data is encrypted.</p>  <p>The diagram shows a blue cylinder labeled 'Backup' with a green padlock icon (unlocked) next to it. An arrow points from the backup to a blue box labeled 'Drive' which contains an orange cylinder labeled 'Drive data' with a red padlock icon (locked) next to it. A motor icon is at the bottom of the drive box.</p>	None	<p>The drive data is restored from the backup file data. The drive password is retained after the drive data has been restored.</p>
<p>The backup file is encrypted. The drive data is unencrypted.</p>  <p>The diagram shows a blue cylinder labeled 'Backup' with a red padlock icon (locked) next to it. An arrow points from the backup to a blue box labeled 'Drive' which contains an orange cylinder labeled 'Drive data' with a green padlock icon (unlocked) next to it. A motor icon is at the bottom of the drive box. Above the drive box, there is a green padlock icon (unlocked) and a red padlock icon (locked) connected by a double-headed arrow.</p>	Backup password	<p>The drive data is restored from the backup file data. The drive data is encrypted. The drive handles the backup file password.</p>

Encryption	Password to be entered to restore the drive data	Result
<p>The backup file and the drive data are encrypted.</p> <p>The backup password and the drive password are different, or the backup file was created with a different drive.</p> 	Backup password	<p>The drive data is restored from the backup file data.</p> <p>The drive data remains encrypted.</p> <p>The drive handles the backup file password.</p>

13.1.4 Replacing the converter

Overview

When replacing a converter, you may only replace it with another converter under certain conditions.

Requirement

The following requirements apply to a replacement:

- The new converter has the same or more recent firmware version than that of the converter being replaced.
- The two converters must also satisfy one of the following conditions:
 - The new and replaced converters have the same article number.
 - The new converter has a different article number to the converter it replaced but the same frame size.
In this case, the ratio of the rated motor power to the rated converter power must be within the following range: 0.25 ... 1.



! WARNING

Fire or electric shock after tripping of overcurrent protection devices

If an overcurrent protection device is tripped, the converter may be defective. A defective converter can cause a fire or electric shock.

- Have the converter and the overcurrent protection device checked by a specialist.



! 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 removing the connecting cables.

! WARNING

Unexpected machine movement caused by incorrect converter type

If a replacement is made with a converter of a different type, this can result in incomplete or unsuitable converter settings. This can result in unexpected machine movements, e.g. speed oscillation, overspeed or incorrect direction of rotation. Unexpected machine movements can result in death, injury or property damage.

- In all cases not permitted according to the above requirements, you must recommission the drive after replacing the converter.

! WARNING

Unexpected machine movement caused by unsuitable converter settings

Missing or unsuitable converter settings can lead to unexpected operating states or machine movements, e.g. a non-functioning EMERGENCY STOP or an incorrect direction of rotation. This can result in damage to machine components or system sections or in death or bodily injury.

- Restore the drive data of the replaced converter from backup file or using a memory card.
- Recommission the drive if there is no drive data backup.

NOTICE

Damage caused by interchanging the motor cables

The direction in which the motor rotates switches if the two phases of the motor cable are interchanged. An incorrect direction of rotation can lead to damage in the machine or system.

- Connect the 3 phases of the motor cables in the correct sequence.

Procedure

Proceed as follows to replace a converter:

1. Disconnect all the power supplies to the converter.
2. Remove all the connecting cables to the converter.
3. Remove the defective converter.
4. Install the new converter.
5. Connect all the connecting cables to the converter.
6. Switch on all the power supplies to the converter.
7. Set the new converter to suit the application:
 - You have backed up the settings of the converter that was replaced to an external storage medium, e.g. a memory card:
If the new converter has the same article number as the converter replaced, transfer the settings to the new converter.
 - If there is no backup of the data for the converter replaced or if the new converter has a different article number, then recommission the converter.

13.1.5 Forming the DC link capacitors

Overview

If the converter has been out of operation for too long, you must form the DC link capacitors before connecting the full line voltage to the converter. Non-formed DC link capacitors can damage the converter in operation.

Forming can be omitted if the line voltage is applied to the converter once a year for one hour.

Requirement

Form the DC link capacitors in the following cases:

- The converter has been out of operation for more than one year.
- It has been more than one year since converter production when the converter is commissioned for the first time.
The production date of the converter is coded in the 3rd and 4th digits of the serial number on the rating plate: S . . ③④...
Example: Serial number S ZVF1Y54000105 → Production date January 2015

Table 13-1 Production year and production month

Digit ③	Production year	Digit ④	Production month
A	2010, 2030	1 ... 9	January ... September
B	2011, 2031	0	October

Digit ③	Production year	Digit ④	Production month
C	2012, 2032	N	November
...	...	D	December

Procedure

You form the DC link capacitors by supplying the converter with an input voltage of $\leq 100\%$ of the rated voltage for a defined time. The figure below shows the voltage and duration required for the forming process. For example, if the converter has been out of operation for one to two years, form the DC link capacitors by supplying the converter with an input voltage of 100% of the rated voltage for one hour.

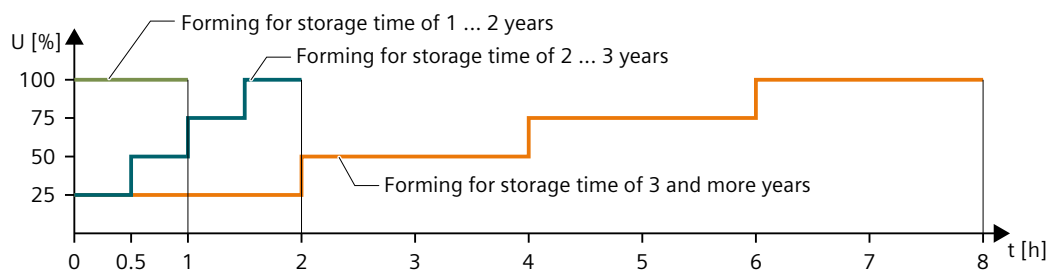


Figure 13-12 Forming the DC link capacitors

13.1.6 Device replacement without removable data storage medium via PROFINET

Overview

The converter with PROFINET interface supports "Device replacement without removable data storage medium" if the topology of the PROFINET IO system with the IO devices involved has been configured in the higher-level control system.

Description of function

The converter can be replaced without having to insert a removable data storage medium (for example, a memory card) with the saved device name in the converter. You also do not have to reassign the device name with the PC.

13.2 Service and maintenance for the motor

Requirement



WARNING

Risk of injury if protective devices are removed.

Operation without functioning protective devices can cause death or severe injury.

- Operate the motor, even in test operation, only with functioning protective devices.

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															
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	Interrupted phase in the converter line supply cable or motor winding	Check the converter and converter line supply cable, measure the winding resistance and insulation resistance, repair after consultation with manufacturer
C	Interrupted phase in the converter line supply cable after switching on	Check the converter, converter line supply cable, and the winding resistance
D	Converter output voltage too high, frequency too low	Check the settings on the 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, replace the motor if required
I	Heat dissipation impeded by deposits	Clean the surface of the servo drive system and ensure that the cooling air can flow in and out unimpeded
	Cooling air inlet or outlet is blocked by foreign bodies	Remove the things that block the inlet or outlet 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 low or medium inertia motors, replace the motor; for high inertia motors, replace the bearings
M	Rotor not balanced	Replace 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 or repair the gearbox

If the fault still cannot be resolved after taking the measures stated above, contact the manufacturer or the Siemens Service Center.

13.2.1 Replacing the motor bearings

Description

Motor bearings are wearing parts. They must be replaced after a defined number of operating hours. At medium loads, the motor bearings last approximately 20000 hours.

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 (for example, continuous operation at n_{max} , high vibration or shock loads, frequent reversing duty) reduce the bearing or motor replacement interval by up to 50%.

The procedure for replacing the motor bearing depends on the size of the motor. Replacement of the motor bearings is only intended for high inertia motors. For low or medium inertia motors, it is not possible to replace the motor bearings. Replace the motors in their entirety.

The maintenance and repair of the motor can be performed in authorized Siemens Service Centers all over the world. Contact your personal Siemens representative if you need this service.

13.2.2 Replacing the motor

Requirement

The new motor has the same article number as the motor to be replaced. If you want to replace the motor with another motor with a different article number, you must commission the converter again after replacing the motor.



! WARNING

Danger to life due to unintentional starting of the drive unit

Unintentional starting of the drive unit can cause death or severe injury.

- Make sure that the drive unit cannot be started accidentally.
- Post a warning notice at the point where the switch is located.



! CAUTION

Burns as a result of touching hot surfaces

In operation, the motor enclosure can reach a high temperature, which can cause burns if touched.

- Do not touch any hot surfaces.
- Allow the motor to cool down before starting any work.
- Use the appropriate personnel protection equipment, for example, gloves.

Procedure

Replacing the motor with a motor with the same article number

1. Switch off all power supplies to the converter.
2. Replace the motor.
 - Disconnect the motor from the converter. You can find detailed information in Section "Connecting the motor (Page 142)".
 - Release the motor mounting screws.
 - Remove the motor.
 - Mount and install the new motor. You can find detailed information in Section "Mounting the motor (Page 110)".
3. Switch the converter on.

Replacing the motor with a motor with another article number

If you are using a different motor type, after performing the three steps above, you must also carry out the following steps:

1. Reset the converter to factory settings.
You can find more information in Section "Restoring the converter to factory settings (Page 573)".
2. Commission the converter. You can find more information in the following sections:
"Commissioning (web server) (Page 173)"
"Commissioning (Startdrive) (Page 237)"
"Series commissioning (Page 249)"

Result

You have now replaced the motor.

13.3 Service and maintenance for spare parts

13.3.1 Spare parts and spare parts compatibility

Overview

Spare parts can be ordered on the Internet via the spare parts service Spares on Web (<https://www.sow.siemens.com/>).

Spares on Web also gives you the option of determining the article numbers of spare parts.

Description

Converter components are being continuously developed within the scope of product maintenance.

Product maintenance includes, for example, measures to increase the ruggedness or hardware changes that become necessary as components are discontinued.

In the scope of such spare parts-compatible ongoing development, connectors or connection positions are sometimes slightly modified. This does not cause any problems when the component is used as intended. Take this fact into consideration in special installation situations (for example, allow sufficient reserve regarding the cable length).

13.3.2 Replacing the fan unit (400 V converters FSC and FSD only)

Overview

The 400 V converters FSC and FSD are integrated with a fan unit.

The service life of the fan can reach 20000 hours at the rated operating temperature and the average 100% operating load; however, the service life may be shorter, especially in a dusty environment.

Parameter r0277 is used to display the service indicator of the fan as a percentage of the operating hours.

Alarm A30042 appears if the maximum operating hours will soon be reached or has already been exceeded.

The alarm value is contained in r2124 (interpret as a binary value):

- Bit 0 = 1: The service indicator has reached 99%, and after the remaining 1% has elapsed, bit 0 is cleared and bit 2 is set.
- Bit 2 = 1: The service indicator has exceeded 100%.

Replace the defective fan in time to ensure the proper operation of the converter.

You can find the article number of the replacement fan in Section "Replacement fans (Page 76)"

Requirement

You have switched off all power supplies to the converter before replacing the fan unit.



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 working on it.



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 five minutes until the capacitors in the converter have discharged so that the residual charge is at a non-hazardous level. Therefore, touching the converter immediately after powering off can result in electric shock due to residual charge in the power components.

- Check the voltage at the converter connections before releasing the connections at the converter.



WARNING

Electric shock when live parts are touched

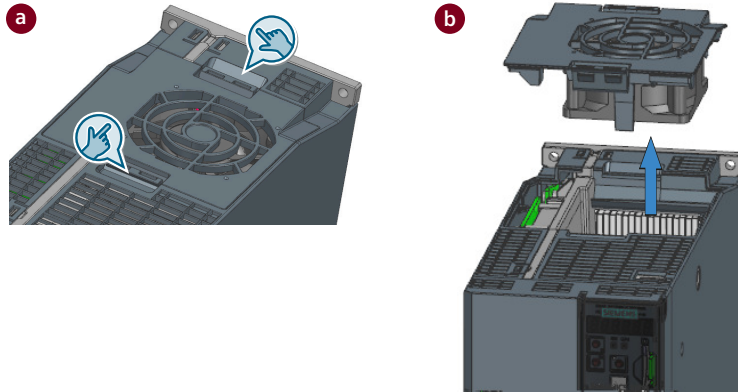
After the fan unit is removed, the live components of the converter are no longer protected from being touched. Contact with live parts can result in death or serious injury.

- Before replacing the fan, switch off the power supply at terminals X1: L1, L2, L3.
- Check that the fan unit is de-energized before removing it.
- Wait until the discharge time specified on the warning labels has elapsed.

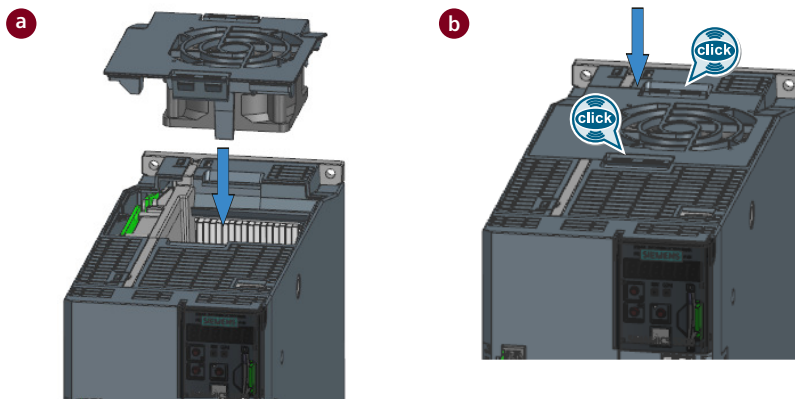
Procedure

The fan unit is installed at the top of the converter.

1. Switch off all power supplies to the converter.
2. Press the release clips to remove the fan unit from the converter as shown below. Use a screwdriver if necessary.



3. Install the new fan unit in the inverse sequence as shown below.



Result

You have now replaced the fan unit.

13.4 Safety Integrated acceptance test after component replacement

Overview

After a component has been replaced or the firmware updated, a reduced acceptance test of the safety functions must be performed.

13.4 Safety Integrated acceptance test after component replacement

Description

Depending on the measure performed, the following acceptance tests and documentation are required:

Measure	Converter message after component replacement ¹⁾	Reduced acceptance test	
		Acceptance test	Documentation
Converter replacement	Yes	Testing the EMERGENCY STOP function STO or SS1	<ul style="list-style-type: none"> • Supplement converter data • Supplement hardware version and firmware version in the converter data • Log new checksums • Countersignature
Encoder replacement	Yes		
Motor replacement	No		
Gearbox replacement	No		No change
Replacing safety-related I/O devices (e.g. EMERGENCY STOP switch)	No	Check the control of the safety functions affected by the components that have been replaced	No change
Converter firmware update	No	No	<ul style="list-style-type: none"> • Supplement firmware version in the converter data • Log new checksums • Countersignature

¹⁾ When a component is replaced, the message in Startdrive and the web server must be acknowledged.

Technical data

14.1 Technical data of the converter

14.1.1 Permissible environmental conditions for the converter

Technical data

Table 14-1 Environmental conditions

Property	Description
Environmental conditions for transport in the transport packaging	
Climatic environmental conditions	<ul style="list-style-type: none"> Surrounding air temperature: -40 °C ... +70 °C Suitable according to Class 2K4 to IEC 60721-3-2:1997 Humidity: Max. 95% at 45 °C according to IEC 60721-3-2:1997
Mechanical environmental conditions	Vibrations permissible according to Class 2M3 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
Environmental conditions for long-term storage in the product packaging	
Climatic environmental conditions	<ul style="list-style-type: none"> Surrounding air temperature: -40 °C ... +70 °C Relative humidity: Max. 95%, condensation not permissible
Mechanical environmental conditions	Vibrations permissible according to Class 1M2 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
Environmental conditions in operation	
Installation altitude	<ul style="list-style-type: none"> ≤ 2000 m above sea level without power derating > 2000 m ... 4000 m above sea level with power derating
Climatic environmental conditions	<ul style="list-style-type: none"> Surrounding air temperature: 0 °C ... 55 °C, > 45 °C with power derating Relative humidity: Max. 95%, condensation not permissible

14.1 Technical data of the converter

Property	Description
Mechanical environmental conditions	<ul style="list-style-type: none"> Vibration levels permissible according to Class 3M1 to IEC 60721-3-3:2002 Vibration test in operation according to IEC 60068-2-6:2007 Test Fc (sinusoidal) <ul style="list-style-type: none"> 10 Hz ... 58 Hz: 0.075 mm displacement amplitude 58 Hz ... 200 Hz: 1 g acceleration amplitude 10 frequency cycles per axis, 1 octave/min Shocks permissible according to Class 3M1 to IEC 60721-3-3:2002 Shock test in operation according to IEC 60068-2-27:2008 Test Ea (semi sinusoidal) <ul style="list-style-type: none"> Peak acceleration: 5 g Duration of shock: 30 ms 3 shocks in all three axes in both directions
Protection against chemical substances	Protected according to Class 3C2 to IEC 60721-3-3:2002
Biological environmental conditions	Suitable according to Class 3B1 to IEC 60721-3-3:2002
Pollution	Suitable for environments with degree of pollution 2 according to IEC 61800-5-1

14.1.2 General technical data

Technical data

Table 14-2 General technical data of the converter

Property	Description
Overload capability	350% overload: for 200 V and 400 V variants with a power rating of 0.1 kW to 0.75 kW 300% overload: for 200 V and 400 V variants with a power rating of 1 kW to 7 kW
Output frequency (Hz)	0 ... 550
IGBT pulse frequency without derating (kHz)	8
Control system	Servo control
Dynamic brake	Integrated
Protective functions	Grounding fault protection, output short-circuit protection ¹⁾ , overvoltage/undervoltage protection ²⁾ , converter I ² t protection, motor overtemperature protection ³⁾ , IGBT overtemperature protection
Surge voltage	Fulfill the requirement of the standard IEC 61800-3
Overvoltage category	Category III according to IEC 61800-5-1
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 times ⁴⁾ the rated current of the protection device used.
Maximum permissible short-circuit current (SCCR, kA rms)	For 200 V variants: 100 ⁵⁾ For 400 V variants: 65

Property	Description
Cooling type	For 200 V variants: Natural cooling For 400 V variants: <ul style="list-style-type: none"> FSA and FSB: Natural cooling FSC and FSD: Fan cooling
Degree of protection according to IEC 60529	IP20
Mains supply	
Permissible mains supply network	TN, TT, IT
Line voltage	1 AC/3 AC 200 V ... 240 V 3 AC 380 V ... 480 V
Line frequency (Hz)	50/60
Permissible line voltage fluctuation	-15% ... +10%
Permissible line frequency fluctuation	-10% ... +10%
24 V DC power supply	
Voltage (V)	24
Permissible voltage fluctuation (V)	When using a motor without brake: 20.4 ... 28.8 (-15% ... +20%) When using a motor with brake: 22.8 ... 28.8 (-5% ... +20%)
Maximum current (A)	For 200 V variants: <ul style="list-style-type: none"> When using a motor without a brake: 1.2 When using a motor with a brake: 2.2 For 400 V variants: <ul style="list-style-type: none"> When using a motor without a brake: 1.2 When using a motor with a brake: 3.2
Safety insulation class	SELV/PELV
Inputs and outputs	
Digital inputs	Type 3 according to IEC 61131-2 Maximum input current: 4 mA (for "1" signal: > 1.5 mA) General delay time: <ul style="list-style-type: none"> DI 0 → 1: < 10 µs DI 1 → 0: < 150 µs Fast digital input delay time: <ul style="list-style-type: none"> Fast DI 0 → 1: < 5 µs Fast DI 1 → 0: < 5 µs
Digital outputs	Maximum output current: 100 mA Delay time: < 2 ms
Pulse train output (for S200 PN only)	Output voltage: line driver (5 V differential) Output frequency: ≤ 4 MHz
Safety Integrated (for S200 PN only)	
Safety functions	STO/SS1-t, SIL 3 / PL e / Category 3 or 4

14.1 Technical data of the converter

Property	Description
	<p>Safety functions fulfill the requirements of the following standards:</p> <ul style="list-style-type: none"> • SIL 3 according to IEC 61800-5-2 • PL e according to ISO 13849-1 • Category 3 or 4 according to ISO 13849-1
	<p>Response time: ≤ 20 ms</p> <p>The response time of the Safe Torque Off function is the time between selecting the function and the function becoming active.</p>
	<p>Probability of Failure per Hour (PFH): $< 10^{-7}$</p> <p>Failure probabilities must be specified for Safety Integrated Functions in the form of a PFH value according to IEC 61800-5-2, IEC 62061 and ISO 13849-1. The PFH value of a Safety Integrated Function depends on the safety concept of the converter, its hardware configuration and the PFH values of the other components used for the Safety Integrated Function.</p>
	<p>Mission time: 20 years</p> <p>You may not operate converters with integrated safety functions for longer than the mission time. The mission time 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.</p>

- ¹⁾ Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.
- ²⁾ The 200 V converter has an overvoltage threshold of 410 V DC and an undervoltage threshold of 155 V DC; the 400 V converter has an overvoltage threshold of 820 V DC and undervoltage threshold of 320 V DC.
- ³⁾ Motor temperature is calculated by motor thermal model and protected by the output current from the converter.
- ⁴⁾ To comply with permissible line harmonics, depending on the line connection conditions, different values may be required.
- ⁵⁾ The maximum permissible short-circuit current for 200 V variants with Type E Combination Motor Controllers is 65 kA.

14.1.3 Specific data of the 200 V converters

Technical data

Table 14-3 Specific technical data of the 200 V converters FSA

Article No. 6SL5□10-1BB	10-1AF0	10-2AF0
Frame size	FSA	FSA
Rated input current (A) 1 AC	1.2	2.0
3 AC	0.6	1.1
Rated output current (A)	0.81	1.33
Maximum output current (A)	3.3	5.1
Maximum supported motor power (kW)	0.1	0.2
Power loss (W)	12.0	15.0
Inrush current (A) 1 AC	8.9	8.9
3 AC	10.5	10.5

14.1 Technical data of the converter

Article No. 6SL5□10-1BB		10-1AF0	10-2AF0
Fuse according to IEC		3NA3804 (4 A) 3NW6304-1 (4 A)	3NA3804 (4 A) 3NW6304-1 (4 A)
Fuse according to UL, Class J		3 A	3 A
Leakage current (mA)	1 AC	19.0	19.0
	3 AC	24.0	24.0
Outline dimensions (W x H x D, mm)		40 x 170 x 135	40 x 170 x 135
Weight (g)	S200 PN	763.0	809.6
	S200 Basic PN	763.0	763.0

Table 14-4 Specific technical data of the 200 V converters FSB

Article No. 6SL5□10-1BB		10-4AF0
Frame size		FSB
Rated input current (A)	1 AC	3.0
	3 AC	1.8
Rated output current (A)		2.4
Maximum output current (A)		9.2
Maximum supported motor power (kW)		0.4
Power loss (W)		24.0
Inrush current (A)	1 AC	8.4
	3 AC	8.5
Fuse according to IEC		3NA3801 (6 A) 3NW6301-1 (6 A)
Fuse according to UL, Class J		6 A
Leakage current (mA)	1 AC	21.0
	3 AC	24.0
Outline dimensions (W x H x D, mm)		40 x 170 x 170
Weight (g)	S200 PN	1028.9
	S200 Basic PN	960.0

Table 14-5 Specific technical data of the 200 V converters FSC

Article No. 6SL5□10-1BB		10-8AF0	11-0AF0
Frame size		FSC	FSC
Rated input current (A)	1 AC	7.0	8.0
	3 AC	3.5	4.0
Rated output current (A)		4.4	4.4
Maximum output current (A)		16.8	16.8
Maximum supported motor power (kW)		0.75	1.0
Power loss (W)		45.0	46.0

14.1 Technical data of the converter

Article No. 6SL5□10-1BB		10-8AF0	11-0AF0
Inrush current (A)	1 AC	6.2	6.2
	3 AC	7.6	7.6
Fuse according to IEC		3NA3805 (16 A) 3NW6006-1 (12 A)	3NA3805 (16 A) 3NW6006-1 (12 A)
Fuse according to UL, Class J		15 A	15 A
Leakage current (mA)	1 AC	20.0	20.0
	3 AC	23.0	23.0
Outline dimensions (W x H x D, mm)		60 x 170 x 195	60 x 170 x 195
Weight (g)	S200 PN	1741.4	1741.4
	S200 Basic PN	1741.4	1741.4

14.1.4 Specific data of the 400 V converters

Technical data

Table 14-6 Specific technical data of the 400 V converters FSA

Article No. 6SL5510-1BE		10-2AF0	10-4AF0
Frame size		FSA	FSA
Rated input current (A)		1.3	1.3
Rated output current (A)		1.3	1.3
Maximum output current (A)		5.1	6.0
Maximum supported motor power (kW)		0.2	0.4
Power loss (W)		31.0	32.0
Inrush current (A)		8.0	8.0
Fuse according to IEC		3NA3804 (4 A) 3NW6304-1 (4 A)	3NA3804 (4 A) 3NW6304-1 (4 A)
Fuse according to UL, Class J		3 A	3 A
Leakage current (mA)		36.0	36.0
Outline dimensions (W x H x D, mm)		50 x 180 x 200	50 x 180 x 200
Weight (g)		1517.5	1517.5

Table 14-7 Specific technical data of the 400 V converters FSB

Article No. 6SL5510-1BE		10-8AF0	11-0AF0
Frame size		FSB	FSB
Rated input current (A)		2.5	3.0
Rated output current (A)		2.5	3.0
Maximum output current (A)		9.3	11.5
Maximum supported motor power (kW)		0.75	1.0

14.1 Technical data of the converter

Article No. 6SL5510-1BE	10-8AF0	11-0AF0
Power loss (W)	46.0	54.0
Inrush current (A)	10.0	10.0
Fuse according to IEC	3NA3803 (10 A) 3NW6303-1 (10 A)	3NA3803 (10 A) 3NW6303-1 (10 A)
Fuse according to UL, Class J	10 A	10 A
Leakage current (mA)	39.0	39.0
Outline dimensions (W x H x D, mm)	60 x 180 x 200	60 x 180 x 200
Weight (g)	1912.4	1912.4

Table 14-8 Specific technical data of the 400 V converters FSC

Article No. 6SL5510-1BE	11-5AF0	12-5AF0
Frame size	FSC	FSC
Rated input current (A)	5.5	8.0
Rated output current (A)	5.3	7.8
Maximum output current (A)	20.0	26.5
Maximum supported motor power (kW)	1.75	2.5
Power loss (W)	84.0	123.0
Inrush current (A)	23.0	23.0
Fuse according to IEC	3NA3805 (16 A) 3NW6006-1 (12 A)	3NA3805 (16 A) 3NW6305-1 (16 A)
Fuse according to UL, Class J	15 A	20 A
Leakage current (mA)	46.0	46.0
Outline dimensions (W x H x D, mm)	70 x 180 x 200	70 x 180 x 200
Weight (g)	2008.4	2008.4

Table 14-9 Specific technical data of the 400 V converters FSD

Article No. 6SL5510-1BE	13-5AF0	15-0AF0	17-0AF0
Frame size	FSD	FSD	FSD
Rated input current (A)	11.0	13.0	14.2
Rated output current (A)	11.0	12.6	13.2
Maximum output current (A)	38.1	38.8	37.4
Maximum supported motor power (kW)	3.5	5.0	7.0
Power loss (W)	171.0	194.0	205.0
Inrush current (A)	53.0	53.0	53.0
Fuse according to IEC	3NA3807 (20 A) 3NW6307-1 (20 A)	3NA3807 (20 A) 3NW6007-1 (20 A)	3NA3810 (25 A) 3NW6010-1 (25 A)
Fuse according to UL, Class J	25 A	25 A	25 A
Leakage current (mA)	60.0	60.0	60.0

14.1 Technical data of the converter

Article No. 6SL5510-1BE	13-5AF0	15-0AF0	17-0AF0
Outline dimensions (W x H x D, mm)	95 x 260 x 230	95 x 260 x 230	95 x 260 x 230
Weight (g)	4517.5	4517.5	4517.5

14.1.5 Overload capacity

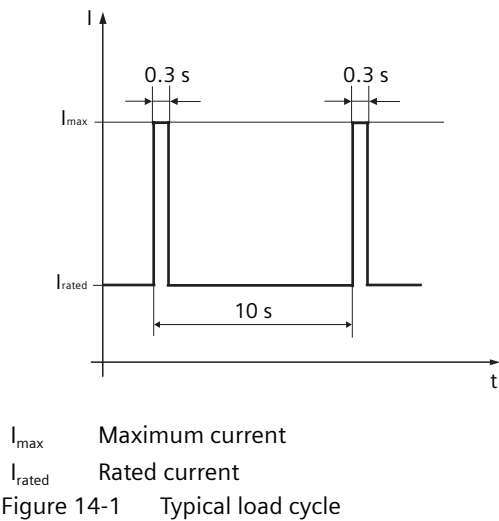
Description

Note

The following description applies to converters with an FS code ≥ 12 . You can find the FS code on the rating plate of the converter.

SINAMICS S200 converter product line can work with a certain overload capacity for a specific time period.

- 350% overload capacity: for 200 V and 400 V variants with a power rating of 0.1 kW to 0.75 kW
- 300% overload capacity: for 200 V and 400 V variants with a power rating of 1 kW to 7 kW



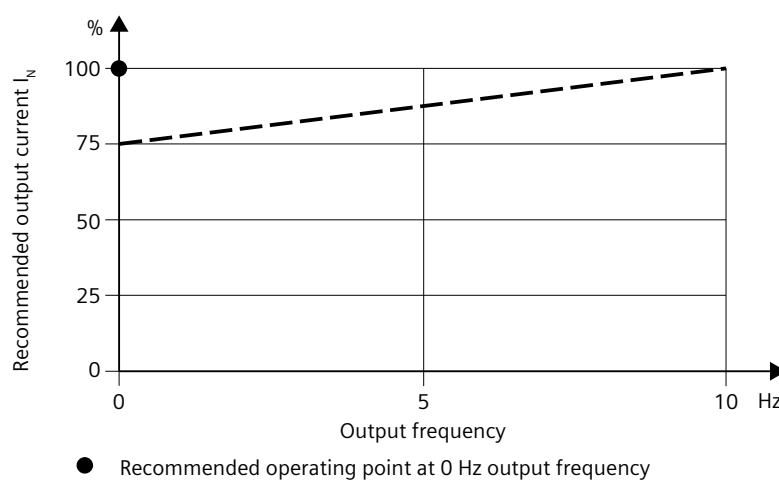


Figure 14-2 Recommended output current at low frequencies

A current derating is only applicable for output frequencies < 10 Hz. The current derating at 0 Hz output frequency may vary for different power ratings.

A current derating must be taken into account if the percentage time of operation at frequencies < 10 Hz is more than 2 % of the total daily operating time.

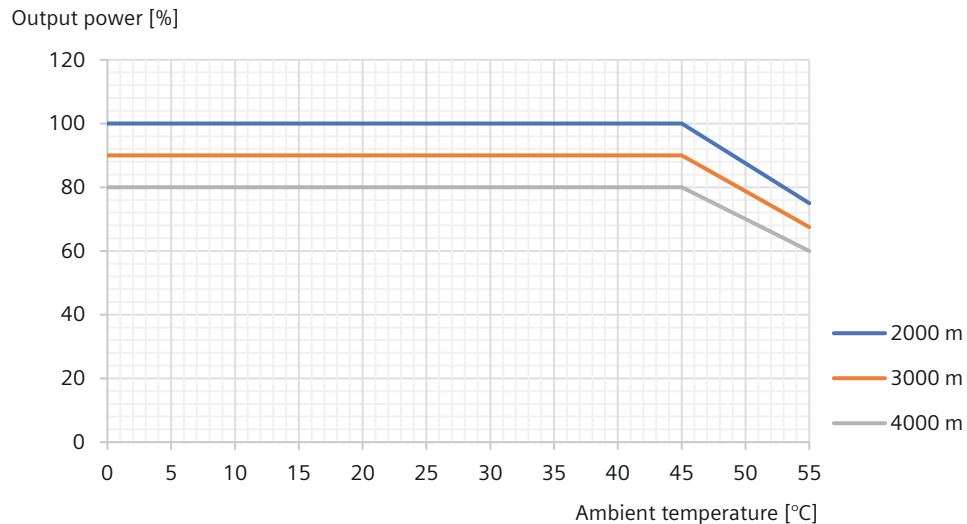
The current specified here must also not be exceeded during load cycles.

When quickly passing through frequencies 0 to 10 Hz, derating can be ignored (e.g. for positioning applications).

14.1.6 Power derating as a function of the installation altitude and ambient temperature

Description

Power derating as a function of the installation altitude and ambient temperature



Note

A maximum of 2000 m is permissible for CSA compliance.

14.1.7 Protection of persons 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.

Requirement

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 μT (RMS) for the assessment of active implants.
According to Directive 2013/35/EU, 500 μT (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-compliant installation (Page 102)").

Description

The converters are normally used in machines. The assessment and testing is based on DIN EN 12198-1 and IEC 62311.

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 14-10 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 (approximately 35 cm)	Must be separately assessed depending on the active implant.	

14.2 Technical data of the motor

14.2.1 Permissible environmental conditions for the motor

Technical data

Table 14-11 Environmental conditions for transport

Environmental conditions for transport in the transport packaging according to Class 2K3 to IEC 60721-3-2:1997, except for environmental variables "air temperature" and "condensation"	
Climatic environmental conditions	<ul style="list-style-type: none"> • Temperature: -15 °C ... +70 °C • Highest relative humidity: < 90% at 30 °C, condensation not permissible
Mechanical environmental conditions	Vibrations permissible according to Class 2M5 to IEC 60721-3-2:1997 Vibration: <ul style="list-style-type: none"> • 2 Hz ... 9 Hz: 7.5 mm displacement amplitude • 9 Hz ... 200 Hz: 2 g acceleration amplitude

14.2 Technical data of the motor

Environmental conditions for transport in the transport packaging according to Class 2K3 to IEC 60721-3-2:1997, except for environmental variables "air temperature" and "condensation"

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

Table 14-12 Environmental conditions for long-term storage

Environmental conditions for long-term storage in the product packaging according to Class 1K3 to IEC 60721-3-1:1997, except for environmental variables "air temperature", "highest relative humidity" and "condensation"

Climatic environmental conditions	<ul style="list-style-type: none"> Temperature: -20 °C ... +65 °C Highest relative humidity: < 90% at 30 °C, 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 to IEC 60721-3-1:1997
Biological environmental conditions	Suitable according to Class 1B2 to IEC 60721-3-1:1997
Duration	<ul style="list-style-type: none"> Six months for the above-mentioned conditions. Special preservation measures are required for storage periods of six months up to a maximum of two years. <p>For more information, please contact your local sales partner.</p>

Table 14-13 Environmental conditions during operation

Environmental conditions during operation according to 3K4 to IEC 60721-3-3:2002, 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 get additional information in Section "Derating factors (Page 616)".
Climatic environmental conditions ¹⁾	<ul style="list-style-type: none"> Temperature: -15 °C ... +40 °C, power derating at higher temperatures Relative humidity: < 90% at 30 °C, condensation not permissible Absolute air humidity: 1 g/m³ ... 29 g/m³ Rate of temperature change²⁾: 0.5°C/min Atmospheric pressure: 89 kPa^{1) 3)} ... 106 kPa⁴⁾ Solar radiation: 700 W/m² ²⁾ Movement of the air: 1.0 m/s Water (other than rain): see Section "Degree of protection (Page 618)"
Mechanical environmental conditions	<ul style="list-style-type: none"> Vibration severity grade: A (according to IEC 60034-14:2018) Shock resistance (m/s²): <ul style="list-style-type: none"> 1FL2102, 1FL2□03, 1FL2104, 1FL2204, 1FL2□05: 50 (continuous in axial direction), 50 (continuous in radial direction), 300 (in a short time of 11 ms) 1FL23□□: 25 (continuous in axial direction), 50 (continuous in radial direction), 300 (in a short time of 11 ms)
Protection against chemical substances	Protected according to 3C2 to IEC 60721-3-3:2002
Biological environmental conditions	Suitable according to 3B2 to IEC 60721-3-3:2002

Environmental conditions during operation according to 3K4 to IEC 60721-3-3:2002, except for environmental variables "low air temperature", "condensation" and "low air pressure"

Pollution	Suitable for environments with degree of pollution 2 according to IEC 61800-5-1
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Cooling air	Clean and dry air
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The motors are not suitable for operation under the following circumstances:

- In a vacuum⁵⁾
- In salt-laden or aggressive atmospheres
- Outdoors

- 1) Increased ruggedness with regard to low air temperature and low atmospheric pressure better than 3K3 according to IEC 60721-3-3:2002
- 2) Averaged over a period of 5 min
- 3) The limit value of 89 kPa covers applications at altitudes up to 1000 m.
- 4) Conditions in mines are not considered.
- 5) Operation in a vacuum is not permissible because of the low dielectric strength and poor heat dissipation.

14.2.2 General technical data

Technical data

Table 14-14 General technical data of the motor

Property	Description
Type of motor	Servo motor
Rotor inertia	<ul style="list-style-type: none"> • 1FL21: motor with low rotor inertia • 1FL22: motor with medium rotor inertia • 1FL23: motor with high rotor inertia
Cooling	Natural cooling
Thermal class	<ul style="list-style-type: none"> • 1FL2102, 1FL2□03, 1FL23□□-□AC, 1FL2104-□B, 1FL2204-□B: B • 1FL2104-□A, 1FL2204-□A, 1FL23□□-□AB, 1FL2□05: F
Operating temperature	-15 °C ... +40 °C, power derating at higher temperatures
Relative humidity	< 90% at 30 °C, condensation not permissible
Installation altitude according to IEC 60034-6	≤ 1000 m above sea level; otherwise power derating
Type of construction according to IEC 60034-7	IM B5 (IM V1, IM V3)
Degree of protection according to IEC 60034-5	<ul style="list-style-type: none"> • 1FL2102, 1FL2□03, 1FL2104-□A, 1FL2204-□A: IP54 for the shaft extension (without shaft sealing) and IP65 for the motor body, optionally IP65 for the whole motor (with shaft sealing) • 1FL2104-□B, 1FL2204-□B, 1FL2□05, 1FL23□□: IP65
Temperature monitoring	Thermal motor model
Paint finish	Anthracite (614 Anthrazit)
Shaft extension according to DIN 748-3 and IEC 60072-1	Plain shaft, optionally shaft with feather key (half-key balancing)

14.2 Technical data of the motor

Property	Description
Radial eccentricity, concentricity, and axial eccentricity according to DIN 42955 and IEC 60072-1	Tolerance N (normal)
Vibration severity grade according to IEC 60034-14	Grade A
China energy efficiency grade according to GB 30253-2024	<ul style="list-style-type: none"> 1FL2306-1: Grade 2 Other variants: Grade 1
Sound pressure level L_{pA} (1 m) according to ISO 1680, max. tolerance +3 dB(A)	<ul style="list-style-type: none"> 1FL2102, 1FL2□03, 1FL2104, 1FL2204: 60 dB(A) 1FL2□05, 1FL2304, 1FL2306-□AB: 65 dB(A) 1FL2306-□AC, 1FL2310: 70 dB(A)
Encoder	<ul style="list-style-type: none"> Absolute encoder single-turn, 17-bit Absolute encoder single-turn, 21-bit Absolute encoder, 21-bit single-turn + 12-bit multiturn
Holding brake	Optional integrated holding brake
Connection	<ul style="list-style-type: none"> 1FL2102, 1FL2□03, 1FL2104, 1FL2204: dual-cable connections with a hybrid connector 1FL2□05, 1FL23□□-□AB: two-cable connections with two angular connectors 1FL23□□-□AC: three-cable connections with three angular connectors

14.2.3 Protection against electromagnetic fields (motor)

Description

WARNING

Malfunction of active implants due to magnetic and electrical fields

Electric motors pose a danger to people with active medical implants, e.g. heart pacemakers, who come close to these motors.

- 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).

NOTICE

Damage to the absolute encoder due to the magnetic interference from the magnetic field

The magnetic interference from the magnetic field can cause a damage to the absolute encoder.

- To avoid magnetic interference to the absolute encoder, keep the motor at least 15 mm away from devices that produce a magnetic field stronger than 10 mT.

14.2.4 Cooling

Description

The 1FL2 motor 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 the clearance 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.

Table 14-15 Mounting conditions for non-thermally insulated mounting

Motor	Steel plate: width x height x thickness (mm)
1FL2102	200 x 200 x 6
1FL2□03	250 x 250 x 6
1FL2104	
1FL2204	
1FL2□05	
1FL2304	300 x 300 x 12
1FL2306	270 x 270 x 10
1FL2310	400 x 400 x 20
	550 x 550 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 can find information on this in Section "Derating factors (Page 616)".

Larger mounting surfaces improve heat dissipation.

Thermally insulated mounting without additional mounted components

For naturally cooled motors, you must reduce the S1-characteristic curve as follows:

- Reduce the motor static torque by a range of 20% to 30%.
- Reduce the torque at 3000 r/min by a range of 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 fault 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.

You can find additional information in Section "Parameter list (Page 698)".

14.2.5 Derating factors

Overview

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 or powers by the factors from the following table.

Reduce the torques and powers according to the values determined.

Description

Factors for power derating depending on the installation altitude and the ambient temperature

Table 14-16 Power derating factors

Installation altitude above sea level in m	Ambient temperature in °C					
	30	40	45	50	55	60
1000	1.08	1.00	0.96	0.91	0.87	0.82
2000	1.02	0.93	0.89	0.84	0.79	0.73
3000	0.95	0.86	0.81	0.75	0.70	0.63
4000	0.88	0.77	0.72	0.66	0.59	0.52
5000	0.80	0.68	0.62	0.55	0.47	0.37

Calculating the reduced characteristic curve

$$M_{S1\text{ red}}(n) = x_d \cdot M_{S1}(n / x_d)$$

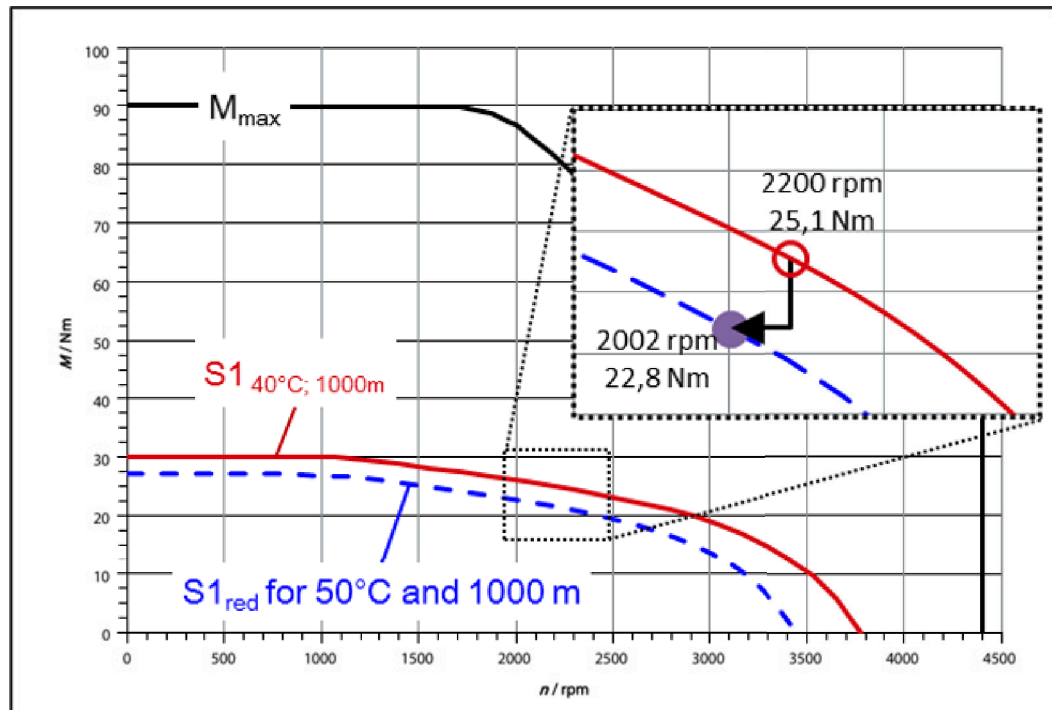
$M_{S1\text{ red}}$ Reduced motor torque for S1 operation at the required installation altitude and ambient temperature

M_{S1} Motor torque for S1 operation at ambient temperature of 40 °C and 1000 m above sea level

n Motor speed

x_d Derating factor from the table above

Graphic display of the derating factors



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 14-17 Limit values for the DC link voltage for 1FL2 motors at installation altitudes below 2000 m mean sea level

Motors with the following rated speed in the article number 1FL2□□□-□□X□□..., X =	Max. permissible converter DC link voltage in V
G	375
C, F	720

Table 14-18 Typical DC link voltage of the SINAMICS converters

Network	Infeed	DC link voltage in V
1 AC 200 V	Non-regulated	230
1 AC 240 V	Non-regulated	276
3 AC 200 V	Non-regulated	270
3 AC 240 V	Non-regulated	324

14.2 Technical data of the motor

Network	Infeed	DC link voltage in V
3 AC 380 V	Non-regulated	513
3 AC 480 V	Non-regulated	648

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 Section "Technical data and characteristics of the 1FL2 (Page 635)".

14.2.6 Degree of protection

Overview

The degree of protection of a motor is marked, for example, using "IP65".

The motor degree of protection is classified according to IEC 60034-5.

IP = International Protection

1st digit = protection against the ingress of foreign bodies

2nd digit = protection against water

IEC 60034-5 is valid for water as potentially occurring medium, not for oil or other creeping fluids.

Configure the motor in the required degree of protection.

Description

Table 14-19 Degree of protection of 1FL2

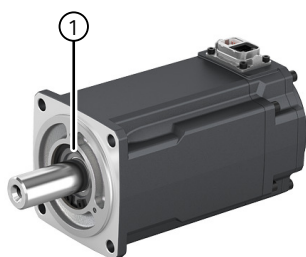
Motor	IP54	IP65
1FL2102	X	X
1FL2□03		
1FL2104-□A		
1FL2204-□A		
1FL2104-□B	-	X
1FL2204-□B		
1FL2□05		
1FL23□□		

Note

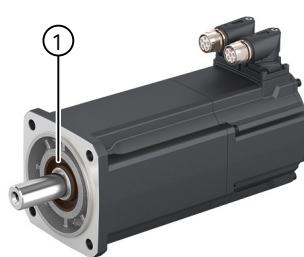
For 1FL2 motors SH20/SH30 with IP54, you can install a shaft sealing ring to upgrade the degree of protection from IP54 to IP65.

To order a shaft sealing ring, see Section "IP65 degree of protection kit for 1FL2 motors SH20 and SH30 (Page 78)".

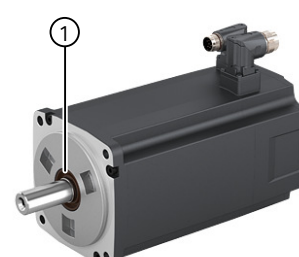
To install a shaft sealing ring, see Section "Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30 (Page 936)".



1FL2102



1FL2□05



1FL23□□

1FL2□03

1FL2104

1FL2204

① Radial shaft sealing ring

The radial shaft sealing ring shortens the length of shaft extension that can be used.

Note

The radial shaft sealing ring should be used with sufficient lubricant oil splashed on it. Do not use a motor with a radial shaft sealing ring submerged in oil.

It is permissible that the radial shaft sealing ring runs dry for a short time.

With degrees of protection IP65, it is not permissible for liquid to collect on the flange.

The service life of the radial shaft sealing ring is approximately 5000 operating hours.

More information

For more information, see Section "Shaft extension (Page 621)".

14.2.7 Balancing

Description

The motors are balanced according to IEC 60034-14.

Motors with feather key in the shaft are half-key balanced.

A mass equalization for the protruding half key must be taken into account for the output elements.

14.2.8 Vibrational behavior

Description

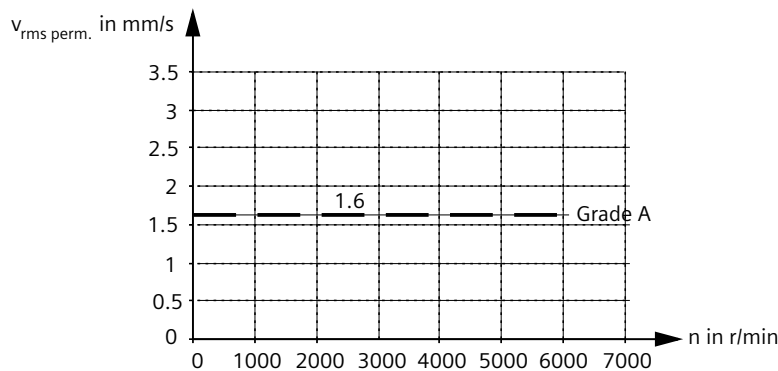
Vibration severity grade

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 IEC 60034-14:2018.

The specified values refer only to the motor. The conditions at the installation location can influence the system vibration response and increase the vibration values on the motor.

The vibration severity grade is maintained up to the rated speed (n_N).



Vibration response

Comply with the vibration values in the following tables to ensure perfect functioning of the motor and a long service life.

Table 14-20 Vibration values for motors with low or medium inertia

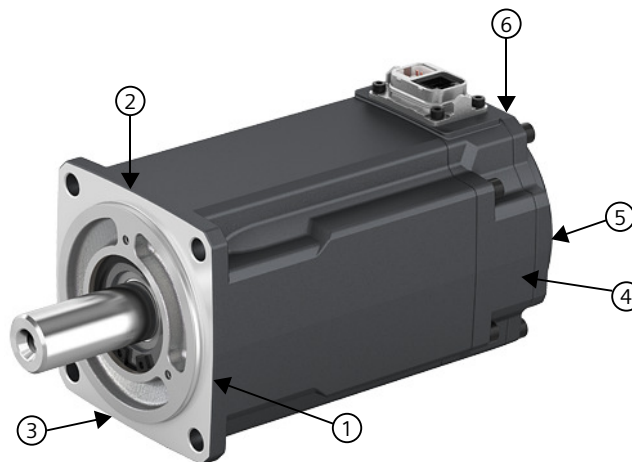
Vibration velocity V_{rms} to ISO 10816	Vibration acceleration a_{peak} axial	Vibration acceleration a_{peak} radial
Max. 4.5 mm/s	50 m/s ²	50 m/s ²

Table 14-21 Vibration values for motors with high inertia

Vibration velocity V_{rms} to ISO 10816	Vibration acceleration a_{peak} axial	Vibration acceleration a_{peak} radial
Max. 4.5 mm/s	25 m/s ²	50 m/s ²

To evaluate the vibration velocity, the measuring equipment must meet the requirements of ISO 2954.

Select the measuring locations according to ISO 10816-1, Section 3.2. See the illustration below for more information on the measuring points.



- | | | | |
|---|----------------------|---|-----------------------|
| ① | End shield DE radial | ④ | End shield NDE radial |
| ② | End shield DE radial | ⑤ | End shield NDE axial |
| ③ | End shield DE axial | ⑥ | End shield NDE radial |

The vibration acceleration is evaluated in the frequency range from 10 Hz to 2000 Hz. The maximum peak in the measurement time range is considered.

The vibration values must not exceed the specified limits at any measuring location.

14.2.9 Shaft extension

Technical data

The motors are supplied with cylindrical shaft extensions. The shaft extension usually has a centering thread according to DIN 332, form DR.

Optionally, a shaft extension with key slot and feather key is available.

14.2 Technical data of the motor

With motors 1FL2102, 1FL2□03, 1FL2104-□A, and 1FL2204-□A, the usable shaft extension is reduced by the radial shaft sealing ring with the IP65 degree of protection.

Table 14-22 Dimension values

Motor	Shaft dimensions with IP54 Diameter x length in mm	Shaft dimensions with IP65 Diameter x length in mm	Feather key Width x height x length in mm	Centering thread
1FL2102	8 (h6) × 22.5	8 (h6) × 18.2	3 × 3 × 16	M3
1FL2□03	14 (h6) × 27	14 (h6) × 21	5 × 5 × 16	M5
1FL2104-□A 1FL2204-□A	19 (h6) × 37	19 (h6) × 32	6 × 6 × 25	M6
1FL2104-□B 1FL2204-□B	-	19 (h6) × 37	6 × 6 × 25	M6
1FL2105	-	19 (h6) × 42	6 × 6 × 25	M6
1FL2205	-	19 (h6) × 37	6 × 6 × 25	M6
1FL2304	-	19 (h6) × 30	6 × 6 × 25	M6
1FL2306	-	22 (h6) × 50.5	8 × 7 × 44	M8
1FL2310	-	35 (h6) × 75.5	10 × 8 × 60	M12

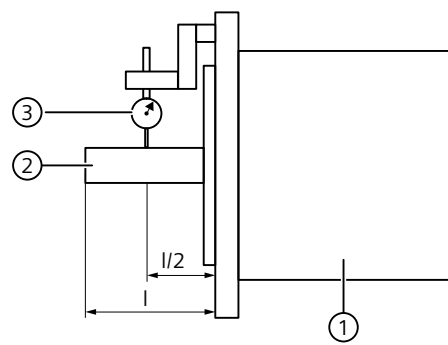
14.2.10 Radial eccentricity, concentricity, and axial eccentricity

Technical data

The shaft and flange accuracies for the 1FL2 motors are implemented according to DIN 42955 and IEC 60072-1 as standard (Normal class).

Table 14-23 Radial eccentricity tolerance of the shaft to the frame axis (referring to cylindrical shaft extensions)

Motor	Standard (Normal class)
1FL2102 1FL2310-3AB	0.03 mm
1FL2□03	0.035 mm
1FL2□04 1FL2□05 1FL2306-□AC	0.04 mm
1FL2306-□AB	0.021 mm
1FL2310-□AC	0.05 mm

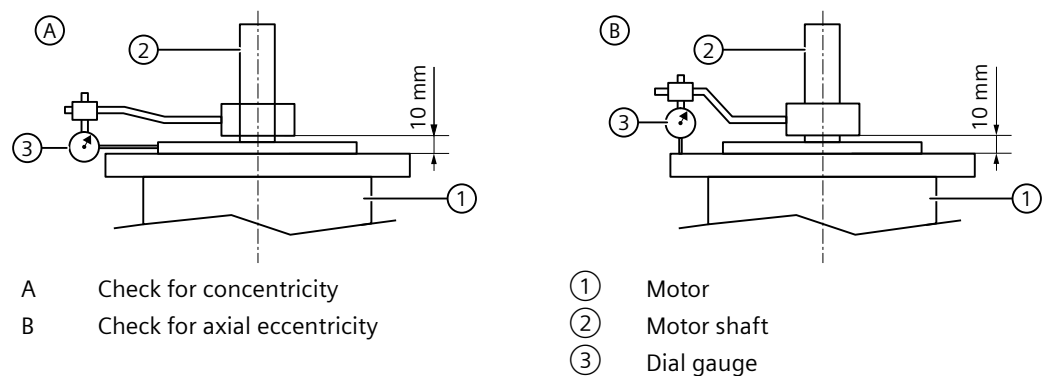


- ① Motor
- ② Motor shaft
- ③ Dial gauge

Figure 14-3 Checking the radial eccentricity

Table 14-24 Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis (referring to the centering diameter of the mounting flange)

Motor	Standard (Normal class)
1FL2102	0.06 mm
1FL2306-□AB	
1FL2310-3AB	
1FL2□03	0.08 mm
1FL2□04	
1FL2□05	
1FL2306-□AC	0.1 mm
1FL2310-□AC	



- A Check for concentricity
- B Check for axial eccentricity

- ① Motor
- ② Motor shaft
- ③ Dial gauge

Figure 14-4 Checking the concentricity and axial eccentricity

14.2.11 Axial and radial forces

14.2.11.1 Permissible axial forces

Technical data

Table 14-25 Permissible axial forces

Type	Axial force, static ¹⁾ $F_{A\text{ stat}} / \text{N}$
1FL2102	50
1FL2□03	98
1FL2104	100
1FL2204	
1FL2□05	120
1FL2304	140
1FL2306	245
1FL2310	590

¹⁾ The specified axial forces are determined by the spring loading and therefore also apply to motors with holding brake.

Note

Applications with an angular toothed pinion directly on the motor shaft are not permitted if the permissible axial forces are exceeded.

14.2.11.2 Permissible radial forces

Description

As a result of the bearing arrangement, the 1FL2 is designed for aligned forces. Forces such as these occur for belt drives, for example.

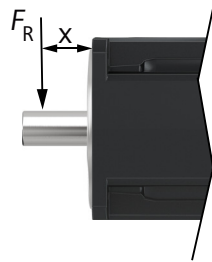
All radial forces always refer to aligned forces.

NOTICE

Motor damage caused by circulating forces

Circulating forces can cause bearing motion, and therefore damage the motor.

- Avoid rotating forces.



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 14-5 Point of application of radial forces F_R 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 service life (L10h) of 20000 h.

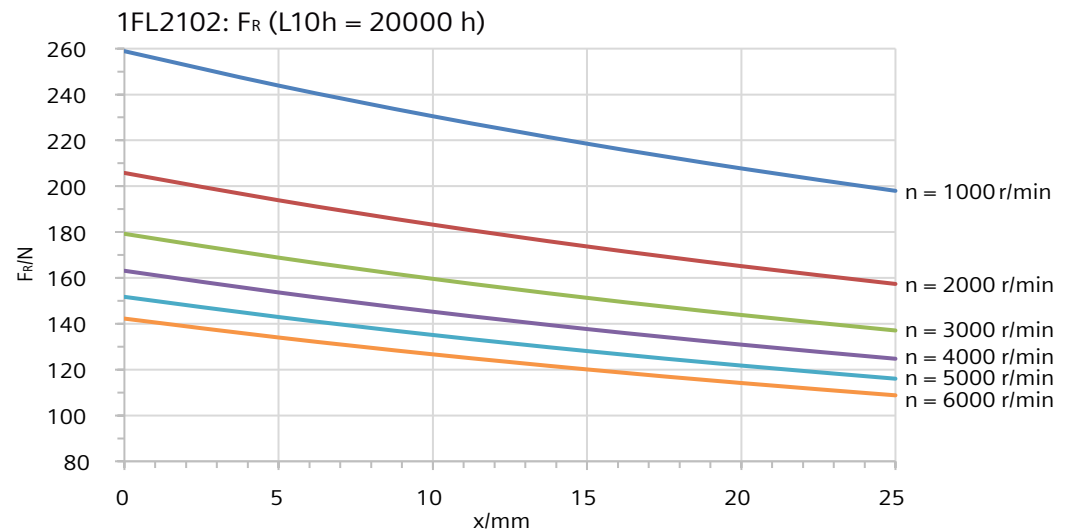


Figure 14-6 Radial force diagram 1FL2102

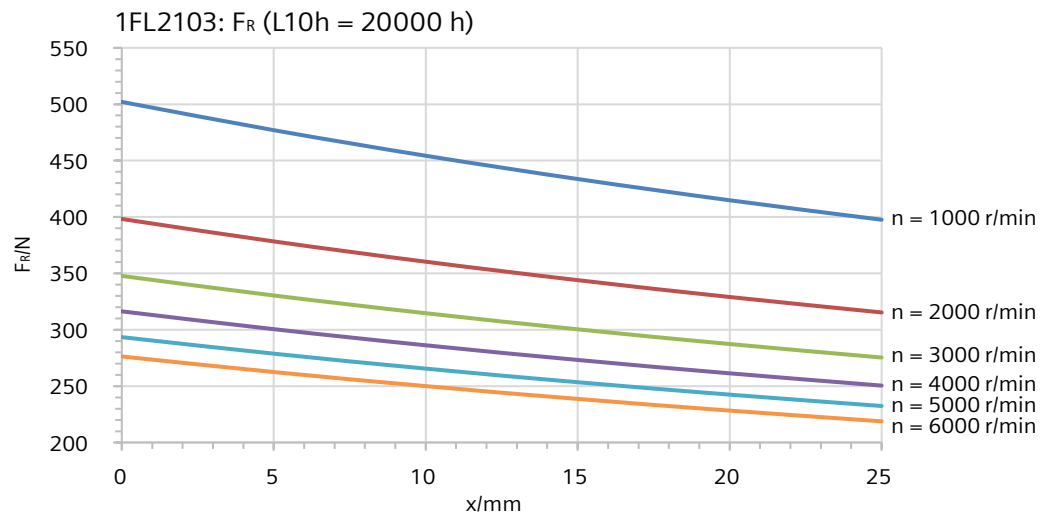


Figure 14-7 Radial force diagram 1FL2103

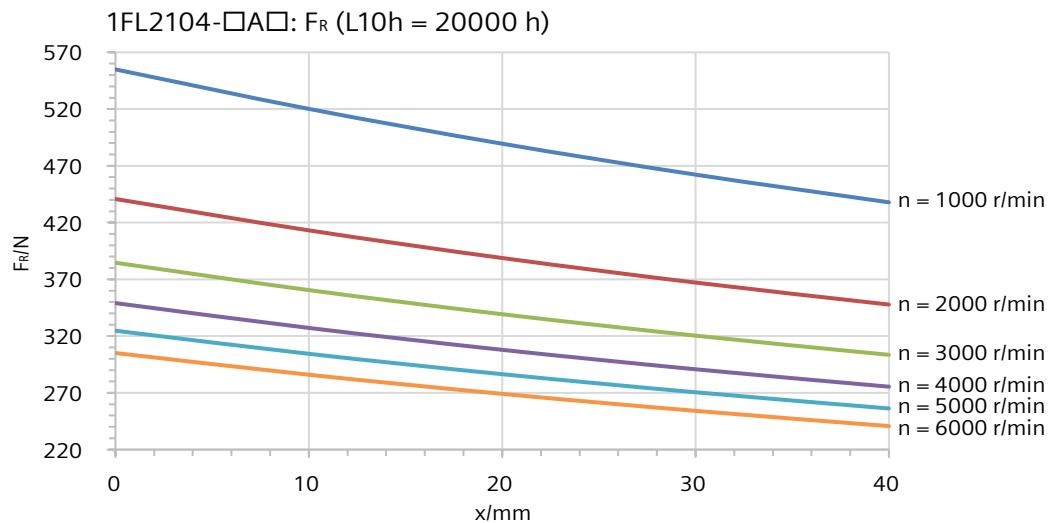


Figure 14-8 Radial force diagram 1FL2104-□A□

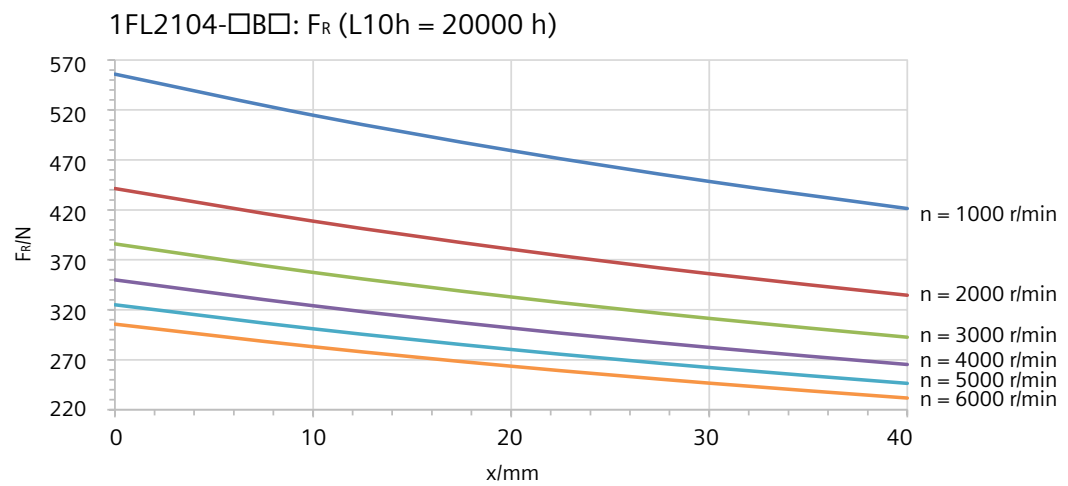


Figure 14-9 Radial force diagram 1FL2104-□B□

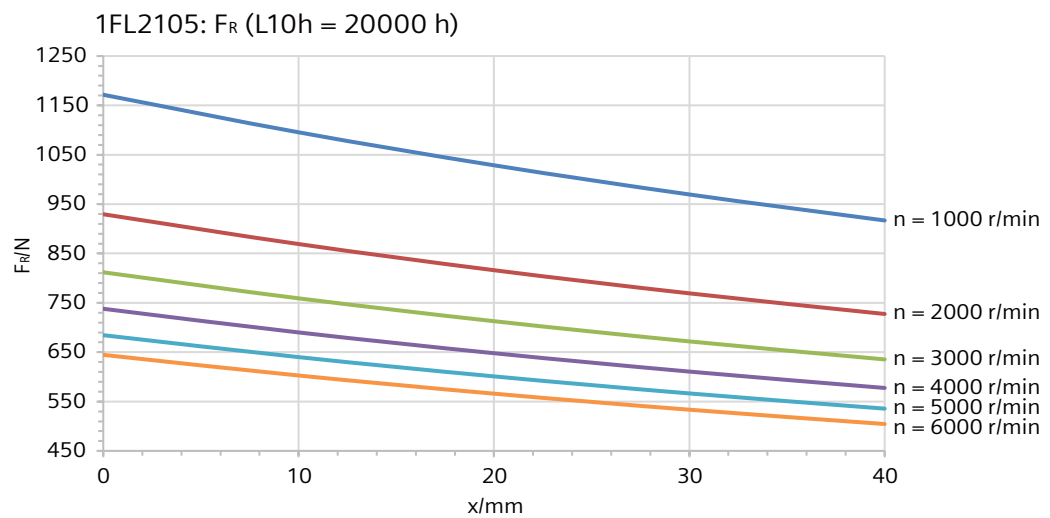


Figure 14-10 Radial force diagram 1FL2105

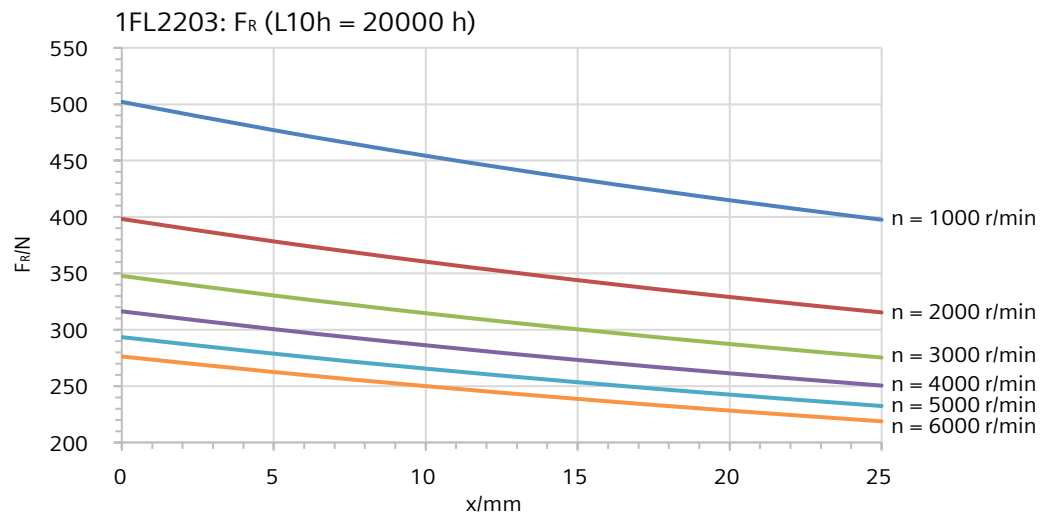


Figure 14-11 Radial force diagram 1FL2203

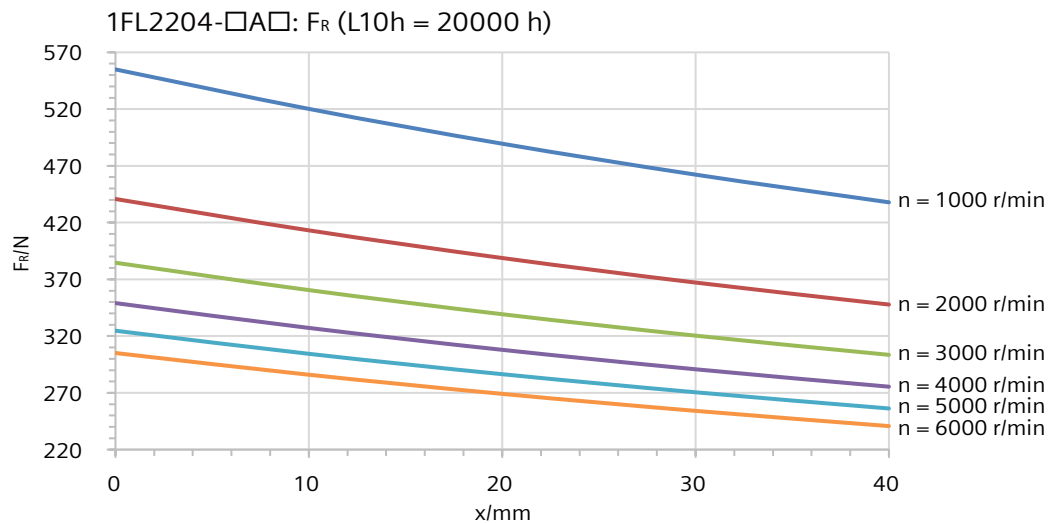


Figure 14-12 Radial force diagram 1FL2204-□A□

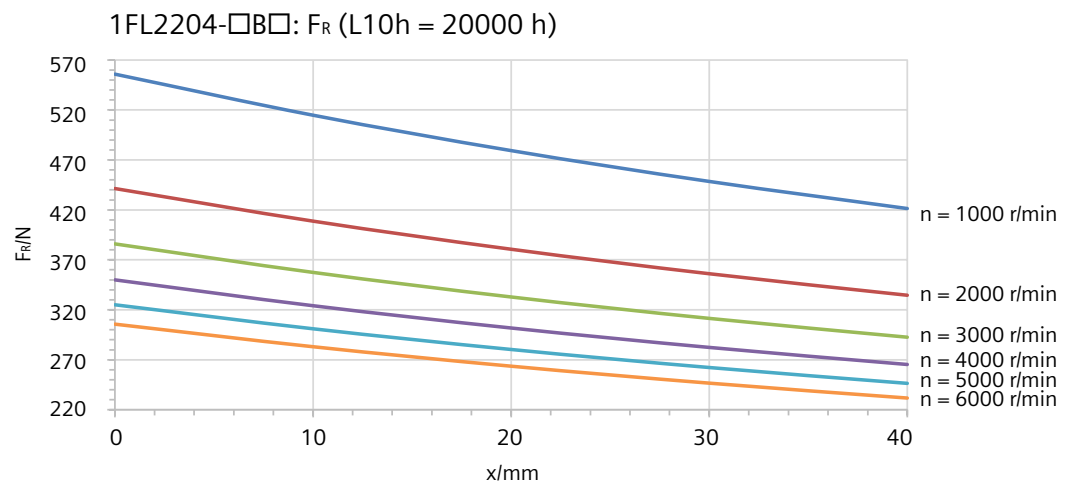


Figure 14-13 Radial force diagram 1FL2204-□B□

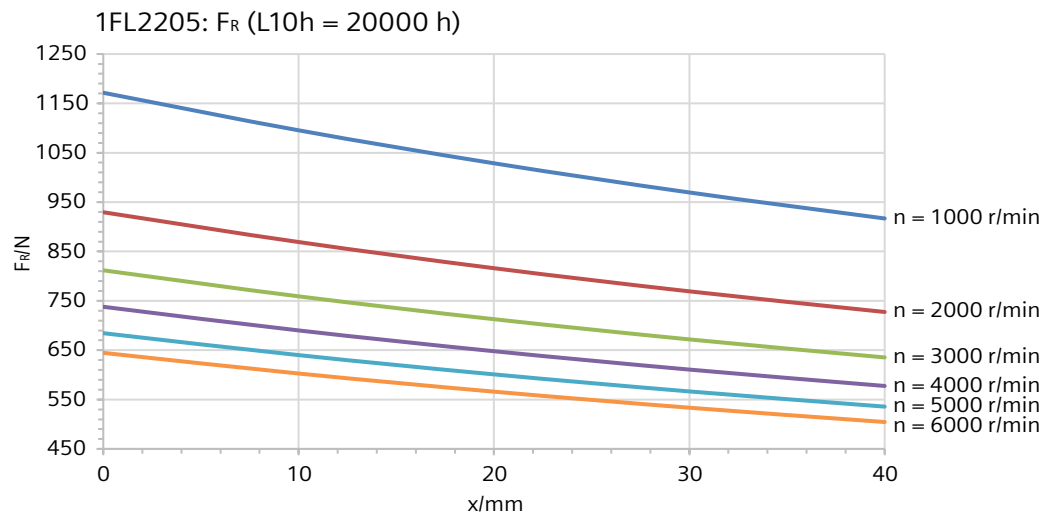


Figure 14-14 Radial force diagram 1FL2205

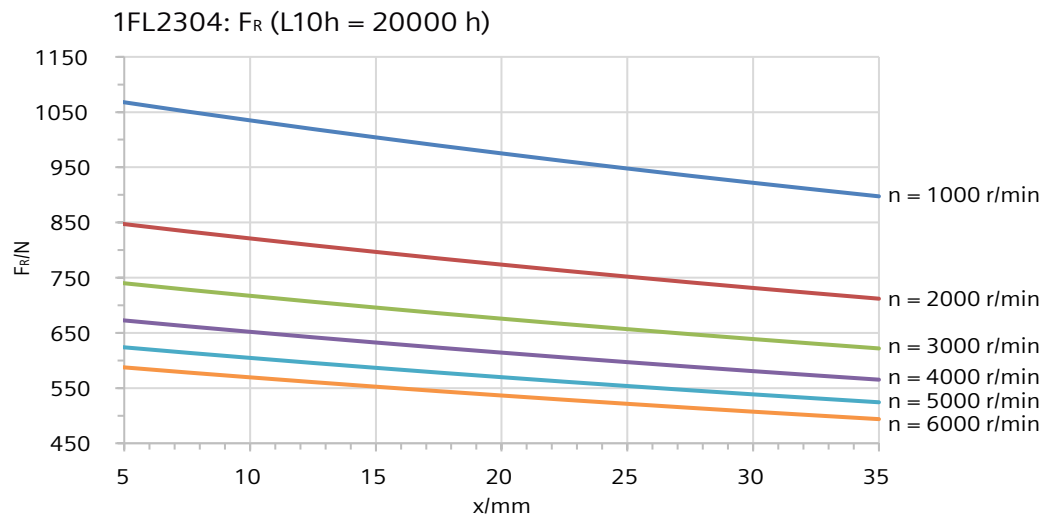


Figure 14-15 Radial force diagram 1FL2304

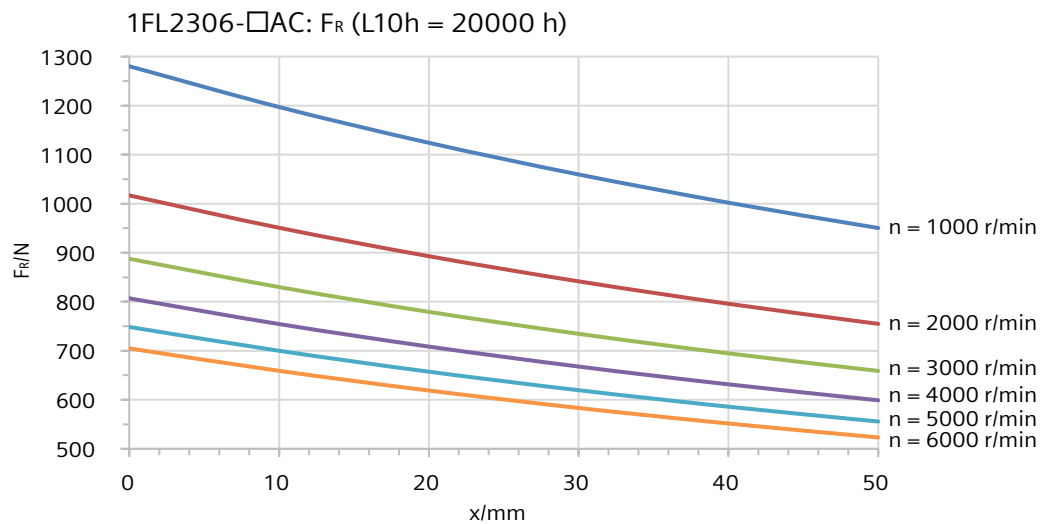


Figure 14-16 Radial force diagram 1FL2306-□AC

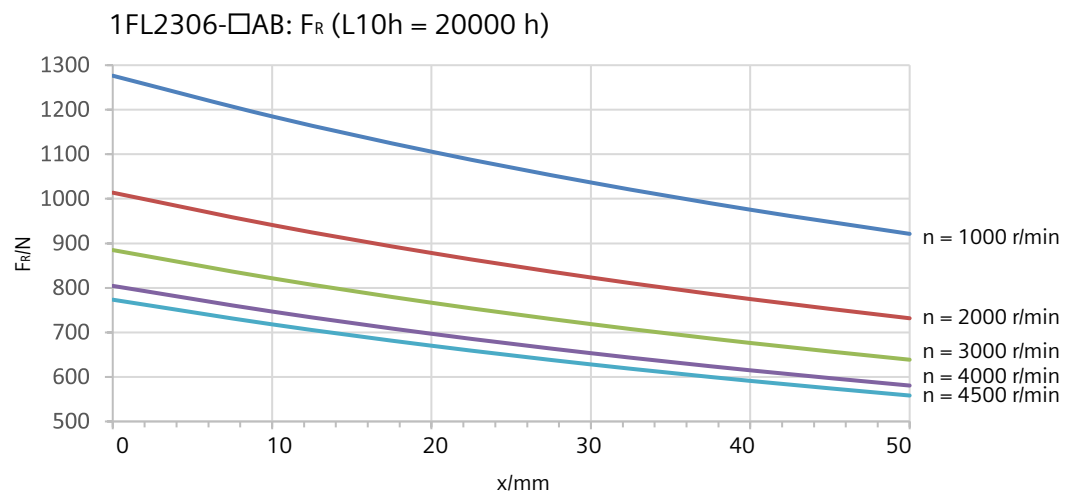


Figure 14-17 Radial force diagram 1FL2306-□AB

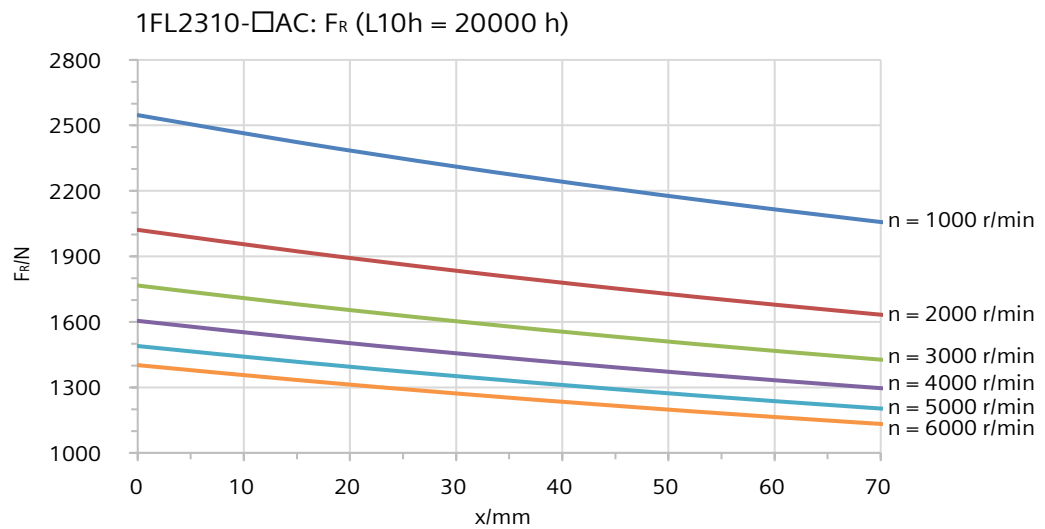


Figure 14-18 Radial force diagram 1FL2310-□AC

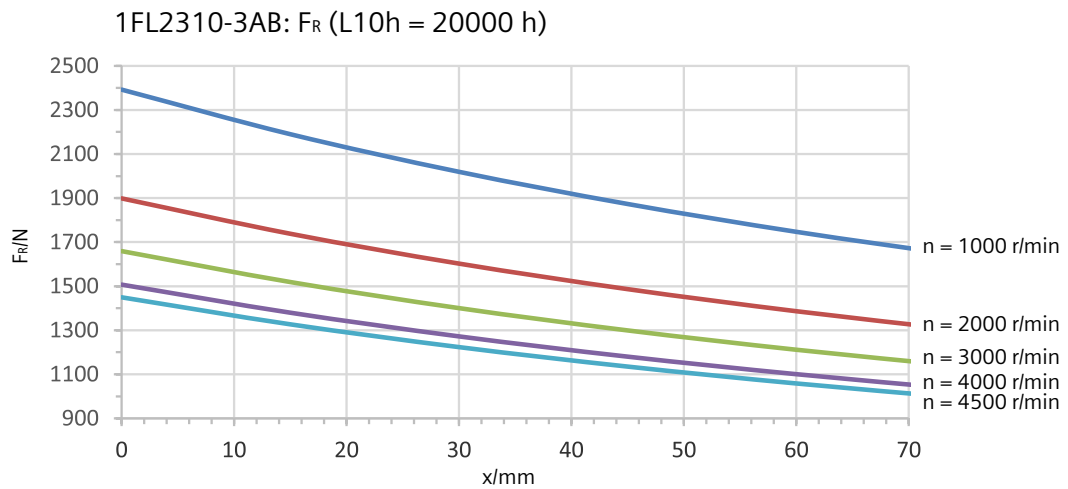


Figure 14-19 Radial force diagram 1FL2310-3AB

14.2.12 Available encoders

Technical data

Table 14-26 Encoders that can be ordered for the 1FL2

	Absolute encoder single-turn, 17-bit	Absolute encoder single-turn, 21-bit	Absolute encoder, 21-bit single-turn + 12-bit multiturn
14th position in the Article No. of the motor	H	S	M
Resolution	131072 = 17-bit	2097152 = 21-bit	2097152 = 21-bit
Absolute position	One revolution	One revolution	4096 revolutions (12-bit)
Angle error	$\pm 120''$	$\pm 120''$	$\pm 120''$

14.2.13 Brake data

14.2.13.1 Overview of the 1FL2 holding brake

Description

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 five million switching cycles.

Limited EMERGENCY STOP operation is permissible. Take into account the maximum permissible single operating energy as well as total operating energy (service life) of the brake.

**WARNING****Unintentional movements through inadequate braking effect**

If you use the holding brake incorrectly, for example, 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.

- Observe the permissible number of operating cycles and EMERGENCY STOP properties.
- Operate the motor only in conjunction with an intact brake.
- Avoid repeated brief acceleration of the motor against a holding brake that is still closed.

The holding brakes of the 1FL2 have a torsional backlash of less than 1°.

14.2.13.2 Technical data of the 1FL2 holding brake

Technical data

Table 14-27 Technical data of the holding brake

Motor type	Holding torque	Dynamic braking torque	Opening time	Closing time	Maximum permissible single operating energy ¹⁾	Total operating energy (service life)	Holding current
	M_4 / Nm	M_{1m} / Nm	t_{open_f} / ms	t_{close_f} / ms	W_{max} / J	W_{tot} / kJ	I_h / A
Permanent-magnet brake							
1FL2□05	8	5	90	25	142	284	< 1
Spring-loaded brake							
1FL2102	0.32	-	35	10	1	2	< 1
1FL2□03	1.3	-	60	10	10	20	< 1
1FL2104	3.3	-	110	30	43	86	< 1
1FL2204							
1FL2304	3.5	-	60	45	140	280	< 2
1FL2306-□AC	12	-	180	60	600	1200	< 2
1FL2306-□AB	16.5	-	120	60	1500	674	< 2
1FL2310-□AC	33.4	-	220	115	1100	2200	< 2
1FL2310-3AB	55	-	220	60	6000	1323	< 2

¹⁾ Maximum of three consecutive EMERGENCY STOP procedures. Maximum 25% of all EMERGENCY STOP procedures as high-energy stops with W_{max} .

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 to the state at operating temperature (120 °C).

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.

Opening time t_o and closing time t_{cl} : The delay times that occur when switching the brake t_o and t_{cl} 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 motor still remains in closed-loop control with speed/velocity setpoint "Zero" during closing time t_{cl} . The pulses are only deleted after this.

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 three minutes before you operate the motor again.

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.

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 overexcitation until the brake is released.

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 (see Technical data and characteristics of the 1FL2 (Page 635))
J_{load} / kgm^2	Load moment of inertia of the mounting part on the motor with brake
182.4	Constant for calculating the circular frequency and SI units

14.2.14 Technical data and characteristics of the 1FL2

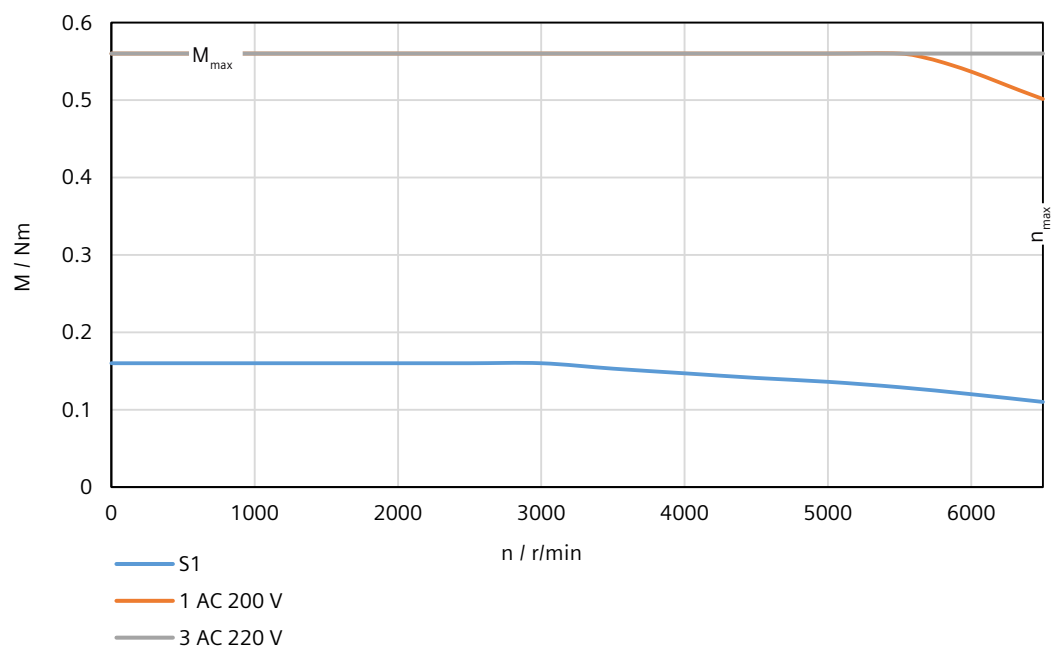
14.2.14.1 1FL2102-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-28 Technical data of 1FL2102-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.16
Stall current	I_0	A	0.81
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	0.56
Maximum current	I_{max}	A	3.1
Thermal time constant	T_{th}	min	6.2
Moment of inertia	J_{mot}	kgcm ²	0.017
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.022
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	0.29
Weight (with brake)	$m_{mot\ br}$	kg	0.46
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.16
Rated current	I_{rated}	A	0.81
Rated power	P_{rated}	kW	0.05

14.2 Technical data of the motor

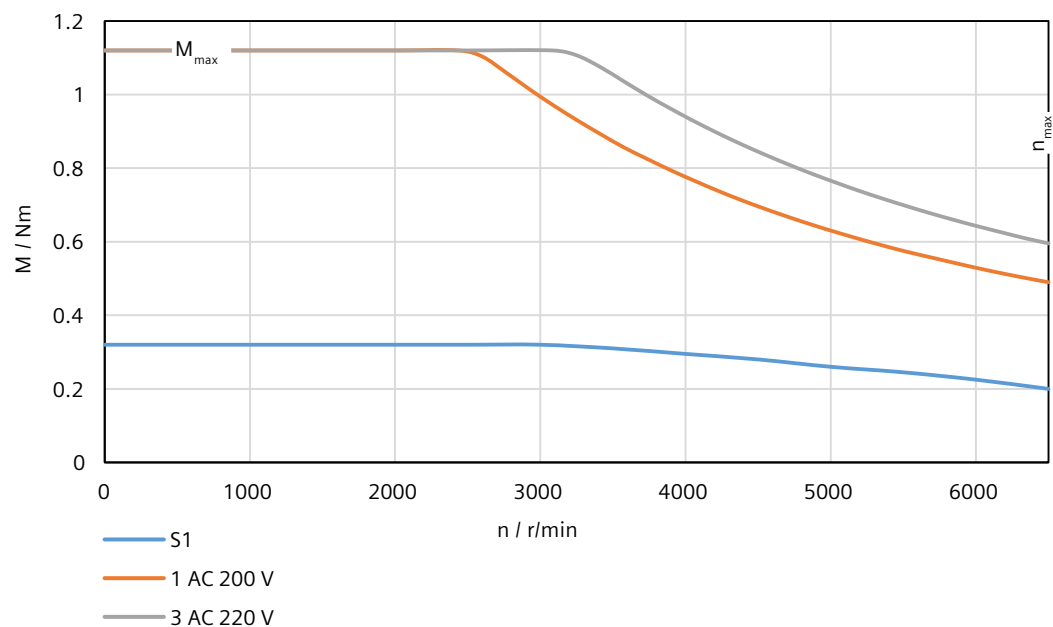


14.2.14.2 1FL2102-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-29 Technical data of 1FL2102-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.32
Stall current	I_0	A	0.76
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	1.12
Maximum current	I_{max}	A	2.95
Thermal time constant	T_{th}	min	6.2
Moment of inertia	J_{mot}	kgcm ²	0.029
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.034
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.39
Weight (with brake)	$m_{mot\ br}$	kg	0.56
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.32
Rated current	I_{rated}	A	0.76
Rated power	P_{rated}	kW	0.1

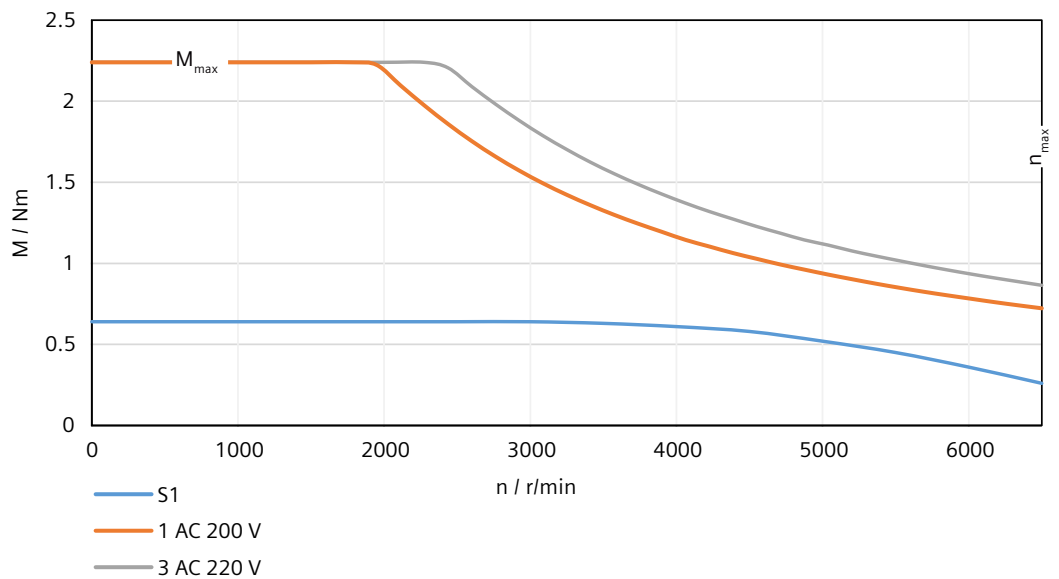


14.2.14.3 1FL2103-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-30 Technical data of 1FL2103-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.28
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	2.24
Maximum current	$I_{\max}$	A	4.8
Thermal time constant	T_{th}	min	10.2
Moment of inertia	J_{mot}	kgcm ²	0.080
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.110
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.79
Weight (with brake)	$m_{\text{mot br}}$	kg	1.14
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.28
Rated power	P_{rated}	kW	0.2

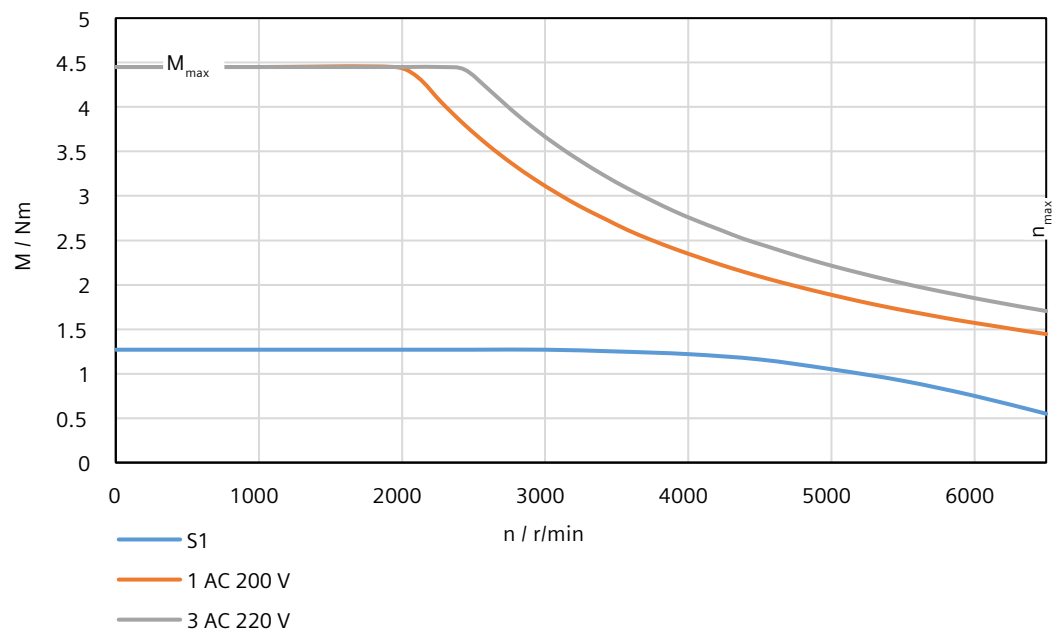


14.2.14.4 1FL2103-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-31 Technical data of 1FL2103-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	4.45
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	13
Moment of inertia	J_{mot}	kgcm ²	0.155
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.185
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	1.16
Weight (with brake)	$m_{mot\ br}$	kg	1.5
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4

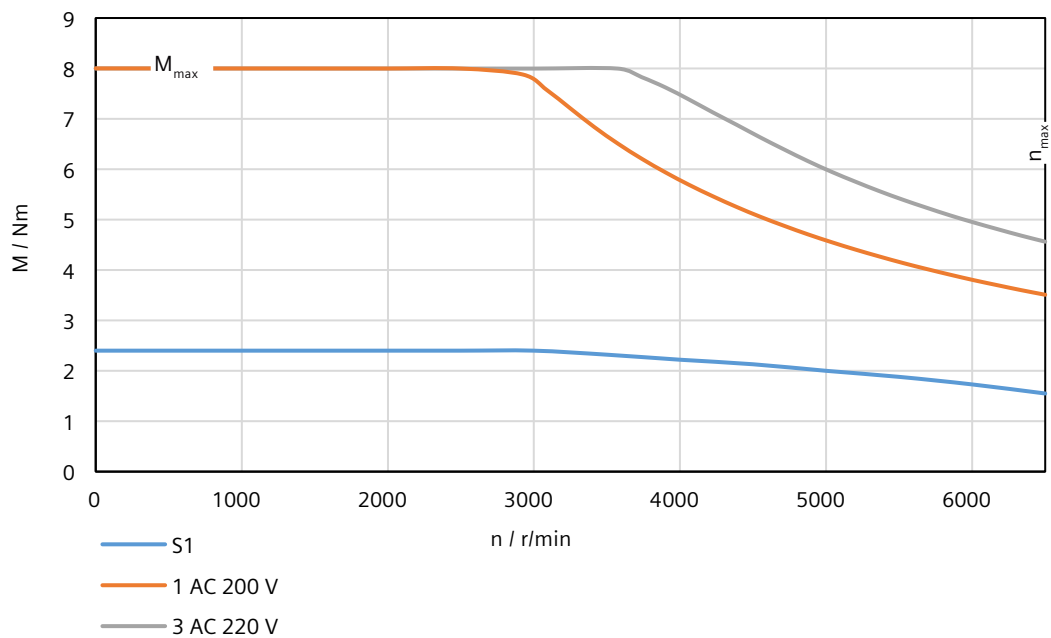


14.2.14.5 1FL2104-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-32 Technical data of 1FL2104-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	8
Maximum current	$I_{\max}$	A	16
Thermal time constant	T_{th}	min	23.4
Moment of inertia	J_{mot}	kgcm ²	0.50
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.58
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.7
Weight (with brake)	$m_{\text{mot br}}$	kg	3.5
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75

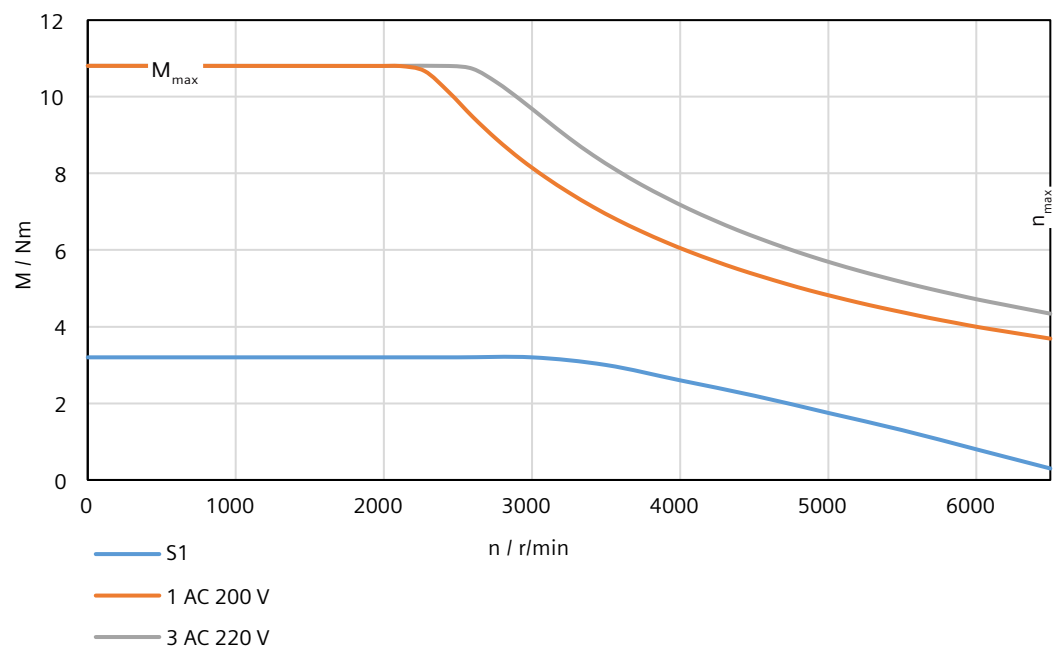


14.2.14.6 1FL2104-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-33 Technical data of 1FL2104-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	29.6
Moment of inertia	J_{mot}	kgcm ²	0.63
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.71
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	3.3
Weight (with brake)	$m_{mot\ br}$	kg	4.1
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	1

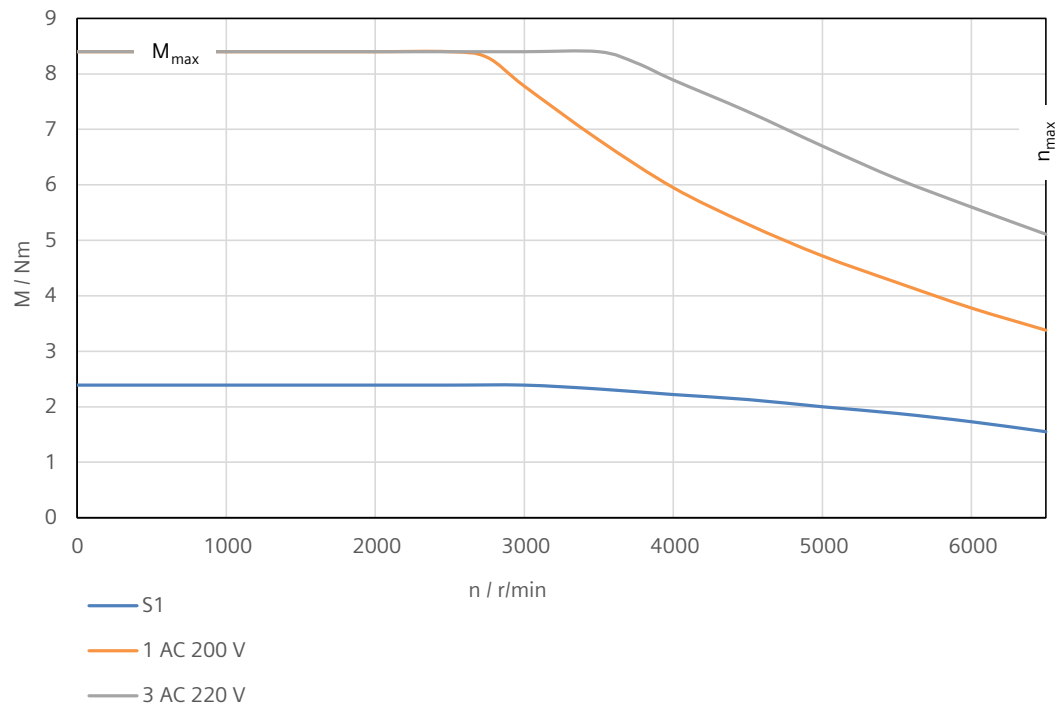


14.2.14.7 1FL2104-2BG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-34 Technical data of 1FL2104-2BG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.2
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	8.4
Maximum current	$I_{\max}$	A	16
Thermal time constant	T_{th}	min	10
Moment of inertia	J_{mot}	kgcm ²	0.67
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.77
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.0
Weight (with brake)	$m_{\text{mot br}}$	kg	2.8
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.2
Rated power	P_{rated}	kW	0.75

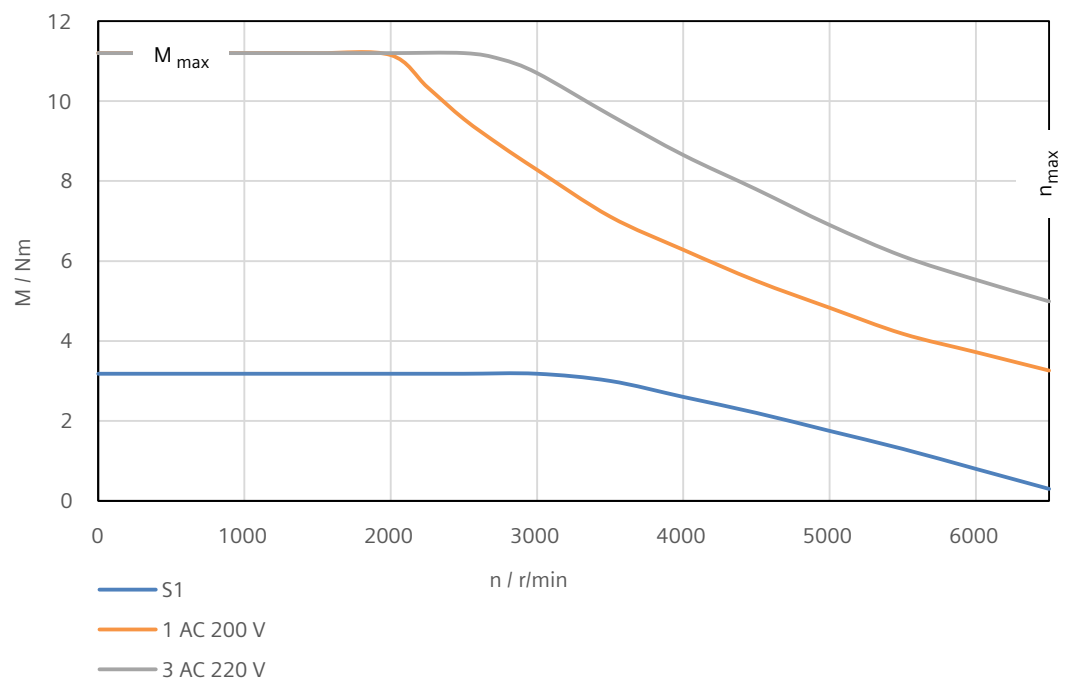


14.2.14.8 1FL2104-4BG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-35 Technical data of 1FL2104-4BG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	11.2
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	12
Moment of inertia	J_{mot}	kgcm ²	0.87
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.97
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.4
Weight (with brake)	$m_{mot\ br}$	kg	3.2
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	1

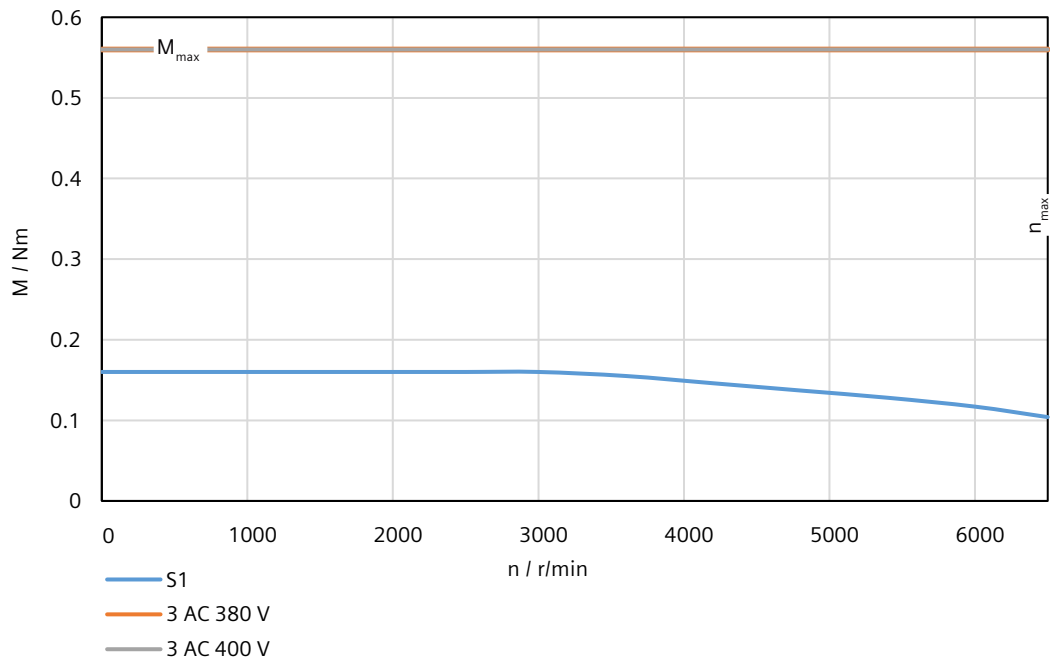


14.2.14.9 1FL2102-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-36 Technical data of 1FL2102-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.16
Stall current	I_0	A	0.84
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	0.56
Maximum current	$I_{\max}$	A	3.4
Thermal time constant	T_{th}	min	4.8
Moment of inertia	J_{mot}	kgcm ²	0.017
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.022
Recommended load to motor inertia ratio	-	-	Maximum 40x
Weight	m_{mot}	kg	0.29
Weight (with brake)	$m_{\text{mot br}}$	kg	0.45
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.16
Rated current	I_{rated}	A	0.84
Rated power	P_{rated}	kW	0.05

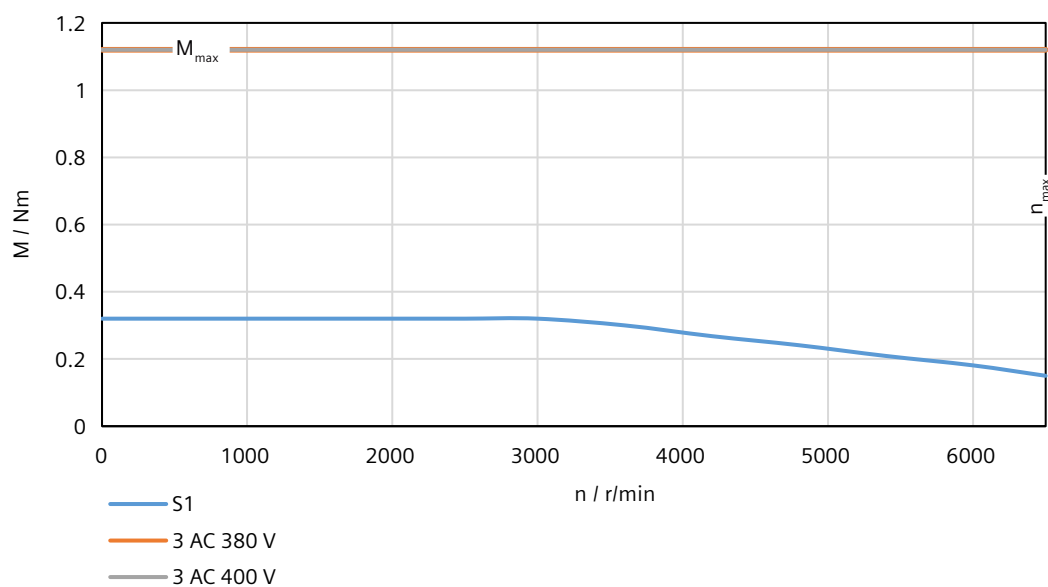


14.2.14.10 1FL2102-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-37 Technical data of 1FL2102-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.32
Stall current	I_0	A	0.81
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	1.12
Maximum current	I_{max}	A	2.9
Thermal time constant	T_{th}	min	4.6
Moment of inertia	J_{mot}	kgcm ²	0.029
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.034
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.38
Weight (with brake)	$m_{mot\ br}$	kg	0.55
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.32
Rated current	I_{rated}	A	0.81
Rated power	P_{rated}	kW	0.1

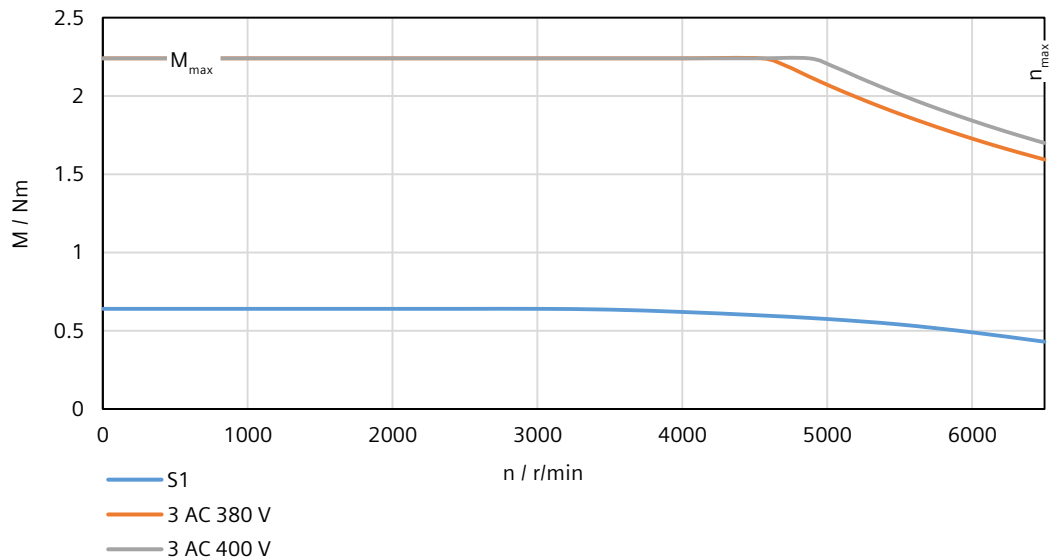


14.2.14.11 1FL2103-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-38 Technical data of 1FL2103-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.3
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	2.24
Maximum current	$I_{\max}$	A	4.8
Thermal time constant	T_{th}	min	8.1
Moment of inertia	J_{mot}	kgcm ²	0.080
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.110
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.78
Weight (with brake)	$m_{\text{mot br}}$	kg	1.12
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.3
Rated power	P_{rated}	kW	0.2

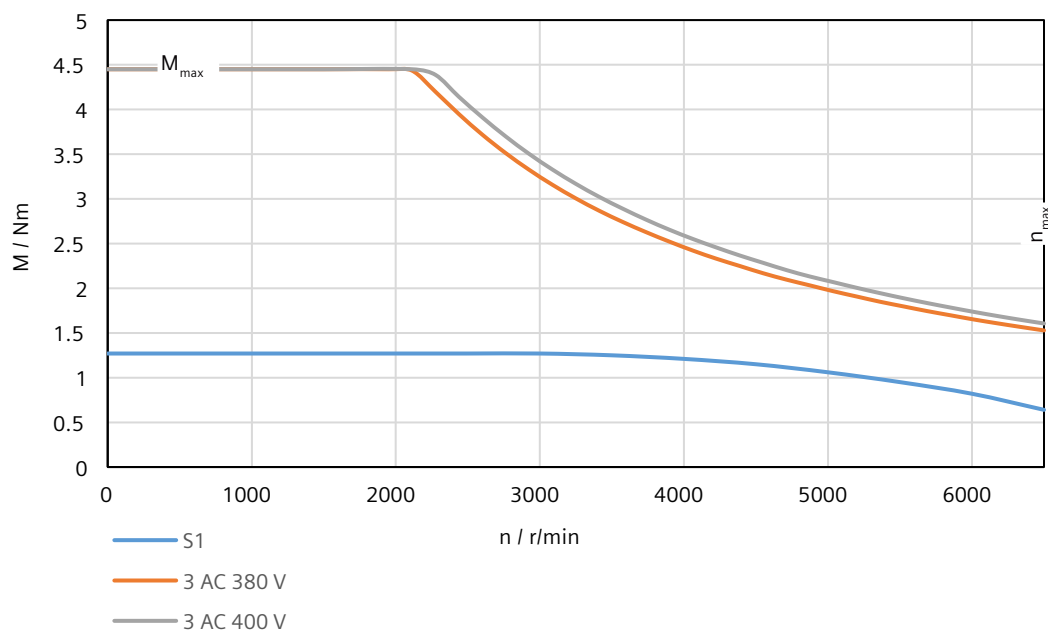


14.2.14.12 1FL2103-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-39 Technical data of 1FL2103-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.3
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	4.45
Maximum current	$I_{\max}$	A	4.8
Thermal time constant	T_{th}	min	9.3
Moment of inertia	J_{mot}	kgcm ²	0.155
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.185
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	1.14
Weight (with brake)	$m_{mot\ br}$	kg	1.49
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	1.3
Rated power	P_{rated}	kW	0.4

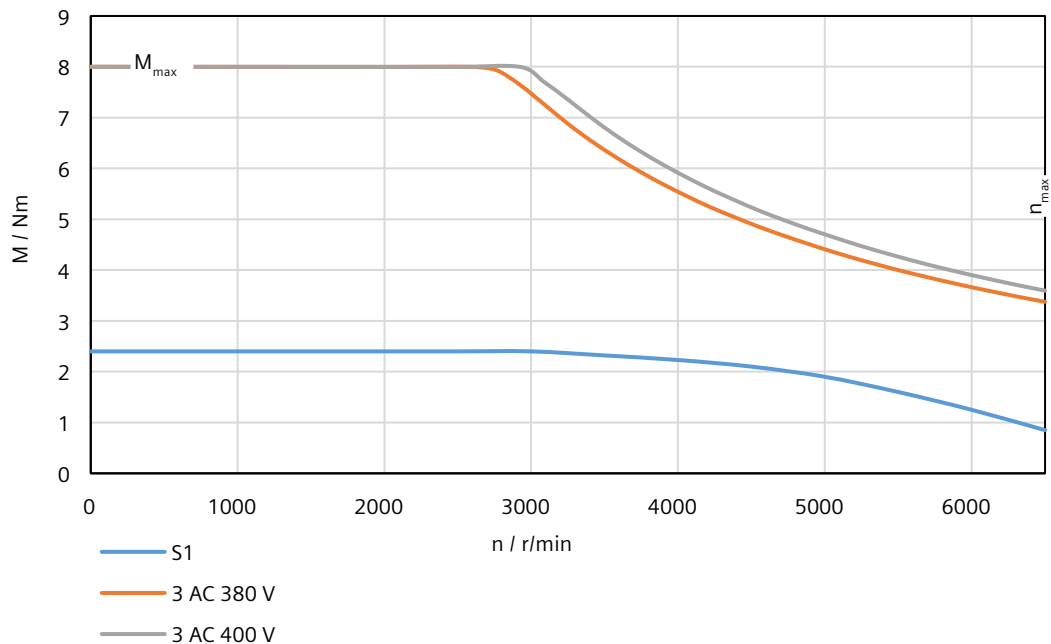


14.2.14.13 1FL2104-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-40 Technical data of 1FL2104-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.1
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	8
Maximum current	$I_{\max}$	A	7.6
Thermal time constant	T_{th}	min	23.3
Moment of inertia	J_{mot}	kgcm ²	0.50
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.58
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.7
Weight (with brake)	$m_{\text{mot br}}$	kg	3.5
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.1
Rated power	P_{rated}	kW	0.75

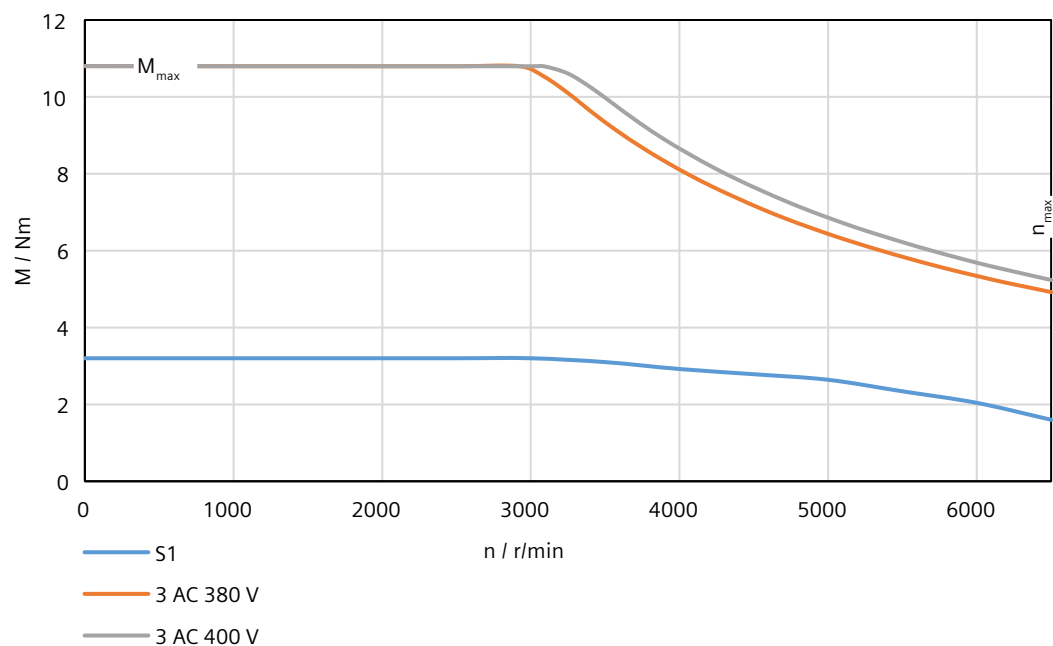


14.2.14.14 1FL2104-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-41 Technical data of 1FL2104-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	10.8
Maximum current	$I_{\max}$	A	10.9
Thermal time constant	T_{th}	min	25.4
Moment of inertia	J_{mot}	kgcm ²	0.63
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.71
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	3.3
Weight (with brake)	$m_{mot\ br}$	kg	4.1
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1

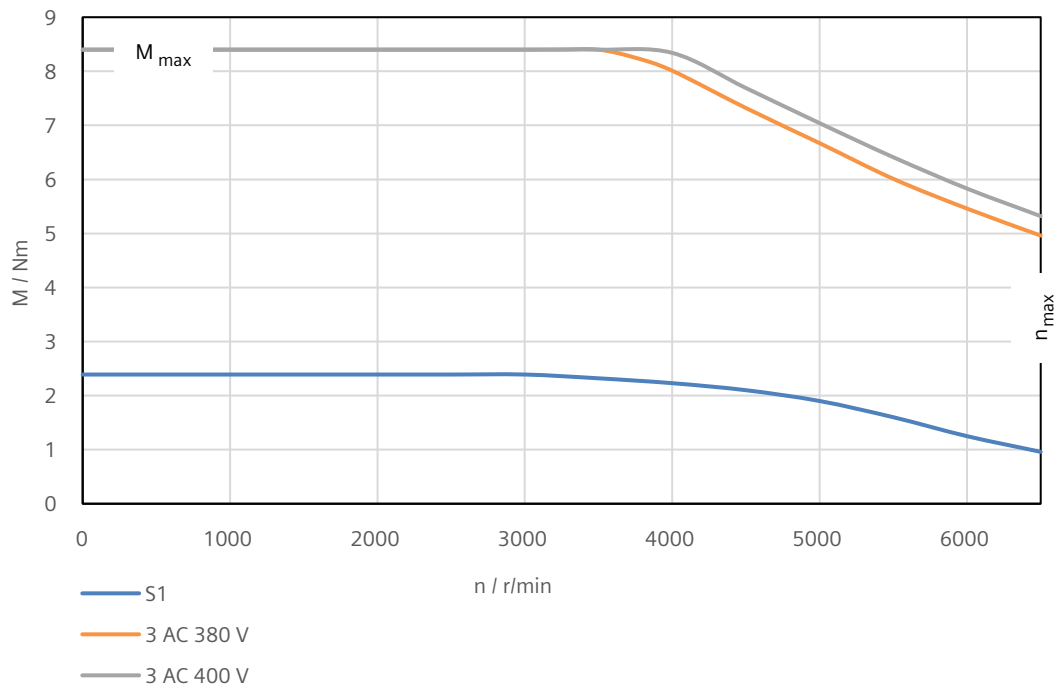


14.2.14.15 1FL2104-2BF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-42 Technical data of 1FL2104-2BF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.4
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	8.4
Maximum current	$I_{\max}$	A	9.3
Thermal time constant	T_{th}	min	10
Moment of inertia	J_{mot}	kgcm ²	0.67
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.77
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.0
Weight (with brake)	$m_{\text{mot br}}$	kg	2.8
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.75

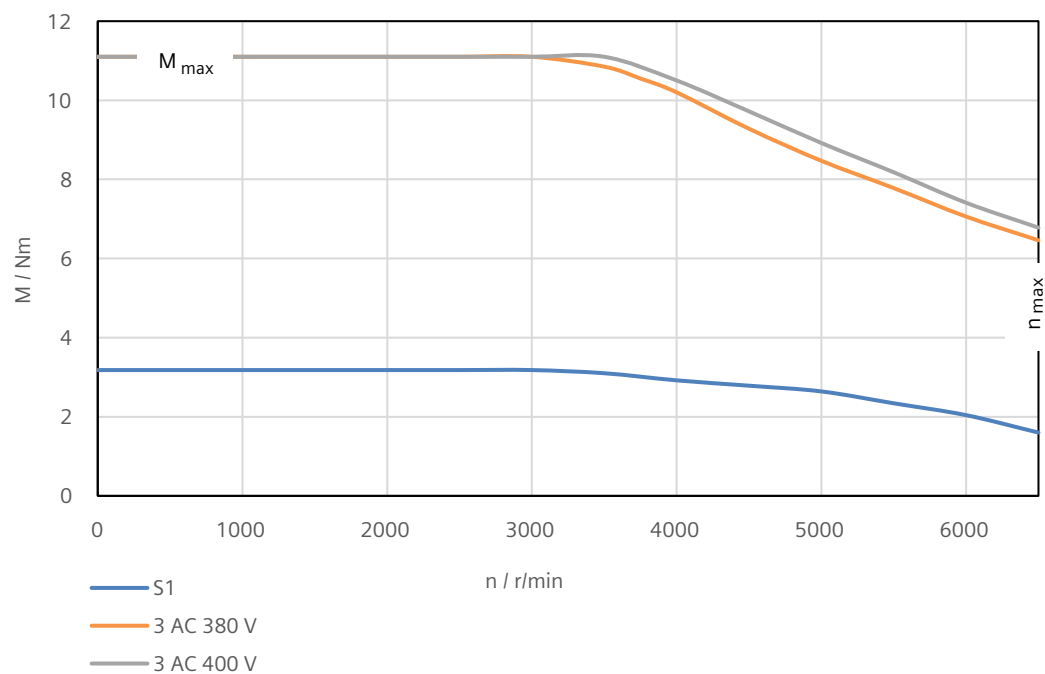


14.2.14.16 1FL2104-4BF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-43 Technical data of 1FL2104-4BF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	11.2
Maximum current	I_{max}	A	10.9
Thermal time constant	T_{th}	min	11
Moment of inertia	J_{mot}	kgcm ²	0.87
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.97
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	2.4
Weight (with brake)	$m_{mot\ br}$	kg	3.2
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1

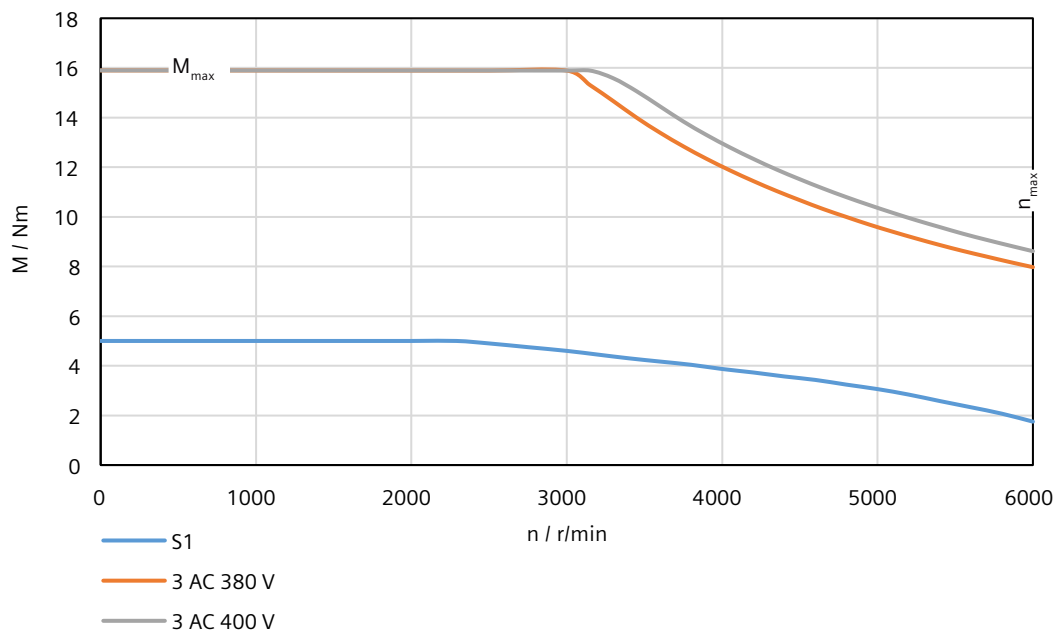


14.2.14.17 1FL2105-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-44 Technical data of 1FL2105-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	5
Stall current	I_0	A	4.65
Maximum permissible speed	$n_{\max}$	r/min	6000
Maximum torque	$M_{\max}$	Nm	15.9
Maximum current	$I_{\max}$	A	18
Thermal time constant	T_{th}	min	37
Moment of inertia	J_{mot}	kgcm ²	1.71
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	2.54
Recommended load to motor inertia ratio	-	-	Maximum 20x
Weight	m_{mot}	kg	5.5
Weight (with brake)	$m_{\text{mot br}}$	kg	6.4
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	4.6
Rated current	I_{rated}	A	4.35
Rated power	P_{rated}	kW	1.45

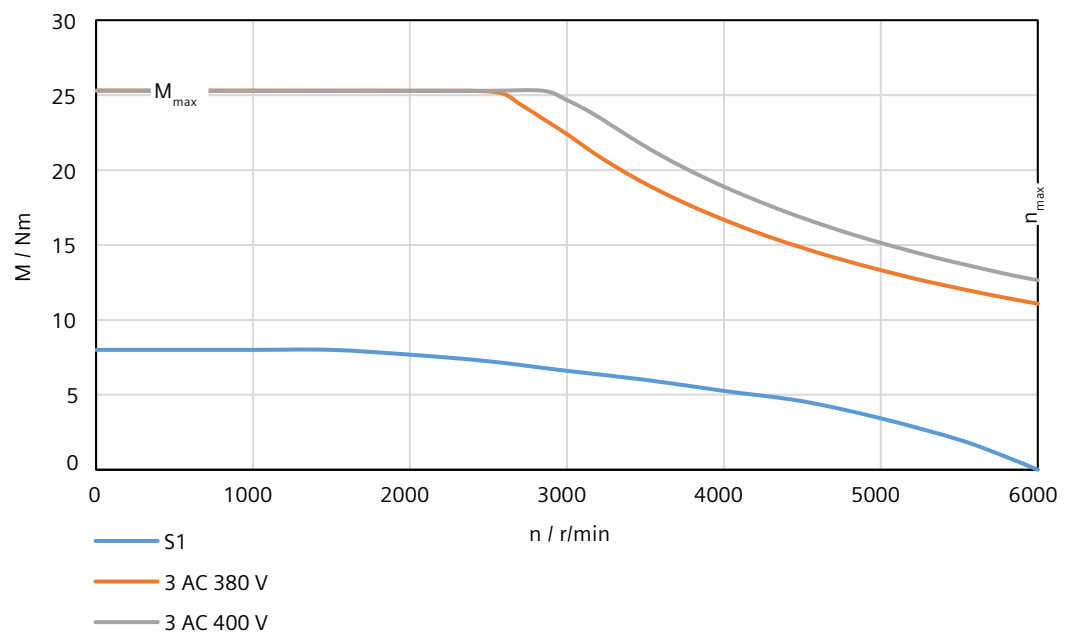


14.2.14.18 1FL2105-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-45 Technical data of 1FL2105-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	8
Stall current	I_0	A	6.7
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	25.3
Maximum current	I_{max}	A	24
Thermal time constant	T_{th}	min	42.9
Moment of inertia	J_{mot}	kgcm ²	2.65
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	3.48
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	7.8
Weight (with brake)	$m_{mot\ br}$	kg	8.7
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	6.6
Rated current	I_{rated}	A	5.6
Rated power	P_{rated}	kW	2.1

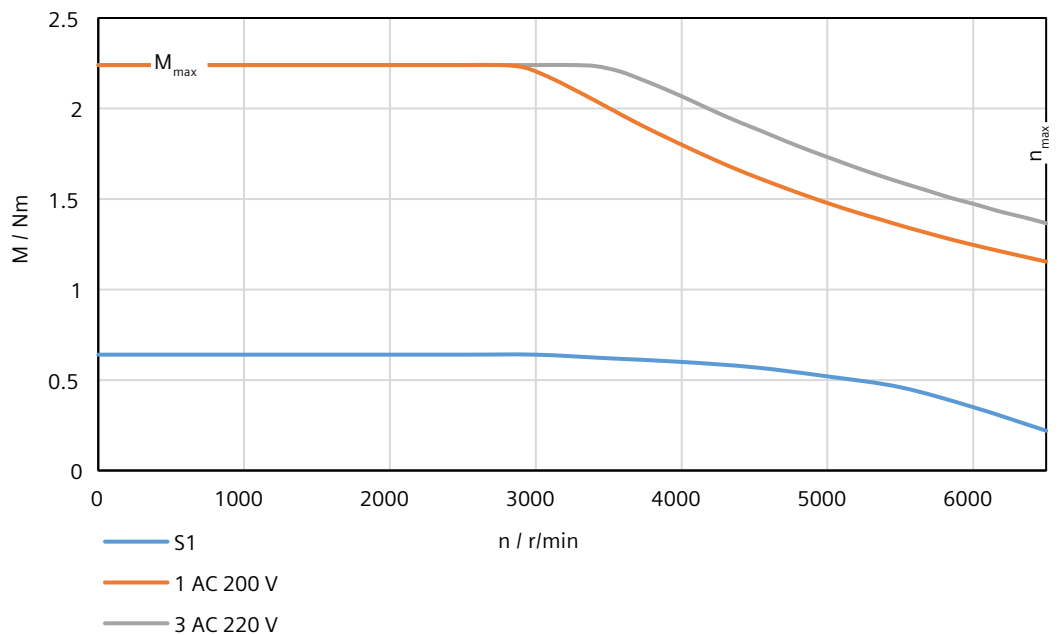


14.2.14.19 1FL2203-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-46 Technical data of 1FL2203-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.33
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	2.24
Maximum current	$I_{\max}$	A	4.8
Thermal time constant	T_{th}	min	11.5
Moment of inertia	J_{mot}	kgcm ²	0.180
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.210
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.76
Weight (with brake)	$m_{\text{mot br}}$	kg	1.11
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.33
Rated power	P_{rated}	kW	0.2

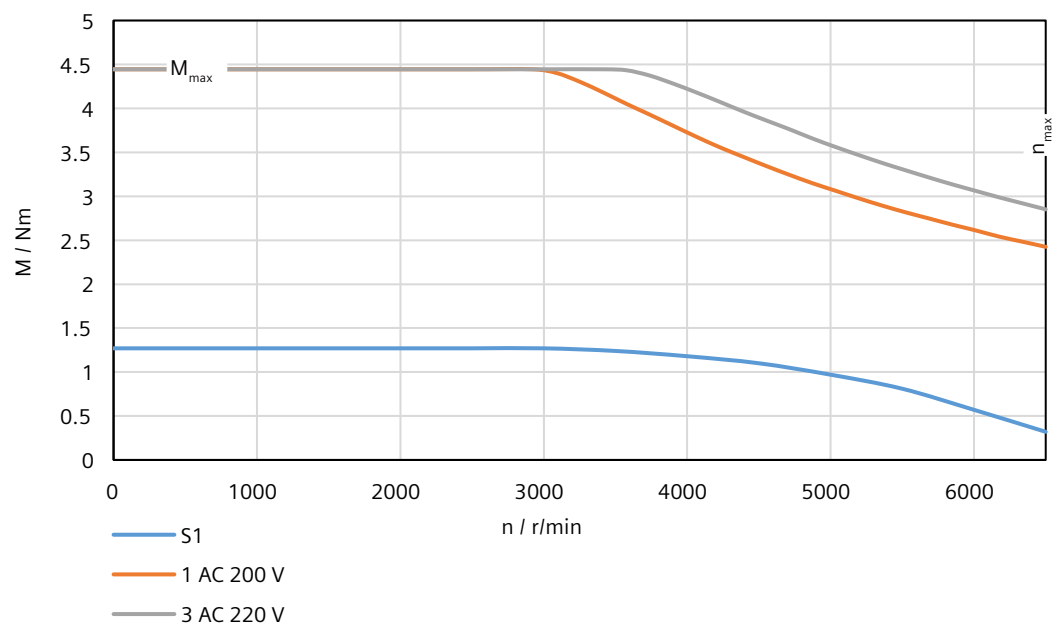


14.2.14.20 1FL2203-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-47 Technical data of 1FL2203-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	4.45
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	12.8
Moment of inertia	J_{mot}	kgcm ²	0.350
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.380
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	1.11
Weight (with brake)	$m_{mot\ br}$	kg	1.46
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4

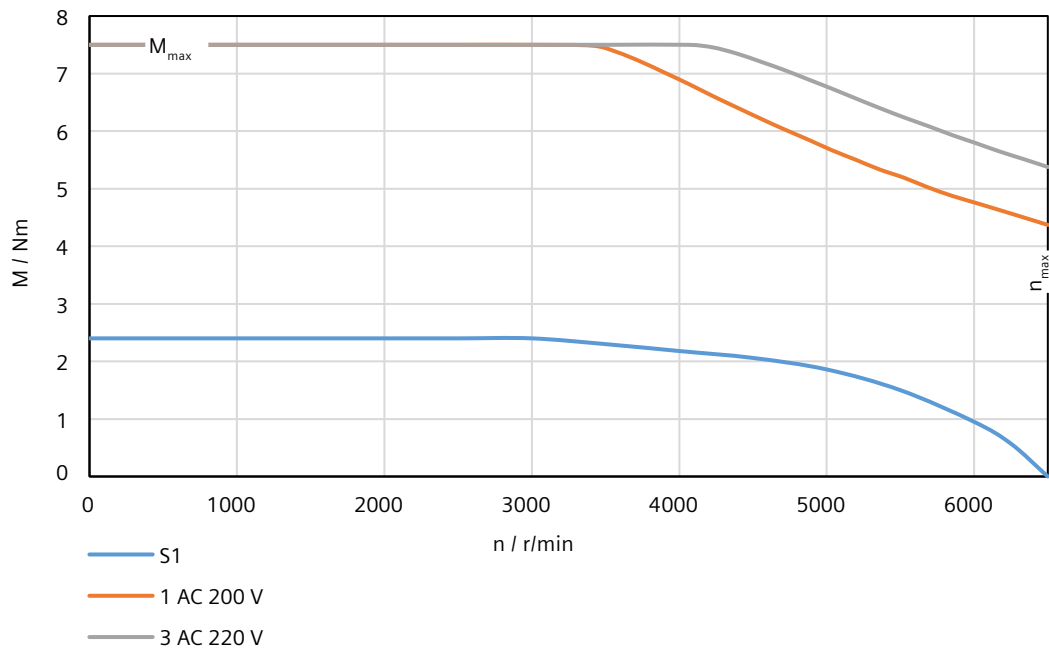


14.2.14.21 1FL2204-2AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-48 Technical data of 1FL2204-2AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	7.5
Maximum current	$I_{\max}$	A	14.2
Thermal time constant	T_{th}	min	25.1
Moment of inertia	J_{mot}	kgcm ²	1.23
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	1.31
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.6
Weight (with brake)	$m_{\text{mot br}}$	kg	3.4
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75

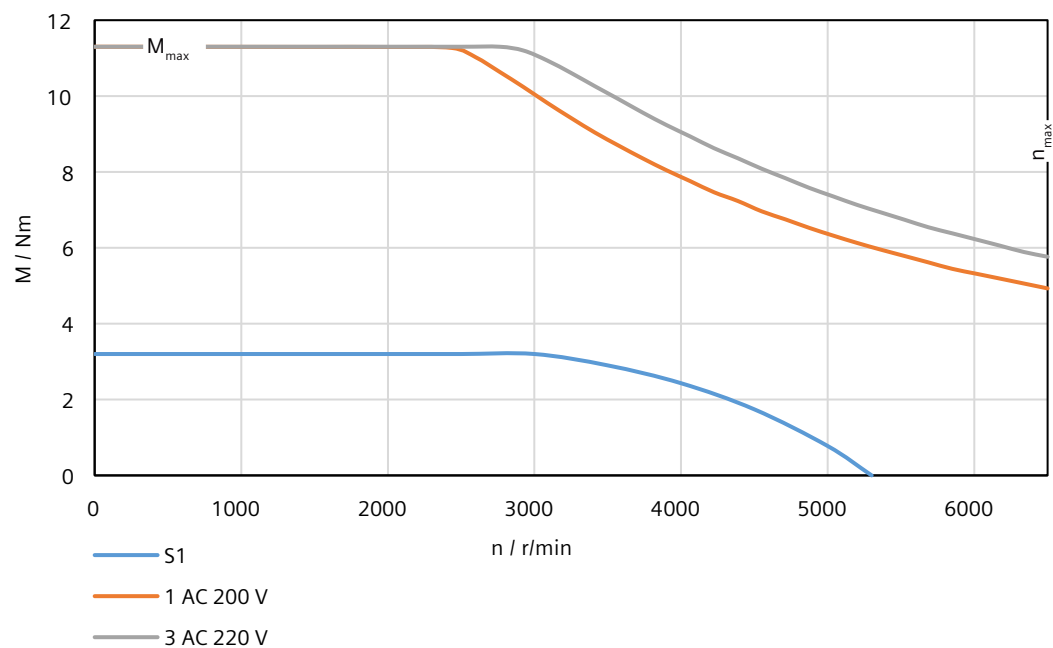


14.2.14.22 1FL2204-4AG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-49 Technical data of 1FL2204-4AG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	4.4
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	11.3
Maximum current	$I_{\max}$	A	16
Thermal time constant	T_{th}	min	24.1
Moment of inertia	J_{mot}	kgcm ²	1.61
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	1.69
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	3.1
Weight (with brake)	$m_{\text{mot br}}$	kg	3.9
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	1

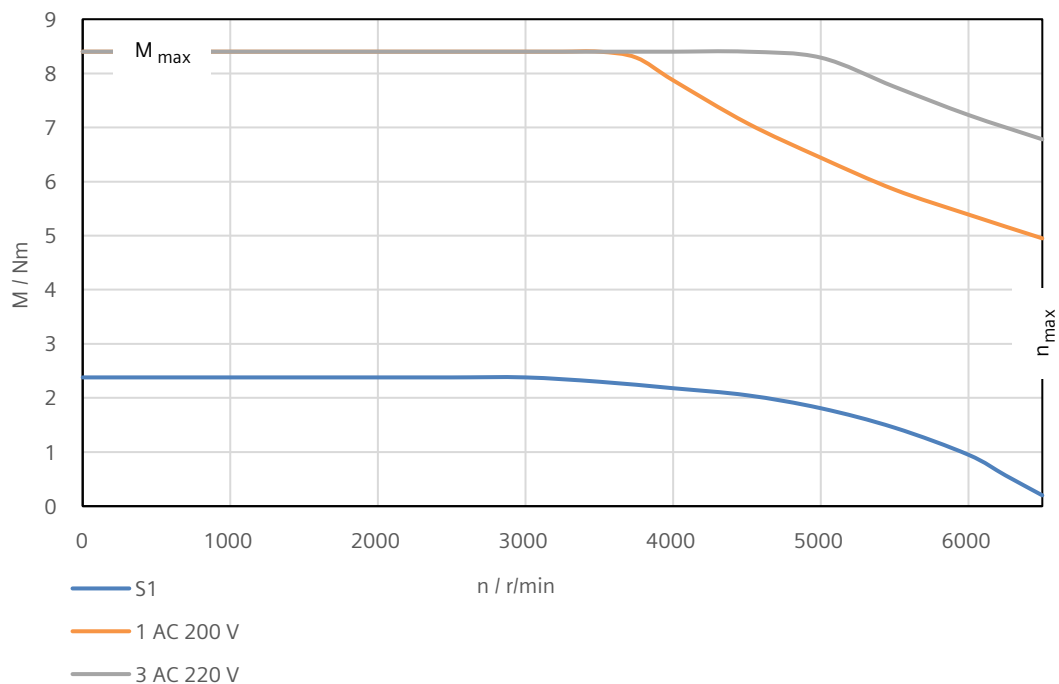


14.2.14.23 1FL2204-2BG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-50 Technical data of 1FL2204-2BG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	8.4
Maximum current	$I_{\max}$	A	16
Thermal time constant	T_{th}	min	10
Moment of inertia	J_{mot}	kgcm ²	1.27
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	1.37
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.0
Weight (with brake)	$m_{\text{mot br}}$	kg	2.8
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75

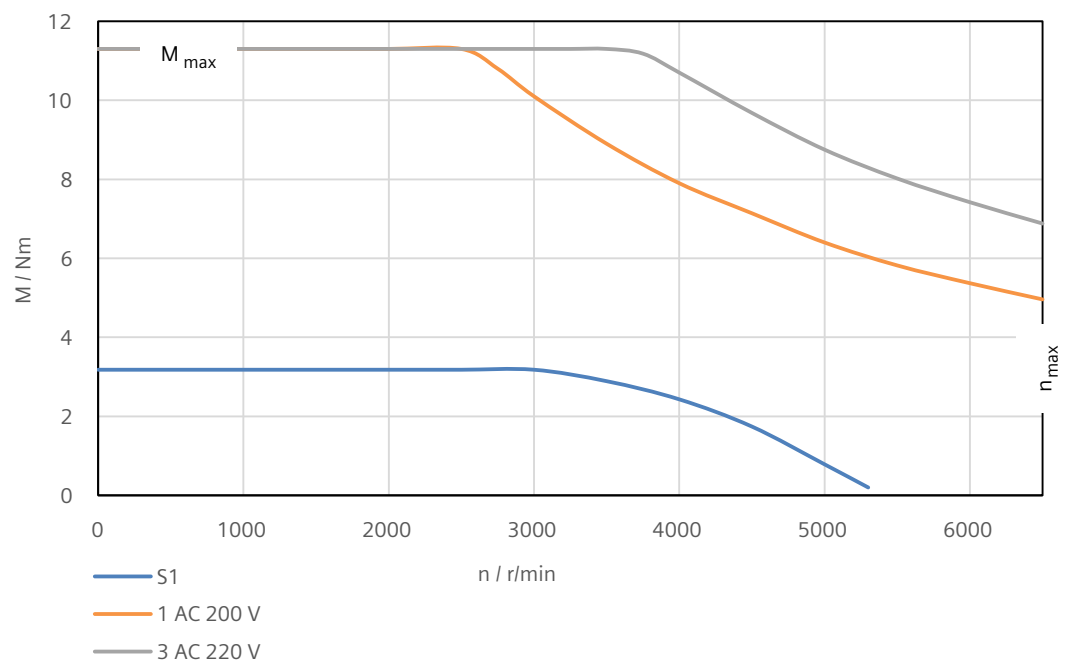


14.2.14.24 1FL2204-4BG connected to 1 AC 200 V/3 AC 220 V

Technical data

Table 14-51 Technical data of 1FL2204-4BG

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	11.3
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	17
Moment of inertia	J_{mot}	kgcm ²	1.67
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	1.77
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.4
Weight (with brake)	$m_{mot\ br}$	kg	3.2
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	1

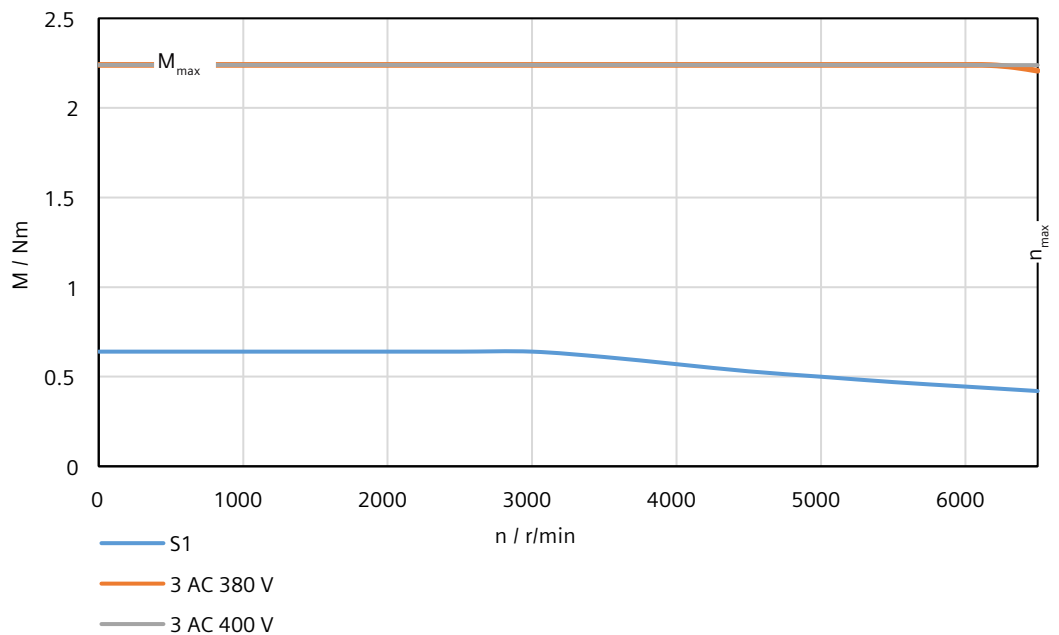


14.2.14.25 1FL2203-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-52 Technical data of 1FL2203-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.3
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	2.24
Maximum current	$I_{\max}$	A	4.8
Thermal time constant	T_{th}	min	8.3
Moment of inertia	J_{mot}	kgcm ²	0.180
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	0.210
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	0.77
Weight (with brake)	$m_{\text{mot br}}$	kg	1.12
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.3
Rated power	P_{rated}	kW	0.2

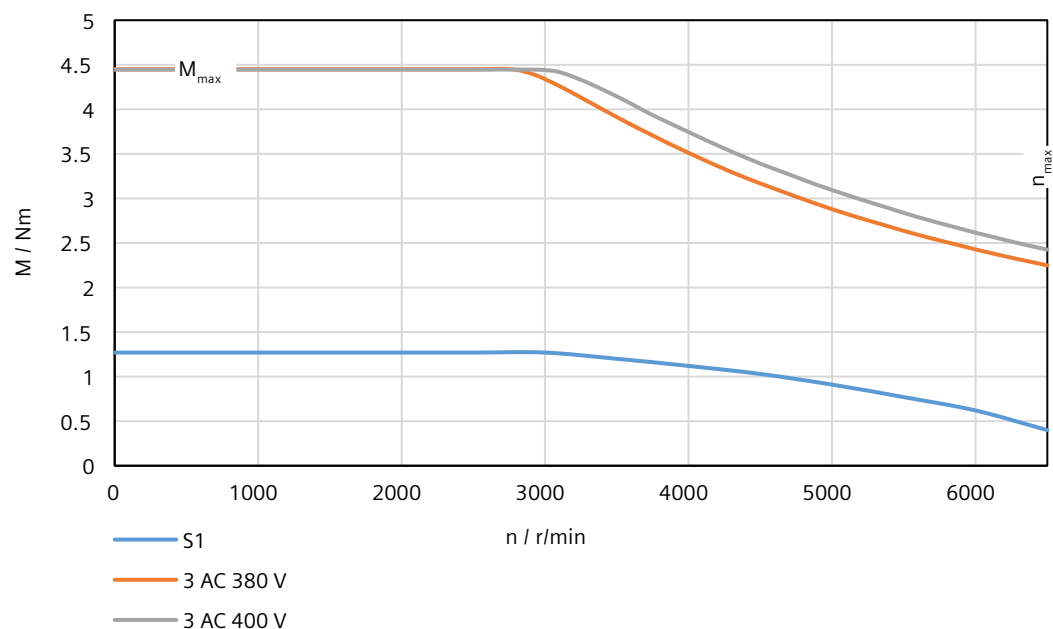


14.2.14.26 1FL2203-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-53 Technical data of 1FL2203-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.3
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	4.45
Maximum current	I_{max}	A	4.8
Thermal time constant	T_{th}	min	9.4
Moment of inertia	J_{mot}	kgcm ²	0.350
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	0.380
Recommended load to motor inertia ratio	-	-	Maximum 30x
Weight	m_{mot}	kg	1.09
Weight (with brake)	$m_{mot\ br}$	kg	1.44
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	1.3
Rated power	P_{rated}	kW	0.4

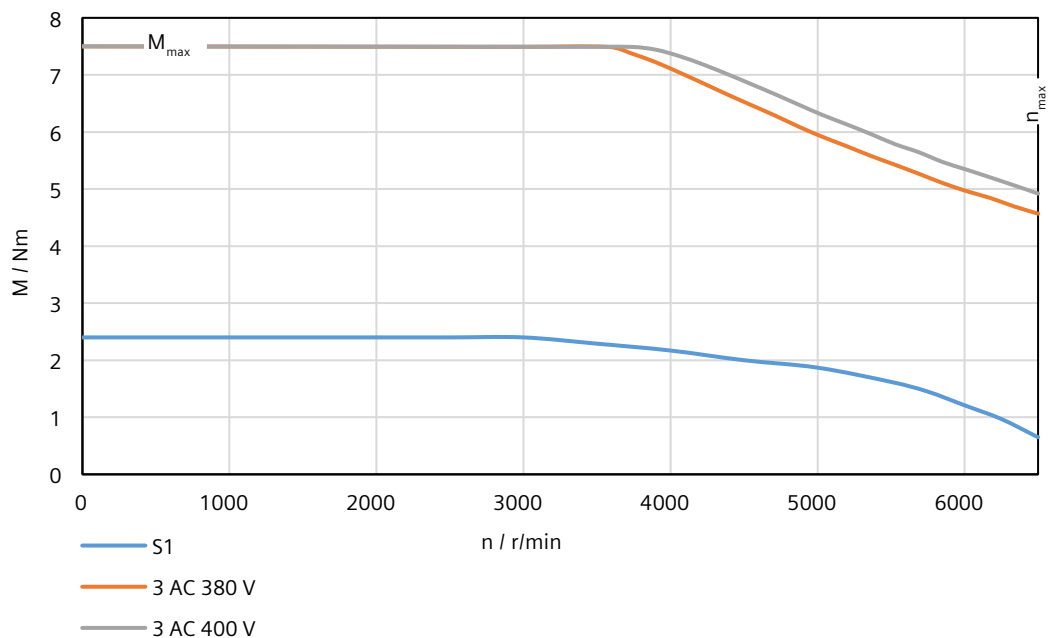


14.2.14.27 1FL2204-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-54 Technical data of 1FL2204-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.25
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	7.5
Maximum current	$I_{\max}$	A	7.1
Thermal time constant	T_{th}	min	22.5
Moment of inertia	J_{mot}	kgcm ²	1.23
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	1.31
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.6
Weight (with brake)	$m_{\text{mot br}}$	kg	3.4
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.25
Rated power	P_{rated}	kW	0.75

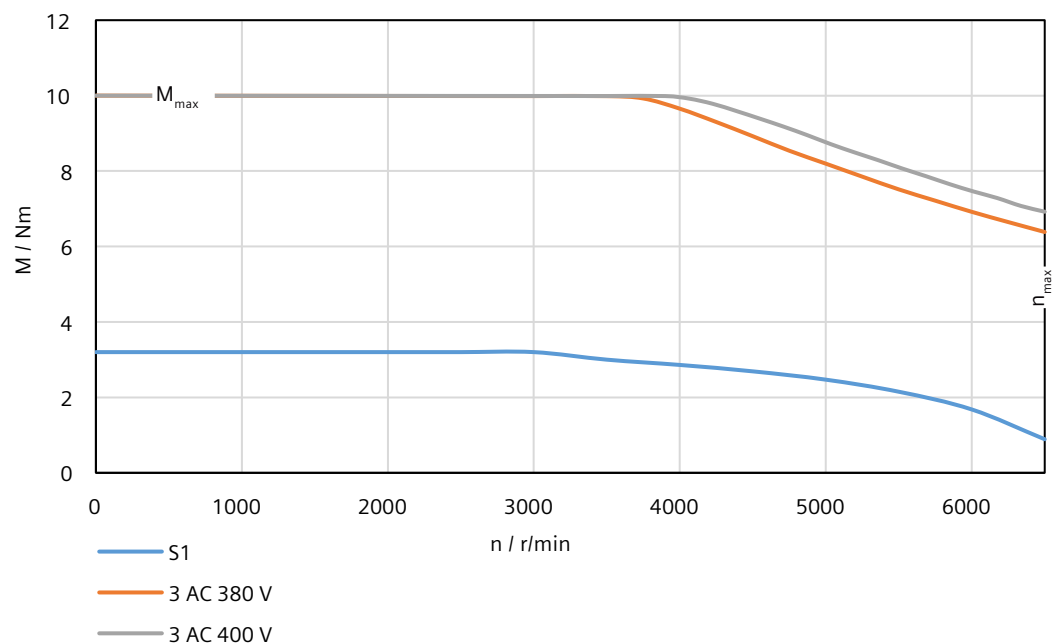


14.2.14.28 1FL2204-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-55 Technical data of 1FL2204-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	9.9
Thermal time constant	T_{th}	min	28.4
Moment of inertia	J_{mot}	kgcm ²	1.61
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	1.69
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	3.1
Weight (with brake)	$m_{mot\ br}$	kg	3.9
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1

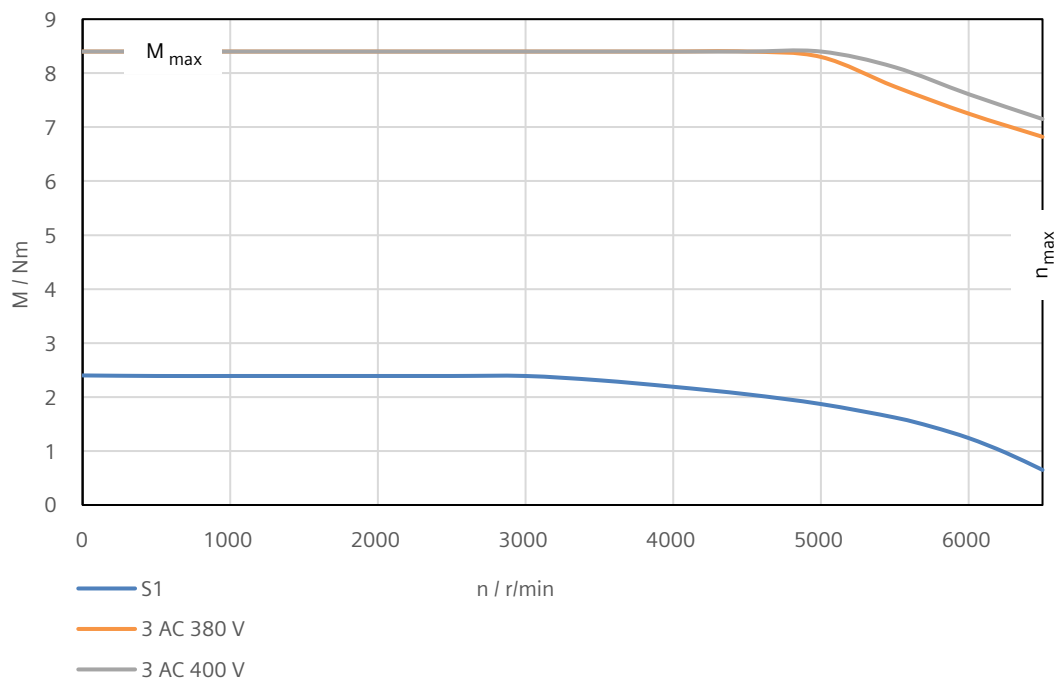


14.2.14.29 1FL2204-2BF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-56 Technical data of 1FL2204-2BF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.5
Maximum permissible speed	$n_{\max}$	r/min	6500
Maximum torque	$M_{\max}$	Nm	8.4
Maximum current	$I_{\max}$	A	9.3
Thermal time constant	T_{th}	min	10
Moment of inertia	J_{mot}	kgcm ²	1.27
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	1.37
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.0
Weight (with brake)	$m_{\text{mot br}}$	kg	2.8
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.5
Rated power	P_{rated}	kW	0.75

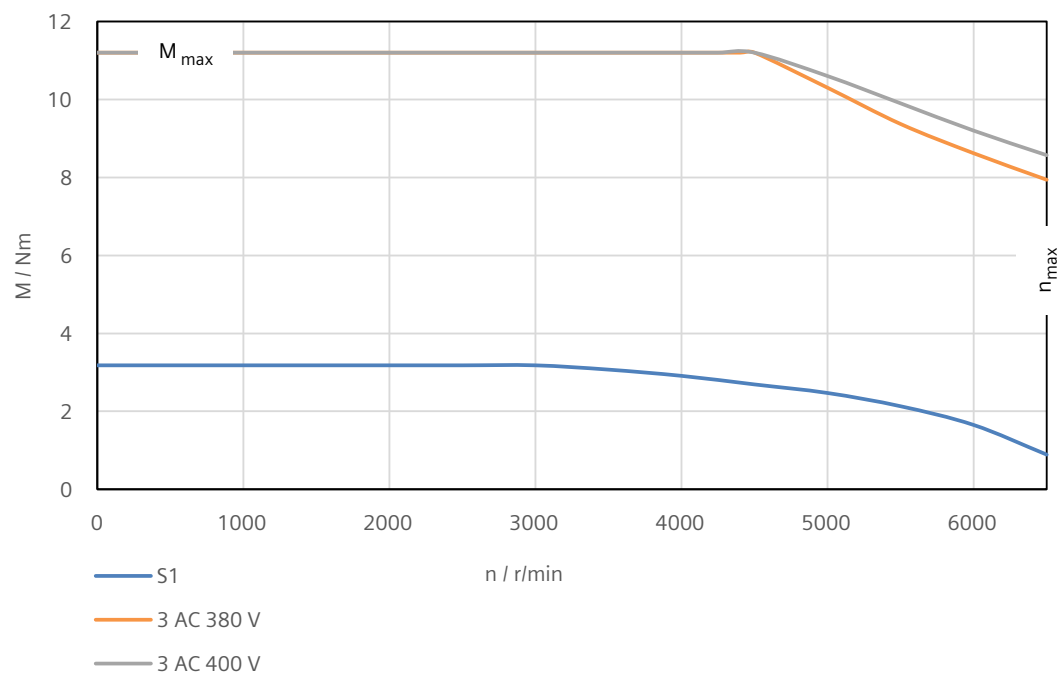


14.2.14.30 1FL2204-4BF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-57 Technical data of 1FL2204-4BF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	11.2
Maximum current	I_{max}	A	10.9
Thermal time constant	T_{th}	min	12
Moment of inertia	J_{mot}	kgcm ²	1.67
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	1.77
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	2.4
Weight (with brake)	$m_{mot\ br}$	kg	3.2
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1

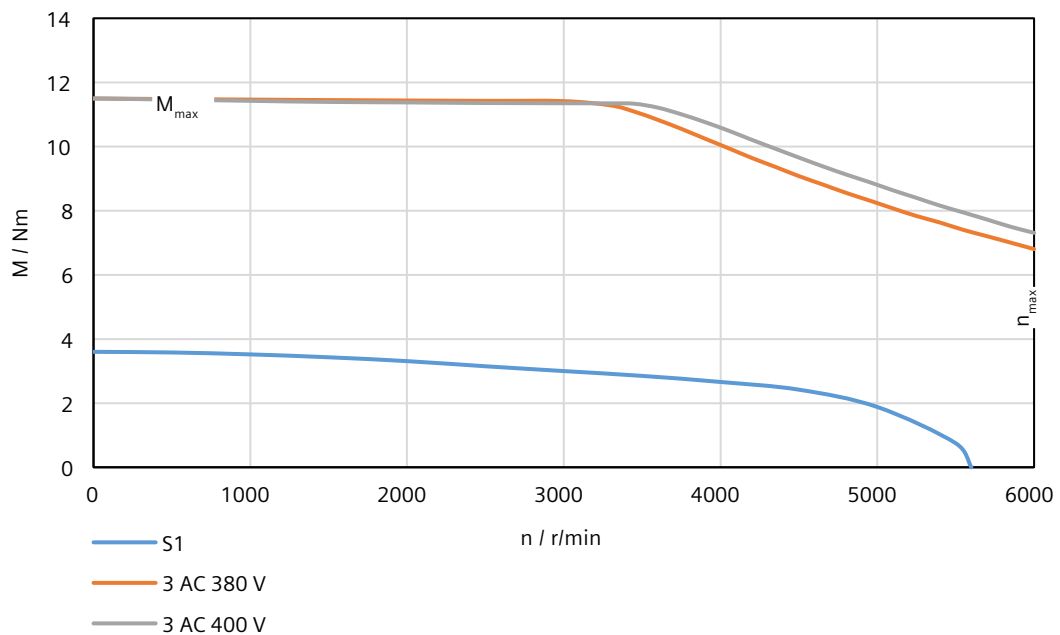


14.2.14.31 1FL2205-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-58 Technical data of 1FL2205-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.6
Stall current	I_0	A	2.9
Maximum permissible speed	$n_{\max}$	r/min	6000
Maximum torque	$M_{\max}$	Nm	11.5
Maximum current	$I_{\max}$	A	9.5
Thermal time constant	T_{th}	min	24.4
Moment of inertia	J_{mot}	kgcm ²	3.15
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	4.03
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	3.6
Weight (with brake)	$m_{\text{mot br}}$	kg	4.7
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3
Rated current	I_{rated}	A	2.5
Rated power	P_{rated}	kW	0.94

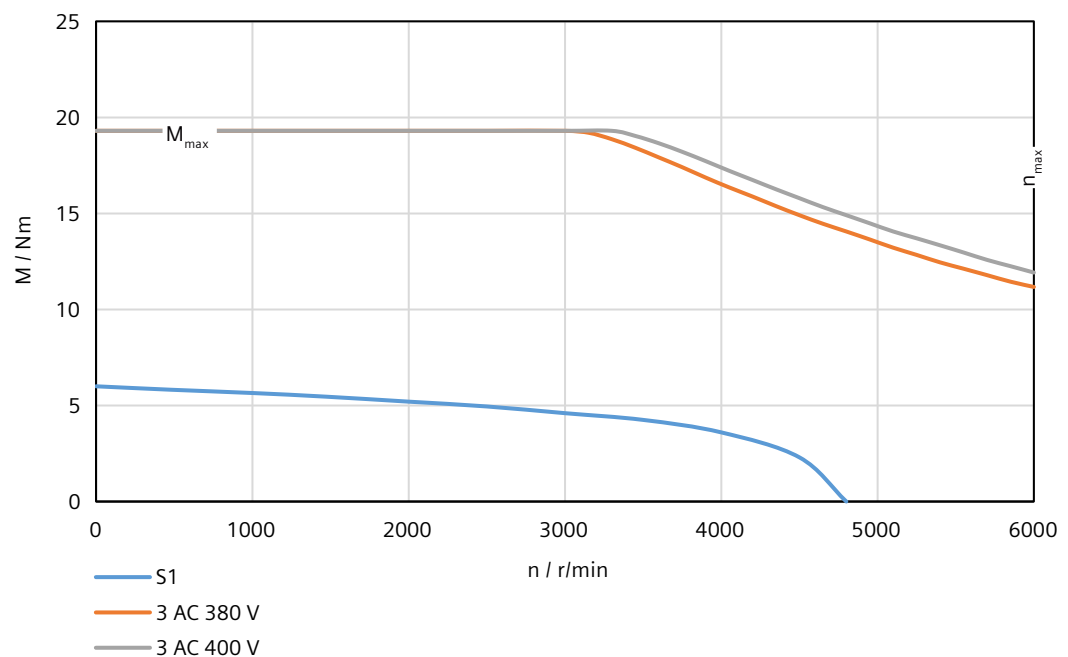


14.2.14.32 1FL2205-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-59 Technical data of 1FL2205-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	6
Stall current	I_0	A	4.7
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	19.3
Maximum current	I_{max}	A	15.1
Thermal time constant	T_{th}	min	31
Moment of inertia	J_{mot}	kgcm ²	5.10
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	5.98
Recommended load to motor inertia ratio	-	-	Maximum 15x
Weight	m_{mot}	kg	5
Weight (with brake)	$m_{mot\ br}$	kg	6.1
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	4.6
Rated current	I_{rated}	A	3.75
Rated power	P_{rated}	kW	1.45

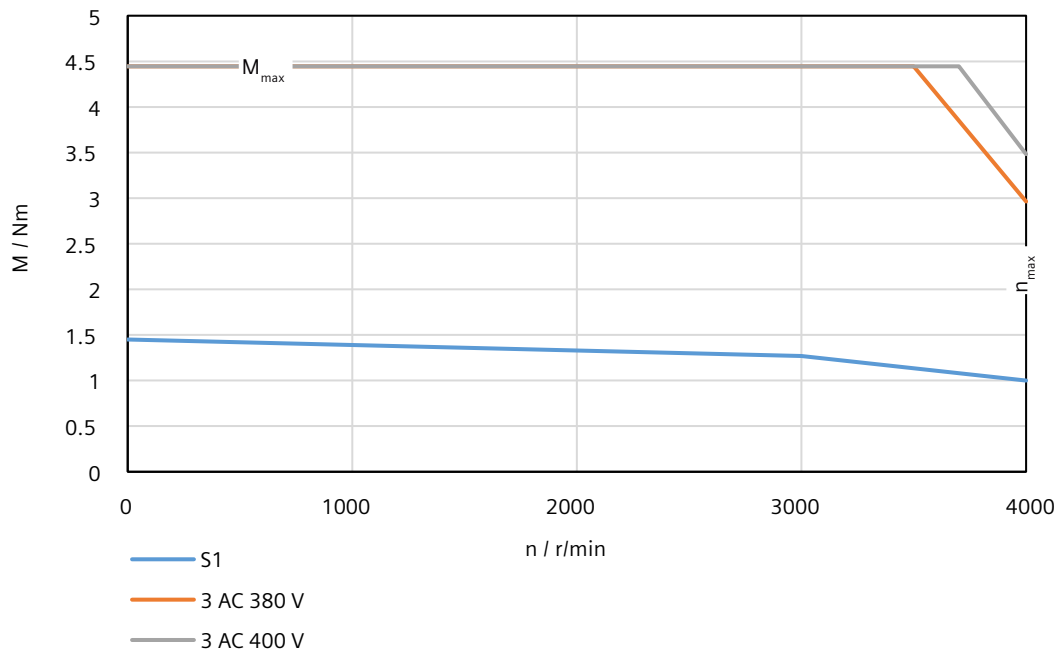


14.2.14.33 1FL2304-2AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-60 Technical data of 1FL2304-2AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	1.45
Stall current	I_0	A	1.3
Maximum permissible speed	$n_{\max}$	r/min	4000
Maximum torque	$M_{\max}$	Nm	4.445
Maximum current	$I_{\max}$	A	4.2
Thermal time constant	T_{th}	min	18
Moment of inertia	J_{mot}	kgcm ²	2.69
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	3.05
Recommended load to motor inertia ratio	-	-	Maximum 10x
Weight	m_{mot}	kg	3.5
Weight (with brake)	$m_{\text{mot br}}$	kg	4.9
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	1.2
Rated power	P_{rated}	kW	0.4

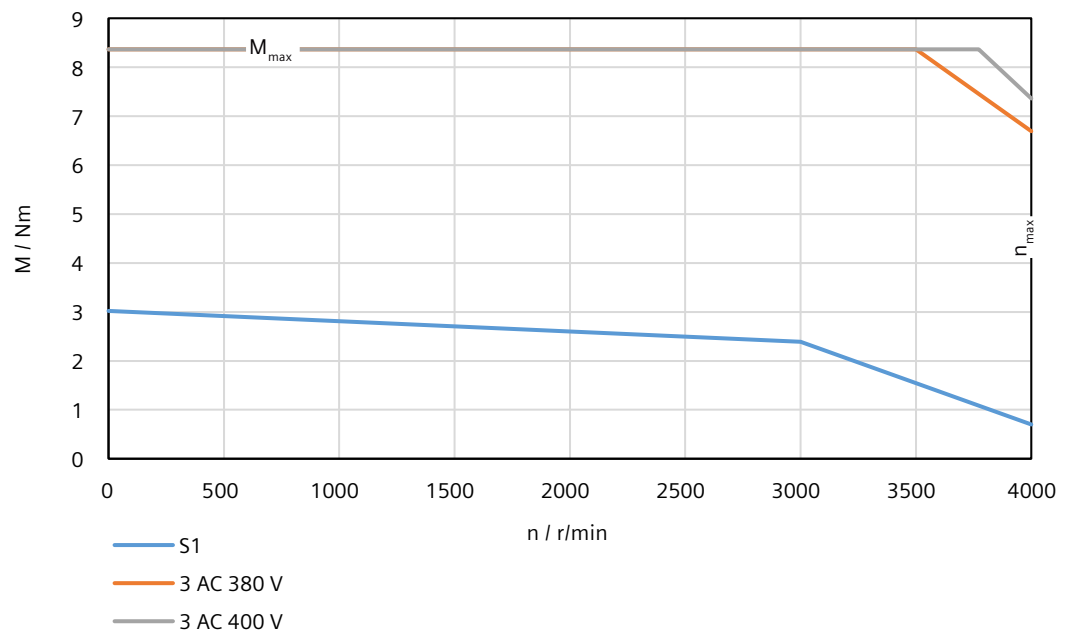


14.2.14.34 1FL2304-4AF connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-61 Technical data of 1FL2304-4AF

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.02
Stall current	I_0	A	2.5
Maximum permissible speed	n_{max}	r/min	4000
Maximum torque	M_{max}	Nm	8.365
Maximum current	I_{max}	A	7.3
Thermal time constant	T_{th}	min	22
Moment of inertia	J_{mot}	kgcm ²	5.18
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	5.54
Recommended load to motor inertia ratio	-	-	Maximum 10x
Weight	m_{mot}	kg	5.4
Weight (with brake)	$m_{mot\ br}$	kg	6.8
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.39
Rated current	I_{rated}	A	2.1
Rated power	P_{rated}	kW	0.75

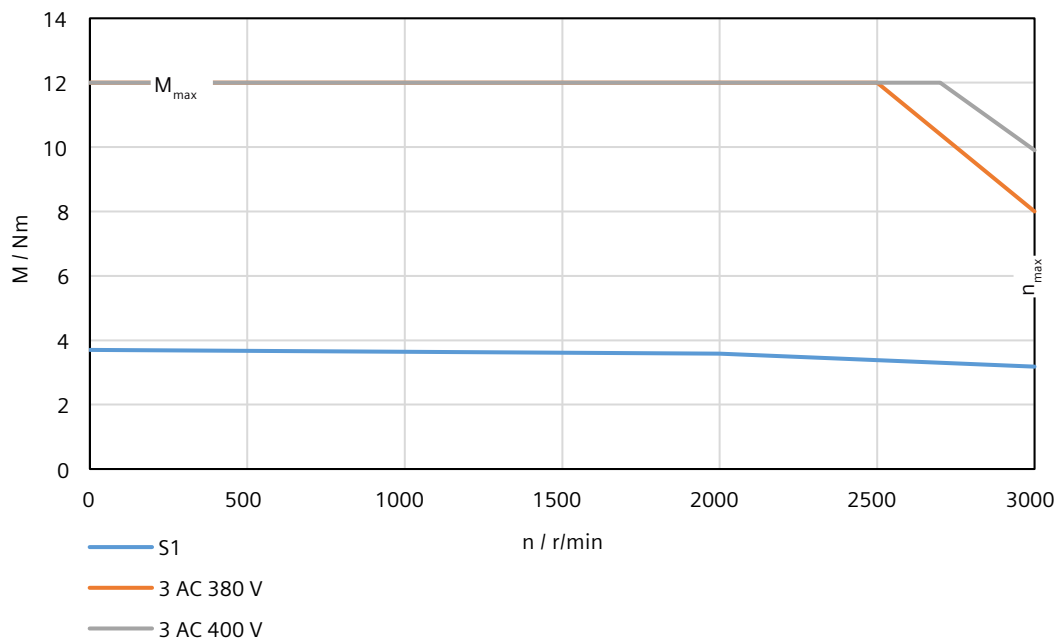


14.2.14.35 1FL2306-1AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-62 Technical data of 1FL2306-1AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	3.7
Stall current	I_0	A	2.5
Maximum permissible speed	$n_{\max}$	r/min	3000
Maximum torque	$M_{\max}$	Nm	12
Maximum current	$I_{\max}$	A	8.4
Thermal time constant	T_{th}	min	22
Moment of inertia	J_{mot}	kgcm ²	7.96
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	9.57
Recommended load to motor inertia ratio	-	-	Maximum 10x
Weight	m_{mot}	kg	5.9
Weight (with brake)	$m_{\text{mot br}}$	kg	8.9
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	3.58
Rated current	I_{rated}	A	2.5
Rated power	P_{rated}	kW	0.75

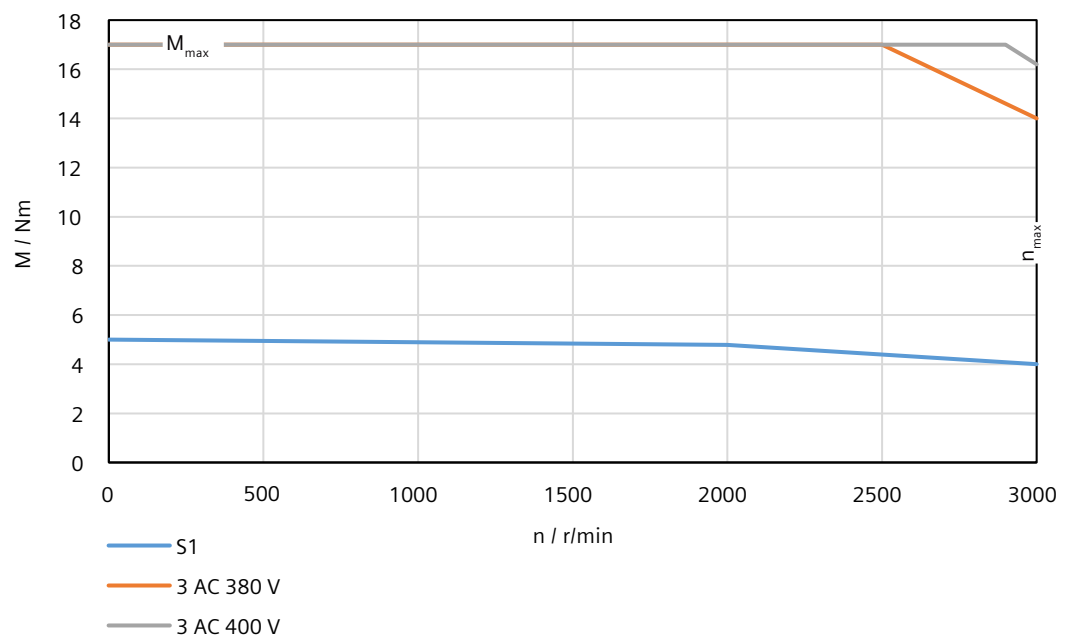


14.2.14.36 1FL2306-2AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-63 Technical data of 1FL2306-2AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	5
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	3000
Maximum torque	M_{max}	Nm	17
Maximum current	I_{max}	A	10.7
Thermal time constant	T_{th}	min	22
Moment of inertia	J_{mot}	kgcm ²	11.65
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	13.26
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	7.3
Weight (with brake)	$m_{mot\ br}$	kg	10.3
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	4.78
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1

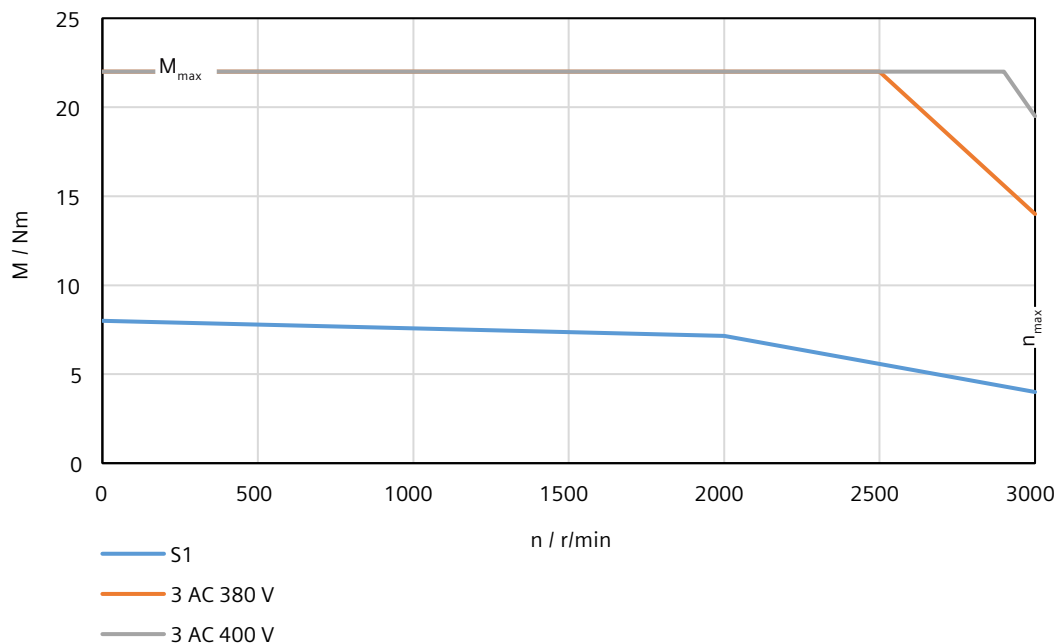


14.2.14.37 1FL2306-4AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-64 Technical data of 1FL2306-4AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	8
Stall current	I_0	A	4.9
Maximum permissible speed	$n_{\max}$	r/min	3000
Maximum torque	$M_{\max}$	Nm	22
Maximum current	$I_{\max}$	A	14.1
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{mot}	kgcm ²	15.29
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	16.90
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	8.6
Weight (with brake)	$m_{\text{mot br}}$	kg	11.6
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	7.16
Rated current	I_{rated}	A	4.6
Rated power	P_{rated}	kW	1.5

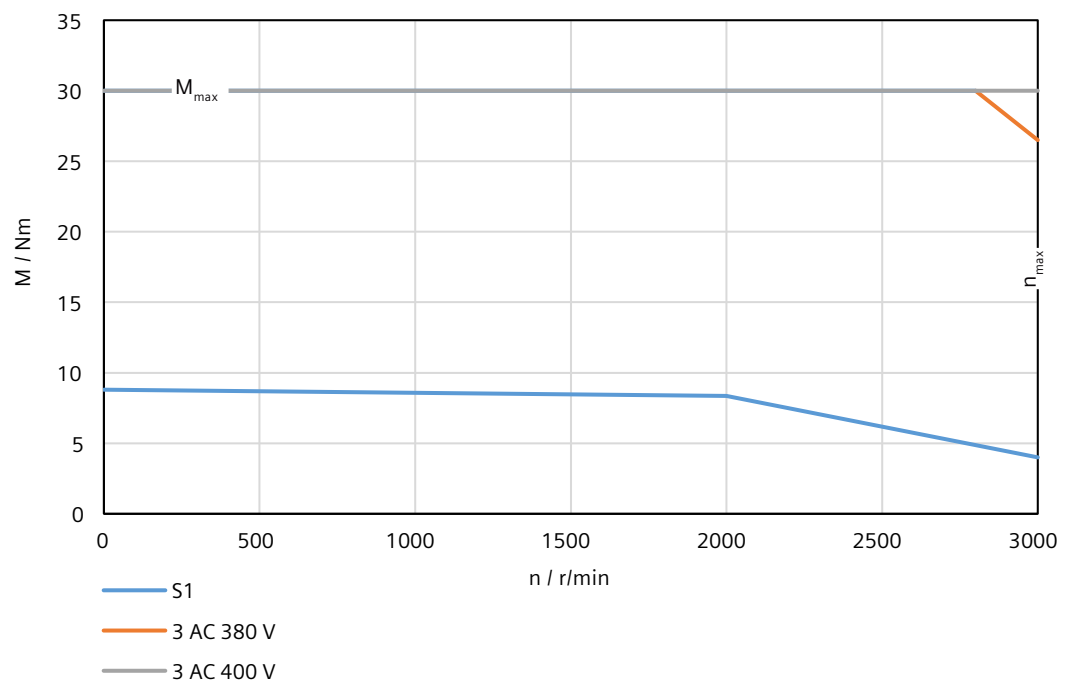


14.2.14.38 1FL2306-6AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-65 Technical data of 1FL2306-6AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	8.8
Stall current	I_0	A	5.3
Maximum permissible speed	n_{max}	r/min	3000
Maximum torque	M_{max}	Nm	30
Maximum current	I_{max}	A	19
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{mot}	kgcm ²	22.61
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	24.22
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	11.1
Weight (with brake)	$m_{mot\ br}$	kg	14.1
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	8.4
Rated current	I_{rated}	A	5.3
Rated power	P_{rated}	kW	1.75

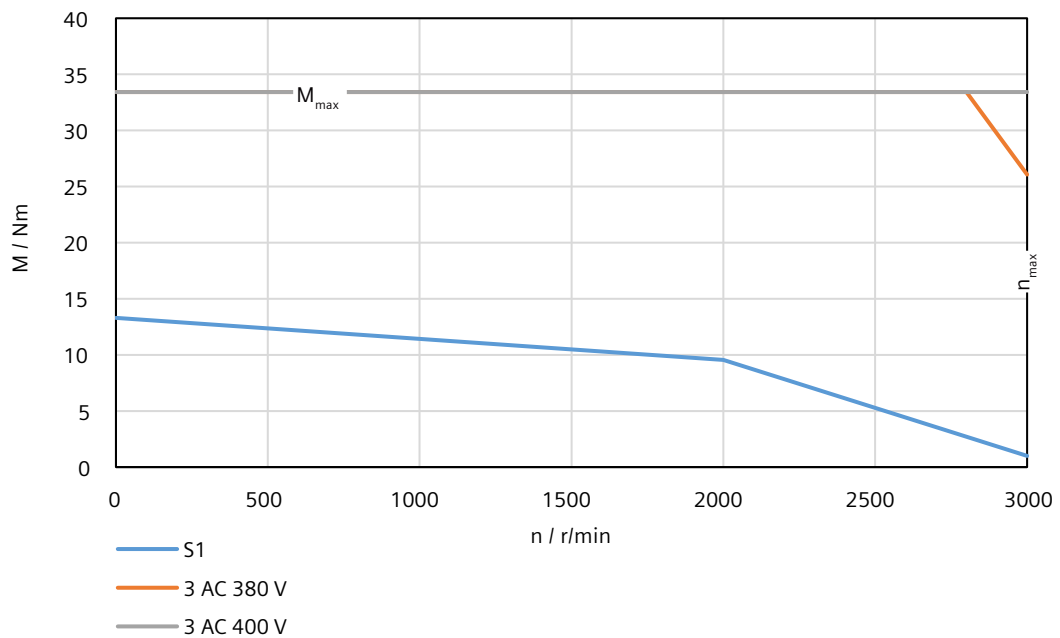


14.2.14.39 1FL2306-7AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-66 Technical data of 1FL2306-7AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	13.3
Stall current	I_0	A	7.8
Maximum permissible speed	$n_{\max}$	r/min	3000
Maximum torque	$M_{\max}$	Nm	33.425
Maximum current	$I_{\max}$	A	20.7
Thermal time constant	T_{th}	min	32
Moment of inertia	J_{mot}	kgcm ²	29.94
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	31.55
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	13.7
Weight (with brake)	$m_{\text{mot br}}$	kg	16.7
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	9.6
Rated current	I_{rated}	A	5.9
Rated power	P_{rated}	kW	2

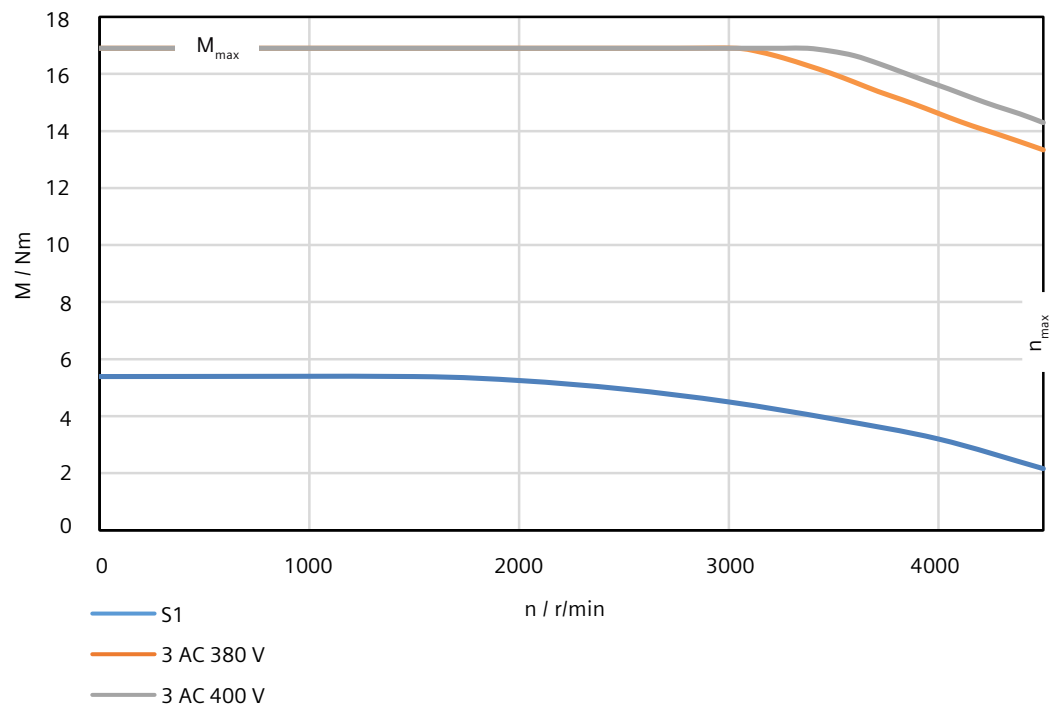


14.2.14.40 1FL2306-3AB connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-67 Technical data of 1FL2306-3AB

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	5.39
Stall current	I_0	A	4
Maximum permissible speed	n_{max}	r/min	4500
Maximum torque	M_{max}	Nm	16.9
Maximum current	I_{max}	A	12.8
Thermal time constant	T_{th}	min	32
Moment of inertia	J_{mot}	kgcm ²	12.2
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	13.6
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	6.1
Weight (with brake)	$m_{mot\ br}$	kg	8.0
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	5.39
Rated current	I_{rated}	A	4
Rated power	P_{rated}	kW	0.85

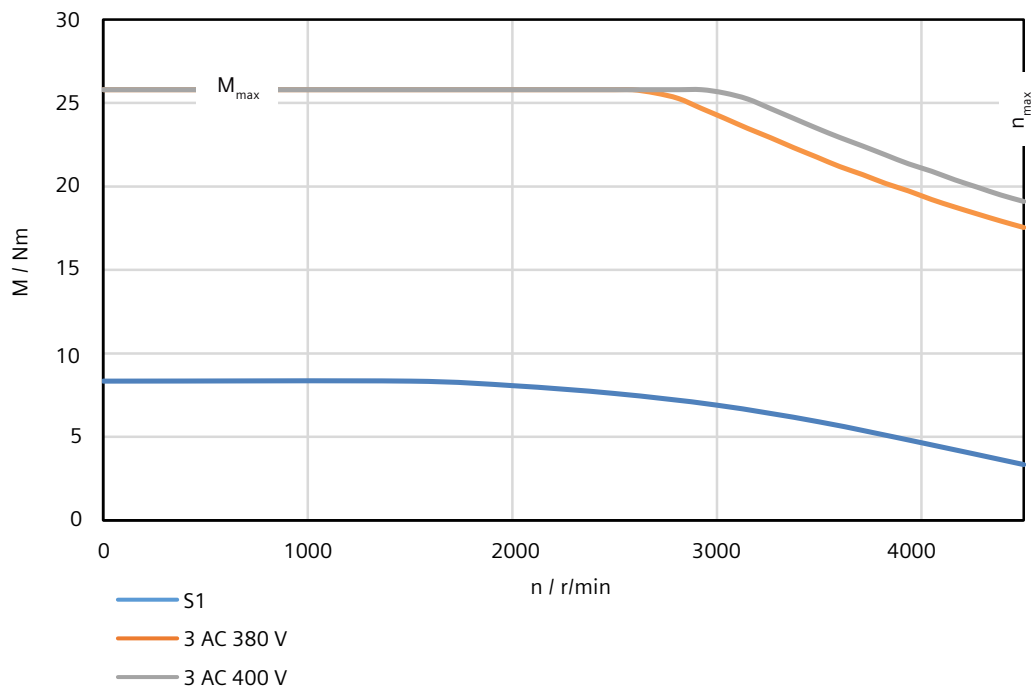


14.2.14.41 1FL2306-5AB connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-68 Technical data of 1FL2306-5AB

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	8.34
Stall current	I_0	A	5.3
Maximum permissible speed	$n_{\max}$	r/min	4500
Maximum torque	$M_{\max}$	Nm	25.8
Maximum current	$I_{\max}$	A	16.96
Thermal time constant	T_{th}	min	35
Moment of inertia	J_{mot}	kgcm ²	17.9
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	19.3
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{\text{mot br}}$	kg	9.3
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	8.34
Rated current	I_{rated}	A	5.3
Rated power	P_{rated}	kW	1.3

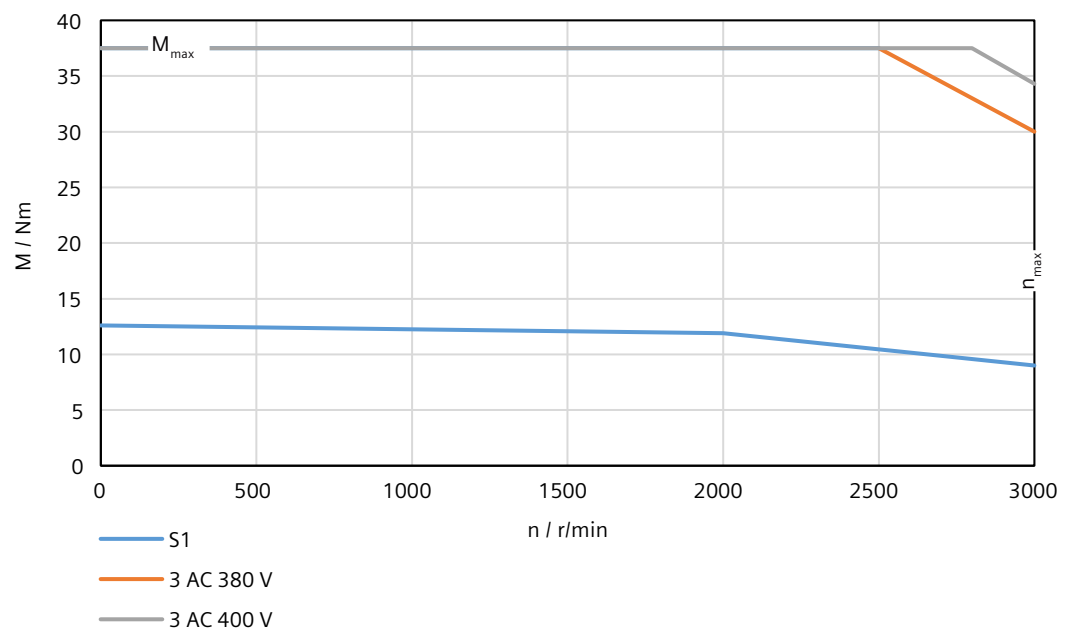


14.2.14.42 1FL2310-0AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-69 Technical data of 1FL2310-0AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	12.6
Stall current	I_0	A	7.8
Maximum permissible speed	n_{max}	r/min	3000
Maximum torque	M_{max}	Nm	37.5
Maximum current	I_{max}	A	25.2
Thermal time constant	T_{th}	min	35
Moment of inertia	J_{mot}	kgcm ²	47.41
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	56.78
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	15.4
Weight (with brake)	$m_{mot\ br}$	kg	21.4
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	11.9
Rated current	I_{rated}	A	7.8
Rated power	P_{rated}	kW	2.5

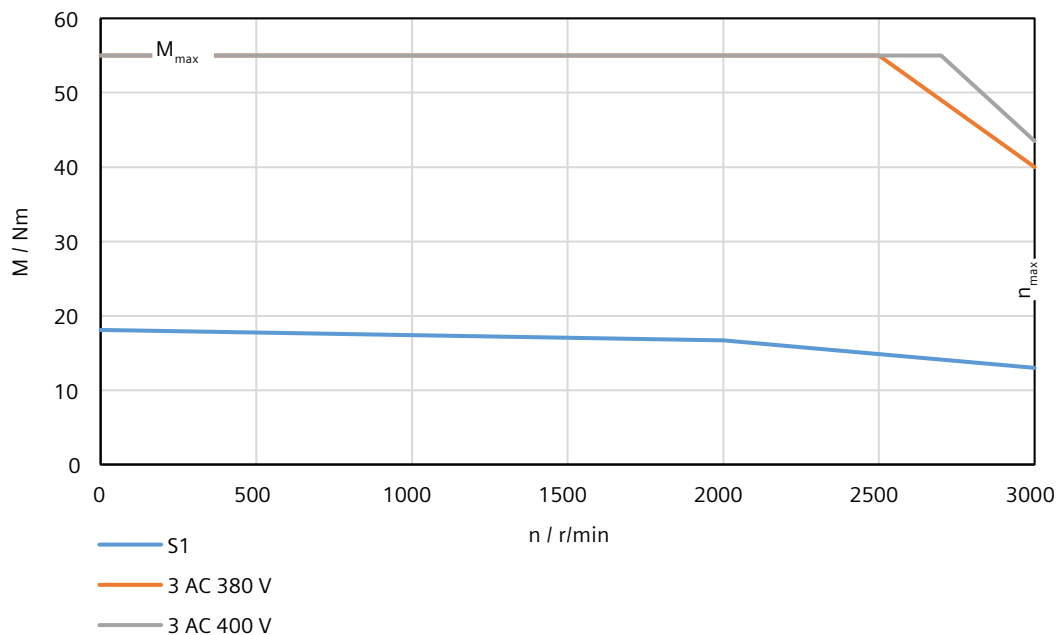


14.2.14.43 1FL2310-2AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-70 Technical data of 1FL2310-2AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	18.1
Stall current	I_0	A	11
Maximum permissible speed	$n_{\max}$	r/min	3000
Maximum torque	$M_{\max}$	Nm	55
Maximum current	$I_{\max}$	A	36.2
Thermal time constant	T_{th}	min	38
Moment of inertia	J_{mot}	kgcm ²	69.10
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	78.47
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	19.4
Weight (with brake)	$m_{\text{mot br}}$	kg	25.4
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	16.7
Rated current	I_{rated}	A	11
Rated power	P_{rated}	kW	3.5

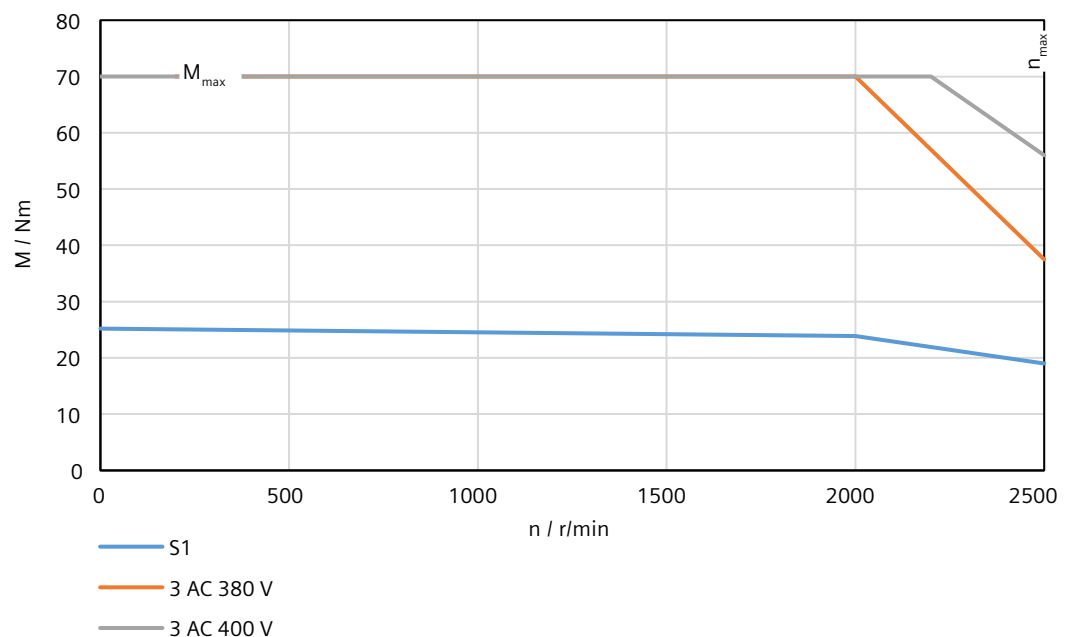


14.2.14.44 1FL2310-4AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-71 Technical data of 1FL2310-4AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	25.2
Stall current	I_0	A	12.6
Maximum permissible speed	n_{max}	r/min	2500
Maximum torque	M_{max}	Nm	70
Maximum current	I_{max}	A	36.9
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{mot}	kgcm ²	90.83
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	100.20
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	23.7
Weight (with brake)	$m_{mot\ br}$	kg	29.7
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	23.9
Rated current	I_{rated}	A	12.6
Rated power	P_{rated}	kW	5

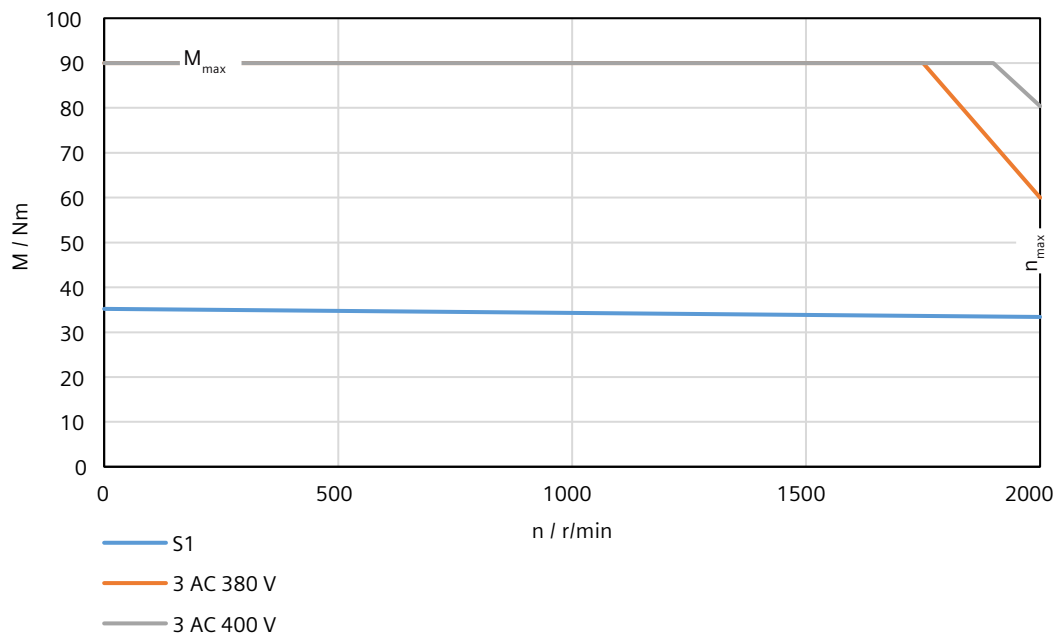


14.2.14.45 1FL2310-6AC connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-72 Technical data of 1FL2310-6AC

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	35.2
Stall current	I_0	A	13.2
Maximum permissible speed	$n_{\max}$	r/min	2000
Maximum torque	$M_{\max}$	Nm	90
Maximum current	$I_{\max}$	A	35.6
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{mot}	kgcm ²	134.29
Moment of inertia (with brake)	$J_{\text{mot br}}$	kgcm ²	143.66
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	31.9
Weight (with brake)	$m_{\text{mot br}}$	kg	37.9
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	33.4
Rated current	I_{rated}	A	13.2
Rated power	P_{rated}	kW	7

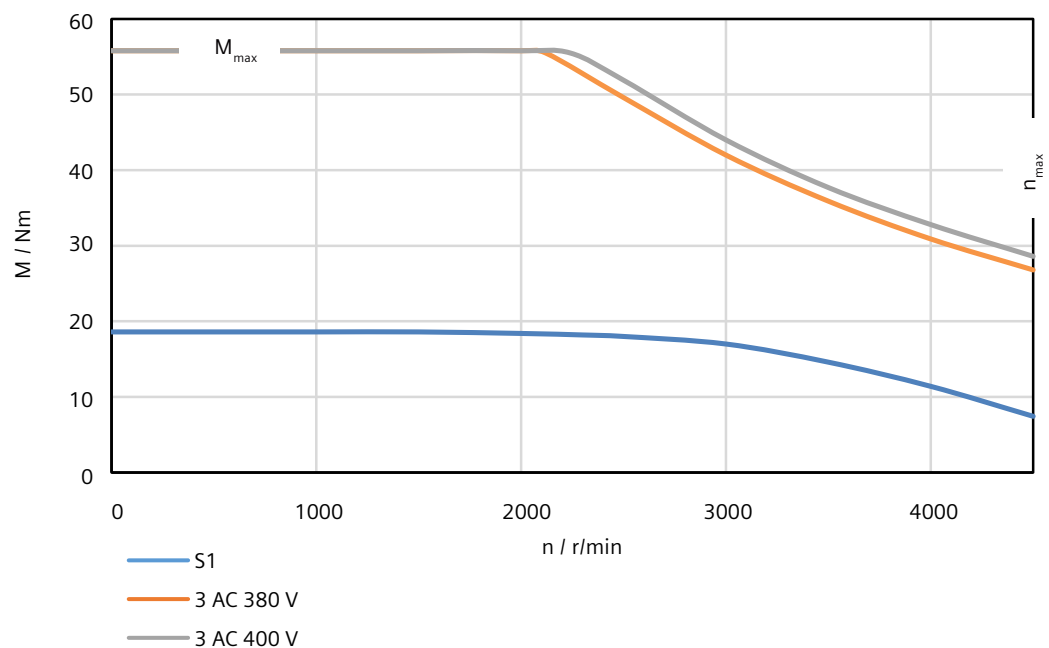


14.2.14.46 1FL2310-3AB connected to 3 AC 380 V/3 AC 400 V

Technical data

Table 14-73 Technical data of 1FL2310-3AB

Feature	Symbol	Unit	Value
Static torque	M_0	Nm	18.6
Stall current	I_0	A	10.8
Maximum permissible speed	n_{max}	r/min	4500
Maximum torque	M_{max}	Nm	55.8
Maximum current	I_{max}	A	36
Thermal time constant	T_{th}	min	38
Moment of inertia	J_{mot}	kgcm ²	43.4
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm ²	55
Recommended load to motor inertia ratio	-	-	Maximum 5x
Weight	m_{mot}	kg	15.3
Weight (with brake)	$m_{mot\ br}$	kg	20
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	18.6
Rated current	I_{rated}	A	10.8
Rated power	P_{rated}	kW	2.9



14.3 Technical data of MOTION-CONNECT cables

14.3.1 Technical data of MOTION-CONNECT 350

14.3.1.1 General technical data

Technical data

Table 14-74 General technical data of MOTION-CONNECT 350

Property	MOTION-CONNECT 350 power cable	MOTION-CONNECT 350 encoder cable	MOTION-CONNECT 350 brake cable
Jacket material	PVC	PVC	PVC
Number of conductors	<ul style="list-style-type: none"> With brake conductors: 6 Without brake conductors: 4 	6	2
Operating temperature (°C)	-20 ... +80	-20 ... +80	-20 ... +80
Shielding	Braided shield; coverage ≥ 85%	Braided shield; coverage ≥ 85%	Braided shield; coverage ≥ 85%
Oil resistance	EN 60811-2-1	EN 60811-2-1	EN 60811-2-1
Flame retardancy	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3
Coolant resistance	EN 60811-2-1	EN 60811-2-1	EN 60811-2-1
Degree of protection (motor-side only)	IP65	IP65	IP65
Bending cycles	1 million	1 million	1 million
Rated voltage U_0/U (V)	<ul style="list-style-type: none"> 200 V converters: 300/1000 400 V converters: 600/1000 	30/300	30/300

14.3.1.2 Specific technical data

Technical data

Table 14-75 Cable used for 1FL2 low or medium inertia motors

Property	MOTION-CONNECT 350 power cable	MOTION-CONNECT 350 encoder cable	MOTION-CONNECT 350 brake cable
Cross-section of conductors (mm ²)	<ul style="list-style-type: none"> With brake conductors: 4 x 0.75 + 2 x 0.38 (4 x 18 AWG + 2 x 22 AWG) Without brake conductors: 4 x 0.75 (4 x 18 AWG) 	<ul style="list-style-type: none"> Cable length up to 15 m: 3 x 2 x 0.25 (3 x 2 x 24 AWG) Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 x 2 x 24 AWG + 2 x 22 AWG) 	-
Outer diameter (mm)	ø (7.5 ± 0.2)	ø (7 ± 0.2)	-
Minimum bending radius, static (mm)	4 x outer diameter	4 x outer diameter	-
Minimum bending radius, dynamic (mm)	7.5 x outer diameter	7.5 x outer diameter	-
Maximum acceleration (m/s ²)	3	3	-
Maximum traversing velocity (m/min)	40	40	-

Table 14-76 Cable used for 1FL2 high inertia motors

Property	MOTION-CONNECT 350 power cable		MOTION-CONNECT 350 encoder cable	MOTION-CONNECT 350 brake cable
Cross-section of conductors (mm ²)	Without brake conductors <ul style="list-style-type: none"> 1FL2 0.4 kW ... 1.75 kW, 2 kW: 4 x 0.75 (4 x 18 AWG) 1FL2 2.5 kW: 4 x 1.5 (4 x 16 AWG) 1FL2 2.9 kW ... 7 kW: 4 x 2.5 (4 x 14 AWG) 	With brake conductors <ul style="list-style-type: none"> 1FL2 0.85 kW, 1.3 kW: 4 x 0.75 + 2 x 0.5 (4 x 18 AWG + 2 x 20 AWG) 1FL2 2.9 kW: 4 x 2.5 + 2 x 0.5 (4 x 14 AWG + 2 x 20 AWG) 	<ul style="list-style-type: none"> Cable length up to 15 m: 3 x 2 x 0.25 (3 x 2 x 24 AWG) Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 x 2 x 24 AWG + 2 x 22 AWG) 	2 x 0.75 (2 x 18 AWG)

14.3 Technical data of MOTION-CONNECT cables

Property	MOTION-CONNECT 350 power cable	MOTION-CONNECT 350 encoder cable	MOTION-CONNECT 350 brake cable
Outer diameter (mm)	<ul style="list-style-type: none"> 1FL2 0.4 kW ... 1.75 kW, 2 kW: $\varnothing (7.5 \pm 0.2)$ 1FL2 2.5 kW: $\varnothing (7.8 \pm 0.3)$ 1FL2 2.9 kW ... 7 kW: $\varnothing (9 \pm 0.3)$ 	<ul style="list-style-type: none"> 1FL2 0.85 kW, 1.3 kW: $\varnothing (7 \pm 0.2)$ 1FL2 2.9 kW: $\varnothing (11.5 \pm 0.3)$ 	$\varnothing (6 \pm 0.2)$
Minimum bending radius, static (mm)	4 x outer diameter	4 x outer diameter	4 x outer diameter
Minimum bending radius, dynamic (mm)	7.5 x outer diameter	7.5 x outer diameter	7.5 x outer diameter
Maximum acceleration (m/s ²)	3	3	3
Maximum traversing velocity (m/min)	<ul style="list-style-type: none"> 1FL2 0.4 kW ... 2 kW: 40 1FL2 2.5 kW ... 7 kW: 50 	40	50

14.3.2 Technical data of MOTION-CONNECT 380

14.3.2.1 General technical data

Technical data

Table 14-77 General technical data of MOTION-CONNECT 380

Property	MOTION-CONNECT 380 power cable	MOTION-CONNECT 380 encoder cable	MOTION-CONNECT 380 brake cable
Jacket material	PUR	PUR	PUR
Number of conductors	<ul style="list-style-type: none"> With brake conductors: 6 Without brake conductors: 4 	6	2
Operating temperature (°C)	-20 ... +80	-20 ... +80	-20 ... +80
Shielding	Braided shield; coverage $\geq 85\%$	Braided shield; coverage $\geq 85\%$	Braided shield; coverage $\geq 85\%$
Oil resistance	EN 60811-2-1	EN 60811-2-1	EN 60811-2-1
Flame retardancy	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3
Coolant resistance	EN 60811-2-1	EN 60811-2-1	EN 60811-2-1

Property	MOTION-CONNECT 380 power cable	MOTION-CONNECT 380 encoder cable	MOTION-CONNECT 380 brake cable
Degree of protection (motor-side only)	IP65	IP65	IP65
Bending cycles	5 million	5 million	5 million
Rated voltage U_0/U (V)	<ul style="list-style-type: none"> 200 V converters: 300/1000 400 V converters: 600/1000 	30/300	30/300

14.3.2.2 Specific technical data

Technical data

Table 14-78 Cable used for 1FL2 low or medium inertia motors

Property	MOTION-CONNECT 380 power cable	MOTION-CONNECT 380 encoder cable	MOTION-CONNECT 380 brake cable
Cross-section of conductors (mm ²)	<ul style="list-style-type: none"> With brake conductors: 4 x 0.75 + 2 x 0.38 (4 x 18 AWG + 2 x 22 AWG) Without brake conductors: 4 x 0.75 (4 x 18 AWG) 	<ul style="list-style-type: none"> Cable length up to 15 m: 3 x 2 x 0.25 (3 x 2 x 24 AWG) Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 x 2 x 24 AWG + 2 x 22 AWG) 	-
Outer diameter (mm)	ø (7.5 ± 0.2)	ø (7 ± 0.2)	-
Minimum bending radius, static (mm)	4 x outer diameter	4 x outer diameter	-
Minimum bending radius, dynamic (mm)	7.5 x outer diameter	7.5 x outer diameter	-
Maximum acceleration (m/s ²)	5	5	-
Maximum traversing velocity (m/min)	180	180	-

14.3 Technical data of MOTION-CONNECT cables

Table 14-79 Cable used for 1FL2 high inertia motors

Property	MOTION-CONNECT 380 power cable		MOTION-CONNECT 380 encoder cable	MOTION-CONNECT 380 brake cable
Cross-section of conductors (mm ²)	Without brake conductors <ul style="list-style-type: none"> 1FL2 0.4 kW ... 1.75 kW, 2 kW: 4 x 0.75 (4 x 18 AWG) 1FL2 2.5 kW: 4 x 1.5 (4 x 16 AWG) 1FL2 2.9 kW ... 7 kW: 4 x 2.5 (4 x 14 AWG) 	With brake conductors <ul style="list-style-type: none"> 1FL2 0.85 kW, 1.3 kW: 4 x 0.75 + 2 x 0.5 (4 x 18 AWG + 2 x 20 AWG) 1FL2 2.9 kW: 4 x 2.5 + 2 x 0.5 (4 x 14 AWG + 2 x 20 AWG) 	<ul style="list-style-type: none"> Cable length up to 15 m: 3 x 2 x 0.25 (3 x 2 x 24 AWG) Cable length 20 m or 30 m: 2 x 2 x 0.25 + 2 x 0.38 (2 x 2 x 24 AWG + 2 x 22 AWG) 	2 x 0.75 (2 x 18 AWG)
Outer diameter (mm)	<ul style="list-style-type: none"> 1FL2 0.4 kW ... 1.75 kW, 2 kW: $\varnothing (7.5 \pm 0.2)$ 1FL2 2.5 kW: $\varnothing (9 \pm 0.3)$ 1FL2 2.9 kW ... 7 kW: $\varnothing (10.5 \pm 0.3)$ 	<ul style="list-style-type: none"> 1FL2 0.85 kW, 1.3 kW: $\varnothing (7.5 \pm 0.2)$ 1FL2 2.9 kW: $\varnothing (7.5 \pm 0.2)$ 	$\varnothing (7 \pm 0.2)$	$\varnothing (6 \pm 0.3)$
Minimum bending radius, static (mm)	4 x outer diameter		4 x outer diameter	4 x outer diameter
Minimum bending radius, dynamic (mm)	7.5 x outer diameter		7.5 x outer diameter	7.5 x outer diameter
Maximum acceleration (m/s ²)	5		5	5
Maximum traversing velocity (m/min)	180		180	180

14.3.2.3 Acceleration characteristic curve

Description

The acceleration characteristic curve of MOTION-CONNECT 380 is as follows:

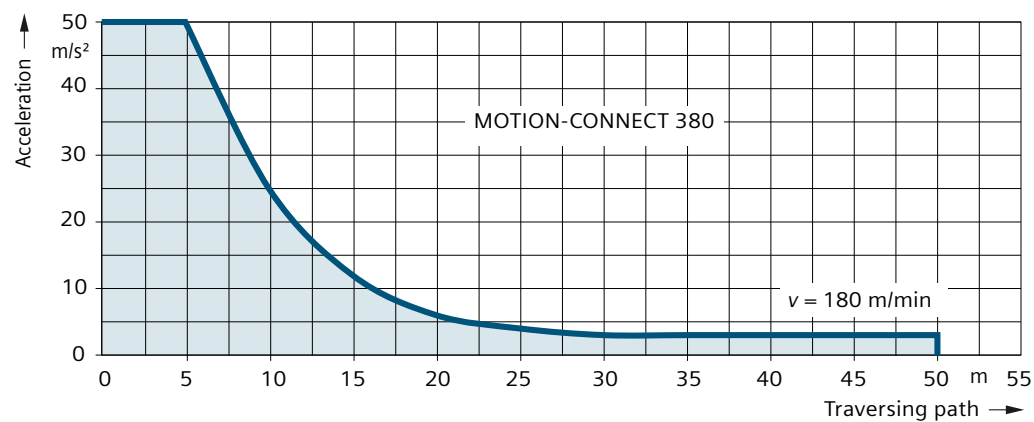


Figure 14-20 Acceleration characteristic curve of MOTION-CONNECT 380

Examples/applications

Description

You can find SINAMICS application examples in the Application examples (<https://sieportal.siemens.com/su/bkbaa>).

Appendix

A.1 UL Markings

Description

Converter variant of 1 AC/3 AC 200 V ... 240 V

For US/Canadian installations (UL/cUL): The products are cULus-listed under File E355661.

- Suitable for use in a circuit that cannot provide more than 100 kA rms (symmetrical), max. 240 V.
Note: The maximum permissible short-circuit current for 200 V variants with Type E Combination Motor Controllers is 65 kA.
- Protection of the branch circuit for individual drives must be guaranteed using Class J fuses in accordance with the technical data.
For other protection equipment and SCCRs (Short Circuit Current Rating) for individual drives, see:
Protective Devices for SINAMICS S200 Product Line (<https://support.industry.siemens.com/cs/ww/en/ps/29596/man>)
- This device must be installed in an enclosure that provides an environment with degree of pollution 2 (controlled).
- Maximum rated temperature 45 °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.

Converter variant of 3 AC 380 V ... 480 V

For US/Canadian installations (UL/cUL): The products are cULus-listed under File E355661.

- 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.
- For other protection equipment and SCCRs (Short Circuit Current Rating) for individual drives, see:
Protective Devices for SINAMICS S200 Product Line (<https://support.industry.siemens.com/cs/ww/en/ps/29596/man>)
- This device must be installed in an enclosure that provides an environment with degree of pollution 2 (controlled).
- Maximum rated temperature 45 °C. Maximum height 4000 m.

- 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.

Additional requirements relating to CSA compliance:

Maximum height for CSA: 2000 m.

Motor overload protection according to UL 61800-5-1 Ed.2

For the settings required to activate the motor overload protection according to UL 61800-5-1 Ed.2, see Section "Setting motor overload protection in accordance with UL 61800-5-1 Ed.2 (Page 320)".

MOTION-CONNECT connection system

The recommended assignment of motors and cables can be found in Section "Device combinations (Page 55)".

Other assignments are not possible.

The technical parameters of the cables are tailored to the requirements of the motors and verified by system tests. For detailed information, see Section "Technical data of MOTION-CONNECT cables (Page 682)".

A.2 EMERGENCY OFF and EMERGENCY STOP

Overview

In plants, systems and machines a distinction must be made between "EMERGENCY OFF" and "EMERGENCY STOP".

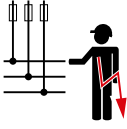
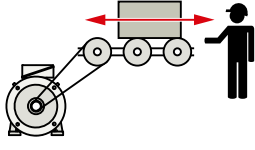
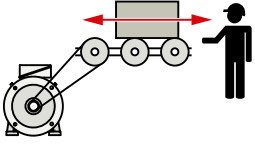
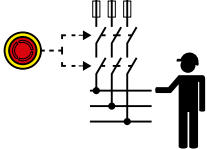
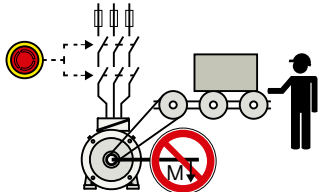
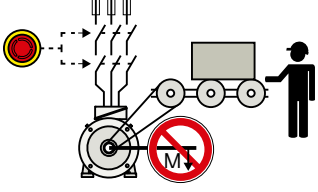
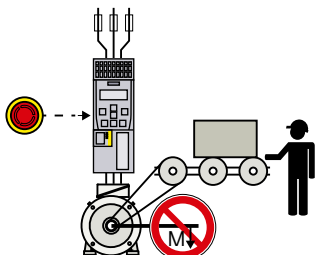
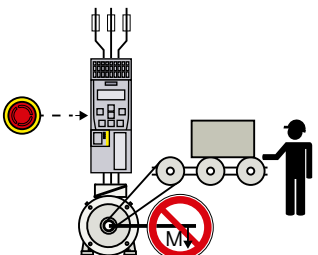
The Safe Torque Off (STO) and Safe Stop 1 (SS1) Safety Integrated Functions are suitable for implementing an "EMERGENCY STOP", but are not suitable for implementing an "EMERGENCY OFF".

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 the machine or system:
 - "EMERGENCY OFF" reduces the risk from electric shock.
 - "EMERGENCY STOP" reduces the risk from 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:	Switch off voltage Switch off hazardous voltages completely or in part	Prevent movement Prevent any hazardous movement	Stop movement Stop hazardous movement and prevent any restart.
Classic solution:	Switch off the voltage: 	Switch off the power supply of the drive: 	 Brake the motor and switch off the drive power supply
Solution with the STO or SS1 Safety Integrated function integrated into the drive:	STO and SS1 are not suitable for switching off an electrical voltage.	Select STO: 	Select SS1: 
		It is permissible that you also switch off the converter supply voltage. However, switching off the voltage is not required as a risk reduction measure.	

A.3 Parameters

A.3.1 Explanation of the list of parameters

Overview

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.

The parameters are displayed according to the following example:

rxxxx	Parameter name		
	Variant:	Product variant	
	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:	Name of the group(s)	
	Unit: -		
	Min:	Max:	Factory setting:
	-	-	-
Description:	Text		
Value:	0: Name of value 0 10: Name of value 10		
Recommendation:	Text		
Index:	[0] = Name and meaning of index 0 [1] = Name and meaning of index 1		
Bit array:	Bit	Signal name	1 signal
	00	Name of bit 0	Yes
	01	Name of bit 1	Yes
Dependency:	Text See also: pxxx, rxxx See also: Fxxxxx, Axxxxx, Cxxxxx		
Danger/Caution/ Warning/Notice:	Safety-related note corresponding to the warning note concept		
Note:	Text		

Note

Some parameters may have different properties and descriptions depending on the selected axis type. And those parameters are displayed twice in the parameter list with additional labels. You need to refer to the specific parameters according to your actual axis type.

Description of function**Parameter number**

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... Adjustable parameters (read and write)
- r... Display parameters (read-only)
- c... Display parameters (read-only)
- p0972 Adjustable parameter 972
- p0489[0...2] Adjustable parameter 489, index 0 to 2
- r0945 Display parameter 945

- r0196[0...255].0...15 Display parameter with index 0 to 255 and bit array from bit 0 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] Adjustable parameter 9563, index 1
- r0196[1].5 Display parameter 196, index 1, bit 5
- r0964[2] Display parameter 964, index 2
- p5611.1 Adjustable parameter 5611, bit 1

Parameter name

Shows the parameter name in the long 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.

- For parameters that displayed only once
 - S200 PN: The parameter applies to the S200 PN converter only.
 - S200 Basic PN: The parameter applies to the S200 Basic PN converter only.
- For parameters that displayed twice
 - S200 Basic PN (basic positioner for rotary movement), S200 PN (basic positioner for rotary movement): The parameter is used in the "rotary" axis type application only and applies to both the S200 PN converter and the S200 Basic PN converter.
 - no variant information: The parameter is used in the "linear" axis type application only and applies to both the S200 PN converter and the S200 Basic PN converter.

Data type

Each parameter is assigned one of the following data types:

- Integer8 8-bit integer
- Integer16 16-bit integer
- Integer32 32-bit integer
- Unsigned8 8-bit without sign
- Unsigned16 16-bit without sign
- Unsigned32 32-bit without sign
- FloatingPoint32 32-bit floating-point number
- FloatingPoint64 64-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.

Permission

The user and rights management (UMAC) controls access to the parameters.

You require runtime function rights to read and set parameters.

The following read permissions are available:

- Read drive data or acknowledge messages

The 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 configuration or drive applications
- Edit Safety Integrated application
- Edit web server configuration
- Manage users and roles
- Edit drive data encryption
- Edit other security settings
- Read security events

Runtime function rights depend on user roles, which are assigned in the commissioning tool being used. As a consequence, setting parameters can be write-protected.

The commissioning tool provides additional support.

Can be changed in the 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 adjustable parameters, the unit is additionally specified according to the values (Min, Max, Factory setting) in square brackets.

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.

Value

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 adjustable 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 fields, the following information is provided about each bit:

- Bit number and signal name
- Meaning for signal states 0 and 1
- Function diagram (optional)
The signal is shown in the 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 note 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

A.3.2 Parameter list

The following list contains the parameters of the converter.

Note that parameters p5750 - p5780 are not described in this manual because they are intended for internal use only.

Product: SINAMICS S200, Version: 607012000, Language: eng

Objects: S200 Basic PN, S200 PN

r0002	Drive operating display
	Data type: Integer16 Visible in: Standard display
	Read permission: Read drive data or acknowledge messages
	Parameter group: Status parameters, Diagnostics general, Drive enable signals
	Unit: -
Description:	Operating display for the drive.
Value:	0: Operation - Everything enabled 10: Operation - Set "enable setpoint" = "1" 11: Operation - Set "Enable speed controller" = "1" 12: Operation - RFG frozen, set "RFG start" = "1" 13: Operation - Set "enable RFG" = "1" 14: Operation - MotID, excitation running or brake opens, SS2 15: Operation - Open brake (p1215) 16: Operation - Withdraw braking with OFF1 using "ON/OFF1" = "1" 17: Operation - Braking with OFF3 can only be interrupted with OFF2 18: Operation - Brake on fault, remove fault, acknowledge 21: Ready for operation - Set "Enable operation" = "1" 23: Ready for operation - Set "Infeed operation" = "1"

- 31: Ready for switching on - Set "ON/OFF1" = "0/1"
- 35: Switching on inhibited - Carry out first commissioning
- 41: Switching on inhibited - Set "ON/OFF1" = "0"
- 42: Switching on inhibited - Set "Operating condition/OFF2" = "1"
- 43: Switching on inhibited - Set "Operating condition/OFF3" = "1"
- 44: Switching on inhibited - Resolve messages with STO, deselect STO
- 45: Switching on inhibited - Rectify fault, acknowledge fault, STO
- 46: Switching on inhibited - Exit commissioning mode
- 60: Drive deactivated/not operational
- 70: Initialization
- 200: Wait for run-up
- 250: Device signals a topology error

Dependency:

See also: r0046

NOTICE

For several missing enable signals, the corresponding value with the highest number is displayed.

Note

OC: Operating condition
EP: Enable Pulses (pulse enable)
RFG: Ramp-function generator
COMM: Commissioning
MotID: Motor data identification

r0020

Speed setpoint smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Unit: rpm

Description:

Displays the actual smoothed speed setpoint at the speed controller input.

Dependency:

See also: r1438

Note

Smoothing time constant = 100 ms
The signal is not suitable as a process quantity and may only be used as a display quantity.
The speed setpoint is available smoothed (r0020) and unsmoothed (r1438).

r0021

Speed actual value smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics, Mode signals / displays
Unit: rpm

Description:

Display for the smoothed actual value of the motor speed.

Dependency:

See also: r0063

Note

Smoothing time constant = 100 ms
The speed actual value is available smoothed (r0021) and unsmoothed (r0063).

r0026

DC link voltage smoothed

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

	Parameter group:	Brake control, Mode signals / displays
	Unit:	V
Description:	Displays the smoothed actual value of the DC link voltage.	
Dependency:	See also: r0070	
<div>NOTICE</div> <div>This smoothed signal is not suitable for diagnostics or evaluation of dynamic operations. In this case, the unsmoothed value should be used.</div>		
<div>Note</div> <div>Smoothing time constant = 100 ms</div> <div>The signal is not suitable as a process quantity and may only be used as a display quantity.</div> <div>The DC link voltage is available smoothed (r0026) and unsmoothed (r0070).</div>		
r0027	Absolute actual current smoothed	
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Mode signals / displays, Power unit
	Unit: Arms	
Description:	Displays the smoothed absolute current actual value.	
Dependency:	See also: r0068	
<div>NOTICE</div> <div>This smoothed signal is not suitable for diagnostics or evaluation of dynamic operations. In this case, the unsmoothed value should be used.</div>		
<div>Note</div> <div>ALM_S120, S_INF, VECTOR: Smoothing time constant = 300 ms</div> <div>SERVO: Smoothing time constant = 100 ms</div> <div>The signal is not suitable as a process quantity and may only be used as a display quantity.</div> <div>The absolute current actual value is available smoothed (r0027) and unsmoothed (r0068).</div>		
r0031	Actual torque smoothed	
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Brake control, Mode signals / displays
	Unit: Nm	
Description:	Displays the smoothed torque actual value.	
Dependency:	See also: r0080	
<div>Note</div> <div>Smoothing time constant = 100 ms</div> <div>The signal is not suitable as a process quantity and may only be used as a display quantity.</div> <div>The torque actual value is available smoothed (r0031) and unsmoothed (r0080).</div>		
r0032	Active power actual value smoothed	
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Mode signals / displays
	Unit: kW	
Description:	Display for the smoothed actual value of the active power.	
Dependency:	See also: r0082	

Note

The active power is available smoothed (r0032 with 100 ms, r0082[1] with 1 ms) and unsmoothed (r0082[0]).

r0034

Motor utilization thermal

Data type: FloatingPoint32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Motor temperature, Mode signals / displays

Unit: %

Description:

Displays the thermal motor utilization taking into account the ambient temperature set in p0613.

Dependency:

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.

r0035

Motor temperature

Data type: FloatingPoint32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Motor temperature, Mode signals / displays

Unit: °C

Description:

Displays the actual temperature in the motor.

r0036[0...2]

Power unit overload

Data type: FloatingPoint32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Mode signals / displays, Power unit

Unit: %

Description:

Display when the power unit is overloaded.

A reference value is defined for the monitoring functions.

An overload (0 %) is not displayed if the reference value is not exceeded.

The display value increases if the reference value is exceeded.

An alarm is output if an overload is active over a certain time period; a fault is output when 100% is reached.

Index:

[0] = I2t (AC)

[1] = Reserved

[2] = Reserved

Dependency:

See also: p0290

See also: F30005, A30256, A30257, F30258, A30267, F30268

Note

For index [0]:

This index shows the actual state of the I2t monitoring on the AC side.

The reference value represents the AC current that the power unit can permanently provide, without the influence of switching losses (e.g. the continuously permissible current of capacitors, inductances, busbars, etc.).

For index [1]:

This index shows the actual state of the active power monitoring.

The reference value represents the active power that the power unit can continuously provide.

For index [2]:

This index shows the actual state of the I2t monitoring on the DC side.

The reference value represents the DC current that can continuously flow in the DC link.

r0037[0...10]	Power unit temperatures
	Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Mode signals / displays, Power unit Unit: °C
Description:	Displays the temperatures in the power unit.
Index:	[0] = Inverter maximum value [1] = Depletion layer maximum value [2] = Reserved [3] = Reserved [4] = Interior of power unit [5] = Reserved [6] = Reserved [7] = Depletion layer maximum value 1 [8] = Depletion layer maximum value 2 [9] = Reserved [10] = Reserved
	Note r0037[0]: Maximum value of the inverter temperatures. r0037[1]: Maximum value of the depletion layer temperatures. 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 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 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 signals
	Data type: Unsigned32 Visible in: Standard display Read permission: Read drive data or acknowledge messages

	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.			
Bit array:	Bit	Signal name	1 signal	0 signal
	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
	10	Ramp-function generator enable missing	Yes	No
	12	Speed 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
	24	License missing	Yes	No
	26	Drive inactive or not operational	Yes	No
	28	Brake open missing	Yes	No
	30	Speed controller enable missing	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.
- Switching on inhibited is active.

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 (Safe Torque Off) is active.
- A safety-relevant message with STO as response is active.

Details relating to the reason that STO was selected are provided in 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 still not completed.

Bit 21 = 1 (enable signal missing), if:

the pulses have been enabled although the speed setpoint has still not been enabled, because:

- The opening time of the holding brake has not yet elapsed.
- The encoder has not been calibrated (synchronous motor).

Bit 26 = 1 (enable signal missing), if:

- The drive is inactive (STW2.7 = 1) or not capable of operation.

Bit 28 = 1 (enable signal missing), if:

- The holding brake is closed or has still not been opened.

Bit 30 = 1 (speed controller inhibited), if:

- Pulse enable missing.
 - The function generator with current setpoint is active.
 - Measuring function "Current controller reference frequency response" is active.
-

p0057	CO2 emission factor			
	Data type:	FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Ready for operation		
	Parameter group:	Mode signals / displays		
	Unit:	gCO2/kWh		
	Min:	Max:	Factory setting:	
	-3.4028235e+38 [gCO2/kWh]	3.4028235e+38 [gCO2/kWh]	380.0 [gCO2/kWh]	
	Description:	Sets the required CO2 emission factor. The factor is used to calculate the CO2 emissions derived from the energy display of the power unit.		
Dependency:	See also: r0058			
Note				
The value of the factory setting corresponds to the estimated value for the German electricity mix from 2023. It should be adapted to the power mix of the line supply on which the power unit is used.				
r0058[0...2]	CO2 display			
	Data type:	FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Mode signals / displays		
	Unit:	kgCO2		
	Description:	Displays the CO2 emission of the power unit derived from the energy consumed. The value is calculated as follows: $r0058[x] = r0039[x] \text{ (energy display)} * p0057 \text{ (CO2 emission factor)}$		
	Index:	[0] = CO2 display of the energy balance [1] = CO2 display of the energy consumed [2] = CO2 display of the energy recovered to the line supply		
	Dependency:	See also: r0039, p0057		
	r0060	Speed setpoint before the setpoint filter		
		Data type:	FloatingPoint32	Visible in: Extended display
Read permission:		Read drive data or acknowledge messages		
Parameter group:		Mode signals / displays, Speed setpoint filter		
Unit:		rpm		
Description:		Displays the actual, unsmoothed speed setpoint at the speed controller input.		
r0061[0...1]		Actual speed unsmoothed		
		Data type:	FloatingPoint32	Visible in: Extended display
		Read permission:	Read drive data or acknowledge messages	
		Parameter group:	Encoder evaluation, 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	

	Parameter group:	Speed controller, Mode signals / displays, Speed setpoint filter
	Unit:	rpm
Description:	Displays 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
	Parameter group:	Speed controller, Speed actual value filter, Mode signals / displays
	Unit:	rpm
Description:	Display for the smoothed speed actual value.	
Dependency:	See also: r0021, r0061, p1441	

Note

The smoothing time is set in p1441.

The speed actual value is available strongly smoothed (r0021) and unsmoothed (r0061).

r0068	Absolute current actual value	
	Data type:	FloatingPoint32
	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages
	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).

r0070	Actual DC link voltage	
	Data type:	FloatingPoint32
	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Vdc-min/max controller, Mode signals / displays, Power unit, Vdc controller
	Unit:	V
Description:	Display for the measured actual value of the DC link voltage.	
Dependency:	See also: r0026	

Note

The DC link voltage is available smoothed (r0026) and unsmoothed (r0070).

r0072	Output voltage	
	Data type:	FloatingPoint32
	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Current controller, Mode signals / displays, Power unit
	Unit:	Vrms
Description:	Display for the actual output voltage of the power unit.	

r0076	Current actual value field-generating	
	Data type:	FloatingPoint32
	Visible in:	Extended display

	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Current controller
	Unit: Arms	
Description:	Display for the field-generating current actual value.	

r0077[0...1]	Current setpoint torque-generating	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Current controller, Mode signals / displays
	Unit: Arms	
Description:	Displays the torque/force-generating current setpoint.	
Index:	[0] = Current setpoint [1] = Current setpoint model	

r0078[0...1]	Current actual value torque-generating	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Mode signals / displays
	Unit: Arms	
Description:	Display for the actual value of the torque-generating current Iq.	
Index:	[0] = Unsmoothed [1] = Smoothed with 1 ms	

r0079[0...1]	Torque setpoint total	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Torque limiting, Mode signals / displays
	Unit: Nm	
Description:	Displays the torque setpoint at the output of the speed controller.	
Index:	[0] = Unsmoothed [1] = Smoothed with 1 ms	

r0080	Torque actual value	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Motor model, Mode signals / displays
	Unit: Nm	
Description:	Displays the actual torque value.	
Dependency:	See also: r0031	
	Note The value is available smoothed (r0031) and unsmoothed (r0080).	

r0081	Torque utilization	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Torque limiting, Mode signals / displays
	Unit: %	

Description: Displays the torque utilization as a percentage.
The torque utilization is obtained from the required smoothed torque referred to the torque limit.

Note

The torque utilization is obtained from the required torque referred to the torque limit as follows:

- Positive torque: $r0081 = ((r0079 + p1532) / (r1538 - p1532)) * 100 \%$

- Negative torque: $r0081 = ((-r0079 + p1532) / (-r1539 + p1532)) * 100 \%$

The calculation of the torque utilization depends on the selected smoothing time constant (1 ms).

r0082[0...3]**Active power actual value**

Data type: FloatingPoint32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Mode signals / displays

Unit: kW

Description: Displays the actual active power.

Index:

[0] = Unsmoothed

[1] = Smoothed with 1 ms

[2] = Power drawn

[3] = Power drawn smoothed

Dependency:

See also: r0032

Note

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

p0140**Number of Encoder Data Sets (EDS)**

Data type: Unsigned8

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Commissioning

Parameter group:

Data sets

Unit: -

Min:

Max:

Factory setting:

1

1

1

Description:

Sets the number of Encoder Data Sets (EDS).

Note

When parameterizing the drive with "no encoder" there must be at least one encoder data set (p0140 >= 1).

r0196[0...255].0...15 Topology component status

Data type: Unsigned32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Diagnostics general

Unit: -

Description:

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

Bit array:

Bit **Signal name**

1 signal

0 signal

00	Component status bit 0	High	Low
01	Component status bit 1	High	Low
02	Component status bit 2	High	Low
03	Component status bit 3	High	Low
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
09	Safety message present	Yes	No
10	Fault 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 ... 00:

Bit 3, 2, 1, 0 = 0, 0, 0, 0 --> component not available.

Bit 3, 2, 1, 0 = 0, 0, 0, 1 --> run up, acyclic communications (LED = orange).

Bit 3, 2, 1, 0 = 0, 0, 1, 0 --> operating mode, cyclic communications (LED = green).

Bit 3, 2, 1, 0 = 0, 0, 1, 1 --> alarm (LED = green).

Bit 3, 2, 1, 0 = 0, 1, 0, 0 --> fault (LED = red).

Bit 3, 2, 1, 0 = 0, 1, 0, 1 --> detection via LED and operating mode (LED = green/orange).

Bit 3, 2, 1, 0 = 0, 1, 1, 0 --> detection via LED and alarm (LED = green/orange).

Bit 3, 2, 1, 0 = 0, 1, 1, 1 --> detection via LED and fault (LED = red/orange).

Bit 3, 2, 1, 0 = 1, 0, 0, 0 --> firmware being downloaded (LED = green/red with 0.5 Hz).

Bit 3, 2, 1, 0 = 1, 0, 0, 1 --> firmware download completed, wait for POWER ON (LED = green/red with 2.0 Hz).

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

Changeable in 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.

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

Changeable in operating state: Ready for operation

Parameter group:

Power unit, Quick commissioning

Unit: V

	Min: 1 [V]	Max: 63000 [V]	Factory setting: 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 _{rated} = 230 V: - p0210 = 200 ... 240 V U _{rated} = 400 V: - p0210 = 380 ... 480 V (wide voltage range, in addition to 200 ... 240 V)		

p0215	Braking resistor selection		
	Data type: Integer16	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Dynamic braking, Quick commissioning	
	Unit: -		
	Min: 3	Max: 10	Factory setting: 10
Description:	Sets the external braking resistor.		
Value:	3: Third-party braking resistor (with software monitoring) 10: No monitoring (external braking resistor)		
Dependency:	See also: p0216, p0218, p0219		
	Note p0215 = 3: An externally connected braking resistor is controlled and also thermally monitored per software. Parameters p0216, p0218 and p0219[0] and p0219[1] must be set in order that the monitoring functions. Chopper operation is not possible if the values are not set. p0215 = 10: The externally connected braking resistor is not monitored. If the power unit has an internal braking resistor, then this is monitored.		

p0216	Braking resistance value		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Dynamic braking, Quick commissioning	
	Unit: ohm		
	Min: 0.0 [ohm]	Max: 1000.0 [ohm]	Factory setting: 0.0 [ohm]
Description:	Sets the resistance value of a connected external braking resistor.		
Dependency:	The parameter is only relevant for p0215 = 3.		

p0218	Braking resistor duration at maximum power		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	

	Changeable in operating state:	Commissioning
	Parameter group:	Dynamic braking, Quick commissioning
	Unit: s	
	Min:	Max:
	0.00 [s]	2000.00 [s]
		Factory setting:
		0.00 [s]
Description:	Sets the maximum duration when operating the braking resistor at its maximum power level.	
Dependency:	The parameter is only relevant for p0215 = 3.	

p0219[0...1]	Braking resistor braking power		
	Data type: FloatingPoint32		Visible in: Extended display
	Read permission:		Read drive data or acknowledge messages
	Write permission:		Edit device configuration or drive applications
	Changeable in operating state:		Commissioning
	Parameter group:		Dynamic braking, Quick commissioning
	Unit: kW		
	Min:	Max:	Factory setting:
	0.00 [kW]	20000.00 [kW]	0.00 [kW]
	Description:	Sets the braking power of the connected braking resistor.	
Index:	[0] = Maximum power		
	[1] = Rated power		

r0277[0...2]	Power unit fan service indicator	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Power unit
	Unit: %	
Description:	Displays the service indicators of the fans 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.	
Index:	[0] = Main fan [1] = Auxiliary fan 1 [2] = Auxiliary fan 2	
Dependency:	See also: A30042	

p0290	Power unit overload response		
	Data type: Integer16		Visible in: Extended display
	Read permission:		Read drive data or acknowledge messages
	Write permission:		Edit device configuration or drive applications
	Changeable in operating state:		Ready for operation
	Parameter group:		Power unit
	Unit: -		
	Min:	Max:	Factory setting:
	0	1	0

Description:	<p>Sets the response to a thermal overload condition of the power unit.</p> <p>The following quantities can result in a response to thermal overload:</p> <ul style="list-style-type: none">- Heat sink temperature (r0037[0]).- Chip temperature (r0037[1]).- Power unit overload I2t (r0036). <p>Possible measures to avoid thermal overload:</p> <ul style="list-style-type: none">- Reduction of the output current limit (for closed-loop speed/velocity or torque/force control).- Reduction of the pulse frequency. <p>A reduction, if parameterized, is always realized after an appropriate alarm is output.</p> <p>For p0290 = 0:</p> <p>When a temperature alarm threshold is exceeded, the output current is reduced, and in turn, the output frequency. If the current reduction is not sufficient to thermally relieve the power unit, when the drive reaches the temperature fault threshold it switches off.</p> <p>This setting is not suitable for drives that require a constant torque.</p> <p>Application:</p> <p>Pumps, fans</p> <p>For p0290 = 1:</p> <p>The power unit operates at the required operating point. When the fault threshold is reached, the drive switches off and an appropriate fault is output.</p> <p>Application:</p> <p>Drive applications where, as a result of the underlying process, no setpoint deviations of individual drives in the group are permitted - or where the pulse frequency must be strictly maintained.</p>		
Value:	<p>0: Reduction output current</p> <p>1: No reduction shutdown when overload threshold is reached</p>		
Dependency:	<p>For a thermal power unit overload, an appropriate alarm or fault is output.</p> <p>See also: r0036, r0037</p>		
<table><tr><td>NOTICE</td></tr><tr><td>If the thermal overload of the power unit is not sufficiently reduced by the actions taken, the drive is always shut down. This means that the power unit is always protected irrespective of the setting of this parameter.</td></tr></table>		NOTICE	If the thermal overload of the power unit is not sufficiently reduced by the actions taken, the drive is always shut down. This means that the power unit is always protected irrespective of the setting of this parameter.
NOTICE			
If the thermal overload of the power unit is not sufficiently reduced by the actions taken, the drive is always shut down. This means that the power unit is always protected irrespective of the setting of this parameter.			
<p>Note</p> <p>When the motor data identification routine is selected, parameter p0290 cannot be changed.</p> <p>For p0290 = 0:</p> <p>This is setting is only practical if the load decreases with decreasing speed (e.g. for applications with variable torque such as for pumps and fans).</p>			

r0296	DC link voltage undervoltage threshold
	<p>Data type: Unsigned16 Visible in: Extended display</p> <p>Read permission: Read drive data or acknowledge messages</p> <p>Parameter group: Power unit</p> <p>Unit: V</p>
Description:	<p>Threshold to detect a DC link undervoltage.</p> <p>If the DC link voltage falls below this threshold, the drive unit is tripped due to a DC link undervoltage condition.</p>
Dependency:	<p>See also: F30003</p>
<p>Note</p> <p>The actual threshold value depends on the device type and the selected device supply voltage (p0210).</p>	
r0297	DC link voltage overvoltage threshold
	<p>Data type: Unsigned16 Visible in: Extended display</p> <p>Read permission: Read drive data or acknowledge messages</p>

	Parameter group: Power unit Unit: V
Description:	Threshold to detect a DC link overvoltage. If the DC link voltage exceeds the threshold specified here, the drive device is tripped due to DC link overvoltage.
Dependency:	See also: F30002
p0300[0]	Motor type selection Data type: Integer16 Visible in: Standard display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Changeable in operating state: Commissioning Parameter group: Motor data, Quick commissioning Unit: - Min: 0 Max: 10100 Factory setting: 0
Description:	Selects the motor type or start to read in the motor parameters for a motor with self-identifying data (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
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 Changeable in operating state: Commissioning Parameter group: Motor data, Quick commissioning Unit: - Min: 0 Max: 99999999 Factory setting: 0
Description:	Code number of the connected motor, whose data was accepted when commissioning.
Dependency:	Code numbers are only possible for motor types that correspond to the motor type selected in p0300. See also: p0300
	Note For a motor with self-identifying data, 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 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.
p0304[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	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data, Quick commissioning	
	Unit: Vrms		
	Min:	Max:	Factory setting:
	0 [Vrms]	20000 [Vrms]	0 [Vrms]
Description:	Displays the rated motor voltage.		

p0305[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	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data, Quick commissioning	
	Unit: Arms		
	Min:	Max:	Factory setting:
	0.00 [Arms]	10000.00 [Arms]	0.00 [Arms]
Description:	Displays the rated motor current.		

p0307[0]	Rated motor power		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data, Quick commissioning	
	Unit: kW		
	Min:	Max:	Factory setting:
	0.00 [kW]	100000.00 [kW]	0.00 [kW]
Description:	Displays the rated motor power.		

p0311[0]	Rated motor speed		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data, Quick commissioning	
	Unit: rpm		
	Min:	Max:	Factory setting:
	0.0 [rpm]	210000.0 [rpm]	0.0 [rpm]
Description:	Displays the rated motor speed.		

p0312[0]	Rated motor torque		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data	
	Unit: Nm		

	Min: 0.00 [Nm]	Max: 1000000.00 [Nm]	Factory setting: 0.00 [Nm]
Description:	Displays the rated motor torque.		
r0313[0]	Motor pole pair number, actual (or calculated)		
	Variant:	S200 PN	
	Available when function is active:	AST Lite	
	Data type: Unsigned16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Motor data, Quick commissioning	
	Unit: -		
Description:	Displays the number of motor pole pairs. The value is used for internal calculations. r0313 = 1: 2-pole motor r0313 = 2: 4-pole motor, etc.		
Dependency:	See also: p0311		
	Note For the automatic calculation, the pole pair number is set to the value of 2 if the rated speed or the rated frequency is zero.		
r0316[0]	Motor torque constant		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Motor data, Quick commissioning	
	Unit: Nm/A		
Description:	Sets the torque constant of the synchronous motor. r0316 = 0: The torque constant is calculated from p0312 or p0307. r0316 > 0: The set value is used as torque constant.		
Dependency:	See also: r0334		
p0318[0]	Motor stall current		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data	
	Unit: Arms		
	Min: 0.00 [Arms]	Max: 10000.00 [Arms]	Factory setting: 0.00 [Arms]
Description:	Displays the rated motor stall current.		
p0319[0]	Motor static torque		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	

	Parameter group: Motor data Unit: Nm Min: 0.00 [Nm] Max: 100000.00 [Nm] Factory setting: 0.00 [Nm]
Description:	Displays the motor standstill/static torque.
p0322[0]	Maximum motor speed Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Changeable in operating state: Commissioning Parameter group: Motor data, Quick commissioning Unit: rpm Min: 0.0 [rpm] Max: 210000.0 [rpm] Factory setting: 0.0 [rpm]
Description:	Displays the maximum motor speed.
Dependency:	See also: p1082
p0323[0]	Maximum motor current Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Changeable in operating state: Commissioning Parameter group: Motor data, Quick commissioning Unit: Arms Min: 0.00 [Arms] Max: 20000.00 [Arms] Factory setting: 0.00 [Arms]
Description:	Displays the maximum permissible motor current.
r0334[0]	Actual motor-torque constant Variant: S200 PN Available when function is active: AST Lite Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Motor data, Extended torque control Unit: Nm/A
Description:	Displays the torque constant of the synchronous motor used.
Dependency:	IEC drives (p0100 = 0): unit Nm / A NEMA drives (p0100 = 1): unit lbf ft / A See also: r0316, p0316
	Note This parameter is not used for induction motors (p0300 = 1xx). For synchronous motors, parameter r0334 = p0316 is displayed. For p0316 = 0, r0334 is calculated from p0305 and p0312.
r0341[0]	Motor moment of inertia Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages

Parameter group: Motor data, Speed controller
Unit: kgm²
Description: Displays the motor moment of inertia (without load).

p0400[0...n] Encoder type selection

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Commissioning
Parameter group: Encoder evaluation, Quick commissioning
Unit: -
Min: 0 **Max:** 10100 **Factory setting:** 0

Description: Selects the encoder from the list of encoder types supported.

Value:
0: No encoder
801: Digital encoder interface AS17, singleturn
802: Digital encoder interface AS21, singleturn
803: Digital encoder interface AM21, multiturn 4096
9999: User defined
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.

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...n].1...20 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
Changeable in operating state: Commissioning
Parameter group: Encoder evaluation
Unit: -
Min: - **Max:** - **Factory setting:** 0000 0000 0000 0000 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
	07	Digital Encoder Interface	Yes	No
	20	Voltage level 5 V	Yes	No

NOTICE

This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400).
When selecting a catalog encoder, this parameter cannot be changed (write protection).

Note

For bit 01, 02 (absolute encoder, multiturn encoder):
These bits can only be selected for a DEI encoder.

p0408[0...n]**Rotary encoder pulse number****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Commissioning**Parameter group:** Encoder evaluation**Unit:** -**Min:****Max:****Factory setting:**

0

16777215

1024

Description:

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).

NOTICE

This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400).
When selecting a catalog encoder, this parameter cannot be changed (write protection).

Note

The smallest permissible value is 1 pulse.

This value does not always correspond to the physical pulse number of the measuring device. For a DEI encoder, a value is entered here that facilitates optimum transfer of the resolution (p0423).

p0419[0...n]**Fine resolution absolute value Gx_XIST2 (in bits)****Data type:** Unsigned8**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Commissioning**Parameter group:** Encoder evaluation**Unit:** -**Min:****Max:****Factory setting:**

0

18

9

Description:

Sets the fine resolution in bits of the absolute position actual values.

Note

This parameter applies to process data Gx_XIST2 when reading the absolute value.

p0421[0...n]**Absolute encoder rotary multiturn resolution****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Commissioning**Parameter group:** Encoder evaluation**Unit:** -

	Min: 0	Max: 4294967295	Factory setting: 4096
Description:	Sets the number of revolutions that can be resolved for a rotary absolute encoder.		
	<div>NOTICE This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).</div>		

p0423[0...n]	Absolute encoder rotary singleturn resolution		
	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Encoder evaluation	
	Unit: -		
	Min: 0	Max: 1073741823	Factory setting: 8192
Description:	Sets the number of measuring steps per revolution for a rotary absolute encoder. The resolution refers to the absolute position.		
	<div>NOTICE This parameter is automatically preset for encoders from the encoder list and for "Encoder type selection" (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).</div>		

r0479[0...2]	Diagnostics encoder position actual value Gn_XIST1		
	Data type: Integer32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Encoder evaluation	
	Unit: -		
Description:	Display for the encoder position actual value Gn_XIST1 according to PROFIdrive for diagnostics. The value is displayed with sign.		
Index:	[0] = Motor encoder [1] = Reserved [2] = Reserved		

p0488[0...2]	Measuring probe 1 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	
	Changeable in operating state:	Operation	
	Parameter group:	Measuring probe, Traversing blocks	
	Unit: -		
	Min: 0	Max: 210	Factory setting: [0] 210 [1] 0 [2] 0
Description:	Sets the input terminal to connect probe 1.		
Value:	0: No measuring probe 210: DI 0 (X130.1)		

Index: [0] = Motor encoder
[1] = Reserved
[2] = Reserved

Dependency: See also: p0489, p0490

**CAUTION**

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.

p0489[0...2]**Measuring probe 2 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

Changeable in operating state: Operation

Parameter group:

Measuring probe, Traversing blocks

Unit: -

Min:

Max:

Factory setting:

0

211

[0] 211

[1] 0

[2] 0

Description: Sets the input terminal to connect probe 2.

Value: 0: No measuring probe

211: DI 1 (X130.2)

Index: [0] = Motor encoder
[1] = Reserved
[2] = Reserved

Dependency: See also: p0488, p0490

**CAUTION**

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 or equivalent zero mark**

Data type: Unsigned32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group:

Measuring probe

Unit: -

Min:

Max:

Factory setting:

-

-

0000 bin

Description: Setting to invert the digital input signals to connect a measuring probe or an equivalent zero mark.

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130.1)	Inverted	Not inverted
01	DI 1 (X130.2)	Inverted	Not inverted

Dependency: See also: p0488, p0489, p0494

Note

The terminal must be set as input.

When the measuring probe or the equivalent zero mark is inverted, this has no effect on the status displays of the digital inputs (r0721, r0722).

DI: Digital Input

p0494[0...n]

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

Changeable in operating state:

Operation

Parameter group:

Encoder evaluation, Homing

Unit: -

Min:

Max:

Factory setting:

0

211

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)

211: DI 1 (X130.2)

Dependency:

See also: p0490

CAUTION

In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note

Refer to the encoder interface for PROFIdrive.

p0550[0]

Brake version

Data type: Integer16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state:

Commissioning

Parameter group:

Motor holding brake, Quick commissioning

Unit: -

Min:

Max:

Factory setting:

0

2

0

Description:

Sets the brake version.

Value:

0: No data

1: Holding brake

2: High performance holding brake

NOTICE

After entering a corresponding code number (p0551), this parameter is automatically pre-assigned and write protected. The information in p0551 should be observed when removing write protection.

Note

For p0550 = 1:

The default value for opening time/closing time applies.

For p0550 = 2:

A shorter opening time/closing time is realized if the power unit supports the function.

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

Changeable in operating state:

Commissioning

Parameter group:

Motor holding brake, Quick commissioning

Unit: -**Min:****Max:****Factory setting:**

0

4294967295

1

Description:

Setting the code number for the brake.

0 = No data

1 = Manual entry

> 1 = valid code number

For value = 0:

- Parameters listed under Dependent are set to a value of zero and are write protected.

- Parameters p1216, p1217 are set to a value of zero.

For value = 1:

- Write protection for the parameters listed under Dependent is withdrawn.

For value > 1:

- Parameters listed under Dependent are automatically pre-assigned and are write protected.

- Parameters p1216, p1217 are automatically appropriately pre-assigned.

Dependency:

See also: p0550

Note

Only code numbers can be set that are permitted for the selected motor code (p0301).

p0613[0]**Motor temperature model ambient temperature****Data type:** FloatingPoint32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state:

Operation

Parameter group:

Motor temperature

Unit: °C**Min:****Max:****Factory setting:**

-40 [°C]

100 [°C]

20 [°C]

Description:

Sets the motor ambient temperature.

Based on this value, the motor temperature model calculates the thermal motor utilization (r0034).

Dependency:

See also: r0034

See also: F07011, A07012

Note

If the thermal motor model is activated for permanent-magnet synchronous motors, then the parameter is incorporated in the model calculation if a temperature sensor is not being used.

For thermal motor model 1, the factory setting is based on an ambient temperature of 40 °C.

r0721.0...3**CU digital inputs terminal actual value****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Parameter group:

Digital inputs

Unit: -

Description:	Displays the actual value at the digital inputs. This means that the actual input signal can be checked at terminal DI x prior to switching from the simulation mode (p0795.x = 1) to the terminal mode (p0795.x = 0).		
Bit array:	Bit	Signal name	1 signal
	00	DI 0 (X130.1)	High
	01	DI 1 (X130.2)	High
	02	DI 2 (X130.3)	High
	03	DI 3 (X130.4)	High
	Note DI: Digital Input		

r0722.0...3	Digital inputs status		
	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Digital inputs	
	Unit: -		
Description:	Displays for the status of the digital inputs.		
Bit array:	Bit	Signal name	1 signal
	00	DI 0 (X130.1)	High
	01	DI 1 (X130.2)	High
	02	DI 2 (X130.3)	High
	03	DI 3 (X130.4)	High
Dependency:	See also: p0488, p0489		
	Note For bits 00, 01: DI 0 and DI 1 are fast digital inputs and can be used as measuring probe (p0488, p0489). DI: Digital Input		

c0730	Signal for terminal DO 0		
	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:	Digital outputs	
	Unit: -		
Description:	Signal for terminal DO 0 (X130.11/12).		
	Note DO: Digital Output		

c0731	Signal for terminal DO 1		
	Variant:	S200 PN	
	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:	Digital outputs	
	Unit: -		
Description:	Signal for terminal DO 1 (X130.13/14).		
	Note DO: Digital Output		

r0747.0	Digital outputs status			
	Variant:		S200 Basic PN	
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Digital outputs	
	Unit: -			
Description:	Displays the status of digital outputs.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	DO 0 (DO+: X130.11 / DO-: X130.12)	High	Low
	Note			
	DO: Digital Output			

r0747.0...1	Digital outputs status			
	Variant:		S200 PN	
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Digital outputs	
	Unit: -			
Description:	Displays the status of digital outputs.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	DO 0 (DO+: X130.11 / DO-: X130.12)	High	Low
	01	DO 1 (DO+: X130.13 / DO-: X130.14)	High	Low
<hr/>				
Note				
DO: Digital Output				

p0748.0	Invert digital outputs		
	Variant:	S200 Basic PN	
	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Digital outputs	
	Unit: -		
	Min:	Max:	Factory setting:
	-	-	0000 bin
Description:	Setting to invert the signals at the digital outputs.		
Bit array:	Bit	Signal name	1 signal
	00	DO 0 (DO+: X130.11 / DO-: X130.12)	Inverted
			0 signal
			Not inverted
	Note		
	DO: Digital Output		

p0748.0...1	Invert digital outputs		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	

	Parameter group:		Digital outputs	
	Unit: -			
	Min:		Max:	Factory setting:
	-		-	0000 bin
Description:	Setting to invert the signals at the digital outputs.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	DO 0 (DO+: X130.11 / DO-: X130.12)	Inverted	Not inverted
	01	DO 1 (DO+: X130.13 / DO-: X130.14)	Inverted	Not inverted
<hr/>				
	Note			
	DO: Digital Output			

p0795.0...3	Digital inputs simulation mode			
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Write permission:		Edit device configuration or drive applications	
	Changeable in operating state:		Operation	
	Parameter group:		Digital inputs	
	Unit: -			
	Min:		Max:	Factory setting:
	-		-	0000 bin
	Description:	Sets the simulation mode for digital inputs.		
Bit array:	Bit	Signal name	1 signal	0 signal
	00	DI 0 (X130.1)	Simulation	Terminal eval
	01	DI 1 (X130.2)	Simulation	Terminal eval
	02	DI 2 (X130.3)	Simulation	Terminal eval
	03	DI 3 (X130.4)	Simulation	Terminal eval
Dependency:	The setpoint for the input signals is specified using p0796. See also: p0796, p10000			
<hr/>				
Note				
This parameter is not saved when backing up data (p0977).				
DI: Digital Input				

p0796.0...3	Digital inputs simulation mode setpoint			
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Write permission:		Edit device configuration or drive applications	
	Changeable in operating state:		Operation	
	Parameter group:		Digital inputs	
	Unit: -			
	Min:		Max:	Factory setting:
	-		-	0000 bin
	Description:	Sets the setpoint for the input signals in the digital input simulation mode.		
Bit array:	Bit	Signal name	1 signal	0 signal
	00	DI 0 (X130.1)	High	Low
	01	DI 1 (X130.2)	High	Low
	02	DI 2 (X130.3)	High	Low
	03	DI 3 (X130.4)	High	Low
Dependency:	The simulation of a digital input is selected using p0795.			
	See also: p0795			

Note

This parameter is not saved when backing up data (p0977).
DI: Digital Input

c0849[0]**No Quick Stop / Quick Stop (OFF3)****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:

Enable logic, Drive enable signals

Unit: -**Description:**

Second signal for command "No Quick Stop / Quick Stop (OFF3)"

The following signals are AND'ed:

- OFF3 enable via PROFIdrive

- c0849 "No Quick Stop / Quick Stop (OFF3) signal 2"

For the PROFIdrive profile, the result of the AND logic operation corresponds to control word 1 bit 2 (STW1.2).

No OFF3 enable via PROFIdrive or c0849 = 0 signal

- OFF3 (braking along the OFF3 ramp (p1135), then pulse cancellation and switching on inhibited)

OFF3 enable via PROFIdrive and c0849 = 1 signal

- No OFF3 (enable possible)

**CAUTION**

This signal also remains active when "master control from PC" is activated.

Note

After switching over to closed-loop torque control via telegram (see r1407.2 = 1 signal), Quick Stop (OFF3) does not have a dedicated braking response; however, pulses are canceled when standstill is detected (p1226, p1227).

r0898.0...14**Control word sequence control****Data type:** Unsigned16**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Parameter group:

Control/status words

Unit: -**Description:**

Display for the control word of the sequence control.

Bit array:

Bit	Signal name	1 signal	0 signal
00	ON/OFF1	ON	OFF
01	No coast-down / coast-down (OFF2)	No OFF2	OFF2
02	No Quick Stop / Quick Stop (OFF3)	No OFF3	OFF3
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
10	Control by PLC	Yes	No
12	Enable speed controller	Yes	No
14	Command close brake	Yes	No

Note

For bit 10:

This bit is only relevant for telegram types that cyclically send the associated bit in the control word. Otherwise, r0898.10 is always "Yes".

r0899.0...13	Status word sequence control			
	Data type: Unsigned16		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Control/status words	
	Unit: -			
Description:	Display for the status word of the sequence control. The status word is cyclically sent from the drive to the higher-level control.			
Bit array:	Bit	Signal name	1 signal	0 signal
	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 requested	Yes	No
	11	Pulses enabled	Yes	No
	12	Motor holding brake control	Yes	No
	13	Motor holding brake status	Yes	No
	<hr/>			
Note				
For bits 00, 01, 02, 04, 05, 06, 09:				
For PROFIdrive, these signals are used for status word 1.				
<hr/>				
r0922	IF1 PROFIdrive PZD telegram			
	Data type: Unsigned16		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Quick commissioning, Configuration	
	Unit: -			
Description:	Displays the PROFIdrive telegram.			
Value:	1:	Standard telegram 1, PZD-2/2		
	2:	Standard telegram 2, PZD-4/4		
	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		
	999:	Reserved		
	<hr/>			
Note				
The telegram is set in the commissioning tool or by the control.				
<hr/>				
r0922	IF1 PROFIdrive PZD telegram			
	Variant:		S200 Basic PN, S200 PN	
	Values for:		Basic positioner	
	Data type: Unsigned16		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Quick commissioning, Configuration	
	Unit: -			

Description: Displays the PROFIdrive telegram.

Value:

7:	Standard telegram 7, PZD-2/2
9:	Standard telegram 9, PZD-10/5
111:	SIEMENS telegram 111, PZD-12/12
112:	SIEMENS telegram 112, PZD-17/12
113:	SIEMENS telegram 113, PZD-21/14
999:	Reserved

Note

The telegram is set in the commissioning tool or by the control.

r0924[0...1] ZSW bit pulses enabled

Data type: Unsigned16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Configuration

Unit: -

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

Data type: Unsigned16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group:

Configuration

Unit: -

Min:

0

Max:

65535

Factory setting:

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

Data type: Unsigned16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Configuration

Unit: -

Description: Displays the operating mode.

1: Closed-loop speed controlled operation with ramp-function generator

2: Closed-loop position controlled operation

3: Closed-loop speed controlled operation without ramp-function generator

r0944 Counter for fault buffer changes

Data type: Unsigned16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

	Parameter group:	Faults / alarms
	Unit:	-
Description:	Display and numerical signal source for the counter for changes of the fault buffer. This counter is incremented every time the fault buffer changes.	
Recommendation:	Used to check whether the fault buffer has been read out consistently.	
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		
	Parameter group: Faults / alarms		
	Unit: -		
Description:	Displays the codes of faults that have occurred.		
Dependency:	See also: r0947, r0948, r0949, r2109, r2130, r2133, r2136, r3122		
<table><tr><td>NOTICE</td></tr><tr><td>The properties of the fault buffer should be taken from the corresponding product documentation.</td></tr></table>		NOTICE	The properties of the fault buffer should be taken from the corresponding product documentation.
NOTICE			
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
	Parameter group: Faults / alarms
	Unit: -
Description:	Displays the numbers of faults that have occurred.
Dependency:	See also: r0945

NOTICE

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 time received in milliseconds**

Data type: Unsigned32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Faults / alarms

Unit: ms

Description:

Displays the system runtime in milliseconds when the fault occurred.

Dependency:

See also: r0945, r0947, r0949, r2109, r2114, r2130, r2133, r2136, r3122

NOTICE

The time comprises r2130 (days) and r0948 (milliseconds).

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

The structure of the fault buffer and the assignment of the indices is shown in r0945.

When the parameter is read via PROFIdrive, the TimeDifference data type applies.

r0949[0...63]**Fault value**

Data type: Integer32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Faults / alarms

Unit: -

Description:

Displays additional information about the fault that occurred (as integer number).

Dependency:

See also: r0945, r0947, r0948, r2109, r2130, r2133, r2136, r3122

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the fault buffer and the assignment of the indices is shown in r0945.

p0952

Fault 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
Changeable in operating state: Operation
Parameter group: Faults / alarms
Unit: -
Min: **Max:** **Factory setting:**
0 65535 0

Description: Number of fault situations that have occurred since the last reset.

Dependency: The fault buffer is deleted (cleared) by setting p0952 to 0.
In order that faults with "POWER ON" acknowledgment can also be cleared from the fault buffer, POWER ON must first be carried out.
See also: r0945, r0947, r0948, r0949, r2109, r2130, r2133, r2136

r0964[0...6]

Device identification

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification
Unit: -
Description: Displays the device identification.
Index: [0] = Company (Siemens = 42)
[1] = Device type
[2] = Firmware version
[3] = Firmware date (year)
[4] = Firmware date (day/month)
[5] = Reserved
[6] = Firmware patch/hot fix

Note

Example:
r0964[0] = 42 --> SIEMENS
r0964[1] = device type, see below
r0964[2] = 602 --> first part firmware version V06.02 (second part, refer to index 6)
r0964[3] = 2023 --> year 2023
r0964[4] = 1706 --> June 17
r0964[5] = 1 --> 1 (fixed value)
r0964[6] = 0 --> second part firmware version (complete version: V06.02.00.00)
Device type:
r0964[1] = 11200 --> SINAMICS S200 PN
r0964[1] = 11202 --> SINAMICS S200 PTI
r0964[1] = 11210 --> SINAMICS S200 Basic PN
r0964[1] = 11212 --> SINAMICS S200 Basic PTI

r0965

PROFIdrive profile number profile version

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

	Parameter group:	Configuration	
	Unit: -		
Description:	Displays the PROFIdrive profile number and profile version. Constant value = 032A hex. Byte 1: Profile number = 03 hex = PROFIdrive profile Byte 2: profile version = 2A hex = 42 dec = version 4.2		
<hr/>			
Note When the parameter is read via PROFIdrive, the Octet String 2 data type applies.			
<hr/>			
p0972	Drive reset		
	Data type: Unsigned16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Save & reset	
	Unit: -		
	Min:	Max:	Factory setting:
	0	3	0
Description:	Sets the required procedure to execute a hardware reset for the drive.		
Value:	0: Inactive 1: Hardware-Reset immediate 2: Hardware reset preparation 3: Hardware reset after cyclic communication has failed		
<hr/>			
<div> DANGER</div>			
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.			
<hr/>			
Note For value = 1: The reset is immediately executed and communications interrupted. The reset operation should be checked once communications have been established. 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 no longer acknowledged). The communication is then interrupted. - The reset operation should be checked once communications have been established. 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 drives. The reset is immediately executed if cyclic communications is not active. The reset operation should be checked once communications have been established.			
 Checking the reset operation: After the drive has been restarted and communications have been established, read parameter p0972 and check the following: p0972 = 0 --> the reset was successfully executed. p0972 > 0 --> the reset was not executed.			

	Read permission:	Read drive data or acknowledge messages
	Parameter group:	System identification
	Unit:	-
Description:	Displays the identification of the converter. The drive internally comprises components, device and converter. Both components require their own identification parameters according to PROFIdrive.	
Index:	[0] = Company (Siemens = 42) [1] = Converter type [2] = Firmware version [3] = Firmware date (year) [4] = Firmware date (day/month) [5] = PROFIdrive converter type class [6] = PROFIdrive converter subtype class [7] = Reserved [8] = Reserved [9] = Reserved [10] = Firmware patch/hot fix	
Dependency:	See also: r0964	
	<hr/> Note Example: r0975[0] = 42 --> SIEMENS r0975[1] = 311 --> SERVO converter type r0975[2] = 602 --> first part firmware version V06.02 (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] = 8 --> PROFIdrive subtype class = 4 (application class) r0975[7] = 1 --> 1 (fixed value) r0975[8] = 0 (reserved) r0975[9] = 0 (reserved) r0975[10] = 0 --> second part firmware version (complete version: V06.02.00.00)	

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
	Changeable in operating state: Ready for operation
	Parameter group: Save & reset
	Unit: -
	Min: 0
	Max: 1
	Factory setting: 0
Description:	Resets all drive system parameters to the factory settings.
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
	Changeable in operating state: Operation

	Parameter group:	Save & reset
	Unit: -	
	Min:	Max:
	0	1
		Factory setting:
		0
Description:	Retentively saves all parameters of the drive system to the non-volatile memory. When the converter is restarted, the retentively stored parameters are loaded. When saving, only the adjustable parameters intended to be saved are taken into account.	
Value:	0: Inactive 1: Save in a non-volatile fashion	
Dependency:	See also: p0976	
NOTICE		
The converter supply voltage may only be switched off after saving has been completed (i.e. after saving has started, wait until the parameter again has a value of 0). Writing to parameters is inhibited while saving.		

r0979[0...30]**PROFIdrive encoder format**

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification, Configuration
Unit: -

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

r0980[0...299]**List of existing parameters 1**

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification
Unit: -

Description: Displays the parameters that exist for this drive.

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 parameter lists of the commissioning tool. However, they can be read from a higher-level control system.

p1082[0]**Maximum speed**

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

	Changeable in operating state:	Ready for operation	
	Parameter group:	Speed limiting, Speed controller, Limits	
	Unit:	rpm	
	Min:	Max:	Factory setting:
	0.000 [rpm]	210000.000 [rpm]	1500.000 [rpm]
Description:	Sets the maximum motor speed to a value less than or equal to the maximum motor speed (p0322). The set value is valid for both directions of rotation.		
Dependency:	See also: p0322		

p1083[0]	Speed limit in positive direction of rotation		
	Data type:	Float32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed limiting, Speed controller, Limits	
	Unit:	rpm	
	Min:	Max:	Factory setting:
	0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]
Description:	Sets the maximum speed for the positive direction.		

p1086[0]	Speed limit in negative direction of rotation		
	Data type:	Float32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed limiting, Speed controller, Limits	
	Unit:	rpm	
	Min:	Max:	Factory setting:
	-210000.000 [rpm]	0.000 [rpm]	-210000.000 [rpm]
Description:	Sets the speed limit for the negative direction.		

p1115	Ramp-function generator selection		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Extended setpoint channel	
	Data type:	Integer16	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Ramp-function generator	
	Unit:	-	
	Min:	Max:	Factory setting:
	0	1	0
Description:	Sets the ramp-function generator type.		
Value:	0: Basic ramp-function generator 1: Extended ramp-function generator		

Note

Another ramp-function generator type can only be selected when the motor is at a standstill.

p1120[0]	Ramp-function generator ramp-up time			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Extended setpoint channel		
	Data type:	FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Ramp-function generator, Limits		
	Unit:	s		
		Min:	Max:	Factory setting:
	0.000 [s]	999999.000 [s]	10.000 [s]	
Description:	Setting the ramp-up time of the ramp-function generator. The ramp-function generator ramps-up the speed setpoint from standstill (setpoint = 0) up to the maximum speed (p1082) in this time.			
Dependency:	See also: p1082			
<hr/>				
p1121[0]	OFF1 ramp-down time			
	Data type:	FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Quick commissioning		
	Unit:	s		
		Min:	Max:	Factory setting:
		0.000 [s]	999999.000 [s]	1.000 [s]
	Description:	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.		
Dependency:	See also: p1082			
<hr/>				
p1130[0]	Ramp-function generator initial rounding-off time			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Extended setpoint channel		
	Data type:	FloatingPoint32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Ramp-function generator		
	Unit:	s		
		Min:	Max:	Factory setting:
	0.000 [s]	30.000 [s]	0.000 [s]	
Description:	Sets the initial rounding-off time for the extended ramp-function generator. The value applies to ramp-up and ramp-down.			
<hr/>				
Note				
Rounding-off times avoid an abrupt response and prevent damage to the mechanical system.				

p1131[0]	Ramp-function generator final rounding-off time				
	Variant:	S200 Basic PN, S200 PN			
	Available when function is active:	Extended setpoint channel			
	Data type:	FloatingPoint32	Visible in:	Extended display	
	Read permission:	Read drive data or acknowledge messages			
	Write permission:	Edit device configuration or drive applications			
	Changeable in operating state:	Operation			
	Parameter group:	Ramp-function generator			
	Unit:	s			
	Min:	Max:	Factory setting:		
	0.000 [s]	30.000 [s]	0.000 [s]		
Description:	Sets the final rounding-off time for the extended ramp generator. The value applies to ramp-up and ramp-down.				
Note Rounding-off times avoid an abrupt response and prevent damage to the mechanical system.					
p1135[0]	OFF3 ramp-down time				
	Data type:	FloatingPoint32	Visible in:	Standard display	
	Read permission:	Read drive data or acknowledge messages			
	Write permission:	Edit device configuration or drive applications			
	Changeable in operating state:	Operation			
	Parameter group:	Ramp-function generator, Enable logic, Setpoint addition, Limits			
	Unit:	s			
	Min:	Max:	Factory setting:		
		0.000 [s]	600.000 [s]	0.000 [s]	
	Description:	Sets the ramp-down time from the maximum speed down to zero speed for the OFF3 command.			
r1196[0...1]	DSC position setpoint/position actual value				
	Data type:	Integer32	Visible in:	Standard display	
	Read permission:	Read drive data or acknowledge messages			
	Parameter group:				
	Unit:	-			
	Description:	Displays the position setpoint and position actual value of Dynamic Servo Control in fine pulses.			
	Index:	[0] = Position setpoint [1] = Position actual value			
	Note DSC: Dynamic Servo Control				
	p1215[0]	Motor holding brake configuration			
		Variant:	S200 Basic PN		
Data type:		Integer16	Visible in:	Standard display	
Read permission:		Read drive data or acknowledge messages			
Write permission:		Edit device configuration or drive applications			
Changeable in operating state:		Ready for operation			
Parameter group:		Motor holding brake			
Unit:		-			

	Min:	Max:	Factory setting:
	0	3	0
Description:	Sets the holding brake configuration.		
Value:	0: No motor holding brake available 3: Motor holding brake like seq control, conn via interconnection		
Dependency:	See also: p1216, p1217, p1226, p1227, p1228		
<div> CAUTION</div> <div>For the setting p1215 = 0, if a brake is used, it remains closed. If the motor moves, this will destroy the brake.</div>			
<div>NOTICE</div> <div>If p1215 was set to 3, then when the pulses are canceled, the brake is closed even if the motor is still rotating. Pulses can be canceled as a result of an OFF2 or "Enable operation" via fieldbus or a fault with OFF2 response.</div>			
<div>Note</div> <div>If p1215 is set = 0 (no holding brake available) when running up, then the motor holding brake is automatically identified. If an external motor holding brake is being used, then p1215 should be set to 3 and r0899.12 should be interconnected to a freely selectable digital output as control signal. This digital output must control the brake via a coupling relay or contactor relay.</div>			

p1215[0]	Motor holding brake configuration		
	Variant:	S200 PN	
	Data type: Integer16	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Motor holding brake	
	Unit: -		
	Min:	Max:	Factory setting:
	0	2	0
Description:	Sets the holding brake configuration.		
Value:	0: No motor holding brake available 1: Motor holding brake acc. to sequence control 2: Motor holding brake always open		
Dependency:	See also: p1216, p1217, p1226, p1227, p1228		
<div> CAUTION</div> <div>For the setting p1215 = 0, if a brake is used, it remains closed. If the motor moves, this will destroy the brake. If the brake must hold a load, then it is not permissible that p1215 is set = 2, as otherwise damage can occur as a result of the falling load.</div>			
<div>NOTICE</div> <div>If p1215 was set to 1, then when the pulses are cancelled, the brake is closed even if the motor is still rotating. Pulses can be canceled as a result of withdrawing OFF2, or withdrawing enable operation or by faults with an OFF2 response.</div>			
<div>Note</div> <div>If p1215 is set = 0 (no holding brake available) when running up, then the motor holding brake is automatically identified. If a motor holding brake is detected, then p1215 is set = 2 (motor holding brake as for sequence control). For value 2: This setting allows the motor shaft to be rotated for installation purposes.</div>			

p1216[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
	Changeable in operating state:	Operation
	Parameter group:	Motor holding brake
	Unit: ms	
	Min:	Max:
	0 [ms]	10000 [ms]
		Factory setting:
		100 [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, p1217	

p1217[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
	Changeable in operating state:	Operation
	Parameter group:	Motor holding brake
	Unit: ms	
	Min:	Max:
	0 [ms]	10000 [ms]
		Factory setting:
		100 [ms]
Description:	Sets the time to apply the motor holding brake. After OFF1 or OFF3 and the holding brake is controlled (the brake closes), then the drive remains closed-loop controlled for this time stationary with a speed setpoint/velocity setpoint of zero. The pulses are canceled when the time expires.	
Recommendation:	This time should be set longer than the actual closing time of the brake. This ensures that the pulses are only canceled after the brake has closed.	
Dependency:	See also: p1215, p1216	

NOTICE
If the selected closing time is too short with respect to the actual closing time of the brake, then the load can sag. If the closing time is selected to be too long with respect to the actual closing time of the brake, the control works against the brake and therefore reduces its lifetime.

Note
The time is preassigned with the value saved in the motor.

p1226[0]	Threshold for standstill detection	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Motor holding brake, Enable logic
	Unit: rpm	
	Min:	Max:
	0.00 [rpm]	210000.00 [rpm]
		Factory setting:
		20.00 [rpm]
Description:	Sets the speed threshold for the standstill detection. Acts on the actual value and setpoint monitoring. When braking with OFF1 or OFF3, when the threshold is undershot, standstill is identified. The following applies when the brake control is activated: When the threshold is undershot, the brake control is started and the system waits for the brake closing time in p1217. The pulses are then canceled. If the brake control is not activated, the following applies: When the threshold is undershot, the pulses are canceled and the drive coasts down.	
Dependency:	See also: p1215, p1216, p1217, p1227	

Note

Standstill is identified in the following cases:

- 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.

The actual value sensing is subject to measuring noise. For this reason, standstill cannot be detected if the speed threshold is too low.

p1227[0]**Standstill detection monitoring time**

Data type: FloatingPoint32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group:

Motor holding brake, Enable logic

Unit: s

Min:

Max:

Factory setting:

0.000 [s]

300.000 [s]

4.000 [s]

Description:

Sets the monitoring time for the standstill detection.

When braking with OFF1 or OFF3, standstill is identified after the time set here has expired, after the setpoint speed has fallen below the threshold p1226.

After this, the brake control is started, the system waits for the closing time in p1217 and then the pulses are canceled.

Dependency:

See also: p1215, p1216, p1217, p1226

Note

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 canceled and the motor "coasts" down.

p1228[0]**Pulse cancellation delay time**

Data type: FloatingPoint32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group:

Motor holding brake, Enable logic

Unit: s

Min:

Max:

Factory setting:

0.000 [s]

299.000 [s]

0.000 [s]

Description:

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.

Dependency:

See also: p1226, p1227

NOTICE

When the motor holding brake is activated, pulse cancellation is additionally delayed by the brake closing time (p1217).

r1407.0...28**Status word speed controller**

Data type: Unsigned32

Visible in: Extended display

Read permission: Read drive data or acknowledge messages
Parameter group: Torque setpoints, Torque limiting, Speed actual value filter, Control/status words, Acceleration model, Setpoint addition, Speed precontrol, Speed setpoint filter

Unit: -

Description: Displays the status word of the speed controller.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Reserved	Yes	No
	01	Reserved	Yes	No
	02	Torque control active	Yes	No
	04	Speed setpoint from DSC	Yes	No
	05	Speed controller I component frozen	Yes	No
	06	Speed controller I component set	Yes	No
	07	Torque limit reached	Yes	No
	08	Upper torque limit active	Yes	No
	09	Lower torque limit active	Yes	No
	11	Speed setpoint limited	Yes	No
	13	Reserved	Yes	No
	17	Speed limiting control active	Yes	No
	19	Reserved	Yes	No
	20	Reserved	Yes	No
	21	Reserved	Yes	No
	22	Reserved	Yes	No
	23	Torque-speed precontrol on	Yes	No
	24	Moment of inertia estimator active	Yes	No
	25	Load estimate active	Yes	No
	26	Moment of inertia estimator stabilized	Yes	No
	28	Speed precontrol	For symmetrizing	For setp_filter 2

Note

For bit 04:

For bit 04 = 1 signal, the following conditions must be fulfilled:

- A telegram type that supports DSC must be selected (r0922 = 5 or 105)
- OFF1, OFF3 or STOP2 must not be active.
- Master control must not be active.

The following conditions can mean that the DSC function is not active in spite of the fact that the bit is set:

- DSC is not switched in on the control side; this means that KPC = 0 is transferred.

p1409[0].1...2 Speed control extended configuration

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Ready for operation
Parameter group: Torque setpoints
Unit: -

Min: - **Max:** - **Factory setting:** 0000 bin

Description: Sets the extended configuration for the closed-loop speed control.

Bit array:	Bit	Signal name	1 signal	0 signal
	01	DSC with 4 cycles dead time	Yes	No
	02	Speed limiting for torque control	Yes	No

Note

For bit 01:

When the bit is set, the position actual value in the DSC model is permanently set to 4 Tdp cycles. This is only required for a special control system (e.g. from Beckhoff) with a higher dead time.

When the bit is deleted, the dead time is taken from the telegram configuration.

p1414[0].0...1**Speed setpoint filter activation****Data type:** Unsigned16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation**Parameter group:** Speed setpoint filter**Unit:** -**Min:****Max:****Factory setting:**

-

-

0000 bin

Description: Setting for activating/deactivating the speed setpoint filter.**Recommendation:** If only one filter is required, filter 1 should be activated and filter 2 deactivated, to avoid excessive processing time.**Bit array:****Bit** **Signal name****1 signal****0 signal**

00 Activate filter 1

Yes

No

01 Activate filter 2

Yes

No

Dependency:

The individual speed setpoint filters are parameterized from p1415.

p1415[0]**Speed setpoint filter 1 type****Data type:** Integer16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation**Parameter group:** Speed setpoint filter**Unit:** -**Min:****Max:****Factory setting:**

0

2

0

Description: Sets the type for speed setpoint filter 1.**Value:**

0: Low pass: PT1

1: Low pass: PT2

2: General 2nd order filter

Dependency:

PT1 low pass: p1416

PT2 low pass: p1417, p1418

General filter: p1417 ... p1420

p1416[0]**Speed setpoint filter 1 time constant****Data type:** FloatingPoint32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation**Parameter group:** Speed setpoint filter**Unit:** ms**Min:****Max:****Factory setting:**

0.00 [ms]

5000.00 [ms]

0.00 [ms]

Description:

Sets the time constant for the speed setpoint filter 1 (PT1).

Dependency: See also: p1414, p1415

Note

This parameter is only effective if the filter is set as a PT1 low pass.

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
Changeable in operating state: Operation
Parameter group: Speed setpoint filter
Unit: Hz
Min: 0.5 [Hz] **Max:** 16000.0 [Hz] **Factory setting:** 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
Changeable in operating state: Operation
Parameter group: Speed setpoint filter
Unit: -
Min: 0.001 **Max:** 10.000 **Factory setting:** 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
Changeable in operating state: Operation
Parameter group: Speed setpoint filter
Unit: Hz
Min: 0.5 [Hz] **Max:** 16000.0 [Hz] **Factory setting:** 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.

p1420[0]	Speed setpoint filter 1 numerator damping		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed setpoint filter	
	Unit: -		
	Min:	Max:	Factory setting:
	0.000	10.000	0.700
Description:	Sets the numerator damping 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.		
p1421[0]	Speed 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	
	Changeable in operating state:	Operation	
	Parameter group:	Speed setpoint filter	
	Unit: -		
	Min:	Max:	Factory setting:
	0	2	0
Description:	Sets the type for speed setpoint filter 2.		
Value:	0: Low pass: PT1 1: Low pass: PT2 2: General 2nd order filter		
Dependency:	PT1 low pass: p1422 PT2 low pass: p1423, p1424 General filter: p1423 ... p1426		
p1422[0]	Speed setpoint filter 2 time constant		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed setpoint filter	
	Unit: ms		
	Min:	Max:	Factory setting:
	0.00 [ms]	5000.00 [ms]	0.00 [ms]
Description:	Sets the time constant for the speed setpoint filter 2 (PT1).		
Dependency:	See also: p1414, p1421		
	Note		
	This parameter is only effective if the speed filter is set as a PT1 low pass.		
p1423[0]	Speed 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		
Changeable in operating state:	Operation		
Parameter group:	Speed setpoint filter		
Unit: Hz			
Min:	Max:	Factory setting:	
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]	
Description:	Sets the denominator natural frequency for speed setpoint filter 2 (PT2, general filter).		
Dependency:	See also: p1414, p1421		
<hr/>			
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.			

p1424[0]	Speed 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	
	Changeable in operating state:	Operation	
	Parameter group:	Speed setpoint filter	
	Unit:	-	
	Min:	Max:	Factory setting:
	0.001	10.000	0.700
Description:	Sets the denominator damping for speed setpoint filter 2 (PT2, general filter).		
Dependency:	See also: p1414, p1421		
<hr/>			
Note			
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.			

p1425[0]	Speed setpoint filter 2 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	
	Changeable in operating state:	Operation	
	Parameter group:	Speed setpoint filter	
	Unit:	Hz	
	Min:	Max:	Factory setting:
	0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]
Description:	Sets the numerator natural frequency for speed setpoint filter 2 (general filter).		
Dependency:	See also: p1414, p1421		
<hr/>			
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.			

p1426[0]	Speed setpoint filter 2 numerator damping		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed setpoint filter	
	Unit: -		

	Min: 0.000	Max: 10.000	Factory setting: 0.700
Description:	Sets the numerator damping for speed setpoint filter 2 (general filter).		
Dependency:	See also: p1414, p1421		
	Note This parameter is only effective if the speed filter is set as a general filter.		
p1433[0]	Speed controller reference model 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	
	Changeable in operating state:	Operation	
	Parameter group:	Speed controller	
	Unit: Hz		
	Min: 0.00 [Hz]	Max: 8000.00 [Hz]	Factory setting: 0.00 [Hz]
Description:	Sets the natural frequency of a PT2 element for the reference model of the speed controller.		
Recommendation:	The reference model is finely set using p1433.		
Dependency:	See also: p1434, p1435		
p1434[0]	Speed controller reference model damping		
	Variant:	S200 PN	
	Available when function is active:	AST Lite	
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed controller	
	Unit: -		
	Min: 0.000	Max: 5.000	Factory setting: 1.000
Description:	Sets the damping of a PT2 element for the reference model of the speed controller.		
Recommendation:	The reference model is correctly set when the characteristics of r1439 (reference model output) and r1445 (speed actual value) are almost identical when the I component of the speed controller is deactivated.		
Dependency:	In conjunction with p1433 and p1435, the response of the P-controlled speed control loop can be emulated. See also: p1433, p1435		
p1435[0]	Speed controller reference model dead time		
	Variant:	S200 PN	
	Available when function is active:	AST Lite	
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed controller	
	Unit: -		

	Min: 0.00	Max: 2.00	Factory setting: 2.00
Description:	Sets the "fractional" dead time for the reference model of the speed controller. This parameter emulates the computing dead time of the proportionally controlled speed control loop. The selected multiplier refers to the speed controller sampling time (dead time= p1435 * p0115[1]).		
Recommendation:	The reference model is correctly set when the characteristics of r1439 (reference model output) and r1445 (speed actual value) are almost identical when the I component of the speed controller is deactivated.		
Dependency:	In conjunction with p1433 and p1434, the response of the P-controlled speed control loop can be emulated. See also: p1433, p1434		
r1438	Speed controller speed setpoint		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Speed controller	
	Unit: rpm		
Description:	Displays the speed setpoint after setpoint limiting for the P component of the speed controller.		
Dependency:	See also: r0020		
p1441[0]	Actual speed smoothing time		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed controller, Speed actual value filter	
	Unit: ms		
	Min: 0.00 [ms]	Max: 50.00 [ms]	Factory setting: 0.00 [ms]
Description:	Sets the smoothing time constant (PT1) for the speed actual value.		
Dependency:	See also: r0063		
	Note The speed actual value should be smoothed for encoders with a low pulse number or for resolvers. After this parameter has been changed, we recommend that the speed controller is adapted and/or the speed controller settings checked Kp (p1460) and Tn (p1462).		
r1445	Speed controller actual speed smoothed		
	Variant:	S200 PN	
	Available when function is active:	AST Lite	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Speed controller, Speed actual value filter	
	Unit: rpm		
Description:	Displays the actual smoothed speed actual value of the closed-loop speed control.		
p1460[0]	Speed controller P gain		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	

	Parameter group:	Speed controller	
	Unit: Nms/rad		
	Min:	Max:	Factory setting:
	0.00000 [Nms/rad]	5e+08 [Nms/rad]	0.30000 [Nms/rad]
Description:	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.		
Dependency:	See also: p1462		
<hr/>			
	Note		
	The higher the set P gain, the faster and more unstable the control.		

p1462[0]	Speed controller integral time		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed controller	
	Unit: ms		
	Min:	Max:	Factory setting:
	0.00 [ms]	100000.00 [ms]	10.00 [ms]
Description:	Sets the integral time for the speed controller		
	The drive determines the integral time for One Button Tuning - and writes the value to p1462.		
Dependency:	See also: p1460		
	Note		
	The shorter the integral time, the faster and more unstable the control.		

p1498[0]	Load moment of inertia		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed controller	
	Unit: kgm ²		
	Min:	Max:	Factory setting:
	0.000000 [kgm ²]	100000.000000 [kgm ²]	0.000000 [kgm ²]
Description:	Sets the load moment of inertia. The setting is made during commissioning while the One Button Tuning is being performed.		

p1520[0]	Torque limit upper		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Torque limiting, Limits	
	Unit: Nm		
	Min:	Max:	Factory setting:
	-1000000.00 [Nm]	2e+07 [Nm]	0.00 [Nm]
Description:	Setting the upper torque limit. This setting is made as part of the basic commissioning.		

Dependency: See also: p1521, p1532, r1538, r1539

p1521[0]	Torque limit lower		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Torque limiting, Limits	
	Unit: Nm		
	Min:	Max:	Factory setting:
	-2e+07 [Nm]	1000000.00 [Nm]	0.00 [Nm]
Description:	Sets the lower torque limit This setting is made as part of the basic commissioning.		
Dependency:	See also: p1520, p1532, r1538, r1539		

p1532[0]	Torque limit offset		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Torque limiting	
	Unit: Nm		
	Min:	Max:	Factory setting:
	-100000.00 [Nm]	100000.00 [Nm]	0.00 [Nm]
Description:	Sets the torque offset for the torque limit. The setting allows electronic weight equalization to be used for vertical axes.		
Recommendation:	The torque offset can also be used for torque precontrol or as integrator setting value for the speed controller.		
Dependency:	See also: p1520, p1521		

 DANGER

If the offset is set higher/lower than the lower/upper torque limit, then the unloaded drive can accelerate up to the maximum speed.

r1538	Upper effective torque limit	
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Torque limiting
	Unit: Nm	
Description:	Displays the currently effective upper torque limit.	
	<hr/>	
	Note	
	The value in r1538 may not exceed the value in p1520.	

r1539	Lower effective torque limit		
	Data type:	FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Torque limiting	
	Unit:	Nm	
Description:	Displays the currently effective lower torque limit.		

Note

The value in r1539 may not exceed the value in p1521.

p1558**Measure/precontrol hanging/suspended axis force due to weight****Data type:** Integer16**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation**Parameter group:**

Motor data identification routine

Unit: -**Min:**

-1

Max:

1

Factory setting:

0

Description:

Setting to start/reset the measurement of the force due to weight for a hanging 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.

For the measurement, the torque to hold the axis is determined and entered into p1532.

Further, this value is used internally for the precontrol.

Value:

-1: Reset values

0: Inactive

1: Start measurement and activate precontrol

Dependency:

The pulse enable is withdrawn at the end of the measurement.

See also: p1532

Note

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.

r1651**Torque setpoint function generator****Data type:** FloatingPoint32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Parameter group:

Current setpoint filter

Unit: Nm**Description:**

Displays the torque setpoint of the function generator.

p1656[0].0...3**Activates current setpoint filter****Data type:** Unsigned16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation**Parameter group:**

Current setpoint filter

Unit: -**Min:**

-

Max:

-

Factory setting:

0001 bin

Description:

Setting for activating/deactivating the current setpoint filter.

Bit array:**Bit** **Signal name****1 signal****0 signal**

00 Filter 1

Active

Inactive

01 Filter 2

Active

Inactive

02 Filter 3

Active

Inactive

03 Filter 4

Active

Inactive

Dependency:

The individual current setpoint filters are parameterized as of p1657.

Note

If not all of the filters are required, then the filters should be used consecutively starting from filter 1.

p1657[0]

Current setpoint filter 1 type

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Operation
Parameter group: Current setpoint filter
Unit: -
Min: 1 **Max:** 2 **Factory setting:** 1

Description: Sets the current setpoint filter 1 as low pass (PT2) or general 2nd-order filter.

Value:
 1: PT2 low pass
 2: General 2nd order filter

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

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, then 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:

$$f_{3dB} \text{ bandwidth} = 2 * D_{\text{denominator}} * f_{\text{bandstop frequency}}$$

p1658[0]

Current 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
Changeable in operating state: Operation
Parameter group: Current setpoint filter
Unit: Hz
Min: 0.5 [Hz] **Max:** 16000.0 [Hz] **Factory setting:** 1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 1 (PT2, general filter).

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1659[0]

Current 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
Changeable in operating state: Operation
Parameter group: Current setpoint filter
Unit: -
Min: 0.001 **Max:** 10.000 **Factory setting:** 0.700

Description: Sets the denominator damping for current setpoint filter 1.

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1660[0]

Current 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		
Changeable in operating state:	Operation		
Parameter group:	Current setpoint filter		
Unit: Hz			
Min:	Max:	Factory setting:	
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]	
Description:	Sets the numerator natural frequency for current setpoint filter 1 (general filter).		
Dependency:	The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.		

p1661[0]	Current setpoint filter 1 numerator damping	
Data type: FloatingPoint32	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: -		
Min: 0.000	Max: 10.000	Factory setting: 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	
Changeable in operating state:	Operation	
Parameter group:	Current setpoint filter	
Unit: -		
Min: 1	Max: 2	Factory setting: 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, then 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
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Data type: FloatingPoint32	Visible in: Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Changeable in operating state:	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	
	Changeable in operating state:	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.		

p1665[0]	Current setpoint filter 2 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	
	Changeable in operating state:	Operation	
	Parameter group:	Current setpoint filter	
	Unit: Hz		
	Min:	Max:	Factory setting:
	0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]
Description:	Sets the numerator natural frequency for current setpoint filter 2 (general filter).		
Dependency:	Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.		

p1666[0]	Current setpoint filter 2 numerator damping		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Current setpoint filter	
	Unit: -		
	Min:	Max:	Factory setting:
	0.000	10.000	0.700
Description:	Sets the numerator damping for current setpoint filter 2.		
Dependency:	Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.		

p1667[0]	Current setpoint filter 3 type		
	Data type: Integer16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Current setpoint filter	
	Unit: -		

	Min:	Max:	Factory setting:
	1	2	1
Description:	Sets current setpoint filter 3 as lowpass filter (PT2) or general 2nd order filter.		
Value:	1: PT2 low pass 2: General 2nd order filter		
Dependency:	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.		

p1668[0] Current setpoint filter 3 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
	Changeable in operating state:	Operation
	Parameter group:	Current setpoint filter
	Unit: Hz	
	Min:	Max:
	0.5 [Hz]	16000.0 [Hz]
		Factory setting:
		1999.0 [Hz]
Description:	Sets the denominator natural frequency for current setpoint filter 3 (PT2, general filter).	
Dependency:	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.	

p1669[0] Current setpoint filter 3 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
	Changeable in operating state:	Operation
	Parameter group:	Current setpoint filter
	Unit: -	
	Min:	Max:
	0.001	10.000
		Factory setting:
		0.700
Description:	Sets the denominator damping for current setpoint filter 3.	
Dependency:	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.	

p1670[0] Current setpoint filter 3 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
	Changeable in operating state:	Operation
	Parameter group:	Current setpoint filter
	Unit: Hz	
	Min:	Max:
	0.5 [Hz]	16000.0 [Hz]
		Factory setting:
		1999.0 [Hz]
Description:	Sets the numerator natural frequency for current setpoint filter 3 (general filter).	
Dependency:	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.	

p1671[0] Current setpoint filter 3 numerator damping

	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation

	Parameter group:	Current setpoint filter	
	Unit: -		
	Min:	Max:	Factory setting:
	0.000	10.000	0.700
Description:	Sets the numerator damping for current setpoint filter 3.		
Dependency:	Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.		

p1672[0]	Current setpoint filter 4 type		
	Data type: Integer16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Current setpoint filter	
	Unit: -		
	Min:	Max:	Factory setting:
	1	2	1
Description:	Sets current setpoint filter 4 as lowpass filter (PT2) or general 2nd order filter.		
Value:	1: PT2 low pass 2: General 2nd order filter		
Dependency:	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

p1673[0]	Current setpoint filter 4 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	
	Changeable in operating state:	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 4 (PT2, general filter).		
Dependency:	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

p1674[0]	Current setpoint filter 4 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	
	Changeable in operating state:	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 4.		
Dependency:	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

p1675[0]	Current setpoint filter 4 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	

	Changeable in operating state:	Operation	
	Parameter group:	Current setpoint filter	
	Unit: Hz		
	Min:	Max:	Factory setting:
	0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]
Description:	Sets the numerator natural frequency for current setpoint filter 4 (general filter).		
Dependency:	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

p1676[0] Current setpoint filter 4 numerator damping

	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Current setpoint filter	
	Unit: -		
	Min:	Max:	Factory setting:
	0.000	10.000	0.700
Description:	Sets the numerator damping for current setpoint filter 4.		
Dependency:	Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.		

p1699 Filter data acceptance

	Data type: Integer16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed actual value filter, Active vibration suppression (AVS), Speed setpoint filter, Current setpoint filter	
	Unit: -		
	Min:	Max:	Factory setting:
	0	1	0
Description:	Activates data acceptance for parameter changes for the filter. p1699 = 0: The new filter data are immediately accepted. p1699 = 1: The new filter data are only accepted when this parameter is reset.		
Dependency:	Speed setpoint filter 1, 2 (p1414 and following) Speed actual value filter (p1413, p1446 and following) Current setpoint filter 1 ... 4 (p1656 and following) Current setpoint filter 5 ... 10 (function module, p5200 and following) AVS filter (p3704 and following) AVS: Active Vibration Suppression See also: p1414, p1656		

p1703[0] Isq current controller precontrol scaling

Data type:	FloatingPoint32	Visible in:	Extended display
Read permission:	Read drive data or acknowledge messages		
Write permission:	Edit device configuration or drive applications		
Changeable in operating state:	Operation		

Description:	Parameter group:	Current controller	
	Unit:	%	
	Min:	Max:	Factory setting:
	0.0 [%]	200.0 [%]	0.0 [%]
	Sets the scaling of the dynamic current controller precontrol for the torque/force-generating current component I_{sq} .		
Note			
p1703 > 0 can only be used			
- For p1810.11=1 for pulse frequency = 0.5 * or 0.25 * sampling frequency.			
- For p1810.11=0 for all synchronous pulse frequencies (0.25, 0.5, 1, 1.5 or 2 * sampling frequency).			
Sampling frequency = 1000000 / p0115[0].			

p1821[0]	Direction of rotation		
	Data type: Integer16	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data	
	Unit: -		
	Min:	Max:	Factory setting:
	0	1	0
Description:	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.		
Value:	0: Clockwise 1: Counterclockwise		
Dependency:	See also: F07434		
NOTICE			
After changing parameter p1821, the direction of rotation is not automatically adapted in the safety area. The following parameters can be used to set the direction of rotation for safety monitoring: - p9516.1 "Position actual value sign change" (only for operation with encoder) - p9539 "SI gearbox direction of rotation reversal" (also in encoderless operation)			

p1966[0]	Speed controller calculation dynamic response factor		
	Data type:	FloatingPoint32	
	Visible in:	Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Rotating measurement/speed controller optimization	
	Unit:	%	
	Min:	Max:	Factory setting:
	50 [%]	800 [%]	100 [%]
Description:	Sets the dynamic response factor for speed controller calculation.		
<div><div></div><div>CAUTION</div></div>			
Values that are too high can lead an unstable speed controller being preassigned.			
<div>Note</div> <div>If p1966 is changed, p1460 and p1441 are recalculated.</div>			

p2000	Reference speed		
	Data type: FloatingPoint32	Visible in: Standard display	

	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Ready for operation
	Parameter group:	Reference variables
	Unit: rpm	
	Min:	Max:
	6.00 [rpm]	210000.00 [rpm]
		Factory setting:
		3000.00 [rpm]
Description:	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).	
Dependency:	See also: p2003	

p2001**Reference voltage**

	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Ready for operation
	Parameter group:	Reference variables
	Unit: Vrms	
	Min:	Max:
	10 [Vrms]	100000 [Vrms]
		Factory setting:
		1000 [Vrms]
Description:	Sets the reference quantity for the voltage values. All voltages 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).	

p2002**Reference current**

	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Ready for operation
	Parameter group:	Reference variables
	Unit: Arms	
	Min:	Max:
	0.10 [Arms]	100000.00 [Arms]
		Factory setting:
		100.00 [Arms]
Description:	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).	

NoteDefault value is 2 * p0305 or the motor current limit.

p2003**Reference torque**

	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Ready for operation
	Parameter group:	Reference variables
	Unit: Nm	
	Min:	Max:
	0.01 [Nm]	2e+07 [Nm]
		Factory setting:
		1.00 [Nm]

Description: 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).

p2004	Reference power		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Reference variables	
	Unit: kW		
	Min: 0.01 [kW]	Max: 20000.00 [kW]	Factory setting: 20000.00 [kW]
Description:	Sets the reference quantity for the power values. All power ratings 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).		
Dependency:	See also: p2000, p2001, p2002, p2003		

r2043.0...2	PROFIdrive PZD state			
	Data type: Unsigned8		Visible in: Extended display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Configuration	
	Unit: -			
Description:	Displays the PROFIdrive PZD state.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Setpoint failure	Yes	No
	01	Isochronous operation active	Yes	No
	02	Fieldbus running	Yes	No
	Note			
	When using the "setpoint failure" signal, the bus can be monitored and an application-specific response triggered when the setpoint fails.			

r2050[0...31].0...15 PROFIdrive PZD receive word	
Data type: Unsigned16	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Receive direction
Unit: -	
Description:	Displays the PZD (setpoints) in the word format received from the fieldbus controller.

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
 [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
 [28] = PZD 29
 [29] = PZD 30
 [30] = PZD 31
 [31] = PZD 32

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Bit 0	On	Off
	01	Bit 1	On	Off
	02	Bit 2	On	Off
	03	Bit 3	On	Off
	04	Bit 4	On	Off
	05	Bit 5	On	Off
	06	Bit 6	On	Off
	07	Bit 7	On	Off
	08	Bit 8	On	Off
	09	Bit 9	On	Off
	10	Bit 10	On	Off
	11	Bit 11	On	Off
	12	Bit 12	On	Off
	13	Bit 13	On	Off
	14	Bit 14	On	Off
	15	Bit 15	On	Off

Dependency: See also: r2060

c2053[0...31]	PROFIdrive PZD send word
	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: Send direction Unit: -
Description:	Displays the PZD (actual values) in the word format that are sent to the fieldbus controller.
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 [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 [28] = PZD 29 [29] = PZD 30 [30] = PZD 31 [31] = PZD 32
Dependency:	See also: c2063
r2060[0...30]	PROFIdrive PZD receive double word
	Data type: Integer32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Receive direction Unit: -
Description:	Displays the PZD (setpoints) in the double word format received from the fieldbus controller.

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
	[27] = PZD 28 + 29
	[28] = PZD 29 + 30
	[29] = PZD 30 + 31
	[30] = PZD 31 + 32

Dependency: See also: r2050

c2063[0...30] PROFIdrive PZD send double 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:	Send direction
Unit: -	

Description: Displays the PZD (actual values) in the double word format that are sent to the fieldbus controller.

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
	[27] = PZD 28 + 29
	[28] = PZD 29 + 30
	[29] = PZD 30 + 31
	[30] = PZD 31 + 32

Dependency: See also: c2053

c2104[0] 2nd acknowledge faults

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:	Faults / alarms
Unit: -	

Description: Signal 2 to acknowledge faults.

Note
A fault acknowledgment is triggered with a 0/1 signal.

c2106[0] External fault 1

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:	Faults / alarms
Unit: -	

Description: Signal for external fault 1.

Dependency: See also: F07860

Note

An external fault is triggered with a 0 signal.

r2109[0...63] Fault time removed in milliseconds

Data type: Unsigned32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Faults / alarms

Unit: ms

Description: Displays the system runtime in milliseconds when the fault was removed.

Dependency: See also: r0945, r0947, r0948, r0949, r2114, r2130, r2133, r2136, r3122

NOTICE

The time comprises r2136 (days) and r2109 (milliseconds).

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

The structure of the fault buffer and the assignment of the indices is shown in r0945.

r2111 Alarm counter

Data type: Unsigned16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Faults / alarms

Unit: -

Description: Number of alarms that have occurred.

Dependency: See also: r2122, r2123, r2124, r2125

Note

The parameter is reset to 0 at POWER ON.

r2114[0...1] System runtime total

Data type: Unsigned32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Diagnostics general

Unit: -

Description: 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.

Index: [0] = Milliseconds

[1] = Days

Note

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.

p2118[0...19] Change message type 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

Changeable in operating state: Operation

Parameter group:

Faults / alarms

Unit: -

	Min: 0	Max: 65535	Factory setting: 0
Description:	Selects the numbers of faults or alarms for which the message type should be changed.		
Dependency:	The number of the fault or alarm and the required message type are under the same index. See also: p2119		
<hr/>			
Note			
Re-parameterization is also possible if a message is present. The change only becomes effective after the message has gone.			
If a fault is reparameterized to "alarm" or "no message", there must be no entry in p2100, p2101 for this message, as a fault response is only permissible for faults.			

p2119[0...19]	Change message type type		
	Data type: Integer16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Faults / alarms	
	Unit: -		
	Min:	Max:	Factory setting:
	1	3	1
Description:	Sets the message type for the selected fault or alarm (from p2118).		
Value:	1: Fault (F) 2: Alarm (A) 3: No message (N)		
Dependency:	The number of the fault or alarm and the required message type are under the same index. See also: p2118		
<hr/>			
Note Re-parameterization is also possible if a message is present. The change only becomes effective after the message has gone. The message type can only be changed for messages with the appropriate identification (exception, value = 0). Example: F12345(A) --> Fault F12345 can be changed to alarm A12345. p2118[0]= 12345 p2119[0] = 2			
If a fault is reparameterized to "alarm" or "no message", there must be no entry in p2100, p2101 for this message, as a fault response is only permissible for faults.			

r2121	Counter alarm buffer changes		
	Data type: Unsigned16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Faults / alarms	
	Unit: -		
Description:	This counter is incremented every time the alarm buffer changes.		
Dependency:	See also: r2122, r2123, r2124, r2125		

r2122[0...63]	Alarm number		
	Data type: Unsigned16	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	

	Parameter group: Faults / alarms		
Unit: -			
Description:	Displays the numbers of the last 64 alarms.		
Dependency:	See also: r2123, r2124, r2125, r2134, r2145, r2146, r3123		
<table><tr><td>NOTICE</td></tr><tr><td>The properties of the alarm buffer should be taken from the corresponding product documentation.</td></tr></table>		NOTICE	The properties of the alarm buffer should be taken from the corresponding product documentation.
NOTICE			
The properties of the alarm buffer should be taken from the corresponding product documentation.			
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 time received in milliseconds		
Data type: Unsigned32	Visible in: Extended display		
Read permission:	Read drive data or acknowledge messages		
Parameter group:	Faults / alarms		
Unit: ms			
Description:	Displays the system runtime in milliseconds when the alarm occurred.		
Dependency:	See also: r2114, r2122, r2124, r2125, r2134, r2145, r2146, r3123		
<table><tr><td>NOTICE</td></tr><tr><td>The time comprises r2145 (days) and r2123 (milliseconds).</td></tr></table>		NOTICE	The time comprises r2145 (days) and r2123 (milliseconds).
NOTICE			
The time comprises r2145 (days) and r2123 (milliseconds).			
Note The buffer parameters are cyclically updated in the background (refer to status signal in r2139). 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
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, r3123
Note The buffer parameters are cyclically updated in the background (refer to status signal in r2139). The structure of the alarm buffer and the assignment of the indices is shown in r2122.	

r2125[0...63]	Alarm time removed in milliseconds
Data type: Unsigned32	Visible in: Extended display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Faults / alarms
Unit: ms	
Description:	Displays the system runtime in milliseconds when the alarm was removed.

Dependency: See also: r2114, r2122, r2123, r2124, r2134, r2145, r2146, r3123

NOTICE
The time comprises r2146 (days) and r2125 (milliseconds).

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the alarm buffer and the assignment of the indices is shown in r2122.

r2130[0...63] Fault time received in days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the system runtime in days when the fault occurred.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2114, r2133, r2136, r3122

NOTICE
The time comprises r2130 (days) and r0948 (milliseconds).

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

r2131 Actual fault code

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the code of the oldest active fault.

Note

0: No fault present.

r2132 Actual alarm code

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Unit: -

Description: Displays the code of the last alarm that 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
Parameter group: Faults / alarms
Unit: -

Description: Displays additional information about the fault that occurred for float values.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2130, r2136

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

r2134[0...63]	Alarm value for float values			
	Data type: FloatingPoint32	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Faults / alarms		
	Unit: -			
Description:	Displays additional information about the active alarm for float values.			
Dependency:	See also: r2122, r2123, r2124, r2125, r2145, r2146, r3123			
Note				
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).				
r2136[0...63]	Fault time removed in days			
	Data type: Unsigned16	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Faults / alarms		
	Unit: -			
Description:	Displays the system runtime in days when the fault was removed.			
Dependency:	See also: r0945, r0947, r0948, r0949, r2109, r2114, r2130, r2133, r3122			
NOTICE				
The time comprises r2136 (days) and r2109 (milliseconds).				
Note				
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).				
r2139.0...15	Status word faults/alarms 1			
	Data type: Unsigned16	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Faults / alarms		
	Unit: -			
Description:	Displays 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 time received in days				
	Data type:	Unsigned16	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages			
	Parameter group:	Faults / alarms			
	Unit:	-			
Description:	Displays the system runtime in days when the alarm occurred.				
Dependency:	See also: r2114, r2122, r2123, r2124, r2125, r2134, r2146, r3123				
<table><tr><td>NOTICE</td></tr><tr><td>The time comprises r2145 (days) and r2123 (milliseconds).</td></tr></table>				NOTICE	The time comprises r2145 (days) and r2123 (milliseconds).
NOTICE					
The time comprises r2145 (days) and r2123 (milliseconds).					
Note The buffer parameters are cyclically updated in the background (refer to status signal in r2139).					

r2146[0...63]	Alarm time cleared in days				
	Data type:	Unsigned16	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages			
	Parameter group:	Faults / alarms			
	Unit:	-			
Description:	Displays the system runtime in days when the alarm was cleared.				
Dependency:	See also: r2114, r2122, r2123, r2124, r2125, r2134, r2145, r3123				
<table><tr><td>NOTICE</td></tr><tr><td>The time comprises r2146 (days) and r2125 (milliseconds).</td></tr></table>				NOTICE	The time comprises r2146 (days) and r2125 (milliseconds).
NOTICE					
The time comprises r2146 (days) and r2125 (milliseconds).					
Note The buffer parameters are cyclically updated in the background (refer to status signal in r2139).					

p2149[0].16	Monitoring configuration			
	Variant:	S200 Basic PN		
	Data type:	Unsigned32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Speed messages, Load torque monitoring		
	Unit:	-		
	Min:		Max:	
	-		-	
				Factory setting:
				0000 0000 0000 0000 0000 0000 0000 0000 bin
	Description:	Sets the configuration for messages and monitoring functions.		
	Bit array:	Bit	Signal name	1 signal0 signal
		16	Reserved	YesNo

p2149[0].16	Monitoring configuration			
	Variant:	S200 PN		
	Data type:	Unsigned32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Speed messages, Load torque monitoring		
	Unit:	-		

	Min:	Max:	Factory setting:	
	-	-	0000 0000 0000 0001 0000 0000 0000 0000 bin	
Description:	Sets the configuration for messages and monitoring functions.			
Bit array:	Bit	Signal name	1 signal	0 signal
	16	Line voltage failure detection	Yes	No
Note				
For bit 16:				
When the bit is set, the line voltage failure detection function is activated				

p2153[0]	Speed actual value filter time constant		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed messages	
	Unit: ms		
	Min:	Max:	Factory setting:
	0 [ms]	1000000 [ms]	0 [ms]
	Description:	Sets the time constant of the PT1 element to smooth the speed / velocity actual value. The smoothed actual speed/velocity is compared with the threshold values and is only used for messages and signals.	

p2161[0]	Speed threshold 3		
	Data type:	FloatingPoint32	
	Visible in:	Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed messages	
	Unit:	rpm	
	Min:	Max:	Factory setting:
	0.00 [rpm]	210000.00 [rpm]	5.00 [rpm]
Description:	Sets the speed threshold value for signal " n_act < speed threshold 3".		
Dependency:	See also: r2199		

p2162[0]	Hysteresis speed n_act > n_max		
	Data type:	FloatingPoint32	
	Visible in:	Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Speed messages	
	Unit:	rpm	
	Min:	Max:	Factory setting:
	0.00 [rpm]	60000.00 [rpm]	0.00 [rpm]
Description:	Sets the hysteresis speed (bandwidth) for signal "n_act > n_max".		
NOTICE			
For p0322 = 0, the following applies: $p2162 \leq 0.1 \cdot p0311$			
For p0322 > 0, the following applies: $p2162 \leq 1.02 \cdot p0322 - p1082$			
If one of the conditions is violated, p2162 is appropriately and automatically reduced when exiting the commissioning mode.			

Note

For a negative speed limit, the hysteresis is effective below the limit value and for a positive speed limit, above the limit value.

If significant overshoot occurs in the maximum speed range (e.g. due to load shedding), you are advised to increase the dynamic response of the speed controller (if possible). If this is insufficient, the hysteresis p2162 can only be increased by more than 10% of the rated speed when the maximum speed (p0322) of the motor is sufficiently greater than the speed limit p1082.

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
Changeable in operating state: Operation
Parameter group: Speed messages

Unit: rpm

Min:	Max:	Factory setting:
0.00 [rpm]	210000.00 [rpm]	120.00 [rpm]

Description: Sets the speed threshold for message "Motor blocked".
Monitoring is deactivated with p2175 = 0.

Dependency: See also: p2177
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.

p2177[0]

Motor blocked delay time

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Operation
Parameter group: Speed messages

Unit: s

Min:	Max:	Factory setting:
0.000 [s]	65.000 [s]	1.000 [s]

Description: Sets the delay time for the message "Motor blocked".

Dependency: See also: p2175
See also: F07900

r2199.0...11

Status word monitoring 3

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Speed messages, Control/status words
Unit: -

Description: Displays the third status word of the monitoring functions.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	n_act < p2161	Yes	No
	01	f or n comparison value reached or exceeded	Yes	No
	04	Speed setpoint - actual value deviation in tolerance t_on	Yes	No
	05	Ramp-up/ramp-down completed	Yes	No
	11	Torque utilization < torque threshold value 2	Yes	No

Note

For bit 00:

The speed threshold value 3 is set in p2161.

For bit 01:

The comparison value is permanently set to 5 rpm.

For bit 11:

Torque threshold value 2 is permanently set to 90 %.

p2496**LR measurement unit position****Variant:** S200 Basic PN, S200 PN**Available when function is active:** Closed-loop position control with setpoint input via DCC**Data type:** Integer16**Visible in:** Standard display**Read permission:** Read drive data or acknowledge messages**Write permission:** Edit device configuration or drive applications**Changeable in operating state:** Commissioning**Parameter group:** Position control, Basic parameters / mechanical system**Unit:** -**Min:**

0

Max:

8

Factory setting:

3

Description:

Sets the measurement unit (MU) for the length.

Value:

0: LU (user-defined)

1: km

2: m

3: mm

4: μm

5: nm

6: in

7: ft

8: mi

Note

This parameter is only of significance for visualization (e.g. using the commissioning tool).

Internally in the drive, the neutral length unit (LU) without dimensions is used for calculations.

MU: measurement unit

p2496**LR measurement unit position****Variant:** S200 Basic PN, S200 PN**Available when function is active:** Closed-loop position control with setpoint input via DCC**Values for:** Basic positioner for rotary motion**Data type:** Integer16**Visible in:** Standard display**Read permission:** Read drive data or acknowledge messages**Write permission:** Edit device configuration or drive applications**Changeable in operating state:** Commissioning**Parameter group:** Position control, Basic parameters / mechanical system**Unit:** -**Min:**

0

Max:

10

Factory setting:

10

Description:

Sets the measurement unit (MU) for the length.

Value:

0: LU (user-defined)

10: °

Note

This parameter is only of significance for visualization (e.g. using the commissioning tool). Internally in the drive, the neutral length unit (LU) without dimensions is used for calculations.
MU: measurement unit

p2497

LR measurement unit velocity

Variant: S200 Basic PN, S200 PN
Available when function is active: Closed-loop position control with setpoint input via DCC
Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Commissioning
Parameter group: Position control, Basic parameters / mechanical system
Unit: -
Min: 0 **Max:** 15 **Factory setting:** 8

Description: Sets the measurement unit (MU) for velocities.

Value:

0:	1000LU/min (user-defined)
1:	km/h
2:	km/min
3:	m/h
4:	m/min
5:	m/s
6:	mm/h
7:	mm/min
8:	mm/s
11:	in/min
12:	in/s
13:	ft/min
14:	ft/s
15:	mi/h

Note

MU: measurement unit

p2497

LR measurement unit velocity

Variant: S200 Basic PN, S200 PN
Available when function is active: Closed-loop position control with setpoint input via DCC
Values for: Basic positioner for rotary motion
Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Commissioning
Parameter group: Position control, Basic parameters / mechanical system
Unit: -
Min: 0 **Max:** 18 **Factory setting:** 18

Description: Sets the measurement unit (MU) for velocities.

Value: 0: 1000LU/min (user-defined)
18: °/s

Note

MU: measurement unit

p2498

LR measurement unit acceleration

Variant: S200 Basic PN, S200 PN

Available when function is active: Closed-loop position control with setpoint input via DCC

Data type: Integer16

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Commissioning

Parameter group: Position control, Basic parameters / mechanical system

Unit: -

Min:

0

Max:

11

Factory setting:

7

Description: Sets the measurement unit (MU) for acceleration.

Value: 0: 1000LU/s² (user-defined)
6: m/s²
7: mm/s²
10: in/s²
11: ft/s²

Note

MU: measurement unit

p2498

LR measurement unit acceleration

Variant: S200 Basic PN, S200 PN

Available when function is active: Closed-loop position control with setpoint input via DCC

Values for: Basic positioner for rotary motion

Data type: Integer16

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Commissioning

Parameter group: Position control, Basic parameters / mechanical system

Unit: -

Min:

0

Max:

18

Factory setting:

18

Description: Sets the measurement unit (MU) for acceleration.

Value: 0: 1000LU/s² (user-defined)
18: °/s²

Note

MU: measurement unit

p2499

LR measurement unit jerk

Variant: S200 Basic PN, S200 PN

	Available when function is active:	Closed-loop position control with setpoint input via DCC
	Data type: Integer16	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Commissioning
	Parameter group:	Position control, Basic parameters / mechanical system
	Unit: -	
	Min:	Max:
	0	11
		Factory setting:
		7
Description:	Sets the measurement unit (MU) for jerk.	
Value:	0: 1000LU/s ³ (user-defined)	
	7: mm/s ³	
	10: in/s ³	
	11: ft/s ³	
	Note	
	MU: measurement unit	

p2499	LR measurement unit jerk
	Variant: S200 Basic PN, S200 PN
	Available when function is active: Closed-loop position control with setpoint input via DCC
	Values for: Basic positioner for rotary motion
	Data type: Integer16
	Visible in: Standard display
	Read permission: Read drive data or acknowledge messages
	Write permission: Edit device configuration or drive applications
	Changeable in operating state: Commissioning
	Parameter group: Position control, Basic parameters / mechanical system
	Unit: -
	Min:
	0
	Max:
	18
	Factory setting:
	18
Description:	Sets the measurement unit (MU) for jerk.
Value:	0: 1000LU/s ³ (user-defined)
	18: °/s ³
	Note
	MU: measurement unit

p2502[0]	LR encoder assignment
	Variant: S200 Basic PN, S200 PN
	Available when function is active: Closed-loop position control with setpoint input via DCC
	Data type: Integer16
	Visible in: Standard display
	Read permission: Read drive data or acknowledge messages
	Write permission: Edit device configuration or drive applications
	Changeable in operating state: Commissioning
	Parameter group: Basic parameters / mechanical system, Actual position value preprocessing
	Unit: -
	Min:
	1
	Max:
	1
	Factory setting:
	1

Description:	Setting to assign the encoder. The actual value preprocessing and the closed-loop position control are carried out using the assigned encoder.
Value:	1: Motor encoder

p2503[0] LR measurement unit MU per 10 mm

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Mechanical data configuration for APC or LR	
Data type: FloatingPoint32	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Commissioning	
Parameter group:	Position control	
Unit: mm		
Min: 0.000001 [mm]	Max: 2.1474837e+09 [mm]	Factory setting: 10.000000 [mm]

Description: Sets the measurement unit MU per 10 mm set by the user.
When selecting a physical unit (p2496 not equal to 0), then the drive automatically preassigns the parameter and it cannot be changed.

For p2496 = 0, a reference is established between the physical arrangement and the neutral length unit LU used in the drive.

Example, linear scale:

p2503 = 10000 means: 10 mm should be resolved to μm (this means that 1 LU = 1 μm).

Note

MU: measurement unit

p2503[0] LR measurement unit MU per 10 mm

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Mechanical data configuration for APC or LR	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Commissioning	
Parameter group:	Position control	
Unit: °		
Min: 0.000001 [°]	Max: 2.1474837e+09 [°]	Factory setting: 10.000000 [°]

Description: Sets the measurement unit MU per 10 mm set by the user.
When selecting a physical unit (p2496 not equal to 0), then the drive automatically preassigns the parameter and it cannot be changed.

For p2496 = 0, a reference is established between the physical arrangement and the neutral length unit LU used in the drive.

Example, linear scale:

p2503 = 10000 means: 10 mm should be resolved to μm (this means that 1 LU = 1 μm).

Note

MU: measurement unit

p2504[0]	LR motor/load motor revolutions		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Mechanical data configuration for APC or LR	
	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Position control, Basic parameters / mechanical system	
	Unit: -		
	Min:	Max:	Factory setting:
	1	1048576	1
Description:	Sets the motor revolutions for the gearbox factor between the motor shaft and load shaft. Gearbox factor = motor revolutions (p2504) / load revolutions (p2505)		
Dependency:	See also: p2505		
p2505[0]	LR motor/load load revolutions		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Mechanical data configuration for APC or LR	
	Data type: Integer32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Position control, Basic parameters / mechanical system	
	Unit: -		
	Min:	Max:	Factory setting:
	-1048576	1048576	1
Description:	Sets the load revolutions for the gearbox factor between the motor shaft and load shaft. Gearbox factor = motor revolutions (p2504) / load revolutions (p2505)		
Dependency:	See also: p2504		
p2506[0]	LR measurement unit MU per load distance		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Mechanical data configuration for APC or LR	
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Position control, Basic parameters / mechanical system	
	Unit: mm		
	Min:	Max:	Factory setting:
	0.000001 [mm]	2.1474837e+09 [mm]	10.000000 [mm]

Description:	<p>Sets the measurement unit MU per load distance set by the user.</p> <p>For a rotary encoder, this establishes a reference between the actual physical situation and the user-specific measurement unit MU.</p> <p>Example:</p> <p>Rotary encoder, ballscrew with 10 mm/revolution, 10 mm should be broken down to units of μm.</p> <p>Length unit LU (p2496 = 0)</p> <p>--> One load distance corresponds to 10000 LU (i.e. 1 LU = 1 μm)</p> <p>--> p2506 = 10000</p> <p>Physical unit μm (2496) = 4</p> <p>--> One load distance corresponds to 10000 μm</p> <p>--> p2506 = 10000</p>
Dependency:	See also: p2496

p2506[0] LR length unit MU per load revolution

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Mechanical data configuration for APC or LR	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Unit: °		
Min:	Max:	Factory setting:
0.000001 [°]	2.1474837e+09 [°]	360.000000 [°]
Description:	<p>Sets the rotary unit MU per load revolution set by the user. For a rotary encoder, this establishes a reference between the physical arrangement and the user-specific rotating unit MU.</p> <p>Example:</p> <p>Rotating unit LU (p2496 = 0)</p> <p>Rotary encoder, 1 revolution should be broken down into mdegrees, (i.e. 1 LU = 1 mdegrees).</p> <p>--> One load revolution corresponds to 360000 LU</p> <p>--> p2506 = 360000</p>	
Dependency:	See also: p2496	

Note

When selecting a physical length unit, the drive automatically preassigns the parameter and it cannot be changed.

p2507[0...n] LR absolute encoder adjustment status

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Closed-loop position control with setpoint input via DCC	
Data type: Integer16	Visible in: Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Position control	
Unit: -		
Min:	Max:	Factory setting:
0	3	1

Description: Activates the adjustment and display of the status of the adjustment for absolute encoders.
For p2507 = 2:

This initiates encoder adjustment. The status is displayed using the other values.

Value:

0:	Error occurred while adjusting
1:	Absolute encoder not adjusted
2:	Absolute encoder not adjusted and encoder adjustment initiated
3:	Absolute encoder adjusted

Dependency: See also: c2598, p2599, c11500

CAUTION

For rotating absolute encoders, when adjusting, a range is set up symmetrically around zero with half of the encoder range, within which the position must be re-established after switch-off/switch-on. In this range, it is only permissible that the encoder overflows.

After the adjustment has been completed, it must be guaranteed that the range is not exited. The reason for this is that outside the range, there is no clear reference any longer between the encoder actual value and mechanical system. If the home position (c2598) lies in this range, then the position actual value is set when adjusting to the home position. Otherwise, adjustment is canceled with F07443.

There is no overflow for linear absolute encoders. This means that after the adjustment, the position can be re-established in the complete traversing range after switch-off/switch-on. When adjusting, the position actual value is set to the home position.

Note

To permanently accept the determined position offset, it must be retentively saved (p0977).
This adjustment can only be initiated for an absolute encoder.

c2510[0...3] LR selecting measuring probe evaluation

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Closed-loop position control with setpoint input via DCC
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:	Homing, Traversing blocks, Position control
Unit: -	

Description: Signal to select the measuring probe.
0 signal, measuring probe 1 is used.
1 signal, measuring probe 2 is used.

Index:

[0]	= Position control
[1]	= Motor encoder
[2]	= Reserved
[3]	= Reserved

Dependency: See also: p2502, c2511

Note

When function "Basic positioner" is activated, the measuring probe is selected at the 0/1 edge at r2684.1 (passive homing active).

c2511[0...3] LR measuring probe evaluation edge

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Closed-loop position control with setpoint input via DCC
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:	Homing, Traversing blocks, Position control
	Unit:	-
Description:	Signal to evaluate the measuring probe edge. 1 signal: The falling edge of the measuring probe (c2510) is used. 0 signal: The rising edge of the measuring probe (c2510) is used.	
Index:	[0] = Position control [1] = Motor encoder [2] = Reserved [3] = Reserved	
Dependency:	See also: p2502, c2510	

r2521[0...3]	LR position actual value	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Closed-loop position control with setpoint input via DCC
	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
	Unit: mm	
Description:	Display for the position actual value determined by the position actual value processing.	
Index:	[0] = Position control [1] = Motor encoder [2] = Reserved [3] = Reserved	
Dependency:	See also: p2502, r2526	
	Note r2526.0 = 1 --> The position actual value in r2521[0] for the position control is valid.	

r2521[0...3]	LR position actual value	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Closed-loop position control with setpoint input via DCC
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
	Unit: °	
Description:	Display for the position actual value determined by the position actual value processing.	
Index:	[0] = Position control [1] = Motor encoder [2] = Reserved [3] = Reserved	
Dependency:	See also: p2502, r2526	
	Note r2526.0 = 1 --> The position actual value in r2521[0] for the position control is valid.	

r2522[0...3]	LR velocity actual value
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing Unit: mm/s
Description:	Display for the velocity actual value determined by the position actual value processing.
Index:	[0] = Position control [1] = Motor encoder [2] = Reserved [3] = Reserved
Dependency:	See also: p2502, r2526
	Note r2526.0 = 1 --> The velocity actual value in r2522[0] for the position control is valid.
r2522[0...3]	LR velocity actual value
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Values for: Basic positioner for rotary motion Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing Unit: °/s
Description:	Display for the velocity actual value determined by the position actual value processing.
Index:	[0] = Position control [1] = Motor encoder [2] = Reserved [3] = Reserved
Dependency:	See also: p2502, r2526
	Note r2526.0 = 1 --> The velocity actual value in r2522[0] for the position control is valid.
r2523[0...3]	LR measured value
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Data type: FloatingPoint64 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Position control Unit: mm
Description:	Displays the measured values that were determined using functions "Homing mark search" and "Measuring probe evaluation".

Index: [0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note

r2526.2 = 1 --> The measured value in r2523[0] for the closed-loop position control is valid.

r2523[0...3]**LR measured value**

Variant: S200 Basic PN, S200 PN

Available when function is active: Closed-loop position control with setpoint input via DCC

Values for: Basic positioner for rotary motion

Data type: FloatingPoint64 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Position control

Unit: °

Description: Displays the measured values that were determined using functions "Homing mark search" and "Measuring probe evaluation".

Index: [0] = Position control
[1] = Motor encoder
[2] = Reserved
[3] = Reserved

Dependency: See also: p2502, r2526

Note

r2526.2 = 1 --> The measured value in r2523[0] for the closed-loop position control is valid.

r2526.0...12**LR status word**

Variant: S200 Basic PN, S200 PN

Available when function is active: Closed-loop position control with setpoint input via DCC

Data type: Unsigned16 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Actual position value preprocessing

Unit: -

Description: Displays the status word of the position controller.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Position actual value valid	Yes	No
	01	Homing active	Yes	No
	02	Measured value valid	Yes	No
	03	Position control active	Yes	No
	04	Fixed stop reached	Yes	No
	05	Fixed stop outside window	Yes	No
	06	Position controller output limited	Yes	No
	07	Request tracking mode	Yes	No
	08	Clamping active when traveling to fixed stop	Yes	No
	09	Setting value for adjustment valid	Yes	No
	10	Absolute encoder adjusted	Yes	No
	11	Absolute encoder adjustment unsuccessful	Yes	No

Dependency:	12 Absolute encoder being adjusted	Yes	No
	See also: r2521, r2522, r2523		
Note For bit 04: The signal is influenced via p2634. For bit 05: The signal is influenced via p2635.			
c2530	LR position setpoint Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Data type: FloatingPoint64 Visible in: Standard display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Parameter group: Position controller Unit: mm		
Description:	Signal for the position setpoint of the position controller.		
Dependency:	See also: r2665		
c2530	LR position setpoint Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Values for: Basic positioner for rotary motion Data type: FloatingPoint64 Visible in: Standard display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Parameter group: Position controller Unit: °		
Description:	Signal for the position setpoint of the position controller.		
Dependency:	See also: r2665		
c2531	LR velocity setpoint Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC 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: Position controller Unit: mm/s		
Description:	Signal for the velocity setpoint of the position controller.		
Dependency:	See also: r2666		
c2531	LR velocity setpoint Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC		

	Values for:	Basic positioner for rotary motion
	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:	Position controller
	Unit: %s	
Description:	Signal for the velocity setpoint of the position controller.	
Dependency:	See also: r2666	

p2533[0]	LR position setpoint filter time constant		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Data type: FloatingPoint32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Position controller	
	Unit: ms		
	Min:	Max:	Factory setting:
	0.00 [ms]	1000.00 [ms]	0.00 [ms]
Description:	Sets the time constant for the position setpoint filter (PT1).		
	Note		
	The effective Kv factor (position loop gain) is reduced with the filter. This allows a softer control behavior with improved tolerance with respect to noise/disturbances.		
	Applications:		
	- Reduces the precontrol dynamic response.		
	- Jerk limiting.		

p2534[0]	LR speed precontrol factor		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Data type: FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Position controller	
	Unit: %		
	Min:	Max:	Factory setting:
	0.00 [%]	200.00 [%]	0.00 [%]
Description:	Setting for activation and weighting of the speed precontrol value.		
	Value = 0 % --> The precontrol is deactivated.		
Dependency:	See also: p2535, p2536, r2563		
	Note		
	When the axis control loop is optimally set as well as a precisely determined equivalent time constant of the speed control loop, the precontrol factor is 100%.		

p2535[0]	LR speed precontrol symmetrizing filter dead time		
	Variant:	S200 Basic PN, S200 PN	

Available when function is active:	Closed-loop position control with setpoint input via DCC	
Data type: FloatingPoint32	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Position controller	
Unit: -		
Min: 0.00	Max: 2.00	Factory setting: 0.00

Description: Sets the "fractional" dead time to emulate the timing behavior of the speed control loop. The selected multiplier refers to the position controller sampling time (dead time= p2535 * position controller clock cycle).

Dependency: See also: p2536

NOTICE
When speed precontrol is active (p2534 > 0 %), the following applies: In addition to the set dead time (p2535), internally two position controller sampling times are effective. When speed precontrol is inactive (p2534 = 0 %), the following applies: No dead time is effective (p2535 and internal).

Note
Together with p2536, the time response of the closed speed control loop can be emulated.

p2536[0] LR speed precontrol symmetrizing filter PT1

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Closed-loop position control with setpoint input via DCC	
Data type: FloatingPoint32	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Position controller	
Unit: ms		
Min: 0.00 [ms]	Max: 100.00 [ms]	Factory setting: 0.00 [ms]

Description: Sets a PT1 filter to emulate the time response of the closed speed control loop.

Dependency: See also: p2535

NOTICE
When speed precontrol is inactive (p2534 = 0 %), the following applies: If a PT1 filter has been set, it is not effective.

Note
Together with p2535, the time response of the closed speed control loop can be emulated.

p2538[0] LR proportional gain

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Closed-loop position control with setpoint input via DCC	
Data type: FloatingPoint32	Visible in: Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	

	Changeable in operating state:	Operation	
	Parameter group:	Position controller	
	Unit:	1000 rpm	
	Min:	Max:	Factory setting:
	0.000 [1000 rpm]	300.000 [1000 rpm]	1.000 [1000 rpm]
Description:	Sets the proportional gain (P gain, position loop gain, Kv factor) of the position controller.		
Dependency:	See also: p2539, r2557, r2558		
<hr/>			
Note			
The proportional gain is used define at which traversing velocity which following error is obtained (without precontrol)			
Low proportional gain:			
Slow response to a setpoint - actual value difference, the following error becomes large.			
High proportional gain:			
Fast response to the setpoint - actual value difference, the following error becomes small.			

p2539[0]	LR integral time			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Closed-loop position control with setpoint input via DCC		
	Data type:	FloatingPoint32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Position controller		
	Unit:	ms		
		Min:	Max:	Factory setting:
	0.00 [ms]	100000.00 [ms]	0.00 [ms]	
Description:	Setting to activate the integral time of the position controller. Value = 0 ms --> The I component of the position controller is deactivated.			
Dependency:	See also: p2538, r2559			

p2540	LR position controller output speed limit		
	Variant:		S200 Basic PN, S200 PN
	Available when function is active:		Closed-loop position control with setpoint input via DCC
	Data type:	FloatingPoint32	Visible in: Extended display
	Read permission:		Read drive data or acknowledge messages
	Write permission:		Edit device configuration or drive applications
	Changeable in operating state:		Operation
	Parameter group:		Position controller
	Unit: rpm		
	Min:		Max:
	0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]
Description: Sets the speed limit of the position controller output.			
Dependency: See also: c2541			

c2541	LR position controller output speed limit signal	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Closed-loop position control with setpoint input via DCC
	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:	Position controller
	Unit: rpm	
Description:	Signal for limiting the position controller output.	
Dependency:	See also: p2540	

p2542	LR standstill window		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Data type: FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Position monitoring	
	Unit: mm		
	Min:	Max:	Factory setting:
	0.000000 [mm]	2.1474839e+09 [mm]	0.250000 [mm]
Description:	Sets the standstill window for the standstill monitoring function. After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output. Value = 0 --> The standstill monitoring is deactivated.		
Dependency:	See also: p2543, p2544		
	Note The following applies for the setting of the standstill window and positioning window: Standstill window (p2542) >= positioning window (p2544)		

p2542	LR standstill window		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Position monitoring	
	Unit: °		
	Min:	Max:	Factory setting:
	0.000000 [°]	2.1474839e+09 [°]	10.000000 [°]
Description:	Sets the standstill window for the standstill monitoring function. After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output. Value = 0 --> The standstill monitoring is deactivated.		
Dependency:	See also: p2543, p2544		
	Note The following applies for the setting of the standstill window and positioning window: Standstill window (p2542) >= positioning window (p2544)		

p2543	LR standstill monitoring time		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Position monitoring	
	Unit: ms		
	Min:	Max:	Factory setting:
Description:	0.00 [ms]	100000.00 [ms]	200.00 [ms]
	Sets the standstill monitoring time for the standstill monitoring function. After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output.		
Dependency:	See also: p2542, p2545		
	Note The following applies for the setting of the standstill and positioning monitoring time: Standstill monitoring time (p2543) <= positioning monitoring time (p2545)		
p2544	LR positioning window		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Position monitoring	
	Unit: mm		
	Min:	Max:	Factory setting:
Description:	0.000000 [mm]	2.1474839e+09 [mm]	0.050000 [mm]
	Sets the positioning window for the positioning monitoring function. After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output. Value = 0 --> The positioning monitoring function is deactivated.		
Dependency:	See also: p2542, p2545, r2684		
	Note The following applies for the setting of the standstill and positioning window: Standstill window (p2542) >= positioning window (p2544)		
p2544	LR positioning window		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	

	Parameter group:	Position monitoring
	Unit: °	
	Min:	Max:
	0.000000 [°]	2.1474839e+09 [°]
		Factory setting:
		2.000000 [°]
Description:	Sets the positioning window for the positioning monitoring function. After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output. Value = 0 --> The positioning monitoring function is deactivated.	
Dependency:	See also: p2542, p2545, r2684	
	Note The following applies for the setting of the standstill and positioning window: Standstill window (p2542) >= positioning window (p2544)	

p2545	LR positioning monitoring time		
	Variant:		S200 Basic PN, S200 PN
	Available when function is active:		Closed-loop position control with setpoint input via DCC
	Data type: FloatingPoint32		Visible in: Standard display
	Read permission:		Read drive data or acknowledge messages
	Write permission:		Edit device configuration or drive applications
	Changeable in operating state:		Operation
	Parameter group:		Position monitoring
	Unit: ms		
	Min:		Max:
0.00 [ms]		100000.00 [ms]	1000.00 [ms]
Description:	Sets the positioning monitoring time for the positioning monitoring. After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output.		
Dependency:	See also: p2543, p2544, r2684		
<hr/>			
Note			
The following applies for the setting of the standstill and positioning monitoring time: Standstill monitoring time (p2543) <= positioning monitoring time (p2545)			

p2546[0]	LR dynamic following error monitoring tolerance		
	Variant:		S200 Basic PN, S200 PN
	Available when function is active:		Closed-loop position control with setpoint input via DCC
	Data type: FloatingPoint32		Visible in: Standard display
	Read permission:		Read drive data or acknowledge messages
	Write permission:		Edit device configuration or drive applications
	Changeable in operating state:		Operation
	Parameter group:		Position monitoring
	Unit: mm		
	Min:		Max:
	0.000000 [mm]	2.1474839e+09 [mm]	1.000000 [mm]
Description:	Sets the tolerance for the dynamic following error monitoring. If the dynamic following error (r2563) exceeds the selected tolerance, then an appropriate fault is output. Value = 0 --> The dynamic following error monitoring is deactivated.		
Dependency:	See also: r2563, r2684		

Note

The tolerance bandwidth is intended to prevent the dynamic following error monitoring incorrectly responding due to operational control sequences (e.g. during load surges).

p2546[0]**LR dynamic following error monitoring tolerance**

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Closed-loop position control with setpoint input via DCC	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	Visible in:	Standard display
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Position monitoring	
Unit: °		
Min:	Max:	Factory setting:
0.000000 [°]	2.1474839e+09 [°]	36.000000 [°]

Description:

Sets the tolerance for the dynamic following error monitoring.
If the dynamic following error (r2563) exceeds the selected tolerance, then an appropriate fault is output.
Value = 0 --> The dynamic following error monitoring is deactivated.

Dependency:

See also: r2563, r2684

Note

The tolerance bandwidth is intended to prevent the dynamic following error monitoring incorrectly responding due to operational control sequences (e.g. during load surges).

r2556[0...1]**LR position setpoint after setpoint smoothing**

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Closed-loop position control with setpoint input via DCC	
Data type: FloatingPoint64	Visible in:	Standard display
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Position controller	
Unit: mm		

Description:

Displays the position setpoint after the setpoint smoothing.

Index:

[0] = Position setpoint before symmetrization
[1] = Position setpoint after symmetrization

r2556[0...1]**LR position setpoint after setpoint smoothing**

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Closed-loop position control with setpoint input via DCC	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint64	Visible in:	Standard display
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Position controller	
Unit: °		

Description:

Displays the position setpoint after the setpoint smoothing.

Index:

[0] = Position setpoint before symmetrization
[1] = Position setpoint after symmetrization

r2557	LR position controller input system deviation
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Position controller Unit: mm
Description:	Displays the difference between the position setpoint and the position actual value at the position controller input.
r2557	LR position controller input system deviation
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Values for: Basic positioner for rotary motion Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Position controller Unit: °
Description:	Displays the difference between the position setpoint and the position actual value at the position controller input.
r2558	LR position controller output P component
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Position controller Unit: rpm
Description:	Displays the P component at the output of the position controller (speed setpoint).
r2559	LR position controller output I component
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Position controller Unit: rpm
Description:	Displays the I component at the output of the position controller (speed setpoint).
r2560	LR speed setpoint
	Variant: S200 Basic PN, S200 PN Available when function is active: Closed-loop position control with setpoint input via DCC Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Position controller Unit: rpm

Description: Displays the speed setpoint after limiting (c2541).

r2561	LR speed precontrol value
Variant:	S200 Basic PN, S200 PN
Available when function is active:	Closed-loop position control with setpoint input via DCC
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Position controller
Unit: rpm	

Description: Displays the speed setpoint due to the precontrol.

r2562	LR total speed setpoint
Variant:	S200 Basic PN, S200 PN
Available when function is active:	Closed-loop position control with setpoint input via DCC
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Position controller
Unit: rpm	

Description: Displays the total speed setpoint

This value is obtained from the sum of the speed precontrol and position controller output.

Dependency: See also: r2560, r2561

r2563	LR following error dynamic model
Variant:	S200 Basic PN, S200 PN
Available when function is active:	Closed-loop position control with setpoint input via DCC
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring
Unit: mm	

Description: Displays the dynamic following error.

This value is the deviation, corrected by the velocity-dependent component, between the position setpoint and the position actual value.

Note

For p2534 $\geq 100\%$ (precontrol activated) the following applies:

The dynamic following error (r2563) corresponds to the system deviation (r2557) at the position controller input.

For $0\% < p2534 < 100\%$ (precontrol activated) or $p2534 = 0\%$ (precontrol deactivated) the following applies:

The dynamic following error (r2563) is the deviation between the measured position actual value and a value that is calculated from the position setpoint via a PT1 model. This compensates the system-related velocity-dependent system deviation for a P controller.

r2563	LR following error dynamic model
Variant:	S200 Basic PN, S200 PN
Available when function is active:	Closed-loop position control with setpoint input via DCC
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages

	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring
	Unit: °	
Description:	Displays the dynamic following error.	
	This value is the deviation, corrected by the velocity-dependent component, between the position setpoint and the position actual value.	
	Note	
	For p2534 >= 100 % (precontrol activated) the following applies:	
	The dynamic following error (r2563) corresponds to the system deviation (r2557) at the position controller input.	
	For 0 % < p2534 < 100 % (precontrol activated) or p2534 = 0 % (precontrol deactivated) the following applies:	
	The dynamic following error (r2563) is the deviation between the measured position actual value and a value that is calculated from the position setpoint via a PT1 model. This compensates the system-related velocity-dependent system deviation for a P controller.	
r2564	LR torque precontrol value	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Closed-loop position control with setpoint input via DCC
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Position controller
	Unit: Nm	
Description:	Displays the torque precontrol value.	
	Note	
	The torque precontrol value is the derivation over time of the speed precontrol value and is referred to a moment of inertia of 1 kgm^2/2 PI. When using the precontrol, then this should be evaluated corresponding to the actual moment of inertia.	
r2565	LR following error actual	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Closed-loop position control with setpoint input via DCC
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Position controller
	Unit: mm	
Description:	Displays the actual following error.	
	This value is the deviation between the position setpoint - after fine interpolation - and the position actual value.	
	NOTICE	
	When speed precontrol is active (p2534 > 0 %), the following applies:	
	To calculate this value, the position setpoint is delayed by two position controller sampling times.	
	When speed precontrol is inactive (p2534 = 0 %), the following applies:	
	To calculate this value, the position setpoint is delayed by two position controller clock cycles.	
r2565	LR following error actual	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Closed-loop position control with setpoint input via DCC
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages

Description:	Parameter group:	Position controller
	Unit: °	
	Displays the actual following error. This value is the deviation between the position setpoint - after fine interpolation - and the position actual value.	

NOTICE

When speed precontrol is active (p2534 > 0 %), the following applies:
To calculate this value, the position setpoint is delayed by two position controller sampling times.
When speed precontrol is inactive (p2534 = 0 %), the following applies:
To calculate this value, the position setpoint is delayed by two position controller clock cycles.

p2567[0]**LR torque precontrol moment of inertia**

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Closed-loop position control with setpoint input via DCC	
Data type: FloatingPoint32	Visible in:	Standard display
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Position controller	
Unit: kgm ²		
Min:	Max:	Factory setting:
0.000000 [kgm ²]	100000.000000 [kgm ²]	0.000000 [kgm ²]

Description: Sets the moment of inertia for the torque precontrol.

Dependency: See also: p2534, r2564

Note

When calculating the torque precontrol value (c2654), the derivation over time of the speed precontrol value is multiplied by $2 \text{ PI} * \text{p2567}$.

For reasons associated with the compatibility to earlier firmware versions, the factory setting for p2567 = $1 \text{ kgm}^2/2 \text{ PI}$. This means that r2564 remains as standard the derivation over time of the speed precontrol value and is referred, as before, to a moment of inertia of $1 \text{ kgm}^2/2 \text{ PI}$. For torque precontrol, the moment of inertia can now be directly entered into p2567 (instead of subsequently evaluating the precontrol value).

c2568**EPOS hardware limit switch activation**

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Basic positioner	
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:	Position limits	
Unit: -		

Description: Signal to activate the hardware limit switch.

For c2568 = 1 signal:

Negative hardware limit switch (c2569) and positive hardware limit switch (c2570) are activated.

For c2568 = 0 signal:

Negative hardware limit switch (c2569) and positive hardware limit switch (c2570) are not evaluated.

Dependency: See also: c2569, c2570

Note

The traversing range can also be limited using software limit switches.

c2569	EPOS negative hardware limit switch
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner 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: Position limits Unit: -
Description:	Signal for the hardware limit switch in the negative direction of travel.
Recommendation:	Set the OFF3 ramp-down time (p1135) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available. Sets message 07491 as alarm (A07491): Set the maximum deceleration (p2573) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.
Dependency:	See also: p1135, c2568, c2570, p2573, r2684
	<div>CAUTION</div> The hardware limit switch is low active. Sets message 07491 as fault (F07491): For a 0 signal, the drive stops with the OFF3 ramp-down time (p1135), status signal r2684.13 = 1 is set, saved and the corresponding fault is output. After the fault has been acknowledged, only motion moving away from the hardware limit switch is permitted. For a 0/1 signal and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.13 is set to 0. Sets message 07491 as alarm (A07491): For a 0 signal, the axis is stopped with the maximum deceleration (p2573), status signal r2684.13 is set to 1, saved and the appropriate alarm is output. Only motion away from the hardware limit switch is permitted. For a 0/1 signal and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.13 is set to 0 and the alarm is cleared.
c2570	EPOS positive hardware limit switch
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner 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: Position limits Unit: -
Description:	Signal for the hardware limit switch in the positive direction of travel.
Recommendation:	Set the OFF3 ramp-down time (p1135) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.
Dependency:	See also: p1135, c2568, c2569, p2573, r2684
	<div>CAUTION</div> The hardware limit switch is low active. For a 0 signal the drive stops with the OFF3 ramp-down time (p1135), status signal r2684.14 = 1 is set, saved and the corresponding fault is output. After the fault has been acknowledged, only motion moving away from the hardware limit switch is permitted. For a 0/1 signal and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.14 is set to 0.

p2571	EPOS maximum velocity				
	Variant:	S200 Basic PN, S200 PN			
	Available when function is active:	Basic positioner			
	Data type:	FloatingPoint32	Visible in: Standard display		
	Read permission:	Read drive data or acknowledge messages			
	Write permission:	Edit device configuration or drive applications			
	Changeable in operating state:	Operation			
	Parameter group:	Dynamic response limits			
	Unit:	mm/s			
	Min:	0.010 [mm/s]	Max:	4e+07 [mm/s]	Factory setting:
Description:	Sets the maximum velocity for the "basic positioner" function (EPOS).				
Dependency:	See also: p2503, p2504, p2505, p2506				
Note					
The maximum velocity is active in all of the operating modes of the basic positioner.					
The maximum velocity for the basic positioner should be aligned with the maximum speed/velocity of the speed/velocity controller:					
Rotary encoders:					
p2571[1000 LU/min] = min(p1082, p1083, p1086)[rpm] x p2505/p2504 x p2506/1000					
Linear encoders:					
p2571[1000 LU/min] = min(p1082, p1083, p1086)[m/min] x p2503/10[m]					

p2571	EPOS maximum velocity				
	Variant:	S200 Basic PN, S200 PN			
	Available when function is active:	Basic positioner			
	Values for:	Basic positioner for rotary motion			
	Data type:	FloatingPoint32	Visible in: Standard display		
	Read permission:	Read drive data or acknowledge messages			
	Write permission:	Edit device configuration or drive applications			
	Changeable in operating state:	Operation			
	Parameter group:	Dynamic response limits			
	Unit:	°/s			
Min:	0.010 [°/s]	Max:	4e+07 [°/s]	Factory setting:	18000.000 [°/s]
Description:	Sets the maximum velocity for the "basic positioner" function (EPOS).				
Dependency:	See also: p2503, p2504, p2505, p2506				
Note					
The maximum velocity is active in all of the operating modes of the basic positioner.					
The maximum velocity for the basic positioner should be aligned with the maximum speed/velocity of the speed/velocity controller:					
Rotary encoders:					
p2571[1000 LU/min] = min(p1082, p1083, p1086)[rpm] x p2505/p2504 x p2506/1000					
Linear encoders:					
p2571[1000 LU/min] = min(p1082, p1083, p1086)[m/min] x p2503/10[m]					

p2572	EPOS maximum acceleration		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	

	Data type: FloatingPoint32 Read permission: Write permission: Changeable in operating state: Parameter group: Unit: mm/s ² Min: 0.001 [mm/s ²] Max: 2e+06 [mm/s ²] Factory setting: 10000.000 [mm/s ²] Description: Sets the maximum acceleration for the "basic positioner" function (EPOS). Dependency: See also: p2619, c2644
	Note The maximum acceleration appears to exhibit jumps (without jerk). "Traversing blocks" operating mode: The programmed acceleration override (p2619) acts on the maximum acceleration. "Direct setpoint input/MDI" operating mode: The acceleration override is effective (c2644, 4000 hex = 100 %). "Jog" and "Active homing" operating modes: No acceleration override is active. The axis starts with the maximum acceleration.
p2572	EPOS maximum acceleration Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Values for: Basic positioner for rotary motion Data type: FloatingPoint32 Visible in: Standard display Read permission: Write permission: Changeable in operating state: Ready for operation Parameter group: Dynamic response limits, Jog Unit: °/s ² Min: 0.001 [°/s ²] Max: 2e+06 [°/s ²] Factory setting: 360000.000 [°/s ²] Description: Sets the maximum acceleration for the "basic positioner" function (EPOS). Dependency: See also: p2619, c2644
	Note The maximum acceleration appears to exhibit jumps (without jerk). "Traversing blocks" operating mode: The programmed acceleration override (p2619) acts on the maximum acceleration. "Direct setpoint input/MDI" operating mode: The acceleration override is effective (c2644, 4000 hex = 100 %). "Jog" and "Active homing" operating modes: No acceleration override is active. The axis starts with the maximum acceleration.
p2573	EPOS maximum deceleration Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Data type: FloatingPoint32 Visible in: Standard display Read permission: Write permission:

	Changeable in operating state:	Ready for operation
	Parameter group:	Dynamic response limits, Jog
	Unit:	mm/s ²
	Min:	Max:
	0.001 [mm/s ²]	2e+06 [mm/s ²]
		Factory setting:
		10000.000 [mm/s ²]
Description:	Sets the maximum deceleration for the "basic positioner" function (EPOS).	
Dependency:	See also: p2620, c2645	

Note

The maximum deceleration appears to exhibit jumps (without jerk).
 "Traversing blocks" operating mode:
 The programmed deceleration override (p2620) acts on the maximum deceleration.
 "Direct setpoint input/MDI" operating mode:
 The deceleration override is effective (c2645, 4000 hex = 100 %).
 "Jog" and "Active homing" operating modes:
 No deceleration override is effective. The axis breaks with the maximum deceleration.

p2573**EPOS maximum deceleration**

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type:	FloatingPoint32
	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Ready for operation
	Parameter group:	Dynamic response limits, Jog
	Unit:	°/s ²
	Min:	Max:
	0.001 [°/s ²]	2e+06 [°/s ²]
		Factory setting:
		360000.000 [°/s ²]
Description:	Sets the maximum deceleration for the "basic positioner" function (EPOS).	
Dependency:	See also: p2620, c2645	

Note

The maximum deceleration appears to exhibit jumps (without jerk).
 "Traversing blocks" operating mode:
 The programmed deceleration override (p2620) acts on the maximum deceleration.
 "Direct setpoint input/MDI" operating mode:
 The deceleration override is effective (c2645, 4000 hex = 100 %).
 "Jog" and "Active homing" operating modes:
 No deceleration override is effective. The axis breaks with the maximum deceleration.

p2574**EPOS jerk limiting**

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type:	FloatingPoint32
	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Dynamic response limits
	Unit:	mm/s ³

	Min: 0.001 [mm/s ³] Max: 1e+08 [mm/s ³] Factory setting: 200000.000 [mm/s ³]	
Description:	Sets the jerk limiting	
Dependency:	See also: p2572, p2573, c2575	
Note The jerk limiting is internally converted into a jerk time as follows: Jerk time $T_r = \max(p2572, p2573) / p2574$ The jerk time is internally limited to 1000 ms, and is rounded off to an integer multiple of the sampling time of the basic positioner cycle. The jerk time is valid for the acceleration and deceleration phases also for unequal maximum acceleration (p2572) and maximum deceleration (p2573). For unequal maximum acceleration and maximum deceleration, the motion is not optimal from a time perspective as the jerk limit cannot be used for the lower of the two values. If, in the traversing profile, the acceleration time without jerk limiting is shorter than jerk time T_r , then motion with jerk limiting is not time-optimized. For traversing motion with a direct transition between acceleration and deceleration (i.e. jerk time is greater than the constant velocity phase), jerk can increase up to twice the parameterized jerk. CONTINUE_FLYING with direction reversal acts internally just like a CONTINUE_WITH_STOP without the "position reached" being set. Without jerk limiting, this behavior can hardly be noticed as, when reversing, the position setpoint is only kept at zero for one interpolator clock cycle. For block change enable CONTINUE_WITH_STOP, jerk limiting results in a longer delay time.		
p2574	EPOS jerk limiting	
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Values for: Basic positioner for rotary motion Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Changeable in operating state: Operation Parameter group: Dynamic response limits Unit: °/s ³	
	Min: 0.001 [°/s ³] Max: 1e+08 [°/s ³] Factory setting: 7.2e+06 [°/s ³]	
Description:	Sets the jerk limiting	
Dependency:	See also: p2572, p2573, c2575	
Note The jerk limiting is internally converted into a jerk time as follows: Jerk time $T_r = \max(p2572, p2573) / p2574$ The jerk time is internally limited to 1000 ms, and is rounded off to an integer multiple of the sampling time of the basic positioner cycle. The jerk time is valid for the acceleration and deceleration phases also for unequal maximum acceleration (p2572) and maximum deceleration (p2573). For unequal maximum acceleration and maximum deceleration, the motion is not optimal from a time perspective as the jerk limit cannot be used for the lower of the two values. If, in the traversing profile, the acceleration time without jerk limiting is shorter than jerk time T_r , then motion with jerk limiting is not time-optimized. For traversing motion with a direct transition between acceleration and deceleration (i.e. jerk time is greater than the constant velocity phase), jerk can increase up to twice the parameterized jerk. CONTINUE_FLYING with direction reversal acts internally just like a CONTINUE_WITH_STOP without the "position reached" being set. Without jerk limiting, this behavior can hardly be noticed as, when reversing, the position setpoint is only kept at zero for one interpolator clock cycle. For block change enable CONTINUE_WITH_STOP, jerk limiting results in a longer delay time.		

c2575	EPOS jerk limiting activation
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner 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: Dynamic response limits, Jog, Homing, Traversing blocks, Direct setpoint input (MDI) Unit: -
Description:	Signal to activate jerk limiting. Activating/deactivating: - Using c2575 = 1 signal or 0 signal. - Using the JERK command in the traversing block (only for c2575 = 0 signal).
Dependency:	See also: p2574
	Note A change to the signal state is only accepted at zero speed.

p2576	EPOS modulo correction modulo range
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Data type: FloatingPoint64 Visible in: Standard display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Changeable in operating state: Ready for operation Parameter group: Basic parameters / mechanical system, Actual position value preprocessing Unit: mm Min: 0.000100 [mm] Max: 2.1474828e+09 [mm] Factory setting: 360.000000 [mm]
Description:	Sets the modulo range for axes with modulo correction.
Dependency:	See also: c2577

p2576	EPOS modulo correction modulo range
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Values for: Basic positioner for rotary motion Data type: FloatingPoint64 Visible in: Standard display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Changeable in operating state: Ready for operation Parameter group: Basic parameters / mechanical system, Actual position value preprocessing Unit: ° Min: 0.000100 [°] Max: 2.1474828e+09 [°] Factory setting: 360.000000 [°]
Description:	Sets the modulo range for axes with modulo correction.
Dependency:	See also: c2577

c2577	EPOS modulo correction activation	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	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:	Basic parameters / mechanical system, Actual position value preprocessing
	Unit:	-
	Description:	Signal to activate modulo correction.
Dependency:	See also: p2576	
	Note	
	When the signal state changes, this only becomes effective in the "ready for switching on" state.	
	Selecting modulo correction:	
	The actual position setpoint in the modulo range is corrected. The position actual value differs from the position setpoint by the following error and can also leave the modulo range.	
	Deselecting modulo correction:	
	It is based on the actual position actual value.	
c2578	EPOS negative software limit switch	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type:	FloatingPoint64
	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Position limits
	Unit:	mm
	Description:	Signal for the negative software limit switch.
Dependency:	See also: c2579, p2580, p2581, c2582	
	NOTICE	
	A change to the software limit switch immediately becomes effective.	
	If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.	
	Note	
	The following applies for the setting of the software limit switch:	
	Negative software limit switch < positive software limit switch	
c2578	EPOS negative software limit switch	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type:	FloatingPoint64
	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Position limits
	Unit:	°
Description:	Signal for the negative software limit switch.	
Dependency:	See also: c2579, p2580, p2581, c2582	

NOTICE

A change to the software limit switch immediately becomes effective.
If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note

The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

c2579**EPOS positive software limit switch**

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Dynamic response limits
Unit: mm

Description:

Signal for the positive setpoint limit switch.

Dependency:

See also: c2578, p2580, p2581, c2582

NOTICE

A change to the software limit switch immediately becomes effective.
If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note

The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

c2579**EPOS positive software limit switch**

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Dynamic response limits
Unit: °

Description:

Signal for the positive setpoint limit switch.

Dependency:

See also: c2578, p2580, p2581, c2582

NOTICE

A change to the software limit switch immediately becomes effective.
If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note

The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

p2580**EPOS negative software limit switch**

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner

	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Position limits
	Unit: mm	
	Min: -2.1474828e+09 [mm]	Max: 2.1474828e+09 [mm]
		Factory setting: -2.1474828e+09 [mm]
Description:	Sets the software limit switch, in the negative direction of travel.	
Dependency:	See also: c2578, c2579, p2581, c2582	

p2580

EPOS negative software limit switch

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Position limits
	Unit: °	
	Min: -2.1474828e+09 [°]	Max: 2.1474828e+09 [°]
		Factory setting: -2.1474828e+09 [°]
Description:	Sets the software limit switch, in the negative direction of travel.	
Dependency:	See also: c2578, c2579, p2581, c2582	

p2581

EPOS positive software limit switch

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Dynamic response limits
	Unit: mm	
	Min: -2.1474828e+09 [mm]	Max: 2.1474828e+09 [mm]
		Factory setting: 2.1474828e+09 [mm]
Description:	Sets the software limit switch, in the positive direction of travel.	
Dependency:	See also: c2578, c2579, p2580, c2582	

p2581

EPOS positive software limit switch

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint64	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages

	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Dynamic response limits
	Unit: °	
	Min:	Max:
	-2.1474828e+09 [°]	2.1474828e+09 [°]
		Factory setting:
		2.1474828e+09 [°]
Description:	Sets the software limit switch, in the positive direction of travel.	
Dependency:	See also: c2578, c2579, p2580, c2582	

c2582**EPOS software limit switch activation**

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	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:	Position limits
	Unit: -	
Description:	Signal to activate the software limit switch.	
Dependency:	See also: c2578, c2579, p2580, p2581	

⚠ CAUTION

Software limit switch is effective for:

- Axis is homed ($r2684.11 = 1$) and
- c2582 = 1 signal.

Software limit switch is ineffective for:

- Modulo correction active (c2577 = 1 signal) or
- "Active homing" is executed.

NOTICE

Target position for relative positioning outside software limit switch:

The traversing block is started and the axis comes to a standstill at the software limit switch. An appropriate alarm is output and the traversing block is interrupted. Traversing blocks with valid position can be activated.

Target position for absolute positioning outside software limit switch:

In the "traversing blocks" mode, the traversing block is not started and an appropriate fault is output.

Axis outside the valid traversing range:

If the axis is already outside the valid traversing range, then an appropriate fault is output. The fault can be acknowledged at standstill. Traversing blocks with valid position can be activated.

Note

The traversing range can also be limited using hardware limit switches.

p2583**EPOS backlash compensation**

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation

	Parameter group:	Basic positioner	
	Unit: mm		
	Min:	Max:	Factory setting:
	-200000.000000 [mm]	200000.000000 [mm]	0.000000 [mm]
Description:	Sets the amount of play (backlash) for positive or negative play. 0: backlash compensation is deactivated. > 0: Positive backlash (normal case) When the direction is reversed, the encoder actual value leads the actual value. < 0: Negative backlash When the direction is reversed, the actual value leads the encoder actual value.		
Dependency:	If a stationary axis is referenced by "setting the home position", or an adjusted with absolute encoder is switched on, then the setting of c2604 is relevant for entering the compensation value. c2604 = 1: Traveling in the positive direction -> A compensation value is immediately entered. Traveling in the negative direction -> A compensation value is not entered c2604 = 0: Traveling in the positive direction -> A compensation value is not entered Traveling in the negative direction -> A compensation value is immediately entered. When again setting the home position (a homed axis) or for "passive homing", c2604 is not relevant but instead the history of the axis. See also: c2604		

p2583

EPOS backlash compensation

	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Basic positioner	
	Unit: °		
	Min:	Max:	Factory setting:
	-200000.000000 [°]	200000.000000 [°]	0.000000 [°]
Description:	Sets the amount of play (backlash) for positive or negative play. 0: backlash compensation is deactivated. > 0: Positive backlash (normal case) When the direction is reversed, the encoder actual value leads the actual value. < 0: Negative backlash When the direction is reversed, the actual value leads the encoder actual value.		
Dependency:	If a stationary axis is referenced by "setting the home position", or an adjusted with absolute encoder is switched on, then the setting of c2604 is relevant for entering the compensation value. c2604 = 1: Traveling in the positive direction -> A compensation value is immediately entered. Traveling in the negative direction -> A compensation value is not entered c2604 = 0: Traveling in the positive direction -> A compensation value is not entered Traveling in the negative direction -> A compensation value is immediately entered. When again setting the home position (a homed axis) or for "passive homing", c2604 is not relevant but instead the history of the axis. See also: c2604		

p2584.0...3**EPOS functions configuration****Variant:** S200 Basic PN, S200 PN**Available when function is active:** Basic positioner**Data type:** Unsigned32**Visible in:** Extended display**Read permission:** Read drive data or acknowledge messages**Write permission:** Edit device configuration or drive applications**Changeable in operating state:** Ready for operation**Parameter group:** Basic positioner**Unit:** -**Min:****Max:****Factory setting:**

-

-

0100 bin

Description:

Sets the configuration for additional functions for the basic positioner (EPOS).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Activate position feedback signal	Yes	No
01	Hardware limit switch evaluation	Level evaluation	Edge evaluation
02	Travel to fixed stop - torque calculation based on the offset	Yes	No
03	Active homing with absolute encoder adjustment	Yes	No

Note

For bit 00:

When the bit is set, for traversing blocks with absolute target positions (p2617[x]) when the tolerance window (p2688) is reached, the traversing block number (p2616[x]) is output bit-coded (r2689).

For bit 01:

When the bit is set, the hardware limit switch is evaluated, level-triggered.

This setting is recommended for a poor position actual value resolution, as in this case the direction does not have to be evaluated.

For bit 02:

When the bit is set, for "Travel to fixed stop", the torque setpoints are calculated based on the offset for the torque limit (p1532).

For bit 03:

After successful active homing, an absolute encoder is adjusted (p2507).

p2585**EPOS jog 1 setpoint velocity****Variant:** S200 Basic PN, S200 PN**Available when function is active:** Basic positioner**Data type:** FloatingPoint32**Visible in:** Standard display**Read permission:** Read drive data or acknowledge messages**Write permission:** Edit device configuration or drive applications**Changeable in operating state:** Operation**Parameter group:** Jog**Unit:** mm/s**Min:****Max:****Factory setting:**

-4e+07 [mm/s]

4e+07 [mm/s]

-5.000 [mm/s]

Description:

Sets the setpoint velocity for jog 1.

Dependency:

See also: p2587, c2589, c2591

p2585**EPOS jog 1 setpoint velocity****Variant:** S200 Basic PN, S200 PN**Available when function is active:** Basic positioner

	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Jog	
	Unit: °/s		
	Min:	Max:	Factory setting:
	-4e+07 [°/s]	4e+07 [°/s]	-180.000 [°/s]
Description:	Sets the setpoint velocity for jog 1.		
Dependency:	See also: p2587, c2589, c2591		

p2586	EPOS jog 2 setpoint velocity		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Jog	
	Unit: mm/s		
	Min:	Max:	Factory setting:
	-4e+07 [mm/s]	4e+07 [mm/s]	5.000 [mm/s]
Description:	Sets the setpoint velocity for jog 2.		
Dependency:	See also: p2588, c2590, c2591		

p2586	EPOS jog 2 setpoint velocity		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Jog	
	Unit: °/s		
	Min:	Max:	Factory setting:
	-4e+07 [°/s]	4e+07 [°/s]	180.000 [°/s]
Description:	Sets the setpoint velocity for jog 2.		
Dependency:	See also: p2588, c2590, c2591		

p2587	EPOS jog 1 traversing distance		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	

	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Jog	
	Unit: mm		
	Min:	Max:	Factory setting:
	0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]
Description:	Sets the traversing distance for incremental jog 1.		
Dependency:	See also: p2585, c2589, c2591		
<hr/>			
Note			
Incremental jog 1 is started with c2591 = 1 signal and c2589 = 0/1 signal.			
With c2589 = 0 signal, incremental jogging is interrupted.			

p2587	EPOS jog 1 traversing distance			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Basic positioner		
	Values for:	Basic positioner for rotary motion		
	Data type:	FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Jog		
	Unit:	°		
	Min:	Max:	Factory setting:	
	0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]	
Description:	Sets the traversing distance for incremental jog 1.			
Dependency:	See also: p2585, c2589, c2591			
<hr/>				
Note				
Incremental jog 1 is started with c2591 = 1 signal and c2589 = 0/1 signal.				
With c2589 = 0 signal, incremental jogging is interrupted.				

p2588	EPOS jog 2 traversing distance			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Basic positioner		
	Data type:	FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Jog		
	Unit:	mm		
		Min:	Max:	Factory setting:
	0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]	
Description:	Sets the traversing distance for incremental jog 2.			
Dependency:	See also: p2586, c2590, c2591			
<hr/>				
Note				
Incremental jog 2 is started with c2591 = 1 signal and c2590 = 0/1 signal.				
Incremental jogging is interrupted with c2590 = 0 signal.				

p2588	EPOS jog 2 traversing distance			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Basic positioner		
	Values for:	Basic positioner for rotary motion		
	Data type: FloatingPoint32	Visible in: Standard display		
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Jog		
	Unit: °			
Description:	Min:	Max:	Factory setting:	
	0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]	
	Sets the traversing distance for incremental jog 2.			
Dependency:	See also: p2586, c2590, c2591			
Note				
Incremental jog 2 is started with c2591 = 1 signal and c2590 = 0/1 signal.				
Incremental jogging is interrupted with c2590 = 0 signal.				
c2589	EPOS jog 1			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Basic positioner		
	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:	Jog		
	Unit: -			
	Description:	Signal for jog 1.		
	Dependency:	When jogging, the axis is accelerated or braked with the maximum acceleration/deceleration (p2572/p2573).		
c2591 = 0 signal				
The axis endlessly moves with the setpoint velocity, jog 1 (p2585).				
c2591 = 1 signal				
The axis traverses through a parameterized distance (p2585) with the setpoint velocity, jog 1 (p2587).				
See also: p2572, p2573, p2585, p2587, c2591				
NOTICE				
The parameter may be protected as a result of r0922 and cannot be changed.				
c2590	EPOS jog 2			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Basic positioner		
	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:	Jog		
	Unit: -			
	Description:	Signal for jog 2.		

Dependency: When jogging, the axis is accelerated or braked with the maximum acceleration/deceleration (p2572/p2573).
 c2591 = 0 signal
 The axis endlessly moves with the setpoint velocity, jog 2 (p2586).
 c2591 = 1 signal
 The axis traverses through a parameterized distance (p2586) with the setpoint velocity, jog 2 (p2588).
 See also: p2572, p2573, p2586, p2588, c2591

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

c2591**EPOS jogging incremental**

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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: Jog
Unit: -

Description: Signal for incremental jogging.

Dependency: See also: p2585, p2586, p2587, p2588, c2589, c2590

c2595**EPOS homing start**

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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: Homing
Unit: -

Description: Signal to start "Active homing" or "Passive homing".

0/1 signal edge: Homing is started.

1/0 signal edge: Homing is interrupted.

Dependency: See also: c2597, c2598, p2599, r2684

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Active homing (c2597 = 0 signal):

Active homing can only be activated (0/1 edge) after traversing motion that is being processed has been completed.

With the start, where relevant, the state signal "home position set" (r2684.11) is reset.

Passive homing (c2597 = 1 signal):

With the start, the state signal "home position set" (r2684.11) is not reset.

c2596**EPOS set home position**

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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:	Homing
	Unit: -	
Description:	Signal for "Set home position".	
Dependency:	See also: c2598, p2599, r2684	

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Home position setting is effective in the following operating states:

- In the basic state.
- For FIXED STOP with progress condition END (corresponds to the initial state).
- For traversing block interrupted via c2640 = 0 signal (intermediate stop).
- For EPOS not enabled and position actual value valid

c2597

EPOS homing type selection

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	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:	Homing
	Unit: -	
Description:	Signal to select homing type. 1 signal: Passive homing 0 signal: Active homing	
Dependency:	See also: c2595	

Note

Homing is activated as follows:

- Select homing type (c2597)
- Start homing (c2595 = 0/1 signal edge)

c2598[0...3]

EPOS home position signal

	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Homing
	Unit: mm	
Description:	Signal for the home position. This value is used as reference for the following homing operations: <ul style="list-style-type: none"> - Active homing - Set home position - Passive homing - Absolute value adjustment 	

Index: [0] = Position control
 [1] = Motor encoder
 [2] = Reserved
 [3] = Reserved

Dependency: See also: p2502, p2507, c2595, c2596, c2597, p2599

Note

Absolute encoder:

When adjusting the encoder, the position received is set as the actual axis position.

c2598[0...3] EPOS home position signal

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Values for: Basic positioner for rotary motion

Data type: FloatingPoint64

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Homing

Unit: °

Description: Signal for the home position.

This value is used as reference for the following homing operations:

- Active homing
- Set home position
- Passive homing
- Absolute value adjustment

Index: [0] = Position control
 [1] = Motor encoder
 [2] = Reserved
 [3] = Reserved

Dependency: See also: p2502, p2507, c2595, c2596, c2597, p2599

Note

Absolute encoder:

When adjusting the encoder, the position received is set as the actual axis position.

p2599 EPOS home position value

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: FloatingPoint64

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group: Homing

Unit: mm

Min:

-2.1474828e+09 [mm]

Max:

2.1474828e+09 [mm]

Factory setting:

0.000000 [mm]

Description: Sets the position value for the home position.

This value is set as the actual axis position after homing or adjustment.

Dependency: See also: p2507, c2595, c2596, c2597, c2598

p2599	EPOS home position value		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint64	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Homing	
	Unit: °		
	Min:	Max:	Factory setting:
	-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]
Description:	Sets the position value for the home position. This value is set as the actual axis position after homing or adjustment.		
Dependency:	See also: p2507, c2595, c2596, c2597, c2598		
p2600	EPOS active homing home position offset		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint64	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Homing	
	Unit: mm		
	Min:	Max:	Factory setting:
	-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]
Description:	Sets the home position shift for active homing.		
Dependency:	See also: c2598		
p2600	EPOS active homing home position offset		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint64	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Homing	
	Unit: °		
	Min:	Max:	Factory setting:
	-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]
Description:	Sets the home position shift for active homing.		
Dependency:	See also: c2598		

p2601	EPOS passive homing inner window		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint64	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Homing	
	Unit: mm		
	Min:	Max:	Factory setting:
	0.000000 [mm]	2.1474828e+09 [mm]	0.000000 [mm]
Description:	Sets the inner window for passive homing. For a value = 0, the evaluation of the inner window is deactivated.		
Dependency:	See also: c2597, p2602, r2684		
NOTICE			
The inner window must be set so that it is smaller than the outer window.			
Note			
If the difference between the homing position and sensed actual position is less than the inner window, then No correction is executed for a homed axis.			
If the difference between the homing position and detected actual position is greater than the inner window and less than the outer window (p2602), then a correction is executed for a homed axis.			

p2601	EPOS passive homing inner window		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint64	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Homing	
	Unit: °		
	Min:	Max:	Factory setting:
	0.000000 [°]	2.1474828e+09 [°]	0.000000 [°]
Description:	Sets the inner window for passive homing. For a value = 0, the evaluation of the inner window is deactivated.		
Dependency:	See also: c2597, p2602, r2684		
NOTICE			
The inner window must be set so that it is smaller than the outer window.			
Note			
If the difference between the homing position and sensed actual position is less than the inner window, then No correction is executed for a homed axis.			
If the difference between the homing position and detected actual position is greater than the inner window and less than the outer window (p2602), then a correction is executed for a homed axis.			

p2602	EPOS passive homing outer window		
	Variant:	S200 Basic PN, S200 PN	

Available when function is active:	Basic positioner	
Data type: FloatingPoint64	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Homing	
Unit: mm		
Min: 0.000000 [mm]	Max: 2.1474828e+09 [mm]	Factory setting: 0.000000 [mm]

Description: Sets the outer window for passive homing.
For a value = 0, the evaluation of the outer window is deactivated.

Dependency: See also: c2597, r2684

NOTICE

The inner window must be set so that it is smaller than the outer window.

Note

If the difference between the homing position and detected actual position is greater than the outer window, then No correction is executed for a homed axis. Further, an appropriate message is output and r2684.3 is set to 1.

p2602 EPOS passive homing outer window

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint64	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Homing	
Unit: °		
Min: 0.000000 [°]	Max: 2.1474828e+09 [°]	Factory setting: 0.000000 [°]

Description: Sets the outer window for passive homing.
For a value = 0, the evaluation of the outer window is deactivated.

Dependency: See also: c2597, r2684

NOTICE

The inner window must be set so that it is smaller than the outer window.

Note

If the difference between the homing position and detected actual position is greater than the outer window, then No correction is executed for a homed axis. Further, an appropriate message is output and r2684.3 is set to 1.

p2603 EPOS passive homing, positioning mode relative

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Basic positioner	
Data type: Integer32	Visible in: Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	

	Parameter group: Homing		
	Unit: -		
	Min: 0		
	Max: 1		
	Factory setting: 1		
Description:	Sets the relative positioning mode for passive homing. Value = 1: The corrected setpoint is not calculated into the traversing distance. Value = 0: The corrected setpoint is calculated into the traversing distance.		
Dependency:	See also: c2597, p2623, c2648		
	<table><tr><td>NOTICE</td></tr><tr><td>For p2603 = 0, the direction of rotation can change.</td></tr></table>	NOTICE	For p2603 = 0, the direction of rotation can change.
NOTICE			
For p2603 = 0, the direction of rotation can change.			

c2604	EPOS active homing start direction
	Variant: S200 Basic PN, S200 PN
	Available when function is active: Basic positioner
	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: Homing
	Unit: -
Description:	Signal for the start direction for active homing. 1 signal: Start in the negative direction. 0 signal: Start in the positive direction.
Dependency:	See also: p2583, c2595, c2597

p2605	EPOS active homing approach velocity reference cam
	Variant: S200 Basic PN, S200 PN
	Available when function is active: Basic positioner
	Data type: FloatingPoint32
	Visible in: Standard display
	Read permission: Read drive data or acknowledge messages
	Write permission: Edit device configuration or drive applications
	Changeable in operating state: Operation
	Parameter group: Homing
	Unit: mm/s
	Min: 0.0001 [mm/s]
	Max: 4e+07 [mm/s]
	Factory setting: 100.0000 [mm/s]
Description:	Sets the approach velocity to the reference cam for active homing.
Dependency:	Active homing only starts with the approach velocity to the reference cam when there is a reference cam (p2607 = 1). See also: c2595, c2597, c2604, p2606, p2607
	Note When traversing to the reference cam, the velocity override is effective. If, at the start of active homing, the axis is already at the reference cam, then the axis immediately starts to traverse to the zero mark.

	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Homing
	Unit: °/s	
	Min: 0.0001 [°/s]	Max: 4e+07 [°/s]
		Factory setting: 3600.0000 [°/s]
Description:	Sets the approach velocity to the reference cam for active homing.	
Dependency:	Active homing only starts with the approach velocity to the reference cam when there is a reference cam (p2607 = 1). See also: c2595, c2597, c2604, p2606, p2607	

Note

When traversing to the reference cam, the velocity override is effective.
If, at the start of active homing, the axis is already at the reference cam, then the axis immediately starts to traverse to the zero mark.

p2606	EPOS active homing reference cam maximum distance	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint64	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Homing
	Unit: mm	
	Min: 0.000000 [mm]	Max: 2.1474828e+09 [mm]
		Factory setting: 2.1474828e+09 [mm]
Description:	Sets the maximum distance after starting active homing when traversing to the reference cam.	
Dependency:	See also: c2595, c2597, c2604, p2605, p2607	
	Note	
	When using a reversing cam, the maximum distance must be set appropriately long.	

p2606	EPOS active homing reference cam maximum distance	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint64	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Operation
	Parameter group:	Homing
	Unit: °	
	Min: 0.000000 [°]	Max: 2.1474828e+09 [°]
		Factory setting: 2.1474828e+09 [°]

Description: Sets the maximum distance after starting active homing when traversing to the reference cam.

Dependency: See also: c2595, c2597, c2604, p2605, p2607

Note

When using a reversing cam, the maximum distance must be set appropriately long.

p2607

EPOS active homing reference cam available

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: Unsigned8

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group: Homing

Unit: -

Min:

Max:

Factory setting:

0

1

1

Description: Sets whether or not a reference cam is available for active homing.

Value = 1: Reference cam present.

Value = 0: No reference cam present.

Dependency: See also: c2595, c2597, c2604, p2605, p2606

p2608

EPOS active homing approach velocity zero mark

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: FloatingPoint32

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group: Homing

Unit: mm/s

Min:

Max:

Factory setting:

0.0001 [mm/s]

4e+07 [mm/s]

25.0000 [mm/s]

Description: Sets the approach velocity after detecting the reference cam to search for the zero mark for active homing.

Dependency: If there is no reference cam (p2607 = 0), active homing starts immediately with the axis traversing to the zero mark.

See also: c2595, c2597, c2604, p2607, p2609, p2610



CAUTION

If the reference cam is not adjusted so that for each active homing the same zero mark for synchronization is detected, then an "incorrect" axis reference point is obtained.

After the reference cam has been left, the search for the zero mark is activated with a time delay due to internal factors. This is the reason that the reference cam should be adjusted in this center between two zero marks and the approach velocity should be adapted to the distance between two zero marks.

Note

The velocity override is not effective when traversing to the zero mark.

p2608

EPOS active homing approach velocity zero mark

Variant: S200 Basic PN, S200 PN

Available when function is active:	Basic positioner	
Values for:	Basic positioner for rotary motion	
Data type: FloatingPoint32	Visible in: Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Homing	
Unit: °/s		
Min: 0.0001 [°/s]	Max: 4e+07 [°/s]	Factory setting: 900.0000 [°/s]

Description: Sets the approach velocity after detecting the reference cam to search for the zero mark for active homing.
Dependency: If there is no reference cam (p2607 = 0), active homing starts immediately with the axis traversing to the zero mark.
 See also: c2595, c2597, c2604, p2607, p2609, p2610

 CAUTION
If the reference cam is not adjusted so that for each active homing the same zero mark for synchronization is detected, then an "incorrect" axis reference point is obtained. After the reference cam has been left, the search for the zero mark is activated with a time delay due to internal factors. This is the reason that the reference cam should be adjusted in this center between two zero marks and the approach velocity should be adapted to the distance between two zero marks.

Note
 The velocity override is not effective when traversing to the zero mark.

p2609 EPOS active homing max distance reference cam and zero mark

Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Basic positioner	
Data type: FloatingPoint32	Visible in: Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Changeable in operating state:	Operation	
Parameter group:	Homing	
Unit: mm		
Min: 0.000000 [mm]	Max: 2.1474828e+09 [mm]	Factory setting: 20.000000 [mm]

Description: Sets the maximum distance after leaving the reference cam when traversing to the zero mark.
Dependency: See also: c2595, c2597, c2604, p2607, p2608, p2610

p2609 EPOS active homing max distance reference cam and zero mark

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Changeable in operating state:	Operation
Parameter group:	Homing
Unit: °	

	Min: 0.000000 [°]	Max: 2.1474828e+09 [°]	Factory setting: 720.000000 [°]
Description:	Sets the maximum distance after leaving the reference cam when traversing to the zero mark.		
Dependency:	See also: c2595, c2597, c2604, p2607, p2608, p2610		

p2610 EPOS active homing tolerance band for distance to zero mark

	Variant: S200 Basic PN, S200 PN	
	Available when function is active: Basic positioner	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission: Read drive data or acknowledge messages	
	Write permission: Edit device configuration or drive applications	
	Changeable in operating state: Operation	
	Parameter group: Homing	
	Unit: mm	
	Min: 0.000000 [mm]	Max: 2.1474828e+09 [mm]
		Factory setting: 2.1474828e+09 [mm]
Description:	Sets the tolerance bandwidth for the distance to the zero mark The zero mark is evaluated within the maximum distance between the reference cam and zero mark (p2609) minus the tolerance bandwidth for the distance to the zero mark (p2610).	
Dependency:	See also: p2609	

p2610 EPOS active homing tolerance band for distance to zero mark

	Variant: S200 Basic PN, S200 PN	
	Available when function is active: Basic positioner	
	Values for: Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in: Extended display
	Read permission: Read drive data or acknowledge messages	
	Write permission: Edit device configuration or drive applications	
	Changeable in operating state: Operation	
	Parameter group: Homing	
	Unit: °	
	Min: 0.000000 [°]	Max: 2.1474828e+09 [°]
		Factory setting: 2.1474828e+09 [°]
Description:	Sets the tolerance bandwidth for the distance to the zero mark The zero mark is evaluated within the maximum distance between the reference cam and zero mark (p2609) minus the tolerance bandwidth for the distance to the zero mark (p2610).	
Dependency:	See also: p2609	

p2611 EPOS active homing approach velocity home position

	Variant: S200 Basic PN, S200 PN	
	Available when function is active: Basic positioner	
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission: Read drive data or acknowledge messages	
	Write permission: Edit device configuration or drive applications	
	Changeable in operating state: Operation	
	Parameter group: Homing	
	Unit: mm/s	

	Min: 0.0001 [mm/s] Max: 4e+07 [mm/s] Factory setting: 25.0000 [mm/s]
Description:	Sets the approach velocity after detecting the zero mark to approach the home position.
Dependency:	See also: c2595, c2597, c2604, p2607, p2609, p2610
	Note When traversing to the home position, the velocity override is not effective.
p2611	EPOS active homing approach velocity home position Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Values for: Basic positioner for rotary motion Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Write permission: Edit device configuration or drive applications Changeable in operating state: Operation Parameter group: Homing Unit: °/s Min: 0.0001 [°/s] Max: 4e+07 [°/s] Factory setting: 900.0000 [°/s]
Description:	Sets the approach velocity after detecting the zero mark to approach the home position.
Dependency:	See also: c2595, c2597, c2604, p2607, p2609, p2610
	Note When traversing to the home position, the velocity override is not effective.
c2612[0...1]	EPOS active homing reference cam Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner 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: Homing Unit: -
Description:	Signal for the reference cam.
Index:	[0] = Reference cam selection 1 [1] = Reference cam selection 2
Dependency:	See also: r0922, p2607
	NOTICE Parameter c2612[0] may be protected as a result of r0922 and cannot be changed.
	Note The selection of reference cam 1 or 2 can be configured using p11550.
c2613	EPOS active homing negative reversing cam Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner 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:	Homing
	Unit: -	
Description:	Signal for the reversing cam in the negative direction of travel. 1 signal: Reversing cam not reached. 0 signal: Reversing cam reached.	
Dependency:	See also: c2614	
<hr/>		
	Note	
	If, during active homing of the positive and negative reversing cam, a 0 signal is detected, then the axis remains at a standstill.	

c2614	EPOS active homing positive reversing cam	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	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:	Homing
	Unit: -	
Description:	Signal for the reversing cam in the positive direction of travel.	
	1 signal: Reversing cam not reached.	
	0 signal: Reversing cam reached.	
Dependency:	See also: c2613	
	<hr/>	
	Note	
	If, during active homing of the positive and negative reversing cam, a 0 signal is detected, then the axis remains at a standstill.	

p2615	EPOS maximum number of traversing blocks	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: Unsigned8	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Changeable in operating state:	Commissioning
	Parameter group:	Traversing blocks
	Unit: -	
	Min:	Max:
	1	32
		Factory setting:
		32
Description:	Sets the maximum number of traversing blocks that are available.	
Dependency:	See also: p2616, p2617, p2618, p2619, p2620, p2621, p2622, p2623	

p2616[0...n]	EPOS traversing block block number	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: Integer16	Visible in: Standard display

	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: -		
	Min:	Max:	Factory setting:
	-1	31	-1
Description:	Sets a block number. -1: Invalid block number. These blocks are not taken into account. 0 ... 31: Valid block number.		
Dependency:	The number of indices depends on p2615. See also: p2615, p2617, p2618, p2619, p2620, p2621, p2622, p2623		

p2617[0...n]	EPOS traversing block position		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint64	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: mm		
	Min:	Max:	Factory setting:
	-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]
Description:	Sets the target position for the traversing block.		
Dependency:	The number of indices depends on p2615. See also: p2615, p2616, p2618, p2619, p2620, p2621, p2622, p2623		
	Note The target position is approached in either relative or absolute terms depending on p2623.		

p2617[0...n]	EPOS traversing block position		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint64	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: °		
	Min:	Max:	Factory setting:
	-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]
Description:	Sets the target position for the traversing block.		
Dependency:	The number of indices depends on p2615. See also: p2615, p2616, p2618, p2619, p2620, p2621, p2622, p2623		
	Note The target position is approached in either relative or absolute terms depending on p2623.		

p2618[0...n]	EPOS traversing block velocity		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: mm/s		
	Min:	Max:	Factory setting:
	0.0001 [mm/s]	4e+07 [mm/s]	100.0000 [mm/s]
Description:	Sets the velocity for the traversing block.		
Dependency:	The number of indices depends on p2615. See also: p2615, p2616, p2617, p2619, p2620, p2621, p2622, p2623, c2646		
	Note The velocity can be influenced using the velocity override (c2646).		
p2618[0...n]	EPOS traversing block velocity		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: °/s		
	Min:	Max:	Factory setting:
	0.0001 [°/s]	4e+07 [°/s]	3600.0000 [°/s]
Description:	Sets the velocity for the traversing block.		
Dependency:	The number of indices depends on p2615. See also: p2615, p2616, p2617, p2619, p2620, p2621, p2622, p2623, c2646		
	Note The velocity can be influenced using the velocity override (c2646).		
p2619[0...n]	EPOS traversing block acceleration override		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: %		
	Min:	Max:	Factory setting:
	1.0 [%]	100.0 [%]	100.0 [%]

Description: Sets the acceleration override for the traversing block.
The override refers to the maximum acceleration (p2572).

Dependency: The number of indices depends on p2615.
See also: p2572, p2615, p2616, p2617, p2618, p2620, p2621, p2622, p2623

p2620[0...n]	EPOS traversing deceleration override		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: %		
	Min:	Max:	Factory setting:
	1.0 [%]	100.0 [%]	100.0 [%]
Description:	Sets the deceleration override for the traversing block.		
	The override refers to the maximum deceleration (p2573).		
Dependency:	The number of indices depends on p2615.		
	See also: p2573, p2615, p2616, p2617, p2618, p2619, p2621, p2622, p2623		
	NOTICE		
	If, when calculating the traversing profile, it is identified that the target position of the next block with the programmed deceleration override will not be reached without direction reversal (flying block change), then the old (actual) deceleration override remains effective.		

p2621[0...n]	EPOS traversing block task		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: Integer16	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: -		
	Min:	Max:	Factory setting:
	1	9	1
Description:	Sets the required task for the traversing block.		
Value:	1: POSITIONING		
	2: FIXED STOP		
	3: ENDLESS_POS		
	4: ENDLESS_NEG		
	5: WAITING		
	6: GOTO		
	7: SET_O		
	8: RESET_O		
	9: JERK		
Dependency:	The number of indices depends on p2615.		
	See also: p2615, p2616, p2617, p2618, p2619, p2620, p2622, p2623		

p2622[0...n]	EPOS traversing block task parameter		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: Integer32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: -		
	Min:	Max:	Factory setting:
	-2147483648	2147483647	0
Description:	Sets additional information/data of the appropriate task for the traversing block.		
Dependency:	The number of indices depends on p2615. See also: p2615, p2616, p2617, p2618, p2619, p2620, p2621, p2623		
	Note		
	The following should be set depending on the task:		
	FIXED STOP: Clamping torque and clamping force (rotary 0...65536 [0.01 Nm], linear 0...65536 [N])		
	WAIT: Wait time [ms]		
	GOTO: Block number		
	SET_O: 1, 2 or 3 - set direct output 1, 2 or 3 (both)		
	RESET_O: 1, 2 or 3 - reset direct output 1, 2 or 3 (both)		
	JERK: 0 - deactivate, 1 - activate		

p2623[0...n]	EPOS traversing block task mode		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: Unsigned16	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: -		
	Min:	Max:	Factory setting:
	0	65535	0

Description: Sets the influence of the task for the traversing block.
Value = 0000 cccc bbbb aaaa
cccc: Positioning mode
cccc = 0000 --> ABSOLUTE
cccc = 0001 --> RELATIVE
cccc = 0010 --> ABS_POS (only for a rotary axis with modulo correction)
cccc = 0011 --> ABS_NEG (only for a rotary axis with modulo correction)
bbbb: Progression condition
bbbb = 0000 --> END
bbbb = 0001 --> CONTINUE_WITH_STOP
bbbb = 0010 --> CONTINUE_FLYING
bbbb = 0011 --> CONTINUE_EXTERNAL
bbbb = 0100 --> CONTINUE_EXTERNAL_WAIT
bbbb = 0101 --> CONTINUE_EXTERNAL_ALARM
aaaa: IDs
aaaa = 000x --> show/hide block (x = 0: show, x = 1: hide)

Dependency: The number of indices depends on p2615.
See also: p2615, p2616, p2617, p2618, p2619, p2620, p2621, p2622

c2625

EPOS traversing block selection bit 0

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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: Traversing blocks
Unit: -

Description: Signal to select the traversing block, bit 0.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
See also: c2626, c2627, c2628, c2629

c2626

EPOS traversing block selection bit 1

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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: Traversing blocks
Unit: -

Description: Signal to select the traversing block, bit 1.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
See also: c2625, c2627, c2628, c2629

c2627

EPOS traversing block selection bit 2

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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:	Traversing blocks
	Unit:	-
Description:	Signal to select the traversing block, bit 2.	
Dependency:	Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks. See also: c2625, c2626, c2628, c2629	

c2628	EPOS traversing block selection bit 3	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	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:	Traversing blocks
	Unit:	-
Description:	Signal to select the traversing block, bit 3.	
Dependency:	Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks. See also: c2625, c2626, c2627, c2629	

c2629	EPOS traversing block selection bit 4	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	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:	Traversing blocks
	Unit:	-
Description:	Signal to select the traversing block, bit 4.	
Dependency:	Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks. See also: c2625, c2626, c2627, c2628	

c2631	EPOS activate traversing task (0 -> 1)	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	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:	Traversing blocks
	Unit:	-
Description:	Signal for "Activate traversing task". c2631 = 0/1 signal The traversing task, selected using c2625 ... c2629, is started.	
Dependency:	See also: c2625, c2626, c2627, c2628, c2629, c2640, c2641	

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

To start a traversing block, the axis must be homed (r2684.11 = 1).
The status signal r2684.12 = 0/1 signal is used for acknowledgment.
A traversing task can be influenced using the following signals:
- Intermediate stop via c2640.
- Reject traversing task via c2641.

p2632

EPOS external block change evaluation

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
Data type: Integer16
Visible in: Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Ready for operation
Parameter group: Traversing blocks
Unit: -
Min: 0
Max: 1
Factory setting: 0

Description: Sets the mode to evaluate "external block change".
Value: 0: External block change via a measuring probe
1: External block change via c2633
Dependency: See also: p2623, c2633, r2677, r2678

Note

In the mode "external block change via measuring probe" (p2632 = 0), the following applies:
When starting a traversing block with the block change enable CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT and CONTINUE_EXTERNAL_ALARM, an activated "passive homing" is interrupted.
After ending the block, "Passive homing" must be reactivated using a 0/1 edge in c2595.

c2633

EPOS external block change (0 -> 1)

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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: Traversing blocks
Unit: -

Description: Signal for the "External block change" for a positive signal edge.
Dependency: The evaluation of the signal is only active p2632 = 1.
See also: p2623, p2632, c2640, c2641, r2677, r2678

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

A positive signal edge initiates a flying block change in the subsequent traversing block.
When the external block change is identified, the actual position is saved in r2678.
A traversing task can be influenced using the following signals:
- Intermediate stop via c2640.
- Reject traversing task via c2641.

p2634[0]	EPOS fixed stop maximum following error		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: mm		
	Min:	Max:	Factory setting:
	0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]
Description:	Sets the following error to detect the "fixed stop reached" state (r2526.4).		
Dependency:	See also: r2526, p2621, r2675		
	Note		
	The state "fixed stop reached" is detected if the following error exceeds the theoretically calculated following error value by p2634.		

p2634[0]	EPOS fixed stop maximum following error		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: °		
	Min:	Max:	Factory setting:
	0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]
Description:	Sets the following error to detect the "fixed stop reached" state (r2526.4).		
Dependency:	See also: r2526, p2621, r2675		
	Note		
	The state "fixed stop reached" is detected if the following error exceeds the theoretically calculated following error value by p2634.		

p2635	EPOS fixed stop monitoring window		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Data type: FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:	Traversing blocks	
	Unit: mm		
	Min:	Max:	Factory setting:
	0.000000 [mm]	2.1474828e+09 [mm]	0.125000 [mm]

Description: Sets the monitoring window of the actual position after the fixed stop is reached.
Dependency: See also: r2526, r2683

Note

If, after the fixed stop is reached, the end stop shifts in either the positive or negative direction by more than the value set here, then r2526.5 is set to 1 and an appropriate message is output.

p2635

EPOS fixed stop monitoring window

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint32
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Operation
Parameter group: Traversing blocks
Unit: °
Min: 0.000000 [°]
Max: 2.1474828e+09 [°]
Factory setting: 3.600000 [°]

Description: Sets the monitoring window of the actual position after the fixed stop is reached.
Dependency: See also: r2526, r2683

Note

If, after the fixed stop is reached, the end stop shifts in either the positive or negative direction by more than the value set here, then r2526.5 is set to 1 and an appropriate message is output.

c2640

EPOS intermediate stop (0 signal)

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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: Traversing blocks, Direct setpoint input (MDI)
Unit: -

Description: Signal for "No intermediate stop/intermediate stop".
1 signal: No intermediate stop
0 signal: Intermediate stop.

Dependency: See also: c2631, c2641, c2647, c2649

 CAUTION
For c2649 = 1 signal, the following applies: Motion starts without any explicit control signal.
NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note

This signal is only effective in the modes "traversing blocks" and "direct setpoint input/MDI".
When the intermediate stop is activated, then the axis brakes with the parameterized deceleration (p2620 or c2645).

c2641 EPOS reject traversing task (0 signal)

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
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: Traversing blocks, Direct setpoint input (MDI)
Unit: -

Description: Signal for "Do not reject traversing task/reject traversing task".

1 signal: Do not reject traversing task.

0 signal: Reject traversing task

Dependency: See also: c2631, c2640, c2647, c2649

⚠ CAUTION

For c2649 = 1 signal, the following applies:
 Motion starts without any explicit control signal.

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

This signal is only effective in the modes "traversing blocks" and "direct setpoint input/MDI".
 When activating reject traversing tasks, then the axis brakes with the maximum deceleration (p2573).

c2642 EPOS direct setpoint input/MDI position setpoint

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner with MDI
Data type: FloatingPoint64
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Unit: mm

Description: Signal for the position setpoint in the mode "direct setpoint input/MDI".

Dependency: See also: c2648, c2649, c2650

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the position setpoint is either transferred continuously or edge-triggered.
 The position setpoint input is interpreted as length unit [LU].

c2642 EPOS direct setpoint input/MDI position setpoint

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner with MDI
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

Parameter group:	Direct setpoint input (MDI)
Unit: °	
Description:	Signal for the position setpoint in the mode "direct setpoint input/MDI".
Dependency:	See also: c2648, c2649, c2650
NOTICE	
The parameter may be protected as a result of r0922 and cannot be changed.	
Note	
Depending on c2649, the position setpoint is either transferred continuously or edge-triggered. The position setpoint input is interpreted as length unit [LU].	

c2643	EPOS direct setpoint input/MDI velocity setpoint	
Description: Dependency:	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner with MDI
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
Description: Dependency:	Write permission:	Edit device configuration or drive applications
	Parameter group:	Direct setpoint input (MDI)
	Unit: mm/s	
	Signal for the velocity setpoint in the mode "Direct setpoint input/MDI".	
Description: Dependency:	See also: c2649, c2650	
	NOTICE	
	The parameter may be protected as a result of r0922 and cannot be changed.	
	Note	
Description: Dependency:	Depending on c2649, the velocity setpoint is either transferred continuously or edge-triggered.	
	The velocity setpoint input is interpreted as [1000 LU/min].	

c2643	EPOS direct setpoint input/MDI velocity setpoint	
Description: Dependency:	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner with MDI
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint32	Visible in: Standard display
Description: Dependency:	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit device configuration or drive applications
	Parameter group:	Direct setpoint input (MDI)
	Unit: °/s	
Description: Dependency:	Signal for the velocity setpoint in the mode "Direct setpoint input/MDI".	
	See also: c2649, c2650	
	NOTICE	
	The parameter may be protected as a result of r0922 and cannot be changed.	
Description: Dependency:	Note	
	Depending on c2649, the velocity setpoint is either transferred continuously or edge-triggered.	
	The velocity setpoint input is interpreted as [1000 LU/min].	

c2644	EPOS direct setpoint input/MDI acceleration override	
Description: Dependency:	Variant:	S200 Basic PN, S200 PN

Available when function is active:	Basic positioner with MDI
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:	Direct setpoint input (MDI)
Unit: %	

Description: Signal for acceleration override in the operating mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650, c11560

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the acceleration override is either transferred continuously or edge-triggered.
The signal value 4000 hex (16384 dec) corresponds to 100 %.

c2645**EPOS direct setpoint input/MDI deceleration override**

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner with MDI
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:	Direct setpoint input (MDI)
Unit: %	

Description: Signal for the deceleration override in the operating mode "Direct setpoint input/MDI".

Dependency: See also: c2649, c2650, c11561

NOTICE

If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration override cannot be reached without reversing the direction, then when accepting the dynamic values, the larger deceleration override is accepted and becomes effective.

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the deceleration override is either transferred continuously or edge-triggered.
The signal value 4000 hex (16384 dec) corresponds to 100 %.

c2646**EPOS velocity override**

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner
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:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Unit: %	

Description: Signal for the velocity override.

This velocity override is effective in the following operating modes "Direct setpoint input/MDI", "Traversing blocks", "Jogging" and "Active homing" (when approaching a reference cam).

Dependency: See also: p2571, p2585, p2586, p2605, p2618, c2643, r2681

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note

The effective override (r2681) can differ from the specified override due to limits (e.g. maximum velocity).

c2647

EPOS direct setpoint input/MDI selection

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner with MDI
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:	Direct setpoint input (MDI)
Unit: -	

Description: Signal to select operating mode "Direct setpoint input/MDI".

Dependency: See also: c2640, c2641, c2642, c2643, c2644, c2645, c2646, c2648, c2649, c2650, c2651, c2652, c2653

Note

In this mode, using c2653, a flying changeover can be made between setting-up and positioning.
In this mode, even if the axis is not referenced (r2684.11 = 0) relative positioning is possible.

c2648

EPOS direct setpoint input/MDI positioning type

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner with MDI
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:	Direct setpoint input (MDI)
Unit: -	

Description: Signal for the positioning type in mode "Direct setpoint input/MDI".

1 signal: Absolute positioning is selected.

0 signal: Relative positioning is selected.

Dependency: See also: c2649, c2650, c2654

NOTICE
Absolute positioning: To traverse, the home position must be set (r2684.11 = 1).
Relative positioning: To traverse, "Home position set" is not required.

Note

Depending on c2649, the positioning type is either transferred continuously or edge-triggered.
This parameter is only evaluated for c2654 = 0.
This parameter is possibly not evaluated as a result of the selected telegram.

c2649

EPOS direct setpoint input/MDI transfer type selection

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner with MDI
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: Direct setpoint input (MDI) Unit: -
Description:	Signal to define how values are transferred in operating mode "Direct setpoint input/MDI". 1 signal: Values are continually transferred (refer to parameter under dependency). 0 signal: The values are transferred for c2650 = 0/1 signal.
Dependency:	See also: c2642, c2643, c2644, c2645, c2648, c2650, c2651, c2652
<div>  CAUTION For a 1 signal, the following applies: Motion starts without any explicit control signal. </div>	
Note Parameter c2649 can only be changed when r0922 = 999.	
c2650	EPOS direct setpoint input/MDI setpoint acceptance edge Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner with MDI 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: Direct setpoint input (MDI) Unit: -
Description:	Signal to accept the values for edge-triggered selection (c2649 = 0 signal) in the operating mode "Direct setpoint input/MDI". c2650 = 0/1 signal and c2649 = 0 signal Values are accepted, edge-triggered (refer to parameter under dependency).
Dependency:	See also: c2640, c2641, c2642, c2643, c2644, c2645, c2648, c2649, c2651, c2652, r2684
<div> NOTICE The parameter may be protected as a result of r0922 and cannot be changed. </div>	
Note The status signal r2684.12 = 0/1 signal is used for acknowledgment. The operating mode "direct setpoint input/MDI" can be influenced via the following signals: - Intermediate stop via c2640. - Reject traversing task via c2641.	
c2651	EPOS direct setpoint input/MDI direction selection, positive Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner with MDI 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: Direct setpoint input (MDI) Unit: -
Description:	Signal for the positive direction selection in operating mode "Direct setpoint input/MDI".
Dependency:	See also: p2576, c2648, c2649, c2650, c2652, c2653, c2654

Note

The following applies for "setting-up":

- The traversing direction can be specified using this parameter.
- If both directions (c2651, c2652) are selected, then the axis remains stationary (zero speed).
- If both directions (c2651, c2652) are deselected, then the axis remains stationary (zero speed).

The following applies for "positioning":

Using parameters c2651 and c2652, when the modulo correction (c2577 = 1 signal) is activated and absolute positioning (c2648 = 1 signal), the travel direction is specified as follows:

c2651 / c2652

0 signal / 0 signal: Absolute positioning through the shortest distance.

1 signal / 0 signal: Absolute positioning in the positive direction.

0 signal / 1 signal: Absolute positioning in the negative direction.

1 signal / 1 signal: Absolute positioning through the shortest distance.

c2652

EPOS direct setpoint input/MDI direction selection negative

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner with MDI
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: Direct setpoint input (MDI)
Unit: -

Description: The signal for the negative direction selection in the operating mode "Direct setpoint input/MDI".

Dependency: See also: p2576, c2648, c2649, c2650, c2651, c2653, c2654

Note

The following applies for "setting-up":

- The travel direction is specified using this signal.
- If both directions (c2651, c2652) are selected, then the axis remains stationary (zero speed).
- If both directions (c2651, c2652) are deselected, then the axis remains stationary (zero speed).

The following applies for "positioning":

Using c2651 and c2652, when the modulo correction (c2577 = 1 signal) is activated and absolute positioning (c2648 = 1 signal), the travel direction can be specified as follows:

c2651 / c2652

0 signal / 0 signal: Absolute positioning through the shortest distance.

1 signal / 0 signal: Absolute positioning in the positive direction.

0 signal / 1 signal: Absolute positioning in the negative direction.

1 signal / 1 signal: Absolute positioning through the shortest distance.

c2653

EPOS direct setpoint input/MDI setting-up selection

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner with MDI
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: Direct setpoint input (MDI)
Unit: -

Description: Signal for setting-up in operating mode "Direct setpoint input/MDI".

1 signal: Setting-up selected.

0 signal: Positioning selected.

Dependency: See also: c2651, c2652

Note

In the operating mode "direct setpoint input/MDI", it is possible to make a flying changeover between setting-up and positioning.

For "setting up" (c2653 = 1 signal), the following applies:

A traversing direction must be selected using parameters c2651 and c2652.

c2654**EPOS direct setpoint input/MDI mode adaptation**

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner with MDI

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: Direct setpoint input (MDI)

Unit: -

Description:

The signals are evaluated and this involves the following signals:

- c2648 (positioning type)
- c2651 (positive direction selection)
- c2652 (negative direction selection)

Dependency:

See also: c2648, c2651, c2652

Note

The parameter is not relevant for S200.

c2655[0...1]**EPOS select tracking mode**

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

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: Basic positioner

Unit: -

Description:

Signal to select tracking operation.

c2655[0] or c2655[1] = 1 signal

Tracking mode after withdrawing the enable signal.

c2655[0] and c2655[1] = 0 signal

No tracking mode after withdrawing the enable signal.

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

For the following events, independent of the signal that is present, the tracking mode is selected:

- After running up.
- After r2526.0 = 0/1 edge.
- While a fault is active.

r2665**EPOS position setpoint**

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: FloatingPoint64

Visible in: Standard display

	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
	Unit: mm	
Description:	Displays the actual absolute position setpoint.	
Dependency:	See also: c2530	
<hr/>		
Note		
As default, c2530 is interconnected with r2665.		
<hr/>		
r2665	EPOS position setpoint	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
	Unit: °	
Description:	Displays the actual absolute position setpoint.	
Dependency:	See also: c2530	
<hr/>		
Note		
As default, c2530 is interconnected with r2665.		
<hr/>		
r2666	EPOS velocity setpoint	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
	Unit: mm/s	
Description:	Displays the actual velocity setpoint.	
Dependency:	See also: c2531	
<hr/>		
Note		
As default, c2531 is interconnected with r2666.		
<hr/>		
r2666	EPOS velocity setpoint	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
	Unit: °/s	
Description:	Displays the actual velocity setpoint.	
Dependency:	See also: c2531	
<hr/>		
Note		
As default, c2531 is interconnected with r2666.		

r2669.0...5	EPOS actual operating mode			
	Variant:		S200 Basic PN, S200 PN	
	Available when function is active:		Basic positioner	
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Jog, Homing, Traversing blocks, Direct setpoint input (MDI)	
	Unit: -			
Description:	Displays the actual active operating mode.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Jog operating mode	Active	Not active
	01	Operating mode active homing	Active	Not active
	02	Operating mode traversing blocks	Active	Not active
	03	Operating mode positioning for direct setpoint input / MDI	Active	Not active
	04	Operating mode setting up for direct setpoint input / MDI	Active	Not active
	05	Option passive homing	Active	Not active
Dependency:	See also: c2589, c2590, c2595, c2631, c2647, c2653			

r2670.0...15	EPOS status word active traversing block			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Basic positioner		
	Data type: Unsigned32	Visible in:	Standard display	
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Traversing blocks		
	Unit: -			
Description:	Displays the status word for the active traversing block. r2670.0: Active traversing block, bit 0 ... r2670.5: Active traversing block, bit 5 r2670.15: MDI active			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Active traversing block bit 0	Active	Not active
	01	Active traversing block bit 1	Active	Not active
	02	Active traversing block bit 2	Active	Not active
	03	Active traversing block bit 3	Active	Not active
	04	Active traversing block bit 4	Active	Not active
	05	Active traversing block bit 5	Active	Not active
	15	MDI active	Active	Not active
Dependency:	See also: c2631, c2647			

Note

For bit 00 ... 05:

Displays the active traversing block in the traversing blocks operating mode.

For bit 15:

For a 1 signal, the operating mode - direct setpoint input/MDI - is active

r2671	EPOS actual position setpoint		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	

Description:	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)
	Unit: mm	
	Displays the position setpoint presently being processed.	
Note		
A position of 0 is displayed for non position-related tasks (e.g. ENDLESS_POS, ENDLESS_NEG).		
<hr/>		
r2671	EPOS actual position setpoint	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint64	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)
	Unit: °	
Description:	Displays the position setpoint presently being processed.	
Note		
A position of 0 is displayed for non position-related tasks (e.g. ENDLESS_POS, ENDLESS_NEG).		
<hr/>		
r2672	EPOS actual velocity setpoint	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
	Unit: mm/s	
Description:	Displays the velocity setpoint presently being processed.	
<hr/>		
r2672	EPOS actual velocity setpoint	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Values for:	Basic positioner for rotary motion
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
	Unit: °/s	
Description:	Displays the velocity setpoint presently being processed.	
<hr/>		
r2673	EPOS actual acceleration override	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages

	Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)
	Unit: %	
Description:	Displays the acceleration override presently being processed.	
	Note An override of 100% is effective in the "Jogging" and "Active homing" operating modes.	
<hr/>		
r2674	EPOS actual deceleration override	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)
	Unit: %	
Description:	Displays the deceleration override presently being processed.	
	Note An override of 100% is effective in the "Jogging" and "Active homing" operating modes.	
<hr/>		
r2675	EPOS actual task	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: Integer16	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Traversing blocks
	Unit: -	
Description:	Display for the task presently being processed.	
Value:	0: Inactive 1: POSITIONING 2: FIXED STOP 3: ENDLESS_POS 4: ENDLESS_NEG 5: WAITING 6: GOTO 7: SET_O 8: RESET_O 9: JERK	
Dependency:	See also: p2621	
<hr/>		
r2676	EPOS actual task parameter	
	Variant:	S200 Basic PN, S200 PN
	Available when function is active:	Basic positioner
	Data type: Integer32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Traversing blocks
	Unit: -	
Description:	Displays the task parameter presently being processed in the "traversing blocks" operating mode.	
Dependency:	See also: p2622	

Note

The following is displayed depending on the task:
 FIXED STOP: Clamping torque (0 ... 65536 [0.01 Nm]) or clamping force (0 ... 65536 [N])
 WAIT: Wait time [ms]
 GOTO: Block number
 SET_O: 1, 2, 3 --> direct output 1, 2 or 3 (both) is set
 RESET_O: 1, 2, 3 --> direct output 1, 2 or 3 (both) is reset
 JERK: 0 --> deactivate, 1 --> activate

r2677

EPOS actual task mode

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Traversing blocks
Unit: -

Description: Displays the task mode presently being processed.

Dependency: See also: p2623

r2678

EPOS external block change actual position

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Traversing blocks, Direct setpoint input (MDI)
Unit: mm

Description: Displays the actual position for the following events:
 - External block change via measuring probe (p2632 = 0).
 - External block change via c2633 (p2632 = 1, c2633 = 0/1 signal).
 - Activate traversing task (c2631 = 0/1 signal).

Dependency: See also: c2631, p2632, c2633

r2678

EPOS external block change actual position

Variant: S200 Basic PN, S200 PN
Available when function is active: Basic positioner
Values for: Basic positioner for rotary motion
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Traversing blocks, Direct setpoint input (MDI)
Unit: °

Description: Displays the actual position for the following events:
 - External block change via measuring probe (p2632 = 0).
 - External block change via c2633 (p2632 = 1, c2633 = 0/1 signal).
 - Activate traversing task (c2631 = 0/1 signal).

Dependency: See also: c2631, p2632, c2633

r2680	EPOS clearance reference cam and zero mark
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Homing Unit: mm
Description:	Display for the distance (clearance) between the reference cam and zero mark. The value is determined for active homing.
r2680	EPOS clearance reference cam and zero mark
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Values for: Basic positioner for rotary motion Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Homing Unit: °
Description:	Display for the distance (clearance) between the reference cam and zero mark. The value is determined for active homing.
r2681	EPOS velocity override effective
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Data type: FloatingPoint32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI) Unit: %
Description:	Displays the actual effective velocity override.
Dependency:	See also: p2571, c2646
	Note The effective override can differ from the specified override due to limits (e.g. p2571, maximum velocity).
r2682	EPOS residual distance to go
	Variant: S200 Basic PN, S200 PN Available when function is active: Basic positioner Data type: FloatingPoint64 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI) Unit: mm
Description:	Displays the current residual distance. The remaining distance is the distance to still to be moved through up to the end of the actual positioning task.
Dependency:	See also: r2665, r2671, r2678

r2682	EPOS residual distance to go		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Basic positioner	
	Values for:	Basic positioner for rotary motion	
	Data type: FloatingPoint64	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)	
	Unit: °		
Description:	Displays the current residual distance.		
	The remaining distance is the distance to still to be moved through up to the end of the actual positioning task.		
Dependency:	See also: r2665, r2671, r2678		
<hr/>			
r2683.0...14	EPOS status word 1		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Data type: Unsigned16	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Control/status words, Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring	
	Unit: -		
Description:	Display for status word 1 of the basic positioner (EPOS).		
Bit array:	Bit	Signal name	1 signal
	00	Tracking mode active	Yes
	01	Velocity limiting active	Yes
	02	Setpoint fixed	Yes
	03	Set position reached	Yes
	04	Axis moves forward	Yes
	05	Axis moves backward	Yes
	06	Negative software limit switch reached	Yes
	07	Positive software limit switch reached	Yes
	10	Direct output 1 via traversing block	Yes
	11	Direct output 2 via traversing block	Yes
	12	Fixed stop reached	Yes
	13	Fixed stop clamping torque reached	Yes
	14	Travel to fixed stop active	Yes
Dependency:	See also: r2684		
	Note		
	For bit 02, 04, 05, 06, 07:		
	This signals designate the state after jerk limiting.		
	For bits 08, 09:		
	These signals are generated in function "Closed-loop position control".		
<hr/>			
r2684.0...15	EPOS status word 2		
	Variant:	S200 Basic PN, S200 PN	
	Available when function is active:	Closed-loop position control with setpoint input via DCC	
	Data type: Unsigned16	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	

Parameter group: Position limits, Dynamic response limits, Control/status words, Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Basic parameters / mechanical system, Position monitoring

Unit: -

Description: Display for status word 2 of the basic positioner (EPOS).

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Active homing active	Active	Not active
	01	Passive homing active	Active	Not active
	02	Homing active	Active	Not active
	03	Printing mark outside outer window	Yes	No
	04	Axis accelerating	Yes	No
	05	Axis decelerating	Yes	No
	06	Jerk limiting active	Yes	No
	07	Activate correction	Yes	No
	08	Following error in tolerance	Yes	No
	09	Modulo correction active	Yes	No
	10	Target position reached	Yes	No
	11	Home position set	Yes	No
	12	Acknowledgment traversing block activated	Yes	No
	13	Negative hardware limit switch reached	Yes	No
	14	Positive hardware limit switch reached	Yes	No
	15	Traversing command active	Yes	No

Note

For bit 02:

The "homing active" signal is an OR logic operation of "active homing active" and "passive homing active"

For bit 08:

The signal is generated in function "Closed-loop position control".

r2685

EPOS corrective value

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: FloatingPoint64

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Basic positioner

Unit: mm

Description: Display for the correction value of the position actual value.

Dependency: See also: r2684

Note

Using this value, for example, modulo corrections are carried out.

r2685

EPOS corrective value

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Values for: Basic positioner for rotary motion

Data type: FloatingPoint64

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Basic positioner

Unit: °

Description: Display for the correction value of the position actual value.

Dependency: See also: r2684

Note

Using this value, for example, modulo corrections are carried out.

r2686[0...1] EPOS torque limiting effective

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Basic positioner

Unit: %

Description: Displays the active torque limit.

r2686[0]:

Displays the active upper torque limiting when traveling to fixed stop.

r2686[1]:

Displays the active lower torque limiting when traveling to fixed stop.

Index: [0] = Upper

[1] = Lower

Dependency: See also: p1520, p1521, r2676

r2687 EPOS torque setpoint

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Traversing blocks

Unit: Nm

Description: Displays the active torque setpoint when reaching the fixed stop.

Dependency: See also: p1520, p1521, r2676

p2688 EPOS position feedback signal tolerance window

Variant: S200 Basic PN, S200 PN

Available when function is active: Basic positioner

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group: Basic positioner

Unit: mm

Min:	Max:	Factory setting:
0.000000 [mm]	2.1474828e+09 [mm]	0.050000 [mm]

Description: Sets the tolerance window for the position feedback signal.

If, for a positioning operation, the actual position (r2521) lies within this tolerance window of the target position, then the traversing block number is displayed in r2689.

Dependency: This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1).

See also: p2584, r2689

p2688	EPOS position feedback signal tolerance window
	<div>Variant: S200 Basic PN, S200 PN</div> <div>Available when function is active: Basic positioner</div> <div>Values for: Basic positioner for rotary motion</div> <div>Data type: FloatingPoint32</div> <div>Visible in: Extended display</div> <div>Read permission: Read drive data or acknowledge messages</div> <div>Write permission: Edit device configuration or drive applications</div> <div>Changeable in operating state: Operation</div> <div>Parameter group: Basic positioner</div> <div>Unit: °</div> <div>Min: 0.000000 [°]</div> <div>Max: 2.1474828e+09 [°]</div> <div>Factory setting: 1.500000 [°]</div>
Description:	Sets the tolerance window for the position feedback signal. If, for a positioning operation, the actual position (r2521) lies within this tolerance window of the target position, then the traversing block number is displayed in r2689.
Dependency:	This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1). See also: p2584, r2689
r2689[0...1]	EPOS position feedback signal display
	<div>Variant: S200 Basic PN, S200 PN</div> <div>Available when function is active: Basic positioner</div> <div>Data type: Unsigned32</div> <div>Visible in: Extended display</div> <div>Read permission: Read drive data or acknowledge messages</div> <div>Parameter group: Basic positioner</div> <div>Unit: -</div>
Description:	Displays the traversing block numbers for position feedback signal. Here, the block numbers of the traversing blocks are displayed bit-coded whose absolute target positions lie within the tolerance window around the actual position.
Index:	[0] = Position feedback signal low [1] = Position feedback signal high
Dependency:	This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1). See also: p2584, p2688
<div>Note</div> <div>r2689[0]: Bit-coded display of traversing block numbers 0 to 31</div> <div>r2689[1]: Bit-coded display of traversing block numbers 32 to 63</div>	
p2720[0].0...2	Load gear configuration
	<div>Variant: S200 Basic PN, S200 PN</div> <div>Available when function is active: Closed-loop position control with setpoint input via DCC</div> <div>Data type: Unsigned32</div> <div>Visible in: Standard display</div> <div>Read permission: Read drive data or acknowledge messages</div> <div>Write permission: Edit device configuration or drive applications</div> <div>Changeable in operating state: Commissioning</div> <div>Parameter group: Encoder evaluation, Basic parameters / mechanical system</div> <div>Unit: -</div>

	Min:	Max:	Factory setting:	
	-	-	0000 bin	
Description:	Sets the configuration for position tracking for a load gear.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Load gear activate position tracking	Yes	No
	02	Load gear reset position	Yes	No
<hr/>				
Note				
For the following events, the non-volatile, saved position values are automatically reset:				
- When an encoder replacement has been identified.				
- When changing the configuration of the Encoder Data Set (EDS).				
- When adjusting the absolute encoder again.				

p2721[0]	Load gear rotary absolute encoder revolutions virtual		
Variant:	S200 Basic PN, S200 PN		
Available when function is active:	Closed-loop position control with setpoint input via DCC		
Data type: Unsigned32	Visible in: Standard display		
Read permission:	Read drive data or acknowledge messages		
Write permission:	Edit device configuration or drive applications		
Changeable in operating state:	Commissioning		
Parameter group:	Encoder evaluation, Basic parameters / mechanical system		
Unit: -			
Min:	Max:	Factory setting:	
0	4194303	0	
Description:	Sets the number of rotations that can be resolved for a rotary absolute encoder with activated position tracking of the load gear.		
Dependency:	This parameter is only of significance for an absolute encoder (p0404.1 = 1) with activated position tracking of the load gear (p2720.0 = 1).		
Note			
The resolution that is set must be able to be represented using r2723.			
For rotary axes/modulo axes, the following applies:			
This parameter is preset with p0421 when activating position tracking and can be changed.			
For linear axes, the following applies:			
This parameter is pre-assigned with p0421 when activating position tracking, expanded by 6 bits for multiturn information (maximum number of overflows) and cannot be changed.			

p2722[0]		Load gear position tracking tolerance window	
Variant:		S200 Basic PN, S200 PN	
Available when function is active:		Closed-loop position control with setpoint input via DCC	
Data type: FloatingPoint32		Visible in: Standard display	
Read permission:		Read drive data or acknowledge messages	
Write permission:		Edit device configuration or drive applications	
Changeable in operating state:		Commissioning	
Parameter group:		Encoder evaluation, Basic parameters / mechanical system	
Unit: -			
Min:		Max:	Factory setting:
0.00		4.2949673e+09	0.00

Description: Sets a tolerance window for position tracking.
 After the system is switched on, the difference between the saved position and the actual position is determined.
 The following response is initiated:
 - Difference within the tolerance window: The position is reproduced based on the encoder actual value.
 - Difference outside the tolerance window: An appropriate message is output.

⚠ CAUTION

Rotation, for example through a complete encoder range is not detected.

Note

The value is entered in complete encoder pulses.

For p2720.0 = 1, the value is automatically pre-assigned one quarter of the encoder range.

Example:

Quarter of the encoder range = (p0408 * p0421) / 4

It is possible that the tolerance window may not be able to be precisely set due to the data type (floating point number with 23 bit mantissa).

r2723[0] Load gear absolute value

Variant: S200 Basic PN, S200 PN
Available when function is active: Closed-loop position control with setpoint input via DCC
Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Encoder evaluation, Basic parameters / mechanical system
Unit: -

Description: Displays the absolute value after the load gear.

NOTICE

The encoder position actual value must be requested using the encoder control word Gn_STW.13.

Note

The increments are displayed in the format the same as Gx_IST2.

r2724[0] Load gear position difference

Variant: S200 Basic PN, S200 PN
Available when function is active: Closed-loop position control with setpoint input via DCC
Data type: Integer32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Encoder evaluation, Basic parameters / mechanical system
Unit: -

Description: Displays the position difference before the load gear between switching off and switching on.

Note

The increments are displayed in the format the same as Gx_IST2 or r2723.

If the measuring gearbox of the motor encoder is not activated, the position difference should be read in encoder increments.

If the measuring gear of the motor encoder is activated, the position difference is converted using the measuring gear ratio.

r2741 LR acceleration precontrol value

Variant: S200 Basic PN, S200 PN
Available when function is active: Closed-loop position control with setpoint input via DCC
Data type: FloatingPoint32 **Visible in:** Standard display

Description:	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Position controller		
	Unit: rev/s ²			
Displays the acceleration precontrol value.				
Note				
The acceleration precontrol value is a derivation of the speed precontrol value with respect to time.				

p3117	Change safety message type			
	Variant:	S200 PN		
	Data type: Unsigned32	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit Safety Integrated application		
	Changeable in operating state:	Commissioning (Safety Integrated)		
	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 is used, message type C)			
	1: Safety messages are not reparameterized (safety message buffer is used, message type A or F)			
Note				
When online safety commissioning has been completed, a change results in an automatic restart.				

r3122[0...63].0...20	Diagnostic attribute fault			
	Data type: Unsigned32	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Faults / alarms		
	Unit: -			
Description:	Displays the diagnostic attribute of the fault which has occurred.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Hardware replacement recommended	Yes	No
	15	Message has gone	Yes	No
	16	PROFIdrive fault class bit 0	High	Low
	17	PROFIdrive fault class bit 1	High	Low
	18	PROFIdrive fault class bit 2	High	Low
	19	PROFIdrive fault class bit 3	High	Low
	20	PROFIdrive fault class bit 4	High	Low
Dependency:	See also: r0945, r0947, r0948, r0949, r2109, r2130, r2133, r2136			

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).

The structure of the fault buffer and the assignment of the indices is shown in r0945.

Bit 20, 19, 18, 17, 16 =

0, 0, 0, 0, 0 → PROFIdrive message class 0: Not assigned

0, 0, 0, 0, 1 → PROFIdrive message class 1: Hardware/software fault

0, 0, 0, 1, 0 → PROFIdrive message class 2: Line fault

0, 0, 0, 1, 1 → PROFIdrive message class 3: Supply voltage fault

0, 0, 1, 0, 0 → PROFIdrive message class 4: DC link fault

0, 0, 1, 0, 1 → PROFIdrive message class 5: Power electronics fault

0, 0, 1, 1, 0 → PROFIdrive message class 6: Overtemperature, electronics component

0, 0, 1, 1, 1 → PROFIdrive message class 7: Ground fault/interphase fault detected

0, 1, 0, 0, 0 → PROFIdrive message class 8: Motor overload

0, 1, 0, 0, 1 → PROFIdrive message class 9: Communications error to higher-level control

0, 1, 0, 1, 0 → PROFIdrive message class 10: Safe monitoring channel has identified an error

0, 1, 0, 1, 1 → PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available

0, 1, 1, 0, 0 → PROFIdrive message class 12: Internal communications error

0, 1, 1, 0, 1 → PROFIdrive message class 13: Infeed faulted

0, 1, 1, 1, 0 → PROFIdrive message class 14: Braking controller / Braking Module faulted

0, 1, 1, 1, 1 → PROFIdrive message class 15: Line filter faulted

1, 0, 0, 0, 0 → PROFIdrive message class 16: External measured value/signal state outside the permissible range

1, 0, 0, 0, 1 → PROFIdrive message class 17: Application/technological function fault

1, 0, 0, 1, 0 → PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence

1, 0, 0, 1, 1 → PROFIdrive message class 19: General drive fault

1, 0, 1, 0, 0 → PROFIdrive message class 20: Auxiliary unit faulted

r3123[0...63].0...20 Diagnostic attribute alarm

Data type: Unsigned32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Faults / alarms

Unit: -

Description:

Displays the diagnostic attribute of the alarm which has occurred.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Hardware replacement recommended	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	Message has gone	Yes	No
16	PROFIdrive fault class bit 0	High	Low
17	PROFIdrive fault class bit 1	High	Low
18	PROFIdrive fault class bit 2	High	Low
19	PROFIdrive fault class bit 3	High	Low
20	PROFIdrive fault class bit 4	High	Low

Dependency:

See also: r2122, r2123, r2124, r2125, r2134, r2145, r2146

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the alarm buffer and the assignment of the indices is shown in r2122.

For bit 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.

Bit 20, 19, 18, 17, 16 =

0, 0, 0, 0, 0 --> PROFIdrive message class 0: Not assigned
0, 0, 0, 0, 1 --> PROFIdrive message class 1: Hardware/software fault
0, 0, 0, 1, 0 --> PROFIdrive message class 2: Line fault
0, 0, 0, 1, 1 --> PROFIdrive message class 3: Supply voltage fault
0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
0, 0, 1, 0, 1 --> PROFIdrive message class 5: Power electronics fault
0, 0, 1, 1, 0 --> PROFIdrive message class 6: Overtemperature, electronics component
0, 0, 1, 1, 1 --> PROFIdrive message class 7: Ground fault/interphase fault detected
0, 1, 0, 0, 0 --> PROFIdrive message class 8: Motor overload
0, 1, 0, 0, 1 --> PROFIdrive message class 9: Communications error to higher-level control
0, 1, 0, 1, 0 --> PROFIdrive message class 10: Safe monitoring channel has identified an error
0, 1, 0, 1, 1 --> PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available
0, 1, 1, 0, 0 --> PROFIdrive message class 12: Internal communications error
0, 1, 1, 0, 1 --> PROFIdrive message class 13: Infeed faulted
0, 1, 1, 1, 0 --> PROFIdrive message class 14: Braking controller / Braking Module faulted
0, 1, 1, 1, 1 --> PROFIdrive message class 15: Line filter faulted
1, 0, 0, 0, 0 --> PROFIdrive message class 16: External measured value/signal state outside the permissible range
1, 0, 0, 0, 1 --> PROFIdrive message class 17: Application/technological function fault
1, 0, 0, 1, 0 --> PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence
1, 0, 0, 1, 1 --> PROFIdrive message class 19: General drive fault
1, 0, 1, 0, 0 --> PROFIdrive message class 20: Auxiliary unit faulted

r3150[0...6]

Sampling times for internal control loops

Variant: S200 PN
Available when function is active: AST Lite
Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: µs

Description: Displays the sampling times for the control loops.

Index:
[0] = Current controller
[1] = Speed controller
[2] = Flux controller
[3] = Setpoint channel
[4] = Position controller
[5] = Positioning
[6] = Technology controller

r3151[0]

Technological application

Variant: S200 PN
Available when function is active: AST Lite
Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

	Parameter group:	Limits
	Unit:	-
Description:	Displays the technological application. The parameter influences the calculation of open-loop and closed-loop control parameters.	
Value:	100: Standard drive (SERVO) 101: Feed drive (limit current limitation) 102: Spindle drive (rated current limitation) 103: Feed drive (maximum power limiting) 104: Spindle drive (maximum current limiting)	
Dependency:	See also: p1520, p1521, p2000, p2177	

r3152[0]	Current limit
	Variant: S200 PN
	Available when function is active: AST Lite
	Data type: FloatingPoint32
	Visible in: Extended display
	Read permission: Read drive data or acknowledge messages
	Parameter group:
	Unit: Arms
Description:	Displays the current limit.
Dependency:	See also: p0323

r3153[0].3...28 Speed control configuration

	Variant:	S200 PN		
	Available when function is active:	AST Lite		
	Data type: Unsigned32	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:			
	Unit: -			
Description:	Displays the configuration for the closed-loop speed control.			
Bit array:	Bit	Signal name	1 signal	0 signal
	03	Reference model speed setpoint I component	On	Off
	04	Torque limiting active in motoring/regenerative mode	Yes	No
	05	Kp/Tn adaptation active	Yes	No
	07	Interpolation speed precontrol active	Yes	No
	08	Interpolation torque setpoint active	Yes	No
	09	Damping for encoderless open-loop controlled oper.	Yes	No
	10	Speed precontrol	For symmetrizing	For setp_filter 2
	11	Encoderless oper. speed actual value starting value	Setpoint	0.0
	12	Encoderless operation changeover	Stationary	When accelerating
	13	Motoring/regenerative depending on	Speed setpoint	Speed actual value
	16	I component for limiting	Enable	Hold
	17	DSC position controller limit active	Yes	No
	18	Moment of inertia estimator active	Yes	No
	22	Obtain moment of inertia estimator value for pulse inhibit	Yes	No
	26	J_est load estimation only for constant velocity travel	Yes	No
	27	Load gearbox, take into account torque limit	No	Yes

28	Prevent plant windup	Yes	No
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Note

AST Lite: Auto Servo Tuning Lite

r3154[0].1...16 Closed-loop current control and motor model configuration

Variant: S200 PN
Available when function is active: AST Lite
Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: -

Description: Displays the configuration for the closed-loop control and the motor model.

Bit array:	Bit	Signal name	1 signal	0 signal
	01	Park encoder for n_act > p1404	Yes	No
	02	Current controller adaptation active	Yes	No
	03	Stall power limiting motoring	Yes	No
	04	Torque-speed precontrol with encoder	Yes	No
	05	Precontrol voltage drop across the resistance	Yes	No
	06	Higher stall power	Yes	No
	12	Lq characteristic model-based	Yes	No
	13	Rotor resistance adaptation	Yes	No
	16	Current controller dynamic response same as the pulse frequency	Yes	No

r3155[0].1 Speed actual value filter activation

Variant: S200 PN
Available when function is active: AST Lite
Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: -

Description: Status display of the actual speed filter (active/inactive).

Bit array:	Bit	Signal name	1 signal	0 signal
	01	General filter activation	Yes	No

r3156[0] Speed controller Kp adaptation speed upper scaling

Variant: S200 PN
Available when function is active: AST Lite
Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Unit: %

Description: Displays the P gain of the speed controller for the upper adaptation speed range.
The entry is made referred to the P gain for the lower adaptation speed range of the speed controller (% referred to p1460).

Dependency: See also: p1460

Note

When automatically calculating the speed controller, only the motor moment of inertia is taken into account (p0341).

r3157[0]	Speed controller Tn adaptation speed upper scaling Variant: S200 PN Available when function is active: AST Lite Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Unit: % Description: Displays the integral time of the speed controller after the adaptation speed range. The entry is made referred to the integral time for the lower adaptation speed range of the speed controller (% referred to p1462). Dependency: See also: p1462
r3158[0]	Speed controller integrator feedback time constant Variant: S200 PN Available when function is active: AST Lite Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Unit: ms Description: Displays the time constant of the PT1 filter for integrator feedback. The integrator of the speed controller is re-parameterized to become a PT1 filter through a feedback element (1st Order low pass filter characteristics). The following applies: $p3158 < 2 \times r3150[1] \rightarrow$ the PT1 filter is not active - the pure integrator is effective. $p3158 \geq 2 \times r3150[1] \rightarrow$ the PT1 filter is active and has replaced the pure integrator. Note Applications: Motion at zero setpoint and dominant stiction can be suppressed but this has a negative impact on the remaining setpoint-actual value difference. This can be used, for example, to avoid oscillation of a position-controlled axis at standstill (stick-slip effect) or overshoot when traversing (moving) in micrometer steps. Also prevents tension/stressing for axes that are mechanically and rigidly coupled with one another (e.g. for synchronous spindles, master - follower axes).
r3159[0]	Power limit motoring Variant: S200 PN Available when function is active: AST Lite Data type: FloatingPoint32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Unit: kW Description: Displays the power limit when motoring. Dependency: See also: r3151, r3160

r3160[0]	Power limit regenerative			
	Variant:	S200 PN		
	Available when function is active:	AST Lite		
	Data type:	FloatingPoint32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:			
	Unit:	kW		
Description:	Displays the power limit when generating.			
Dependency:	See also: r3151, r3159			

r3161[0]	Current controller P gain			
	Variant:	S200 PN		
	Available when function is active:	AST Lite		
	Data type:	FloatingPoint32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:			
	Unit:	V/A		
Description:	Displays the proportional gain of the current controller. The current controller can have an adaptation that reduces the proportional gain depending on the torque-generating current. This value applies to torque-generating current 0.			

p3234	Delay line voltage failure detection			
	Data type:	Unsigned16	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Operation		
	Parameter group:	Load torque monitoring		
	Unit:	ms		
	Min:		Max:	
	0 [ms]		100 [ms]	
	Factory setting:	10 [ms]		
Description:	Sets the delay time for detecting the line voltage failure. The function must be activated via p2149.16.			
Dependency:	See also: p2149			

r3988	Final boot state			
	Data type:	Integer16	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages		
	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).			

p4405	PTO maximum output frequency		
	Variant:	S200 PN	
Description:	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Pulse encoder emulation	
	Unit: kHz		
	Min: 1 [kHz]	Max: 5000 [kHz]	Factory setting: 1000 [kHz]
Sets the maximum output frequency for encoder emulation.			
NOTICE The hardware is designed for a maximum PTO output frequency of 4 MHz. To tolerate any overshoot as a result of the motor control, p4405 can be set approximately 10 % above 4 MHz.			
p4408	PTO pulse number		
	Variant:	S200 PN	
Description:	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Pulse encoder emulation	
	Unit: -		
	Min: 0	Max: 16777216	Factory setting: 1024
Sets the pulse number output from the PTO.			
p4409	Gearbox encoder (motor)/PTO denominator (Control Unit)		
	Variant:	S200 PN	
Description:	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Pulse encoder emulation	
	Unit: -		
	Min: 1	Max: 2147000000	Factory setting: 1
Sets the denominator for the gearbox between the encoder and PTO.			
Note This parameter is only of significance for p4408 = 0. A change only becomes effective after a POWER ON.			
p4410	Gearbox encoder (motor)/PTO numerator (Control Unit)		
	Variant:	S200 PN	
Description:	Data type: Unsigned32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	

	Parameter group:	Pulse encoder emulation		
	Unit:	-		
	Min:	Max:	Factory setting:	
	1	2147000000	1	
Description:	Sets the numerator for the gearbox between the encoder and PTO.			
	Note This parameter is only of significance for p4408 = 0. A change only becomes effective after a POWER ON.			
r4419	PTO diagnostics position setpoint			
	Variant:	S200 PN		
	Data type:	Integer32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Pulse encoder emulation		
	Unit:	-		
Description:	Displays the position setpoint after taking into account the step up / step down.			
c4420	PTO position setpoint			
	Variant:	S200 PN		
	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:	Pulse encoder emulation		
	Unit:	-		
Description:	Signal for the encoder position setpoint for the incremental encoder emulation.			
Recommendation:	The position actual value of the leading encoder in the current controller clock cycle is available in r0479.			
p4422.0	PTO configuration			
	Variant:	S200 PN		
	Data type:	Unsigned16	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Commissioning		
	Parameter group:	Pulse encoder emulation		
	Unit:	-		
	Min:	Max:	Factory setting:	
	-	-	0000 bin	
Description:	Settings for Pulse Train Output (PTO).			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	PTO position actual value	Inverted	Not inverted
Dependency:	See also: c4420			
p4426	PTO zero mark offset			
	Variant:	S200 PN		
	Data type:	Unsigned32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Commissioning		

	Parameter group:	Pulse encoder emulation	
	Unit:	-	
	Min:	Max:	Factory setting:
	0	16777215	0
Description:	Sets a zero mark offset to shift the zero mark within one mechanical revolution. Example: p0408 = 2048 (encoder pulses) p4426 = 512 (zero mark offset in pulses) --> Positive direction: The zero mark is output offset by 512 pulses. --> Negative direction: The zero mark is output offset by 1536 pulses.		
Dependency:	See also: p0408		
	Note The setting for the zero mark offset (p4426) must be less than the encoder pulse number (p4408).		

r4479	PTO diagnostics position actual value			
	Variant:	S200 PN		
	Data type:	Integer32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Pulse encoder emulation		
	Unit:	-		
Description:	Display for PTO position actual value.			

p4934[0]	Motor manufacturer selection		
	Data type: Unsigned16	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data, Quick commissioning	
	Unit:	-	
	Min:	Max:	Factory setting:
	1	9999	1
Description:	Selects the motor manufacturer for motors in the motor database or a motor support package. Examples: 0001 = Siemens 0100 = Innomotics		
Dependency:	See also: p0301		
	Note The motor manufacturer is required to select a motor data set in the associated database.		

p4935[0]	Portfolio selection MSP		
	Data type: Unsigned16	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Commissioning	
	Parameter group:	Motor data, Quick commissioning	
	Unit:	-	
	Min:	Max:	Factory setting:
	1	9999	1
Description:	Selects the portfolio for motors of a motor support package.		

Note

The portfolio selection is required to select a motor data set in a motor support package.

For a clear selection, you need the portfolio number, the manufacturer number, as well as the motor type and the motor code number.

r4936[0]

MSP version display

Data type: Unsigned32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Motor data, Quick commissioning

Unit: -

Description:

Display the version of a motor support package from which a motor data set is used.

p5271[0].0...7

Real Time / One Button Tuning configuration

Data type: Unsigned16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Ready for operation

Parameter group:

Unit: -

Min:

Max:

Factory setting:

-

-

0000 1100 bin

Description:

Sets the configuration for Real Time Tuning / One Button Tuning.

Bit array:

Bit	Signal name	1 signal	0 signal
00	PD controller for large load moments of inertia	Yes	No
01	Reduce gain at low speeds	Yes	No
02	Load adaptation Kp	Yes	No
03	Setting the speed precontrol	Yes	No
04	Setting the torque precontrol	Yes	No
05	Setting the maximum acceleration for the basic positioner	Yes	No
06	Do not change Kp	Yes	No
07	Setting the voltage precontrol	Yes	No

Dependency:

See also: p5272, r5274, p5275

Note

For bit 00:

For significant differences between the motor moment of inertia and load moment of inertia - or for a low controller dynamic response - the P controller in the position control loop is transformed into a PD controller. As a consequence, the dynamic performance of the position controller is increased.

This function should only be set when the speed precontrol (bit 3 = 1) or the torque precontrol (bit 4 = 1) is active.

For bit 01:

At low speeds, the controller gain factors are automatically reduced in order to avoid noise and oscillation at standstill.

For bit 02:

The estimated load moment of inertia is taken into account for the speed controller gain.

For bit 03:

Activates the speed precontrol for the basic positioner (EPOS).

For bit 04:

Activation of the torque precontrol for the basic positioner (EPOS); if this is not active, then the internal drive speed/ torque precontrol is parameterized.

For bit 05:

The maximum acceleration (p2572) and maximum deceleration (p2573) for the basic positioner (EPOS) are determined using the estimated moment of inertia. This is only realized once by setting the bit.

Precondition:

The drive pulses are inhibited and the moment of inertia was previously determined.

For bit 06:

The speed controller gain set in p1460 is not changed when calculating the controller data.

For bit 07:

Activation of the voltage precontrol.

p5272[0]**Real Time Tuning dynamic factor**

Data type: FloatingPoint32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group:

Unit: %

Min:

Max:

Factory setting:

5.0 [%]

1000.0 [%]

100.0 [%]

Description:

Sets the dynamic factor for the proportional gain of the speed controller for Real Time Tuning.

Dependency:

See also: p5271, r5274, p5275

NOTICE

The speed control can become unstable for excessively high values.

Note

The stiffer the mechanical load coupling, the higher the dynamic factor can be set.

r5274**Real Time / One Button Tuning estimated dynamic response**

Data type: FloatingPoint32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Unit: ms

Description:

Display for the estimated dynamic response of the speed control loop as PT1 time constant for Real Time Tuning/One Button Tuning.

This position controller setting is required if the closed-loop position control is in an external control system.

Dependency:

See also: p5271, p5272, p5275

p5275[0]	Real Time / One Button Tuning dynamic response time constant		
	Data type: FloatingPoint32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Operation	
	Parameter group:		
	Unit: ms		
	Min:	Max:	Factory setting:
	0.0 [ms]	60.0 [ms]	7.5 [ms]
Description:	Sets the time constant for the precontrol symmetrization for Real Time Tuning / One Button Tuning. As a consequence, the drive is allocated a defined, dynamic response via its precontrol. Examples: 0 ms = travel without following error (Kv factor is infinity) 5 ms = settling behavior as for PT1 with 5 ms (Kv factor = 12 [1000/min])		
Dependency:	See also: p5271, p5272, r5274		
Note This time constant is only active if p5301.7 is set = 1 or p5302.7 is set = 1. Otherwise, the precontrol symmetrization is adapted to the estimated dynamic response, therefore setting positioning without any overshoot. For axes, which must interpolate with one another, the same value must be entered.			

r5276[0]	Real Time / One Button Tuning maximum Kv factor estimated		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:		
	Unit: 1000 rpm		
Description:	Displays the estimated maximum position controller gain for Real Time Tuning / One Button Tuning.		
Dependency:	See also: p5271, p5272, p5275		
 WARNING The calculation assumes that the DSC is activated in the drive and is controlled on the motor measuring system. If this is not the case, then excessively high values are displayed. The value that is displayed does not take into account low-frequency resonance effects in the drive train. If necessary, the value must be significantly reduced.			
Note The value for the closed-loop position control is required by a higher-level control system.			

r5277[0]	Real Time / One Button Tuning prectr symmetrizing time estimated		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:		
	Unit: ms		
Description:	Displays the estimated time constant for symmetrization of the speed precontrol. This is required to symmetrize the position controller for Real Time Tuning / One Button Tuning if the closed-loop position control is realized in an external control system.		
Dependency:	See also: p5271, p5272, p5275		
 WARNING The calculation assumes that the DSC is activated in the drive and is controlled on the motor measuring system. If this is not the case, then the time is not correctly calculated.			

p5291.0...16**FFT tuning configuration****Data type:** Unsigned32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Operation**Parameter group:****Unit:** -**Min:****Max:**

-

-

Factory setting:0000 0000 0000 0000 0000 0000 0011
1001 bin**Description:**Sets the configuration for the "FFT tuning" function.
This function is used for One Button Tuning (p5300 = 1).**Bit array:**

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

Dependency:

See also: r5293, r5294, r5295, 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:

For unfavorable mechanical relationships between the motor and load torques, the loop compensation allows the P gain of the speed controller to be increased. This means that the controller has a better control behavior.

Loop compensation with the current setpoint filter is only possible under the following preconditions:

- The motor is connected to the load with zero backlash.
- In the traversing range, the mechanical properties are predominantly constant.

Loop compensation is not applied for a low ratio of load moment of inertia to motor moment of inertia.

p5292

FFT tuning 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

Changeable in operating state: Operation

Parameter group:

Unit: %

	Min: 25.0 [%]	Max: 125.0 [%]	Factory setting: 80.0 [%]
Description:	Sets the dynamic factor for the proportional gain of the speed controller for FFT tuning. This function is used for One Button Tuning (p5300 = 1).		
Dependency:	See also: p5291		

r5293 FFT tuning speed controller P gain identified

	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	
	Unit: Nms/rad	
Description:	Displays the determined proportional gain Kp of the speed controller before FFT tuning. This function is used for One Button Tuning (p5300 = 1).	
Dependency:	See also: p5291	

r5294[0...5] FFT tuning zero position identified

	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	
	Unit: Hz	
Description:	Displays the identified mechanical zero points. One Button Tuning must be carried out beforehand (p5300 = 1).	
Dependency:	See also: p5291	

Note

For r5294[0...2]:

Displays the zero positions for the "Load oscillation detection" function (p5301.4 = 1) or "Suppress detected load oscillation" (p5301.5 = 1).

For r5294[3...5]:

Displays the zero positions for the "Set proportional gain Kp" function (p5301.0 = 1) or "Set current setpoint filter" (p5301.1 = 1).

r5295[0...5] FFT tuning pole position identified

	Data type: FloatingPoint32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	
	Unit: Hz	
Description:	Displays the identified mechanical pole positions. One Button Tuning must be carried out beforehand (p5300 = 1).	
Dependency:	See also: p5291	

Note

For r5295[0...2]:

Displays the pole positions for the "Load oscillation detection" function (p5301.4 = 1) or "Suppress detected load oscillation" (p5301.5 = 1).

For r5295[3...5]:

Displays the pole positions for the "Set proportional gain Kp" function (p5301.0 = 1) or "Set current setpoint filter" (p5301.1 = 1).

p5296[0...2] Controller optimization noise amplitude

	Data type: FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Operation

Parameter group:

Unit: %

Min:

1.0 [%]

Max:

300.0 [%]

Factory setting:

[0] 10.0 [%]

[1] 30.0 [%]

[2] 5.0 [%]

Description: The drive determines the noise amplitude for One Button Tuning and writes the value to p5296.

Dependency: See also: p5291

p5300[0]

Autotuning selection

Data type: Integer16

Visible in: Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Changeable in operating state: Ready for operation

Parameter group:

Unit: -

Min:

-1

Max:

2

Factory setting:

0

Description: Activating/deactivating autotuning functions "One Button Tuning" and "Real Time Tuning".

For p5300 = 1:

Function "One Button Tuning" is configured using p5271 and p5301.

For p5300 = 2:

Function "Real Time Tuning" is configured using p5302.

Value: -1: Reset controller parameters

0: Inactive

1: One Button Tuning

2: Real Time 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.

Real Time Tuning:

Function "Real Time Tuning" is configured using p5302.

p5272 if the required dynamic response of the control loops is set.

Other relevant parameters: p5271, p5275, r5274

See also: p5271, p5272, r5274, p5275, p5292, r5293, r5294, r5295, p5296, p5301, p5302, p5308, p5309

CAUTION

For some drive trains, the "Real Time Tuning" function can result in unstable settings (motor makes a whistling sound). This is especially the case for high load moments of inertia, which are coupled to the motor through a low-frequency connection/coupling. In this case, the value in parameter p5272 must be reduced.

Note

For p5300 = -1:

Autotuning is deactivated, and p5300 is automatically set to 0. In addition, the default setting values for the speed and position controller are restored.

For p5300 = 0:

Autotuning is inactive.

To permanently save the values determined for the speed and position controllers, the parameters must be saved in a non-volatile memory (p0977 = 1 or retentively save in the commissioning tool).

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.

For p5300 = 2:

Real Time Tuning is active.

The moment of inertia is estimated. The controller parameters are recalculated if the moment of inertia noticeably changes. The steps to be executed can be configured using p5302.

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

Changeable in operating state: 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
07	Activating synchronized axes	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, r5294, r5295, 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.

p5302[0].2...8**Real Time Tuning configuration**

Data type: Unsigned32

Visible in: Extended display

Read permission:	Read drive data or acknowledge messages		
Write permission:	Edit device configuration or drive applications		
Changeable in operating state:	Operation		
Parameter group:			
Unit:	-		
Min:	Max:	Factory setting:	
-	-	0000 0000 0000 1100 bin	

Description: Setting the functions for Real Time Tuning (p5300 = 2).

Bit array:	Bit	Signal name	1 signal	0 signal
	02	Estimate moment of inertia	Yes	No
	03	Configuring the moment of inertia estimator	Cyclic	Once
	06	Activating the current setpoint filter adaptation	Yes	No
	07	Activating synchronized axes	Yes	No
	08	Moment of inertia determination from frequency response	Yes	No

Dependency: It is only possible to change the configuration if autotuning is not active (p5300 = 0).
See also: p5271, p5272, r5274, p5275, p5300

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 be previously set via 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 Autotuning status

Data type: Unsigned16	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	
Unit:	-

Description: Displays the status of the autotuning functions performed "Real Time Tuning" and "One Button Tuning".
The functions can be activated via p5300.

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
	04	Load vibration detection performed	Yes	No
	05	Detected load oscillation set	Yes	No
	06	Current setpoint filter adaptation active	Yes	No
	07	EPOS set	Yes	No
	12	Real Time Tuning active	Yes	No
	13	One Button Tuning successfully completed	Yes	No
	14	Controller parameters reset due to fault	Yes	No

Dependency: See also: p5300, p5301, p5302

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.

For bit 04 = 1: Load oscillation detection was performed using One Button Tuning

For bit 05 = 1: Detected load oscillation suppression was set using One Button Tuning.

For bit 06 = 1: Adaptive resonance filters of the Real Time Tuning are active.

For bit 12 = 1: Real Time Tuning is active and modifies the controller.

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

Changeable in operating state: Ready for operation

Parameter group:

Unit: °

Min:

-30000 [°]

Max:

30000 [°]

Factory setting:

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 test signal duration**

Data type: Unsigned32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Changeable in operating state: Ready for operation

Parameter group:

Unit: ms

Min:

0 [ms]

Max:

5000 [ms]

Factory setting:

2000 [ms]

Description:

Sets the test signal sequence duration (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

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

Changeable in operating state: 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**

00 Activate monitoring

1 signal

Yes

0 signal

No

01	Activation of speed dependency	Yes	No
----	--------------------------------	-----	----

Note

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.

r7700[0...63]

Hash value for the integrity of UMAC data

Data type: Unsigned8

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Unit: -

Description:

Display of the hash value for the integrity of UMAC data in the ASCII format (Base64 Encoding)

Note

The index contains the value at the corresponding position in the string

r7727[0]

Par_connection power unit main fan service indicator

Data type: FloatingPoint32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Power unit

Unit: %

Description:

Displays the service indicator of the main fans in the power units for a parallel connection. The maximum value of all service indicators is displayed in r0277[0].

Dependency:

See also: A30042

r8400[0...2]

Date

Data type: Unsigned16

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

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 the converter has restarted, the date and time that the converter was in a no-current condition applies.

r8401[0...2]

Time

Data type: Unsigned16

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

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.

r8600[0...30]**PROFIdrive PZD receive Float32**

Data type: FloatingPoint32

Visible in: Standard display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Receive direction

Unit: -

Description:

Displays the PZD (setpoints) in the Float32 format received from the fieldbus controller.

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
 [27] = PZD 28 + 29
 [28] = PZD 29 + 30
 [29] = PZD 30 + 31
 [30] = PZD 31 + 32

c8601[0...30]	PROFIdrive PZD send Float32
	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: Send direction Unit: -
Description:	Displays the PZD (actual values) in the Float32 format that are sent to the fieldbus controller.
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 [27] = PZD 28 + 29 [28] = PZD 29 + 30 [29] = PZD 30 + 31 [30] = PZD 31 + 32
r8602[0...28]	PROFIdrive PZD receive Float64
	Data type: FloatingPoint64 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Receive direction Unit: -
Description:	Displays the PZD (setpoints) in the Float64 format received from the fieldbus controller.

Index:	[0] = PZD 1...4
	[1] = PZD 2...5
	[2] = PZD 3...6
	[3] = PZD 4...7
	[4] = PZD 5...8
	[5] = PZD 6...9
	[6] = PZD 7...10
	[7] = PZD 8...11
	[8] = PZD 9...12
	[9] = PZD 10...13
	[10] = PZD 11...14
	[11] = PZD 12...15
	[12] = PZD 13...16
	[13] = PZD 14...17
	[14] = PZD 15...18
	[15] = PZD 16...19
	[16] = PZD 17...20
	[17] = PZD 18...21
	[18] = PZD 19...22
	[19] = PZD 20...23
	[20] = PZD 21...24
	[21] = PZD 22...25
	[22] = PZD 23...26
	[23] = PZD 24...27
	[24] = PZD 25...28
	[25] = PZD 26...29
	[26] = PZD 27...30
	[27] = PZD 28...31
	[28] = PZD 29...32

c8603[0...28] PROFIdrive PZD send Float64**Data type:** FloatingPoint64**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Write permission:

Edit device configuration or drive applications

Parameter group:

Send direction

Unit: -**Description:** Displays the PZD (actual values) in the Float64 format that are sent to the fieldbus controller.

Index:	[0] = PZD 1...4
	[1] = PZD 2...5
	[2] = PZD 3...6
	[3] = PZD 4...7
	[4] = PZD 5...8
	[5] = PZD 6...9
	[6] = PZD 7...10
	[7] = PZD 8...11
	[8] = PZD 9...12
	[9] = PZD 10...13
	[10] = PZD 11...14
	[11] = PZD 12...15
	[12] = PZD 13...16
	[13] = PZD 14...17
	[14] = PZD 15...18
	[15] = PZD 16...19
	[16] = PZD 17...20
	[17] = PZD 18...21
	[18] = PZD 19...22
	[19] = PZD 20...23
	[20] = PZD 21...24
	[21] = PZD 22...25
	[22] = PZD 23...26
	[23] = PZD 24...27
	[24] = PZD 25...28
	[25] = PZD 26...29
	[26] = PZD 27...30
	[27] = PZD 28...31
	[28] = PZD 29...32

r8640		OPC UA server status
	Data type: Integer16	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	
	Unit: -	
Description:	Displays the OPC UA server status.	
Value:	0:	Server running correctly
	1:	Server faulted
	3:	Server not activated
	4:	Server shutting down
	6:	Data access error

r8641[0...7]		OPC UA server statistics
	Data type: Unsigned32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	
	Unit: -	
Description:	Displays the OPC UA server statistics.	

Index:	[0] = Server UTC time days
	[1] = Server UTC time milliseconds
	[2] = Actual number of sessions
	[3] = Actual number of registrations
	[4] = Accumulated number of sessions
	[5] = Number of rejected sessions
	[6] = Number of rejected queries
	[7] = Number of sessions with timeout

r8936[0...1]**PN cyclic connection state****Data type:** Integer16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Parameter group:**Unit:** -**Description:**

Displays the state of the cyclic PROFINET connection.

Value:

- 0: Canceled
- 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
- 12: Configured controller STOP
- 13: Configured controller RUN

Index:

- [0] = Controller 1
- [1] = Reserved

Dependency:

See also: r8961

Note

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

Parameter group:**Unit:** -**Description:**

Diagnostics display of the cyclic PROFINET connection.

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 an 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
	Parameter group: Configuration
	Unit: -
Description:	Displays the IP address of the PROFINET controller.

c8995[0...3]	Ethernet X127 enable
	Data type: Unsigned8 Visible in: Extended display
	Read permission: Read drive data or acknowledge messages
	Write permission: Edit other security settings
	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 PCS7 [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 restoring the factory settings.

c8997[0...3]	PROFINET X150 enable
	Data type: Unsigned8 Visible in: Extended display
	Read permission: Read drive data or acknowledge messages
	Write permission: Edit other security settings
	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 PCS7 [3] = Data set protocol for commands and configuration

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 restoring the factory settings.

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	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Safety Integrated	
	Unit:	-	
	Min:	Max:	Factory setting:
	0	4294967295	0
Description:	Safety Integrated module identifier for the drive. Replacement of the drive is identified when the safety functions are activated.		
	Note After replacement, when the drive runs up, an alarm is output		

p9699	SI configuration alarm filtering		
	Variant:	S200 PN	
	Data type:	Integer16	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Safety Integrated	
	Unit:	-	
	Min:	Max:	Factory setting:
	0	1	1
Description:	Sets the enable for the "Alarm filtering" function.		
Value:	0: Deactivate alarm filtering 1: Activate alarm filtering		
	Note The parameter is active after a POWER ON Only relevant for internal fault diagnostics.		

r9720.0...7	SI control word			
	Variant:		S200 PN	
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Safety Integrated	
	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
	07	Acknowledgment	Signal edge active	No

r9722.0...7	SI status signals			
	Variant:	S200 PN		
	Data type:	Unsigned32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	Unit:	-		
Description:	Displays 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
	07	Internal event	No	Yes
NOTICE				
For bit 07:				
An internal event is displayed if a stop function is active.				

r9725[0...2]	SI diagnostics data cross-check	
	Variant:	S200 PN
	Data type: Unsigned32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Safety Integrated
	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	
	Note KDV: Data cross-check	

r9728	SI actual checksum configuration of the safety functions		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in:	Extended display
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Safety Integrated	
	Unit: -		
Description:	Displays the checksum over the checked parameters used to configure safety functions (actual checksum).		
Dependency:	See also: p9729		

p9729	SI reference checksum configuration of the safety functions		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	
	Changeable in operating state:	Commissioning (Safety Integrated)	
	Parameter group:	Safety Integrated	
	Unit: -		
	Min:	Max:	Factory setting:
	0000 hex	FFFF FFFF hex	A1A1 A1A1 hex
Description:	Sets the checksum over the checked parameters used to configure safety functions (reference checksum).		
Dependency:	See also: r9728		

r9733[0...2]	SI effective setpoint velocity limiting		
	Variant:	S200 PN	
	Data type: FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Extended functions	
	Unit: rpm		
Description:	Displays the necessary velocity speed limit as a result of the selected safety functions. Contrary to the parameterization of the Safety Integrated limit values, this parameter specifies the motor-side limit value and not the load-side limit value.		
Index:	[0] = Setpoint limiting positive [1] = Setpoint limiting negative [2] = Setpoint limit absolute		
	<hr/>		
	Note The display in r9733 can be delayed by up to one SI 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 specified in r9733.		

r9734.0...15	SI Safety Information Channel status word S_ZSW1B			
	Variant:	S200 PN		
	Data type:	Unsigned16	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	Unit:	-		
Description:	Displays status word S_ZSW1B for the SIC (Safety Information Channel).			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	STO selected or active	Yes	No
	01	SS1 active	Yes	No
	07	Internal event	Yes	No
	15	Safety message present	Yes	No
<hr/>				
	Note			
	For bit 07:			
	An internal event is displayed if a stop function is active.			

r9750[0...63].0...20 SI diagnostic attributes

	Data type: Unsigned32	Visible in: Extended display		
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	Unit: -			
Description:	Displays the diagnostic attributes of the safety messages that have occurred.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Hardware replacement recommended	Yes	No
	15	Message has gone	Yes	No
	16	PROFIdrive fault class bit 0	High	Low
	17	PROFIdrive fault class bit 1	High	Low
	18	PROFIdrive fault class bit 2	High	Low
	19	PROFIdrive fault class bit 3	High	Low
	20	PROFIdrive fault class bit 4	High	Low

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the safety message buffer and the assignment of the indices is shown in r60045.

Bit 20, 19, 18, 17, 16 =

0, 0, 0, 0, 0 → PROFIdrive message class 0: Not assigned

0, 0, 0, 0, 1 → PROFIdrive message class 1: Hardware/software fault

0, 0, 0, 1, 0 → PROFIdrive message class 2: Line fault

0, 0, 0, 1, 1 → PROFIdrive message class 3: Supply voltage fault

0, 0, 1, 0, 0 → PROFIdrive message class 4: DC link fault

0, 0, 1, 0, 1 → PROFIdrive message class 5: Power electronics fault

0, 0, 1, 1, 0 → PROFIdrive message class 6: Overtemperature, electronics component

0, 0, 1, 1, 1 → PROFIdrive message class 7: Ground fault/interphase fault detected

0, 1, 0, 0, 0 → PROFIdrive message class 8: Motor overload

0, 1, 0, 0, 1 → PROFIdrive message class 9: Communications error to higher-level control

0, 1, 0, 1, 0 → PROFIdrive message class 10: Safe monitoring channel has identified an error

0, 1, 0, 1, 1 → PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available

0, 1, 1, 0, 0 → PROFIdrive message class 12: Internal communications error

0, 1, 1, 0, 1 → PROFIdrive message class 13: Infeed faulted

0, 1, 1, 1, 0 → PROFIdrive message class 14: Braking controller / Braking Module faulted

0, 1, 1, 1, 1 → PROFIdrive message class 15: Line filter faulted

1, 0, 0, 0, 0 → PROFIdrive message class 16: External measured value/signal state outside the permissible range

1, 0, 0, 0, 1 → PROFIdrive message class 17: Application/technological function fault

1, 0, 0, 1, 0 → PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence

1, 0, 0, 1, 1 → PROFIdrive message class 19: General drive fault

1, 0, 1, 0, 0 → PROFIdrive message class 20: Auxiliary unit faulted

r9753[0...63]**SI message value for float values**

Variant: S200 PN

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

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**

Variant: S200 PN

Data type: Unsigned16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

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**

Variant: S200 PN

Data type: Unsigned32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Unit: ms

Description: Displays the relative system runtime in milliseconds when the safety message was removed.

Dependency: See also: r9753, r9754, r9756, r60044, r60045, r60048, r60049, p60052

r9756[0...63]	SI message time removed in days			
	Variant:	S200 PN		
	Data type: Unsigned16	Visible in:	Extended display	
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	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			
<hr/>				
r9776.0...4	SI diagnostics			
	Variant:	S200 PN		
	Data type: Unsigned32	Visible in:	Standard display	
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	Unit: -			
Description:	Displays the operating state, referred to the safety functions. The parameter is used for diagnostics.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Safety parameter changed	Yes	No
	01	Safety functions enabled	Yes	No
	02	Safety component replaced and data save required	Yes	No
	03	Safety component replaced and acknowledge/save required	Yes	No
	04	Safety commissioning mode active	Yes	No
<hr/>				
	Note			
	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 was replaced. Saving required (p0977 = 1 or retentively save).			
	For bit 03 = 1:			
	A safety-relevant component was replaced. Confirm component replacement using the button in the commissioning tool and then save (p0977 = 1 or retentively save).			
	For bit 04 = 1:			
	The safety commissioning mode is selected.			
<hr/>				
r9780[0...1]	SI checksum to check changes			
	Variant:	S200 PN		
	Data type: Unsigned32	Visible in:	Standard display	
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	Unit: -			
Description:	Displays the checksum to track changes for Safety Integrated.			
	These are additional checksums that are created to track changes to relevant safety parameters (fingerprint for the "safety logbook" functionality).			
Index:	[0] = SI checksum to track functional changes			
	[1] = SI checksum to track hardware-specific changes			
Dependency:	See also: p9729			

r9781[0...1]	SI change control time stamp days
	Variant: S200 PN Data type: Unsigned16 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Safety Integrated Unit: -
Description:	Displays the day component of the time stamp for the checksums for tracking changes for Safety Integrated. The time stamps are generated for the checksums (r9780[0...1]) (fingerprint for the "safety logbook" functionality) The time is shown in UTC format (Coordinated Universal Time).
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, p9799
	Note The time comprises r9781 (days) and r9782 (milliseconds).
r9782[0...1]	SI change control time stamp milliseconds
	Variant: S200 PN Data type: Unsigned32 Visible in: Standard display Read permission: Read drive data or acknowledge messages Parameter group: Safety Integrated Unit: ms
Description:	Displays the millisecond component of the time stamp for the checksums for tracking changes for Safety Integrated. The time stamps are generated for the checksums (r9780[0...1]) (fingerprint for the "safety logbook" functionality) The time is shown in UTC format (Coordinated Universal Time).
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, p9799
	Note The time comprises r9781 (days) and r9782 (milliseconds).
r9794	SI actual checksum safety enable
	Variant: S200 PN Data type: Unsigned32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Parameter group: Safety Integrated 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
	Variant: S200 PN Data type: Unsigned32 Visible in: Extended display Read permission: Read drive data or acknowledge messages Write permission: Edit Safety Integrated application Changeable in operating state: Commissioning (Safety Integrated) Parameter group: Safety Integrated Unit: -

	Min: 0000 hex	Max: FFFF FFFF hex	Factory setting: A1A1 A1A1 hex
Description:	Sets the checksum over the parameters for enabling the safety functions (reference checksum).		
Dependency:	See also: r9794		

r9798 SI actual checksum over the drive configuration

	Variant: S200 PN	
	Data type: Unsigned32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Safety Integrated
	Unit: -	
Description:	Displays the checksum over the checksum-checked parameters to configure the drive (actual checksum).	
Dependency:	See also: p9799	

p9799 SI reference checksum over the configuration of the drive

	Variant: S200 PN	
	Data type: Unsigned32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit Safety Integrated application
	Changeable in operating state:	Commissioning (Safety Integrated)
	Parameter group:	Safety Integrated
	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 (reference checksum).	
Dependency:	See also: r9798	

r9828 SI actual checksum configuration of safety functions channel B

	Variant: S200 PN	
	Data type: Unsigned32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Safety Integrated
	Unit: -	
Description:	Displays the checksum over the checksum-checked parameters to configure safety functions (actual checksum) channel B.	
Dependency:	See also: p9829	

p9829 SI reference checksum configuration of safety functions chan. B

	Variant: S200 PN	
	Data type: Unsigned32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Write permission:	Edit Safety Integrated application
	Changeable in operating state:	Commissioning (Safety Integrated)
	Parameter group:	Safety Integrated
	Unit: -	
	Min: 0000 hex	Max: FFFF FFFF hex
		Factory setting: B2B2 B2B2 hex
Description:	Sets the checksum over the checked parameters used to configure safety functions (reference checksum).	
Dependency:	See also: r9828	

r9894	SI actual checksum safety enable channel B		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Safety Integrated	
	Unit: -		
Description:	Displays the checksum over the parameters to enable the safety functions (actual checksum) channel B.		
Dependency:	See also: p9895		
<hr/>			
p9895	SI reference checksum safety enable channel B		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	
	Changeable in operating state:	Commissioning (Safety Integrated)	
	Parameter group:	Safety Integrated	
	Unit: -		
	Min:	Max:	Factory setting:
	0000 hex	FFFF FFFF hex	B2B2 B2B2 hex
Description:	Sets the checksum over the parameters for enabling the safety functions (reference checksum) channel B.		
Dependency:	See also: r9894		
<hr/>			
r9898	SI actual checksum configuration of the drive, channel B		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Safety Integrated	
	Unit: -		
Description:	Displays the checksum over the checksum-checked parameters to configure the drive (actual checksum) channel B.		
Dependency:	See also: p9899		
<hr/>			
p9899	SI reference checksum over the drive configuration, channel B		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	
	Changeable in operating state:	Commissioning (Safety Integrated)	
	Parameter group:	Safety Integrated	
	Unit: -		
	Min:	Max:	Factory setting:
	0000 hex	FFFF FFFF hex	B2B2 B2B2 hex
Description:	Sets the checksum over the checksum-checked parameters to configure the drive (reference checksum) channel B.		
Dependency:	See also: r9898		
<hr/>			
r9994	Calculated system utilization		
	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	

	Parameter group:	System identification		
	Unit: %			
Description:	Displays the system utilization. If the utilization is greater than 100%, fault F01054 is output.			
Dependency:	See also: F01054, F01205			
<hr/>				
p10000.0	SI F-DI enable			
	Variant:	S200 PN		
	Data type: Unsigned8	Visible in: Standard display		
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit Safety Integrated application		
	Changeable in operating state:	Commissioning (Safety Integrated)		
	Parameter group:	Safety Integrated		
	Unit: -			
	Min:	Max:	Factory setting:	
	-	-	0001 bin	
Description:	Sets the enable signal for the failsafe digital inputs.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	F-DI 0 (X131.1/2, X131.5/6)	Enabled	Not enabled
	Note			
	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-related functions, as they can be subject to test pulses.			
<hr/>				
p10002	SI F-DI changeover discrepancy time			
	Variant:	S200 PN		
	Data type: FloatingPoint32	Visible in: Standard display		
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit Safety Integrated application		
	Changeable in operating state:	Commissioning (Safety Integrated)		
	Parameter group:	Safety Integrated		
	Unit: ms			
	Min:	Max:	Factory setting:	
	1.00 [ms]	2000.00 [ms]	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 SI monitoring clock cycle.			
<hr/>				
p10017[0...2]	SI digital inputs input filter			
	Variant:	S200 PN		
	Data type: FloatingPoint32	Visible in: Standard display		
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit Safety Integrated application		
	Changeable in operating state:	Commissioning (Safety Integrated)		
	Parameter group:	Safety Integrated		
	Unit: ms			
	Min:	Max:	Factory setting:	
	1.00 [ms]	100.00 [ms]	4.00 [ms]	

Description: Setting 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

The maximum length of cables that are connected to a fail-safe digital input is 30 m.

Note

If the self test is enabled using externally specified dark pulses (p10041 = 3) for at least one F-DI, then p10017 must be set longer than the maximum duration of the dark pulses + 2 ms. If the test pulses are specified using the switchable power supply (p10041 = 1), then this means p10017 > p10018 + 2 ms.

p10018 SI F-DI self test length dark pulses VS+

Variant: S200 PN

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit Safety Integrated application

Changeable in operating state: Commissioning (Safety Integrated)

Parameter group: Safety Integrated

Unit: ms

Min:	Max:	Factory setting:
0 [ms]	50 [ms]	0 [ms]

Description: Sets the dark pulse length of the switchable power supply for the self test using specified dark pulses (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.

Note

The dark pulses of the switchable power supply are only enabled for the self test using specified dark pulses (p10041 = 1).

The switchable power supply is continuously switched on if another self test was set

p10019 SI F-DI self test external dark pulses wait time

Variant: S200 PN

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit Safety Integrated application

Changeable in operating state: Commissioning (Safety Integrated)

Parameter group: Safety Integrated

Unit: s

Min:	Max:	Factory setting:
10 [s]	3600 [s]	1020 [s]

Description: Sets the maximum wait time for the dark pulses for the F-DI self test using an externally specified test pulses.

Note

This parameter is only active for F-DIs that are tested using external test pulses (p10041[x] = 3).

c10022

SI STO input terminal

Variant: S200 PN
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: Signal for the axis-specific selection of function "STO (Safe Torque Off)" (control via F-DI).

Note

F-DI: Failsafe Digital Input

c10023

SI SS1 input terminal

Variant: S200 PN
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: Signal for selecting function "SS1 (Safe Stop 1)".

Note

F-DI: Failsafe Digital Input

p10040.0

SI F-DI input mode

Variant: S200 PN
Data type: Unsigned8
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Changeable in operating state: Commissioning (Safety Integrated)
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 11+ (X131.5/6)	NO contact	NC contact

p10041[0...2]

SI F-DI self test mode selection

Variant: S200 PN
Data type: Integer16
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Changeable in operating state: Commissioning (Safety Integrated)
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 specified dark pulses (VS+) 3: Self test using externally specified dark pulses			
Index:	[0] = F-DI 0 [1] = Reserved [2] = Reserved			
Note Mode 1: A check is made whether p10017 is > p10018 + 2 ms and whether p10018 is set > 0.				

r10051.0	SI digital inputs status channel A			
	Variant:	S200 PN		
	Data type: Unsigned8	Visible in:	Standard display	
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	Unit: -			
Description:	Display for the single-channel, logical and debounced status of the failsafe digital inputs of channel A.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Status of DI 10+ (X131.1/2)	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: Normally closed contacts have for - 0 V at the input, a logical signal level of "0". - 24 V at the input, a logical signal level of "1". As a consequence, for an NC/NC contact parameterization for - 0 V at both inputs of the F-DI results in a status of the F-DI equal to "0" (safety function selected), - 24 V at both inputs of the F-DI results in a status of the F-DI equal to "1" (safety function selected), F-DI: Failsafe Digital Input				

r10071.0	SI F-DI status			
	Variant:	S200 PN		
	Data type: Unsigned8	Visible in:	Standard display	
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Safety Integrated		
	Unit: -			
Description:	Display for the status of the failsafe digital inputs.			
Bit array:	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				

r10080.0...7	SI status signals channel A			
	Variant:		S200 PN	
	Data type: Unsigned32		Visible in: Extended display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Safety Integrated	
	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
	07	Internal event	No	Yes
NOTICE				
For bit 07:				
An internal event is displayed if STO is active.				

r10098	SI actual checksum across device-specific parameters			
	Variant:		S200 PN	
	Data type: Unsigned32		Visible in: Extended display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Safety Integrated	
	Unit: -			
Description:	Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (actual checksum).			
Dependency:	See also: p10099			

p10099	SI reference checksum across device-specific parameters			
	Variant:		S200 PN	
	Data type: Unsigned32		Visible in: Extended display	
	Read permission:		Read drive data or acknowledge messages	
	Write permission:		Edit Safety Integrated application	
	Changeable in operating state:		Commissioning (Safety Integrated)	
Parameter group:		Safety Integrated		
Unit: -				
Min:		Max:	Factory setting:	
0000 hex		FFFF FFFF hex	A1A1 A1A1 hex	
Description:	Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (reference checksum).			
Dependency:	See also: r10098			

r10151.0	SI digital inputs status channel B			
	Variant:		S200 PN	
	Data type: Unsigned8		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Safety Integrated	
	Unit: -			
Description:	Display for the single-channel, logical and debounced status of the failsafe digital inputs of channel B.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Status of DI 11+ (X131.5/6)	Logical 1	Logical 0
Dependency:	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:

NC contacts have

- A logical signal level of "1" for 24 V at the input
- A logical signal level of "0" for 0 V at the input

Therefore, when an NC/NC contact is parameterized

- 0 V at both inputs of the F-DI results in a status of the F-DI equal to "0" (safety function selected)
- 24 V at both inputs of the F-DI results in a status of the F-DI equal to "1" (safety function selected)

NO contacts have

- A logical signal level of "0" for 24 V at the input
- A logical signal level of "1" for 0 V at the input

Therefore, when an NC/NO contact is parameterized

- The level 0 V/24 V results in a status of the F-DI equal to "0" (selection of the safety function)
- The level 24 V/0 V results in a status of the F-DI equal to "1" (deselection of the safety function).

F-DI: Failsafe Digital Input

r10171.0**SI F-DI status channel B**

Variant: S200 PN

Data type: Unsigned8

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Safety Integrated

Unit: -

Description:

Display for the status of the failsafe digital inputs.

Bit array:

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

r10180.0...7**SI status signals channel B**

Variant: S200 PN

Data type: Unsigned32

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Safety Integrated

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
07	Internal event	No	Yes

NOTICE

For bit 07:

An internal event is displayed if STO is active.

r10198**SI actual checksum across device-specific parameters channel B**

Variant: S200 PN

	Data type: Unsigned32	Visible in: Extended display
	Read permission:	Read drive data or acknowledge messages
	Parameter group:	Safety Integrated
	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		
	Variant:	S200 PN	
	Data type: Unsigned32	Visible in: Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	
	Changeable in operating state:	Commissioning (Safety Integrated)	
	Parameter group:	Safety Integrated	
	Unit: -		
	Min:	Max:	Factory setting:
	0000 hex	FFFF FFFF hex	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...15	SI STO select cause			
	Variant:		S200 PN	
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	Parameter group:		Safety Integrated	
	Unit: -			
Description:	Reason that STO (Safe Torque Off) function was selected.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Selection via F-DI	High	Low
	04	Safety commissioning mode active	High	Low
	07	Response to SS1	High	Low
	12	Stop response	High	Low
	14	Response to parameterization/configuration errors	High	Low
	15	Response to internal software error	High	Low
NOTICE				
For bit 04:				
The bit is only set when Safety commissioning is active and Safety has already been enabled (see p9603).				

r10353.0...13	SI SS1 select cause			
	Variant:		S200 PN	
	Data type: Unsigned32		Visible in: Standard display	
	Read permission:		Read drive data or acknowledge messages	
	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

12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

r10452.0...15**SI STO select cause channel B**

Variant: S200 PN
Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Unit: -

Description:

Reason for the selection of function STO (Safe Torque Off) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
04	Safety commissioning mode active	High	Low
07	Response to SS1	High	Low
12	Stop response	High	Low
14	Response to parameterization/configuration errors	High	Low
15	Response to internal software error	High	Low

r10453.0...13**SI SS1 select cause channel B**

Variant: S200 PN
Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Unit: -

Description:

Reason for the selection of function SS1 (Safe Stop 1) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

c11500[0...3]**LR initiate absolute encoder adjustment**

Variant: S200 Basic PN, S200 PN
Available when function is active: Closed-loop position control with setpoint input via DCC
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: Position control
Unit: -

Description:

Initiate adjustment for absolute encoder
 A 0/1 signal starts the absolute encoder adjustment.

Index:

[0] = Position control
 [1] = Motor encoder
 [2] = Reserved
 [3] = Reserved

Dependency:

See also: p2507, r2526, c2598, p2599

⚠ CAUTION
For rotating absolute encoders, when adjusting, a range is set up symmetrically around zero with half of the encoder range, within which the position must be re-established after switch-off/switch-on. In this range, it is only permissible that the encoder overflows.
After the adjustment has been completed, it must be guaranteed that the range is not exited. The reason for this is that outside the range, there is no clear reference any longer between the encoder actual value and mechanical system. If the home position (c2598) lies in this range, then the position actual value is set when adjusting to the home position. Otherwise, adjustment is canceled with F07443.
There is no overflow for linear absolute encoders. This means that after the adjustment, the position can be re-established in the complete traversing range after switch-off/switch-on. When adjusting, the position actual value is set to the home position.

Note

The status of the absolute encoder adjustment is indicated via p2507 and in status word r2526.
To permanently accept the determined position offset, it must be retentively saved (p0977).
This adjustment can only be initiated for an absolute encoder.

p11550	EPOS active homing reference cam selection		
	Variant:		S200 Basic PN, S200 PN
	Available when function is active:		Basic positioner
	Data type: Integer16		Visible in: Standard display
	Read permission:		Read drive data or acknowledge messages
	Write permission:		Edit device configuration or drive applications
	Changeable in operating state:		Ready for operation
	Parameter group:		Homing
	Unit: -		
	Min:		Max:
0		1	0
Description:	Signal to evaluate "Active homing reference cam".		
Value:	0: Reference cam selection 1		
	1: Reference cam selection 2		
Dependency:	See also: p2607, c2612		

c11560	EPOS direct setpoint input/MDI acceleration setpoint	
Variant:	S200 Basic PN, S200 PN	
Available when function is active:	Basic positioner with MDI	
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:	Direct setpoint input (MDI)	
Unit: mm/s ²		
Description:	Signal for the acceleration setpoint in mode "direct setpoint input/MDI".	
Dependency:	See also: c2649, c2650	

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the acceleration setpoint is either transferred continuously or edge-triggered.

c11560 EPOS direct setpoint input/MDI acceleration setpoint

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner with MDI
Values for:	Basic positioner for rotary motion
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:	Direct setpoint input (MDI)
Unit: $^{\circ}/s^2$	

Description: Signal for the acceleration setpoint in mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the acceleration setpoint is either transferred continuously or edge-triggered.

c11561 EPOS direct setpoint input/MDI deceleration setpoint

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner with MDI
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:	Direct setpoint input (MDI)
Unit: mm/s^2	

Description: Signal for the deceleration setpoint in mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE

If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration setpoint cannot be reached without reversing the direction, then when accepting the dynamic response values, the higher deceleration setpoint is accepted and becomes effective.
The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the deceleration setpoint is either transferred continuously or edge-triggered.

c11561 EPOS direct setpoint input/MDI deceleration setpoint

Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner with MDI
Values for:	Basic positioner for rotary motion
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:	Direct setpoint input (MDI)
Unit: $^{\circ}/s^2$	

Description: Signal for the deceleration setpoint in mode "direct setpoint input/MDI".

Dependency: See also: c2649, c2650

NOTICE
If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration setpoint cannot be reached without reversing the direction, then when accepting the dynamic response values, the higher deceleration setpoint is accepted and becomes effective. The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the deceleration setpoint is either transferred continuously or edge-triggered.

r11570	EPOS actual acceleration
Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: mm/s ²	
Description:	Displays the acceleration value currently being processed.
Dependency:	See also: p2572
	Note The maximum acceleration from p2572 is effective in operating mode "Jog" and "Active homing".
r11570	EPOS actual acceleration
Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner
Values for:	Basic positioner for rotary motion
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: °/s ²	
Description:	Displays the acceleration value currently being processed.
Dependency:	See also: p2572
	Note The maximum acceleration from p2572 is effective in operating mode "Jog" and "Active homing".
r11571	EPOS actual deceleration
Variant:	S200 Basic PN, S200 PN
Available when function is active:	Basic positioner
Data type: FloatingPoint32	Visible in: Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)
Unit: mm/s ²	
Description:	Displays the deceleration value currently being processed.
Dependency:	See also: p2573
	Note The maximum deceleration from p2573 is effective in operating mode "Jog" and "Active homing".

r11571	EPOS actual deceleration			
	Variant:	S200 Basic PN, S200 PN		
	Available when function is active:	Basic positioner		
	Values for:	Basic positioner for rotary motion		
	Data type:	FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)		
	Unit:	%s ²		
	Description:	Displays the deceleration value currently being processed.		
	Dependency:	See also: p2573		
<hr/>				
Note				
The maximum deceleration from p2573 is effective in operating mode "Jog" and "Active homing".				
<hr/>				
c29048	Torque limit selection bit 0			
	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:	Torque limiting		
	Unit:	-		
Description:	Signal of bit 0 for the torque limit.			
<hr/>				
c29049	Torque limit selection bit 1			
	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:	Torque limiting		
	Unit:	-		
Description:	Signal of bit 1 for the torque limit.			
<hr/>				
p29050[0...3]	Upper torque limit			
	Data type:	FloatingPoint32	Visible in:	Standard display
	Read permission:	Read drive data or acknowledge messages		
	Write permission:	Edit device configuration or drive applications		
	Changeable in operating state:	Ready for operation		
	Parameter group:	Torque limiting		
	Unit:	%		
	Min:	Max:	Factory setting:	
	-150.0 [%]	350.0 [%]	350.0 [%]	
	Description:	Sets the upper torque limit. Three internal torque limits in total are available. With the combination of the digital input signals "Torque limit selection bit 0" and "Torque limit selection bit 1", you can select one of the three internal torque limits as the source of the upper torque limit.		
Index:	[0] = Upper torque limit 0 [1] = Upper torque limit 1 [2] = Upper torque limit 2 [3] = Upper torque limit 3			

p29051[0...3]	Lower torque limit		
	Data type:	FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Torque limiting	
	Unit:	%	
	Min:	Max:	Factory setting:
	-350.0 [%]	150.0 [%]	-350.0 [%]
	Description:	Sets the lower torque limit. Three internal torque limits in total are available. With the combination of the digital input signals "Torque limit selection bit 0" and "Torque limit selection bit 1", you can select one of the three internal torque limits as the source of the lower torque limit.	
Index:	[0] = Lower torque limit 0 [1] = Lower torque limit 1 [2] = Lower torque limit 2 [3] = Lower torque limit 3		
c29063	Speed limit selection bit 0		
	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:	Speed limiting	
	Unit:	-	
Description:	Signal of bit 0 for the speed limit.		
c29064	Speed limit selection bit 1		
	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:	Speed limiting	
	Unit:	-	
Description:	Signal of bit 1 for the speed limit.		
p29070[0...3]	Speed limit in positive direction of rotation		
	Data type:	FloatingPoint32	Visible in: Standard display
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Speed limiting	
	Unit:	rpm	
	Min:	Max:	Factory setting:
	0.00 [rpm]	210000.00 [rpm]	210000.00 [rpm]
	Description:	Sets the maximum speed for the positive direction. Three internal speed limits in total are available. With the combination of the digital input signals "Speed limit selection bit 0" and "Speed limit selection bit 1", you can select one of the three internal speed limits as the source of the speed limit.	

Index:	[0] = Speed limit for positive direction 0
	[1] = Speed limit for positive direction 1
	[2] = Speed limit for positive direction 2
	[3] = Speed limit for positive direction 3
Dependency:	The default value depends on the maximum motor speed.

p29071[0...3] Speed limit in negative direction of rotation

	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Speed limiting	
	Unit: rpm		
Description:	Min:	Max:	Factory setting:
	-210000.00 [rpm]	0.00 [rpm]	-210000.00 [rpm]
	Sets the maximum speed for the negative direction.		
	Three internal speed limits in total are available.		
	With the combination of the digital input signals "Speed limit selection bit 0" and "Speed limit selection bit 1", you can select one of the three internal speed limits as the source of the speed limit.		
Index:	[0] = Speed limit for negative direction 0		
	[1] = Speed limit for negative direction 1		
	[2] = Speed limit for negative direction 2		
	[3] = Speed limit for negative direction 3		
Dependency:	The default value depends on the maximum motor speed.		

r29404.0...5 DO status word

	Data type: Unsigned32	Visible in: Standard display		
	Read permission:	Read drive data or acknowledge messages		
	Parameter group:	Digital outputs		
	Unit: -			
Description:	Displays the status word of the digital outputs.			
Bit array:	Bit	Signal name	1 signal	0 signal
	00	Ready for servo on	Yes	No
	01	Current control mode	Yes	No
	02	Overload level reached	Yes	No
	03	Speed reached	Yes	No
	04	Warning1	Yes	No
	05	Warning2	Yes	No

p31585 VIBSUP natural frequency

	Data type: FloatingPoint32	Visible in: Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Changeable in operating state:	Ready for operation	
	Parameter group:	Vibration suppression with setpoint filter	
	Unit: Hz		
	Min:	Max:	Factory setting:
	10.000 [Hz]	10000.000 [Hz]	10.000 [Hz]

Description: Sets the frequency of the damped natural vibration of the mechanical system.
This frequency can be determined by making the appropriate measurements.

Dependency: See also: r31613
See also: F53432

r31600.0...15		VIBSUP status word	
		Data type: Unsigned16	Visible in: Standard display
		Read permission:	Read drive data or acknowledge messages
		Parameter group:	Vibration suppression with setpoint filter
		Unit: -	
Description:		Displays the status word of VIBSUP.	
Bit array:	Bit	Signal name	1 signal 0 signal
	00	"Filter not initialized" state	Yes No
	02	"Filter ready" state	Yes No
	03	"Filter being activated" state	Yes No
	04	"Filter active" state	Yes No
	05	"Filter being deactivated" state	Yes No
	06	Axis moves forward	Yes No
	07	Axis moves backward	Yes No
	08	Setpoint fixed	Yes No
	09	Frequency being changed	Yes No
	10	Frequency change limiting active	Yes No
	11	Dead time symmetrization activated	Yes No
	12	Immediate coupling-in possible	Yes No
	13	Tracking active	Yes No
	14	Axis accelerating	Yes No
	15	Axis decelerating	Yes No
Note			
For bit 02:			
The setpoint filter is ready and can be coupled in.			
For bit 03:			
The filter is being coupled into the setpoint channel.			
For bit 04:			
The setpoint filter is activated.			
For bit 05:			
The filter is being coupled out of the setpoint channel.			
For bit 06:			
The axis moves forward.			
The filtered speed setpoint is used to determine the direction of travel.			
For bit 07:			
The axis moves backward.			
The filtered speed setpoint is used to determine the direction of travel.			
For bit 12:			
The filter can be immediately coupled-in.			
For bit 13:			
Filter tracking mode is activated.			
For bit 14:			
The axis accelerates.			
The filtered speed setpoint is used for the calculation.			
For bit 15:			
The axis brakes.			
The filtered speed setpoint is used for the calculation.			

r31613 VIBSUP natural frequency active**Data type:** FloatingPoint32**Visible in:** Standard display**Read permission:**

Read drive data or acknowledge messages

Parameter group:

Vibration suppression with setpoint filter

Unit: Hz**Description:**

Display for the active natural frequency (fd).

Dependency:See also: p31585

r60000 PROFIdrive reference speed**Data type:** FloatingPoint32**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Parameter group:**Unit:** rpm**Description:**

Displays 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).

Dependency:See also: p2000

NoteParameter r60000 is an image of parameter p2000 in conformance with PROFIdrive.

r60044 SI message buffer counter changes**Variant:**

S200 PN

Data type: Unsigned16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Parameter group:

Safety Integrated

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**Variant:**

S200 PN

Data type: Unsigned16**Visible in:** Extended display**Read permission:**

Read drive data or acknowledge messages

Parameter group:

Safety Integrated

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

Variant: S200 PN

Data type: Unsigned16

Visible in: Extended display

Read permission:

Read drive data or acknowledge messages

Parameter group:

Safety Integrated

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,

r60048[0...63] SI message time received in milliseconds

Variant: S200 PN
Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
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

Variant: S200 PN
Data type: Integer32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
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

Variant: S200 PN
Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Changeable in operating state: Operation
Parameter group: Safety Integrated
Unit: -
Min: 0 **Max:** 65535 **Factory setting:** 0

Description: Number of safety message cases that have occurred since the last reset.

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...5] PROFIdrive telegram display total

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Unit: -

Description: Displays the send and receive telegrams.

Index: [0] = Subslot 1: MAP
 [1] = Subslot 2: Reserved
 [2] = Subslot 3: standard/SIEMENS
 [3] = Subslot 4: supplementary telegram
 [4] = Subslot 5: supplementary telegram
 [5] = Subslot 6: supplementary telegram

Dependency: See also: r0922, r60122

Note

Value = 65534: No telegram
 Value = 65535: MAP "Module Access Point"

r60122	PROFIdrive SIC/SCC telegram
	Variant: S200 PN Data type: Unsigned16 Read permission: Read drive data or acknowledge messages 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
	Note When reading the parameter via PROFIdrive, value 65534 is applicable for "No telegram".
r61000[0...239]	PROFINET NameOfStation
	Data type: Unsigned8 Read permission: Read drive data or acknowledge messages Parameter group: Configuration Unit: -
Description:	Displays "PROFINET NameOfStation". This is the device name of the PROFINET interface.
r61001[0...3]	PROFINET IP of Station
	Data type: Unsigned8 Read permission: Read drive data or acknowledge messages Parameter group: Configuration Unit: -
Description:	Displays "PROFINET IP of Station". This is the IP address of the PROFINET interface.

A.4 Assembling cables

Description

Cables are important components of a servo drive system. They are essential to the stable and reliable operation of the system.

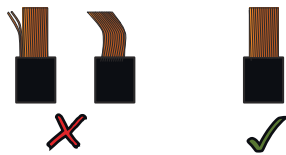
Siemens recommends that you use Siemens cable assemblies and connectors. All Siemens cable assemblies and connectors are tested and compliant with CE standards and EMC requirements. If you use non-Siemens cable assemblies, for example, cables made by yourself or third-party cables, Siemens does not guarantee that the servo drive system meets CE standards. In this case, if the drive system is required to be operated in a CE-compliant environment, you should reapply for the certification.

Siemens does not provide any guarantee or warranty regarding the functionality, reliability or quality of non-Siemens cables used with the servo drive system, and is not responsible for device (e.g. motor and converter) damages due to use with non-Siemens cables.

Siemens allows you to assemble your own cables in case that, for example, cables of special length are needed; therefore, Siemens provides instructions for assembling cables and connectors. Siemens does not guarantee that your cables meet CE standards, EMC requirements, or requirements for the degree of protection of the connected devices.

When assembling the cables, observe the following instructions:

- The assembly must be performed by qualified personnel.
- Prepare appropriate tools, raw cables, and Siemens connectors.
- To avoid splaying or fraying of the strands, strip the wires squarely and evenly.



- To avoid short-circuiting between wires and unused pins on the connector, cover the unused pins with heat-shrinkable tubes.

More information

For more information about Siemens cables and connectors, see Section "Cables and connectors (Page 138)".

A.4.1 Assembling connectors on the converter side

A.4.1.1 Assembling the cable lugs

Overview

This section offers general assembly instructions for cable lugs and is applicable to the following cables:

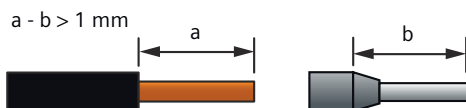
- Mains supply cable
- 24 V DC power supply cable
- Motor holding brake cable
- Motor power cable
- External braking resistor cable
- STO connection cable

Requirement

You have prepared appropriate tools, raw cables, and cable lugs.

Procedure

1. Remove the outer sheath of the cable.
2. Remove the insulation from the conductor. For more information about stripping length, see Section "Cables and connectors (Page 138)".



3. Insert the stripped end into the cable end sleeve.



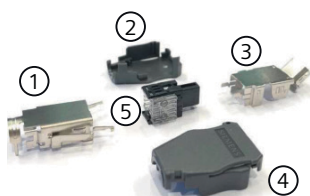
4. Crimp the cable end sleeve.



A.4.1.2 Assembling the encoder connector

Overview

The Siemens IX-C connector is used for encoder connection to the converter. It consists of the following components:



- | | | | |
|---|-------------|---|--|
| ① | Shielding A | ④ | Front cover |
| ② | Back cover | ⑤ | Insulation-displacement contact (IDC) terminal |
| ③ | Shielding B | | |

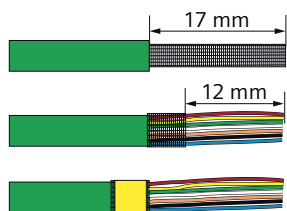
Figure A-1 IX-C connector

Requirement

You have prepared appropriate tools, a raw cable, and the Siemens IX-C connector.

Procedure

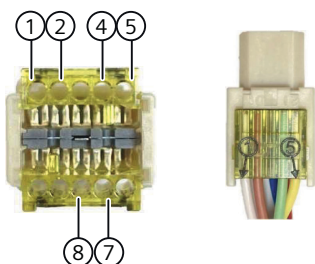
1. Prepare the cable.
 - Remove the outer sheath of the cable by 17 mm.
 - Remove the cable shield by 12 mm.
 - Fold the remaining cable shield backward over the cable sheath, and wrap the folded cable shield with copper tape.



2. Arrange the conductors. The image below is for illustration purpose only. For detailed instructions on the conductor signals and colors, refer to Step 3 and Chapter "Wiring (Page 153)".



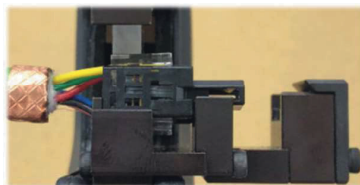
3. Insert the conductors into the connector with the correct order, pushing through until the conductor ends reach the end of the connector.



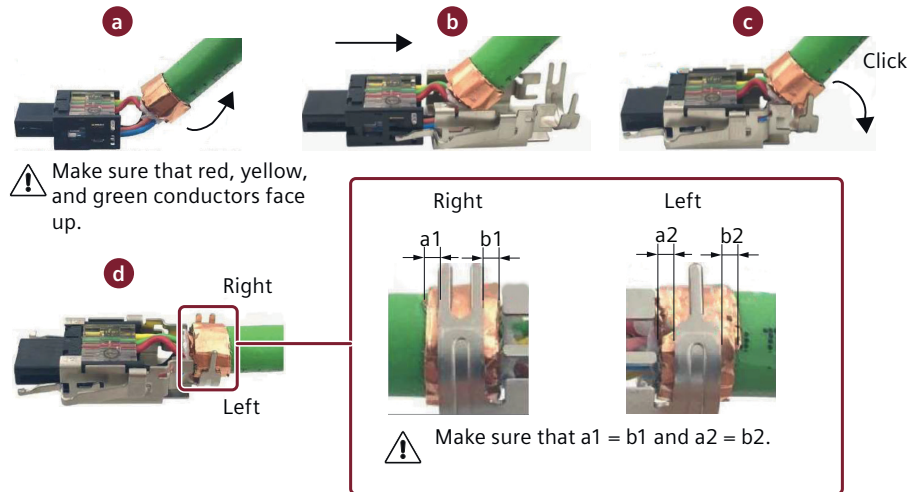
Pin	Signal
1	Data_P
2	Data_N
4	Clock_P

Pin	Signal
5	Clock_N
7	P_Supply
8	M

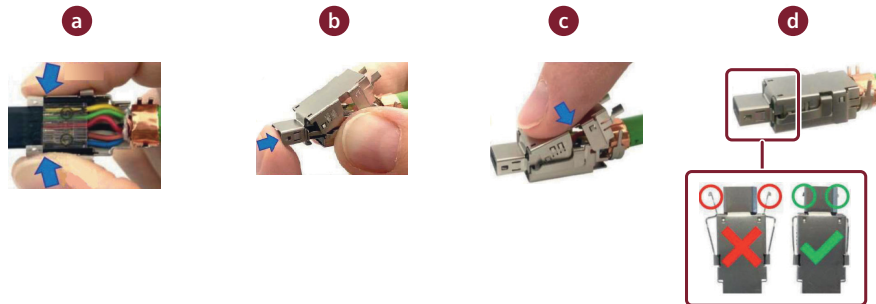
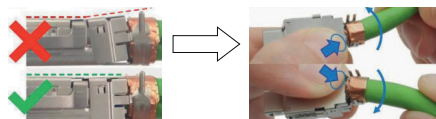
4. Insert the connector into the IDC slot in the crimping tool and crimp the connector. Make sure that red, yellow, and green conductors face up.



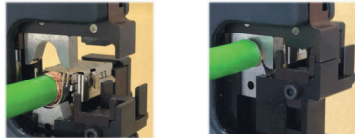
5. Assemble the shielding A.



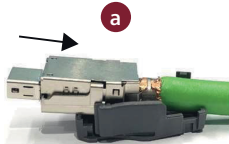
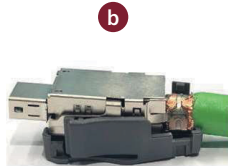
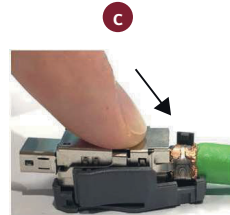
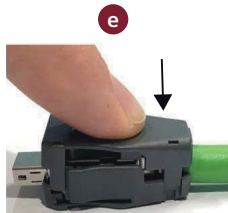
6. Assemble the shielding B.



7. Insert the connector into the cable crimp slot in the crimping tool and crimp the cable shield.



8. Install the housing.



⚠ Make sure that the covers latch into place.

A.4.1.3 Assembling the I/O connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens 20-pin MDR connector.

Procedure

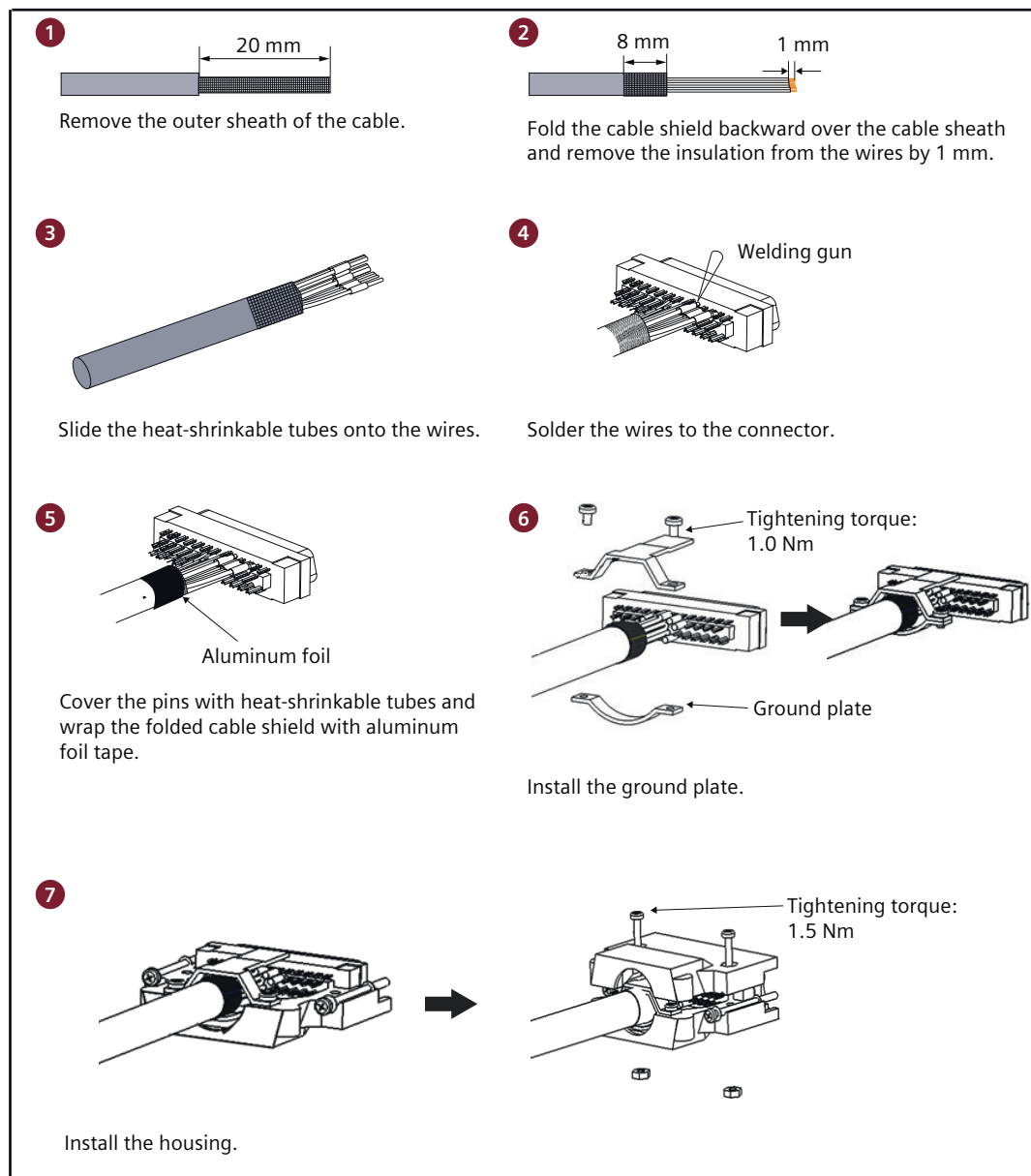


Figure A-2 Assembling the I/O cable

A.4.2 Assembling connectors on the motor side

Note

If you use non-Siemens motor cable assemblies and connectors, to ensure compliance with the degree of protection of the connected motors, it is important to verify that the cable assemblies and connectors meet the necessary requirements.

A.4.2.1 Assembling the hybrid plug for 1FL2 motors, shaft heights 20, 30, and 40

Overview

The Siemens hybrid plug is used for connecting the converter to the motor and the encoder in the motor. It consists of the following components:

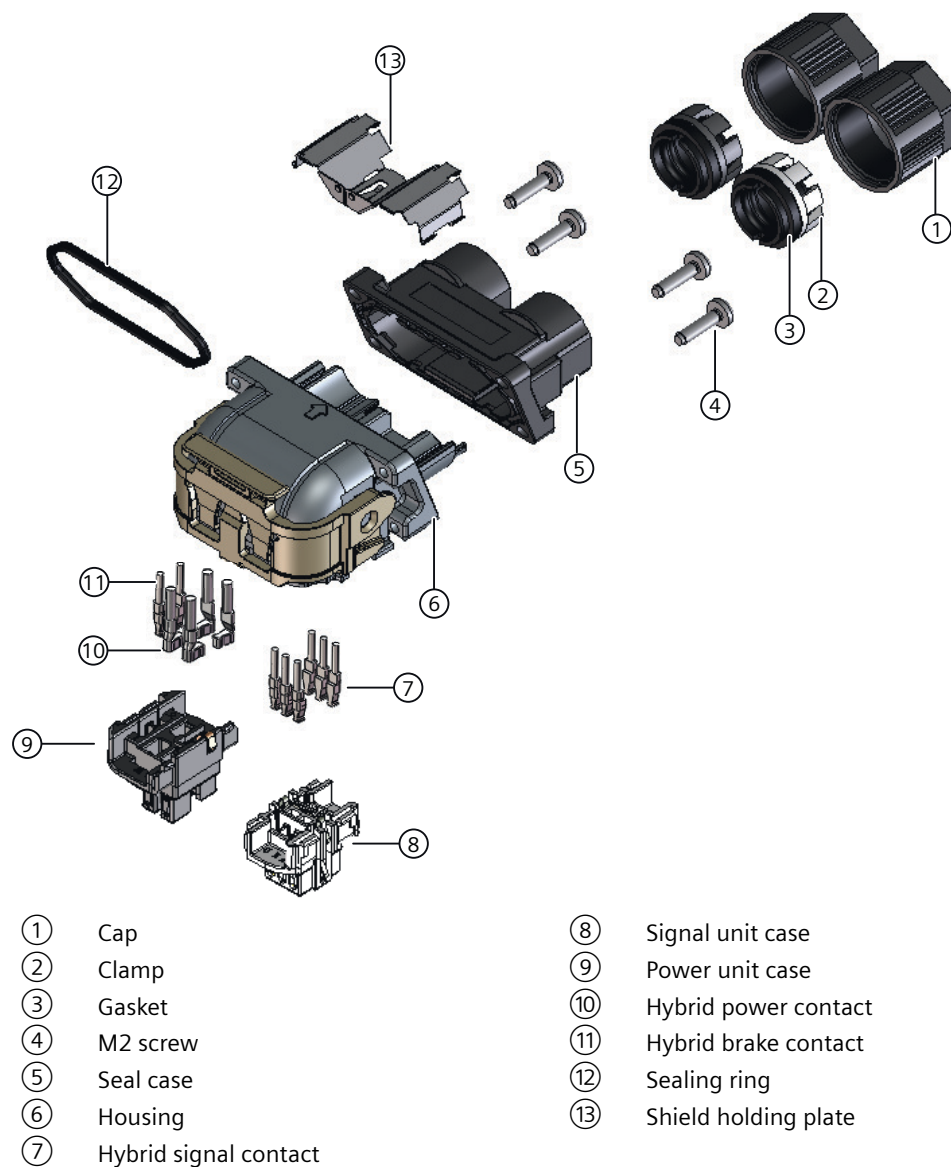


Figure A-3 Hybrid plug overview

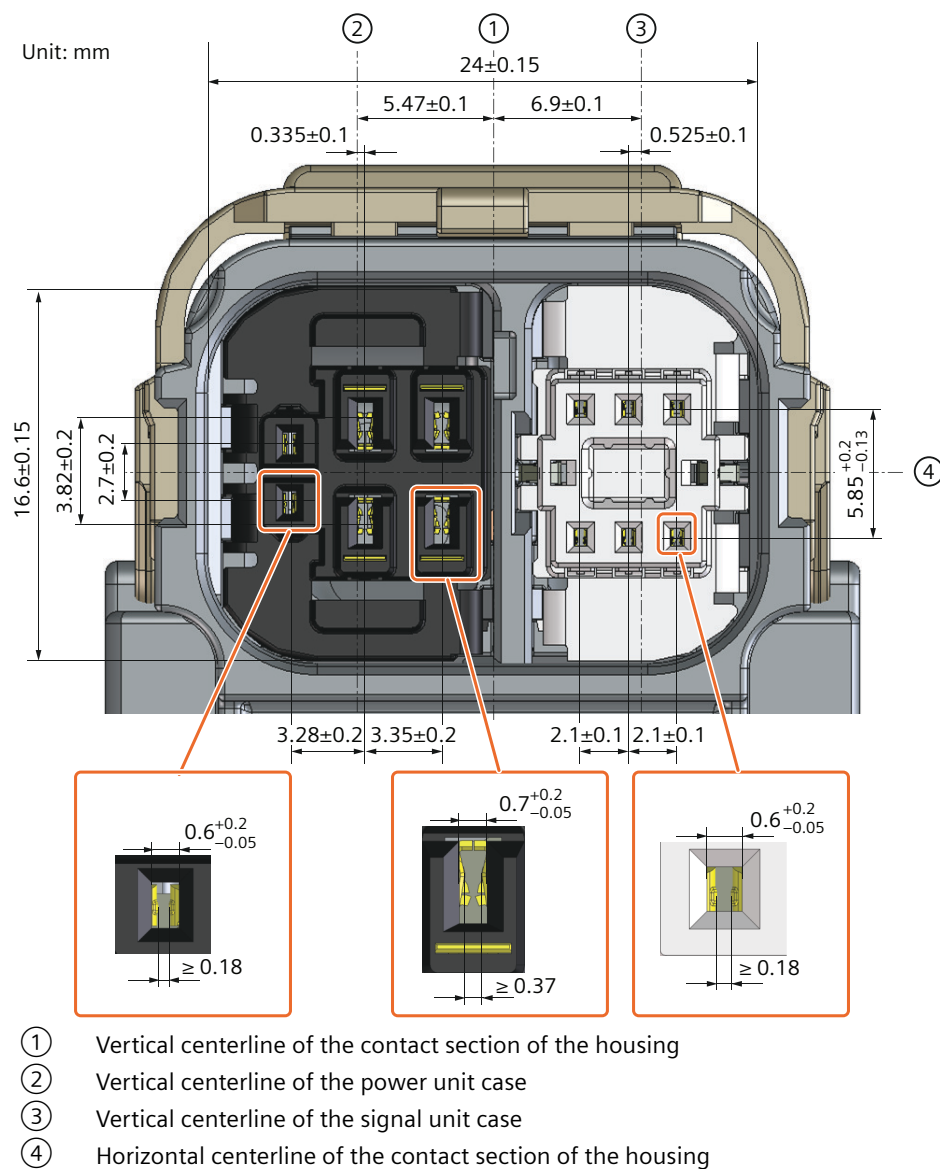
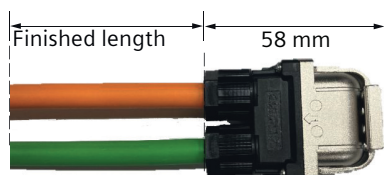


Figure A-4 Hybrid plug dimensions

Requirement

You have prepared the following items:

- Raw cables
Reserve 58 mm at the ends of the cables for termination into the hybrid connector.



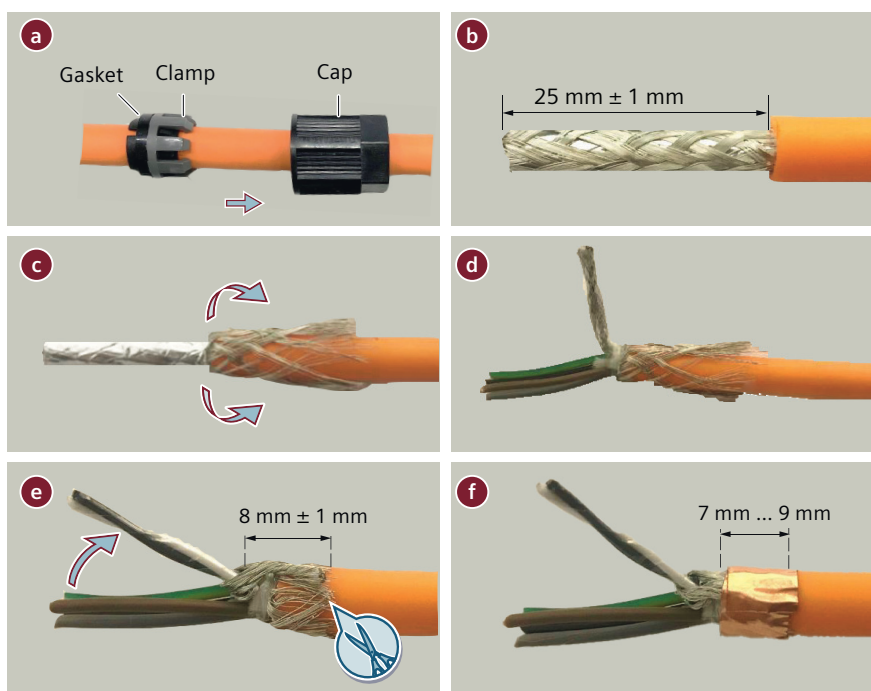
- Siemens hybrid plug

- Copper tapes
- Scissor
- Screwdriver
- Crimping tool

Procedure

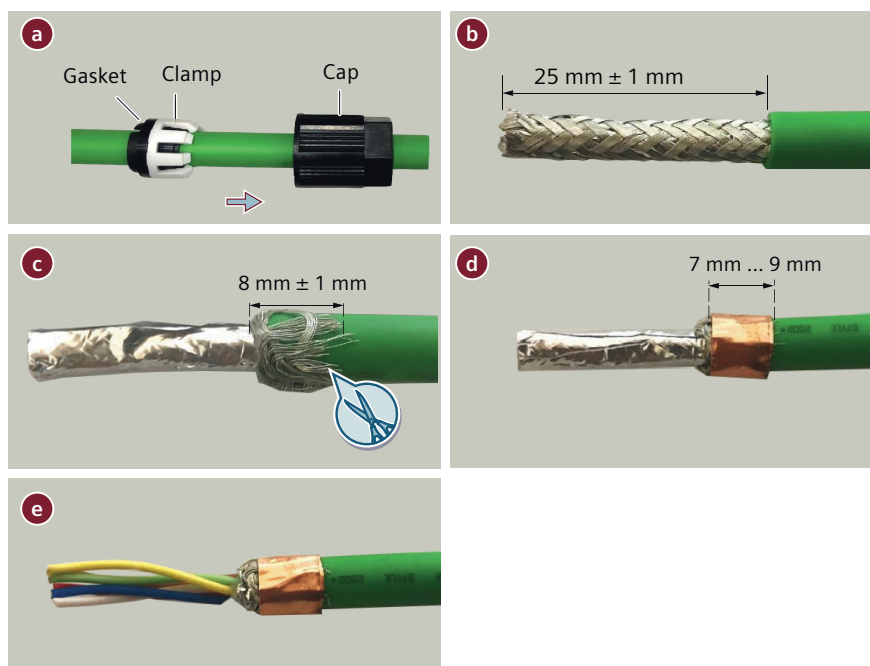
1. Prepare the power cable.

- Slide the cap, the clamp, and the gasket onto the power cable.
- Remove the outer sheath of the cables by $25\text{ mm} \pm 1\text{ mm}$.
- Loosen the braided shield of the cable and fold the shield backward over the cable sheath.
- Remove the foil shield. If the power cable is integrated with the brake conductors, additionally loosen the braided shield of the brake cable and fold its shield backward over the cable sheath.
- Cut the folded shield to make sure that the length of the folded shield is $8\text{ mm} \pm 1\text{ mm}$. Remove the debris to ensure cable insulation.
- Wrap around the shield 1.5 to 2 times with copper tapes.



2. Prepare the encoder cable.

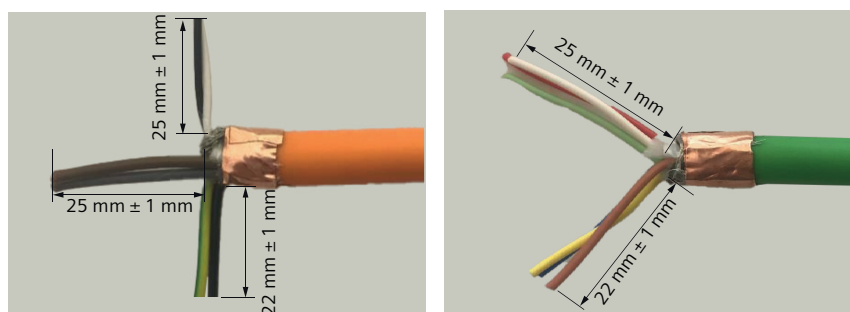
- Slide the cap, the clamp, and the gasket onto the encoder cable.
- Remove the outer sheath of the cables by $25\text{ mm} \pm 1\text{ mm}$.
- Loosen the braided shield of the cable and fold the shield backward over the cable sheath. Cut the folded shield to make sure that the length of the folded shield is $8\text{ mm} \pm 1\text{ mm}$. Remove the debris to ensure cable insulation.
- Wrap around the shield 1.5 to 2 times with copper tapes.
- Remove the foil shield.



3. Arrange and cut the conductors.
The conductor length required for termination into the hybrid plug varies depending on the variant of the hybrid plug and the contacts. Conductors that are close to the cable outlet should be cut 3 mm more.

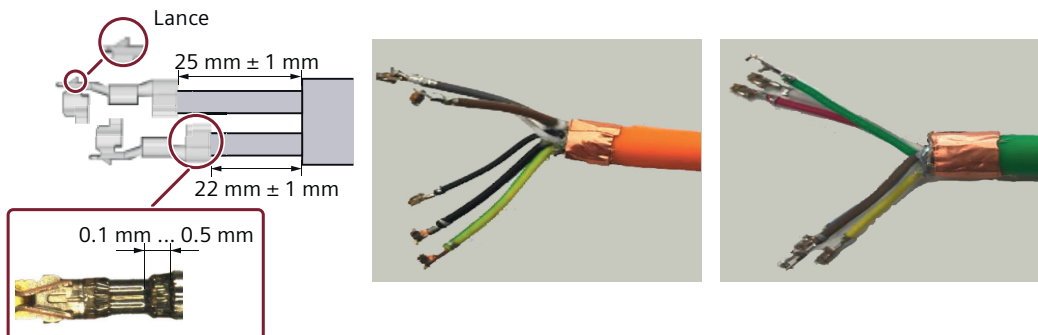
Conductor	Conductor length requirement (mm)	
	Drive-end variant	Non-drive end variant
Power conductor U	25 ± 1	22 ± 1
Power conductor V	22 ± 1	25 ± 1
Power conductor W	25 ± 1	22 ± 1
PE conductor	22 ± 1	25 ± 1
Brake conductor +	25 ± 1	25 ± 1
Brake conductor -	25 ± 1	25 ± 1
Signal conductors A, B, and C	22 ± 1	25 ± 1
Signal conductors D, E, and F	25 ± 1	22 ± 1

The following images show the conductor length requirement of the drive-end hybrid plug.

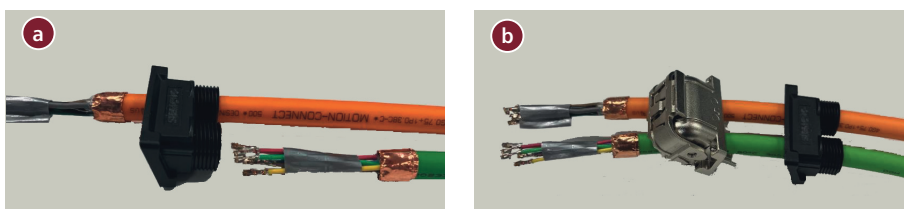


4. Strip the power and PE conductors by $2.4 \text{ mm} \pm 0.5 \text{ mm}$, and encoder and brake conductors by $2.2 \text{ mm} \pm 0.5 \text{ mm}$.

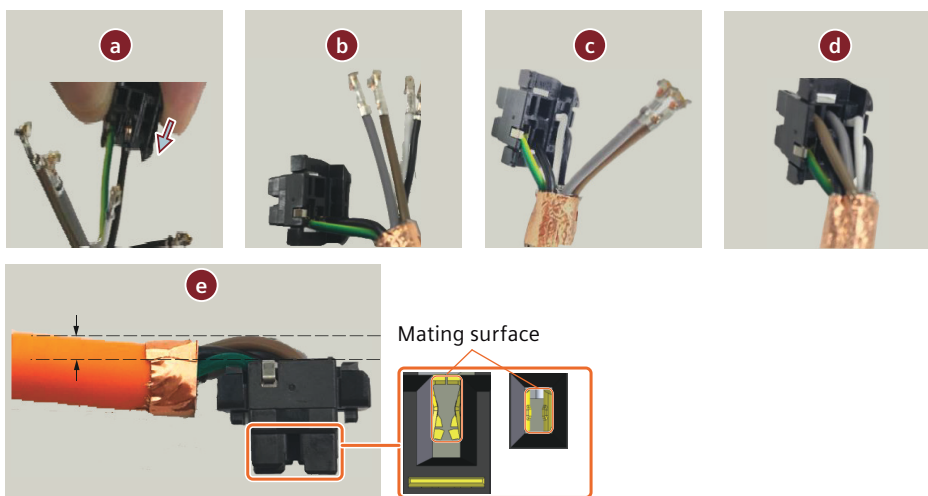
5. Crimp the contacts onto the conductors. Make sure that the lance side of the contacts face outwards.



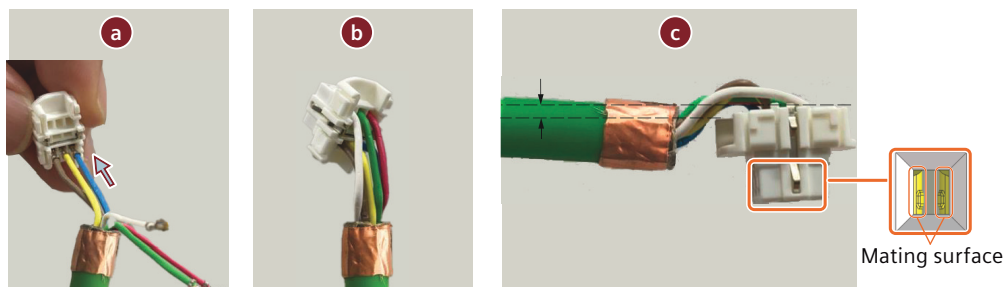
6. Slide the power and signal cables through the seal case and the housing. Avoid deforming the contact tips. Siemens recommends that you protect the conductors with a tape during the process.



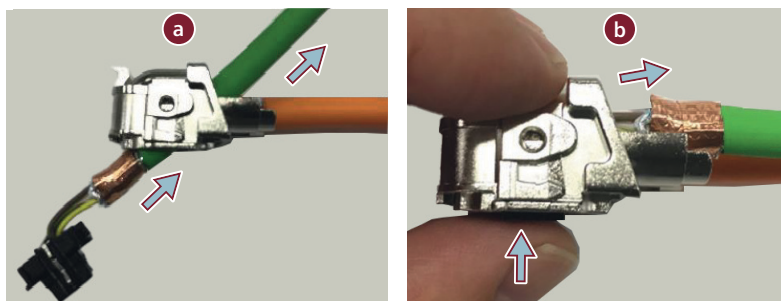
7. Insert the power and brake contacts into the power unit case and adjust the conductors to make sure that the cable does not rise up and that except for the mating surfaces, the contacts are enclosed in the unit case.



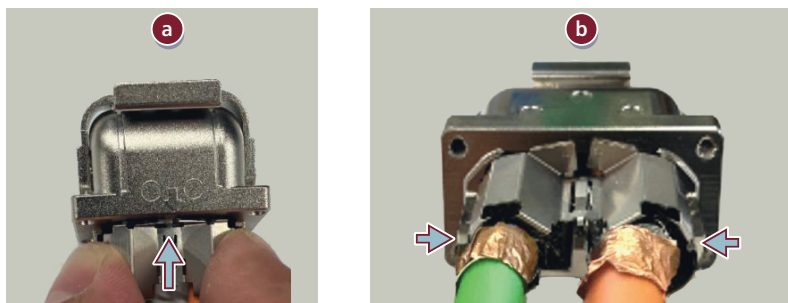
8. Insert the signal contacts into the signal unit case and adjust the conductors to make sure that the cable does not rise up and that except for the mating surfaces, the contacts are enclosed in the unit case.



9. Insert the signal and the power unit cases into the housing by pulling the cables back. Make sure that the signal and the power unit cases are latched to the housing.

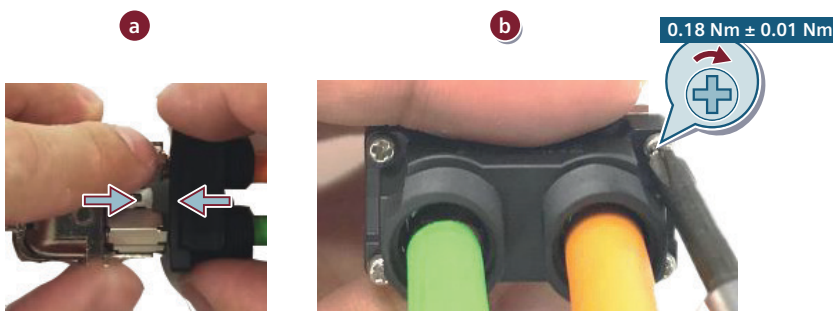


10. Insert the shield holding plate into the housing.

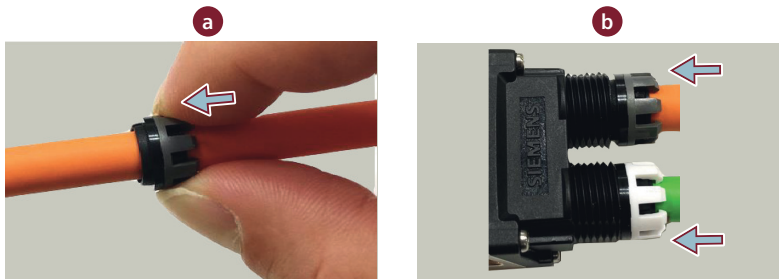


11. Assemble the housing and the seal case.

- Hold the shield holding plate and slide the seal case to the housing.
- Tighten the M2 screws with a tightening torque of $0.18 \text{ Nm} \pm 0.01 \text{ Nm}$.

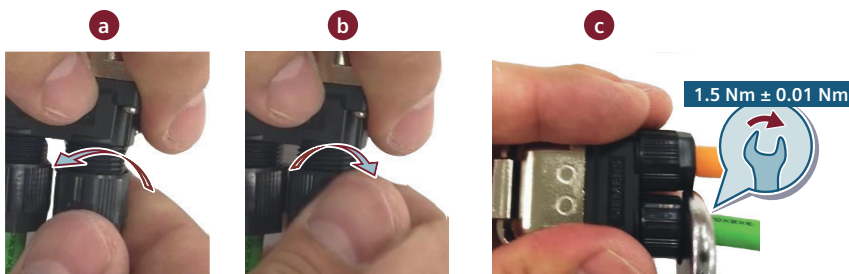


12. Insert the gaskets and the clamps to the seal case.



13. Tighten the caps.

- Rotate the caps in the counterclockwise direction to match the threads of the seal case and the caps.
- Rotate the caps in the clockwise direction.
- Tighten the caps by wrench with a tightening torque of $1.5 \text{ Nm} \pm 0.01 \text{ Nm}$.



More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 142)".

A.4.2.2 Disassembling the hybrid plug for 1FL2 motors, shaft heights 20, 30, and 40

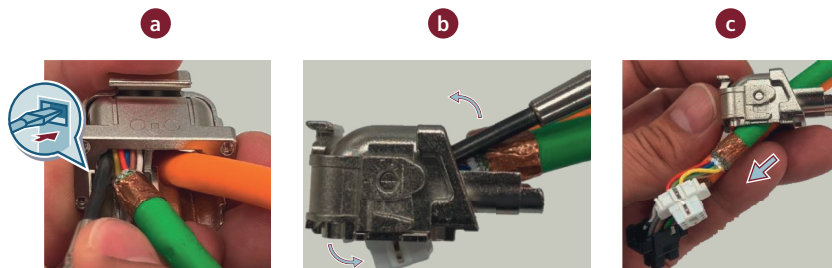
Requirement

You have prepared the following items:

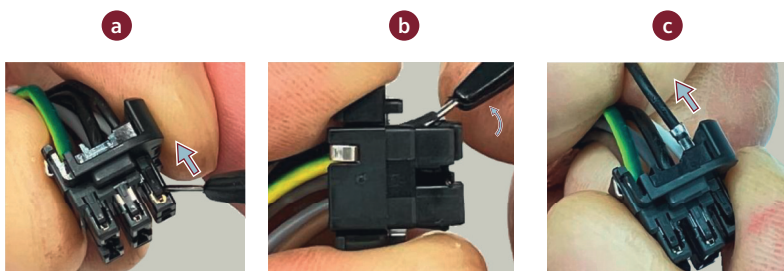
- Assembled Siemens hybrid plug
- Pin removal tool
- Screwdriver

Procedure

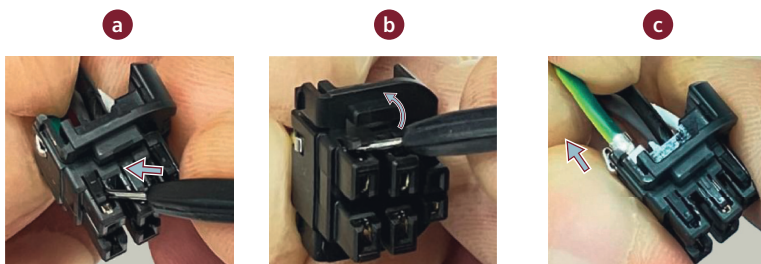
1. Remove the signal and the power unit cases from the housing.
 - Insert the screwdriver into the unit cases from the side of the cable outlet.
 - Press down the tip of the screwdriver to remove the unit cases from the housing.



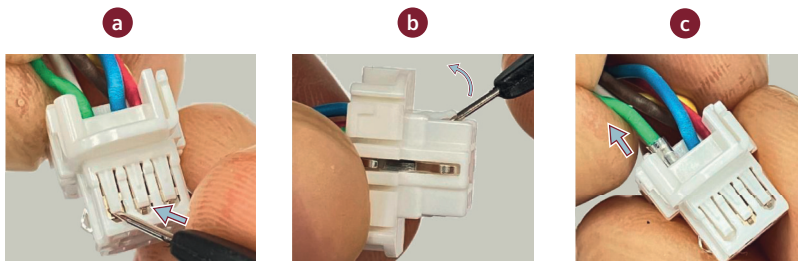
2. Remove the hybrid brake contacts from the power unit case.
 - Insert the tip of the pin removal tool into the gap between the contact and its latch.
 - Lift up the latch and pull out the contact.



3. Repeat Step 2 to remove the hybrid power contacts from the power unit case.



4. Repeat Step 2 to remove the hybrid signal contacts from the signal unit case.



Result

You have disassembled the hybrid plug.

Note

The removal of contacts deforms the signal unit case; therefore, the disassembled signal unit case cannot be reused.

Siemens does not recommend that you reuse the disassembled power unit case. Before reusing the power unit case, check to make sure that there is no deformation or damage.

A.4.2.3 Assembling connectors for 1FL2 motors, shaft heights 48 and 52

Overview

This section offers assembly instructions for power and encoder cables of the 1FL2 motors shaft heights 48 and 52.

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M17 connector.

Procedure

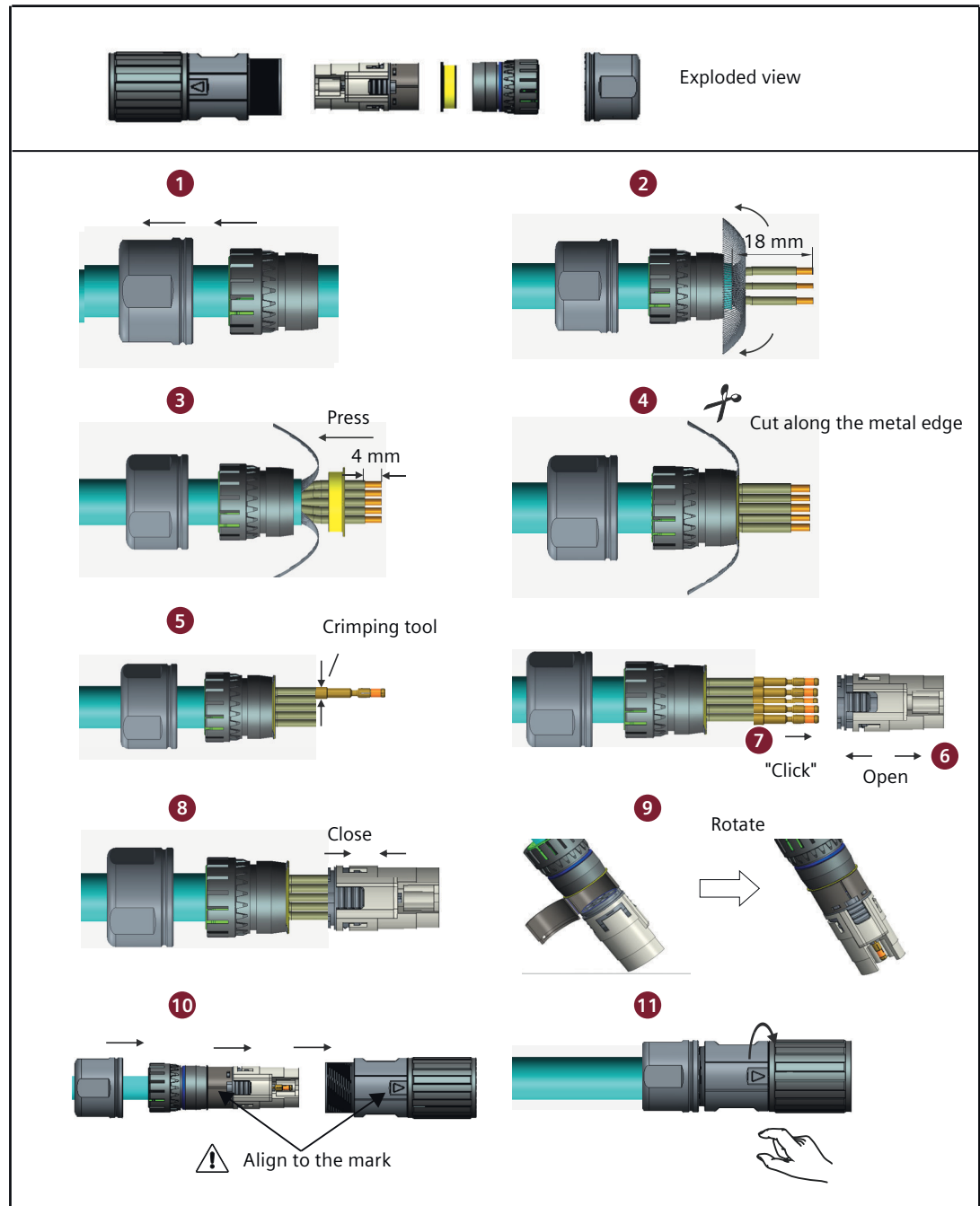


Figure A-5 Assembling the power or encoder cable of the 1FL2 motor shaft height 48 or 52

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 142)".

A.4.2.4 Assembling connectors for 1FL2 motors, shaft heights 45, 65 (rated at 2000 r/min), and 90 (rated at 2000 r/min)

Assembling the power connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M23 connector.

Procedure

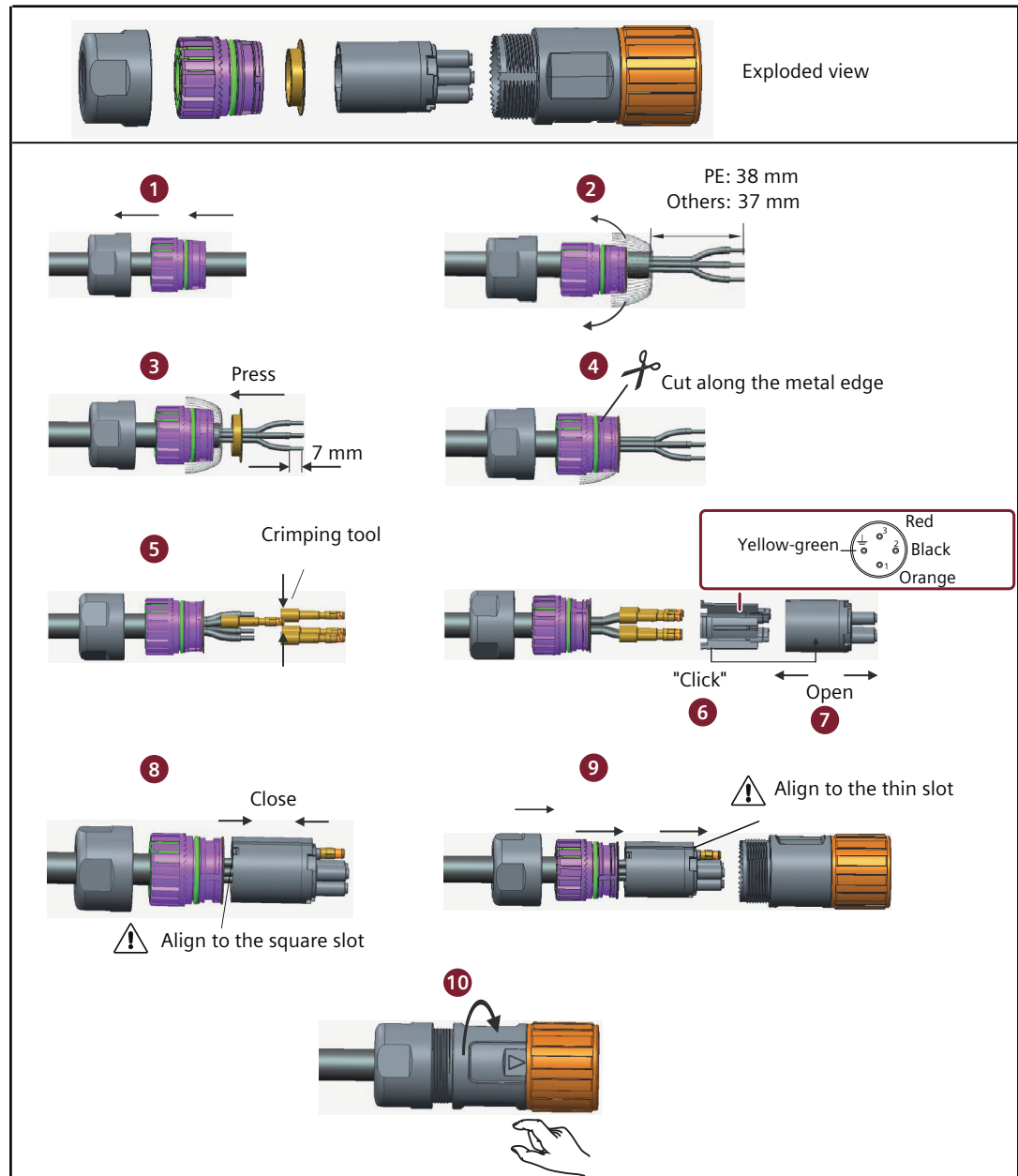


Figure A-6 Assembling the power cable of the 1FL2 motor shaft height 45, 65, or 90

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 142)".

Assembling the encoder connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M17 connector.

Procedure

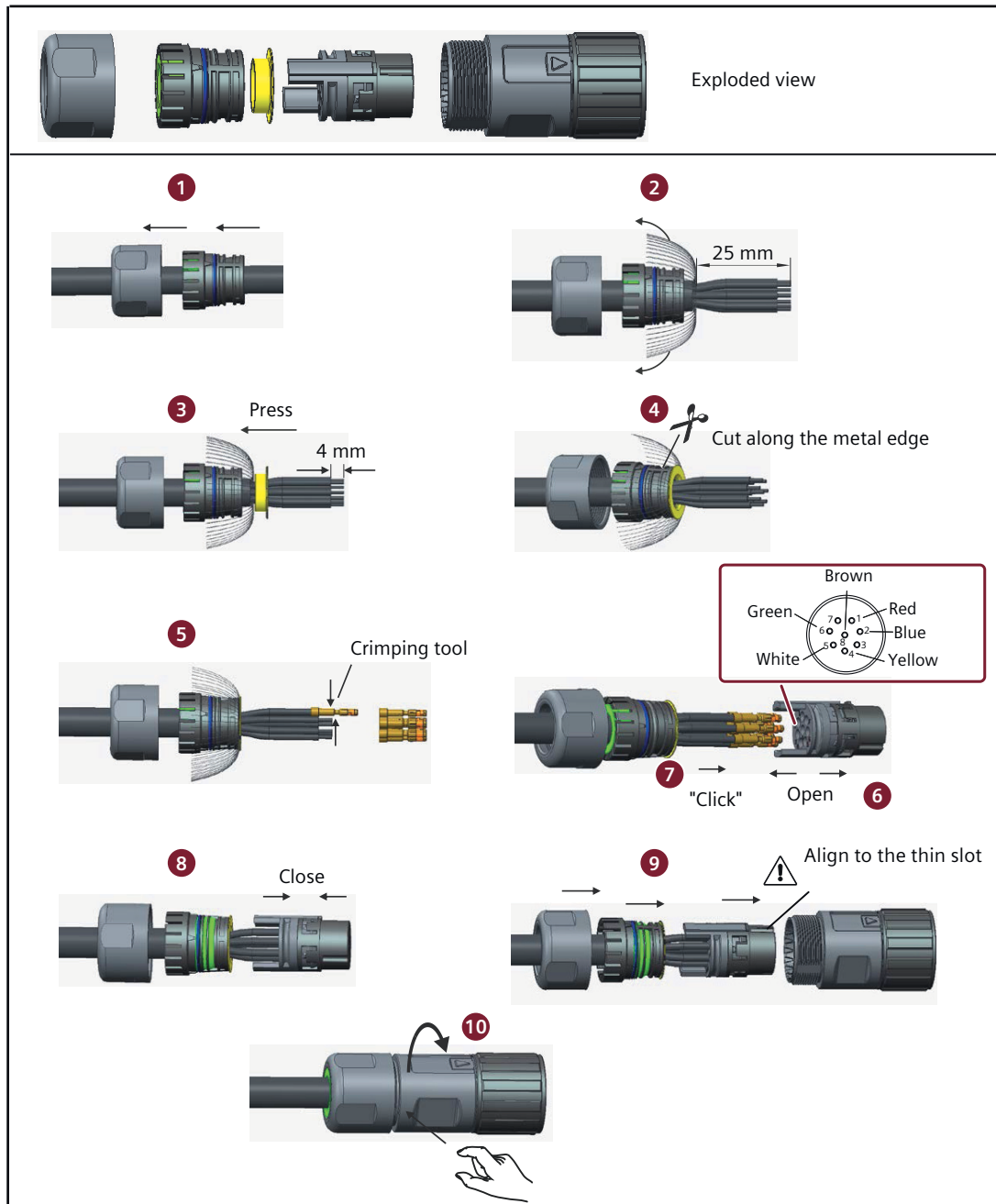


Figure A-7 Assembling the encoder cable of the 1FL2 motor shaft height 45, 65, or 90

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 142)".

Assembling the motor holding brake connector**Requirement**

You have prepared appropriate tools, raw cables, and the Siemens M17 connector.

Procedure

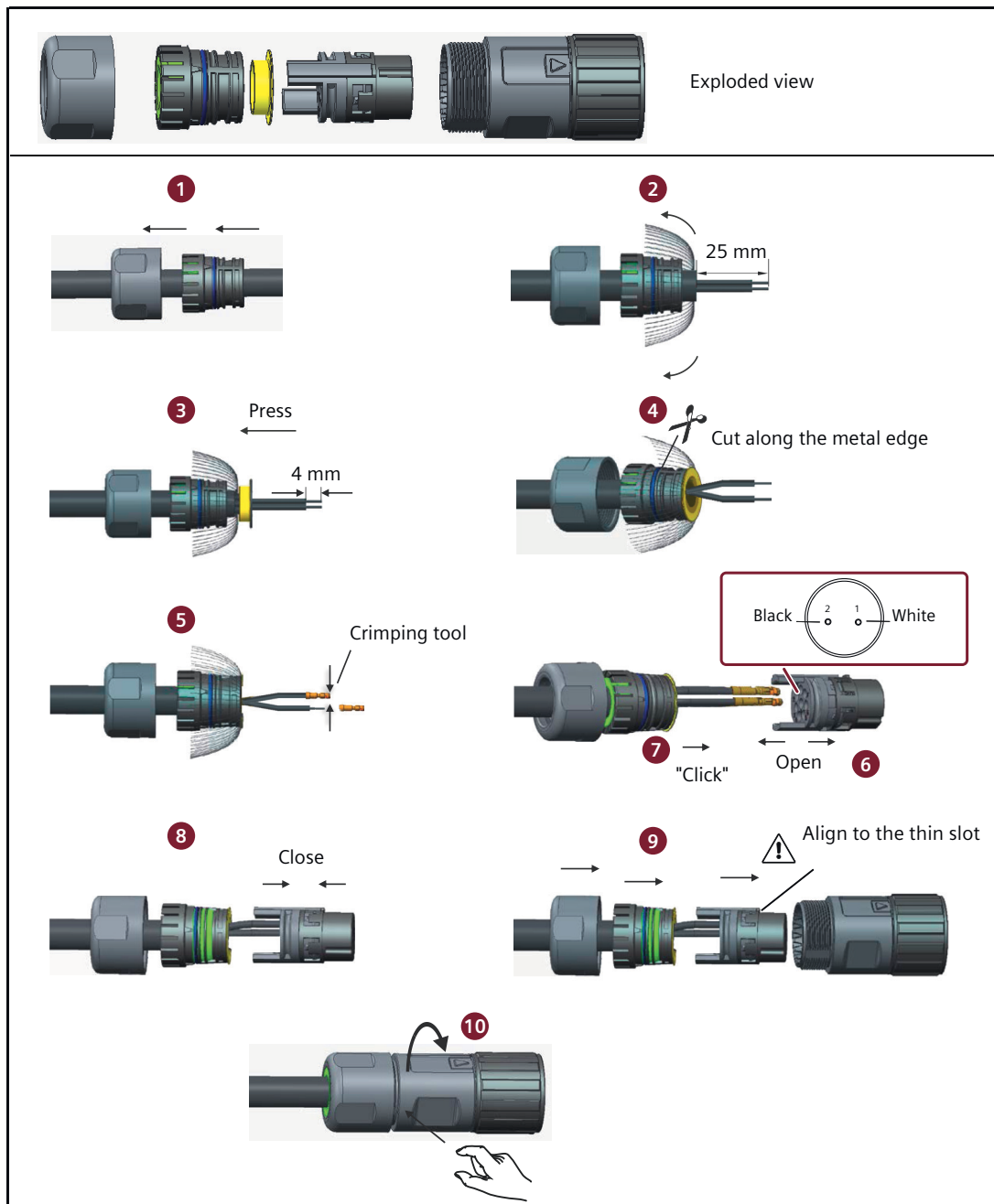


Figure A-8 Assembling the holding brake cable the 1FL2 motor shaft height 45, 65, or 90

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 142)".

A.4.2.5 Assembling connectors for 1FL2 motors, shaft heights 65 (rated at 1500 r/min) and 90 (rated at 1500 r/min)

Assembling the power connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M23 connector.

Procedure

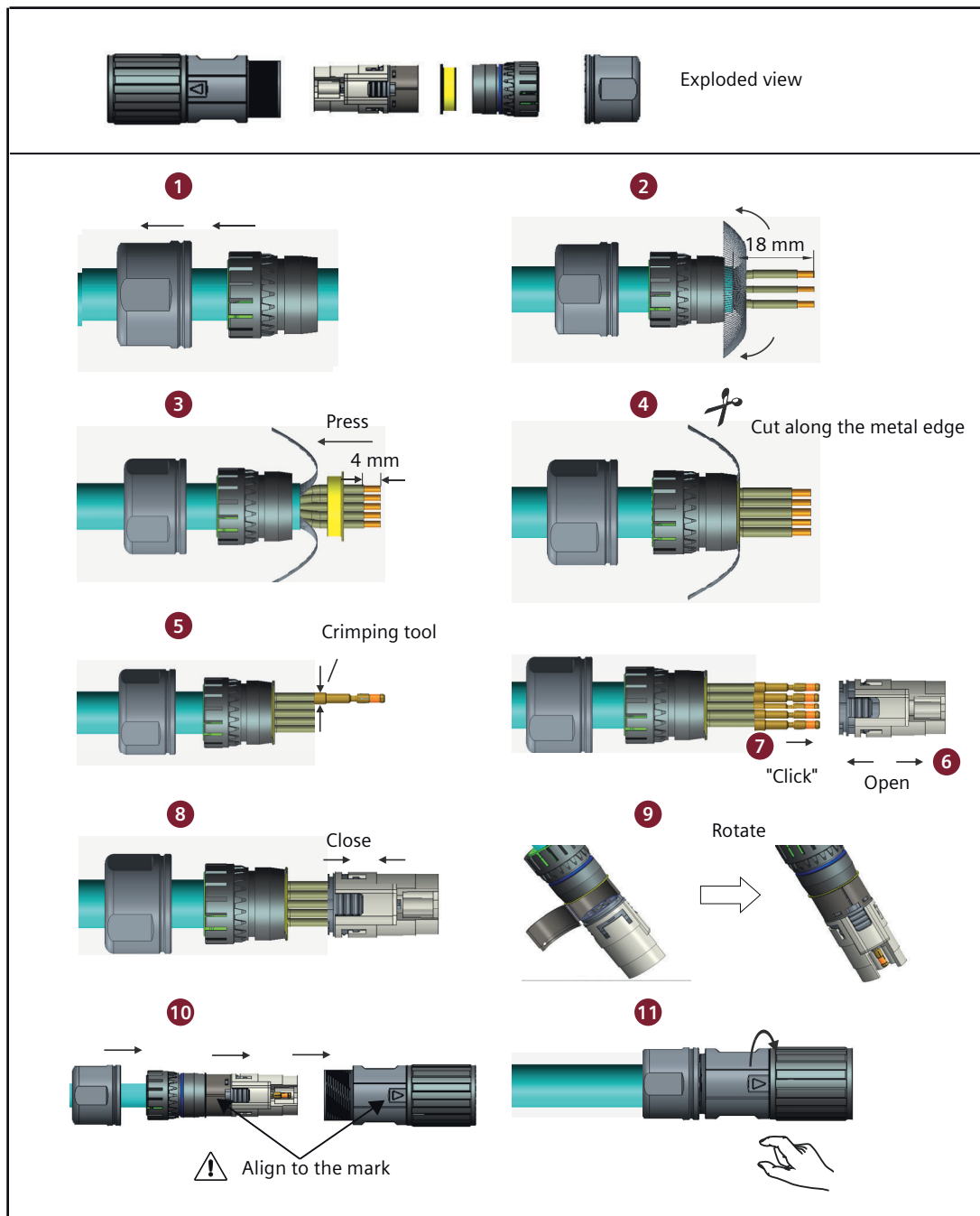


Figure A-9 Assembling the power cable of the 1FL2 motor shaft height 65 or 90 (rated at 1500 r/min)

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 142)".

Assembling the encoder connector

Requirement

You have prepared appropriate tools, raw cables, and the Siemens M17 connector.

Procedure

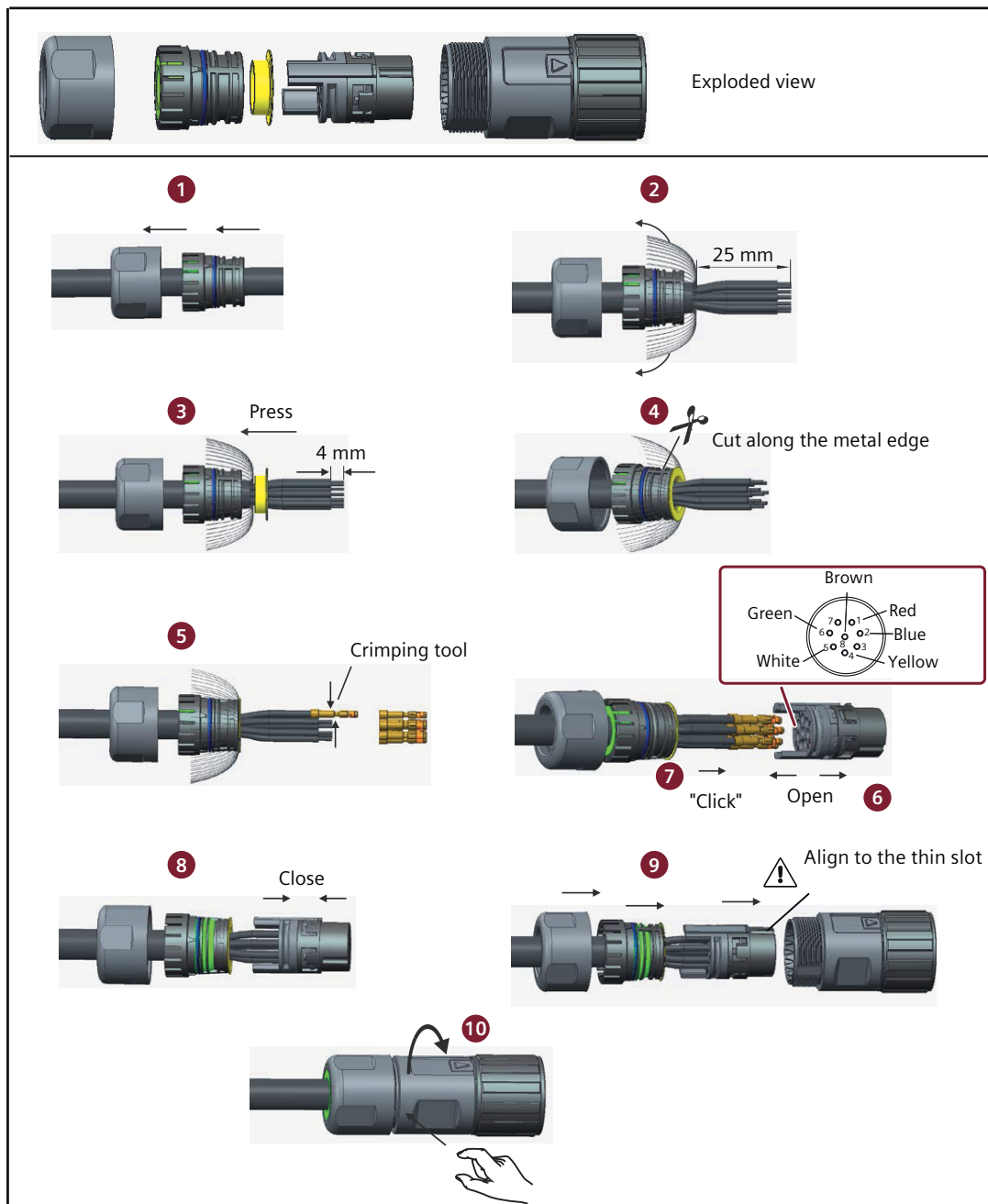


Figure A-10 Assembling the encoder cable of the 1FL2 motor shaft height 45, 65, or 90

More information

For more information about connecting the converter and the motor, see Section "Connecting the motor (Page 142)".

A.5 Motor selection

A.5.1 Selection procedure

Overview

The following section shows the principal steps for selecting a suitable motor. Then you can calculate the moment of inertia of your system and the braking energy accordingly.

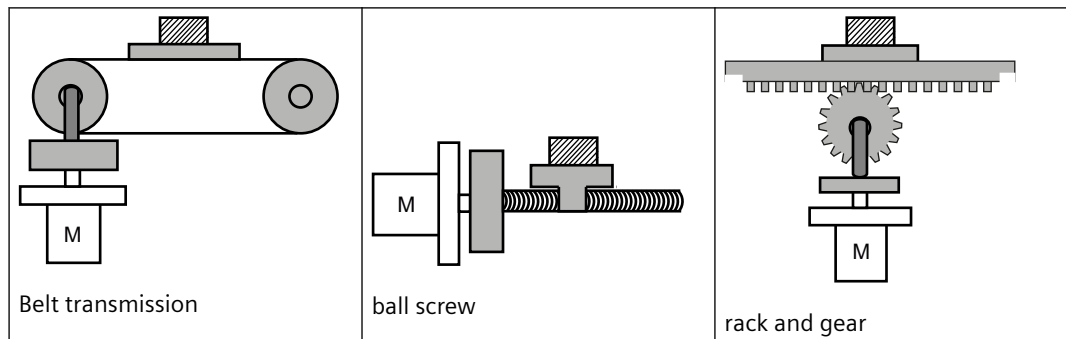
Requirement

None

Procedure

Proceed as follows to select a motor:

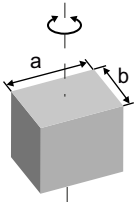
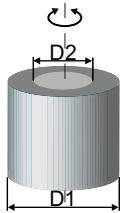
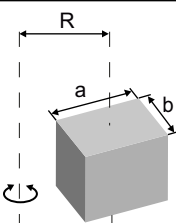
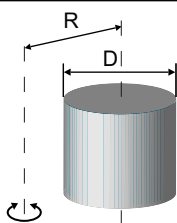
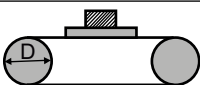
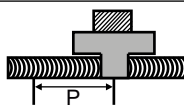
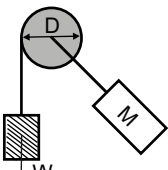
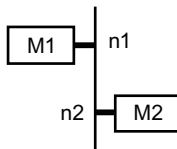
1. Determine the mechanism type as well as the detailed data of the related mechanical parts, such as ball screw lead, diameter, lead, and gear diameter. Three mechanism types are shown below:



2. Determine the operation pattern including such parameters as acceleration time (t_a), constant motion time (t_u), deceleration time (t_d), stopping time (t_s), cycle time (t_c), and travel distance (L).
3. Calculate load inertia and inertia ratio.
The inertia ratio can be obtained by dividing the load inertia by the rotor inertia of the selected motor. The unit of inertia is $\times 10^{-4} \text{ kg} \cdot \text{m}^2$.
4. Calculate the speed.
Calculate the speed according to the travel distance, acceleration time, deceleration time, and constant motion time.

5. Calculate the torque.
Calculate the torque according to the load inertia, acceleration time, deceleration time, and constant motion time.
6. Select the motor.
Select the motor that matches the data in step 3 to step 5.

Typical load inertia equations

Mechanism	Equation	Mechanism	Equation
 <p>Axis of rotation on center</p>	$J = \frac{W}{12} (a^2 + b^2)$ <p>W: Mass (kg) a: Length (m) b: Width (m)</p>	 <p>Axis of rotation on center</p>	$J = \frac{W}{8} (D_1^2 + D_2^2)$ <p>W: Mass (kg) D₁: External diameter (m) D₂: Internal diameter (m)</p>
 <p>Axis of rotation off center</p>	$J = W \cdot \left(\frac{a^2 + b^2}{3} + R^2 \right)$ <p>W: Mass (kg) a: Length (m) b: Width (m) R: Rotational diameter (m)</p>	 <p>Axis of rotation off center</p>	$J = \frac{W}{8} (D^2 + 8R^2)$ <p>W: Mass (kg) D: Workpiece diameter (m) R: Rotational diameter (m)</p>
 <p>Conveyor</p>	$J = \frac{W \cdot D^2}{4}$ <p>W: Mass (kg) D: Pulley wheel diameter (m)</p>	 <p>Ball screw</p>	$J = \frac{W \cdot P^2}{4\pi^2} + J_b$ <p>W: Mass (kg) P: Lead (m) J_b: Ball screw inertia (kg·m²)</p>
 <p>Object hung with pulley</p>	$J = W \cdot \left(\frac{D}{2} \right)^2 + J_p$ <p>W: Mass (kg) D: Pulley wheel diameter (m) J_p: Pulley inertia (kg·m²)</p>	 <p>Reducer</p>	$J = J_1 \cdot \frac{n_1^2}{n_2^2} + J_2$ <p>W: Mass (kg) n₁/n₂: Speed of each motor (rpm) J₁/J₂: Inertia of each motor (kg·m²)</p>

A.5.2 Selection examples

Description

This section uses a ball screw mechanism as an example to illustrate the motor selection procedure.

Exemplary data

The following table lists the data related to the ball screw mechanism and operation pattern.

Workpiece weight	W	10 kg
Material density of the ball screw	ρ	$7.9 \times 10^3 \text{ kg/m}^3$
Ball screw length	B_l	0.5 m
Ball screw diameter	B_d	0.02 m
Ball screw pitch	B_p	0.02 m
Mechanical efficiency	B_η	0.9
Coupler inertia (refer to the supplier's product catalog)	J_c	$20 \times 10^{-6} \text{ kgm}^2$
Acceleration time	t_a	0.15 s
Constant motion time	t_u	0.5 s
Deceleration time	t_d	0.15 s
Cycle time	t_c	2 s
Travel distance	L	0.5 m
Gravitational acceleration	g	9.81 m/s^2
Frictional coefficient	μ	0.025

Calculating velocity

Maximum traveling velocity:

$$V_{max} = \frac{2 \cdot L}{t_a + 2 \cdot t_u + t_d} = \frac{2 \times 0.5}{0.15 + 2 \times 0.5 + 0.15} = 0.769 \text{ m/s}$$

Calculating forces, pitch angle and friction angle

Frictional force:

$$F_R = \mu \cdot W \cdot g = 0.025 \times 10 \times 9.81 = 2.45 \text{ N}$$

Accelerating force/decelerating force:

$$F_a = F_d = W \cdot \frac{V_{max}}{t_a} = 10 \times \frac{0.769}{0.15} = 51.3 \text{ N}$$

Pitch angle of the ball screw:

$$\alpha_B = \arctan \frac{B_p}{\pi \cdot B_d} = \arctan \frac{0.02}{3.14 \times 0.02} = 0.308 \text{ rad}$$

Friction angle of the ball screw:

$$\beta = \arctan \frac{B_p}{\pi \cdot B_d \cdot B_\eta} - \alpha_B = \arctan \frac{0.02}{3.14 \times 0.02 \times 0.9} - 0.308 = 0.0318 \text{ rad}$$

Calculating torques for the ball screw and the coupling when accelerating and decelerating

Angular velocity of the ball screw at $V_{\max}$:

$$\omega_{\max B} = \frac{2 \cdot \pi \cdot V_{\max}}{B_p} = \frac{2 \times 3.14 \times 0.769}{0.02} = 241.538 \text{ s}^{-1}$$

Maximum rotating velocity:

$$n_{\text{motor max}} = \frac{\omega_{\max B} \cdot 60}{2 \cdot \pi} = \frac{241.538 \times 60}{2 \times 3.14} = 2308 \text{ rpm}$$

Angular acceleration of the ball screw:

$$\alpha_{aB} = \frac{\omega_{\max B}}{t_a} = \frac{241.538}{0.15} = 1610.26 \text{ s}^{-2}$$

Ball screw weight:

$$B_W = \rho \cdot \pi \cdot \left(\frac{B_d}{2}\right)^2 \cdot B_l = 7.9 \times 10^3 \times 3.14 \times \left(\frac{0.02}{2}\right)^2 \times 0.5 = 1.24 \text{ kg}$$

Moment of inertia of the ball screw:

$$J_B = \frac{B_W}{8} \cdot B_d^2 = \frac{1.24}{8} \times 0.02^2 = 0.00006 \text{ kgm}^2$$

Moment of inertia of the ball screw + coupling:

$$J_{B+c} = J_B + J_c = 0.00006 + 0.00002 = 0.00008 \text{ kgm}^2$$

Accelerating torque and decelerating torque for the ball screw + coupling:

$$M_{aB+c} = M_{dB+c} = J_{B+c} \cdot \alpha_{aB} = 0.00008 \times 1610.26 = 0.13 \text{ Nm}$$

Preselecting the motor

Based on the calculated torques, if we select the 1FL2203-4AG motor:

$$n_n = 3000 \text{ rpm}, M_n = 1.27 \text{ Nm}, J_{\text{motor}} = 0.038 \times 10^{-3} \text{ kgm}^2$$

Then the inertia ratio:

$$\frac{J_{\text{load}}}{J_{\text{motor}}} = \frac{J_{B+c} + J_W}{J_{\text{motor}}} = \frac{0.00008 + 0.0001}{0.038 \times 10^{-3}} = 4.74$$

Wherein, J_W is the moment of inertia of the workpiece:

$$J_W = W \cdot \frac{B_p^2}{4 \cdot \pi^2} = 10 \times \frac{0.02^2}{4 \times 3.14^2} = 0.0001 \text{ kgm}^2$$

Calculating the motor torques during the constant motion phase

$$M_{motor} = F_R \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta) = 2.45 \times \frac{0.02}{2} \times \tan(0.308 + 0.0318) = 0.009 \text{ Nm}$$

Calculating the motor torques when accelerating and decelerating

$$M_{amotor} = M_{dmotor} = J_{motor} \cdot \alpha_{aB} = 0.038 \times 10^{-3} \times 1610.26 = 0.06 \text{ Nm}$$

Accelerating torque and decelerating torque for the motor:

Motor torque when accelerating:

$$\begin{aligned} M_{motor} &= M_{amotor} + M_{aB+c} + (F_a + F_R) \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta) \\ &= 0.06 + 0.13 + (51.3 + 2.45) \times \frac{0.02}{2} \times \tan(0.308 + 0.0318) = 0.383 \text{ Nm} \end{aligned}$$

Motor torque when decelerating:

$$\begin{aligned} M_{motor} &= -M_{dmotor} - M_{dB+c} + (-F_a + F_R) \cdot \frac{B_d}{2} \cdot \tan(\alpha_B + \beta \cdot \text{sign}(+)^*) \\ &= -0.06 - 0.13 + (-51.3 + 2.45) \times \frac{0.02}{2} \times \tan(0.308 - 0.0318) = -0.332 \text{ Nm} \end{aligned}$$

* If the expression in brackets has a negative sign, the sign of β changes to minus.

Final selection

According to the above calculated speed, torque, and inertia ratio, 1FL2203-4AG motor is suitable.

A.6 Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30

Overview

The IP65 degree of protection kit can be used by the end customer either to replace the shaft sealing ring or to upgrade the degree of protection from IP54 to IP65.

It consists of the following components:

A.6 Replacement instructions for shaft sealing ring on 1FL2 motors SH20 and SH30

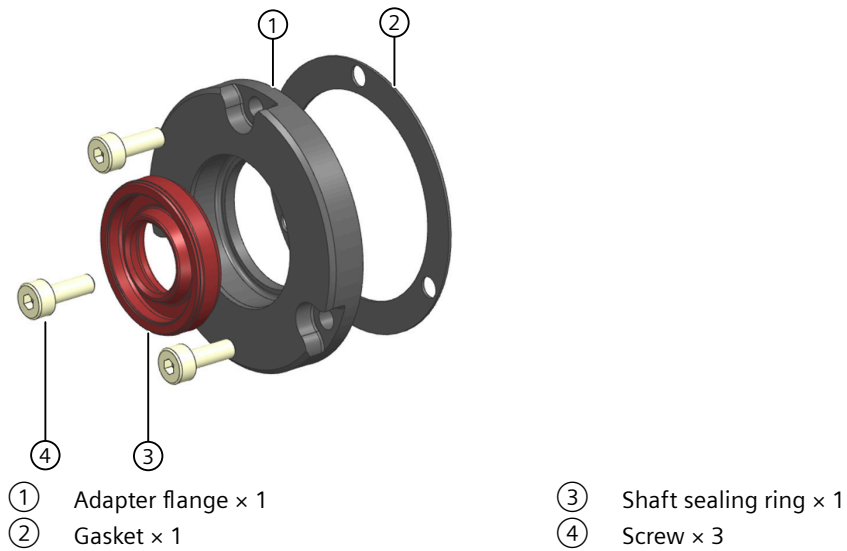


Figure A-11 IP65 degree of protection kit of SH20

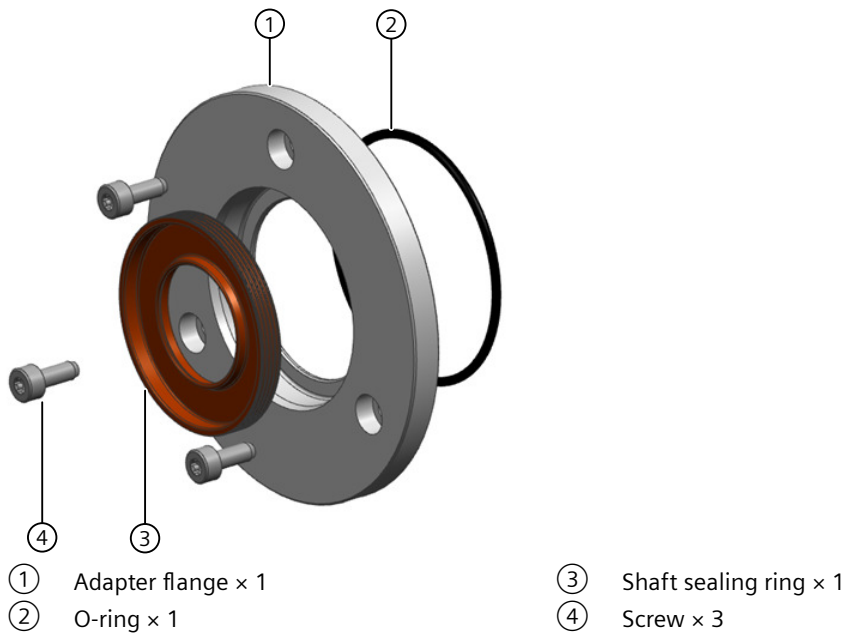


Figure A-12 IP65 degree of protection kit of SH30

Requirement

You have prepared appropriate tools and the IP65 degree of protection kit.

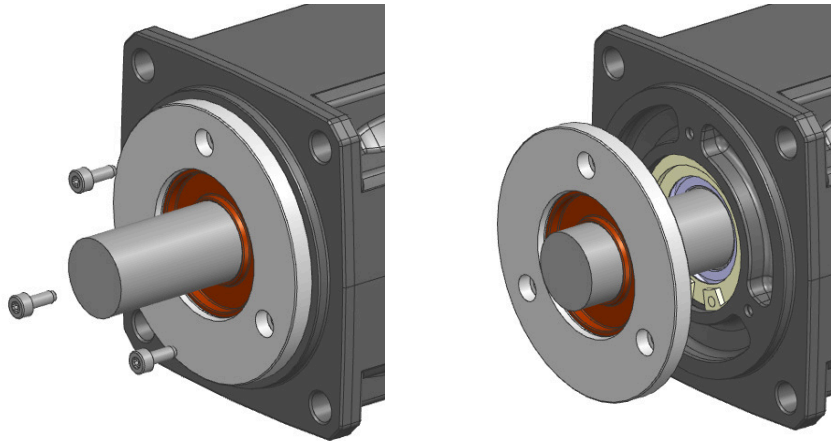
Procedure

The following instructions take 1FL2 motors SH30 as an example.

Disassembly

To disassemble the old components, proceed as follows:

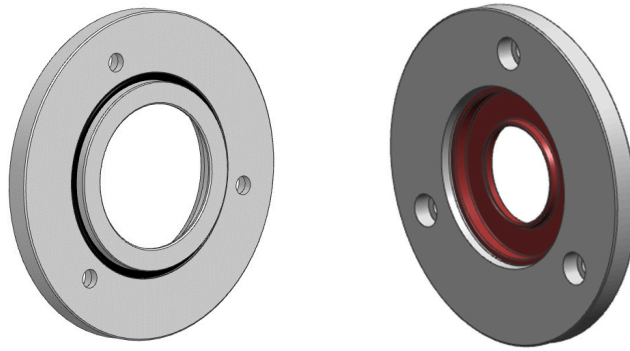
1. Remove three fixing screws of the adapter flange.
2. Take apart the adapter flange with the shaft sealing ring pressed.



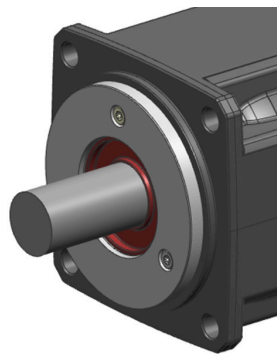
Assembly

To assemble the new components, proceed as follows:

1. Insert an O-ring in the groove of the adapter flange.
Make sure that the O-ring is not clamped between DE end shield and adapter flange.



2. After applying grease onto the sealing area, fix the adapter flange with the shaft sealing ring already pressed on with three screws.



Get more information

SINAMICS:
www.siemens.com/sinamics

SiePortal:
www.siemens.com/sieportal